Draft

WESTSIDE
SAC IRWM

Westside Sacramento
Integrated Regional Water Management Plan

PHOTOS COURTESY OF NAPA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, SOLANO COUNTY WATER AGENCY, US BUREAU OF RECLAMATION

Kennedy/Jenks Consultants

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Executive Summary

This *Integrated Regional Water Management Plan* (IRWM Plan) defines a clear vision for the management of water resources in the Westside Sacramento Region (Region) and highlights important actions needed to help accomplish that vision through the year 2035. This Westside IRWM Plan complies with the *Integrated Regional Water Management Guidelines for Proposition 84 and 1E* published by the California Department of Water Resources (DWR) in November 2012. Financial assistance from DWR and contributions from the Regional Water Management Group funded the development of this Plan.

Proposition 84 identified watershed-based funding areas throughout the state, with the Westside Region being a part of the Sacramento River Funding Area. Each Funding Area is allocated, based on population, a portion of the $1 billion approved by the voters under Proposition 84 in 2006. Predecessor bonds, including Propositions 13 and 50, also provided incentives for development of IRWM Plans. DWR designed the IRWM planning process to be consistent with the *California Water Plan*, a statewide water resources planning document updated periodically, and DWR intends that IRWM Plans and future updates of the *California Water Plan* be integrated further in the future.

1.1 Introduction (Section 1)

The information contained within this IRWM Plan provides an opportunity for the more than 70 water supply, land use management, flood management, and ecosystem-focused organizations operating within the Region to accomplish more than they could accomplish individually. The array of goals, objectives, selected resource management strategies, and high-priority projects represent a collective view of how to improve integrated water management throughout the Region. The Plan establishes a clear path forward both to increase the collective understanding of integrated water management throughout the Region and to respond collaboratively to the challenges of managing water and associated natural resources. If this integrated planning effort has been successful, this IRWM Plan will be a dynamic and useful planning tool for the Region. While it does not provide discretionary approval for any given project, it does provide a framework to improve understanding and take high-priority actions to address the major water-related challenges and opportunities facing the Region through 2035.

To represent the Region, four agencies and an association of agencies formed the Regional Water Management Group (RWMG) through a *Memorandum of Understanding* (MOU). The RWMG includes Lake County Watershed Protection District (WPD), Napa County Flood Control and Water Conservation District (FC&WCD), Colusa County Resource Conservation District (RCD), Solano County Water Agency (SCWA), and Water Resource Association (WRA) of Yolo County. The Westside RWMG satisfies the requirements of such an entity per the California Water Code (CWC) Section 10539. The participating agencies and association joined together to develop this IRWM Plan that:

- Foster[s] coordination, collaboration, and communication among entities responsible for water-related issues and interested stakeholders to achieve greater efficiencies, provide for integration of projects, enhance public services, and build public support for vital projects; and
- [Facilitates] regional cooperation in providing water-supply reliability, water recycling, water conservation, water-quality improvement, stormwater capture and management, flood management, wetlands enhancement and creation, and environmental and habitat protection and improvements, and other elements…

The RWMG appointed a Regional Coordinating Committee (CC) to guide development of and support implementation of the Plan. The CC consists of one staff representative and an alternate appointed from each of the agencies and association that make up the RWMG.

The collective vision presented in this Plan aims to address the major challenges and opportunities related to managing water and associated natural resources within the Region. The numerous and complex challenges and opportunities addressed in this Plan are captured in the following primary focal points:

- Continue to provide safe and reliable water supplies for a variety of uses.
- Improve habitat and ecosystem health (including the monumental challenge of addressing effects caused by numerous invasive species).
- Manage a wide array of risks including public health, fire, flood, and potential disruptions to institutional services.
- Sustain and modernize water supply, water quality, and flood management infrastructure.
- Address many significant and long-standing water quality concerns.
- Foster the reasonable use of water and associated natural resources within the Region through the adoption of evolving technologies and best management practices.
- Further the collective understanding of watershed functions and groundwater basins.
- Improve education and awareness among citizens about the importance of sustainable water and natural resources management and the crucial roles citizens play.
- Improve opportunities for water-based recreation.

1.2 The Westside Region (Section 2)

The Westside Region is vast and encompasses approximately 3,000 square miles, from the Coastal mountain range in the west to the Sacramento River and Sacramento-San Joaquin River Delta on the south and east. The Region includes all of Yolo County and portions of Lake, Napa, Solano, and Colusa Counties that are within the Cache Creek and Putah Creek watersheds. Major communities within the Region include the cities of Clearlake, Davis, Dixon, Lakeport, Rio Vista, Vacaville, West Sacramento, and Woodland. The Westside Region includes the two principal watersheds of Putah and Cache Creeks and other areas of land in the northern portion of Yolo and Solano Counties, as shown on Figure ES-1 on the following page. Figure ES-1 also shows the 3 Planning Areas delineated for the purposes of technical analysis. This Region includes areas that share many common water supply sources and groundwater basin interconnections including the following features:

- Surface water bodies: Clear Lake, Lake Berryessa, and Indian Valley Reservoir; and
- Major water-related infrastructure: Monticello Dam, Indian Valley Dam, Cache Creek Dam, and Capay Diversion Dam.

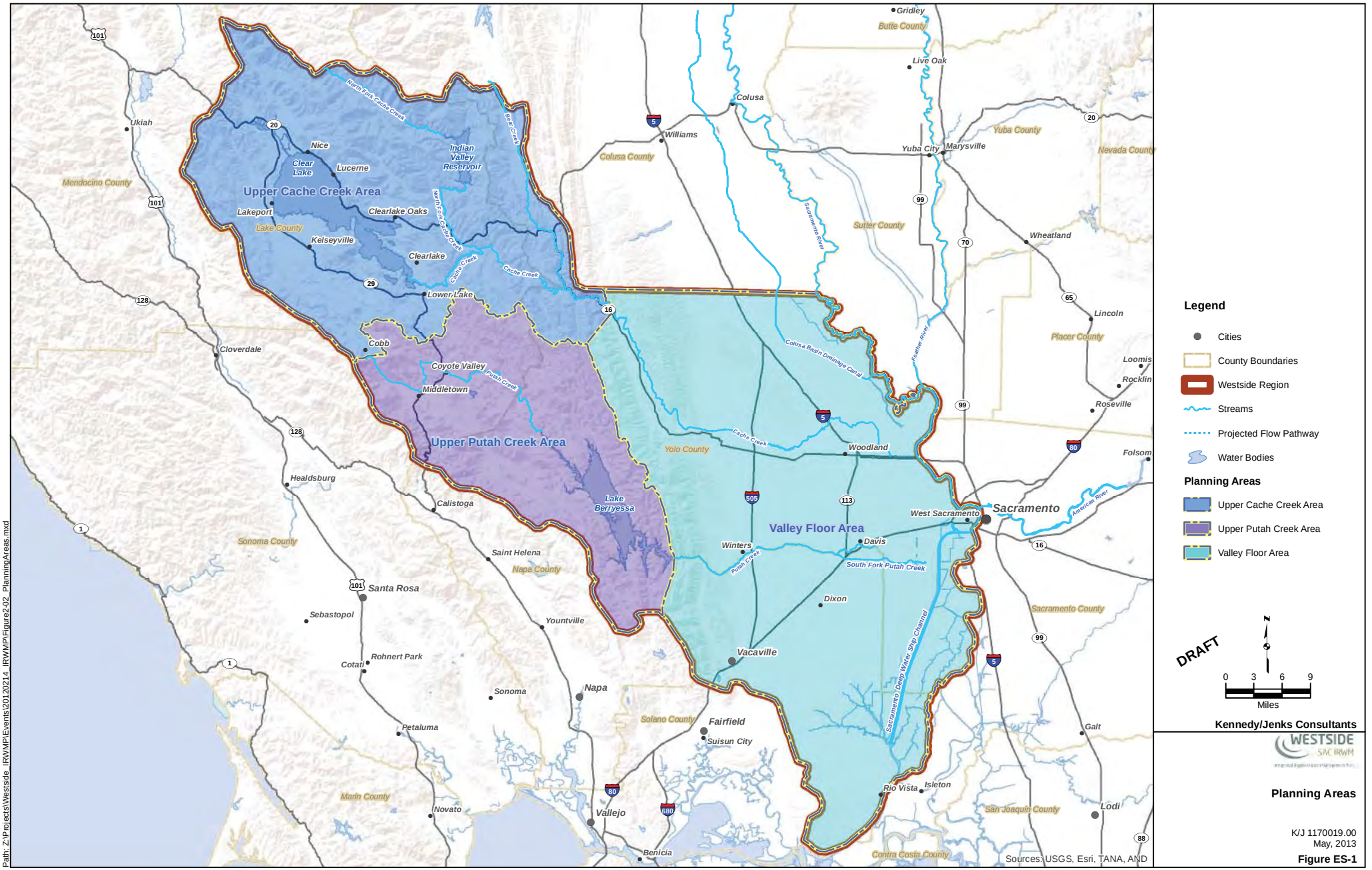
The lakes, creeks, wetlands, sloughs, Delta, and other water features of the Region provide key habitat for many of California's most important fish and wildlife species. The Region encompasses the service areas (or partial service areas) of multiple local agencies, including more than 90 entities with water and related resource management responsibilities.

Approximately 390,000 people live within the Region today, with the majority of the Upper Cache and portions of the Valley Floor Planning Area meeting the definition of a disadvantaged community (DAC). Much of the valley area lands support significant agricultural activities. Even so, the vast majority of the land within the Region remains undeveloped. The communities throughout the Region value preservation of these open spaces and agricultural lands. In addition, many residents both inside and outside the Region demonstrate interest in restoring elements of the Region's historical environmental function.

1.3 Existing and Future Conditions (Section 3)

Section 3 provides an overview of the existing and expected future conditions for the Region that are relevant to creating an IRWM Plan. The description includes information about key water management infrastructure (both constructed and naturally occurring), summarizes and presents important data, introduces some of the major challenges, and offers observations about the current water management system based on available data. The information is organized and presented as it relates to the topics of water quantity, water quality, flood protection, environmental resources, and the potential affects from climate change.

A region the size of Westside Sacramento is extremely complex and the operational aspects of managing water and the associated infrastructure and other resources within the Region require extensive knowledge of many important details. The amount of data and information related to water management that one could consider across the Region can be overwhelming. In keeping with the goals for the IRWM planning process, strategic information is presented in this section in a synthesized way designed to help promote understanding and support



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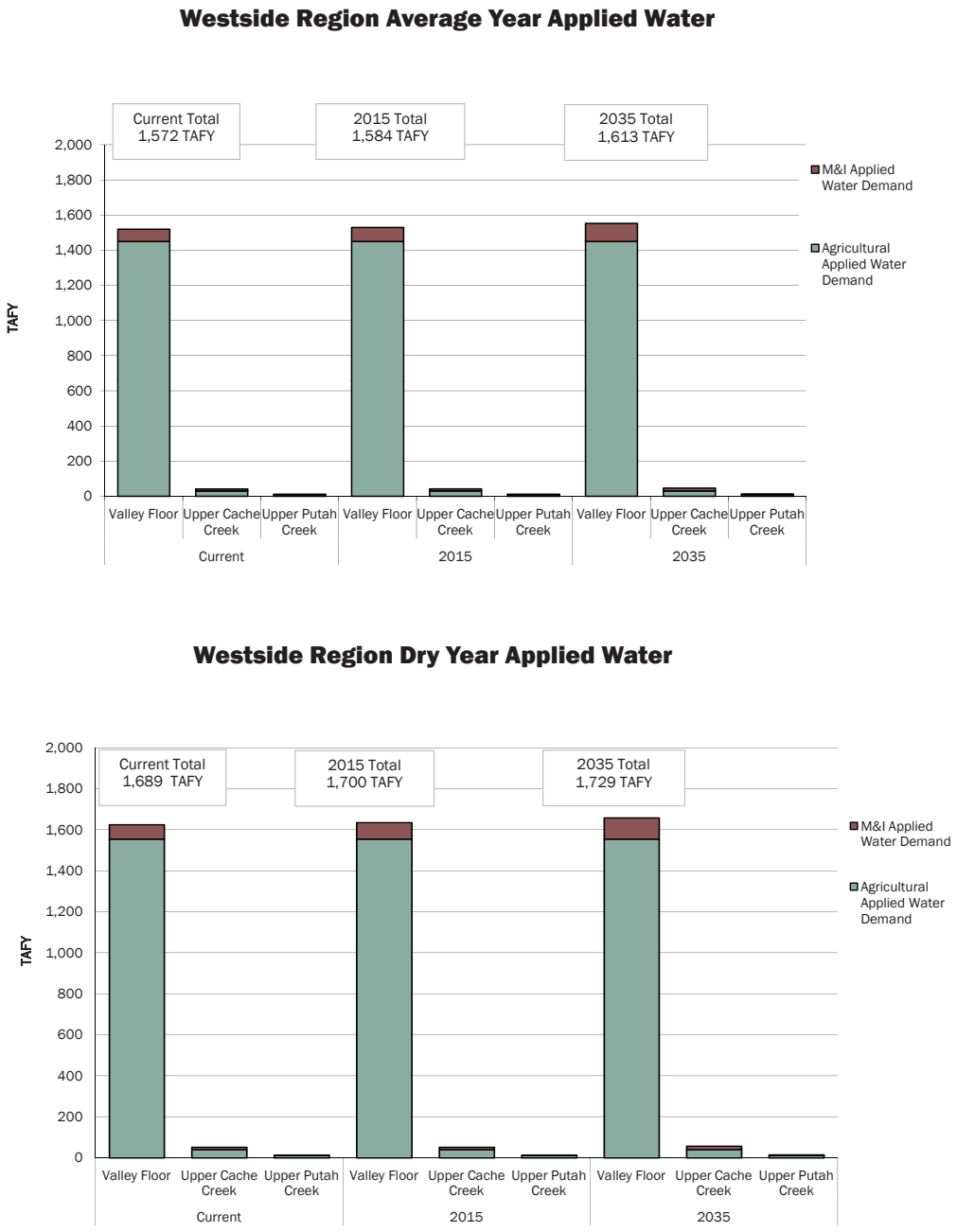
decision makers and stakeholders to work together more effectively in ways that benefit the Region as a whole.

Some key points specific to the Westside Region presented in Section 3 include:

- As shown on Figure ES-2, the region uses about 1.5 million acre-feet per year (AFY) of water in an average year and about 1.7 million AFY in a dry year. Agriculture is estimated to use about 94 percent of the water in the Region on an average annual basis with 96 percent of all water used in the Region occurring in the Valley Floor Planning Area.

Figure ES-2: Current and Future Water Demands



- Surface water accounts for approximately 66 percent of the water used in an average year in the Region. Much of the Region also has access to groundwater allowing conjunctive management of surface water and groundwater sources for increased reliability and resilience to drought and climate change. However, those areas reliant on a single source of supply are at risk for shortages.
- Key water quality concerns center around mercury primarily in the Upper Cache Creek Planning Area and nutrients in Clear Lake; total maximum daily load (TMDLs) have been developed for several water bodies for these constituents. Groundwater quality concerns include arsenic, chromium, iron and manganese.
- Several locations within the Region are susceptible to flood, namely the upper Lake area of Clear Lake and the areas adjacent to the Sacramento River in the Valley Floor Planning Area.
- The proximity of the Westside Region to the Sacramento-San Joaquin River Delta (Delta) necessitates consideration of the myriad environmental, water quality, and flow concerns associated with Delta restoration. In addition, restoration of the Clear Lake hitch, a native fish unique to Clear Lake and management of invasive species are other significant concerns.

1.4 Water and Land Use Planning (Section 4)

Water management and land use are inherently linked in that the activities and processes that occur on the land directly affect the use and movement of water within a watershed. These linkages between land use and the hydrologic cycle, and similarly between water management and the ability to support particular land uses, are important to consider when making decisions about either land or water. DWR recognizes these linkages and requires that IRWM Plans describe the relationships and interactions between regional planning efforts fostered by the Regional Water Management Group and local water planning and local land use planning. Section 4 describes how land use planning and decision making are coordinated with water management planning and implementation within the Region and highlights opportunities for improved coordination particularly in the areas of improved collaboration with federal and state land management agencies and flood management.

1.5 Challenges and Opportunities (Section 5)

A region the size of Westside Sacramento is extremely complex and challenging. Managing the operational aspects of water and the associated infrastructure and other resources within the Region requires extensive knowledge of many important details, and presents several water-related challenges and opportunities. These challenges and opportunities were identified through multiple conversations with resource managers and other stakeholders and were informed by the information presented in Sections 2 - 4 of this Plan. The term “challenges and opportunities” is used to mean the water-related items of interest or concern within the Region. The challenges and opportunities identified include:

Improve Education and Awareness

Raising citizens’ awareness of their role in sustaining the Region’s water and natural resources will be vital. Many individuals and organizations throughout the Region who are interested in water resources management are already engaged in efforts that support the work of water management entities; however, this is not enough to satisfy the objectives in this IRWM Plan. Fulfilling the vision for integrated water management presented in this Plan will require more education for and broader participation of residents within the Region.

Putah Creek Clean Up, Lake Berryessa

Improve Habitat and Ecosystem Health

The Region contains habitats for a broad range of terrestrial and aquatic, state and federally recognized special-status species. In particular, aquatic species

specific to the Sacramento-San Joaquin River Delta and vernal pools, such as Delta smelt, vernal pool fairy shrimp, and steelhead, have led to ongoing preparation of habitat conservation plans by several counties in the Region as well as the California Natural Resource Agency's Bay Delta Conservation Plan.

In addition, a number of aquatic/riparian invasive plants and animal species either already occur or pose a significant threat to the Region. Invasive animal species occurring in the Region include New Zealand mud snails (currently confined to Putah Creek). Dreissenid mussels, such as quagga and zebra mussels, have not yet been found in the Region. However, because of their presence in nearby watersheds, the threat of infestation is real and the potential consequences daunting. Regional resource management agencies have already initiated activities to prevent the introduction of these mussels to the Region, but more must be done. Several invasive plant species, including Arundo donax (giant reed), water hyacinth, Eurasian milfoil, and ravenna grass, already cause significant negative impacts in the Region.

Provide Safe and Reliable Water Supplies

Water is used within the Region predominantly for agricultural irrigation. Municipal and industrial (M&I) use is small relative to agricultural use but vital, because it supports a number of local communities. Although some population growth is expected throughout the Region between now and 2035, agriculture is expected to remain the dominant water use into the foreseeable future.

Existing water supplies within the Region are generally sufficient to fulfill the current M&I and agricultural demands during an average water year. However, in dry years, decreased surface water availability could create negative effects for agricultural and municipal users alike. In years with decreased surface water supply, many agricultural users convert to more expensive groundwater or fallow their land for that year. Some municipal suppliers could experience occasional short-term shortages and might be required to use alternative supplies under the driest of expected conditions. This IRWM Plan includes objectives and numerous strategies to maintain or increase the reliability of water supplies for agricultural and municipal users within the Region.

Many water users rely on conjunctive water management (meaning the strategic and coordinated use of a variety of surface and groundwater sources), which will be essential to the sustainability of a reliable water supply in the future. The water-supply portfolio for the Region is diverse and includes the following primary sources: Lake Berryessa supplied by Upper Putah Creek; Clear Lake and Indian Valley Reservoir in Upper Cache Creek; State Water Project (SWP); Central Valley Project (CVP); Sacramento River; and multiple groundwater aquifers.

Groundwater supplies have been relatively stable, especially in the eastern portion of the Region, since historical groundwater overdraft was corrected with the construction of Monticello Dam on Upper Putah Creek and Indian Valley Dam on the North Fork of Cache Creek. These dams created Lake Berryessa and Indian Valley Reservoir, respectively, which substantially increased conjunctive use of surface water and groundwater throughout Yolo and Solano Counties. Some areas that still rely solely on groundwater occasionally experience the effects of periodic overdraft and subsidence, both of which may occur after multiple years of drought conditions. An improved understanding of the interconnections between the watersheds and groundwater basins of the Region may lead to additional conjunctive water management opportunities on a regional level.

PHOTO: NAPA COUNTY

Groundwater Monitoring

Sustain and Modernize Infrastructure

The water management system within the Region includes a wide array of infrastructure, such as dams, canals, distribution systems, treatment systems, groundwater wells and pumps, and levees. As the infrastructure ages, the risks of disruption or damage increase. Maintaining, modernizing, and improving

this extensive infrastructure to continue to provide the expected level of service will require significant investment and effort over the next 20 years.

Foster Reasonable Use

The growing number of water-related conflicts within California, in particular related to the Sacramento-San Joaquin Delta, increase expectations to foster the reasonable use of water and promote environmental and natural resource stewardship within all regions of California. This IRWM Plan addresses opportunities to increase the wise use of water within the Region and explores ways to reduce negative impacts related to human water use and waterway management.

Manage Risks

Citizens within the Region face a number of other water-related risks that must be managed, including public health hazards associated with water quality and water-borne pathogens; flood hazards; fires; and other potential disruptions to water supply availability. Flood hazards pose a significant challenge for certain areas within the Region, specifically the tributaries to and lakefront areas of Clear Lake, as well as the floodplains of the Sacramento River.

Further Collective Understanding of Watersheds and Aquifers

As human activities related to water resources in the Region and demands on these resources continue to increase, a more robust understanding of the functions of the watersheds and groundwater basins becomes more crucial. This IRWM Plan summarizes much of what is known about the natural and constructed water management systems within the Region and identifies areas where additional investments to improve understanding are important.

Address Water Quality Concerns

The protection and improvement of water quality is essential to both human health and aquatic ecosystem function. Surface water quality within the Region can affect the cost of providing safe drinking water, and it directly impacts ecosystem function. Issues such as mercury contamination, cyanobacteria management, long-term groundwater quality degradation, and other surface water quality concerns are addressed in this IRWM Plan. Groundwater quality varies throughout the Region and among different aquifer formations. Groundwater quality can affect managers' ability to meet wastewater and wastewater discharge requirements in the future. Some agencies that currently rely on groundwater for drinking water supplies are working to develop surface water supplies to help address these concerns.

Improve Opportunities for Recreation

Finally, the lakes and streams in the Region support an array of water-based recreation including fishing, swimming, water skiing, sailing, boating, jet skiing, and white-water sports. These recreational opportunities are enjoyed by both residents of and visitors to the Region. Protecting the Region's waterways to maintain and improve recreational opportunities is important to the quality of life for residents and the economic vitality of the Region.

1.6 Goals and Objectives (Section 6)

The goals and objectives presented in this section represent the foundational intent of this IRWM Plan. Formulating meaningful and relevant goals and objectives for the Westside Sacramento Region required more collaboration and collective interaction than any other topic of this Plan. Section 6 presents the goals and objectives and describes how they were developed. Within this Plan, the term "goal" is used to mean a desired outcome or result for which effort will be made to accomplish it. In contrast, the term "objective" is used to mean a specific and tangible outcome that is intended to be achieved by or during a designated time.

The plan goals are listed alphabetically below:

1. Acknowledge and respect the cultural values and resources of the Region.
2. Improve education and awareness throughout the Region about water, watershed functions, and ecosystems and the need for sustainable resource management to protect community health and well-being.
3. Improve the collective understanding of watershed characteristics and functions (natural and human-induced) within the Region as needed to respond effectively to evolving water resources management challenges and opportunities (e.g., climate change).

4. Improve the form and function of degraded natural channels.
5. Improve water-related public health across the Region and emphasize improvements for populations most in need.
6. Preserve and enhance water-related recreational opportunities.
7. Preserve, improve, and manage water quality to meet designated beneficial uses for all water bodies within the Region.
8. Promote reasonable use of water and watershed resources.
9. Protect and enhance habitat and biological diversity of native and migratory species.
10. Provide reliable water supplies of suitable quality for multiple beneficial uses (e.g., urban, agriculture, environmental, and recreation) within the region.
11. Reduce the risks of disruptive natural and human-caused disturbances affecting the region's water resources, including flooding, fire, and significant institutional interruptions that reduce resources management services.
12. Support improved regional water management through governance throughout the Region that uses science and collaboration to make fair and equitable decisions and investments.
13. Support sustainable economic activities consistent with local and state government planning efforts within the region.

The following table ES-1 presents the Plan Objectives. Each objective was prioritized by assigning it an "importance" and "urgency" priority and linked to one or more of the goals as shown. Section 6 provides a description of the quantitative and/or qualitative measurements that will be used to track completion of the objectives.

Table ES–1: Summary of Objectives

	Summary of Objective	Importance*	Urgency**	Plan Goals
Education and Awareness Focus				
1	Provide and promote use of educational curricula for K-12 students designed to increase awareness of watershed and resource stewardship and how individual stewardship relates to community health and well-being, for K-12 students from July 2013 through the planning period.	Medium	Low	2, 3, 8, 12
2	Provide educational information for the adult population designed to increase awareness of watershed and resource stewardship and how individual stewardship relates to community health and well-being within the Region, from July 2013 through the planning period.	Medium	Low	2, 3, 8, 12
Habitat Focus				
3	Restore native vegetation and form and function along riparian corridors, canals, and other aquatic sites throughout the Region through 2035 to provide stream shading, habitat enhancement, and increased biological diversity.	Medium	Medium	1, 4, 6, 9
4	Quantify the extent of suitable life-cycle habitat currently accessible to T/E/I native fish within the Region by December 31, 2014.	High	Medium	3, 6, 9, 12
5	Prioritize, plan, and schedule improvements in suitable life-cycle habitat accessible to T/E/I native fish within the Region by December 31, 2015.	High	Medium	3, 6, 9, 12
6	Increase availability of suitable life-cycle habitat for T/E/I native fish identified by Objective 5.	High	Medium	4, 6, 9
7	Prevent colonization of any regional water body by quagga mussels or zebra mussels and eliminate or prevent the spread of New Zealand mud snails from Putah Creek during the planning period.	High	High	6, 9, 10, 13

	Summary of Objective	Importance*	Urgency**	Plan Goals
8	Establish an invasive plant management plan (including specific and measurable targeted outcomes for species of concern and a schedule to accomplish target outcomes) for the entire Region by December 31, 2015.	High	High	3, 4, 6, 9, 11, 12
9	Implement programs and projects to meet the outcomes defined in the invasive plant management plan developed through Objective 8 (according to the schedule provided in that plan).	Medium	Medium	4, 6, 9, 11
Infrastructure Focus				
10	Create an asset management plan for key water management infrastructure within the Region consistent with the guidance provided in the International Infrastructure Management Manual, by December 31, 2015.	Medium	Low	2, 3, 7, 10, 11, 12, 13
Reasonable Use Focus				
11	Meet 20% by 2020 statewide water conservation targets by December 31, 2020.	Medium	Medium	8, 10, 13
12	Increase adoption of locally cost-effective agricultural BMPs throughout the planning period.	Medium	Medium	4, 7, 8, 10, 13
Recreation Focus				
13	Maintain and increase water-related recreational opportunities within the Region throughout the planning period.	Medium	Low	6, 13
Risk Management Focus				
14	Provide adequate flood protection for all urban and rural areas within the region by December 31, 2050.	High	Medium	4, 5, 11, 13
15	Manage watershed activities and conditions to reduce the risk of large erosion events that could increase undesirable sediment loading to water bodies throughout the planning period.	Medium	Medium	4, 6, 7, 8, 11
Understand Watershed Function Focus				
16	Monitor planning of state and federal water-related projects and programs in the Delta and estimate potential local impacts throughout the planning period.	Medium	High	3, 12
17	Monitor conditions and improve understanding to support sustainable use of groundwater basins within the Region as an important part of water supply throughout the planning period.	High	Low	3, 7, 10, 12, 13
18	Maintain and enhance monitoring network and information sharing to support management of watersheds and natural resources within the Region throughout the planning period.	High	Medium	2, 3, 7, 10, 11, 12, 13
Water Quality Focus				
19	Address pollutant sources to meet runoff standards and satisfy targets as described in specific TMDLs within the Region throughout the planning period.	High	Medium	5, 6, 7, 9
20	Minimize accidental spillage/discharges of wastewater to receiving waters throughout the planning period.	Medium	Medium	5, 6, 7, 9, 13
21	Reduce public health risks by reducing contaminants of concern in drinking water sources throughout the planning period.	Medium	Medium	3, 7, 10, 13

	Summary of Objective	Importance*	Urgency**	Plan Goals
22	Meet all drinking water and wastewater discharge standards within the region throughout the planning period.	High	High	5, 6, 7, 9, 13
Water Supply Focus				
23	Provide 100% reliability of M&I water supplies of appropriate quality to meet forecasted demands within the Region throughout the planning period.	High	Medium	1, 7, 10, 13
24	Provide agricultural water supplies of appropriate quality to support a robust agricultural industry within the Region throughout the planning period.	High	Medium	1, 10, 13

* The "importance" assigned to each objective reflects the significance or consequence to the Region of satisfying this objective compared with other objectives.

** The "urgency" assigned to each objective reflects the degree to which this objective warrants speedy attention or action compared with other objectives.

Section 6 also discusses Climate Change (CC) Vulnerabilities which were prioritized relative to their relative linkage to Plan objectives. Some high priority CC Vulnerabilities discussed in Section 6 include:

- 1.4: Groundwater supplies in parts of the Region lack resiliency after drought events
- 2.6: The Region has invasive species management issues at facilities, conveyance structures or in habitat areas

Invasive Tamarisk in Bear Creek

- 3.2, 3.3, 3.4: Water quality impacts such as algal blooms related to eutrophication, inability to meet beneficial uses, and vulnerability to water quality shifts during rain events occur in the Region.
- 4.5: A portion of the Region floods at extreme high tides or storm surges.
- 5.1, 5.2, 5.3, 5.4:The Region has critical, aging, infrastructure within the 200-year flood plain, some of which lies within the Sacramento-San Joaquin Drainage District and flood control facilities have been insufficient in the past.
- 6.1, 6.2, 6.3, 6.4, 6.6, 6.8: The Region includes: inland aquatic habitats vulnerable to erosion and sedimentation, estuarine habitats, including the Delta, which rely on freshwater flow, climate sensitive fauna or flora, and endangered and threatened species, and quantified environmental flows or stressors to aquatic life.

1.7 Resource Management Strategies (Section 7)

The Goals and Objectives for the Westside IRWM Plan presented in Section 6 describe the foundational intent of the Plan. The Plan goals represent broad focus areas for water management actions in the Region, and Plan objectives describe specific outcomes that, when achieved, will improve water-related conditions in the Region. Accomplishing these goals and objectives will require that resource managers and other stakeholders implement a variety of water management actions. Those actions could include projects, programs, or policies designed to help agencies and local governments manage water and related resources. DWR refers to these types of projects, programs, or policies as resource management strategies (RMS). A broad list of resource management strategies were identified in the California Water Plan Update 2009 and must be considered for applicability in an IRWM Plan.

The California Water Plan Update 2009 groups RMS into six management outcomes. Table ES-2 provides a summary of the management outcomes and RMS that are described in Section 7 of the Plan. RMS that were determined to be applicable to the Westside Region are followed by a ✓, those that were determined as not applicable to the Westside Region are followed by an ×.

Table ES-2: Summary of Management Outcomes and RMS

CWP Management Outcome	Resource Management Strategies
Reduce Water Demand	Agricultural Water Use Efficiency ✓ Urban Water Use Efficiency ✓ Crop Idling for Water Transfers ✓ Irrigated Land Retirement ✓ Rainfed Agriculture ✓
Improve Operational Efficiency and Transfers	Conveyance – Delta ✓ Conveyance – Regional/local ✓ System Reoperation ✓ Water Transfers ✓ Waterbag Transport/Storage Technology ×
Increase Water Supply	Conjunctive Management & Groundwater Storage ✓ Desalination × Precipitation Enhancement × Recycled Municipal Water ✓ Surface Storage – CALFED × Surface Storage – Regional/local ✓ Dewvaporation or Atmospheric Pressure Desalination × Fog Collection ×
Improve Water Quality	Drinking Water Treatment and Distribution ✓ Groundwater Remediation/Aquifer Remediation ✓ Matching Quality to Use ✓ Pollution Prevention ✓ Salt and Salinity Management ✓ Urban Runoff Management ✓
Practice Resources Stewardship	Agricultural Lands Stewardship ✓ Economic Incentives (Loans, Grants and Water Pricing) ✓ Ecosystem Restoration ✓ Forest Management ✓ Land Use Planning and Management ✓ Recharge Area Protection ✓ Water-Dependent Recreation ✓ Watershed Management ✓
Improve Flood Management	Flood Risk Management ✓

✓ RMS potentially applicable to Westside Region.

× RMS not applicable to Westside Region.

1.8 Project Review and Prioritization (Section 8)

Project ideas were submitted by proponents throughout the Region for consideration to include in the Plan. The process to decide which projects to include in the Plan and how to prioritize them relied on: information submitted by the proponents that addressed a standard list of project criteria; expert judgment about the relevancy of the submitted projects; and Stakeholder discussions. The projects, programs and management actions submitted by the stakeholders were compiled, reviewed, and scored based on the information provided by the project proponents. Two "call for projects" cycles were issued to stakeholders during the preparation of the Plan. The first collected a broad list of regional projects, which was then summarized and shared with the public. The second "call for projects" provided an opportunity for stakeholders to discuss commonalities between projects, identify opportunities to integrate, and refine proposed projects or submit new projects.

The projects that were submitted by stakeholders under the two Calls for Projects demonstrate the breadth of activities needed for Westside to meet its water management objectives. 141 projects were submitted by 39 different organizations and address, to some extent, all 24 of the IRWM Plan objectives. Projects submitted range from large-scale drinking water supply projects to habitat restoration programs, flood management projects, and invasive species management initiatives. The range of projects and programs present multiple opportunities for continued resource and project integration beyond the list of projects included in this Plan. The projects and programs submitted are summarized in Table ES-3 below by objective focus area and the table also helps to portray the broad variety of types of projects, programs, and actions that were submitted.

All projects included in the IRWM Plan are important to meet the objectives of the Region. The Coordinating Committee will encourage and support actions that advance all of the projects, regardless of their priority. However, the Coordinating Committee expects to focus their attention to supporting the implementation of projects with High Importance and High Urgency first. High Importance and High Urgency projects identified during the 2012 project prioritization process are listed in Table ES-4 on the following page. This project list will be updated and appended over time as projects are completed and new projects are identified.

1.9 Impacts and Benefits (Section 9)

This section provides an overview of the potential impacts and benefits associated with implementation of the Westside Region IRWM Plan. Because of the nature of the IRWM planning process, the impacts and benefits discussed in this Section are preliminary and not intended to be a complete list; more extensive and project-specific evaluations of impacts

Table ES-3: Summary of Project Submittals by Objective Focus Area and Project Type

Focus Area	Feasibility Study	Implementable Program	Implementable Project	Planning
Education and Awareness		1	1	2
Habitat and Invasives	17	3	18	7
Infrastructure			19	10
Reasonable Use			1	2
Recreation			4	1
Risk Management	5		13	6
Understand Watershed Function	1		1	9
Water Quality		2	2	6
Water Supply	1	1	4	3
TOTAL[a]	**24**	**7**	**63**	**46**

(a) One project was removed from the list because it is outside the Region.

Table ES-4: High Importance/High Urgency Projects

Project No.	Lead Agency/ Organization	Project Title	Planned Project/Program Types
76	RWMG with selected Lead Agency	Regional Invasive Mussels Management Plan	Formation of an Invasive Species Task Force/Subcommittee to prepare a Regional Invasive Mussels Species Prevention Plan and identifies supplemental programs to be developed to fill gaps in existing programs to prevent invasive species infestation.
40	RWMG with selected Lead Agency	Regional Invasive Plants, Aquatic and Terrestrial Weeds Management Plan	Formation of an Invasive Species Task Force/Subcommittee to prepare a Regional Invasive Plants, Aquatic and Terrestrial Weeds Management/Eradication Plan that documents the extent of invasive species that could be leveraged, and identifies supplemental programs to be developed to fill gaps in existing programs to manage invasive species.
32	Solano County Water Agency	Solano Invasive Species Program	Program will prevent colonization of any regional water body by quagga or zebra mussels and eliminate or prevent the spread of New Zealand mud snails from Putah Creek.
23	Solano County Water Agency	Aquatic Nuisance Vegetation Management	The goal of the Aquatic Nuisance Species Management Plan is to minimize the harmful ecological, economic, and social impact of aquatic nuisance species through prevention and management of introduction, population growth, and dispersal into, within, and from Solano County.
54	City of Davis	Wastewater Treatment Plant Secondary and Tertiary Improvements	To meet new surface water discharge limitations at Willow Slough, the City of Davis must cease its surface water discharge to Willow Slough, all or in part, through upgrades to its existing treatment process to provide for tertiary treatment.
55	Clearlake Oaks County Water District	Plant Intake	Install a new water intake in the lake that is capable of drawing water from different depths, with installation of an amiad pre-filter at the pier where the intakes are located. This will allow a greater control of influent turbidity and pH by controlling what depth the intake will be drawing water from.
48	Crescent Bay Improvement Company	Crescent Bay Improvement Company	Crescent Bay improvement Company has been on a Boil Water Order since 1999. There are 3 objectives to this project: 1) replace the 80-year old distribution lines which are leaking, 2) drill a well and replace our surface water source with ground water, and 3) explore the feasibility of and purchase a neighboring water company and develop an intertie with that system.
87	Lake Berryessa Resort Improvement District	LBRID Wastewater Storage Pond and Disposal Improvements	This project will upgrade the wastewater storage ponds and disposal spray fields.
92	Napa Berryessa Resort Improvement District	NBRID Wastewater Treatment Plant Replacement	This project will upgrade the existing WWTP. The project will also repair or replace all the existing sewer lift stations.
90	Napa Berryessa Resort Improvement District	NBRID Water Treatment Plant Replacement	The existing water treatment plant will be replaced with a new more technically advanced water treatment plant.

Project No.	Lead Agency/ Organization	Project Title	Planned Project/Program Types
95	Reclamation District 2035	Sacramento River Joint Intake Project	The Project consists of a 400-cfs intake and integrally constructed pump station, new discharge pipeline and appurtenant structures, and demolition of the existing facilities.
93	Rural Community Assistance Corporation	Rural Disadvantaged Community (DAC) Partnership Project	RCAC will manage the Prop 84 grant funds to address inadequate water supply and water quality in rural disadvantaged communities (DACs) in the Westside Sacramento IRWM region.
34	Solano County Water Agency	Research on Improving Water Treatment for Delta Sources	The project would build upon past research done at the NBA Treatment Facility, and by other Delta users, to improve water treatment methods, reduce DBPs, and improve water treatment for Delta water users, including the SWP and CVP.
110	Woodland-Davis Clean Water Agency	Davis-Woodland Water Supply Project	The project is comprised of four regional facility components: (1) a joint RD 2035/WDCWA Sacramento River Intake facility (up to 80 cfs capacity for the WDCWA); (2) 4.5 mile raw water pipeline(s) to convey untreated surface water to a water treatment facility; (3) a regional water treatment facility to treat the surface water before delivery; and (4) 10 miles of treated water pipelines to deliver treated water to local water systems.

and benefits usually occur through project implementation. Impacts are most likely to occur over short-term periods and are associated with project implementation, with some potential long-term impacts associated with project operation. Impacts will be evaluated on a case-by-case basis during the environmental compliance process.

The Westside IRWM Plan documents a shared vision for integrated water management and outlines a cooperative approach to achieve that vision. It provides regional water resources benefits largely by fostering improved coordination, collaboration, and communication among entities in the Region. Such collaboration is supported both by the Plan development process and the resulting, newly formed Plan implementation framework.

This collaborative approach to regional planning helps ensure that multiple aspects of watershed planning are considered together rather than allowing one particular geographic area or project type to dominate. It helps share benefits and impacts instead of allowing one group or geographic area to reap benefits while another withstands impacts. Also, regional planning helps ensure that projects designed to achieve one particular objective (e.g., water supply) will be supportive of (or at least compatible with) other objectives (e.g., flood management, water quality, or habitat preservation).

1.10 Coordination (Section 10)

One of the key aspects of improving water resources management includes providing multiple opportunities for water managers, community stakeholders, and other organizations with interests in, to be informed and participate in the IRWM program. The RWMG is responsible for coordinating implementation activities with agencies, local participants and stakeholders within the Region, as well as state and federal agencies and IRWM Regions that are adjacent to the Westside Region. A structured approach to coordination is provided in the Plan to help reduce the likelihood of conflicts within the Region and improve utilization of resources. Activities will be facilitated by the Regional Water Management Group and Coordinating Committee, as defined under their specific responsibilities.

1.11 Plan Implementation Framework (Section 11)

One of the key considerations for developing and implementing an IRWM Plan is the governance structure chosen to perform the tasks necessary to develop and implement the Plan. Section 11 describes the governance structure used for developing the Westside Plan and describes a governance structure that will support implementation and updating of the Plan over the next 20 years. These governance structures are consistent with the Integrated Regional Water Management Guidelines for Proposition 84 and Proposition 1E published by the California Department of Water Resources in November 2012.

Once the Westside IRWM Plan has been adopted, the focus of the RWMG will change significantly. Some of the activities conducted during Plan development will continue, but the emphasis will shift away from planning toward implementation and tracking of progress.

The current structure of the RWMG, which was established through an MOU with a staff led Coordinating Committee, has functioned well for managing funding and providing guidance and oversight during the Plan development process. Therefore, the Coordinating Committee recommended and the Stakeholder Group agreed that the Region should continue with a similar RWMG model through the initial phases of Plan implementation. A draft MOU amendment has been prepared (see Appendix A.1) to establish a Regional Water Management Group responsible to support the implementation of the adopted Westside IRWM Plan.

Decisions authorized by the RWMG will continue to be made using broad agreement as during the development of the Plan. All interested participants will be invited to participate as equals during Stakeholder Input Meetings to discuss implementation activities to meet the Plan objectives. The Coordinating Committee will set agendas, interact with stakeholders, and foster collaborative decisions as described in Section 10. The Westside IRWM CC meetings will follow the Brown Act provisions. If for some reason broad agreement cannot be reached between the Coordinating Committee and the Stakeholder Group related to specific items within a reasonable amount

of time and effort, the Coordinating Committee will discuss the item(s) where broad agreement cannot be reached and then decide by majority vote how to proceed.

Implementation of the Westside IRWM Plan will rely on actions taken by existing agencies and organizations within the Region. The RWMG, as represented by the Coordinating Committee, will provide leadership for fostering cooperation, continuing coordination, tracking of Plan performance, and updating of the Westside IRWM Plan. The Coordinating Committee may form stakeholder subcommittees to help focus collaboration and progress on specific topics or objectives. Changes to the project list or Plan objectives will be decided as described above and published as Plan Amendments. The Coordinating Committee will request that members of the Regional Water Management Group and project proponents adopt the Plan Amendments as an addendum to the previously adopted Westside IRWM Plan.

One of the most important aspects of IRWM Plan implementation for the Westside Region is having processes in place to ensure the public and interested stakeholders continue to be involved. This will be accomplished through multiple avenues of communication and engagement between the CC and stakeholders in order to obtain input and make sound decisions regarding regional activities.

The vast geography and complex relationships between the many water-related entities in the Region, and breadth of projects requires a multi-faceted Plan performance and monitoring strategy. The centerpiece of the performance and monitoring for the Region is measuring progress towards achieving Plan goals and objectives, Resource Management Strategies (RMS), and, ultimately, projects. Changes to the goals and objectives may affect the types of RMS that need to be implemented by stakeholders, which could also have implications on the types of projects that are included in the Plan. Project Proponents will be responsible for developing and implementing most projects, and then collecting performance monitoring data and reporting it to the RWMG. It is anticipated that progress updates will be collected from Project Proponents on an annual basis. Progress towards achieving objectives will be tracked by the Coordinating Committee and/or any subcommittees that are formed.

Performance monitoring will rely on a variety of data that will need to be managed. For the purposes of this Plan, data management includes the collection, storage, processing, and sharing of information that is developed from project-specific implementation and its relative contribution to achieving Plan objectives. The tools and strategies that the RWMG will use to organize, maintain, and share this vast amount of data will be called the Data Management System (DMS). Water-resources related data is generated in this Region from literally dozens of sources, in countless formats, and is reported in varying frequencies to jurisdictional bodies, non-governmental agencies, water agencies, and regulators. The Westside IRWM Plan's DMS is not intended to serve as the central clearinghouse for this vast amount of information, but it has been developed to meet the Proposition 84/1E IRWM Guidelines in performing the following functions including:

- Support the Westside Coordinating Committee in their responsibilities by collecting and sharing information related to:
  - Westside IRWM project implementation
  - Westside IRWM objective progress
- Provide means for interested stakeholders, both inside and outside the Westside Region to locate needed information concerning IRWM project implementation
- Consider means to simplify the interconnection and sharing mechanisms between local and statewide data sources.

Financing of an IRWM Plan is also an enormous undertaking and requires the contributions and attention of local, state, and federal agencies to ensure success. Financing of this Westside IRWM Plan involves two distinct tracks: funding of IRWM Plan administration and tracking activities, and funding project implementation. This section provides some highlights of the anticipated funding needs for both tracks, identifies potential funding sources, and documents some of the activities that the CC and others will employ to secure additional funding.

Finally, the IRWM Plan includes implementation recommendations that are intended to provide a "road map" to guide the Westside Coordinating Committee, especially during the first two years of implementation of the Westside IRWM Plan. Each of

these Plan Recommendations is detailed and includes suggestions for: the Coordinating Committee to help form subcommittees or other mechanisms that will foster collaboration for Plan implementation, Coordinating Committee focus areas for the next 1 – 2 years, tracking progress for IRWM Plan implementation, and researching other grant opportunities for Plan implementation.

Section 1: Introduction

This *Integrated Regional Water Management Plan* (IRWM Plan) defines a clear vision for the management of water resources in the Westside Sacramento Region (Region) and highlights important actions needed to help accomplish that vision through the year 2035. This IRWM Plan complies with the *Integrated Regional Water Management Guidelines for Proposition 84 and 1E* published by the California Department of Water Resources (DWR) in November 2012. Financial assistance from DWR supported the development of this Plan.

The information contained within this IRWM Plan provides an opportunity for the more than 70 water supply, land use management, flood management, and ecosystem-focused organizations operating within the Region to accomplish more than they could accomplish individually. The array of goals, objectives, selected resource management strategies, and high-priority projects represent a collective view of how to improve integrated water management throughout the Region.

The work necessary to produce this IRWM Plan began many years ago. For example, the Westside Regional Water Management Group (RWMG) was formed in September 2010, gathering together numerous resource managers and stakeholders in the Region who had been taking a proactive approach to water management for a number of previous years. Before this effort to produce an IRWM Plan for the entire Westside Sacramento Region, four of the five counties represented in the RWMG had already developed or begun developing county-based IRWM plans. These organizations joined together in 2010 in response to a new requirement from the State that IRWM planning regions must be more watershed-based in order to be eligible for financial assistance from the State's Proposition 84 and 1E funds. This larger collaboration presented a fruitful opportunity to build upon the previous county-focused efforts and strengthen existing collaborative relationships.

This IRWM Plan synthesizes the years of water planning efforts. The Plan establishes a clear path forward both to increase the collective understanding of integrated water management throughout the Region and to respond collaboratively to the challenges of managing water and associated natural resources.

If this effort has been successful, this IRWM Plan will be a dynamic and useful planning tool for the Region. While it does not provide discretionary approval for any given project, it does provide a framework to improve understanding and take high-priority actions to address the major water-related challenges and opportunities facing the Region through 2035.

The RWMG decided that the IRWM Plan would be developed by a Project Team with public input and overseen by the Regional Coordinating Committee (CC). Section 1.1.5 describes the CC and its responsibilities. The Project Team includes the technical, public outreach, and facilitation consultants (Consultant Team) as well as the CC.

1.1 Background

1.1.1 Regional Features

The Region encompasses approximately 3,000 square miles, from the Coastal mountain range in the west to the Sacramento River and Sacramento-San Joaquin River Delta on the south and east. The Region includes all of Yolo County and portions of Lake, Napa, Solano, and Colusa

Counties that are within the Cache Creek and Putah Creek watersheds. Major communities within the Region include the cities of Clearlake, Davis, Dixon, Lakeport, Rio Vista, Vacaville, West Sacramento, and Woodland. Figure 1-1 shows a map of the Region.

1.1.2 Primary Focal Points of the IRWM Plan

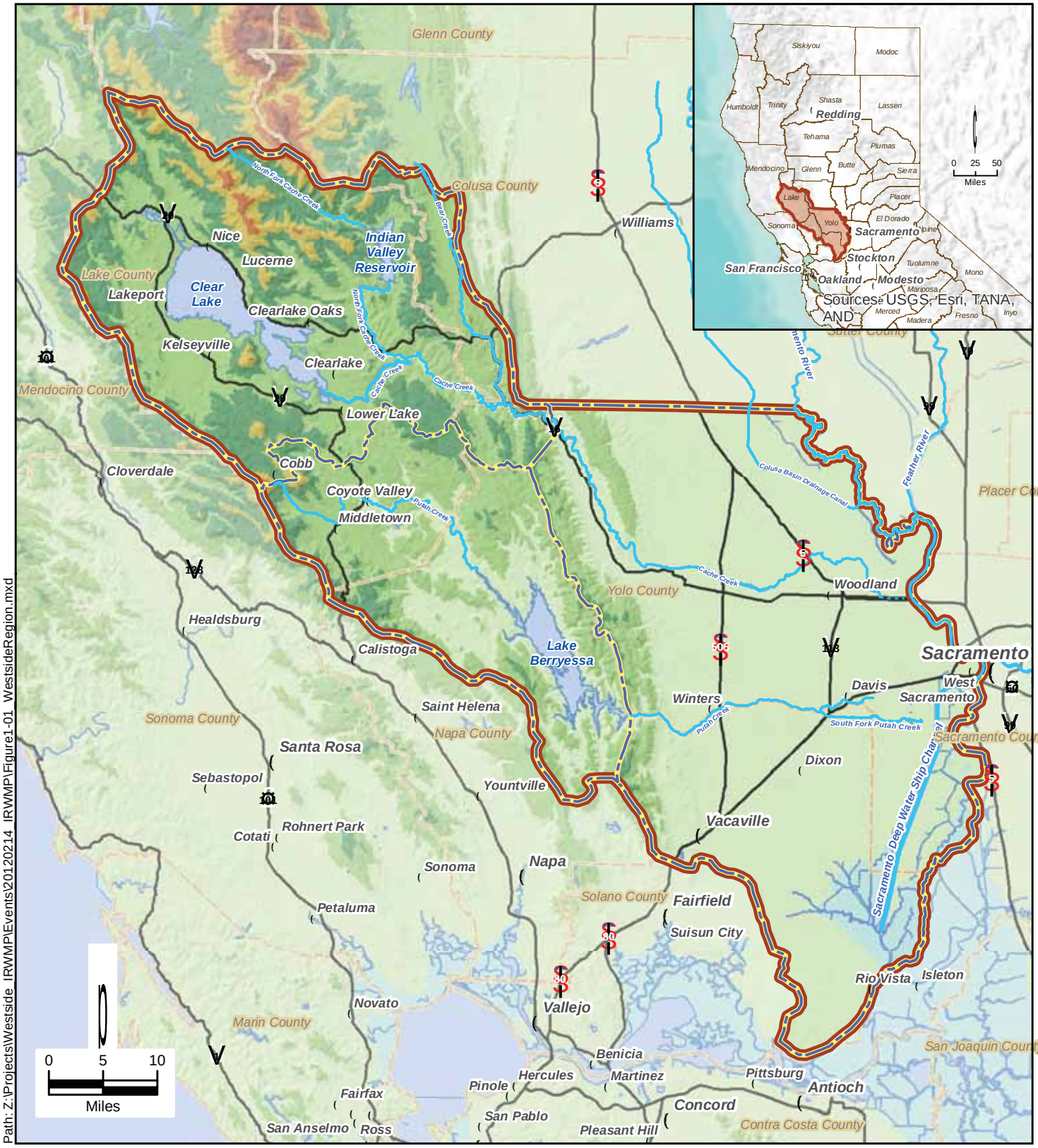
The collective vision presented in this Plan aims to address the major challenges and opportunities related to managing water and associated natural resources within the Region. The numerous and complex challenges and opportunities addressed in this Plan are captured in the following primary focal points:

- Continue to provide safe and reliable water supplies for a variety of uses.
- Improve habitat and ecosystem health (including the monumental challenge of addressing effects caused by numerous invasive species).
- Manage a wide array of risks including public health, fire, flood, and potential disruptions to institutional services.
- Sustain and modernize water supply, water quality, and flood management infrastructure.
- Address many significant and long-standing water quality concerns.
- Foster the reasonable use of water and associated natural resources within the Region through the adoption of evolving technologies and best management practices.
- Further the collective understanding of watershed functions and groundwater basins.
- Improve education and awareness among citizens about the importance of sustainable water and natural resources management and the crucial roles citizens play.
- Improve opportunities for water-based recreation.

1.1.2.1 Provide Safe and Reliable Water Supplies

Water is used within the Region predominantly for agricultural irrigation. Municipal and industrial (M&I) use is small relative to agricultural use but vital, because it supports a number of local communities. Although some population growth is expected throughout the Region between now and 2035, agriculture is expected to remain the dominant water use into the foreseeable future.

Existing water supplies within the Region are generally sufficient to fulfill the current M&I and agricultural demands during an average water year. However, in dry years, decreased surface water availability could create negative effects for agricultural and municipal users alike. In years with decreased surface water supply, many agricultural users convert to more expensive groundwater or fallow their land for that year. Some municipal suppliers could experience occasional short-term shortages and might be required to use alternative supplies under the driest of expected conditions. This IRWM Plan includes objectives and numerous strategies to maintain or increase the reliability of water supplies for agricultural and municipal users within the Region.



Path: Z:\Projects\Westside_IRWMP\Events\20120214_IRWMP\Figure1-01_WestsideRegion.mxd

Legend

- Cities
- County Boundaries
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

Topography

0 Elevation 5,000 ft

DRAFT

Kennedy/Jenks Consultants

WESTSIDE SAC IRWM

The Westside Region

K/J 1170019.00
May, 2013

Figure 1-1

Many water users rely on conjunctive water management (meaning the strategic and coordinated use of a variety of surface and groundwater sources), which will be essential to the sustainability of a reliable water supply in the future. The water-supply portfolio for the Region is diverse and includes the following primary sources: Lake Berryessa supplied by Upper Putah Creek; Clear Lake and Indian Valley Reservoir in Upper Cache Creek; State Water Project (SWP); Central Valley Project (CVP); Sacramento River; and multiple groundwater aquifers.

Groundwater supplies have been relatively stable, especially in the eastern portion of the Region, since historical groundwater overdraft was corrected with the construction of Monticello Dam on Upper Putah Creek and Indian Valley Dam on the North Fork of Cache Creek. These dams created Lake Berryessa and Indian Valley Reservoir, respectively, which substantially increased conjunctive use of surface water and groundwater throughout Yolo and Solano Counties. Some areas that still rely solely on groundwater occasionally experience the effects of periodic overdraft and subsidence, both of which may occur after multiple years of drought conditions. An improved understanding of the interconnections between the watersheds and groundwater basins of the Region may lead to additional conjunctive water management opportunities on a regional level.

1.1.2.2 Improve Habitat and Ecosystem Health

The Region contains habitats for a broad range of terrestrial and aquatic, state and federally recognized special-status species. In particular, aquatic species specific to the Delta and vernal pools, such as Delta smelt, vernal pool fairy shrimp, and steelhead, have led to ongoing preparation of habitat conservation plans as well as the *Bay Delta Conservation Plan*.

In addition, a number of aquatic/riparian invasive plants and animal species either already occur or pose a significant threat to the Region. Invasive animal species occurring in the Region include New Zealand mud snails (currently confined to Putah Creek). Dreissenid mussels, such as quagga and zebra mussels, have not yet been found in the Region. Because of their presence in nearby watersheds, however, the threat of infestation is real and the potential consequences daunting. Regional resource management agencies have already initiated activities to prevent the introduction of these mussels to the Region, but more must be done. Several invasive plant species, including *Arundo donax* (giant reed), water hyacinth, Eurasian milfoil, and ravenna grass, already cause significant negative impacts in the Region.

1.1.2.3 Manage Risks

Citizens within the Region face a number of other water-related risks that must be managed, including public health hazards associated with water quality and water-borne pathogens; flood hazards; fires; and other potential disruptions to water supply availability. Flood hazards pose a significant challenge for certain areas within the Region, specifically the tributaries to and lakefront areas of Clear Lake, as well as the floodplains of the Sacramento River.

1.1.2.4 Sustain and Modernize Infrastructure

The water management system within the Region includes a wide array of infrastructure, such as dams, canals, distribution systems, treatment systems, groundwater wells and pumps, and levees. As the infrastructure ages, the risks described above increase. Maintaining, modernizing, and improving this extensive infrastructure to continue to provide the expected level of service will require significant investment and effort over the next 20 years.

1.1.2.5 Address Water Quality Concerns

The protection and improvement of water quality is essential to both human health and aquatic ecosystem function. Surface water quality within the Region can affect the cost of providing safe drinking water, and it directly impacts ecosystem function. Issues such as mercury contamination, cyanobacteria management, long-term groundwater quality degradation, and other surface water quality concerns are addressed in this IRWM Plan. Groundwater quality varies throughout the Region and among different aquifer formations. Groundwater quality can affect managers' ability to meet wastewater and wastewater discharge requirements in the future. Some agencies that currently rely on groundwater for drinking water supplies are working to develop surface-water supplies to help address these concerns.

1.1.2.6 Foster Reasonable Use

The growing number of water-related conflicts within California, in particular related to the Sacramento-San Joaquin Delta, increase expectations to foster the reasonable use of water and promote environmental and natural resource stewardship within all regions of California. This IRWM Plan addresses opportunities to increase the wise use of water within the Region and explores ways to reduce negative impacts related to human water use and waterway management.

1.1.2.7 Further Collective Understanding of Watersheds and Aquifers

As human activities related to water resources in the Region and demands on these resources continue to increase, a more robust understanding of the functions of the watersheds and groundwater basins becomes more crucial. This IRWM Plan summarizes much of what is known about the natural and constructed water management systems within the Region and identifies areas where additional investments to improve understanding are important.

1.1.2.8 Improve Education and Awareness

In addition to improving understanding among the Region's water management entities regarding watershed functions and groundwater basins, raising citizens' awareness of their role in sustaining the Region's water and natural resources will be vital. Many individuals and organizations throughout the Region who are interested in water resources management are already engaged in efforts that support the work of water management entities; however, this is not enough to satisfy the objectives in this IRWM Plan. Fulfilling the vision for integrated water management presented in this Plan will require more education and broader involvement of residents within the Region.

1.1.2.9 Improve Opportunities for Recreation

Finally, the lakes and streams in the Region support an array of water-based recreation including fishing, swimming, water skiing, sailing, boating, jet skiing, and white-water sports. These recreational opportunities are enjoyed by both residents of and visitors to the Region. Protecting the Region's waterways to maintain and improve recreational opportunities is important to the quality of life for residents and economic vitality of the Region.

1.1.3 Forming the Westside IRWM Region

The Westside IRWM Region was established by several agencies that had completed or were in the process of developing IRWM plans. Before the formation of the Region, Yolo and Solano Counties each adopted IRWMs, Napa County had developed an Integrated Water Resource

Management Planning Framework (IWRMPF), and Lake County was developing an Integrated Watershed Management Plan and had initiated IRWM planning efforts. County lines served as the Region boundaries for each of these efforts.

DWR later clarified its preference that Regions be based on watersheds as well as that they span areas larger than county-based Region boundaries. Proposition 84 identified watershed-based funding areas throughout the state, with the Westside Region being a part of the Sacramento River Funding Area. Each Funding Area is allocated, based on population, a portion of the $1 billion approved by the voters under Proposition 84 in 2006. Predecessor bonds, including Propositions 13 and 50, also provided incentives for development of IRWM Plans. DWR designed the IRWM planning process to be consistent with the *California Water Plan*, a statewide water resources planning document updated periodically, and DWR intends that IRWM Plans and future updates of the *California Water Plan* be integrated further in the future.

The Westside Region includes the two principal watersheds of Putah and Cache Creeks and the commonly managed land in the northern portion of Yolo and Solano Counties, as shown in Figure 1-1. Some portions of the Region include areas that were not likely to be included in neighboring IRWM regions and that share many common water supply sources and groundwater basin interconnections.

Although the Putah and Cache Creek watersheds are the basis for the Region boundaries, the Region also accounts for the following boundaries and includes the following features:

- Political/jurisdictional boundaries: the entirety of Yolo County and portions of Colusa, Lake, Napa, and Solano Counties;
- Surface water bodies: Clear Lake, Lake Berryessa, and Indian Valley Reservoir; and
- Major water-related infrastructure: Monticello Dam, Indian Valley Dam, Cache Creek Dam, and Capay Diversion Dam.

The Region encompasses the service areas (or partial service areas) of multiple local agencies, including more than 90 entities with water and related resource management responsibilities.

1.1.4 Regional Water Management Group (RWMG)

As noted above, several agencies in the Region recognized the need for, and benefits of, more regional cooperation and planning. To represent the Region, four agencies and an association of agencies formed the RWMG through a *Memorandum of Understanding* (MOU) (see Appendix A). The RWMG includes Lake County Watershed Protection District (WPD), Napa County Flood Control and Water Conservation District (FC&WCD), Colusa County Resource Conservation District (RCD), Solano County Water Agency (SCWA), and Water Resource Association (WRA) of Yolo County. Therefore, the RWMG meets the definition of such an entity in California Water Code (CWC) Section 10539, which states, “RWMG means a group… [of] three or more local agencies, at least two of which have statutory authority over water supply or water management.”

As stated in the MOU, these agencies and association joined together to develop an IRWM Plan that will:

- Foster coordination, collaboration, and communication among entities responsible for water-related issues and interested stakeholders to achieve greater efficiencies, provide for integration of projects, enhance public services, and build public support for vital projects; and

- Assist in the development of a comprehensive plan to facilitate regional cooperation in providing water-supply reliability, water recycling, water conservation, water-quality improvement, stormwater capture and management, flood management, wetlands enhancement and creation, and environmental and habitat protection and improvements, and other elements and to obtain funding for plan development.

The Westside RWMG submitted a Region Acceptance Process (RAP) application in 2009 for the Westside Sub-Region of the Proposition 84 Sacramento River Funding Area. Following acceptance of the Region through the RAP process by the DWR, the RWMG began developing the IRWM Plan, using a stakeholder-driven process. The authorities and related planning efforts of each of the entities comprising the RWMG are discussed below.

1.1.4.1 Lake County Watershed Protection District

The Lake County WPD has water quality, flood management, and water supply responsibilities. It is governed by the Lake County Board of Supervisors, which serves as its Board of Directors. The Lake County Board of Supervisors also is responsible for land use planning, management of the bed of Clear Lake, municipal stormwater, implementation of the two Clear Lake total maximum daily loads (TMDLs), and recreational planning and maintenance, and it oversees numerous water supplies and wastewater districts. In addition to participating in planning for the Westside IRWM Plan, the Lake County WPD has been coordinating the development of goals and objectives for the Lake County stakeholders for more than three years. It also has been interacting with other stakeholders and IRWM groups within the Sacramento River Funding Area.

1.1.4.2 Napa County Flood Control and Water Conservation District

Napa County FC&WCD maintains a contract to receive a limited amount of surface water supply from Lake Berryessa with the U.S. Bureau of Reclamation (USBR). The contract serves several small developments along the edge of the Lake. Napa County also manages and operates the water and wastewater systems of two small communities in the Lake Berryessa area: the Lake Berryessa Resort Improvement District (LBRID) and the Napa Berryessa Resort Improvement District (NBRID).

In addition to participating in the present Westside IRWM planning, FC&WCD staff has been attending Sacramento River funding area meetings. In 2007, an informal Napa County IRWM Plan working group was formed and has since met monthly to discuss Napa County's IRWM Plan participation. The group consists of Napa County Public Works, Napa County Department of Planning, Conservation and Development, Napa County FC&WCD, the Napa County Resource Conservation District (RCD), and the City of Napa. The other cities in Napa County and the Napa Sanitation District interact through the county Water Technical Group, which also meets monthly.

1.1.4.3 Colusa County Resource Conservation District

The Colusa County RCD has an interest in water resources projects planning and funding in the Bear Creek watershed. It often coordinates watershed management responsibilities with neighboring agencies in the Region.

Along with participating in the present Westside IRWM planning for the portion of the Bear Creek watershed (tributary to Cache Creek) contained in Colusa County, the RCD works with the North Sacramento Valley RWMG (Colusa, Glenn, Butte, Shasta, Sutter, and Tehama Counties) to develop an IRWM Plan for the majority of Colusa County, which is outside the Bear Creek/Cache Creek watershed.

1.1.4.4 Solano County Water Agency

The SCWA provides untreated water to cities and agricultural districts in Solano County from the Federal Solano Project (i.e., Lake Berryessa and Monticello Dam) and the North Bay Aqueduct of the SWP. The SCWA also has a flood management function.

Along with participating in Westside IRWM planning, the SCWA has been active in the Sacramento Valley IRWM process and is involved in the ongoing San Francisco Bay Area IRWM Plan update.

1.1.4.5 Water Resources Association of Yolo County

The WRA of Yolo County is a non-profit organization composed of agencies with water management responsibilities, including four municipal water agencies, two reclamation districts, and two irrigation districts, as well as UC Davis and Yolo County. Its members are:

- City of Davis,
- City of West Sacramento,
- City of Winters,
- City of Woodland,
- Colusa County Water District,
- County of Yolo,
- Dunnigan Water District,
- Reclamation District 108,
- Reclamation District 2035,
- University of California at Davis, and
- Yolo County Flood Control and Water Conservation District.

In July 2007, the WRA of Yolo County and each of its member agencies approved and adopted the *Yolo County IRWM Plan* (WRA of Yolo County 2007), a successful water planning document presently used in Yolo County. The WRA was the lead agency in Yolo County conducting public workshops, coordinating member agencies, and assembling the *Yolo County IRWM Plan*. Yolo County also was included in the Sacramento Valley IRWM Plan for projects related to the Sacramento River.

1.1.5 Coordinating Committee

The Region Coordinating Committee (CC) consists of one staff representative and an alternate appointed from each of the agencies and associations that comprise the RWMG. The committee was officially formed on March 1, 2012, through a charter signed by each member of

the RWMG (see Appendix A). The CC's overall function is to oversee the preparation of the Westside IRWM Plan through its adoption, including identifying proposed Plan goals and objectives, proposing a process for prioritizing projects, developing drafts of the IRWM Plan, hiring and managing consultants, and administering grant funds.

The charter outlines the goals and responsibilities of the CC and establishes shared principles for Plan development. It also includes agreements to develop the IRWM Plan in an open and transparent process, encourage the participation and input of stakeholders, and support a decision-making process led by broad public agreement wherever possible.

1.1.6 Existing IRWM Plans and Previous Planning Efforts

Development of the Westside IRWM Plan benefited considerably from previous plans and documents written for portions of the Region. While many other documents were consulted during development of this Plan, the following documents specifically relate to integrated resources management within the Region:

1. *Yolo County IRWM Plan* (WRA of Yolo County 2007);

2. *Solano Agencies IRWM Plan* (SCWA and Solano Agencies 2005);

3. *Clear Lake Integrated Watershed Management Plan* (County of Lake Department of Public Works 2010); and

4. *Napa County IRWM Plan Integrated Resources Water Management Planning Framework* (Napa County FC&WCD, 2011) (*IRWM Plan Functional Equivalent* [Napa County FC&WCD, 2005]).

The Bear Creek watershed portion of Colusa County (tributary to Cache Creek) has not been included in any IRWM Plan previously but now is addressed in the Westside IRWM Plan.

The background for and description of these plans, previous planning efforts, and their integration into the Westside IRWM are described in this subsection. The Westside IRWM Plan includes key information from these documents, builds on these previous IRWM planning efforts, and supersedes the actions laid out in previous IRWM plans.

Yolo County IRWM Plan

The WRA of Yolo County adopted the Yolo County IRWM Plan in 2007, defining the IRWM Plan region as within the Yolo County boundaries. This decision was made with the understanding that detailed formulation and implementation of projects may involve member agencies working in partnership with agencies from other neighboring regions. The preparation of the Westside IRWM Plan has facilitated identification of partnership opportunities with implementation of the Yolo IRWM and coordinated project development.

Solano Agencies IRWM Plan

The SCWA adopted the Solano Agencies IRWM Plan in 2005, using the Solano County boundaries, while simultaneously participating in the Bay Area IRWM Plan. Because SCWA understands that the State prefers larger, watershed-based regions, SCWA chose not to update

its IRWM Plan and instead became part of the Westside RWMG to address the eastern portion of Solano County located in the Putah Creek watershed.

Clear Lake Integrated Watershed Management Plan

Lake County water managers recognized the benefits of the IRWM program early on. In 2005, Lake County staff began the process of developing an IRWM Plan at the county level. Starting in May 2007, the County held public meetings and established strong stakeholder participation for preparation of an integrated document. In addition, Lake County WPD worked with the Yolo County FC&WCD to address Clear Lake issues and to identify projects of mutual benefit, with a focus on the Cache Creek watershed. Lake County staff also attended several of the Yolo County IRWM planning meetings during development of the 2007 Yolo County IRWM Plan.

Before the County completed development of a county-based IRWM Plan, the State indicated that it prefers larger, watershed-based regions. Therefore, Lake County chose to participate in the Westside IRWM Plan development instead of proceeding with its local plan, and the portions of Lake County located in the Cache and Putah Creek watersheds are addressed within the Westside IRWM Plan.

Napa County IRWM Plan Integrated Resources Water Management Planning Framework and *IRWM Plan Functional Equivalent*

Napa County did not have an adopted IRWM Plan in 2005, when Round 1 grant opportunities for Proposition 50 became available. Therefore, Napa County decided to form the Napa County RWMG, a working group of local water agencies, with the Flood Control District as the lead agency. The group worked together to draft the Napa County IRWM Plan Functional Equivalent, dated June 2005. This functional equivalent was used to identify local projects under the Proposition 50 Round 1 grant cycle. Napa County projects did not receive any funding under this grant cycle because DWR stated that Napa County's plan lacked sufficient regional focus.

Napa County includes watersheds that are part of other established IRWM planning regions. Therefore, Napa County is now participating in the Bay Area RWMG for the Napa River watershed and in the Westside RWMG efforts for the Putah Creek watershed. Furthermore, Napa County embarked on a County IRWM Plan Integrated Resources Water Management Planning Framework (IRWMPF) in 2011, coordinated by the Watershed Information Center and Conservancy of Napa County (WICC). The WICC Board serves as an advisory board to the Napa County Board of Supervisors. The Napa County FC&WCD Board of Directors governs the Napa County IRWMPF with assistance from several advisory committees.

1.2 Stakeholder Involvement

This section describes the stakeholder involvement and public outreach processes employed during Westside IRWM Plan development.

1.2.1 Overview of Stakeholder Involvement Process

The RWMG acknowledged that agencies and planning jurisdictions must work closely together to foster the delivery of clean, reliably available water, improve protection of people and structures from flood damage, and protect aquatic species and riparian habitats throughout the Region. The planning process used to develop this IRWM Plan included extensive stakeholder engagement to help ensure that the Plan reflects the water-related needs of the entire Region,

promotes the formation of regional partnerships, and encourages increased coordination with state and federal agencies.

The term “stakeholder” refers to representatives of agencies, nonprofit groups, nongovernmental organizations, government organizations, and public citizens who were interested in or could be affected by the development of the IRWM Plan.

One of the benefits of this collaborative approach to planning is that it brought together representatives of a broad array of groups to discuss and better understand shared needs and opportunities. The members of the RWMG and other stakeholders participated in stakeholder input meetings, reviewed meeting materials that included draft IRWM Plan sections, and provided collaborative input to shape this IRWM Plan throughout the planning process. In addition, stakeholders had a variety of opportunities to discover and establish mutually beneficial partnerships through participation in meetings and conversations.

The CC convened via conference call at least once before each stakeholder meeting to review and discuss the meeting agenda and materials before posting them on the web. Table 1-1 summarizes the CC and stakeholder input meetings held during the IRWM Plan development process. Stakeholder meetings were held every one to four months, with a total of 10 meetings. Some topics were discussed in meetings held at two different locations to provide ample opportunity for participation. Some meetings were webcast to allow remote participation. 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 (www.westsideirwm.com).

Table 1-1: Summary of IRWM Coordinating Committee and Stakeholder Input Meetings

Meeting No. and Type	Date	Location(s)	Key Topics	No. of Attendees
1 Stakeholder	10/31/2011	Vacaville	Discuss team charter, planning goals, plan development process	11
2 Stakeholder	11/28/2011	Vacaville	Review plan scope and goals, discuss engagement plan, review team charter	13
3 Stakeholder	1/25/2012, 2/1/2012, 2/6/2012	Vacaville, Woodland, Clearlake	Kick-off project, discuss plan development process, scope, goals, objectives	63
4 Stakeholder	4/23/2012, 4/24/2012	Woodland, Clearlake	Review current and future conditions, discuss water balance, refine planning goals, review challenges and opportunities, discuss plan goals and objectives	26
5 Stakeholder	6/4/2012	Vacaville & webcast	Call for projects, review region description, refine plan goals and objectives	18 – in person and 22 – separate webcast connections
6 Stakeholder	7/9/2012	Woodland & webcast	Discuss integration and approach for project screening and prioritization, discuss public outreach, refine plan goals and objectives, present plan development status	29

Meeting No. and Type	Date	Location(s)	Key Topics	No. of Attendees
7 Stakeholder	9/17/2012, 9/20/2012	Vacaville, Clearlake	Evaluate, screen, and prioritize integrated projects, refine plan goals and objectives, present draft plan sections	36
1 CC	10/15/2012	Vacaville	Review and finalize plan goals and objectives, discuss and agree upon approach to project selection and prioritization, discuss ideas for governance, discuss draft prioritized climate change vulnerabilities	0
2 CC	11/7/2012	Woodland	Discuss proposed governance, discuss round 2 implementation grant application, finalize plan goals and objectives and prioritize objectives, discuss approach for project selection and prioritization, and draft prioritized climate change vulnerabilities	0
3 CC	12/4/2012	Vacaville	Discuss proposed governance revised text, review project lists and prioritization, discuss questions on draft water balance and Section 3	3
8 Stakeholder	12/13/2012, 12/18/2012	Woodland, Clearlake	Present final draft goals and objectives, refine projects, develop recommendations, revisit governance, and introduce plan sections available for review	27
4 CC	1/28/2013	Vacaville	Review refined governance, discuss crafting of plan recommendations, discuss definition of plan performance monitoring and data management, review financing of plan update/implementation	0
9 Stakeholder	2/14/13	Clearlake & webcast	Give update on IRWM plan preparation, discuss refined governance, discuss draft plan recommendations, discuss plan performance monitoring and data management, discuss approach to financing plan update and plan implementation	0
5 CC	3/26/2013	Vacaville	Discuss schedule for plan completion, prepare for plan implementation, consider data management system options	0
10 Stakeholder	5/21/13	Vacaville & webcast	Present draft of entire plan for public review	0

The Westside IRWM Plan benefited from the input of many interested agencies, organizations, and individuals beyond those on the CC, including the active participation of 69 individuals out of the 700 entries on the Region's public outreach email list. The individuals and organizations who participated are listed in Appendix B. Representatives from 39 agencies and organizations interested in improving water supply reliability, water quality, water conservation, flood management, natural habitat, and land-use planning within the Region participated in one or more meetings. This broad participation resulted in collaboration among an extensive mix of cities as well as regulatory, environmental, agricultural, and land-use planning organizations that represent the entire Region.

All stakeholders were invited to participate in the collaborative IRWM Plan development process, regardless of whether they represented an agency or had contributed funds to develop

the plan. Furthermore, individuals from disadvantaged, small, and rural communities, tribal communities, and other interested groups were frequently encouraged to participate and were provided information about the IRWM Plan development efforts through a variety of targeted outreach efforts.

1.2.2 Stakeholders and Plan Participants

As noted earlier, the RWMG communicated regularly to more 700 people on its public outreach email list, including citizens and representatives of:

- Municipal and county governments;
- Wholesale and retail water purveyors, wastewater agencies, flood management agencies, and similar special districts;
- State and federal regulatory and resource agencies;
- The environmental community; and
- The tribal communities.

1.2.2.1 Municipal and County Governments

Representatives of municipal and county governments participating in the IRWM Plan process included local jurisdictions and land use planning agencies. They were involved in the identification of challenges and opportunities, formation of objectives, and development of projects for the Plan. Participants included the representatives of the Cities of Clearlake, Davis, Dixon, Vacaville, Winters, and Woodland and the Counties of Colusa, Lake, Napa, Solano, and Yolo.

1.2.2.2 Wholesale and Retail Water Purveyors, Wastewater Agencies, Flood Management Agencies, and Other Special Districts

Several organizations with a water management focus (including wholesale and retail water purveyors, wastewater agencies, flood management agencies, reclamation districts [RDs], and other special districts) participated throughout the planning process. Appendix B includes a list of the 100 organizations that focus on water or resource management within the Region and identifies the 17 organizations that participated in one or more stakeholder meetings.

The active participants helped develop all aspects of this IRWM Plan. Their participation focused particularly on the water supply, water quality, flood management, and resource management concerns of the Region.

Water management organizations active in the planning process include the City of Davis, City of Vacaville, City of Woodland, Colusa County RCD, Dixon RCD, Dunnigan Water District, Eastlake and Westlake RCD, Golden State Water Company, Lake County WPD, Napa County FC&WCD, Reclamation District 2068, SCWA, Solano RCD, WRA of Yolo County, Watershed Information Center and Conservancy of Napa County, Yolo County FC&WCD, and Yolo County RCD.

1.2.2.3 State and Federal Regulatory and Resource Agencies

Several state and federal regulatory and resource agencies helped in describing ongoing activities that require coordination with IRWM, identifying challenges and opportunities, shaping Plan objectives, and developing projects for the Plan. They provided an invaluable perspective and will likely support the effort to obtain regulatory and environmental approval for Plan actions during implementation.

State agencies participating in the planning process were DWR, including the DWR FloodSAFE Environmental Stewardship and Statewide Resource Office (FESSRO), and the Central Valley Regional Water Quality Control Board (RWQCB). Federal agencies such as the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and USBR provided information for the Plan, along with the U.S. Forest Service and Bureau of Land Management, which manage a large portion of the lands in the Upper Cache Creek.

1.2.2.4 Environmental Community

Representatives who focus on improving ecosystem health helped incorporate meaningful objectives and projects for conservation and protection of the natural resources and habitat within the Region. The environmental organizations involved in the planning process include the Putah Creek Council, Cache Creek Conservancy, Tuleyome, Inc., Sierra Club-Lake Group, and Upper Putah Creek Stewardship. Several private citizens interested in the environmental aspects of the IRWM Plan also participated.

1.2.2.5 Tribal Communities

Several tribal communities were represented throughout the planning process. (Outreach to tribal communities is also discussed in Section 1.2.3.3.) The tribal communities involved in planning included Big Valley Band of Pomo, Yocha Dehe Wintun Nation, Scotts Valley Band of Pomo, Cortina Band of Wintoon, Robinson Rancheria of Pomo, and the Suscol Intertribal Council.

1.2.2.6 Others

Other entities involved in the Westside IRWM Planning process were representatives from FloodSAFE Yolo, League of Women Voters of Woodland, Luhdorff & Scalmanini Consulting Engineers, West Yost Associates, Essential Public Information Center, and KPFZ Radio. Agricultural and farm industry involvement came from individual CC members that deliver water to agricultural users, including Reclamation District 2068 and the Colusa County Agricultural Department. Several private citizens interested in water management also participated.

1.2.3 Public Outreach Process

Public outreach to a wide variety of stakeholders was a key component of efforts to create a successful IRWM Plan. Outreach built upon previous public outreach efforts for the county-based IRWM Plans adopted by Yolo and Solano Counties, as well as on input from Napa and Lake Counties, to yield a master list of more than 700 individuals, agencies, and organizations to contact.

1.2.3.1 Inclusive Planning Area Outreach

This IRWM Plan development included evaluating and addressing regional issues while recognizing local interests. To help accomplish this, stakeholder input was sought through outreach and then incorporated.

The general approach to outreach during this planning process had three key elements:

1. Identify stakeholders including disadvantaged communities and tribes;

2. Rotate meeting places to different locations within the Region to facilitate participation; and

3. Provide multiple opportunities and methods for participation and communication.

As discussed previously in Section 1.2, meetings were the main way that stakeholder input was sought and communicated during the planning process. Attendees were invited to participate through facilitated discussions and review of draft documents. The meetings and additional opportunities to review and comment on draft documents were announced to a broad distribution list via email and mailed invitations. Meeting materials were made available on the website one week before each stakeholder meeting. All meetings were open to the public, and some were webcast and recorded to facilitate participation.

Public outreach activities throughout the IRWM Plan process are described below:

- **Review of Plan Sections** – The sections of the IRWM were drafted incrementally and provided to stakeholders at multiple points for review and input. The content in draft sections was discussed with stakeholders and refined until there was broad agreement about it.

- **Stakeholder Meetings** – Ten stakeholder meetings were held throughout the IRWM process. These meetings were occasions for various participants to provide background on the planning process, identify challenges and opportunities within the Region, draft and discuss plan goals and objectives, consider opportunities for coordination among local and regional agencies, present plan sections and give and receive comments on them, identify and prioritize projects, and cover other topics included in the IRWM Plan. Some meetings were conducted at multiple locations to allow for involvement of a larger stakeholder group, in which case the content remained the same at each meeting location. Meeting 3 was conducted at Woodland, Vacaville, and Clearlake; Meeting 4 was conducted at Woodland and Clearlake, Meeting 7 was conducted at Vacaville and Clearlake, and Meeting 8 was held at Woodland and Clearlake. The topics discussed during the stakeholder meetings are summarized in Section 3.1.

- **Webcast** – Because not all of the meetings were conducted in areas within a short driving distance from each planning area, all stakeholder meetings held at a single location after Meeting 4 were webcast to enable inclusion of stakeholders who could not attend the meeting in person. To allow for interaction throughout the meeting, comments could be submitted via email during the meeting. The webcasts also were recorded for viewing and posted to the project website.

- **Project Website** – The Westside IRWM website (http://www.westsideirwm.com) was developed to inform stakeholders about the IRWM planning process and to make IRWM documents and handouts publically available. As noted previously, handouts were posted one week before each meeting, along with additional information, including general information on the IRWM Plan purpose and online resources, such as existing planning documents within the Region.

- **Electronic and Written Communications** – Email was the main tool used to communicate with and engage stakeholders. The email list, which contained approximately 700 entries, was used to invite participation at the meetings as well as to notify stakeholders that materials were available for review.

- **eNews** – A link to sign up for Westside eNews is available on the Westside IRWM website. This newsletter gave important updates on the IRWM planning process as well as information on upcoming stakeholder meetings.

- **Contact Information** – Email addresses and phone numbers of the IRWM planning coordinators were made available to any stakeholder or interested party to ask questions or offer comments about the IRWM Plan.

- **Notice of Intent** – A notice was published in four local newspapers describing the RWMG's intent to prepare an IRWM Plan. A second notice will also be published describing the RWMG's intent to adopt the Plan. These are available in Appendix B.

1.2.3.2 Disadvantaged Community Outreach

Outreach included special efforts to connect with the Region's disadvantaged communities (DAC), defined as a community with a median household income (MHI) of less than 80% of the statewide MHI (Proposition 84 guidelines). A number of areas throughout the Region are considered DACs. These communities are primarily located around the Clear Lake area, with other areas located in central and northern Yolo County as well as in the Middletown area of Lake County. Section 2.4 gives additional information on DACs.

Informational invitations were sent or emailed to water agencies servicing known DACs within the Region, inviting them to stakeholder meetings and soliciting their input to the Plan and Plan projects. Additional information targeting DACs included mailers and focused meetings to engage DACs as well as coordination with agencies such as the Rural Community Assistance Corporation (RCAC), which provides technical assistance to rural and DAC areas.

Although no organizations specifically addressing environmental justice (EJ) concerns have been identified in the Region, opportunities to address EJ issues were coordinated with DAC outreach as appropriate.

1.2.3.3 Tribal Outreach

Consistent with the 2009 *Update to the California Water Plan*, the Westside RWMG has used the term "California Native American Tribe" to signify all indigenous communities of California, including those that are non-federally recognized and federally recognized. The RAP identified the following tribes within the Westside Region:

- Yocha Dehe Wintun Nation (Yolo County)
- Big Valley Band of Pomo Indians (Lake County)

- Scotts Valley Band of Pomo Indians (Lake County)
- Habematolel Pomo of Upper Lake (Lake County)
- Robinson Rancheria of Pomo Indians (Lake County)
- Elem Indian Colony of Pomo Indians (Lake County)
- Middletown Rancheria of Pomo Indians (Lake County)

The Project Team sought input and participation from the tribes throughout the IRWM planning process. Emails, flyers, and focused meetings were used to inform the tribes about the Plan process and to explore their goals and challenges related to water planning, quality, and sustainability. In addition, tribal cultural values pertaining to aquatic and riparian habitats were discussed and are documented in the IRWM Plan.

The WRA of Yolo County already coordinates with the Yocha Dehe Wintun Nation on water-related data collection efforts, and Lake County has regular contact with many of the environmental coordinators for tribes in Lake County. Lake County engages regularly with all of the tribal environmental directors in watershed-related venues such as the Clear Lake Advisory Committee and TMDL stakeholder meetings. Collaboration with tribes is most active in native fish restoration projects, Clear Lake issues and management, invasive species council and task force, TMDL plans and implementation, sustainable agricultural practices, mercury clean-up and restoration, and habitat protection and enhancement. Additional contact during the IRWM planning process included attendance of representatives from the Big Valley Band of Pomo, Yocha Dehe Wintun Nation, Robinson Rancheria, and Scotts Valley Band of Pomo at stakeholder input meetings as well as at tribal outreach meetings. All of these activities resulted in tribal input throughout the IRWM Plan preparation process.

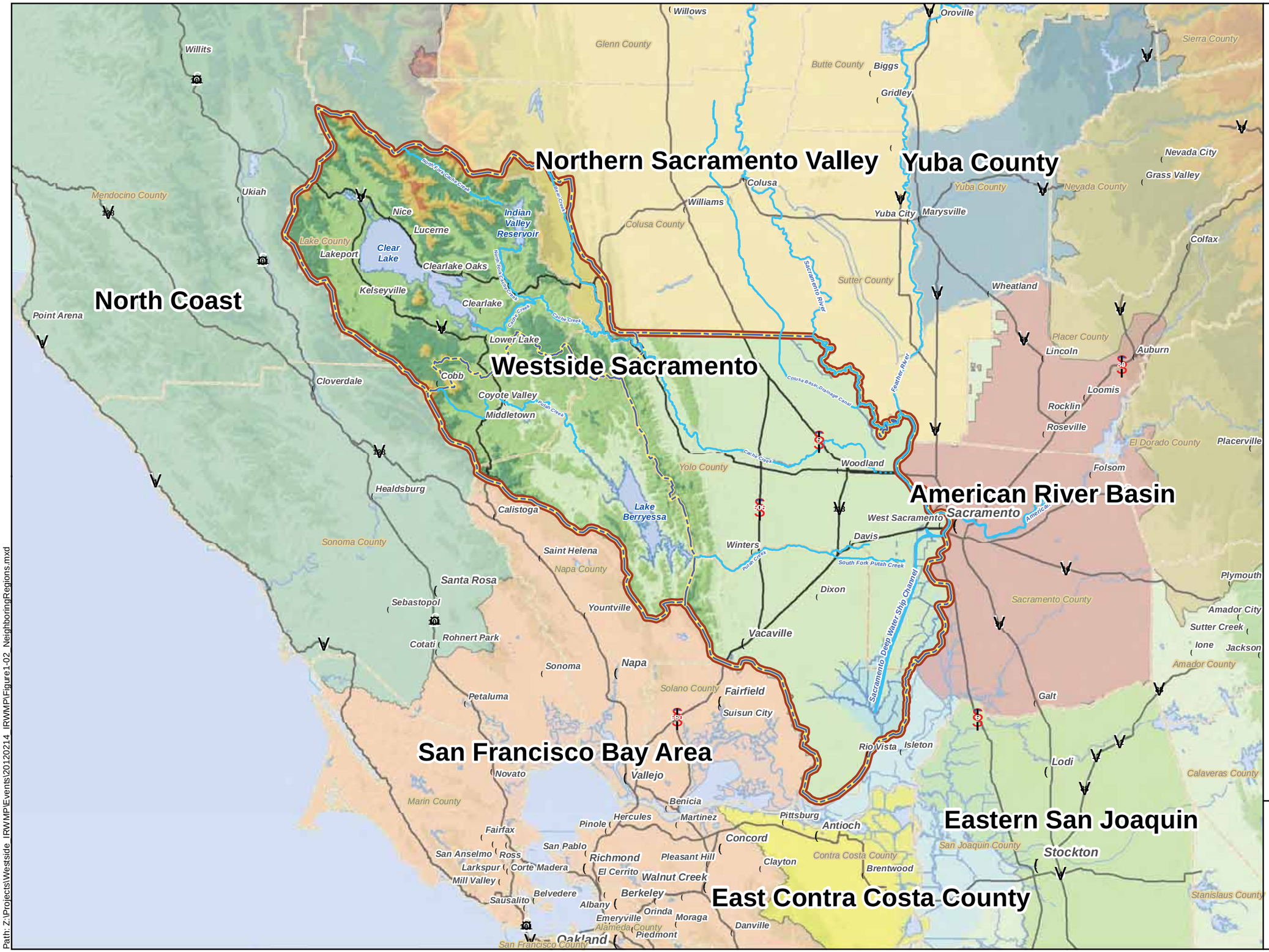
1.2.3.4 Media Coverage of Plan Preparation

Media coverage of plan preparation included the attendance of a representative from KPFZ radio and publication of notices of IRWM Plan preparation in four newspapers in the Region.

1.2.4 Interregional Coordination

Coordination with neighboring IRWM regions was viewed as essential to the development of the Plan, since several of the water management challenges and opportunities involve or affect places outside of the Westside regional boundaries. The Westside Region is bordered by the Northern Sacramento Valley (NSV) Region to the north, the American River Basin Region to the east, the San Francisco Bay Area Region to the southwest, and the North Coast Region to the west and north. The East Contra Costa County Region and the Eastern San Joaquin Region are located to the south and southeast of the Westside Region, respectively, but do not directly border the Westside Region. The neighboring regions are illustrated in Figure 1-2. Interregional Coordination is discussed further in Section 10 with regard to specific opportunities between regions.

The NSV Region includes six counties: Butte, Colusa, Glenn, Shasta, Sutter, and Tehama. The NSV Region is closely linked to the Westside Region through the Sacramento River watershed.



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The American River Basin Region comprises three counties: Sacramento, Placer, and El Dorado. The Woodland-Davis Clean Water Agency and the City of West Sacramento located within the Westside Region are both members of the Regional Water Authority, which is a joint powers authority formed in 2001 to promote collaboration on water management and water supply reliability programs in the greater Sacramento, Placer, and El Dorado County region, and that is part of the American River Basin Region. Also, the Valley Floor planning area of the Westside Region shares many of the characteristics and attributes of much of the western portion of the American River Basin Region.

The San Francisco Bay Area Region includes all or portions of nine counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma. Because Napa and Solano Counties are divided between the Bay Area and Westside Regions, these two agencies participated in both IRWM Plan development efforts. Specifically, Solano County Water Agency and the City of Napa (a member agency of Napa County Flood Control and Water Conservation District) are part of the Bay Area Regional Water Management Group.

The North Coast Region includes all of the Counties of Del Norte, Humboldt, Mendocino, and Trinity, major portions of Siskiyou and Sonoma Counties, and small portions of Glenn, Lake, Marin, and Modoc Counties.

To help ensure effective interregional coordination, the CC designated members to track the plans and projects of each neighboring and overlapping Region. Examples of coordination efforts between the groups are participation in adjacent IRWM meetings, consultant-to-consultant outreach between regions, and review of draft IRWM Plan sections from adjacent regions. Table 1-2 lists the agencies/representatives in charge of managing coordination.

Table 1-2: Interregional Coordination Representatives

Westside RWMG Member Responsible for Coordination	**Coordinating Individual**	**Neighboring IRWM Region**
Colusa County Resource Conservation District	Patti Turner/RCD Staff	Northern Sacramento Valley
Water Resources Association of Yolo County	Jacques DeBra Tim O'Halloran	American River Basin Northern Sacramento Valley
Solano County Water Agency	Chris Lee	San Francisco Bay Area
Napa County Flood Control and Water Conservation District	Jeff Sharp	San Francisco Bay Area
Lake County Watershed Protection District	Gary Hanson or Tom Smythe	North Coast

1.3 Plan Development

This subsection gives a brief overview of the process of developing this IRWM Plan.

1.3.1 Goals for the IRWM Planning Process

To gain a common framework to guide development of the Plan and clarify its overall intent, the Project Team developed the following goals for the planning process:

1. The Plan will help foster a better understanding of the Region's water resource challenges, needs, and opportunities through careful consideration of relevant watershed issues.

2. The Plan development process will foster collaboration among agencies and stakeholders and will lead to development of effective strategies to address challenges, take advantage of opportunities, prioritize objectives and projects, and strengthen relationships between affected parties.

3. The Plan development process will help improve understanding of water management activities that can be better accomplished collectively rather than individually.

4. The Plan will provide a useful foundation for ongoing regional water resources efforts and support meaningful integration with and enhancement of County-based IRWMs and other sub-regional planning efforts.

5. The Plan will comply with applicable state requirements (Proposition 84) and the legislative intent of the California Water Code. Also, the Plan will be consistent with the statewide California Water Plan.

6. The Plan will be maintained as a living document under a governance structure that supports periodic updates in response to changing conditions. Plan updates will be completed as needed to benefit the region and better position and prepare for implementation grant funding opportunities.

7. The Plan will be prepared so as to provide compelling information that supports future efforts to secure available grant funding, including IRWM Implementation Grants.

8. The Plan will be written and formatted to be engaging, clear, informative, and compelling.

9. Existing data from County-based IRWM plans and other information relevant to the Region will be used where appropriate to develop the Plan.

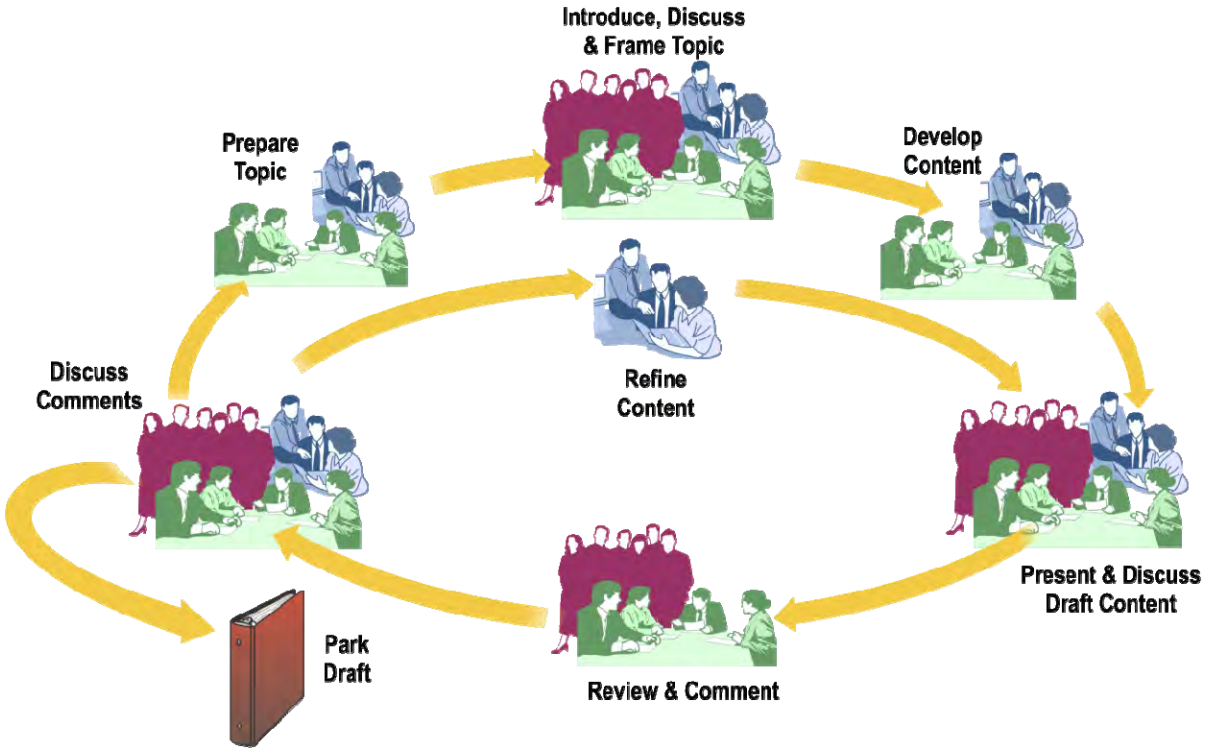
10. The Plan will be developed in a manner that encourages public participation in, and broad support of, the development process and the final plan content.

1.3.2 Plan Development Process

1.3.2.1 Overview

The IRWM Plan development process was organized around the stakeholder input meetings, as described in Section 1.2.2. A set of Topics for Engagement, discussed in Section 1.3.2.2, was identified at the beginning of the process and scheduled for discussion at specific times during the stakeholder and public outreach process. The Project Team introduced these topics, and introduced and discussed draft plan sections addressing the topics, at the meetings. The Project

Team also invited stakeholders to review plan sections and submit written comments after the meetings. The graphic below illustrates this interactive and iterative planning process.



1.3.2.2 Topics for Engagement

The Project Team developed the following list of topics to be discussed in a logical sequence. The list includes all of the content necessary to develop an IRWM Plan consistent with DWR's published standards for IRWM Plans (see *Proposition 84 and Proposition 1E Integrated Regional Water Management Grant Program Guidelines*, August 2010), including Table 2 in these DWR guidelines, which lists 16 standards that must be covered in the IRWM Plan.

- Topic 1: Team Charter
- Topic 2: Plan Development Process
- Topic 3: Plan Scope
- Topic 4: Current Conditions
- Topic 5: Future Conditions
- Topic 6: Challenges and Opportunities
- Topic 7: Potential Projects
- Topic 8: Integration
- Topic 9: Benefits and Impacts
- Topic 10: Project Selection and Priority
- Topic 11: Plan Recommendations
- Topic 12: Governance
- Topic 13: Finance
- Topic 14: Plan Performance and Monitoring

See Appendix B for more detail on each topic.

1.3.2.3 Plan Section Development and Refinement

The Project Team presented information related to each of the Topics for Engagement and facilitated collaborative discussions during stakeholder input meetings. Content for most of the topics was discussed in more than one stakeholder input meeting. The Project Team then prepared the draft IRWM Plan content based on the discussion of each topic, posting the content for public review and comment throughout the planning process. The Project Team revised draft content as needed on the basis of comments by the stakeholders, offering the revised content for review and comment until it was broadly accepted by the stakeholder group. At the end of the planning process, the Project Team combined and refined the agreed-upon content into this IRWM Plan for final public review and member agency adoption.

1.3.3 Subcommittees

The CC decided to form one ad hoc subcommittee during the course of plan development: the Water Balance Subcommittee. The Project Team assembled the Water Balance Subcommittee to discuss the topic and details of crafting a quantitative water balance for the Region. The Consultant Team engaged with the Water Balance Subcommittee to discuss detailed content with people interested and knowledgeable about that content while continuing to expedite overall IRWM Plan development during stakeholder input meetings.

1.4 Plan Organization

The Project Team fashioned this Westside IRWM Plan as a narrative, telling the story of the challenges and opportunities of the Region and how those challenges and opportunities informed the Plan goals and objectives, projects, and recommendations.

Also, the Plan includes all of the elements required by the IRWM Guidelines issued by DWR. Appendix B contains a cross-referencing table, which describes where each of the DWR required elements is presented in the Westside IRWM Plan.

Table 1-3: IRWM Plan Required Elements

Standard	IRWM Plan Reference/Section
A. Governance	1, 11
B. Region Description	1, 2, 3, 5
C. Objectives	6
D. Resource Management Strategies (RMS)	7
E. Integration	8
F. Project Review Process	8
G. Impact and Benefit	9
H. Plan Performance and Monitoring	11
I. Data Management	11
J. Finance	11
K. Technical Analysis	14
L. Relation to Local Water Planning	2, 4
M. Relation to Local Land Use Planning	2, 4
N. Stakeholder Involvement	1
O. Coordination	1, 10
P. Climate Change	2, 3, 4, 5, 6, 8

1.5 Plan Adoption

The IRWM Plan is recommended to be adopted by all participants in the planning process, including each of the governing boards of the RWMG. It is currently anticipated that the Plan adoption will begin once the final IRWM Plan has been released in July 2013. Additional information regarding the Plan adoption process and recommendations is provided in Section 11 – Plan Implementation Framework.

Section 2: Region Description

This section describes the Westside Sacramento Region (Region). Large and diverse, the Region has evolved significantly since the mid-1800s as a result of human interaction with its key available natural resources. Important historical decisions and practices factor into the challenges people now face in trying to manage the Region's water and environmental resources.

2.1 Region Overview and History

2.1.1 Overview

The unique and wide-ranging landscape of the Region includes nearly 3,000 square miles located west of the Sacramento River and north of the San Francisco Bay-Delta at the most downstream end of the extensive Sacramento River watershed. The Region encompasses all of Yolo County and portions of Lake, Napa, Solano, and Colusa Counties, as shown in Figure 2-1. The Region boasts a diverse mix of landscapes, including national forest, mountainous serpentine landscape and canyons, vast agriculturally developed valleys, and burgeoning urban communities. Several of the Region's surface and groundwater resources are inextricably linked; therefore, to explore and address the common water challenges of the more than 70 water agencies and other interested parties operating within the Region, it makes sense to focus attention within the Region boundaries.

The four watersheds within the Region are the Cache and Putah Creek watersheds and portions of the Sacramento-Stone Corral, and Lower Sacramento watersheds. All drain to the lower Westside portion of the Sacramento River. The Cache Creek and Putah Creek watersheds comprise a large portion of the Region's area. They drain from the coastal mountains on the western edge of the Region towards the Sacramento River valley. The Region also incorporates those portions of Yolo County that are outside the Cache and Putah Creek watersheds. The Sacramento-Stone Corral watershed overlies the northern portion of Yolo County, while the Lower Sacramento watershed overlies portions of both Yolo and Solano Counties. Both of these watersheds are large drainage basins in the flatter Sacramento Valley area of the Region that flow into the Sacramento River and Sacramento-San Joaquin Delta.

The eastern side of the Region is a part of the expansive and interconnected Sacramento Valley groundwater basin. Since the two major watersheds of the Region, Cache Creek and Putah Creek, influence the Sacramento Valley groundwater basin, considering this Region as a whole fosters a broader understanding of water management challenges and opportunities not previously considered in integrated regional water management (IRWM) plans.

Together, the watersheds and groundwater resources throughout the numerous basins in the Region provide diverse water sources, which people rely on for numerous agricultural, urban, and rural water uses and the support of critical ecosystems. Specific linkages between the water sources of the Region are described throughout this section.

Legend

- Cities
- County Boundaries
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

Topography

0 Elevation 5,000 ft

DRAFT

0 3 6 9

Miles

Kennedy/Jenks Consultants

WESTSIDE SAC IRWM

Topography

K/J 1170019.00
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Figure 2-1

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2.1.2 Planning Areas

Because of the Region's expansive geography, the Project Team subdivided it into Planning Areas (PAs). Three PAs were identified, with the aim of describing hydrologic functions within each area, facilitating focused study, and improving understanding of watershed management challenges, opportunities unique to each area, and insight into the organization and use of water resources throughout the Region. The three PAs are shown in Figure 2-2 and described below:

- Upper Cache Creek PA (605,704 acres) – Includes the Cache Creek and Bear Creek watersheds, located primarily in rural Lake and Colusa Counties, down to the Rumsey Bridge in Yolo County. The Rumsey Bridge was selected as the downstream extent of the Upper Cache PA because of its location where Cache Creek enters the flatter valley.

- Upper Putah Creek PA (361,285 acres) – Includes the mountainous and sparsely populated Putah Creek watershed upstream of Monticello Dam and Lake Berryessa in eastern Napa County and southern portions of Lake County.

- Valley Floor PA (944,473 acres) – 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. The Valley Floor PA is the largest of the three PAs and extends to the Sacramento River in the east and the Delta in the south.

2.1.3 History of Water Development

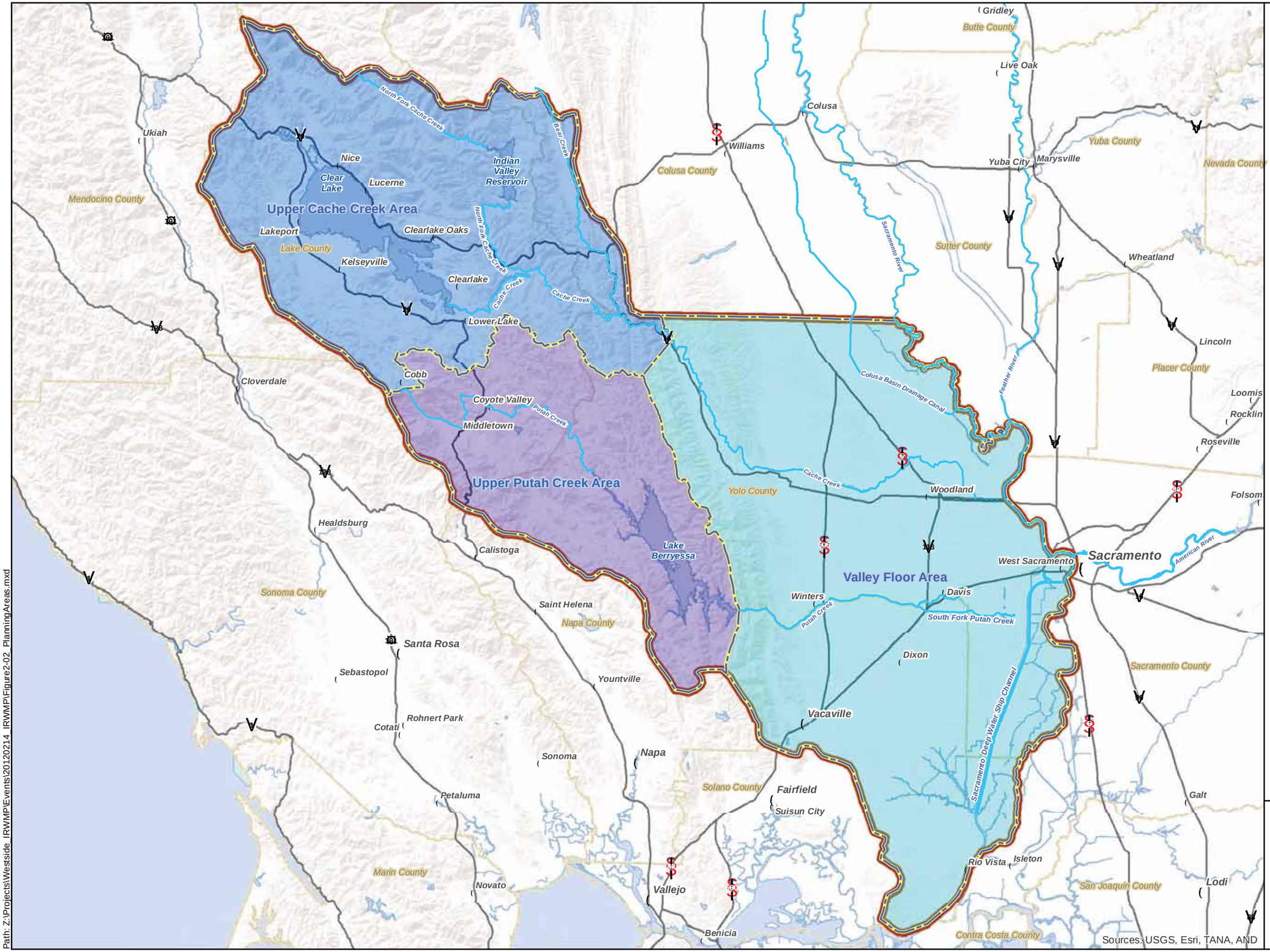
Understanding the historical influences on water supply development and use in the Region provides essential context for the complex relationships that surround water management and that have affected the water resources landscape over time. Historical understanding also provides a foundation for addressing the Region's challenges and opportunities through this IRWM Plan.

2.1.3.1 Early History

Native American tribes are the first known settlers within the Region. Historians believe that Native American communities existed in the area more than 10,000 years before European settlers. These tribes resided near water sources, including Clear Lake, Cache Creek, and Putah Creek, and other areas within the Valley. Early residents in the Region included the Pomo (Clear Lake) and Wintun (Cache Creek, Putah Creek, and valley floor areas) people. A handful of Wappo and Miwok also lived around Clear Lake.

Yocha Dehe Wintun Nation – Yolo County

At one time, Wintun-speaking people occupied nearly all of what has become north central California, with a population of about 15,000 people. For thousands of years, members of Wintun tribes dwelled along the waters of Cache Creek in the Capay Valley and prospered while hunting, farming, and trading the resources of the land. When white settlers inhabited the territory of Northern California, the Wintun people were nearly wiped out by malaria and smallpox epidemics in the early 1800s. Those who survived the diseases later encountered the influx of non-Indians who came to search for gold in the 1850s. Later, survivors were put onto small rancherias, or reservations, and became wards of the federal government. The Rumsey Band of Wintun Indians, as named by the federal government, was placed at the Rumsey


Upper Cache Creek Area
Upper Putah Creek Area
Valley Floor Area
Ukiah
Nice
Clear Lake
Lucerne
Indian Valley Reservoir
Mendocino County
Lakeport
Clearlake Oaks
Lake County
Kelseyville
Clearlake
Lower Lake
Cloverdale
Cobb
Coyote Valley
Middletown
Healdsburg
Calistoga
Lake Berryessa
Sonoma County
Saint Helena
Napa County
Santa Rosa
Sebastopol
Yountville
Rohnert Park
Cotati
Vacaville
Sonoma
Napa
Petaluma
Solano County
Fairfield
Suisun City
Marin County
Novato
Vallejo
Benicia
Contra Costa County
Gridley
Butte County
Live Oak
Colusa
Williams
Colusa County
Yuba City
Marysville
Yuba County
Nevada County
Sutter County
Wheatland
Lincoln
Placer County
Loomis
Rocklin
Roseville
Yolo County
Woodland
Folsom
Winters
Davis
West Sacramento
Sacramento
Dixon
Sacramento County
Galt
Rio Vista
Isleton
San Joaquin County
Lodi
North Fork Cache Creek
Bear Creek
Cache Creek
Putah Creek
South Fork Putah Creek
Sacramento River
Colusa Basin Drainage Canal
Feather River
American River
Sacramento Deep Water Ship Channel
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Rancheria in the early 1900s and then relocated again to an unproductive parcel of land in Capay Valley about 40 years later. In the late 1980s, the U.S. Congress enacted the Indian Gaming Regulatory Act (IGRA), which allowed the tribe to open Cache Creek Indian Bingo on 188 acres of trust land. In 2009, the tribe legally changed its name to Yocha Dehe Wintun Nation after the homeland in the tribe's ancestral Patwin language.

Pomo Indians – Lake County

Lake County Pomo Indians are direct descendants of the Pomos who have historically inhabited the Clear Lake area for over 11,800 years. Although the Pomo were migratory, they often stayed for extended periods in single locations, subsisting on local wildlife and plants including acorns, which were a staple. The Pomo are particularly well known for their basket-making using local plants and grasses. Beginning in 1821, enslavement and mistreatment by Spanish soldiers and missionaries, Mexican land barons, European settlers, and gold diggers, combined with a lack of natural immunity to European diseases, nearly devastated the Pomos.

In 1878 several tribal groups joined together and communally purchased 90 acres of land, establishing a traditional community called Habematolel in Upper Lake. By 1900, only 450 Pomos survived, compared with an estimated 1850 population of 3,000 in 30 villages. In the early 1900s, six Lake County Rancherias were set aside by the federal government: the Big Valley Rancheria, Middletown Rancheria, Robinson Rancheria, Scotts Valley Rancheria, Sulphur Bank Rancheria (now known as the Elem Indian Colony of Pomo Indians), and Upper Lake Rancheria (now known as the Habematolel Pomo of Upper Lake). However, in 1959 the federal government passed legislation terminating the Tribe's status as a federally recognized Indian Tribe and disestablished the rancherias.

Today, many of the Pomo tribes remain landless, although several have purchased lands for tribal offices, housing, and in some cases, gaming and lodging. Pomo tribal membership ranges from about 70 persons/tribe up to almost 500 persons/tribe. It is estimated that the cumulative membership in the six tribes is over 1,100 persons, a portion of whom live in Lake County. The tribes seek to improve and preserve the natural resources of their aboriginal lands. Most of the Pomo tribes have environmental planning and monitoring divisions, which perform water quality monitoring and data management, land and waterway restoration, waste management, and education. In addition, the Robinson Rancheria Environmental Center has undertaken monitoring and a pilot breeding program for the Clear Lake hitch, a native fish whose numbers are in decline.

2.1.3.2 19th Century

American and European settlers began arriving in the mid-1800s, with the first recorded contact with Native Americans occurring in the 1830s. Early immigrants began planting crops and developing ranchos on Spanish land grants in the late 1830s and early 1840s. Significant agricultural and cattle ranching industries began to develop in the 1850s around Clear Lake and within the valley floor. The early settlers practiced subsistence farming based on livestock and dairy. In the late 1800s, farmers began to capitalize on the rich and fertile soils and ideal growing conditions and started exporting crops from the Region. Native oak woodland and riparian habitat was cleared and replaced with agricultural fields, pastures, and orchards. The mountainous sections of the Region have included vineyards and pear orchards for many years now. The valley's rich alluvial soils and relatively flat terrain supported the development of a wide variety of crops, including rice, grains, and citrus orchards.

The discovery of gold in 1848 in the Sierra Nevada and the resulting influx of prospectors into California dramatically changed the makeup of the Region. By the 1850s, settlers were making their homes throughout the Region, and some communities, such as Lakeport and Woodland, were forming. Mining developed into a large industry within Napa, Colusa, and Lake Counties during the gold rush. People mined gold, borax, and large quantities of mercury, particularly in the upper Cache Creek and Putah Creek watersheds within Lake and Napa Counties. Mercury, used in placer and hydraulic mining to amalgamate gold fines, was mined extensively throughout the upper watershed areas for use in the Sierra Nevada during the mid- to late 1800s. Some mercury and gold mining in the Region continued through the late 1950s for military and commercial uses elsewhere. With negligible pollution controls, mining waste contaminated the mine sites and downstream waterways throughout the two watersheds. These mines are now inactive, but many have not been properly reclaimed and still affect the mercury levels in the creeks and water bodies within the Region. Mineral springs and natural mercury-enriched soils are additional sources of mercury. A portion of the inorganic mercury in water is converted into methylmercury, a highly toxic form that gets incorporated into food webs, reaching concentrations one million times greater in predatory fish than in water. Most major waterways in the Region are now impaired by mercury because of the high levels of methylmercury in fish consumed by humans and wildlife.

Entrepreneurs also created a large industry of gravel mining within the lower stream channels along Cache and Putah Creeks]. Although in-channel gravel mining no longer occurs along either creek, the effects of historic mining still affect the integrity of portions of the stream channels, resulting in decreased salmonid spawning habitat.

By the end of the 19th century, immigrants had transformed the Region from an area that hosted relatively isolated populations of Native Americans to one with expanding agricultural and mining communities of Western settlers dispersed throughout it. By the early 1900s, few Native Americans remained because of local skirmishes and diseases introduced by Europeans. Conversion of land for agriculture and mining activities continued to expand. Western-style communities within the Region began to develop along the waterways, including the Sacramento River, Cache Creek, Putah Creek, and Clear Lake. Some of these communities can still be recognized today, such as Clearlake, Lakeport, Winters, Davisville (now called Davis), and Rio Vista. Others, such as Vacaville and Dixon, developed along the route between the Sacramento Valley and San Francisco.

2.1.3.3 Development of Water Supply

Demand for water supply increased along with the rapid growth in population and agricultural activities in the late 1800s. Water was either directly diverted from the Sacramento River, Putah Creek, Cache Creek, and Clear Lake or extracted from local aquifers during the 1800s and early 1900s. The advent of reliable groundwater pumping techniques provided for a significant expansion of agriculture. Unfortunately, this development also resulted in an unsustainable use of groundwater. Excessive groundwater pumping created an overdraft of basins and caused localized subsidence in lowland areas. This overpumping began to threaten access to shallow groundwater for irrigation. Water agencies began to supplement their local resources with projects that delivered available supply from the Cache Creek and Putah Creek watersheds, as well as importing water supplies from outside the Westside Region to meet the growing water demands. Local water suppliers constructed several important supply enhancement projects between 1914 and 1988, which included Cache Creek Dam, Solano Project (Monticello Dam), Indian Valley Reservoir, and the North Bay Aqueduct.

Cache Creek

The Yolo Water and Power Company constructed the Cache Creek Dam at Clear Lake in 1914 to supplement the growing need for water within Yolo County. The Cache Creek Dam serves to both increase the natural storage and regulate the release of irrigation water from Clear Lake for downstream uses. Today, the Yolo County Flood Control and Water Conservation District (YCFCWCD) owns and operates the dam as consistent with the Gopcevic Decree, issued in 1920, which regulates how much water can be stored in Clear Lake during non-flood and flood conditions. YCFCWCD stores up to 150,000 acre-feet per year (AFY) in Clear Lake for agricultural water use in Yolo County as allowed in the Solano Decree, which was approved in 1978. In 1975, YCFCWCD completed construction of the Indian Valley Reservoir, located on the North Fork of Cache Creek, to help meet agricultural water demands within Yolo County during dry years that could not be met by Clear Lake supplies alone. Indian Valley Reservoir also provides 40,000 AF capacity for flood management storage within the 300,600 AF of total storage

Putah Creek

Solano County and the water users of the Solano Basin similarly employed surface water supplies to offset groundwater overdraft. In 1957, the U.S. Bureau of Reclamation (USBR) completed the Solano Project on Putah Creek to increase Solano County's water supply because groundwater resources had been depleted. This project features the Monticello Dam, which created Lake Berryessa. Releases from the dam flow downstream to Lake Solano, created by the Putah Diversion Dam. The Putah Diversion Dam provides regulation for releases to the lower portion of Putah Creek and supports diversions to the Putah South Canal, which transports agricultural and municipal water supplies to much of Solano County.

Imported Supplies

Some municipal and agricultural users also rely significantly on sources of water imported into the Region from the State Water Project (SWP) and federal Central Valley Project (CVP). The most recently constructed major supply source, the North Bay Aqueduct (NBA), completed in 1988, supplies SWP water to agencies in Solano County. The California Department of Water Resources (DWR) envisioned the NBA as part of the SWP during the initial SWP planning in the 1950s and 1960s. The Solano County Water Agency (SCWA) contracted with DWR for water supply from the SWP. In turn, SCWA provides water under contract to Vacaville and Napa County Flood Control and Water Conservation District (FC&WCD), which supplies the water to a number of cities in Napa County. SCWA also has contracts to provide NBA water to Rio Vista and Dixon; however, additional facilities need to be constructed for Rio Vista or Dixon to receive the water.

While water managers within the Region have expanded their portfolios to include additional surface water supplies, some communities still face challenges meeting their demands for water. Surface water supply availability varies depending on hydrologic conditions, and surface water delivery infrastructure does not extend to all communities in the PAs. Likewise, some communities and agricultural users who rely on groundwater supplies must deal with elevated concentrations of naturally occurring constituents such as boron, selenium, and total dissolved solids as well as constituents such as nitrate that have been added by human activities within the Region.

2.1.3.4 Development of Flood Protection

Throughout the late 1800s and into the 1900s, communities began to modify local waterways and operate constructed facilities (dams) to decrease the negative effects of local flooding. For example, one of the natural features of Clear Lake is the Grigsby Riffle, a rock sill that has long functioned as a dam to create Clear Lake. This natural hydraulic impediment in Cache Creek also causes levels to rise in Clear Lake when inflows are high and has resulted in periodic flooding around the shores of the lake. Some of the highest known lake stages occurred in 1890. Around 1918, Cache Creek was straightened and turned into a channel between Clear Lake and Grigsby Riffle. Then, after a significant flood in 1938, water managers excavated the Riffle to allow for increased flows into downstream portions of Cache Creek when the lake reaches high stages. However, in response to the effects of those higher downstream flows, the Bemmerly Decree was issued in 1940, prohibiting further excavation of the Riffle. Since flooding around the lake continues to be a persistent problem and increasing releases out of the lake during flood stages is not permitted under current law, communities have altered the streams entering Clear Lake. They have constructed levees to reclaim low-lying land adjacent to Middle Creek and to prevent flooding along Scotts, Middle, Clover, and Adobe Creeks, which are tributaries to Clear Lake.

Communities established within the lower valley areas of the Sacramento River watershed have also faced significant flood hazards. These communities, many of which are located in the floodplain of the Sacramento River, experienced significant flooding in 1850, 1861-1862, 1878, 1902, and 1909. As a result, state and local agencies have significantly altered stream channels and constructed levees in many areas of the valley floodplain to improve public safety and reduce flood-related damages. The largest set of flood management facilities affecting this Region is the Sacramento River Flood Control project initiated in 1918, which includes the Yolo Bypass, constructed to reduce flood risk in the City of Sacramento. Like all communities located within natural floodplains, Rio Vista and portions of Woodland, Davis, and Vacaville and unincorporated areas of Yolo and Solano Counties still face residual flood risk.

2.1.3.5 The Modern Era

The development of the Region's communities, formation of local governments, and incorporation of cities began in the mid-1800s. Solano, Yolo, Colusa, and Napa were formed among the original 27 counties created in the statehood proceedings for California in 1850. Lake County formed in 1861. Within Yolo County, the cities of Davis, Woodland, and Winters, incorporated in 1917, 1871, and 1898, respectively; West Sacramento incorporated much later, in 1987. Within Solano County, the cities of Dixon, Vacaville, and Rio Vista incorporated in 1878, 1892, and 1893, respectively. Within Lake County, the cities of Lakeport and Clear Lake incorporated in 1888 and 1980, respectively. No incorporated cities exist within the portions of Napa and Colusa Counties located within the Region.

Approximately 390,000 people live within the Region today. Much of the valley area lands support significant agricultural activities. Even so, the vast majority of the land within the Region remains undeveloped. The communities throughout the Region value preservation of these open spaces and agricultural lands**.** In addition, many residents both inside and outside the Region demonstrate interest in restoring elements of the Region's historical environmental function. A number of environmental enhancement efforts have been undertaken to continue to protect and enhance significant habitat and water resources. Examples include the ongoing development of the Habitat Conservation Plan (HCP) for Solano County, a HCP/Natural

Communities Conservation Plan (NCCP) for Yolo County, and the state led Bay-Delta Conservation Plan (BDCP).

The modern focus of water resources management in the Region involves several key factors:

- Supporting sustainable economic activities and beneficial uses of water,
- Preserving open space and agricultural activities within the Region,
- Engaging in environmental stewardship, and
- Protecting and improving water quality to support the range of beneficial uses.

These key factors are emphasized throughout this IRWM Plan.

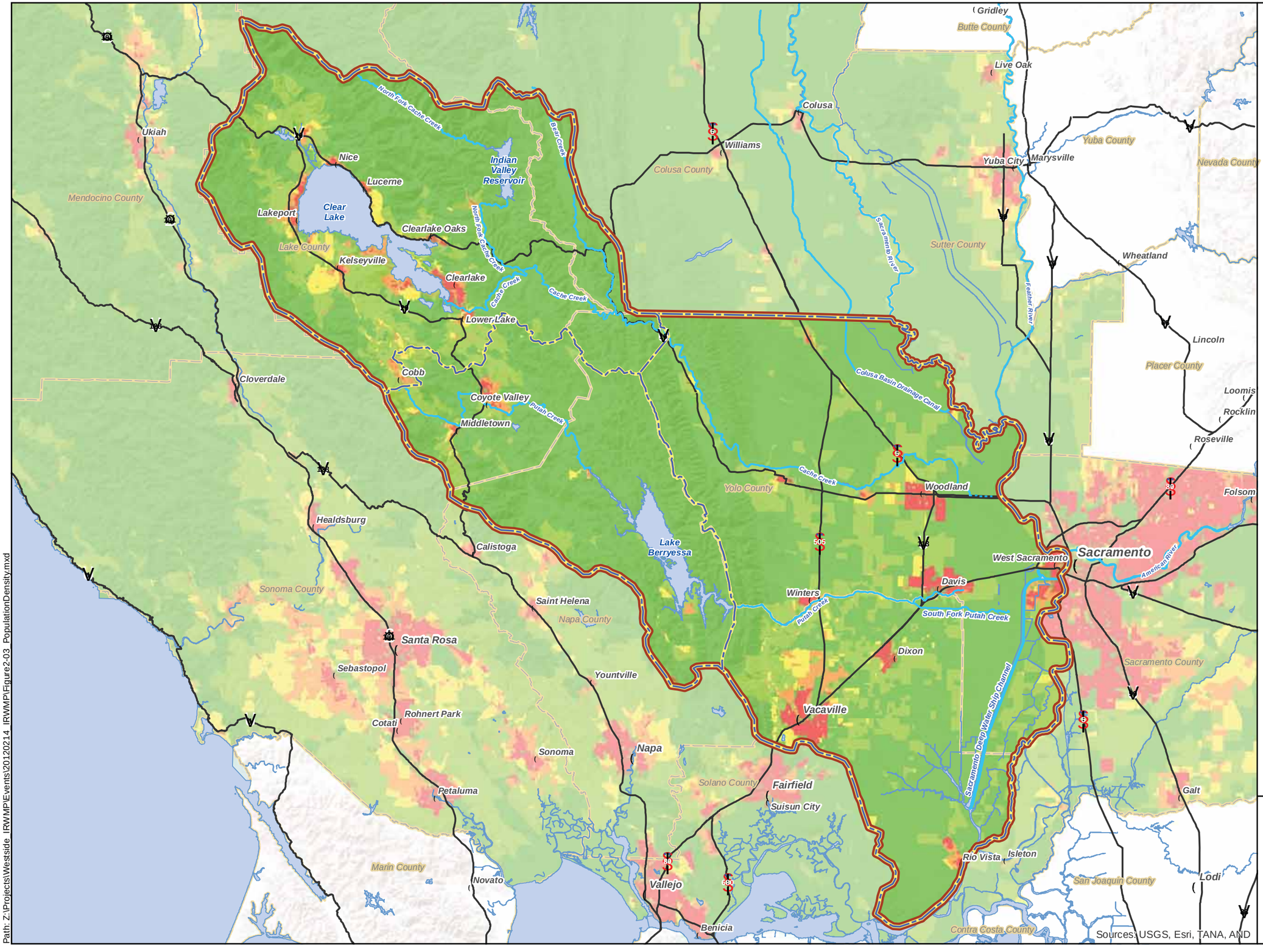
2.2 Population

The population of the Region more than doubled over the past 40 years, growing approximately 174 percent. Its estimated current population is more than 390,000. The majority of the population is located in the incorporated cities in Solano and Yolo Counties, including Vacaville, Davis, Woodland, Dixon, and West Sacramento. The total population and population for each community are summarized in Table 2-1. U.S. Census data (census tract data) for 2010 were used to estimate current population. The population density for the Region has been mapped in Figure 2-3, which shows the number of persons per square mile. This figure demonstrates that the majority of the population in the Region exists primarily in and around city/community areas. Agricultural lands, which include smaller communities and scattered ranches and farms, contain lower-density populations.

Table 2-1: Projected Population by Community

	1970	1980	1990	2000	2010	2015	2020	2025	2030	2035
Communities										
Dixon [1]	4,432	7,541	10,401	16,103	18,376	19,916	21,148	22,380	23,304	24,536
Rio Vista [1]	3,135	3,142	3,316	4,571	7,346	8,348	9,516	10,685	11,770	12,772
Vacaville [1]	21,690	43,367	71,479	88,625	92,344	95,030	97,253	99,383	101,328	102,903
Davis [2]	23,488	36,640	46,209	60,308	64,965	68,117	71,421	74,886	78,519	82,328
West Sacramento [2]	-	-	28,898	31,615	48,744	55,244	62,611	70,960	80,422	91,147
Winters	2,419	2,652	4,639	6,125	6,624	7,125	7,664	8,243	8,866	9,537
Woodland [2]	20,677	30,235	39,802	49,151	55,472	58,196	61,053	64,051	67,196	70,495
Lakeport [3]	3,005	3,675	4,390	4,820	4,753	5,248	5,794	6,397	7,063	7,798
Clearlake [3]	-	-	-	13,142	15,250	16,837	18,590	20,524	22,661	25,019
Rural										
Lake County - Other Communities/Rural	15,467	32,131	46,029	40,220	44,591	48,640	53,088	57,976	63,348	69,255
Solano County - Rural [1]	1,859	2,601	3,819	4,436	4,648	4,870	5,012	5,113	5,214	5,234
Yolo County - Rural [2]	45,204	43,847	21,544	21,461	25,161	26,749	28,437	30,231	32,139	34,167
Colusa County - Rural [4]	17	18	23	26	30	31	32	34	35	36
Napa County - Rural [1]	1,530	1,927	2,155	2,421	2,661	2,788	2,869	2,927	2,985	2,997
Westside Region	142,923	207,776	282,703	343,024	390,965	417,138	444,488	473,790	504,849	538,222

Source: Dept. of Finance, Historical Census Populations of California, Counties, and Incorporated Cities, 1850-2000 (2011).
2010 population based on GIS calculation of U.S. Census Bureau 2010 U.S. Census by Census Block Data. (1) 2010-2035 growth rate based on Association of Bay Area Governments (ABAG) 2009 projections; (2) 2010-2035 growth rate based on Sacramento Area Council of Governments (SACOG) Draft 2012 Regional Data; (3) 2010-2035 growth rate based on 2008 Lake County General Plan, Table 2-1, Community Profiles; and (4) 2010-2035 Colusa County growth rate assumed to be the same as Lake County rural growth rate.
Note: West Sacramento incorporated in 1987 and Clearlake incorporated in 1980.



Legend

- Cities
- County Boundaries
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

Population Density
(people per square mile)

- ≤ 10
- 11 - 100
- 101 - 250
- 251 - 1000
- >1000

Source:
Census Block U.S. Census Bureau 2010.

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Population Density

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May, 2013

Figure 2-3

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The population projections shown in Table 2-1 and summarized in Figure 2-4 are based on models specific to localized areas provided by the Sacramento Area Council of Governments (SACOG), Association of Bay Area Governments (ABAG), and Lake County General Plan projected growth rates. California Department of Finance growth data were used where local government data were not available. Growth rates were applied to the 2010 estimated population according to census tract boundaries to project growth in five-year increments, which is consistent with the population projection methodology presented in the *2010 Urban Water Management Plan Guidebook* (DWR 2010). The historical population of the Region and projected growth through the 2035 planning horizon are shown in Figure 2-4. The population is estimated to reach approximately 550,000 by 2035. A detailed tabulation of projected population by community with growth rates can be found in Appendix C.

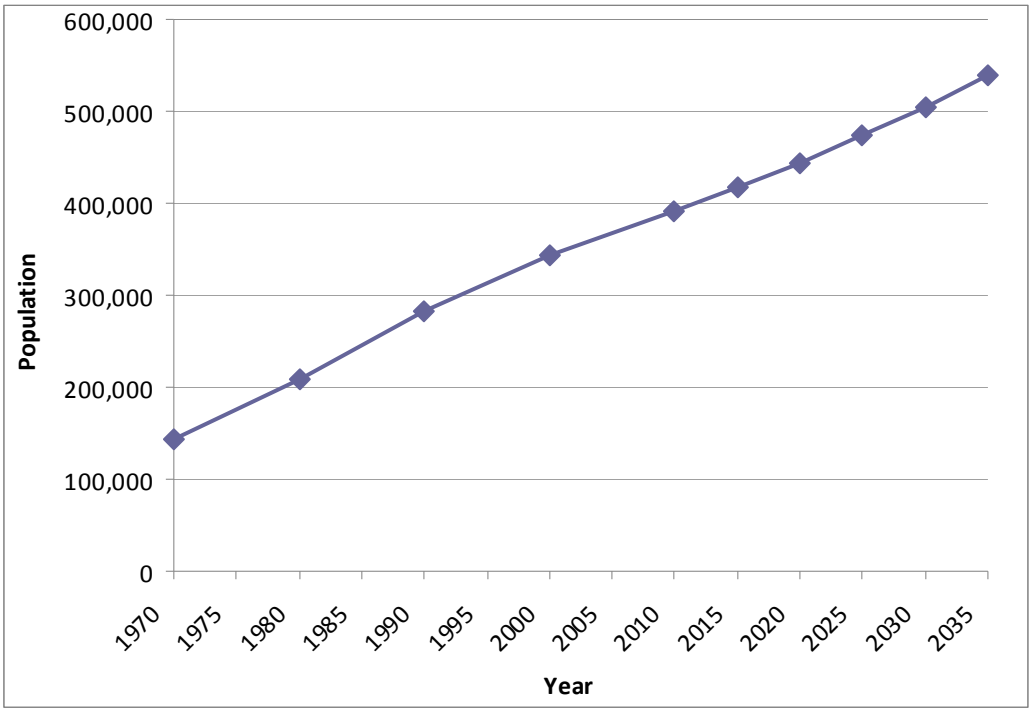


Figure 2-4: Historical and Projected Population

2.3 Social and Cultural Values

The story of the Region's development earlier in this section hints at the broad range of social and cultural values that characterize the Region. The most commonly held social and cultural values that affect the Region's water management activities include open space preservation, agricultural preservation, and economic development. These values are interconnected: recreation in open spaces and agriculture are important contributors to the Region's economic vitality. The values have been supported through public policy on land use, education, and continued support of Native American traditions. These policies are documented in the existing County and incorporated City general plans, discussed in greater detail in Section 4.

2.3.1 Maintaining Agricultural Character

Collectively, the counties of Colusa, Lake, Napa, Solano, and Yolo are committed to retaining the existing agricultural and rural character of the Region. Each county and many of the cities have adopted general plans that largely reflect this vision of preserving the Region's agricultural and recreational resources. Lake, Yolo, and Napa County have policies in their general plans to conserve and preserve agricultural land by enacting ordinances limiting the use of agricultural lands, creating minimum parcel sizes, and implementing the Williamson Act (which enables local governments to enter into restrictive contracts with private landowners of agricultural lands to preserve agriculture in exchange for reduced taxes). Strong support from industry groups and members of the communities and UC Davis (which conducts much of Northern California's research on agriculture) has also helped the counties preserve their agricultural lands.

2.3.2 Maintaining Recreational Opportunities

Maintaining and improving outdoor recreational opportunities is another key value of the Region, not only to improve the quality of life but also to keep the local economy vital. Every year, kayakers and rafters visit the Region for premiere Class II to Class V whitewater runs on Upper Cache and Putah Creeks. Navigation of the creeks by rafters requires adequate instream flows, provided by increased flow management on summer weekends when possible to promote recreational use of the rivers. Fishermen, boaters, and other water recreationists rely on the many lakes of the Region, including Lake Berryessa and Clear Lake, to provide a significant amount of fishing and recreational boating activity.

2.3.3 Environmental Enhancement

Environmental enhancement continues to be an area where both local agencies and non-governmental organizations (NGOs) have focused efforts through policy development, awareness, and education. Some of the major local organizations that have conducted work to improve and sustain the aquatic and riparian environments throughout the Region are:

- Yolo Basin Foundation in the Yolo Bypass,
- Putah Creek Council on Putah Creek,
- Yolo Natural Heritage Program in the development of a Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP) for Yolo County,
- Lake County in the development of the *Clear Lake Integrated Watershed Management Plan* (County of Lake Department of Public Works 2010),
- The Lower Putah Creek Coordinating Committee in the development of the *Lower Putah Creek Management Action Plan* (EDAW 2005),
- Blue Ridge Berryessa Natural Area (BRBNA) Conservation Partnership, and
- Solano Habitat Conservation Plan.

2.3.4 California Native American Tribes

The Region is home to a number of Native American Tribes, each with a long history and rich set of cultural values preserved through the centuries. Identified reservations and rancherias are shown in Figure 2-5, and the federally registered tribal names are listed in Table 2-2.

Table 2-2: Native American Tribes

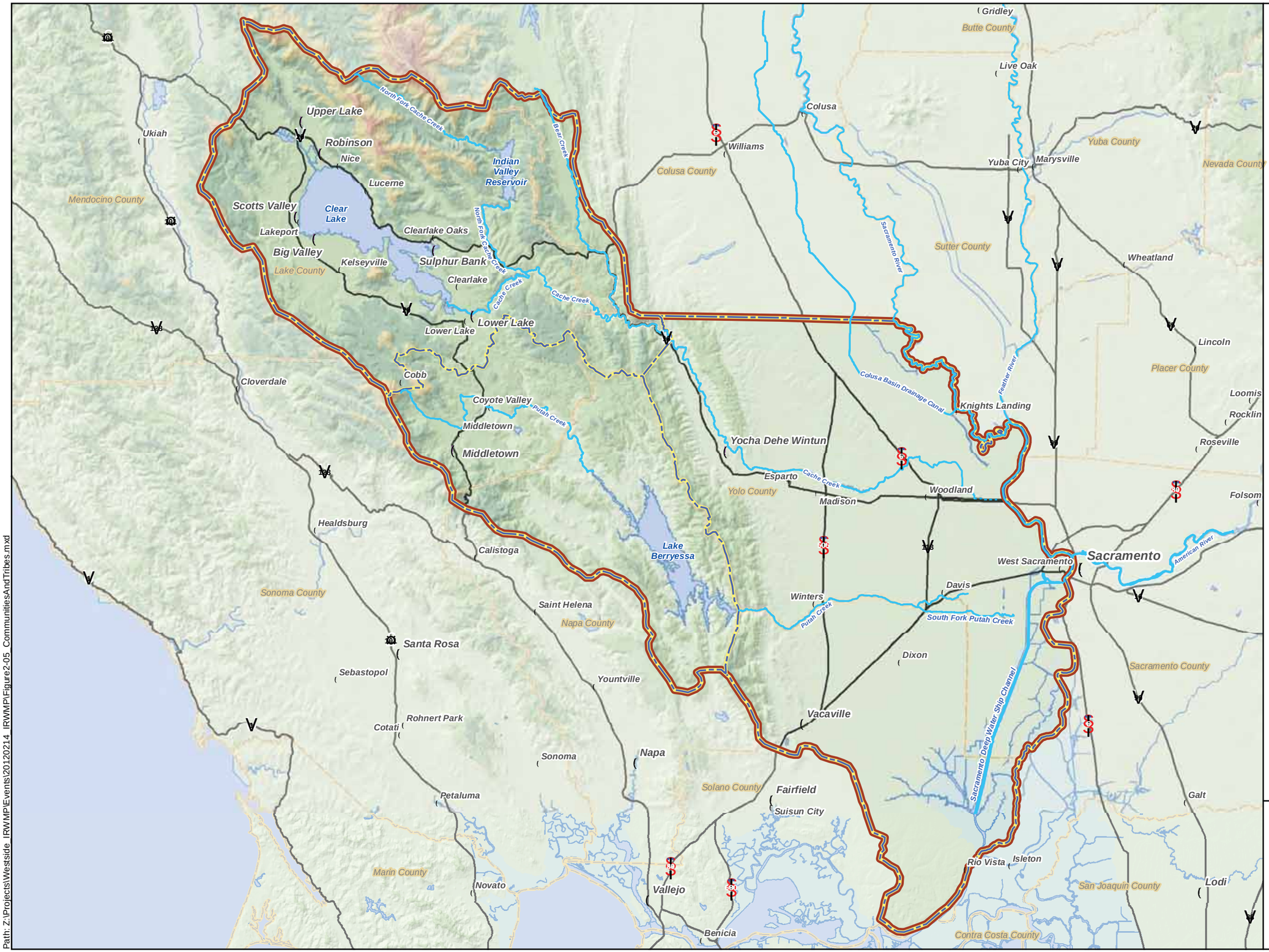
Reservation/Rancheria Name	Official Federal Register Tribal Name
Upper Lake	Habematolel Pomo of Upper Lake
Robinson (below Upper Lake)	Robinson Rancheria of Pomo Indians
Yocha Dehe Wintun	Yocha Dehe Wintun Nation
Scotts Valley	Scotts Valley Band of Pomo Indians
Big Valley	Big Valley Band of Pomo Indians
Sulphur Bank	Elem Indian Colony of Pomo Indians
Middletown	Middletown Rancheria of Pomo Indians
Lower Lake	Not Federally Recognized

2.4 Economic Conditions and Trends

The communities of the Region have a broad socioeconomic makeup. The growing urban cities of southern Yolo and Solano Counties are distinct from the rural and largely disadvantaged communities in Lake County and sparsely populated areas of Napa County. The Valley Floor PA includes a large agricultural industry, a public university at the University of California Davis, and large industrial and commercial areas in West Sacramento and Vacaville. In contrast, the Upper Putah Creek and Upper Cache Creek PAs are largely rural, with limited agricultural areas and scattered small communities. The recreation-vacation industry is the most significant segment of Lake County's economy in the Upper Cache Creek PA. Similarly, the Upper Putah PA, which includes portions of Napa and Lake Counties, provides numerous rafting and boating recreational opportunities on Upper Putah Creek and at Lake Berryessa.

Household income data by county obtained from the U.S. Census Bureau's American Community Survey highlights economic disparities within the Region. The median household income (MHI) of Lake County is estimated to be $39,491 per year, which is $18,000 per year lower than the Yolo County MHI of $57,077 and $29,000 per year lower than the Solano County MHI of $68,409. Appendix C contains a more detailed tabulation of demographic information.

DWR defines a disadvantaged community (DAC) as an area with an MHI of less than 80% of the statewide average of $60,883; $48,706 is 80% of the statewide average MHI. The majority of the communities of the Upper Cache PA and portions of the Valley Floor PA meet the requirements of a DAC. Figure 2-6 shows the DAC areas by census block and census-designated areas for the Region. DACs may be eligible for additional project funding and assistance to implement projects or programs consistent with this IRWM Plan.



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Legend

- Cities and Towns
- County Boundaries
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies
- Tribal Areas

Source:
American Indian Areas/Alaska Native Areas/Hawaiian Home Lands, U.S. Census Bureau, 2000; Prop. 84 IRWM Planning Grant Application, Figure 4.

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Communities and Tribes

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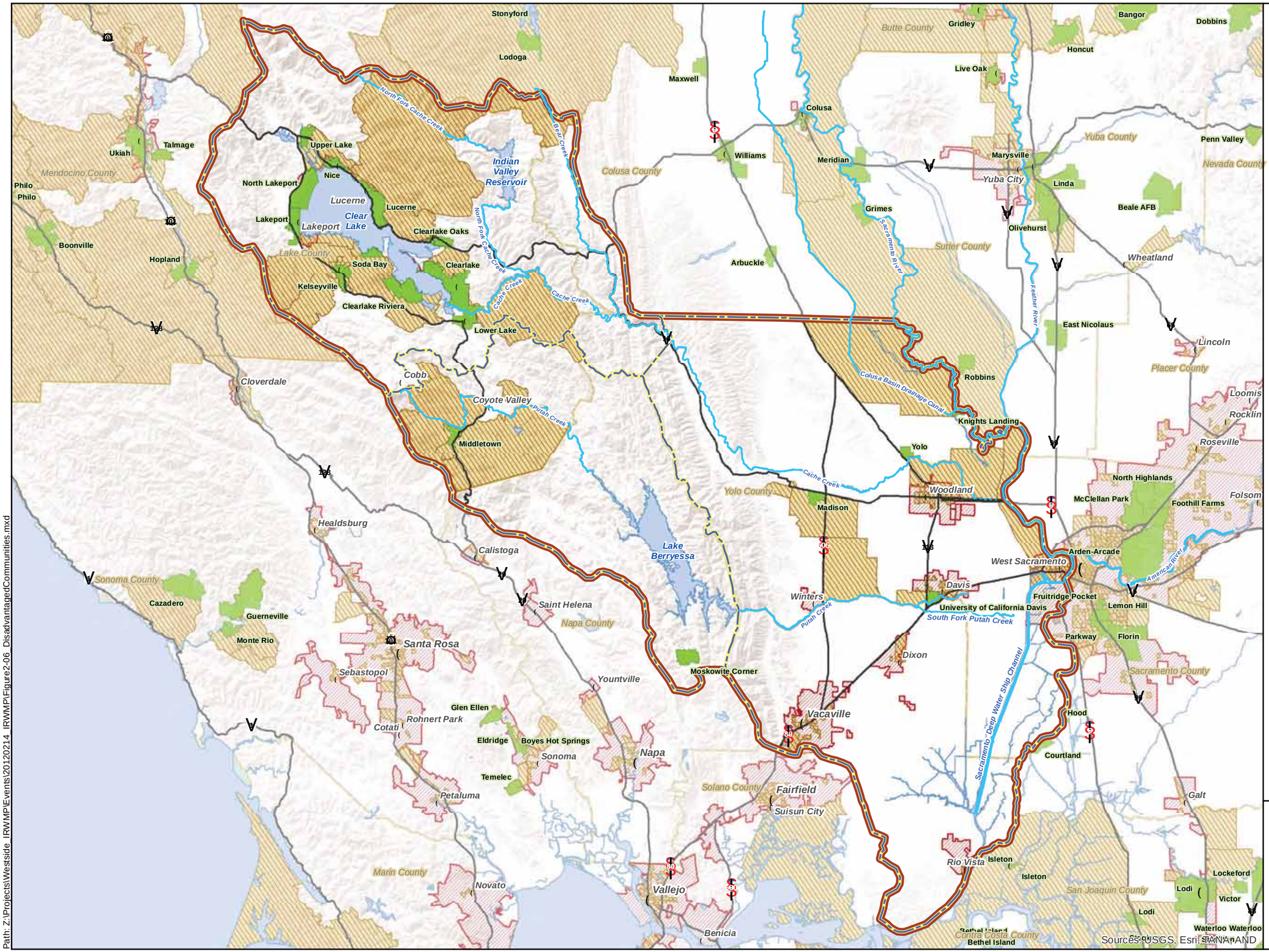
Figure 2-5



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Legend

- Cities
- City Boundaries
- County Boundaries
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies
- DACs (Census Places)
- DACs (Census Tract)

Source:
Compiled by DWR Using US Census Bureau - American Community Survey (ACS); 5-year period 2006-2010.

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Disadvantaged Communities

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May, 2013

Figure 2-6

2.5 Land Characteristics and Uses

The Region encompasses more than 1.9 million acres of land, which is dominated by open space and agriculture. Open space, often with native vegetation, remains the predominant land use in the Region, occupying approximately 68% of the entire land area, despite the vast agricultural and significant urban development that has occurred over the past 150 years. Agriculture makes up approximately 28% of the total land area, while urban and community developments represent only 5% of the total land area. Open space 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, administered 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 Game (CDFG), for recreational activities like boating, fishing, hiking, camping, and hunting.

Table 2-3 summarizes existing land use classifications in the Region by PA, and Figure 2-7 illustrates the distribution of land uses throughout the Region.

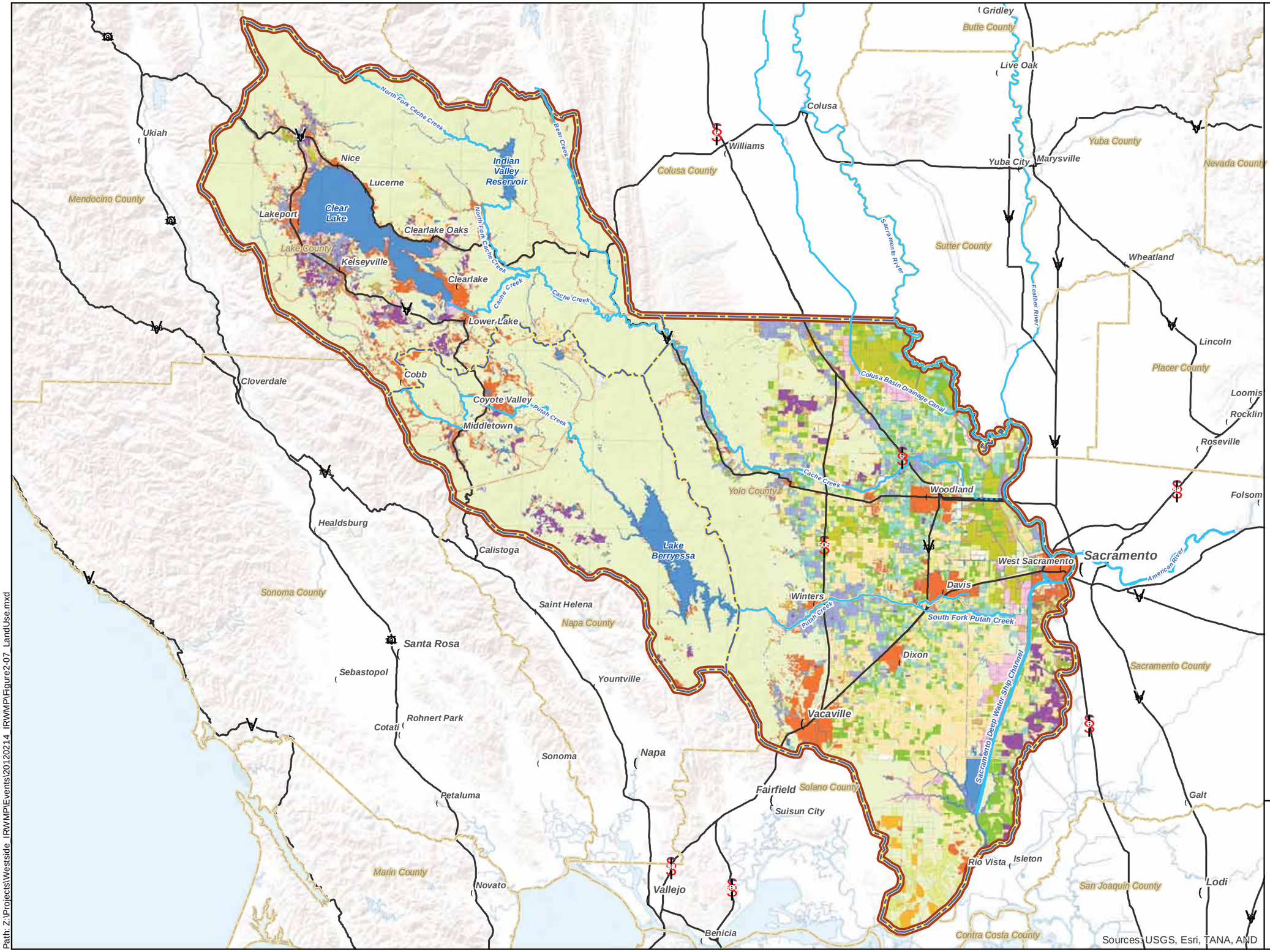
Table 2-3: Summary of Existing Land Use By Planning Area

Land Use Classification	Upper Cache Creek PA (acres)	Upper Putah Creek PA (acres)	Valley Floor PA (acres)	Total (acres)	Percent of Total Land
Agriculture	33,409	9,801	486,668	529,877	28%
Communities	26,708	9,588	55,911	92,207	5%
Water Surface	46,925	21,491	20,218	88,634	5%
Native Riparian/Vegetation	496,826	319,669	372,729	1,189,222	62%
Barren/Unclassified	1,836	738	8,948	11,523	<1%
Total	605,704	361,285	944,473	1,911,462	

Source: *DWR Land Use Survey* (by Counties: Lake 2006; Colusa 2003; Solano 2003; Yolo 2008; Napa 1999)

The land use classifications are adapted from the DWR land use survey classes. The following classifications are used for the Region:

- Agriculture – Includes a variety of permanent and seasonal crops and growing methods, all of which influence water use patterns. Some crops, such as pasture grasses, are dry farmed, while others, such as alfalfa, can be fallowed during seasons or years when water is not available.
- Communities – Includes those in all developed land use categories such as residential, industrial, institutional, office, and commercial space. Includes landscaped lands such as golf courses, parks, and other open spaces situated within the community boundaries.



Legend

- Cities
- County Boundary
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

Land Use Designation

- Communities
- Native
- Riparian
- Water
- Not Surveyed

Agricultural Classes

- Grain and Hay Crops
- Rice
- Field Crops
- Pasture
- Truck, Nursery and Berry Crops
- Deciduous Fruits and Nuts
- Citrus and Sub-Tropical
- Vineyards
- Idle
- Semi-Agricultural

Source:
Land Use Survey. DWR. (Lake 2006; Colusa 2003; Solano 2003; Yolo 2008; Napa 1999)

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Sources: USGS, Esri, TANA, AND

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Land Use Map

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May, 2013

Figure 2-7

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- Water Surface – Includes the total surface area occupied by the major lakes and reservoirs in addition to irrigation ditches and canals, delta sloughs, creeks, streams, rivers, wetlands, and wastewater ponds.
- Native Riparian – Land near streams and water bodies. Includes marshes, meadows, trees, and other watercourse vegetation.
- Native Vegetation – Includes native vegetated grass lands, brush, forests, and oak woodland.
- Barren/Unclassified – Includes barren land potentially including dry stream channels and mine tailings. Unclassified lands are areas not categorized by the DWR land use survey.

Section 4 provides more detailed information regarding land use and anticipated future conditions that could impact water use, including agricultural-to-urban conversion and changes in cropping patterns.

2.5.1 Communities

The major communities and tribal areas within the Region are shown in Figure 2-5. The seven incorporated cities within the Valley Floor PA are Davis, Dixon, Rio Vista, Vacaville, West Sacramento, Winters, and Woodland. Other unincorporated communities scattered throughout the Valley Floor PA include Esparto, Knights Landing, Dunnigan, Monument Hills, Clarksburg, Madison, Yolo, Zamora, and Capay Valley.

The Upper Putah and Upper Cache Creek PAs are predominantly undeveloped, although some agricultural and rural communities are scattered throughout them, particularly around Clear Lake, Hidden Valley Lake, and Middletown, located in the northern portion of the area within Lake County. Some urban growth also has occurred around the western shoreline and southern portion of Lake Berryessa, which is located within Napa County. The Cities of Lakeport and Clearlake, within Lake County, are the only incorporated cities within the Upper Cache Creek PA. Other communities within these two PAs include Clearlake Oaks, Cobb, Kelseyville, Lower Lake, Lucerne, Nice, and Upper Lake. Most of these communities are scattered around the shores of Clear Lake, but some are located in more rural mountainous areas.

2.5.2 Land Use Management Agencies

Local, state, and federal land management agencies in the Region are shown in Figure 2-8 and include the following:

- Colusa County
- Lake County
- Napa County
- Solano County
- Yolo County
- City of Clearlake
- City of Davis
- City of Dixon
- City of Lakeport
- City of Rio Vista
- City of Vacaville
- City of Winters
- City of West Sacramento
- City of Woodland
- U.S. Bureau of Land Management
- USBR
- U.S. Fish and Wildlife
- USFS
- CDFW
- Tribal Lands
- State Lands

Legend

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

Land Use Agencies

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

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Figure 2-8

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2.6 Water and Resource Management Boundaries

The Region includes more than 90 municipalities, special districts, and agencies with water supply, wastewater management, flood control, and other water or resource management responsibilities (see Appendix B). They include 50 agencies that are strictly wholesale or retail water suppliers, 9 that provide only wastewater services, and 12 agencies providing both water and wastewater services. There are 12 agencies that provide only flood control services and 2 resource conservation districts; the remaining 7 provide a combination of one or more of the services listed above. Figure 2-9 identifies the service areas and agency boundaries for the municipalities and agencies where data are available. The figure demonstrates that the majority of the agencies in the upper watershed portions of the Region have small service areas while the largest service areas occur in the valley.

2.7 Hydrologic Features

The major hydrologic areas of the Region, as defined by the U.S. Geologic Survey (USGS) National Watershed Boundary Dataset, are illustrated in Figure 2-10. The key water features as indicated by the USGS subbasin boundaries (using Hydrologic Unit Code Level 8) are Cache Creek (which shapes the Cache Creek watershed), Putah Creek (which shapes the Putah Creek watershed), and the Sacramento River (which shapes the Sacramento-Stone Corral and Lower Sacramento watersheds).

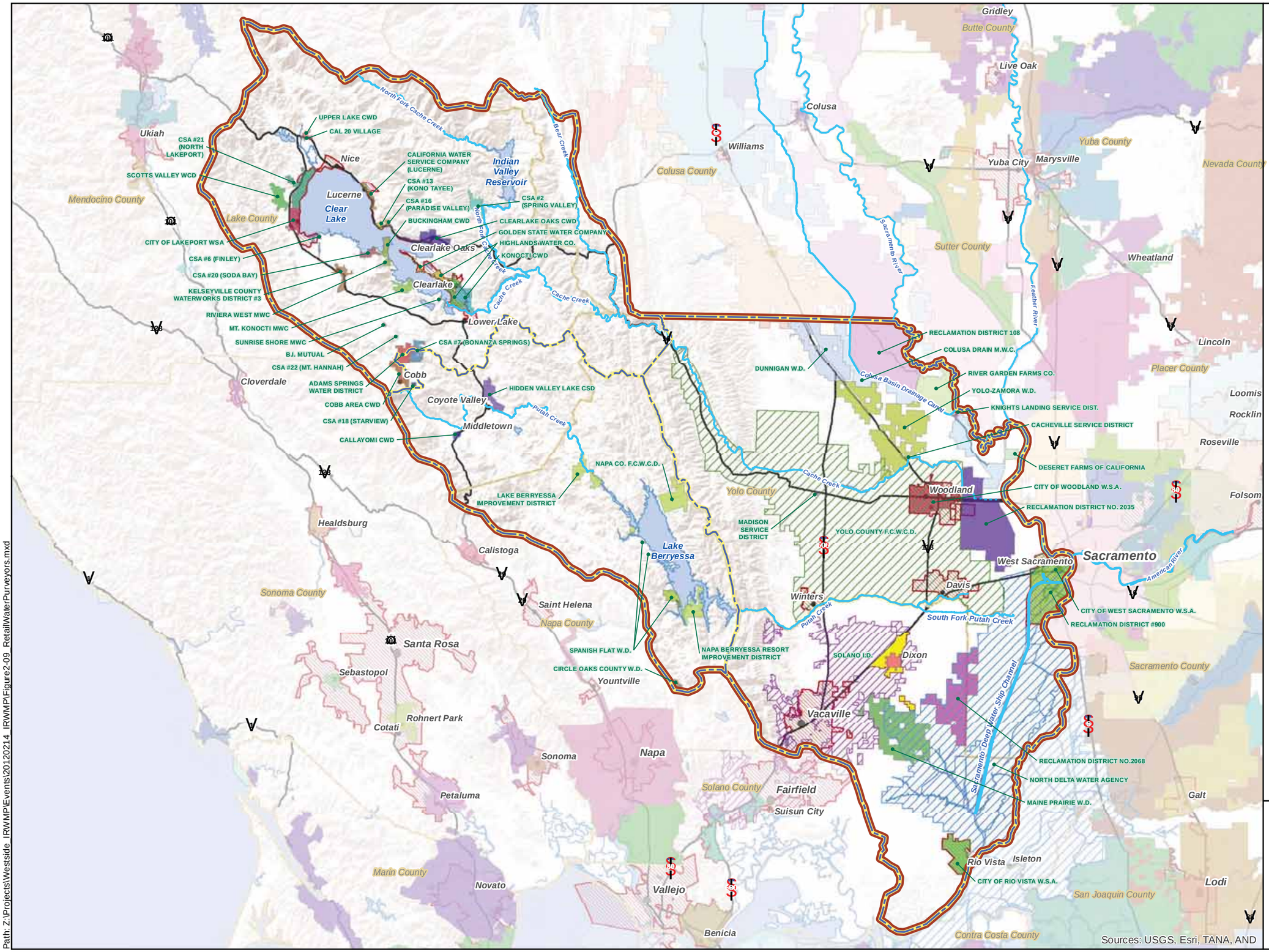
The Region benefits from significant amounts of surface water from its watersheds. Each is discussed in more detail below, followed by a discussion of the 17 groundwater basins within the Region.

2.7.1 Watersheds

The Region is principally defined by Cache Creek and Putah Creek, whose watersheds clearly delineate its upper boundaries. While the actual Cache and Putah Creek watersheds account for only a small percentage of the lower land area of the Region, water from the two creeks comprises a majority of the water entering the downstream end of the Region and is the key connection between the upper watersheds of the Upper Creek and Upper Putah PAs and the flat Valley Floor PA, and ultimately the Sacramento River and Sacramento-San Joaquin River Delta. 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. Cache and Putah Creek water continues to pond but also is managed through a series of facilities that can convey flows to the Sacramento River during high-runoff events.

In the Valley Floor PA, a number of surface water features are found, principally creeks and tributary streams, and floodplain (see Figure 2-10).

The Sacramento River forms the southeasterly border of the Region. The entire Sacramento River watershed covers approximately 27,000 square miles in Northern California. The Region, which lies near the downstream end of the Sacramento River, encompasses around 10% (approximately 3,000 square miles) of the overall Sacramento River watershed. Because of its location and relatively small drainage area, the portion of the Sacramento River located within the Region is influenced heavily by the areas outside it.



Legend

- Cities
- City Boundaries
- County Boundary
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

Source:
Federal Water Districts, U.S. Bureau of Reclamation, MPGIS Service Center in coordination with the California Department of Water Resources, 2006.
Private Water Districts, U.S. Bureau of Reclamation, MPGIS Service Center in coordination with the California Department of Water Resources, 2003.
State Water Districts, U.S. Bureau of Reclamation, MPGIS Service Center in coordination with the California Department of Water Resources, 2003.
County of Napa Water Districts, 2012.

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Retail Water Purveyors

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Figure 2-9

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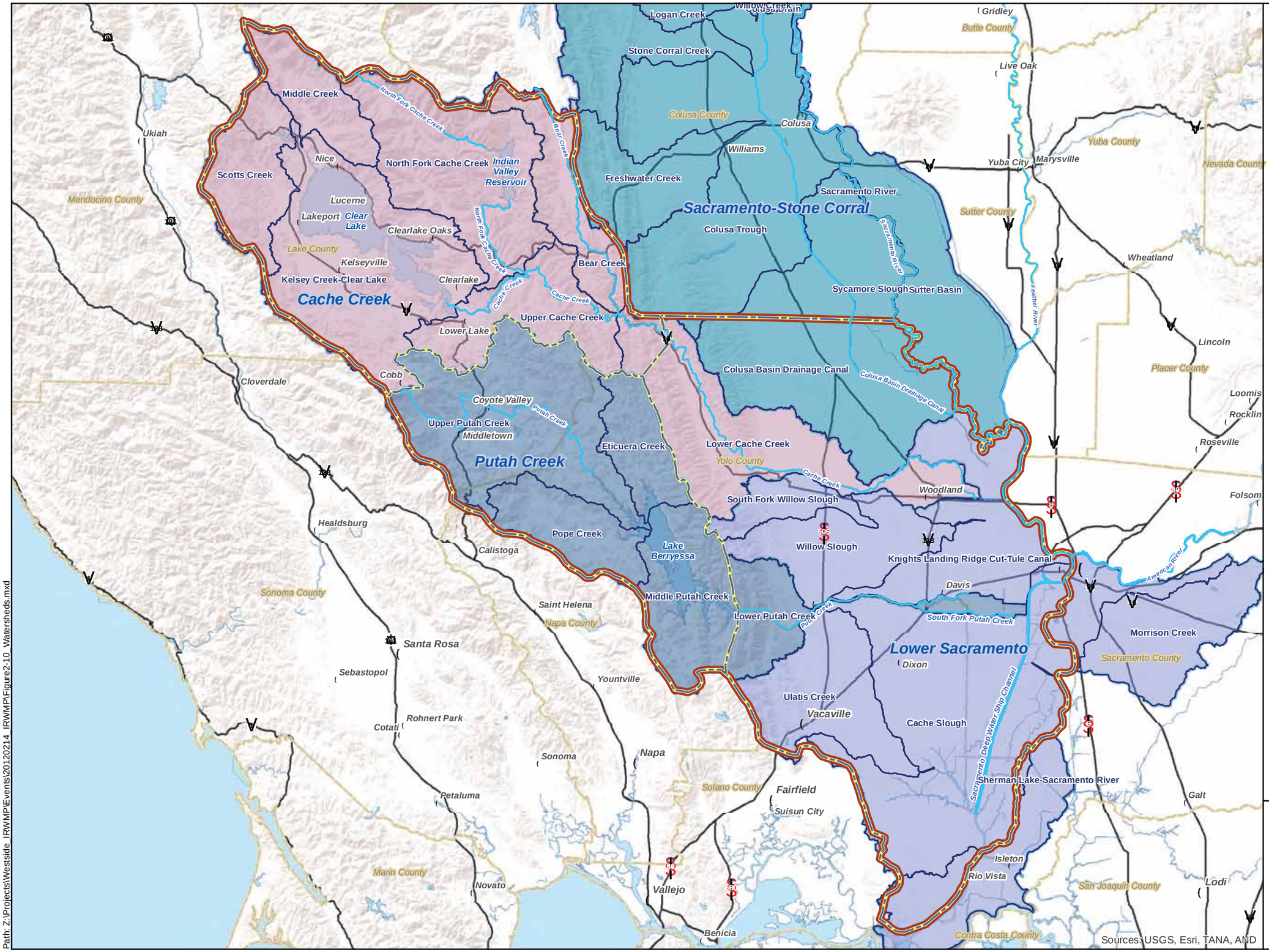

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Legend

- Cities
- County Boundary
- Planning Areas
- 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 2-10

The Sacramento River system represents a complex network of natural and man-made features that are operated to achieve established objectives for water supply, flood management, and environmental purposes. Operation of the system has become more complex over time as the water demands for each purpose have changed and competition has become more intense when supplies are short. The Sacramento watershed contains numerous reservoirs, including Shasta Lake and Lake Oroville, the two largest reservoirs in California, which are major features of the federal CVP and SWP, respectively. The combined operation of these and other water storage facilities largely controls the low-flow regime and exerts a strong influence on the high-flow regime in the river. Unlike the Coastal Range watersheds that drain through the Region, the Sacramento River watershed benefits from a large snowpack, which typically contributes flow throughout the spring and early summer. DWR and USBR operate the Sacramento River system in conjunction with the San Joaquin River system to supply diversions from the Delta and to meet Delta outflow standards established by the State Water Resources Control Board.

The Region relies on many sources of supply to meet its applied water needs. While there are several entities in the Region that divert directly from the Sacramento River, the Cache and Putah Creek's rainfed watersheds sometimes contribute flows to the Sacramento River and Delta under certain high-flow conditions. However, Cache and Putah Creeks do not typically flow into the Sacramento River and Delta during dry hydrologic years. The Region is so widespread geographically that opportunities to reduce dependence on the Delta for water supply are somewhat limited. Even so, many water suppliers conjunctively manage resources to provide increased reliability, considering variable hydrologic conditions and source availability. Surface water storage in Lake Berryessa, Indian Valley Reservoir, and Clear Lake and local groundwater aquifer storage help reduce the impacts of dry-year diversion curtailments from the Sacramento River for certain water users.

2.7.1.1 Cache Creek Watershed

The Cache Creek watershed encompasses approximately 1,165 square miles and begins at the headwaters of Cache Creek at the peak of Cobb Mountain at an elevation of approximately 4,700 feet in Lake County. The Upper Cache Creek is divided into two major reaches within Lake County – the main stem of Cache Creek and the North Fork Cache Creek. Cache Creek flows easterly from Lake County into Yolo County, where it is joined by the Bear Creek reach of the watershed, which lies entirely in Colusa County. See Figure 2-10.

Kelsey Creek, Adobe Creek, Scott's Creek, Middle Creek, and numerous tributaries feed into Clear Lake, which has more than 1 million AF of storage and is the largest freshwater natural surface water body that lies entirely in California. Cache Creek is the sole outflow from Clear Lake. YCFCWCD owns the Cache Creek Dam, which is located on Cache Creek approximately 5 miles downstream of the outlet from Clear Lake, and operates Cache Creek Dam and Clear Lake in accordance with the Solano and Gopcevic Decrees, as mentioned previously. The two major tributaries to the main stem of Cache Creek are North Fork Cache Creek and Bear Creek. North Fork Cache Creek subwatershed drains the area north of Clear Lake and includes Long Valley Creek, Wolf Creek, and Bartlett Creek. YCFCWCD 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. See Figure 2-10.

Once Cache Creek flows into Yolo County into the Valley Floor PA, it continues through the agriculturally intensive Capay Valley until it reaches the Capay Diversion Dam, where some flows are diverted into YCFCWCD'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 releases are made into the creek.

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 does have an overflow into the Yolo Bypass, which enters the Sacramento River upstream of Rio Vista, providing a connection between Cache Creek and the Sacramento River when flows in Cache Creek are sufficient to pass through the overflow into the Yolo Bypass.

2.7.1.2 Putah Creek Watershed

The Putah Creek watershed encompasses approximately 654 square miles and extends from an elevation of 4,700 feet at Cobb Mountain in Lake County southeast for a distance of about 50 miles to the Yolo Bypass, at an elevation a few feet above sea level. 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. Monticello Dam is owned by USBR and operated by SCWA. From the outlet of Monticello Dam, Putah Creek flows into Solano County in the Valley Floor PA, where it eventually discharges to the Yolo Bypass. See Figure 2-10.

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 (Brice 1998). The creek eventually abandoned its original channel (the North Fork) entirely, and for practical purposes the South Fork channel is the channel of Putah Creek. 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 (U.S. Fish and Wildlife Service, 1992).

2.7.1.3 Sacramento-Stone Corral Watershed

The Sacramento-Stone Corral watershed encompasses 1,884 square miles, most of which is located outside of the Region. Flows in the watershed generally travel from the coastal ranges in the west towards the Sacramento River. See Figure 2-10. 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 Westside Region via the Colusa Basin Drain. This drain is a man-made channel designed to convey irrigation drainage to the Knights Landing outfall gates for discharge into the Sacramento River. Thirty-two ephemeral streams convey storm runoff to the drain. Seven of these streams originate in the Dunnigan Hills of Yolo County. The Colusa Basin Drain watershed comprises nearly 1,620 square miles in the Sacramento Valley and includes portions of Glenn, Colusa, and Yolo Counties. About 17% of the Colusa Basin Drain watershed is located in Yolo County (or approximately 255 square miles).

2.7.1.4 Lower Sacramento River Watershed

The Lower Sacramento watershed encompasses 1,229 square miles. Within the Region, the Lower Sacramento watershed includes four important subwatersheds: Willow Slough, Knights Landing Ridge Cut-Tule Canal, Cache Slough, and Ulatis Creek.

- Willow Slough subwatershed – The Willow Slough subwatershed lies between the Cache Creek and Putah Creek watersheds and extends from the slopes of the Coast Ranges into the flatter slopes of the valley floor. Natural levees that have formed along the lower reaches of Cache Creek and Putah Creek direct runoff away from the main creek channels and into a network of sloughs that consolidate in Willow Slough. Willow Slough discharges into the Knight's Landing Ridge Cut-Tule Canal Watershed.

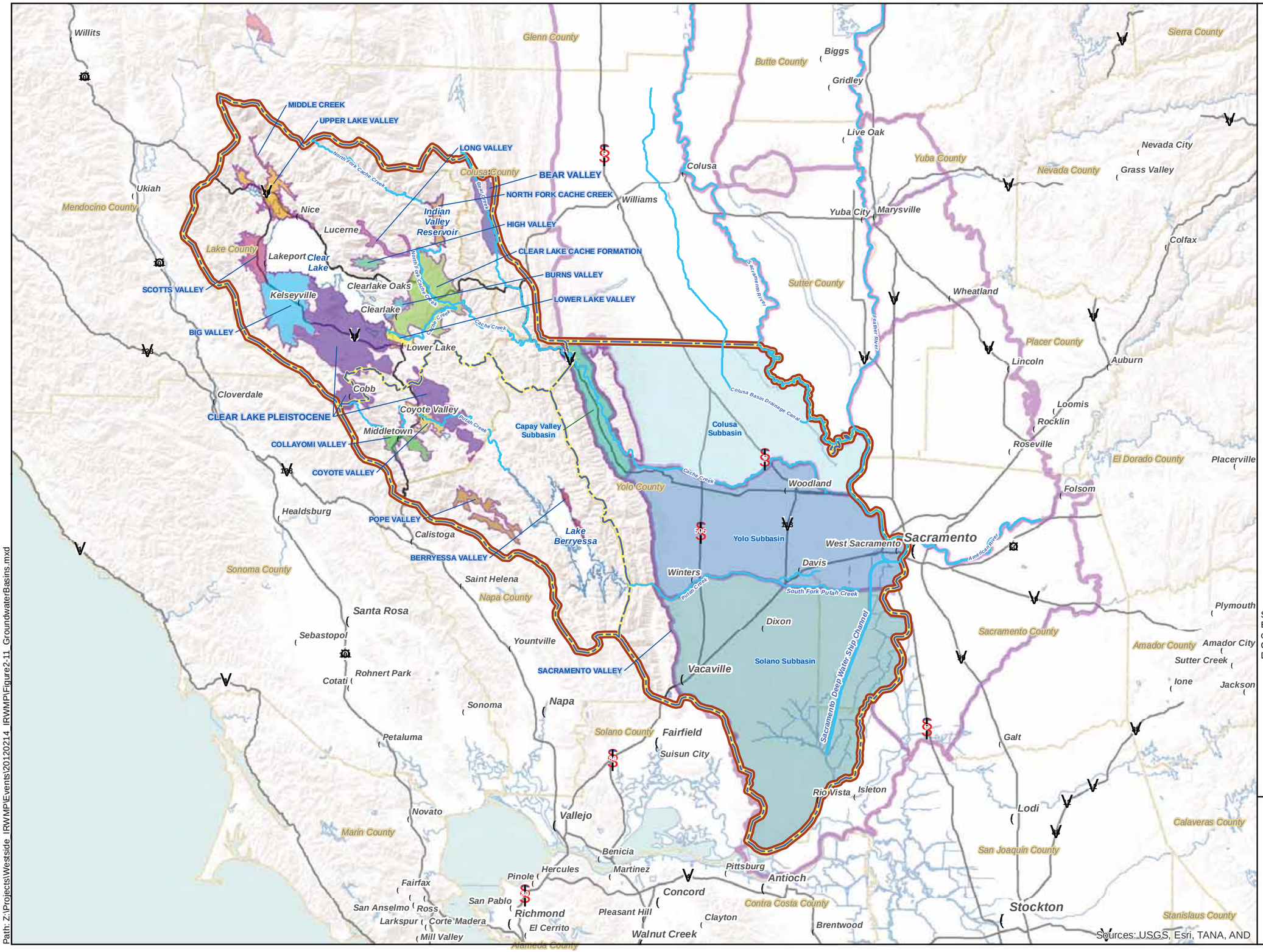
- Knight's Landing Ridge Cut-Tule Canal subwatershed – This subwatershed is at the eastern edge of the Region and is bounded on the east by a levee separating the watershed from the Sacramento River. Its defining features are the Knights Landing Ridge Cut and the Tule Canal. The Knights Landing Ridge Cut, which lies at the northern tip of the watershed, allows flows from the Colusa Basin Drainage Canal, which are primarily discharged to the Sacramento River, to enter the watershed. The Tule Canal, which follows the toe of the levee on the eastern edge of the watershed, collects flows from the Colusa Basin Drain, Cache Creek, and Willow Slough and conveys the flows into the Cache Slough subwatershed.

- Cache Slough subwatershed – This subwatershed is situated at the southeast edge of the Region and lies within the Sacramento-San Joaquin Delta. The majority of the water that flows out of the Region is discharged to the Delta via Cache Slough. Water is conveyed within the Cache Slough watershed through both constructed and natural waterways. An artificial channel on the eastern side of the watershed known as the Toe Drain collects inflows from Putah Creek and Tule Canal and transfers them to Prospect Slough, which merges with Cache Slough a few miles upstream of the Sacramento River. Inflows from the Ulatis Creek watershed and local runoff are captured within natural waterways and discharged to the Sacramento River.

- Ulatis Creek subwatershed – Mountains and flat alluvial valleys characterize the terrain of the Ulatis Creek subwatershed in the southern portion of the Region. The Vaca Mountains are part of the Coast Ranges and lie along the western border of the watershed. The English Hills lie east of the Vaca Mountains, separated by the Vaca Valley. The remainder of the subwatershed is characterized by flat terrain, which gradually slopes to the southeast. The Ulatis Creek subwatershed is drained by a series of major stream courses that discharge into the Cache Slough and ultimately into the Sacramento River. These major stream courses include Alamo Creek, Ulatis Creek, Horse Creek, Gibson Canyon Creek, Sweeny Creek, and McCune Creek.

2.7.2 Groundwater

The geologic formations of the 17 groundwater basins within the Westside Region provide an essential water resource. They were factored into the formation of the Region boundaries (see Figure 2-11). Within Lake County, the basin delineations correspond to the groundwater basins that the Lake County Water Resources Department uses for its California Statewide Groundwater Elevation Monitoring (CASGEM) reporting as approved by DWR. The basin and subbasin delineations for the remainder of the Region are based on the DWR's *Groundwater*



Source:
Bulletin 118-Groundwater Basins, California Department of Water Resources (DWR), 2003; Lake County Groundwater Basins, Lake County Water Resource Department.

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Groundwater Basins

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Figure 2-11

Sources: USGS, Esri, TANA, AND

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Bulletin 118 (DWR 2003). Region agencies have emphasized preservation of the groundwater aquifers through development of surface water projects and preparation and implementation of groundwater management plans.

The groundwater basins of the Upper Cache and Putah watersheds (and PAs) are mainly formed from shallow alluvial deposits, fractured sedimentary and metamorphic rock of the Franciscan Formation, and the Clear Lake volcanic deposits. These groundwater basins have limited storage capacity and, generally, high groundwater tables in the spring that decrease over the summer (CDM 2006a). Although the groundwater basins of the upper watersheds are less extensive then the lower Sacramento Valley groundwater basin, they represent a significant source of supply for the nearby communities and agricultural users.

The single groundwater basin in the Valley Floor PA – the Sacramento Valley groundwater basin – also extends outside the Region and is divided into subbasins. The Region encompasses the Capay Valley, Yolo, Solano, and a portion of the Colusa groundwater subbasins. In contrast to the shallow groundwater basins of the upper watersheds, thick alluvial and river sediments of the Tehama formation overlain by younger sediments form the subbasins of the Sacramento Valley groundwater basin, and these subbasins have significant storage capacity (DWR 2003).

2.8 Climate

The Region as a whole has a Mediterranean-like climate, with warm, dry summers and cool, moist winters. Summer temperatures are generally high during the day with fast cooling in the evenings. Variation in the summer ranges from highs in the 90 degrees Fahrenheit to lows in the 50s. Variations in temperature during the winter are less drastic, with average highs in the 50s to 60s and lows in the 30s to 40s. Figure 2-12 shows the average temperatures for each PA. Average temperatures are relatively consistent throughout the Region.

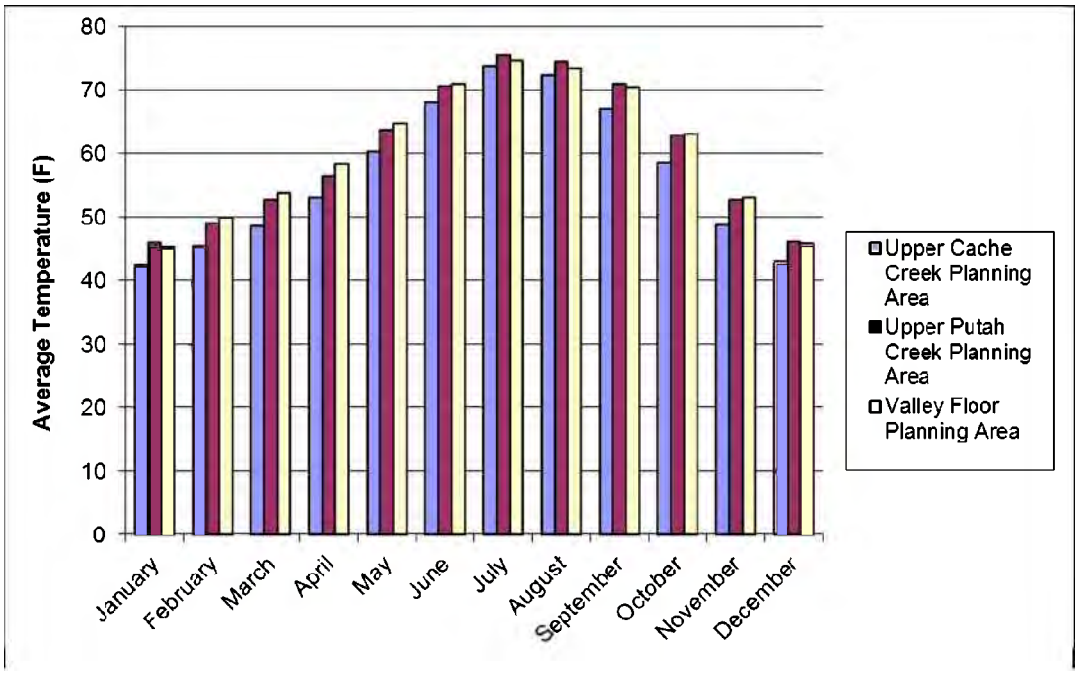


Figure 2-12: Average Monthly Temperatures

Most precipitation in the Region comes in the form of rainfall. Precipitation amounts within the Region are typically larger at higher elevations because of orographic cooling; the valley area experiences significantly less precipitation than the two other planning areas, located in the higher mountainous portions. Precipitation generally occurs between the months of October and March. Snowfall is not a significant component of the Region's locally occurring water resources. Figure 2-13 shows the variability in precipitation from the Valley Floor PA to the Upper Cache Creek and Upper Putah Creek PAs. Cobb Mountain, a portion of which drains to Upper Cache and Upper Putah Creeks, has the highest annual rainfall in California at about 100 inches/year.

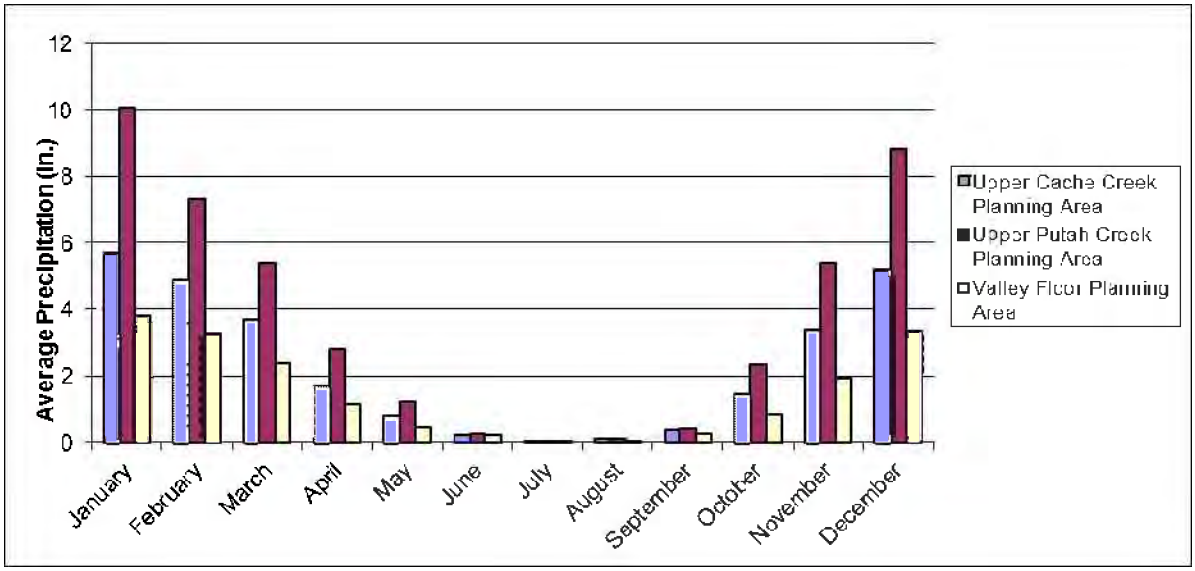


Figure 2-13: Average Monthly Precipitation by Planning Area

Evapotranspiration – the loss of water to the atmosphere through evaporation from soil and plant surfaces and transpiration from plant tissues – is another important aspect of the water cycle. ETo is a measure of evapotranspiration from a standardized grass surface; it is used to estimate specific crop water requirements. The California Irrigation Management Information System (CIMIS) maintains weather stations that measure ETo. CIMIS stations in the Region are limited to the Valley Floor PA. Overlaying representative ETo data for the Valley Floor PA with precipitation data shows a mismatch between plant water demand and precipitation, which drives the need for water supply for irrigation. As illustrated in Figure 2-14, in the summer months when plant water demand is greatest, the precipitation in the Region is lowest.

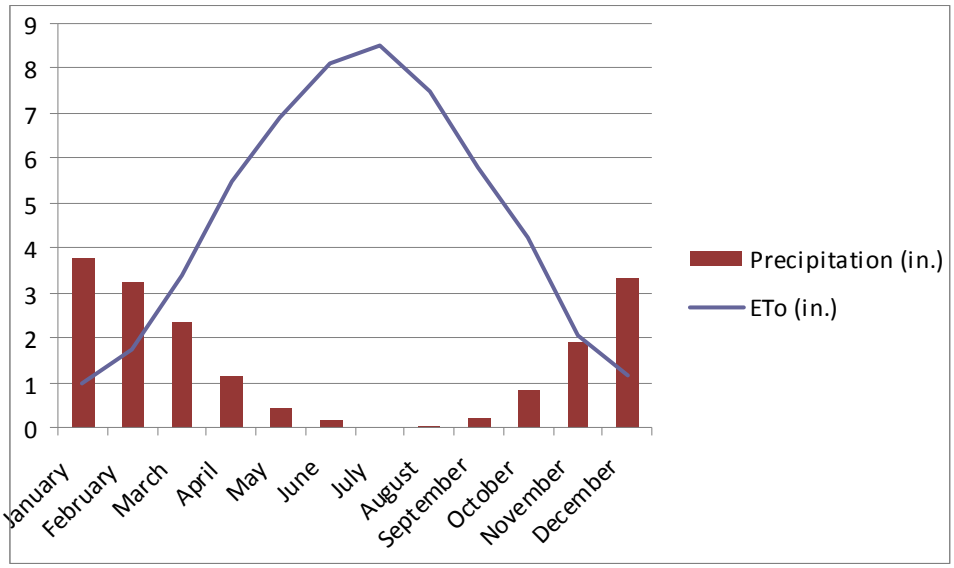


Figure 2-14: Evapotranspiration and Precipitation Comparison for the Valley Floor PA

Tables 2-4 through 2-6 describe the monthly maximum, minimum, and mean temperatures and precipitation for each PA.

Table 2-4: Upper Cache Creek PA Climate Data

	Temperature			Precipitation		
	Ave. Max. (F)	Ave. Min. (F)	Mean (F)	High (in.)	Low (in.)	Mean (in.)
January	54.5	30.6	42.6	25.96	0.11	5.72
February	58	33	45.5	22.03	0.02	4.91
March	61.8	35.5	48.6	15.71	0.06	3.69
April	67.7	38.5	53.1	8.57	0	1.66
May	76.2	44.4	60.3	5.99	0	0.81
June	85.2	51	68.1	1.39	0	0.19
July	93.1	54.3	73.7	0.7	0	0.04
August	92.2	52.6	72.4	1.97	0	0.11
September	86.4	47.8	67.1	4.11	0	0.39
October	75.9	41.3	58.6	7.4	0	1.44
November	62.4	35	48.7	10.44	0	3.41
December	54.9	31.3	43.1	17.88	0	5.2
Total Annual				**61.88**	**8.17**	**27.57**

Source: http://www.wrcc.dri.edu, Station # 041806 (Clearlake) averages from 1954-2011, elev. 1349 feet.
Notes: The monthly high and low precipitation values are the highest and lowest values for each month over the period of record. The annual high and low precipitation values are the total precipitation for the highest and lowest years on record, which were 1983 and 1976, respectively.

Table 2-5: Upper Putah Creek PA Climate Data

	Temperature			Precipitation		
	Ave. Max. (F)	Ave. Min. (F)	Mean (F)	High (in.)	Low (in.)	Mean (in.)
January	55.7	36.1	46	28.9	0.23	10.07
February	60.1	38.2	49.2	20.13	0	7.3
March	64.8	40.6	52.7	18.18	0.09	5.38
April	70.3	43	56.6	10.91	0	2.79
May	78.8	48.6	63.7	7.14	0	1.22
June	87.1	54	70.6	2.1	0	0.26
July	93.7	57.3	75.5	1.12	0	0.02
August	92.8	56.1	74.4	1.76	0	0.1
September	88.5	53.5	71	3.56	0	0.42
October	78.1	47.7	62.9	13.37	0	2.34
November	64.4	41.1	52.7	18.16	0	5.37
December	56	36.3	46.2	31.64	0	8.83
Total Annual				**90.23**	**20.01**	**44.1**

Source: http://www.wrcc.dri.edu, temperature from Station # 045360 (Markley Cove) averages from 1970-2011, elev. 470 and precipitation from Station # 045598 (Middletown) averages from 1893-2011, elev. 1130 feet.
Notes: The monthly high and low precipitation values are the highest and lowest values for each month over the period of record. The annual high and low precipitation values are the total precipitation for the highest and lowest years on record, which were 1983 and 1939, respectively.

Table 2-6: Valley Floor PA Climate Data

	Temperature			Precipitation		
	Ave. Max. (F)	Ave. Min. (F)	Mean (F)	High (in.)	Low (in.)	Mean (in.)
January	53.9	36.9	45.4	13.08	0	3.8
February	60.4	39.7	50	11.38	0.02	3.24
March	65.8	41.8	53.8	8.63	0	2.35
April	72.4	44.5	58.4	6.45	0	1.17
May	80.5	49.1	64.8	2.53	0	0.46
June	88.3	53.6	71	1.97	0	0.19
July	94.1	55.4	74.7	0.63	0	0.01
August	92.8	54	73.4	0.84	0	0.03
September	88.6	52.4	70.5	4.07	0	0.24
October	78.9	47.4	63.1	7.93	0	0.83
November	65.5	40.7	53.1	6.87	0	1.92
December	54.8	36.9	45.9	11.87	0.03	3.34
Total Annual				**38.15**	**5.62**	**17.58**

Source: http://www.wrcc.dri.edu Station # 042294 (Davis) averages from 1893-2011, elev. 60 feet.; www.cimis.water.ca.gov Davis (St. #6)
Notes: The monthly high and low precipitation values are the highest and lowest values for each month over the period of record. The annual high and low precipitation values are the total precipitation for the highest and lowest years on record, which were 1983 and 1976, respectively.

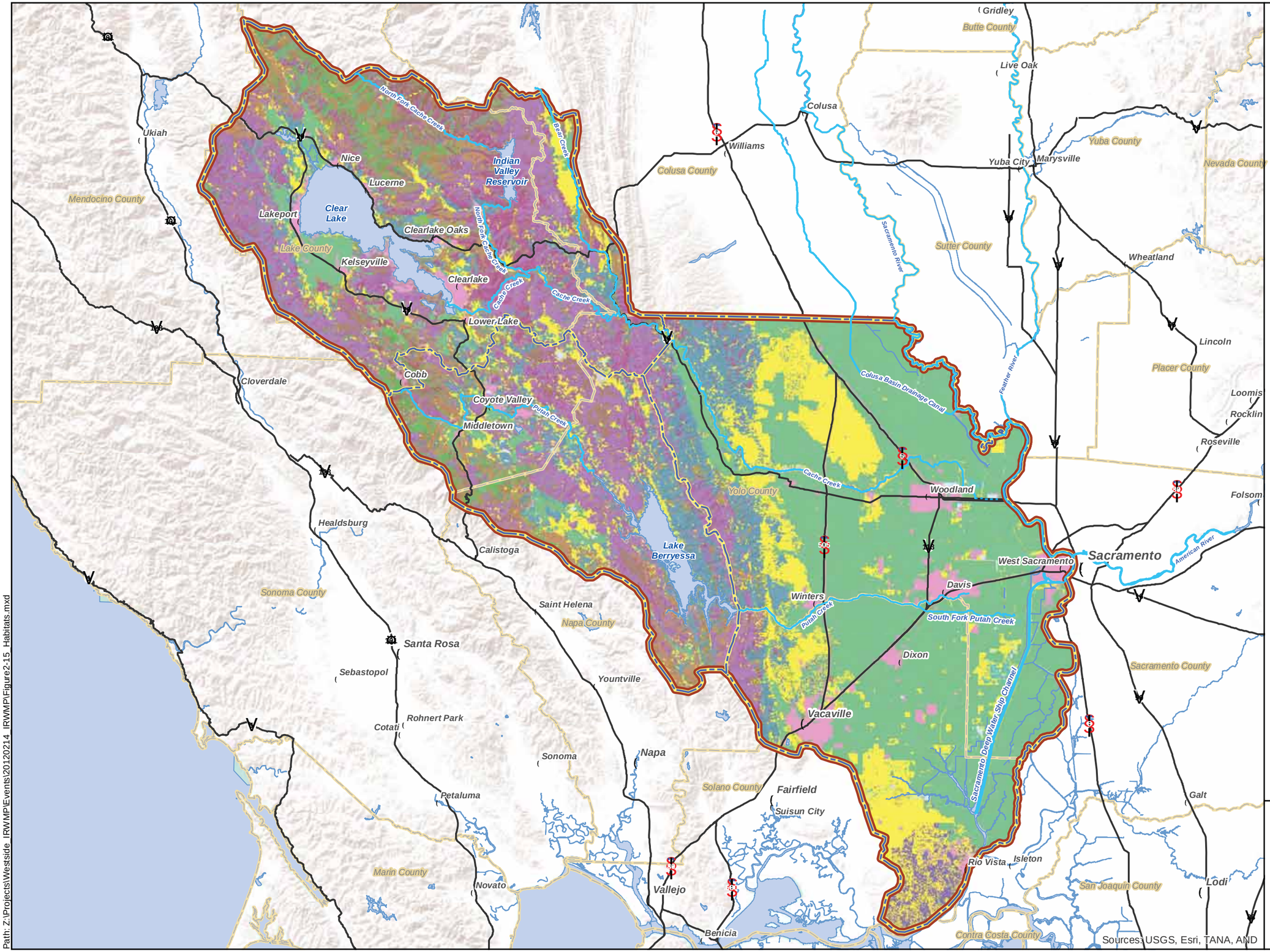
2.9 Environmental Features

The lakes, creeks, wetlands, sloughs, Delta, and other water features that form the Region provide key habitat for many of California's most important fish and wildlife species. Anadromous fish migrate into the Region and use its waterways for spawning. Populations of fish that are declining throughout the state, like the Clear Lake hitch, can still be found in the Region. Resident and migratory waterfowl rely on the lakes, wetlands, and flooded agricultural fields for food and nesting habitat. More than 50 federally and state-listed wildlife and plant species are found in the Region, and hundreds of other species with special-status designations are supported by the habitats of the Region.

Figure 2-15 provides an overview of the habitat types throughout the Region. Native habitat account for the majority of the land area in the Upper Cache Creek and Upper Putah Creek PAs. In contrast, agriculture accounts for the majority of land area in the Valley Floor PA, suggesting that the landscape of the Valley Floor PA has been significantly influenced by human activities.

Water-related habitats comprise a small percentage of the Region, accounting for less than 4% of the area. Of the water-related habitats, the actual waterways (i.e., lake and rivers) represent the majority of the habitat, with wetlands and riparian habitats comprising a smaller amount of – yet equally important – habitat types. The preservation of water-related habitats is important to the maintenance of native species since the majority of threatened and endangered species in the Region are associated with aquatic, wetland, and riverine/lacustrine habitat.

A list of special-status species with recorded occurrences in the Region and a table identifying the habitats and planning areas in which these species are found are provided in Appendix C. Appendix C also presents figures showing listed wildlife and plant species that have been documented to occur within 500 feet of the Region's waterways.



Legend

- Cities
- County Boundaries
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

Habitats

- Agriculture
- Annual Grassland
- Barren
- Blue Oak Woodland
- Blue Oak-Foothill Pine
- Chamise-Redshank Chaparral
- Closed-Cone Pine-Cypress
- Coastal Oak Woodland
- Douglas-Fir
- Eucalyptus
- Freshwater Emergent Wetland
- Klamath Mixed Conifer
- Lacustrine
- Mixed Chaparral
- Montane Chaparral
- Montane Hardwood
- Montane Hardwood-Conifer
- Montane Riparian
- Pasture
- Perennial Grassland
- Ponderosa Pine
- Riverine
- Saline Emergent Wetland
- Unknown Conifer Type
- Unknown Shrub Type
- Urban
- Valley Foothill Riparian
- Valley Oak Woodland
- Water
- Wet Meadow
- White Fir

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

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Habitats of the Region

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Figure 2-15

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Section 3: Existing and Future Conditions

This section describes the existing and expected future conditions for the Region that are relevant to creating an integrated water management plan. The description includes information about key water management infrastructure (both constructed and naturally occurring), summarizes and presents important data, introduces some of the major challenges, and offers observations about the current water management system based on available data. The information is organized and presented as it relates to the topics of water quantity, water quality, flood protection, environmental resources, and the potential affects from climate change.

A region the size of Westside Sacramento is extremely complex and the operational aspects of managing water and the associated infrastructure and other resources within the Region require extensive knowledge of many important details. The amount of data and information related to water management that one could consider across the Region can be overwhelming. In keeping with the goals for the IRWM planning process described in Section 1.3.1, this Plan section presents strategic information in a synthesized way designed to help promote understanding and support decision makers and stakeholders to work together more effectively in ways that benefit the Region as a whole.

A great deal of technical reports and other information was reviewed and coalesced to provide a meaningful message throughout this IRWM Plan. A summary of the technical analysis aspect of this plan, focusing on the water balance framework described in Section 3.1 below is provided in Appendix C.

3.1 Water Quantity

In order to plan for improved water management within a region one needs to understand how much water is (or will be) available and when, where the water originates, how the water is used (or will be used in the future), and how it moves through the system. As a result, the authors of this Plan employed a simple approach called a water balance to help present a high-level representation of the quantity of water that enters, moves, is consumed, and leaves the Region under specific conditions. See Figure 3-1 for a schematic that illustrates which hydrologic interactions were evaluated and summarized.

If data exists for each of the hydrologic components considered, then a water balance can be completed and will show that the quantity of water entering an area for a given amount of time minus the quantity of water exiting the same area during the same amount of time must equal the change in the quantity of water stored within the specific area. There is not sufficient data available for some components represented in the water balance for this Region, so the authors of the Plan were not able to “close” the water balance. Nonetheless, comparing the information that is available for the planning areas and the Region as a whole is instructive. (See Appendix C for the specific missing information within the water balances.)

The water balances shown below include assumptions made about supply and demand throughout the planning period (through 2035). The water balances illustrate the diversified nature of surface water and groundwater supplies and offer a reasonable estimate of demand within the Region. The information summarized in the water balance can be used to help identify potential areas for improving water management, especially opportunities to collaborate more or improve the balance between supplies and demands. Water balances were prepared

for the entire Region, the Upper Cache, Upper Putah, and Valley Floor Planning Areas to explore and illustrate the differences and interrelationships across the Region.

Water moves through the Region in a complex process. Users within the Region access many different sources of water, take advantage of a variety of ways to store water for later use, and apply that water for a variety of beneficial uses. Some specific data and information about various aspects of how water moves through the Region currently do not exist. Much of the missing information correlates with the historical agricultural practices within the Region. The majority of the water used within the Region is applied for agricultural production, and agricultural practices within the Region result from thousands of independent choices made by individual landowners and farmers. The agricultural community (when considered in aggregate) seems to have adapted their practices to accommodate significant annual fluctuations in the availability of water supplies in some areas of the Region.

Many of the water users within the Region conjunctively use water supplies, meaning that they have some flexibility to use different surface water supplies and groundwater supplies, but some water users rely on a single source of supply. The following subsections contain descriptions of the major water balance components illustrated in Figure 3-1.

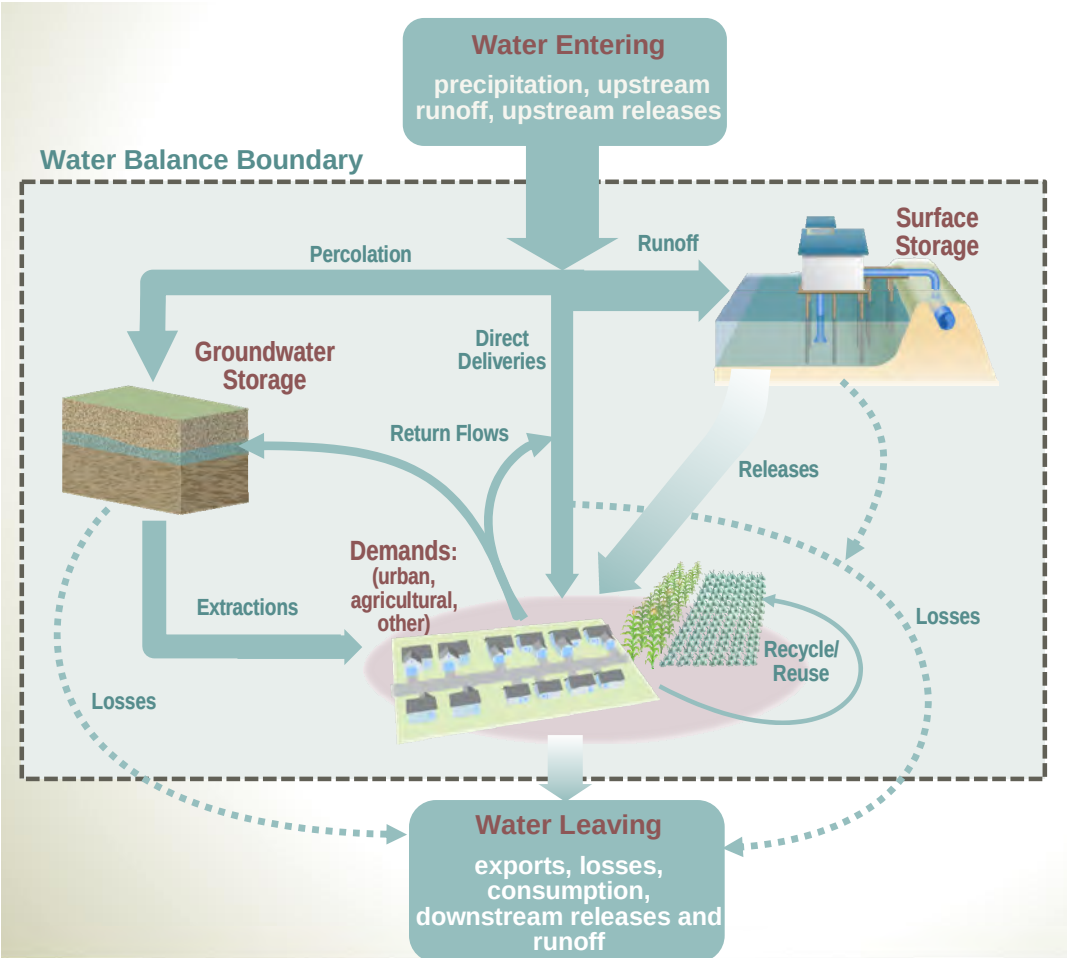


Figure 3-1: Water Balance Schematic

The water balances were prepared using water supply and demand information available at 5-year intervals through the planning horizon for two scenarios: an average water year condition (representing normal conditions) and a dry water year (representing potential drought conditions). Only hydrologic data that was available in a consistent format across the entire region was used. Available hydrologic data for the years 1980 through 2000 was averaged to represent an average water year condition, and the data for 1988 was selected as a representative dry water year for the Region, based on feedback received from the Water Balance Subcommittee participants.

The significant hydrologic difference between an "average" and "dry" water year can be seen in Figure 3-2 in comparing the average rainfall in the Upper Cache Creek watershed of 27.6 inches per year (based on data between 1954 and 2006 (errors in the data occurred between 2006-2011)) with a low of 8.17 inches of precipitation recorded during 1976. A water balance based on data from a single year can provide a useful "snapshot" of water management conditions, but does not depict some important long-term management factors such as changes in groundwater and surface water storage. Development of a complete water balance for multiple dry years drought scenarios may be beneficial for users within the Region in future updates, but was not prepared in this IRWM Plan due to the absence of needed information.

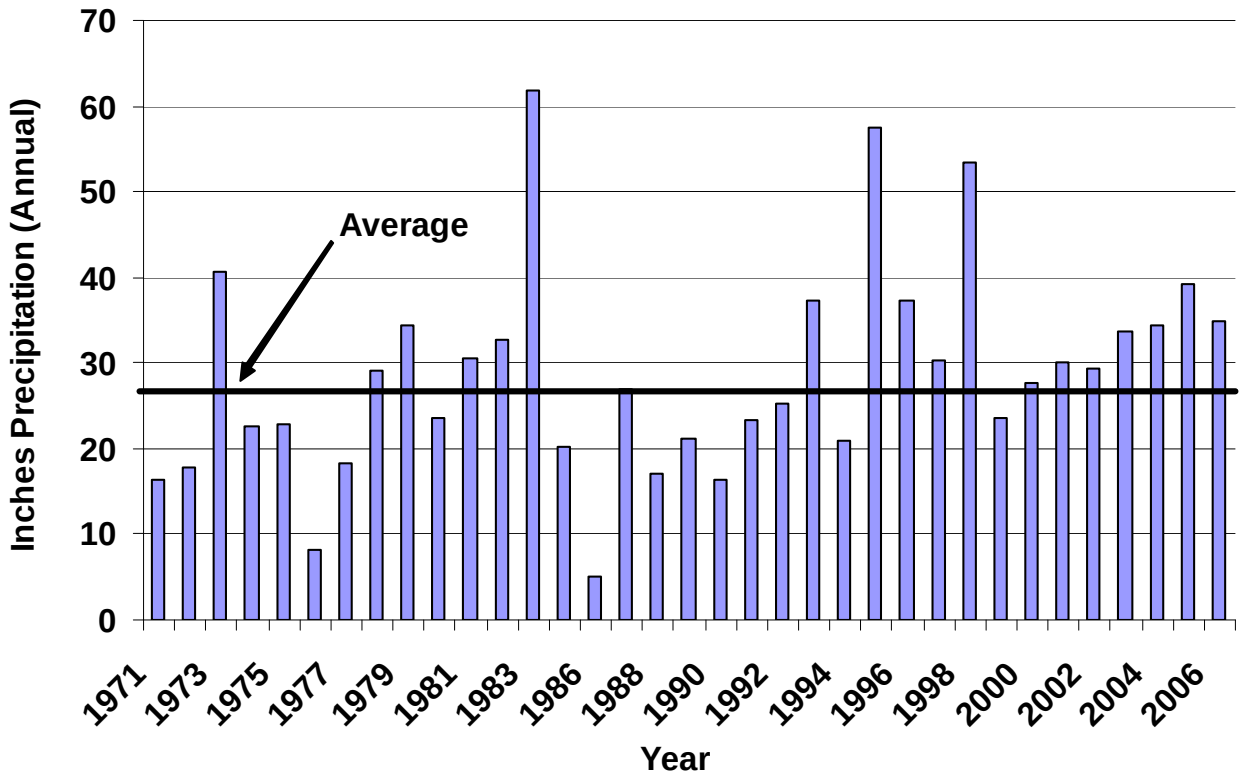


Figure 3-2: Precipitation Data for Upper Cache Creek PA

Source: Gage Station 041806 (http://www.wrcc.dri.edu/)

3.1.1 Water Entering

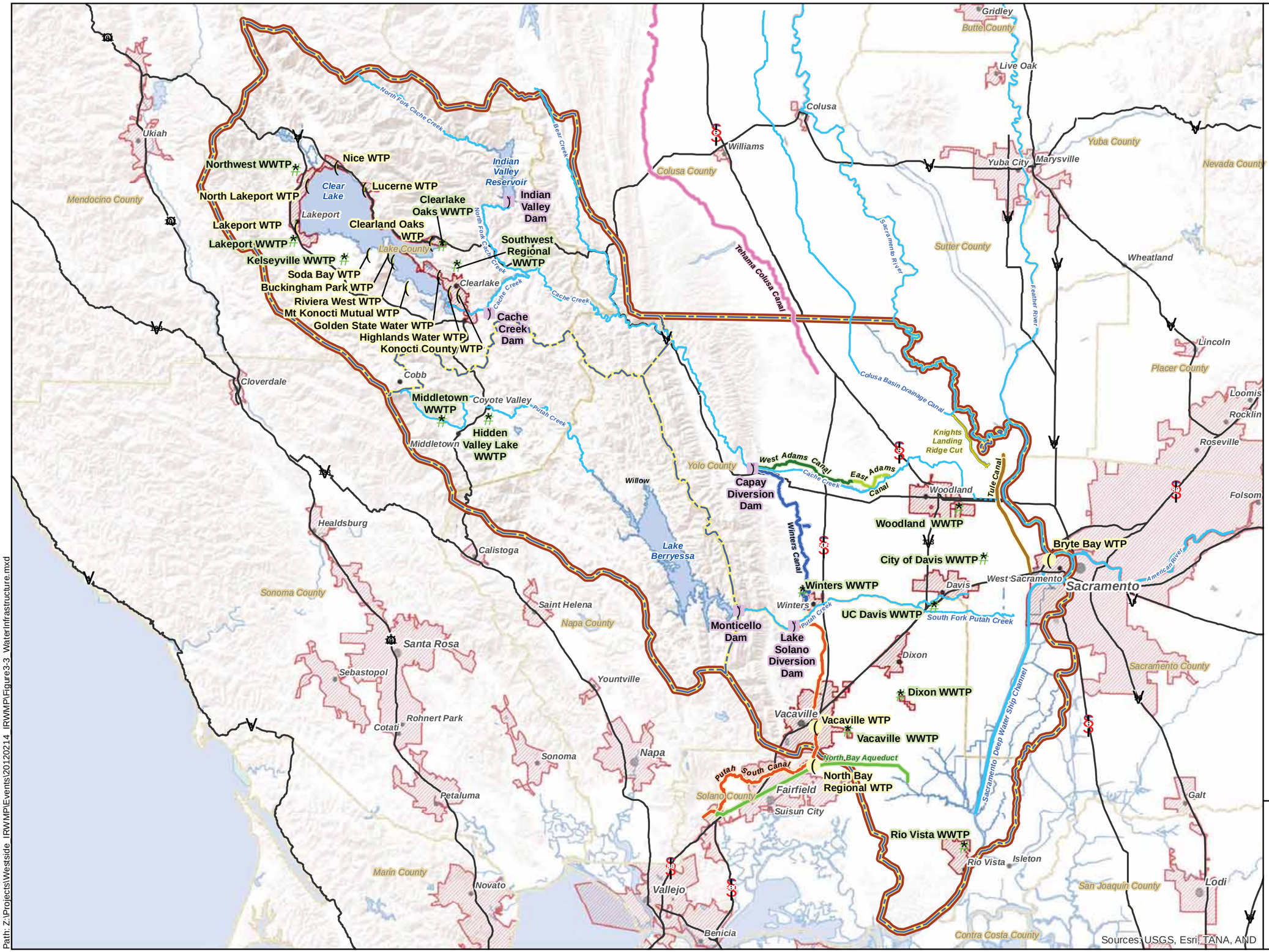
Water enters the Region from multiple sources including precipitation (mostly rainfall with some snowfall) and water imported from a number of sources outside the Region boundary. The low-lying valley floor areas receive approximately 18 inches of precipitation on average per year, while the higher elevations in the Coastal mountain range on the western side of the Region can receive more than 70 inches of rain annually. Much of the precipitation that falls within the Region flows across the landscape into small streams and creeks that enter major lakes and reservoirs. Some percentage of the precipitation percolates into the soil and is consumed by plants or eventually flows into one of the many groundwater aquifers underlying the Region. Some of the precipitation also evaporates or flows downstream out of the Region boundary (refer to Section 3.1.3).

For the purposes of this analysis, water that enters the Region from a watershed wholly or partly outside of the Westside Region is considered an *imported water supply*. For example, water diverted from the Sacramento River and Delta is labeled as imported, even though the Sacramento River and Delta share a common boundary with the eastern boundary of the Westside Region. Imported surface water supplies play an important role in the beneficial activities within the Region. While considerable water supplies originate from within the Region in the Cache and Putah Creek watersheds, local surface and groundwater supplies are not sufficient to meet the extensive agricultural, urban, municipal, and domestic demands for water.

Imported water is made available through a number of different water rights and contracting mechanisms. Some of the imported water is provided to local agencies from the State of California State Water Project (SWP) operated by DWR, or the United States Bureau of Reclamation's Central Valley Project (CVP). Some key import facilities include the SWP's North Bay Aqueduct (NBA) in Solano County and the CVP's Tehama-Colusa Canal in Yolo County. Some individual landowners also have rights to divert surface waters from the Sacramento River and Delta. Figure 3-3 shows the locations of major water management infrastructure, including those used for importing water into the Region.

For the purpose of this analysis, water that enters the lower watershed from upper watershed sources is labeled either *upstream runoff* or *upstream releases*. *Upstream runoff* includes water entering a planning area due to unregulated stream or overland flows from upstream watersheds. *Upstream releases* include water entering a Planning Area through regulated releases from upstream storage facilities. An example of a source of upstream runoff is winter storm flows from the Upper Cache Creek that flow downstream into the Valley Floor PA. An example of an upstream release is runoff from the North Fork Cache Creek watershed that is captured and stored in Indian Valley Reservoir, and later released into the Valley Floor PA to meet irrigation demands.

Note that there are no upstream runoff or upstream releases into the Upper Cache and Upper Putah areas in the water balances because no significant runoff or releases occur into the upper watersheds from outside the watershed. Upstream runoff and releases comprise a major percentage of the water entering the Valley Floor PA. Runoff on the Valley Floor PA was not quantified due to the lack of a consistent estimate of runoff across the subwatersheds in the PA. This could be a refinement and information that could be estimated if the water balance is updated in the future.



Legend

- Cities
- City Boundaries
- County Boundaries
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies
- Dam
- Wastewater Treatment Plant (WWTP)
- Surface Water Treatment Plant (WTP)
- Putah South Canal
- East Adams Canal
- West Adams Canal
- North Bay Aqueduct
- Tule Canal
- Winters Canal
- Tehama Colusa Canal
- Knights Landing Ridge Cut

Note:
Lake County water purveyors WTPs are not shown for clarity.

Source:
Bypasses, SACOG; Major Waterways, Yolo County; Putah South Canal, North Bay Aqueduct, & Ulatis Flood Control Channel, SCWA.

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Kennedy/Jenks Consultants

WESTSIDE SAC IRWM

Water Infrastructure

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Figure 3-3

3.1.2 Water Within

Once water enters the water balance boundary it can be directed in several different ways. As shown conceptually in Figure 3-1, much of the water entering the Region flows into one of several surface storage reservoirs in the upper watersheds as runoff from local precipitation. The remaining water that does not flow into surface storage reservoirs either percolates into shallow groundwater aquifers or is routed for direct delivery to meet demands (urban, agricultural, other). Water can be released from the surface reservoirs to help meet demands. Groundwater can also be pumped from the aquifers to help meet demands. Urban wastewater can be recycled/reused. Applied water (from any source) that is not consumed during the intended use becomes a return flow that can be reused to help meet demand or that can percolate into aquifers for use at a future time.

3.1.2.1 Surface Water

Deliveries from surface water (1,120 TAFY) represent approximately 66 percent of the total water applied to meet demands (1,680 TAFY) in the Westside Region in an average year (Table 3-6). Some of the surface water that enters the Region percolates into aquifers and enters groundwater storage. Runoff from precipitation that remains at the surface is either diverted to end users (called *direct deliveries* in the water balance), flows into one of the major lakes and reservoirs and is stored for potential future use, or flows out of the Region.

Most of the runoff from precipitation in the upper watersheds is captured and stored in lakes and reservoirs. The major lakes and reservoirs within the Region include Clear Lake, Indian Valley Reservoir, and Lake Berryessa. These lakes and reservoirs provide numerous benefits including water supply, flood protection, hydropower generation, habitat, and recreation. Table 3-1 contains some of the key facts about the reservoirs.

Some water users divert water directly from the lakes and reservoirs, but most of the surface water used within the Region is released from storage for use at a location downstream of the lake or reservoir. The surface storage facilities within the Region provide many benefits within the water management system. One of the key benefits is the carryover storage (water captured in one year and held for potential use in future years) that adds resiliency to the water management system and helps to reduce the negative impacts of droughts. However, the amount of carryover storage typically available within the Region is not always sufficient to meet all water demands during periods of multiple dry years.

Table 3-1: Major Lakes and Reservoirs

Lake/Reservoir	Net Usable Capacity (AF)	Dam	Dam Owner/Operator	Hydroelectric Generation Capacity	Owner of Hydroelectric Power Plant
Indian Valley Reservoir	300,600	Indian Valley Dam	YCFCWCD (both)	3,000 kW	YCFCWCD
Clear Lake	313,000	Cache Creek Dam	YCFCWCD (both)	1,750 kW[(a)]	YCFCWCD
Lake Berryessa	1,602,000	Monticello Dam	USBR (owner) SCWA (operator)	11.5 MW	SID

(a) Not currently in operation.

When large rainfall events occur during the winter season, flood releases may be made from the dams into Cache and Putah Creeks, which flow into the lower watershed and ultimately to the Yolo Bypass, Sacramento River and the Sacramento-San Joaquin Delta.

Surface water supplies can be distributed within the Region through an intricate network of canals, sloughs, and pipelines to end users. Hundreds of miles of surface water conveyance infrastructure spread throughout the Region. Figure 3-2 shows the location of major regional water supply infrastructure including facilities such as major diversion structures, canals, surface water treatment plants, and wastewater treatment plants.

Flood protection infrastructure also affects surface water within the Region (see Section 3.3.1 for more details). Some of the flood protection infrastructure, such as the Yolo Bypass and Ulatis Flood Control Project serves multiple purposes and also can be used to convey wastewater discharges, water supply, and provide habitat.

3.1.2.2 Groundwater

Water stored in groundwater aquifers also serve as a key water supply source in the Region. For many water users, groundwater is the only readily accessible supply source. Thousands of groundwater wells exist within the Region, and most of these groundwater wells are used to supply individual domestic demands or small 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 Region such as Davis, Woodland, Rio Vista, and Dixon currently rely on groundwater as their sole supply source. Solano Irrigation District, Vacaville, and some purveyors in Lake County also pump groundwater to supplement their surface water deliveries. Maintaining sustainable groundwater aquifers that yield high quality groundwater will be crucial to meet the long-term water demands within the Region.

Characteristics of the groundwater aquifers vary considerably throughout the Region. The aquifers in the upper watersheds tend to be smaller and more variable than the aquifers located beneath the valley floor. Experts have identified fifteen distinct groundwater basins in the upper Cache Creek and Putah Creek watersheds. The geologic and hydrologic characteristics of each groundwater basin differ considerably including the aquifer permeability and material composition, sources of recharge, distribution over area and depth, and presence of boundaries or faults that limit groundwater flow.

Groundwater users in the upper watersheds may extract groundwater from these basins from shallow alluvial deposits, fractured sedimentary and metamorphic rock within the Franciscan Formation, or the Clear Lake volcanic deposits. Among the fifteen identified groundwater basins, the major basins used for supply in the upper watersheds include Big Valley, Scotts Valley, and Upper Lake Valley. Significant information exists for the major alluvial aquifers in the upper watersheds, but very little information has been gathered for the fractured bedrock and volcanic aquifers.

The Valley Floor PA overlies several subbasins of the Sacramento Valley Groundwater Basin, namely the Capay Valley Subbasin, Colusa Subbasin, Yolo Subbasin and Solano Subbasin. The water bearing formations of these basins generally have very high storage capacities 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. The sustainable yield of these important groundwater subbasins is not yet fully understood.

3.1.2.3 Water Demands (Applied Water)

The term "demand" is used in this Plan to represent the quantity of water various water users choose to use for one or more beneficial uses according to the cost required for them to use that water. Economists have demonstrated that demand for water can most accurately be described as a function that relates the quantity of water a user will purchase/use based on the marginal unit cost of water. However, the information required to estimate specific economic functions of demand within the Region are not readily available at this time.

Therefore, this Plan presents approximations of water demand using estimates of applied water quantities based on historic information and expected urban trends in lieu of economic demand functions. Users apply water within the Westside Region to meet consumptive and non-consumptive uses. Consumptive water uses within the Region include municipal and industrial (M&I) applications and agricultural applied water. Non-consumptive water uses within the Region included hydropower, environmental and recreational flows.

These estimates for applied water include considerations of numerous factors including agricultural acreages, crop types, population, historical applied water data, and hydrologic conditions (water year type). Existing documents and studies documenting the current and projected applied water quantities were used whenever possible. Applied water amounts were calculated for the Planning Area, County, and Urban/Community levels where appropriate and grouped into classifications as data allowed (residential, commercial, agricultural, etc.). Despite some possible trends towards more permanent water intensive crops (such as vineyards and orchards) in parts of the Region, very little data is available for expected future agricultural cropping patterns within the Region, so applied water estimates for agriculture were assumed to remain constant at recent levels through 2035.

Table 3-2 and Table 3-3 contain estimated applied water demands in acre-feet per year (AFY) for 2012, 2015, and 2035 under average and dry hydrologic conditions, respectively. The expected demands increase in dry years due to decreased soil moisture from direct precipitation, increased evaporation and higher transpiration (plant water use) rates. Applied water demand is dominated by agricultural use in the Valley Floor Planning Area, accounting for approximately 95% of total demand within the Region in 2010.

Table 3-2: Average Year Demands (Applied Water) Summary

	2010 (AFY)			2015 (AFY)			2035 (AFY)		
Applied Water Category	**Valley Floor PA**	**Upper Cache Creek PA**	**Upper Putah Creek PA**	**Valley Floor PA**	**Upper Cache Creek PA**	**Upper Putah Creek PA**	**Valley Floor PA**	**Upper Cache Creek PA**	**Upper Putah Creek PA**
Agricultural	1,450	31	10	1,450	31	10	1,450	31	10
M&I	69	11	2	80	12	2	103	16	4
Total	**1,519**	**42**	**12**	**1,530**	**43**	**12**	**1,553**	**47**	**14**

Table 3-3: Dry Year Applied Water Summary

Applied Water Category	2010 (AFY) Valley Floor PA	2010 (AFY) Upper Cache Creek PA	2010 (AFY) Upper Putah Creek PA	2015 (AFY) Valley Floor PA	2015 (AFY) Upper Cache Creek PA	2015 (AFY) Upper Putah Creek PA	2035 (AFY) Valley Floor PA	2035 (AFY) Upper Cache Creek PA	2035 (AFY) Upper Putah Creek PA
Agricultural	1,555	41	11	1,555	41	11	1,555	41	11
M&I	69	11	2	80	12	2	103	16	4
Total	**1,624**	**52**	**13**	**1,635**	**53**	**13**	**1,658**	**57**	**15**

Note: M&I outdoor demands may naturally increase during dry years although these increases are often balanced with voluntary and mandatory conservation measures; therefore M&I demands have not been adjusted in this table.

Urban water suppliers (with more than 3,000 service connections or delivering more than 3,000 AFY) are required by DWR to prepare Urban Water Management Plans (UWMPs) and are now also required to develop gallon per capita day (GPCD) water use reduction targets in accordance with SBx7-7, the Water Conservation Act of 2009. Table 3-4 presents the Baseline GPCD, 2015 Interim Target, and 2020 Compliance Target that were included in the UWMPs. Please refer to each UWMP for a discussion of the data and calculation methods used to select each urban water supplier's GPCD targets. The M&I water use represented in Table 3-2 and Table 3-3 represents the projected water use including these reduction targets for the urban areas shown in Table 3-4. Because of the size of the water agencies within the upper watersheds, many smaller purveyors are not required to prepare an UWMP. However, estimated per capita water use in Lake County is 139 GPCD for an average year and 152 GPCD for a dry year (CDM, 2006b) which are among the lowest per capita water use rates in the region.

Table 3-4: UWMP Per Capita Water Use Targets

Urban Water Supplier	Baseline (GPCD)	2015 Interim Target	2020 Compliance Target
Vacaville	172	169	166
Rio Vista [(a)]	320	---	256
Davis	203	204	167
Dixon	166	168	164
West Sacramento	305	275	244
Woodland	289	260	231

Rio Vista 2010 UWMP did not include a 2015 Interim Target.

3.1.2.4 Recycled/Reuse Flows

Community wastewater collection, treatment, and disposal systems serve larger, more urbanized populations. The majority of domestic wastewater in the Westside Region is treated by community wastewater systems. Community wastewater systems influence how water moves within the Region and the availability of recycled water. Wastewater which is disposed of within the Region and is not currently consumptively used provides a source of water that could be captured for reuse. Table 3-5 summarizes the current disposal methods for the Region's wastewater treatment plants.

Table 3-5: Wastewater Treatment Plants and Disposal Methods

Planning Area/Facility	Disposal Method
Upper Putah Creek Planning Area	
Hidden Valley Lake WWTP	Land application - golf course
Middletown WWTP	Geothermal injection
Upper Cache Creek Planning Area	
Lakeport WWTF	Land application – pasture
Kelseyville WWTP	Land application – vineyards
Northwest Regional WWTP	Geothermal injection – exported outside Region
Southeast Regional WWTP	Geothermal injection – exported outside Region
Clearlake Oaks WWTP	Geothermal injection – exported outside Region
Valley Floor	
Davis WWTP	Willow Slough Bypass and Conaway Toe Drain (tributaries to or part of Yolo Bypass)
Easterly WWTP (Vacaville)	Alamo Creek (to Cache Slough to Delta)
Winters WWTF	Land application - native grasslands
UC Davis WWTP	Putah Creek to Yolo Bypass to Delta
Dixon WWTP	Land application - percolation/evaporation basins
Woodland WWTP	Unimproved channel to Tule Canal (Yolo Bypass)
Rio Vista - Beach Drive	Sacramento River
Rio Vista – Northwest	Sacramento River
West Sacramento WWTP	Export to Sacramento Regional County Sanitation District

Sources: Lake County Inventory & Analysis, Appendix D, City of Davis Urban Water Management Plan, City of Vacaville Urban Water Management Plan, Winters Municipal Service Review, UC Davis NPDES No. CA0077895, City of Woodland Urban Water Management Plan, City of Rio Vista Urban Water Management Plan, City of West Sacramento Urban Water Management Plan

Wastewater treatment systems also serve an important function in protecting water bodies from water quality degradation. There are thousands of septic systems in the Region, including approximately 12,300 septic systems operating in the Clear Lake watershed (data as of 1996, County of Lake Department of Public Works, 2010). Areas where households in the Region are not serviced by community wastewater systems and use on-site wastewater treatment systems (OWTS or septic systems), usually consisting of a septic tank and associated leachfield(s), to store, treat, and dispose of domestic wastewater may be subject to an increased risk in contamination due to septic system leakage of aging and poorly maintained OWTS. Areas near surface waters pose a particularly high risk, and in the 2012 Clear Lake Watershed Sanitary Survey, it was reported that: “at least ten water utilities and Lake County expressed concerns about failing septic systems in the area impacting their source water quality [for surface water treatment plant intakes]. At least two of those utilities are considered particularly vulnerable to poor quality source water due to failing septic systems.” (Forsgren Associates, 2012). In addition, individual domestic wastewater is not considered available for reuse.

Three WWTPs in the Upper Putah and Cache Creek PAs reuse treated wastewater for different types of land application. The remaining four WWTPs in the Upper Putah and Cache Creek PAs export and reuse their effluent at the Geysers geothermal power generation project, which is located north of Middletown in Lake County and in Sonoma County to the west of the planning area boundary (geysers.com). Raw water is also pumped and exported from Clear Lake to supplement treated effluent supplies delivered to the Geysers (Yolo County Flood Control & Water Conservation District, 2012).

Wastewater discharges from the nine wastewater treatment plants in the Valley Floor Planning Area provide multiple reuse and water recycling opportunities. Some of the wastewater is currently being discharged to managed wetlands to provide habitat and aquifer recharge

benefits (City of Davis), while other wastewater effluent is discharged into local creeks where there is seasonal reclamation for agricultural use, such as at the City of Vacaville Easterly WWTP.

3.1.2.5 Return Flows

Return flows include runoff from agricultural irrigation or outdoor landscape irrigation in developed areas that either reenter the surface water system or percolate into the ground to recharge the aquifers and are later potentially recoverable. The term *return flow* refers to the part of applied water that is not consumed by evapotranspiration and that migrates to an aquifer or surface water body. For the Westside Region, there are three types of return flows: agricultural, urban, and wastewater recycle/reuse return flows. Each of these is discussed in more detail in Appendix C.

The quantity of return flows available for reuse are a function of the water applied within the study area, the timing of releases, conveyance losses, and the location of diverters downstream relative to the return flow sources. In certain year types, especially during drier conditions, there may not be enough water available within the Region to supply the total applied water demand. When water is scarce, farmers typically plant fewer row and field crops in the Region, which reduces the demand for applied water, and subsequently reduces the quantity of available return flows.

3.1.3 Water Leaving

Water leaves the Region through several mechanisms including exports to neighboring Regions, downstream runoff to the Sacramento River or Sacramento-San Joaquin Delta, water consumption (which includes evapotranspiration), and other losses including evaporation and unrecoverable percolation. Between the PAs, the term do*wnstream runoff* is used to define water leaving a PA due to unregulated stream or overland flows from the PA and the term *downstream releases* is used to define water leaving a PA through regulated releases from storage facilities.

An example of exports from the Region is when Solano Project water from Lake Berryessa is conveyed via the Putah South Canal to serve areas in Solano County outside the Westside Region. Water consumption includes the portion of M&I and agricultural applied water that is not returned to the water system. Agricultural crops, native vegetation, and lawns and other plants in urban landscapes transpire water which is the major part of water consumption.

Water losses are an important component of the water balance and also one of the most difficult factors to determine. These losses include surface water evaporation, and unrecoverable subsurface groundwater flows. Evaporative losses occur on the expansive surface areas of the three major water bodies, irrigation canals, and ditches throughout the Region. Some water lost due to seepage from leaking pipelines and canals also percolates into the soil and shallow aquifer and contributes to groundwater recharge, but some unknown fraction is unrecoverable. Given the uncertainty present in much of the available water balance data, attempting to quantify these losses does not seem warranted at this time.

3.1.4 Observations from Water Balances

3.1.4.1 Observations from Westside Region Water Balance

The observations for this subsection were made based on a review of the water balance for the entire Region. Sections 3.1.4.2 and 3.1.4.3 contain observations that relate more specifically to each Planning Area. Water balance information is presented in tabular format for the 2035 planning horizon in Table 3-6 and Table 3-7. Much of the data needed to complete a full water balance for various hydrologic conditions does not exist currently. As shown in the figures and tables that follow, a number of items have not been quantified (NQ), and many of the other quantities have been reported with a low level of confidence in their accuracy. Considerable uncertainty exists about groundwater recharge and groundwater storage quantities. Investments and efforts to reduce this uncertainty may become warranted in the future since water users rely heavily on groundwater to adapt to changing availability of surface water from year to year, and existing data and information is not sufficient to estimate the quantity of groundwater available in any given year for many portions of the Region.

As stated before, the water management system within the Region is very complex. Table 3-6 and 3-7 contain information to help quantify how water moves through the Region at a high level of aggregation. The water balances summarize the amount of water entering the Region, how water is used within the Region, and the amount of water leaving the Region. Most of the numbers shown are gross estimates that can provide a sense of scale for the movement of water through the Region's water systems.

The "Water Within" section of the water balances contains two subcategories: "Water Supplies" and "Applied Water Demands". Due to missing information in this water balance, annual changes in groundwater and surface storage were not estimated. Therefore, the water balance does not indicate whether the applied water demand in dry years can be met fully. The available supply from sources that are quantified is less than the expected demand for applied water, but this difference may (or may not) be available from surface or groundwater storage within the Region.

Although analysts determined that some of the information needed to complete a traditional water balance related to supply and demand does not exist, the process led to a number of useful observations as follows:

1. Agricultural water use dominates total water use within the Region. Approximately 89% of the Region's water demand (applied water) during an average year is for agricultural uses.

2. Overall, supply and demand are not managed for the Region as a whole, meaning that no centralized agency or organization has water management authority for the entire Region. A number of surface water supply sources (i.e. Solano Project, CVP, SWP, and YCFCWCD) that amount to approximately 70% of water applied in an average year, are managed independently within or outside the Region according to existing contracts or diverted directly from water courses or water bodies through riparian rights. The remaining 30% of water applied in an average year is extracted from a number of groundwater aquifers according to the choices and behaviors of thousands of independent groundwater pumpers.

3. Precipitation within the Region can vary considerably from year to year and in different parts of the Region, which affects the watersheds unimpaired flow (upstream runoff). For example, the average annual unimpaired flow in the upper Cache Creek watershed (above Rumsey) is 524 TAF, but has ranged from as little as 62 to as much as 1,964 TAF. The variability and timing in precipitation affects the amount of surface water that is captured and stored within the Region, and also affects the amount of water available to recharge the groundwater aquifers.

4. Much of the effects of the water supply variability for the Region are absorbed within the agricultural sector since they are the largest users of water in the Region. In areas of the Region where periodic shortfalls in agricultural water supplies occur, flexible agricultural crop choices have allowed many agricultural water uses to change their activities in a given year based on their expectation of the water that will be available. As a result, year-to-year water demand for agriculture within the region is not well understood. Recently, more permanent type crops have been planted that may make it more difficult to respond to the supply variability in the future without experiencing significant financial losses in water short areas of the Region.

5. Many areas throughout the Region have access to both groundwater and surface water supplies which provides a level of flexibility. However, there are some areas, including communities surrounding Clear Lake and some of the cities (Woodland, Davis, Dixon, and Rio Vista) that rely on a single source of supply and may experience shortages during dry periods. Significant areas of agricultural lands also currently rely on a single source of water and can experience considerable variability in their water supplies each year as a result.

6. Climate change impacts are still being determined, but likely will cause increased variability in temperature, annual precipitation and surface water runoff quantities, and changes in the timing and frequency of storms that affect the ability to store water for agricultural or municipal uses. These changes could lead to less groundwater recharge and more frequent and increased use of groundwater within the Region. Increased use and reduced recharge of groundwater could negatively impact areas that depend on groundwater for their supply.

Table 3-6: Regional Water Balance Summary – Average Year (2035)

Category	Planning Area: Upper Cache	Upper Putah	Valley Floor	Total
Water Entering (TAFY)				
Precipitation	693	455	NQ	1,148
Upstream Runoff (upper watershed)	0	0	669	669
Upstream Releases (regulated releases)	0	0	306	306
Imported Water (outside watershed)	0	0	624	624
Total Water Entering	**693**	**455**	**1,599**	**2,747**
Water Within				
Water Supplies				
Direct Deliveries (TAFY)	0	0	944	944
Surface Water Storage (TAF)				
Surface Storage	1,062	1,103	0	2,165
Local Release Deliveries	25	NQ	0	25
Downstream Releases (see Water Leaving)				
Groundwater Storage (TAF)				
Groundwater Percolation (Recharge)	72	14	524	610
Return Flows (TAFY)				
Agricultural RF	8	2	362	373
Urban RF	2	0.5	15	18
Wastewater RF	0.4	0.1	3	4
Total Return Flows	10	3	381	394
Recycle/Reuse (TAFY)	1	0.4	21	23
Total Water Supplies	**119**	**NQ**	**1,869**	**1,988**
Applied Water Demand (TAFY)				
Applied Surface Water				
M&I	13	0.7	40	53
Agricultural	6	8	986	1,000
Total Surface Water Use	19	8	1,026	1,053
Applied Groundwater Extractions				
M&I	3	3	63	69
Agricultural	25	2	464	491
Total Groundwater Extractions	28	5	527	560
Total Applied Water	**47**	**13**	**1,553**	**1,613**
Water Leaving (TAFY)				
Consumption of Applied Water	35	10	1,151	1,195
Exports	8	0	56	64
Downstream Releases	153	153	0	306
Downstream Runoff	444	225	199	868
Wastewater Discharges	4	0.1	10	14
Losses				
Surface Evaporation/Seepage [(a)]	15	102	NQ	117
Subsurface Aquifer	NQ	NQ	NQ	NQ
Other Unrecoverable Losses	NQ	NQ	NQ	NQ
Total Water Leaving	**659**	**491**	**NQ**	**1,150**

* NQ -Not Quantified

(a) Evaporation from Clear Lake not included because the unimpaired flows that were used to estimate precipitation accounted for evaporation at Clear Lake, thus including evaporation here would double count this water loss.

Table 3-7: Regional Water Balance Summary – Dry Year (2035)

Category	Planning Area: Upper Cache	Upper Putah	Valley Floor	Total
Water Entering (TAFY)				
Precipitation	218	123	NQ	341
Upstream Runoff (upper watershed)	0	0	274	274
Upstream Releases (regulated releases)	0	0	236	236
Imported Water (outside watershed)	0	0	367	367
Total Water Entering	**218**	**123**	**877**	**1,218**
Water Within				
Water Supplies				
Direct Deliveries (TAFY)	0	0	606	606
Surface Water Storage (TAF)				
Surface Storage	935	965	0	1,900
Local Release Deliveries	25	NQ	0	25
Downstream Releases (see Water Leaving)				
Groundwater Storage (TAF)				
Groundwater Percolation (Recharge)	72	14	524	610
Return Flows (TAFY)				
Agricultural RF	10	3	389	402
Urban RF	2	0.5	15	18
Wastewater RF	0.4	0.1	3	4
Total Return Flows	13	3	407	423
Recycle/Reuse (TAFY)	1	0.4	21	23
Total Water Supplies	**99**	**NQ**	**1,558**	**1,657**
Applied Water Demand (TAFY)				
Applied Surface Water				
M&I	13	0.7	40	53
Agricultural	8	9	902	919
Total Surface Water Use	21	10	941	972
Applied Groundwater Extractions				
M&I	3	3	63	69
Agricultural	33	2	653	688
Total Groundwater Extractions	36	5	716	757
Total Applied Water	**57**	**15**	**1,657**	**1,729**
Water Leaving (TAFY)				
Consumption of Applied Water	43	11	1,229	1,283
Exports	0	0	56	56
Downstream Releases	84	152	0	236
Downstream Runoff	166	108	199	473
Wastewater Discharges	4	0.1	10	14
Losses				
Surface Evaporation/Seepage [(a)]	15	102	NQ	117
Subsurface Aquifer	NQ	NQ	NQ	NQ
Other Unrecoverable Losses	NQ	NQ	NQ	NQ
Total Water Leaving	**312**	**374**	**NQ**	**686**

* NQ -Not Quantified

(a) Evaporation from Clear Lake not included because the unimpaired flows that were used to estimate precipitation accounted for evaporation at Clear Lake, thus including evaporation here would double count this water loss.

3.1.4.2 Observations from Upper Watersheds Water Balances

All of the water entering the Upper Cache and Upper Putah creek watersheds arrives in the form of rain or snowfall. The annual variability of rainfall produces wide fluctuations of runoff each year. The estimated quantity of water entering the upper watersheds is approximately 1,150 TAF/YR on average, and 341 TAF/YR in a dry year.

Figures 3-4 through 3-7 show the water balances for the Upper Cache and Upper Putah Planning Areas in the average and dry hydrologic years. Most of this water is captured in one of the three reservoirs and is eventually released, flowing downstream leaving the planning areas and entering the Valley Floor PA. Local water users within the Upper Cache and Upper Putah Planning areas primarily draw their supplies from the lakes and reservoirs and groundwater. Some riparian diversions occur from the streams and creeks, although the quantity of riparian diversions are unknown and are believed to represent a minor portion of the overall water flow. Approximately 75-95% of the water (depending on the type of water year) that enters the upper watersheds is either stored and then released downstream into Putah and Cache Creeks, or lost to surface evaporation on the lakes.

The process of creating water balances for the upper watersheds led to the following noteworthy observations:

1. Most water supply purveyors around Clear Lake receive surface water from the lake via contract with YCFCWCD. YCFCWCD is committed to ensure this supply is available to Clear Lake customers in all hydrologic year types.

2. Current limitations with water supply and/or water storage and delivery infrastructure recently have prevented the issuance of building permits in several areas around Clear Lake. Three County Service Areas and two private purveyors currently have or recently had moratoriums on new service connections.

3. Approximately 80 percent (28 TAF/YR) of agricultural water applied in the upper watersheds is supplied by groundwater. However, the sustainable yield of the fifteen groundwater basins in the planning areas is not well understood. Studies have indicated that a drought condition that has a 1 in 10 (10%) chance of occurring in any given year could result in insufficient groundwater quantities to meet expected demands in some portions of the Upper Cache Planning Area (1987 Lake County Resources Management Plan per Tom Smythe), although these estimates require updating as land and water use patterns have changed over time.

4. The currently available information suggests that M&I and agricultural demands may exceed available groundwater supplies in some years within the Upper Cache Planning Area. More detailed analysis of the expected demands and available supplies during multi-year dry hydrologic conditions for the Upper Cache Planning Area seems warranted.

5. The water users within the Upper Putah Planning Area are mostly rural and self-supplied. These rural users rely predominantly on groundwater. There is no indication that the groundwater supplies have not been sufficient to date. DWR periodically monitors the groundwater levels in the major aquifers in the Upper Putah Planning Area. As demands in this planning area grow, the local aquifers should be monitored for signs of stress.

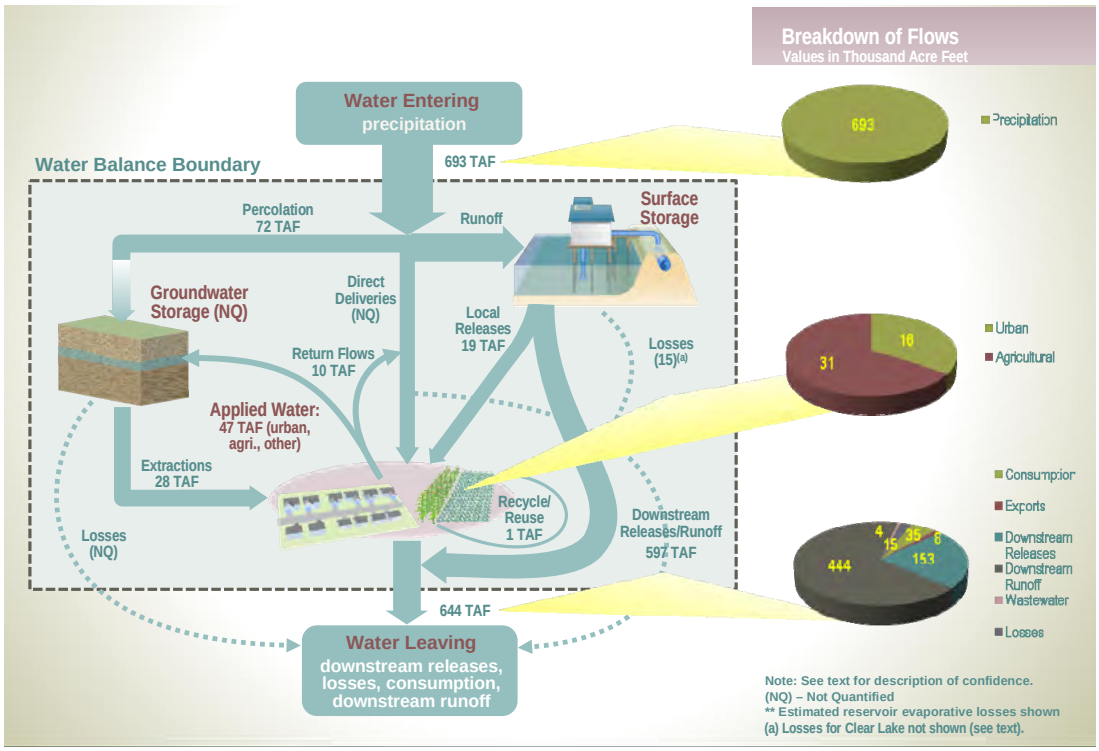


Figure 3-4: Average Year – Upper Cache Planning Area

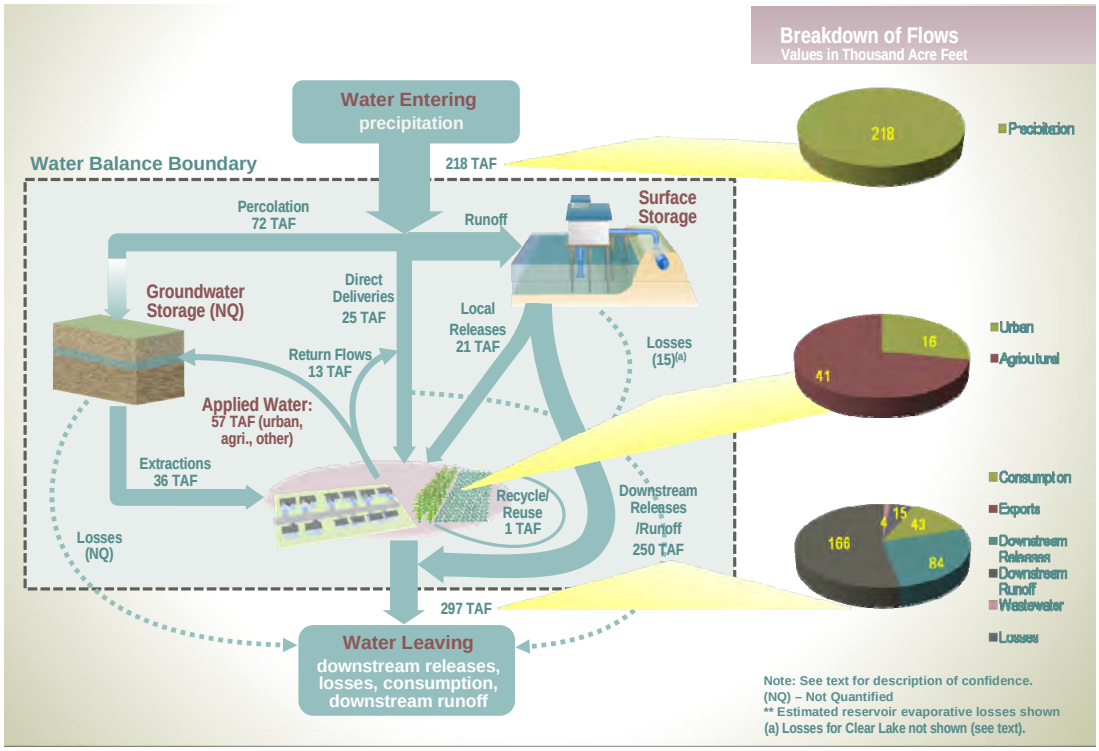


Figure 3-5: Dry Year – Upper Cache Planning Area

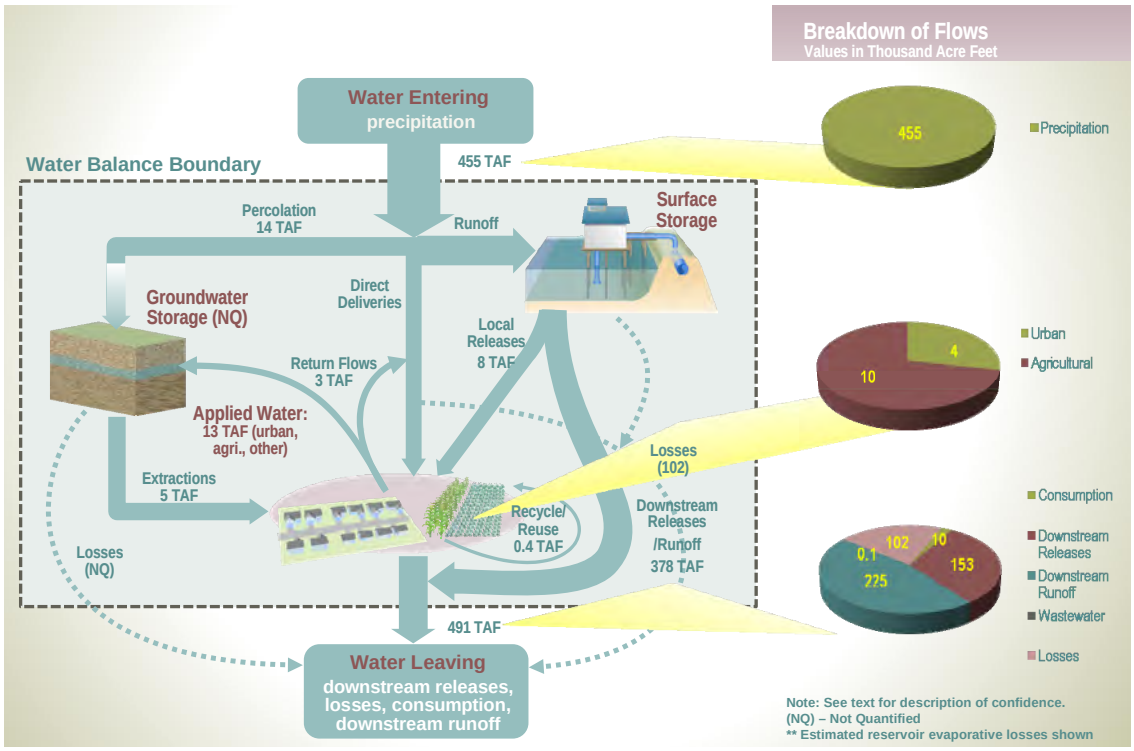


Figure 3-6: Average Year – Upper Putah Planning Area

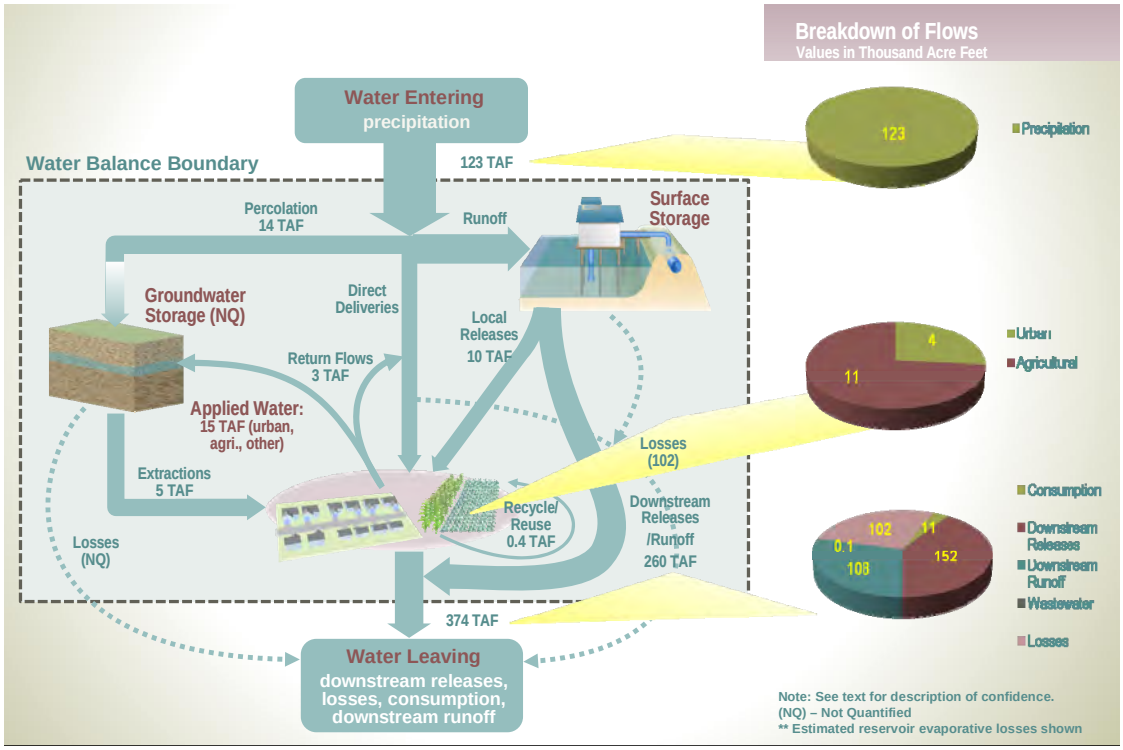


Figure 3-7: Dry Year – Upper Putah Planning Area

3.1.4.3 Valley Floor Water Balance Findings

The Valley Floor PA water balance is summarized in Figure 3-8 and Figure 3-9. Water is supplied to the Valley Floor PA from many different sources including flows from the two upper watershed Planning Areas, groundwater pumping, and extensive imported water infrastructure. Part of the reason that there are so many sources is the fact that that there are no major surface storage reservoirs in this generally flat-lying area and the lands along the valley floor support an active agricultural industry. The water balance schematic shows balancing reservoirs instead of surface storage. Balancing reservoirs include the water impounded by YCFCWCD's Capay Dam and SCWA's Solano Diversion Dam.

Most (over 95%) water use within the Westside Region occurs in the Valley Floor PA. It is estimated that there is over 1,600 TAF of applied water demand in the Valley Floor PA in an average year.

1. The process of creating water balances for the Valley Floor PA led to the following observations: Demand for applied water in the Valley Floor Planning Area (and the Region) is dominated by agricultural uses. However, the agricultural water demands are the least understood within the Region. Recent trends indicate that more growers are planting more permanent crops such as vineyards and olives, which may over time, contribute to demand hardening and changes in irrigation patterns. At present, approximately 15 percent of all crops are of a permanent type within the planning area. Projections for agricultural water demands are not currently available for this Region, but may be available in the near future as part of the California Water Plan 2013 Update.

2. Historical evidence suggests that the agricultural community (in aggregate) adjusts their planting decisions each year based on an assessment of the amount of water supplies available to them. For the water users supplied within Solano County, the agricultural supply and demand seems to be in balance and is expected to stay in balance over the planning horizon. For the other portions of this planning area, the information currently available is not sufficient to determine how the apparent trend towards more permanent crops may match up with the variability of supplies. As demands harden, the potential negative impacts that occur during years with less water supply increase.

3. M&I water supplies are described in UWMP's for the larger communities. Each community has their own water supply challenges with different programs and policies to address them, but no community expects to experience major shortages in M&I water supplies during the planning horizon. With the abundance of agriculture water use in the Planning Area, there are opportunities for collaborations such as transfers, exchanges and conjunctive use projects that could supplement M&I supplies. Conjunctive use is being practiced by some agencies within the region to improve water supply reliability, and this type of effort is expected to continue to develop going forward.

4. Municipalities and agricultural groundwater users would be able to make more informed long-term water management decisions if they had access to an improved understanding of the sustainable yield of shallow and deep aquifers in the Capay, Yolo, and Colusa subbasins. One area of particular uncertainty is the safe yield of the deep Tehama formation serving many of the larger urban areas (City of Davis, UC Davis, Woodland, and Vacaville). Users whom rely on particular aquifers as a major component

of their supply may find it worthwhile to invest in improved characterization of specific aquifers to help ensure these resources are used sustainably.

5. Municipal recycled water use is currently negligible and is projected to account for about 1% of the water supply in the Valley Floor PA by 2020. Required upgrades to existing wastewater treatment plants (for example in the Cities of Vacaville and Davis) to meet regulatory treatment standards as issued by the Central Valley Regional Water Quality Control Board could result in additional recycled water becoming available for reuse to help meet agricultural or domestic demands if is the distribution and application of the more highly treated wastewater is found to be locally cost-effective.

6. An imbalance in the availability of surface water exists across different parts of the Valley Floor PA. For example, some purveyors in northern Yolo County have no or limited access to surface water, especially during dry periods. Water users may be willing to support purveyors to interconnect and leverage their shared resources to a greater extent across the Region in the future. Areas within the PA that could benefit from improved water movement/conjunctive use such as: Cities of Davis and Woodland, Portions of northern Yolo County that do not have access to surface water, such as Yolo-Zamora Water District, and other agricultural water users in Yolo and Solano Counties that do not have access to multiple supply sources

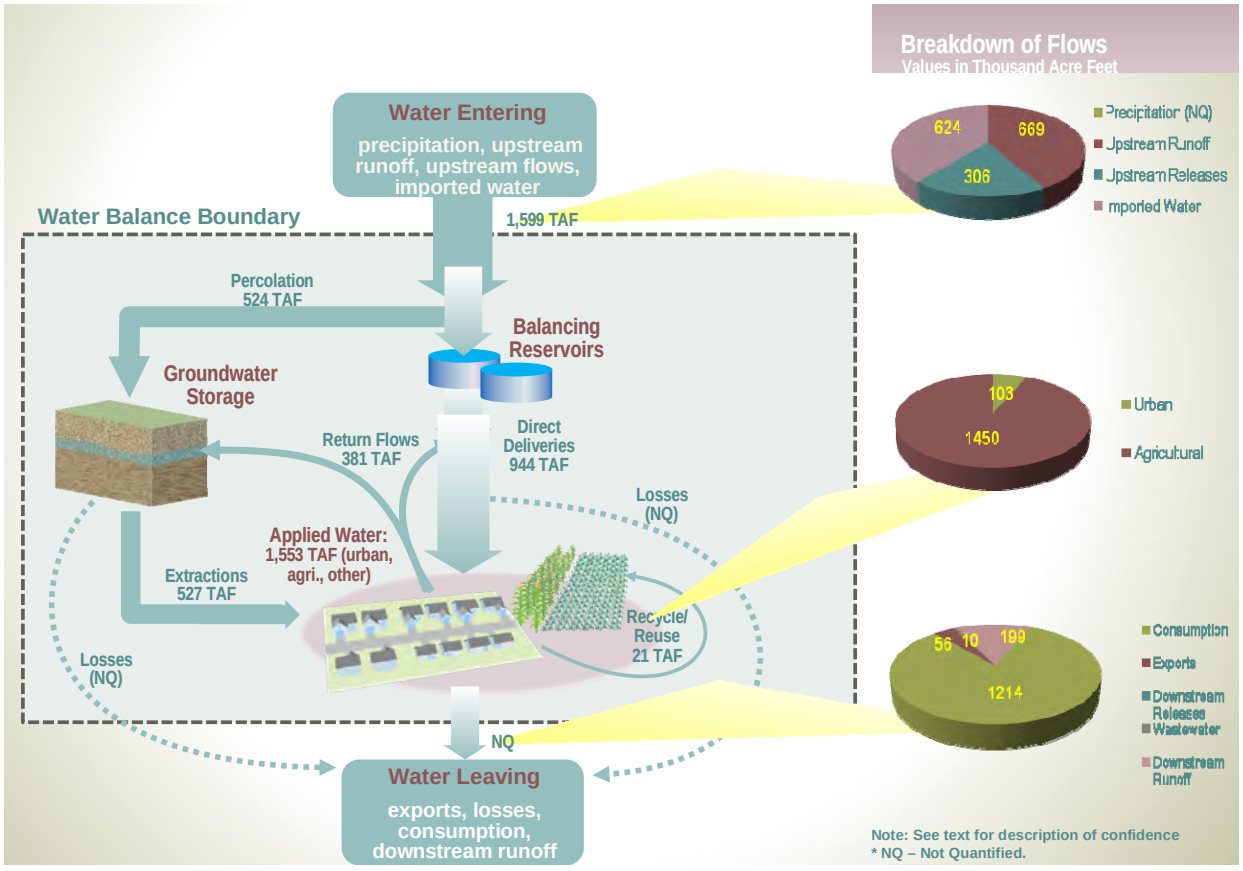


Figure 3-8: Average Year – Valley Floor Planning Area

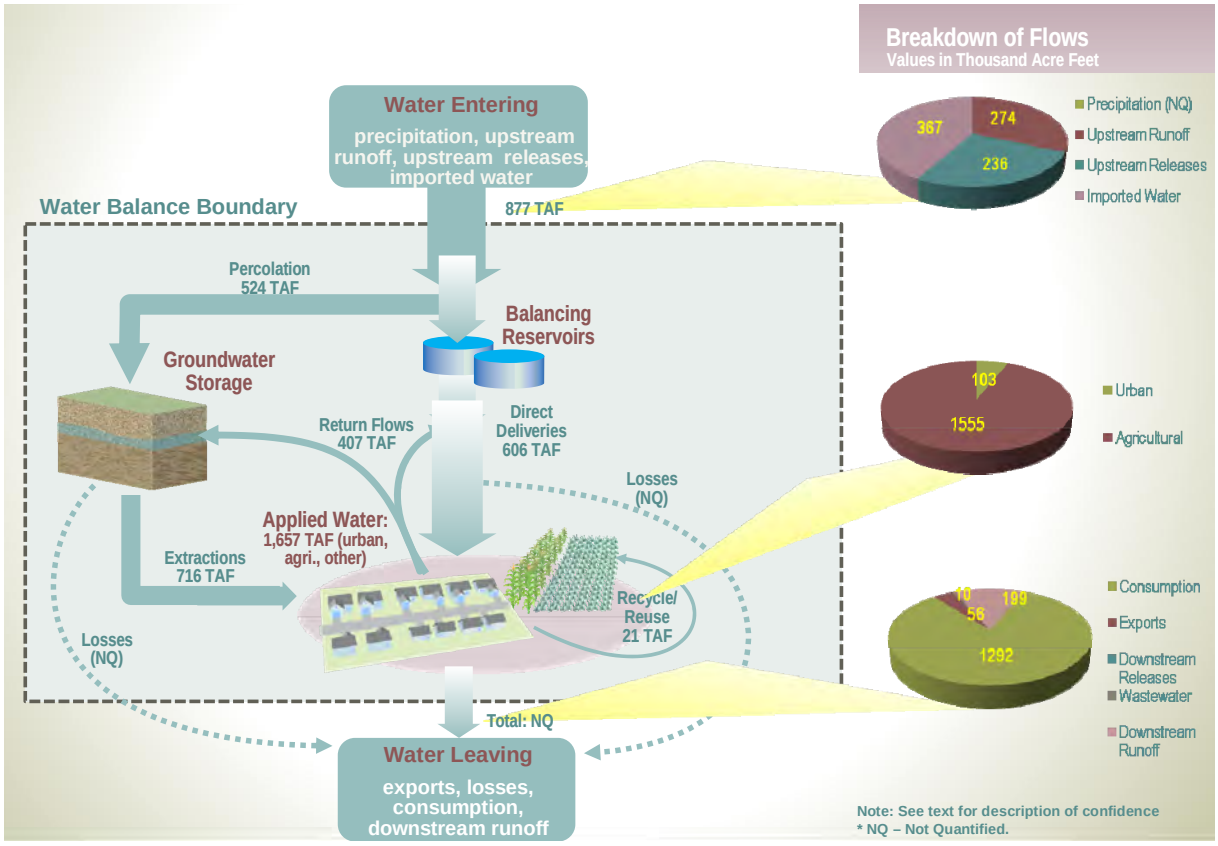


Figure 3-9: Dry Year – Valley Floor Planning Area

3.2 Water Quality

As shown above, water quantity is a major factor that influences the behavior of water users and water managers within the Region. However, water quality is also a dominant factor in influencing water management actions within the Region. The water quality of various surface and groundwater resources affects whether supplies for human uses and the environment will be sustainable. As a result, water managers and interested citizens throughout the Region strive to preserve, protect, and restore the water quality of reservoirs, creeks, aquifers, as well as imported supplies. A number of common challenges related to managing water quality exist within the Westside Region despite the large geographic extent. These shared challenges provide multiple opportunities for water managers and other stakeholders in the Westside Region to collaborate and cooperate to improve the water quality for all end users.

3.2.1 Water Quality Regulatory Framework

An extensive federal, state, and local regulatory framework has evolved to protect and improve water quality for all beneficial uses. Today, many of these regulations directly influence the water management actions in the Westside Region. The regulations are designed to support continued, long-term use of the Region's water supplies for drinking water, agricultural, and ecosystem benefits. The 1972 Federal Clean Water Act (CWA) established strategies for managing water quality including: requirements to establish and maintain at least a minimum level of pollutant management using the best available technology; and a water quality based approach that relies on evaluating the condition of surface waters and setting limitations on the

amount of pollution that the water can be exposed to without adversely affecting the beneficial uses of those waters. Section 303(d) of the CWA bridges these two strategies. Section 303(d) requires that states make a list of waters that are not attaining effluent discharge standards after the technology-based limits are put into place. The list is compiled based on the guidance outlined in the "Water Quality Control Policy for Developing California's Clean Water Act Section 303(d)". There are many resources that provide additional information on State and Federal water quality regulations, including the April 2002 California Legislative Report: "Addressing the needs to Protect California's Watersheds: Working with Local Partnerships."

The US EPA, SWRCB, and Regional Water Quality Control Boards (RWQCBs) have permitting, enforcement, remediation, monitoring, and watershed-based programs to prevent pollution through both the CWA as well as the California Porter-Cologne Water Quality Control Act. Pollution can enter a water body from point sources including wastewater treatment plants (WWTPs) and/or other industries that directly discharge to a river or stream and from nonpoint sources over a broad area, such as runoff from a city and/or agricultural farmland or grazing areas that can reach waterways. Some nonpoint source (NPS) contaminants naturally occur in local rocks and soil, such as heavy metals, (arsenic, chromium, selenium) but NPS also include pollutants coming from urban and agricultural runoff and include heavy metals, oils and greases, herbicides, pesticides, and fertilizers. Preventing pollution from most point sources relies on a combination of source control and treatment, while preventing NPS pollution generally involves the use of best management practices (BMPs), efficient water management practices, and source control.

The Federal Safe Drinking Water Act (SDWA) was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The SDWA applies to every public water system in the United States. SDWA authorizes the US EPA to set national health based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water. Originally, SDWA focused primarily on treatment as the means of providing safe drinking water at the tap. Amendments in 1996 greatly enhanced the existing law by recognizing source water protection, operator training, funding for water system improvements, and public information as important components of safe drinking water. Under the SDWA, technical and financial aid is available for certain source water protection activities. The California Department of Public Health (CDPH) is responsible for enforcing the SDWA and California-specific drinking water regulations as defined in Title 22 of the California Code of Regulations.

3.2.2 Surface Water Quality

The surface waters within the Westside Region support a variety of beneficial uses, including municipal and domestic supply, agriculture water supply, industrial water supply, recreation, commercial and sport fishing, freshwater habitat, migration and spawning of aquatic organisms and wildlife habitat for terrestrial species. Table 3-8 presents the beneficial use designations for major surface water bodies in the Region as identified in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan). The Basin Plan does not identify beneficial uses for all water bodies in the Region; however the tributary streams of any specifically identified water body can generally be assumed to have the same beneficial use designations.

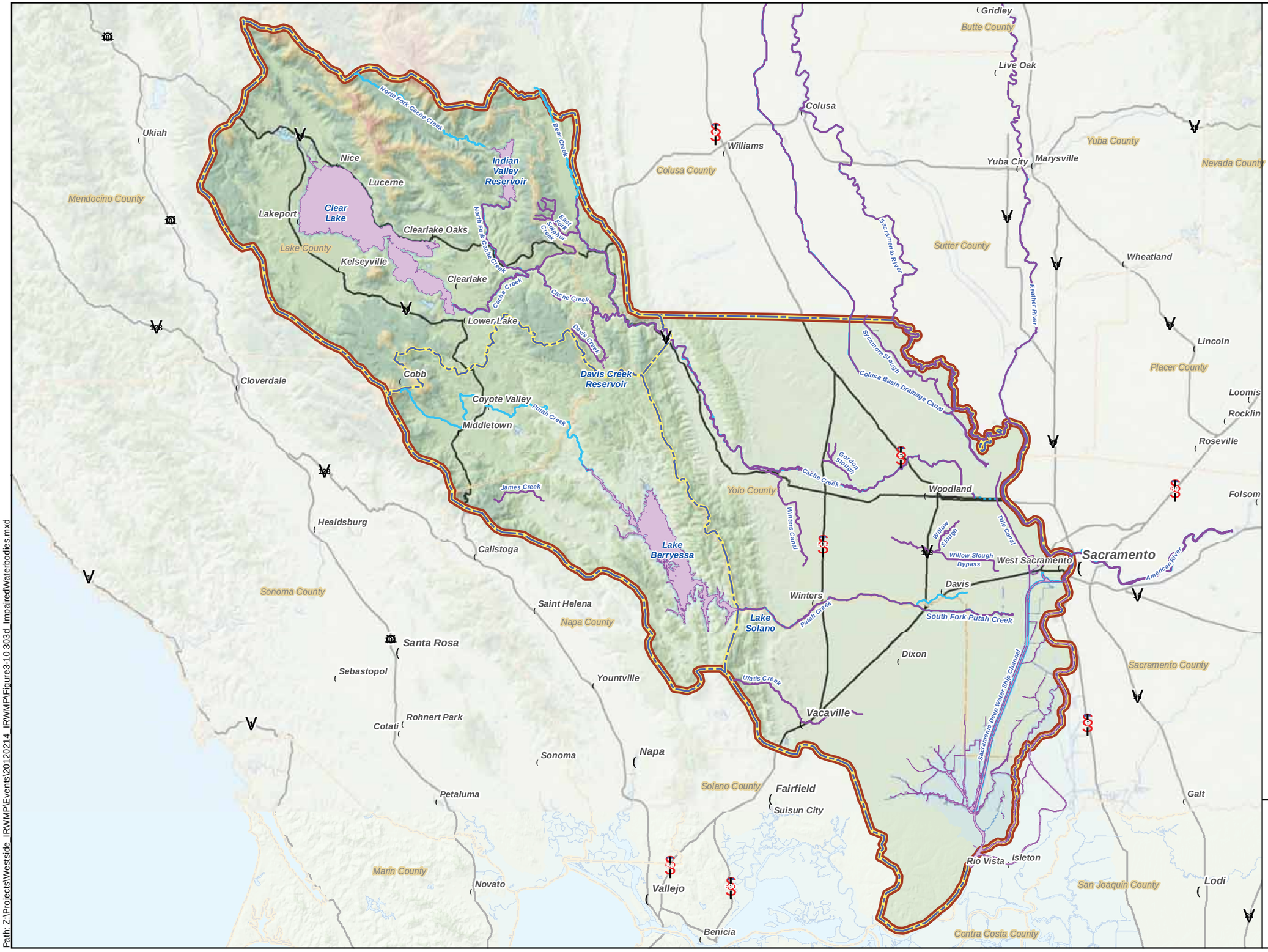
Table 3-8: Westside Region Surface Water Bodies and Beneficial Uses

	Municipal and Domestic Supply	Agricultural Supply	Industrial Supply	Recreation	Commercial and Sport Fishing	Freshwater Habitat	Migration	Spawning	Wildlife Habitat
Clear Lake	X	X		X	X	X		X	X
Cache Creek	X	X	X	X	X	X		X	X
Lake Berryessa	X	X		X		X		X	X
Putah Creek	X	X	X	X		X		X	X
Colusa Basin Drain		X	X			X	X	X	X
Yolo Bypass		X	X	X	X	X	X	X	X
Sacramento San Joaquin Delta	X	X	X	X	X	X	X	X	X

In compliance with Section 303(d) of the CWA, the Regional Water Quality Control Board (Regional Board) has identified surface waters within the Westside Region that contain pollutants which exceed water quality standards for one or more of their beneficial uses, and will eventually require development of a Total Maximum Daily Load (TMDL) for each listed pollutant. Figure 3-10 illustrates the extent of these 303(d) listed surface waters, and Figure 3-11 summarizes the pollutants causing the impairment, the beneficial uses being affected and Basin Plan water quality objectives related to those constituents and beneficial uses. A table identifying the specific 303(d) listed water bodies and their sources of impairment is in included in Appendix C.

In addition to identifying impaired water bodies, the Regional Board is required to develop a Total Maximum Daily Load (TMDL) for each pollutant identified in the 303(d) listing. The TMDL is designed to control the amount of the pollutant entering the water body so that the beneficial use of the water body can be restored over time. The Regional Board has developed several TMDLs for the Region and has plans to develop more in the future. The completed TMDLs include: mercury in Clear Lake, Cache Creek, Bear Creek, Sulphur Creek and Harley Gulch; chlorpyrifos and diazinon in the Delta Waterways; and nutrients in Clear Lake.

Mercury is a significant source of water quality impairment throughout the Westside Region and is a legacy left by the extensive mining done within the Region. Erosion of naturally mercury-enriched soils, flows from geothermal springs and atmospheric deposition all contribute mercury to the watershed, but the major source of mercury is believed to be sediment runoff from historic mines (CVRWQCB, 2010). Numerous mercury mines were developed within the Region during the mid to late 1800s to support the gold rush. These mines were located primarily within the upper reaches of the Cache Creek and Putah Creek watersheds. Because mercury has discharged from the mines through runoff and leachate filters downstream, mercury contamination extends throughout the Westside Region and continues to present significant challenges for water resources managers through today. One of the largest mines was the Sulphur Bank Mercury Mine. In 1990, the Sulphur Bank site, which lies along the lake shoreline, was listed on USEPA's National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act, more commonly known as Superfund. Accordingly, USEPA has responded with long-term actions to remediate hazardous wastes at the site.



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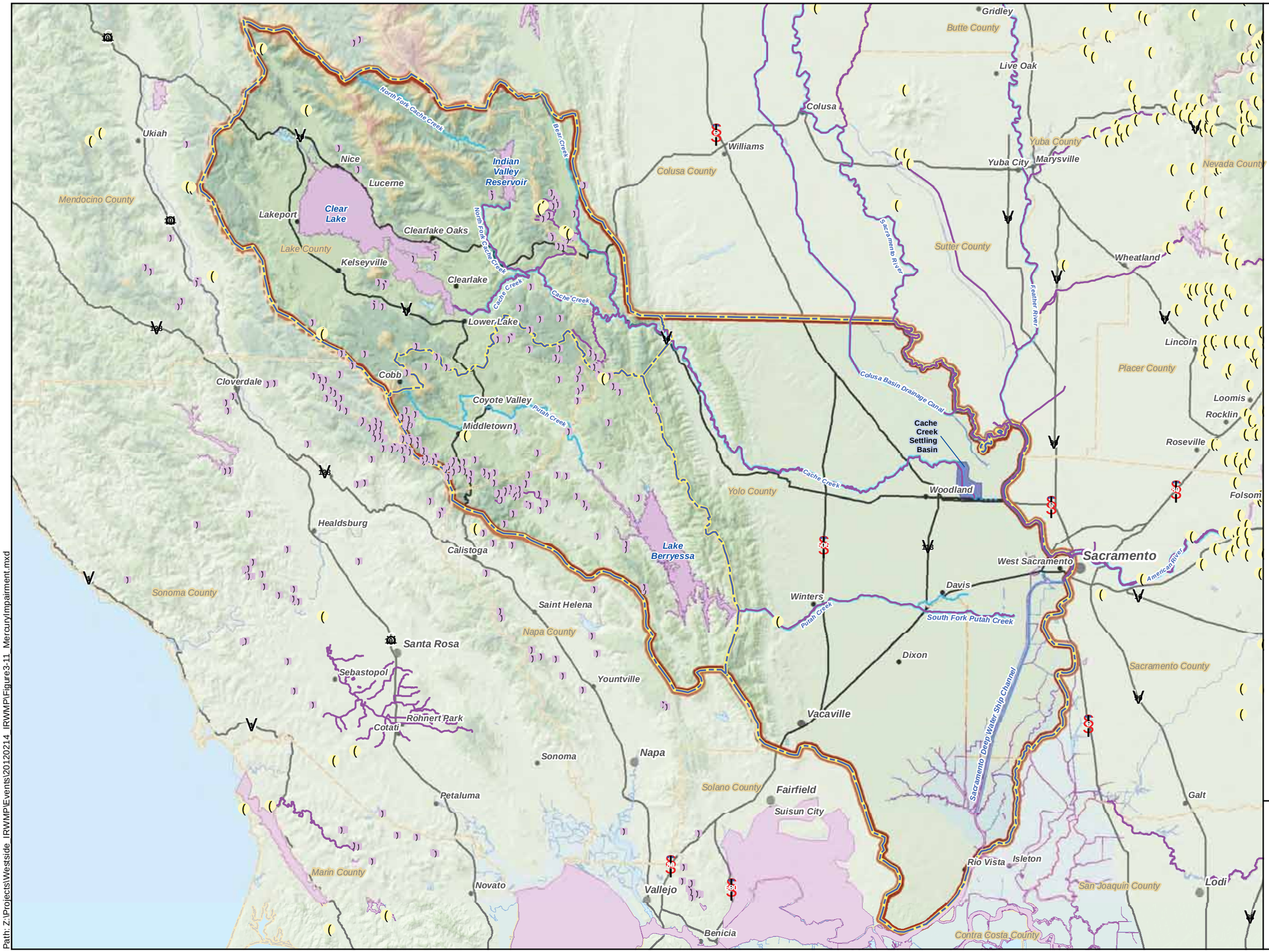
Gridley
Butte County
Live Oak
Colusa
Williams
Colusa County
Yuba County
Yuba City
Marysville
Nevada County
Ukiah
Mendocino County
Nice
Lucerne
Indian Valley Reservoir
Clear Lake
Lakeport
Clearlake Oaks
Lake County
Kelseyville
Clearlake
Lower Lake
Cache Creek
North Fork Cache Creek
Bear Creek
Sacramento River
Sutter County
Wheatland
Feather River
Lincoln
Placer County
Loomis
Rocklin
Roseville
Folsom
Colusa Basin Drainage Canal
Cache Creek Settling Basin
Cloverdale
Cobb
Coyote Valley
Putah Creek
Middletown
Yolo County
Woodland
Healdsburg
Calistoga
Lake Berryessa
Sonoma County
Saint Helena
Napa County
Santa Rosa
Sebastopol
Rohnert Park
Cotati
Yountville
Vacaville
Winters
Davis
West Sacramento
Sacramento
American River
South Fork Putah Creek
Dixon
Sacramento County
Sacramento Deep Water Ship Channel
Sonoma
Napa
Petaluma
Solano County
Fairfield
Suisun City
Galt
Rio Vista
Isleton
Lodi
San Joaquin County
Marin County
Novato
Vallejo
Benicia
Contra Costa County
Legend
Cities
County Boundary
Planning Areas
Westside Region
Streams
Projected Flow Pathway
Water Bodies
Gold Mines
Mercury Mines
303(d) Listed Streams for Mercury
303(d) Listed Water Bodies for Mercury
Source:
U.S. Geologic Survey, 2005, Mineral Resources Data System; 2010 303(d) Listed Waters, SWRCB, 2012.
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Potential Sources of Mercury Impairment & Impaired Streams & Water Bodies
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The property includes extensive mining workings, mine tailings, waste rock, and an open pit referred to as the Herman Impoundment. The Elem Pomo Tribe, which lies directly adjacent to the mine property, is also part of the Superfund site. A wetland which has served as critical habitat for three endangered wildlife species is located in close proximity to the mine (CVRWQCB, 2010).

As described in the Basin Plan (CVRWQCB, 2011), the main concern with mercury in the watershed is bioaccumulation in aquatic systems. Mercury accumulates in the sediment of lakes and streams where bacteria convert it into methylmercury. Methylmercury is the most toxic form of mercury and accumulates within animals faster than it can be eliminated. Neurological, reproductive and other detrimental effects have been linked to methylmercury exposure. A specific study conducted to show the adverse affects of methylmercury on wildlife in the Cache Creek watershed has not been conducted (CVRWQCB, 2011). Beyond the harm caused to organisms within the environment, humans are also subject to harm if they ingest the contaminated organisms and therefore numerous streams in the Region have been listed as impaired for commercial and sport fishing. The Department of Public Health, Office of Environmental Health Hazards Assessment has issued a fish consumption advisory with guidelines for safe consumption of fish for Clear Lake and Cache Creek (www.oehha.com).

While the 303(d) listing for mercury in the Region is in response to human health concerns, accumulation of mercury in fish can also impact the health of wildlife that feed on fish. The impact to wildlife, particularly waterfowl, although not currently an area of regulatory attention is an issue that is being monitored by stakeholder groups such as the San Francisco Estuary Institute and may affect management actions in the future.

The mercury TMDLs that have been developed for Clear Lake, Cache Creek, Bear Creek, Harley Gulch and Sulphur Creek prescribe cleanup of inactive mines and erosion control measures to decrease the transport of mercury. While the mercury TMDLs for other creeks and lakes in the Westside Region are still under development, groups such as the Delta Tributaries Mercury Council and Tuleyome have been working to implement strategies to manage mercury and restore abandoned mercury mines in advance of mandated actions. The Cache Creek Settling Basin has been of particular interest to stakeholders and the focus of various studies. Designed to trap sediments before water from Cache Creek flows into the Yolo Bypass, the Cache Creek Settling Basin has accumulated significant concentrations of mercury. Researchers believe that about half the mercury that is transported down Cache Creek is deposited within the settling basin (CVRWQCB, 2008).

Boron is another common source of water quality impairment for the Region. Boron, a naturally occurring element in the soils of the region, dissolves in water and is carried into surface water bodies. While necessary to 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.

Pesticides are another major concern related to water quality impairment for the Westside Region. Surface waters in the Valley Floor PA 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. Although Clear Lake has not been listed as impaired by pesticides, the potential for pesticides to be carried by surface water runoff to Clear

Lake is a concern that has been expressed by Native American communities as well as other community members such as the Clear Lake Advisory Committee. The presence of pesticides in the Upper Cache Creek PA still needs to be confirmed.

Erosion and sedimentation that results from human activities on the landscape can also present a water quality concern primarily because of sediment impacts on habitat. Erosion and sedimentation are a necessary component in healthy geomorphic processes, but they also can reduce the quality of aquatic habitat by covering gravel needed for fish spawning, harming aquatic invertebrate and increasing biological oxygen demand through the introduction of organic matter and nutrients within the sediment.

Another impact of sediment deposition (even as a result of normal geomorphic processes) can be reduced channel conveyance capacity and a corresponding increased risk of flooding. Sources of sediment loading in the Region include runoff from agricultural lands, over-grazing, construction activities, erosion of unpaved roads and trails, silviculture and increased sedimentation from precipitation following wildfires. Reducing undesirable sediment loads can benefit habitat and reduce the risk of flooding. Reduction of channel conveyance capacity through sediment deposition is a challenge of particular concern in the Valley Floor Planning Area, where the Cache Creek Settling Basin is reaching its design capacity for storing captured sediment.

Clear Lake is highly eutrophic, and is listed on the 303(d) list as impaired by nutrients. Studies indicate that excess phosphorus contributes to the occurrence of nuisance blooms of blue-green algae in Clear Lake during summer and fall periods. Sediment, both natural and anthropogenic, is the primary source of phosphorus to Clear Lake. Sediment sources include erosion from agricultural and urban areas, instream channel erosion, timber harvesting, runoff from roads, construction, gravel mining, wildfires, control burns, off highway vehicle (OHV) use, and dredging and filling. Fertilizer use (both urban and rural) and sewer and septic overflows, which are exacerbated during flood conditions, may also contribute phosphorus to the lake. Essentially all municipal wastewater is land applied or pumped from the watershed and therefore should not be contributing phosphorus to Clear Lake.

Recent improvements in erosion control and watershed restoration have appeared to contribute to improved lake clarity however, more severe cyanobacteria blooms have occurred in the past four years indicating that other factors may be affecting the ecosystem within Clear Lake. While water resources managers and stakeholders generally agree that erosion control, riparian and wetland restoration upstream of Clear Lake will have the greatest beneficial impact on Clear Lake water quality, challenges remain to prioritize which specific actions are needed in which locations.

An emerging contaminant of concern for water quality within the Region is harmful cyanobacteria. Some species of cyanobacteria produce toxins, and these cyanotoxins have varying levels of toxicity to humans and wildlife. Identification of the harmful cyanobacteria and their health effects is a developing area of research. Given its toxicity, one species of cyanobacteria which has been the focus of much recent research is *microcystis aeruginosa*, which produces the toxin microcystin. Although many types of cyanobacteria can produce microcystin, the limited sampling in Clear Lake indicates that *microcystis aeruginosa* is likely the primary source of the toxin. Contact with microcystin can lead to skin irritation, and ingestion of the toxin can result in gastrointestinal discomfort, vomiting and liver damage in humans. Exposure to cyanotoxins has led to death in wildlife species, dogs and livestock. *Microcystis*

aeruginosa as well as other harmful cyanobacteria are known to occur in Clear Lake and portions of the Delta (Mioni et al). The current distribution of the harmful cyanobacteria along with the potential for toxins from Clear Lake to be carried downstream to Yolo County through water releases from Clear Lake make this a contaminant of Regional concern.

3.2.3 Imported Water Quality

As described above, imported water is an important source to the Region, and therefore protection of water quality within these sources of imported water is key for the Westside Region. The City of Vacaville, City of Dixon and City of Rio Vista have contracts to import water from the State Water Project to the Region through the North Bay Aqueduct, although only the City of Vacaville currently imports water. The intake for the North Bay Aqueduct is located in the Barker Slough watershed in the Delta, which has the poorest water quality in the State Water Project system. The North Bay Aqueduct water supply suffers from high organic carbon and turbidity, principally during the winter runoff season, although baseline organic carbon is relatively high year round. The source of organic carbon is decaying organic material within the watershed and Delta waters. Turbidity principally comes from the watershed where the soil type results in long duration suspension of soil particles in the runoff. Natural and human induced erosion within the Barker Slough watershed contribute to high turbidity. Treatment of water with high organic carbon concentrations for distribution as drinking water can result in the formation of carcinogenic disinfection byproducts, and treatment of water with high turbidity to produce safe drinking water requires higher chemical use to remove the suspended particles. Due to these challenges, the Solano County Water Agency and Napa County Flood Control and Water Conservation District (which supplies water in Napa County outside the Westside Region) are investigating the possibility of constructing an alternate intake for the North Bay Aqueduct along the Sacramento River that would provide a higher quality supply source.

Dunnigan Water District, Colusa County Water District and River Garden Farms import water from the Central Valley Project (CVP) to the Region through the Tehama Colusa Canal and through multiple diversions from the Sacramento River (Water Resources Association of Yolo County, 2007). Water from the Tehama Colusa Canal is currently only used to supply agricultural uses and is of sufficient quality to meet the needs of those users. Previous investigations into the extension of the Tehama Colusa Canal to serve additional portions of the Region identified the use of aquatic pesticides in the canal as a potential concern for use to help meet municipal water demands (West Yost, 2012). CVP diversions from the Sacramento River meet all applicable water quality standards for current use by the City of West Sacramento.

Davis and Woodland are also planning to use water from the Sacramento River to help meet their municipal and industrial demands in the future. Davis and Woodland formed the Woodland-Davis Clean Water Agency which has obtained post 1914 water rights for the Sacramento River through the SWRCB. This water right is subject to Term 91 curtailments during the summer months, so they have also made an agreement with Conaway Ranch to purchase water rights without Term 91 curtailments that will provide a water supply during the summer months (Bartkiewicz, 2011).

3.2.4 Groundwater Quality

Groundwater is used throughout the Region for drinking water and irrigation supplies. Impairment of groundwater can be assessed by comparing concentrations of constituents of concern in the groundwater against drinking water maximum contaminant levels (MCLs) and

agricultural water quality parameters needed for specific crops. MCLs consist of primary and secondary MCLs. Primary MCLs are assigned to constituents for which a health-based risk is associated with consumption of water that exceeds a particular concentration. Secondary MCLs are assigned to constituents for which there is no health risk, but for which there may be aesthetic concerns above a particular concentration. Irrigation Water Quality Targets are research based standards that provide a recommended maximum constituent concentration in irrigation water based on quantities that will cause undesirable accumulations in plant tissue and growth reductions. Tolerance for water quality constituents vary by crop type, but general irrigation water quality standards have been developed based on literature review which were summarized in a paper put out by the Food and Agriculture Organization of the United Nations (Ayers, 1985). Table 3-9 identifies groundwater constituents of concern that have been identified in the various groundwater basins throughout the Region and their respective water quality targets.

Table 3-9: Groundwater Quality Constituents of Concern

Constituent (units)	Drinking Water Quality Limit	Irrigation Water Quality Target[(b)]
Arsenic (ppb)	10	100
Boron (ppb)	N/A	700
Chromium, Total (ppb)	50	N/A
Hexavalent Chromium (ppb)	N/A[(a)]	N/A
Iron (ppb)	300	5,000
Manganese (ppb)	50	200
Nitrate (ppm as NO_3)	45	N/A
Total Dissolved Solids (ppm)	500	450

(a) Hexavalent chromium has a Public Health Goal of 0.02 ppb. An MCL likely will be passed within the next few years.
(b) Ayers, 1985.

Arsenic is a naturally occurring element in groundwater. Ingestion of arsenic can result in short-term discomfort and long-term health effects such as skin discoloration, circulatory system impacts and increased cancer risks, and in high concentrations, arsenic consumption can lead to death. The California Department of Public Health (CDPH) has established a primary MCL of 10 ppb for arsenic. Arsenic can also be toxic to plants, but the toxicity varies depending on plant species. The 100 ppb irrigation water quality target is a research based recommendation published by the Food and Agriculture Organization that outlines recommendations for maximum levels of constituents in irrigation water such that the health of the plant is not. Data for the Region suggests that the concentration of arsenic in groundwater is generally below the primary MCL of 10 ppb; however arsenic levels approaching the MCL are found in Colusa and Yolo Subbasins. In the Yolo Subbasin, concentrations of arsenic appear to increase with depth (Yolo County Flood Control & Water Conservation District, 2006). CDPH is considering lowering the arsenic MCL further in the future, which could require treatment for many municipal wells throughout the Region including those drawing from the Solano groundwater subbasin (Solano County Water Agency, 2010).

Boron is a naturally occurring element found in high abundance in many of the soils within the Region, particularly in the Upper Cache Creek Planning Area. Boron has no adverse health effects for humans or aesthetic concerns in drinking water. Plants have varying levels of tolerance to boron; boron is an essential to plant growth in low concentrations, but at high concentrations can be toxic. The agricultural water quality target of 700 ppb is based on research by the Food and Agricultural Organization of the United Nations that indicate that this concentration can be tolerated by even the most sensitive crops. Elevated boron concentrations

in groundwater in the Upper Cache Creek Planning Area is attributed to natural dissolution of boron into the groundwater and geothermal upwelling. Elevated boron concentrations in groundwater in the Valley Floor Planning Area is most likely the result of boron in surface water from the Upper Cache Creek Planning Area recharging the groundwater basins along Cache Creek. Elevated boron concentrations are also present in the southern and southeastern parts of the Solano groundwater subbasin (Solano County Water Agency, 2010).

Chromium in groundwater can be the result of natural processes or industrial contamination. Chromium exists in different forms, and hexavalent chromium is the primary health concern. Hexavalent chromium is an emerging contaminant of concern. While this form of chromium was thought to be mainly a product of industrial processes, recent studies have shown that it can be produced naturally by the chemical alteration of trivalent chromium, and its occurrence in groundwater is not as rare as previously thought. To protect public health, the CDPH has established a primary MCL for total chromium of 50 ppb. Recently, the California Department of Public Health established a Public Health Goal (PHG) of 0.02 ppb for hexavalent chromium; this PHG is not a regulatory requirement but is a step towards the development of a MCL. The presence of hexavalent chromium in the Region is likely the result of natural transformation of trivalent chromium found in the serpentine rock formations. Chromium has been detected at varying concentrations in the Yolo Subbasin (Yolo County Flood Control & Water Conservation District, 2006) and has also been identified as a concern in the Coyote Basin (CDM 2006a). In the Yolo Subbasin, measurements show that total chromium and hexavalent chromium levels decrease with depth in the aquifer (Yolo County Flood Control & Water Conservation District, 2006).

Manganese and iron are groundwater constituents that are mainly a concern from a drinking water aesthetic standpoint; the presence of both of these constituents can cause taste and odor problems. CDPH has established secondary MCLs for manganese and iron of 50 ppb and 300 ppb, respectively. Research also suggests limiting the concentrations in irrigation water to 200 ppb and 5,000 ppb, respectively. Concentrations of manganese above the secondary MCL have been found in the eastern part of the Solano Subbasin (Solano County Water Agency 2010), Yolo Subbasin (Yolo County Flood Control & Water Conservation District, 2006), and Upper Lake, Scotts Valley, Coyote and Collayomi Valley Basins (CDM 2006a). Concentrations of iron above the secondary MCL have been detected in the same subbasin and basins as manganese as well as the Capay Valley Subbasin (Yolo County Flood Control & Water Conservation District, 2006 and CDM, 2006a). Both iron and manganese concentrations are shown to increase with depth in the Yolo Subbasin (Yolo County Flood Control & Water Conservation District, 2006).

Nitrate can be naturally occurring through the decay of organic matter but is generally introduced to groundwater through leaching of nitrogen fertilizers, animal manure and septic systems. Nitrate is a health hazard for infants; the conversion of nitrate to nitrite can lead to reduced oxygen carrying capacity of blood. The CDPH primary MCL for nitrate is 45 ppm. Nitrate in irrigation water helps to stimulate plant growth; an irrigation water quality target for nitrate has not been established. Although nitrate concentrations remain below the primary MCL in most areas, the concentration has been increasing and approaching the MCL throughout the Region. Eight (8) public water supply wells in the Solano Subbasin have had confirmed nitrate detections over the MCL (Solano County Water Agency, 2010). Two City of Davis wells were destroyed in 2002 due to high levels of TDS, nitrate and selenium (Water Resources Association of Yolo County, 2007).

Total dissolved solids (TDS) refer to the total dissolved mineral content in water. TDS concentrations in the groundwater are influenced by the chemistry of the aquifer and quality of water recharging the aquifer. TDS is not a health hazard but can be an aesthetic issue and can shorten the useful life of pipes and water-based appliances in homes and businesses. The CDPH secondary MCL for TDS is 500 ppm. For irrigation, high TDS waters often have high sodium concentrations that cause low soil permeability and lead to increased irrigation `requirements and/or reduced yields. The California EPA recommends a TDS target of 450 ppm for no effects on the most sensitive crops. TDS concentrations in groundwater appear to be increasing in the Region, and some areas are experiencing TDS concentrations in excess of 500 ppm. This trend is likely a result of increasing development and associated wastewater discharges and more intensive agriculture (Water Resources Association of Yolo County 2007).

3.2.5 Wastewater and Recycled Water Quality

3.2.5.1 Upper Cache Creek and Upper Putah Creek

There are a total of seven wastewater treatment plants in the upper watersheds: the Upper Cache Planning Area is served by five wastewater treatment plants as well as onsite individual septic systems and the Upper Putah Creek is served by two wastewater treatment plants as well as onsite individual septic systems. Wastewater discharges within both planning areas consist of land application and geothermal injection. For wastewater treatment plants that rely on land disposal, wet weather can increase soil saturation and decrease percolation rates, thereby leading to unintentional wastewater discharges. Injection of wastewater into the Geysers geothermal steam field is assisting in addressing wastewater storage capacity problems in Lake County while increasing geothermal power generation capability and reliability at the Geysers (Forsgren Associates, 2012). For the location of each wastewater treatment plant see Figure 3-3.

Community wastewater systems serve an important function in protecting Clear Lake from degradation. However, unauthorized wastewater releases due to inadequate infrastructure has the potential to impact Clear Lake in negative ways. Overflows from the sanitary sewer during the 2007-2011 period were estimated at 87,536 gallons (Forsgren Associates, 2012). It should be noted that not all of these overflows reached the lake. In 1994, it was estimated that less than 3% of the total phosphorus in Clear Lake came from community wastewater systems and overflows have since been reduced, therefore impacts to the Lake due to increased phosphorus content from wastewater overflows are minimal (University of California-Davis, 1994).

Septic system contamination of Clear Lake is also possible through leachfield overflow or percolation through groundwater of nutrients or disease-causing pathogens and coliform bacteria. There were 12,300 septic systems in Clear Lake watershed-mainly around Lower and Oak arms of Clear Lake as noted in the Clear Lake Integrated Watershed Management Plan as of 2006.

3.2.5.2 Valley Floor

Wastewater discharges from the nine wastewater treatment plants in the Valley Floor PA provide multiple reuse and water recycling opportunities. Some of the wastewater is discharged to managed wetlands to provide habitat and aquifer recharge benefits (City of Davis), while other wastewater effluent is discharged into local creeks for later seasonal reuse to help meet agricultural water demands (City of Vacaville Easterly WWTP).

The Davis WWTP and Woodland WWTP are challenged by current discharge limitations for selenium and future restrictions on discharge of boron and salinity. The source of the selenium, boron, and salinity is the groundwater delivered for municipal potable supply. The selenium concentrations at times exceed the wastewater treatment plants effluent limitations, and based on current discharge concentrations, the boron and salinity, measured as electrical conductivity, will likely exceed future effluent limitations. While the wastewater discharger is ultimately responsible for complying with the regulations, measures taken to ensure discharge requirements are met may consider processes outside the wastewater treatment facility. In the case of the Davis WWTP and Woodland WWTP, changes in the water supply source are being investigated in order to help meet impending waste discharge requirements. The Dixon WTP is addressing problems with salinity discharges.

3.3 Flood Management

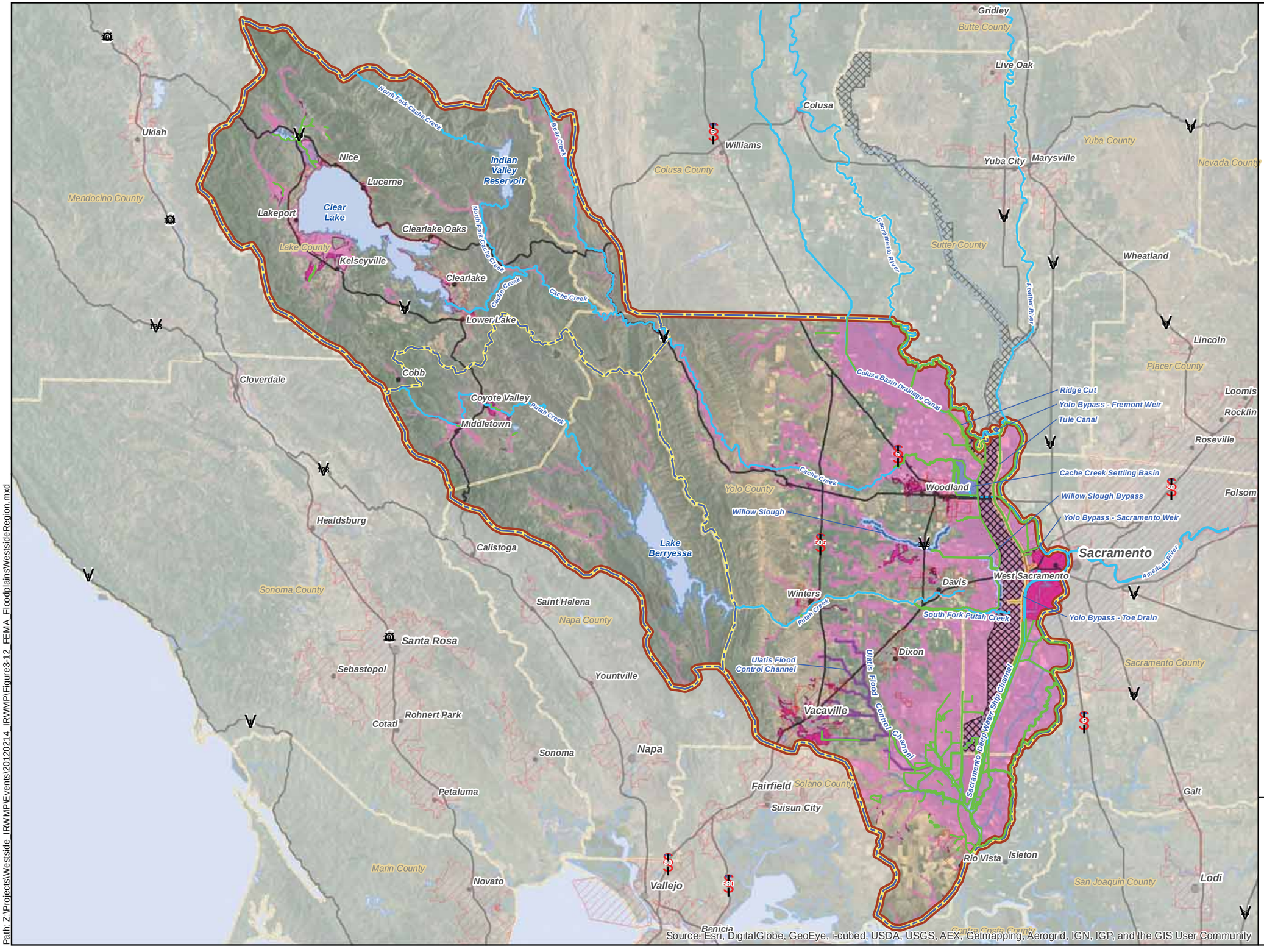
Flood management represents another important aspect of water quantity, and can also affect water quality and environmental resources. A combination of hydrology, basin topography, land use, and natural and human caused geomorphic processes contribute to the flooding that occurs in the Westside Region. The Region contains several areas designated to be within the 100-year and 500-year floodplains as defined by the Federal Emergency Management Agency (FEMA) as shown in Figure 3-12. Lands within these flood-prone zones are private or publically owned, contain mixed land use activities with differing land values. Reducing flood risk in these areas is a significant challenge in the Region. The two main areas of the Westside Region at risk for flooding are in and around Clear Lake in the Upper Cache Creek Planning Area and in the low lying areas along the Sacramento River in the Valley Floor Planning Area, both of which are discussed in greater detail below. Some flooding also occurs in the Upper Putah Creek Planning area as discussed below.

Flood management facilities have been constructed over the years and many studies have and continue to occur to address these areas by federal, state, and local agencies such as the US Army Corps of Engineers (USACOE), California Department of Water Resources (DWR), Lake County Watershed Protection District, County of Lake, Yolo County, Yolo County Flood Control and Water Conservation District (YCFCWCD), Solano County Water Agency, City of Lakeport, City of Clearlake, City of Woodland, and City of Vacaville. Most of the State and federal facilities in the Region are within the State Plan of Flood Control (SPFC) which encompasses areas within the Central Valley of California that are protected by State-federal facilities. Levees shown in Figure 3-12 and Figure 3-14 through Figure 3-16 are those that are accredited by FEMA or have been identified as providing some level of protection by local agency staff.

The Central Valley Flood Protection Board adopted the Central Valley Flood Protection Plan (CVFPP) (developed by DWR through a collaborative stakeholder process) in 2012. Areas subject to flooding within the Sacramento-San Joaquin Valley are now working with DWR to develop additional details for implementation to meet the objectives contained within the CVFPP. Portions of the Valley Floor PA are involved in regional flood management planning.

3.3.1 Flood Management Infrastructure

Flood management infrastructure helps provide valuable flood protection to residents and farmland throughout the Region. The infrastructure has been constructed by multiple private, local, state, and federal agencies responsible for flood management. Major flood protection infrastructure, including levees, bypasses, weirs and flood management systems are shown in Figure 3-13.



Legend

- Cities
- City Boundaries
- County Boundaries
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies
- Levees
- Ulatis Flood Control Channel
- Cache Creek Settling Basin
- Bypass

FEMA Flood Hazard Zones

- 500-Year
- 100-Year

Source:
FEMA DFIRM Database Effective Flood Hazard Zones (Colusa 5/2005; Lake 9/2005; Napa 9/2010; Solano 8/2012; Yolo 5/2012); Bypasses, SACOG.

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FEMA Floodplains Westside Region

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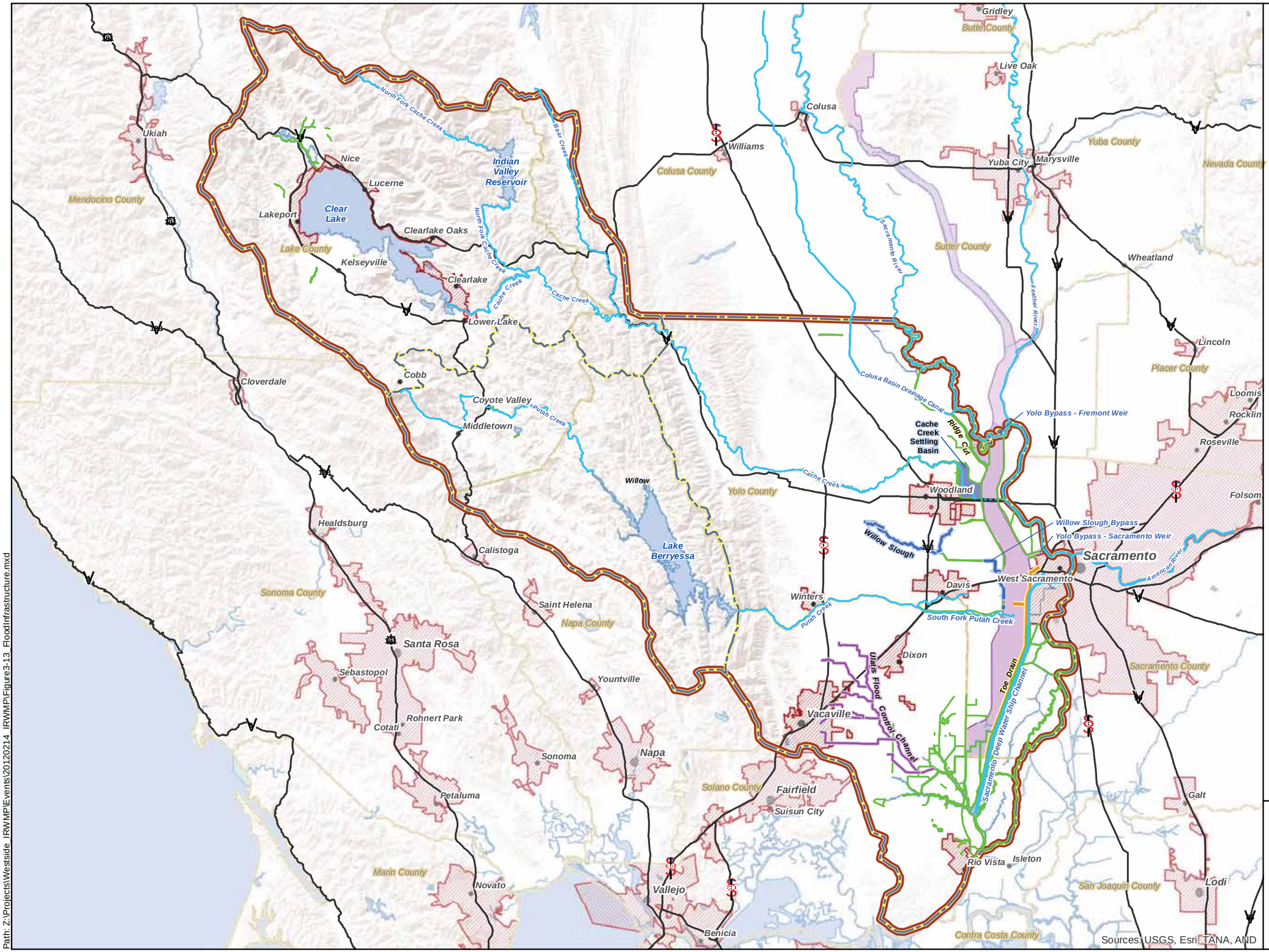
May, 2013

Figure 3-12



Legend

- Cities
- City Boundaries
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- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies
- Ulatis Flood Control Channel
- Toe Drain
- Ridge Cut
- Willow Slough Bypass
- Levees
- Bypass
- Cache Creek Settling Basin

Source:
Bypasses, SACOG; Major Waterways, Yolo County; Putah South Canal, North Bay Aqueduct, & Ulatis Flood Conytrol Channel, SCWA.

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Flood Management Infrastructure

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May, 2013

Figure 3-13

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Some of the major runoff and flood control structures in the Westside Region are summarized below with the respective planning area where they are located:

- Middle Creek Flood Control Project – Upper Cache Creek
- Indian Valley Reservoir – Upper Cache Creek
- Monticello Dam (Lake Berryessa) – Upper Putah Creek
- Hidden Valley Lake Subdivision Levee – Upper Putah Creek
- Cache Creek Settling Basin – Valley Floor
- Knight's Landing Ridge Cut – Valley Floor
- Colusa Basin Drain – Valley Floor
- Yolo Bypass – Valley Floor
- Ulatis Flood Control Project – Valley Floor

This infrastructure is discussed within the context of the flood risk associated with each planning area in the sections that follow.

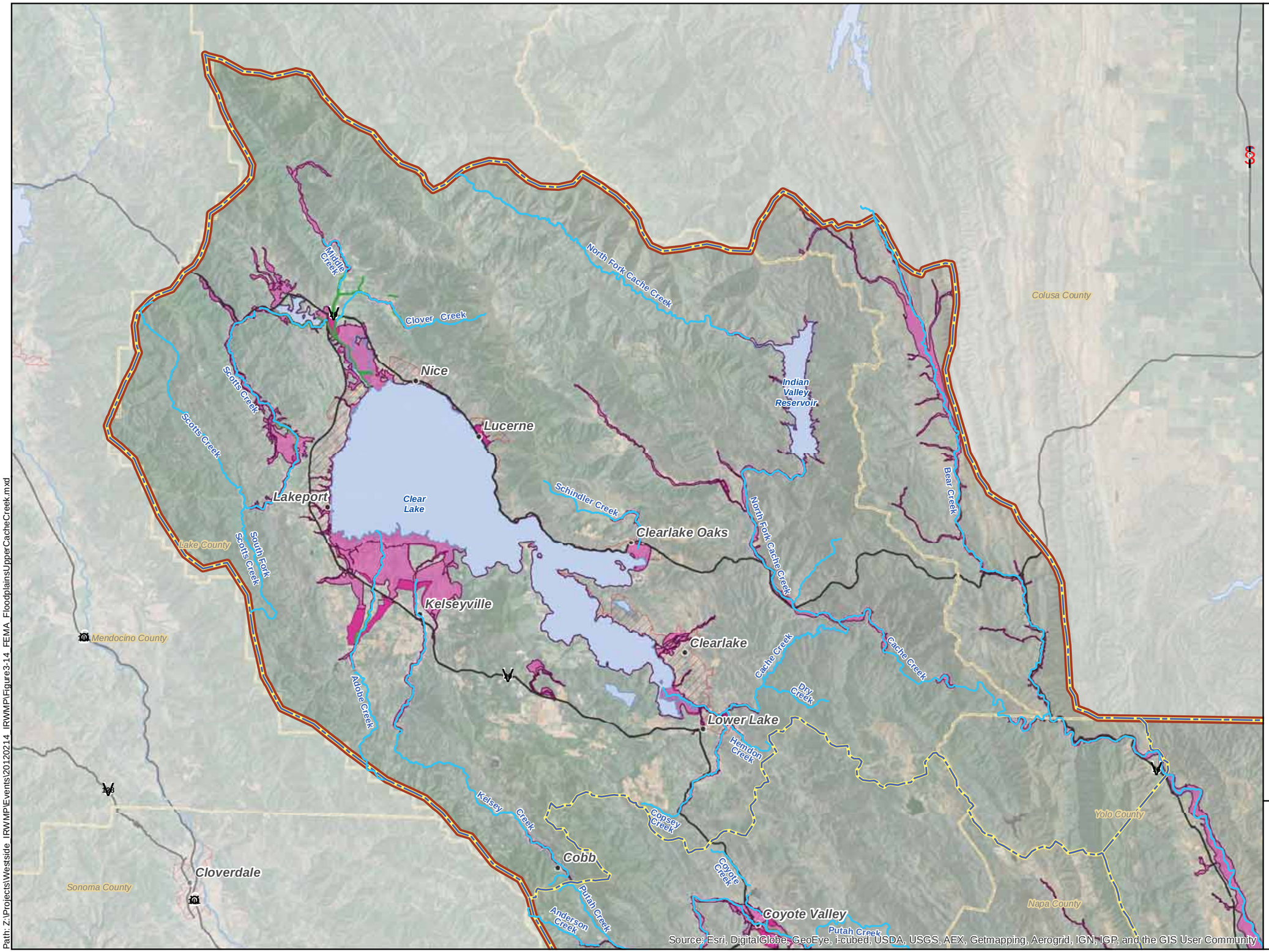
3.3.2 Upper Cache Creek

A more detailed figure showing the 100-year and 500-year flood plains in the Upper Cache Creek planning area can be found in Figure 3-14. GIS data from FEMA were used to estimate that there is approximately 22,350 acres within FEMA designated 100-year floodplains in the Upper Cache Creek portion of Lake County, the majority of which occur along the shores of Clear Lake or along the tributaries that drain to Clear Lake. These areas have a long history of flood events and repeated flood damage as described below. The Middle Creek Flood Control Project in Upper Lake is a part of the SPFC and has been evaluated as part of the Central Valley Flood Protection Plan described in Section 3.3.4. Cow Mountain, located on the western boundary of the Upper Cache Creek watershed, has an average annual precipitation in Upper Cache Creek of about 28 inches/year.

3.3.2.1 People and Property at Risk

Historically, more than fifteen damaging floods have occurred in the Upper Cache Creek watershed since 1938 with damage to agriculture, commercial, industrial, and residential areas (FEMA, 2011). Seven of these events have occurred since 1993. The Upper Cache Creek watershed is characterized by steep terrain surrounding valleys and lakes, where a majority of the flooding occurs. Flooding in the Upper Cache Creek watershed can occur within hours of the onset of heavy rains and is of short duration. Flooding on the shores of Clear Lake occurs relatively slowly as the lake level rises and can last for weeks, or even months at a time and can affect up to 2,500 structures. Due to the frequency of flooding and limited flood management infrastructure, flood damage has a significant impact on the local economy around Clear Lake. There are over 100 homes in the Upper Cache Creek watershed that suffer repetitive loss (i.e., 2 or more National Flood Insurance Program (NFIP) claims within 10-yr period). Damage can occur not only to homes and business structures but also to recreational areas, piers, and boats. Damage can also be extensive to public infrastructure, including roads and utilities.

Flooding can also impact water quality by causing erosion/sedimentation from stream downcutting and loss of floodplain filtration and overloading wastewater pump stations/treatment plants as well as septic systems that can cause bacterial contamination.



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Legend

- Cities
- City Boundaries
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- Planning Areas
- Westside Region
- Streams
- Water Bodies
- Levees

FEMA Flood Hazard Zones

- 500-Year
- 100-Year

Source:
FEMA DFIRM Database Effective Flood Hazard Zones (Colusa 5/2005; Lake 9/2005; Napa 9/2010; Solano 8/2012; Yolo 5/2012); Bypasses, SACOG.

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FEMA Floodplains
Upper Cache Creek

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May, 2013

Figure 3-14

Flooding also has occurred historically at the north end of Clear Lake at the confluence of Middle Creek and Scott Creek which was reclaimed by construction of levees and pumping stations between 1900 and 1933 as part of the Upper Lake Reclamation Area, described in greater detail in the following section. Historically, floods damaged the 18 homes in the Upper Lake Reclamation Area as well as damaged or killed up 1,650 + acres of permanent agricultural crops such as grapes, pears, and walnuts, kept land out of production and damaged livestock as well as farm and ranch improvements. Levee failure could result in flooding in the northern portion of Clear Lake with associated damage to roadways along important transportation routes such as State Highway 20 and the Nice-Lucerne cutoff. Some PG&E electrical transmission lines are at risk of damage as well.

3.3.2.2 Description of Flood Hydrology and Facilities in Upper Cache Creek – Lake County

Flooding in the Upper Cache Creek planning area can occur in the summer and early fall from localized cloudburst storms or in the fall, winter, and spring from severe rain events within a longer duration storm. The watershed consists of relatively steep terrain that does not provide much attenuation of rainfall runoff and can quickly convey flood waters to the flatter areas around the lake.

3.3.2.2.1 Stream Flooding

Because of the mountainous terrain and relatively small watersheds, stream flooding occurs quickly and, in most cases, is of short duration; however, velocity of floodwaters is frequently high. A natural stream channel usually has a floodplain, which gets inundated every other year, on average. Humans have altered streams by dredging, straightening, widening and building levees to increase use of the floodplain. Dependent on the extent of these alterations, some streams still flood near their natural frequency and others have been enlarged to the extent they convey flood events greater than the one percent annual chance flood (100-year flood) without flooding. This has reduced the frequency and depth of flooding, allowing development in the historic floodplain. However, floods can still occur, causing damage to buildings, infrastructure and other improvements in the floodplain. The extent of damage depends on the amount and type of development in the modified floodplain and the magnitude of the flood when it occurs.

In many areas of the Upper Cache Creek, there has been limited infrastructure constructed to reduce flooding from streams in the watershed. However, some reservoirs such as Adobe Creek, Highland Creek and Indian Valley have been constructed with water supply and flood storage to significantly reduced downstream flooding. These reservoirs are highly regulated by the State and Federal governments due to the potentially disastrous flooding that would result from their failure. These structures are well constructed and maintained, therefore, their risk of failure is not thought to be high.

Levees were constructed to protect agricultural lands and properties in many areas of the watershed. Most of these agricultural levees only provide protection from the 5 to 20 percent annual chance flood event (20-year to 5-year flood). While these levees help reduce flooding of agricultural lands, many rural homes have been constructed in the areas that receive some protection by the levees. Most of the areas behind these levees that receive some protection are mapped within FEMA designated floodplains, so the newer homes have been constructed with flood resistant materials. When these levees fail, the flooding can be rapid and deep. Because most of these levees are not maintained by a public agency, their upkeep and repair is problematic. They generally are not eligible for public disaster relief funding (FEMA) and

responsibility for repair may lie with the property owner of the land where the levee failure occurred.

The Middle Creek Flood Control Project levees were constructed by the US Army Corps of Engineers (USACOE) in 1959 to reduce flooding in Upper Lake. These levees are a part of the State Plan of Flood Control (SPFC) and have been evaluated as part of the Central Valley Flood Protection Plan described in Section 3.3.4. These levees were designed to provide protection to Upper Lake from the 0.5 percent annual chance flood (200-year flood). When the Flood Insurance Study and Flood Insurance Rate Maps (FIRMs) were prepared by FEMA in the mid-1970's, these levees upstream of the confluence of Middle and Scotts Creeks (north) were accredited with providing protection to at least the one percent annual chance flood (100-year flood). Currently, observed levee seeps occur which indicates the levees probably do not provide the 100-year level of protection in the vicinity of Upper Lake. Upgrades will be necessary to provide the expected level of protection. The southern portion of the levee protects an area reclaimed from Clear Lake between 1900 and 1933. The levees were constructed on a substandard foundation and the USACOE estimates that the levees have a 28.6 percent chance of failure (less than a 4-year level of protection). A project to remove the levees and restore the protected land to shoreline lake habitat has been pursued since 1995; a portion of the funding for these improvements has been raised.

Flooding also occurs along other tributaries to Clear Lake such as Laurel Dell Lake and Scotts Creek northeast of the lake, Copsey Creek near the southern end of the lake, and Kelsey Creek west of the lake (Lake County, 2009). Flood mechanisms in these tributaries are slightly different in that in some areas, lack of adequate drainage redirects flood waters down residential/commercial streets or results in ponding behind levees that cannot drain by gravity. In some areas, the relatively abrupt change in grade from the surrounding hillsides to the alluvial fans results in channels overtopping such as occurs in Cole Creek to south of Kelseyville. In other areas, such as upstream of Scotts Valley, extensive gravel mining has resulted in a destabilized creek channel with extensive downcutting which is exacerbated during flood events and threatens the road bed adjacent to the creek.

3.3.2.2.2 Lake Flooding

The lands surrounding Clear Lake have a long history of flooding. Lake level records from 1873 to the present show that a 7.56-foot Rumsey stage[1], which represents a full lake, has been exceeded 68 times and a 9-foot Rumsey stage has been exceeded 29 times. Elevations above 9 feet Rumsey generally result in significant flooding, and is considered flood stage. Some of the most damaging floods of recent times around Clear Lake have occurred in 1937-38, 1940, 1956, 1958, 1964-65, 1970, 1974, 1983, 1986, 1995 and 1998. The 1998 flood was the highest lake level recorded since the construction of the Cache Creek Dam in 1914. A recent event in 2011 was the first recorded lake level above flood stage since 1998. The maximum known stage on Clear Lake, 13.66 feet, occurred in January 1890, prior to the construction of the dam and enlargement of the Cache Creek outlet channel.

Due to its size, Clear Lake water levels respond slowly to storm events and rise to flood stage only after prolonged storms. When this happens, Clear Lake's natural outlet, Cache Creek, is too small to allow floodwater to leave the lake as fast as it enters. Contrary to popular belief

[1] Rumsey is an assumed datum from which the level of Clear Lake has been measured since 1914. The gage datum is 1318.26 feet National Geodetic Vertical Datum 1929 (NGVD), and lake stages are converted to elevations above NGVD by adding this value.

among residents near Clear Lake, the Cache Creek Dam, built in 1914, does not contribute to flooding around Clear Lake. The dam can release water much faster than Cache Creek can convey. The narrow, shallow Cache Creek channel restricts the release of water from Clear Lake during times of high lake levels. Cache Creek Dam is designed to release water at 21,000 cubic feet per second (cfs). However, Cache Creek can convey less than 4,700 cfs when Clear Lake levels are at 11 feet Rumsey (2 feet above flood stage).

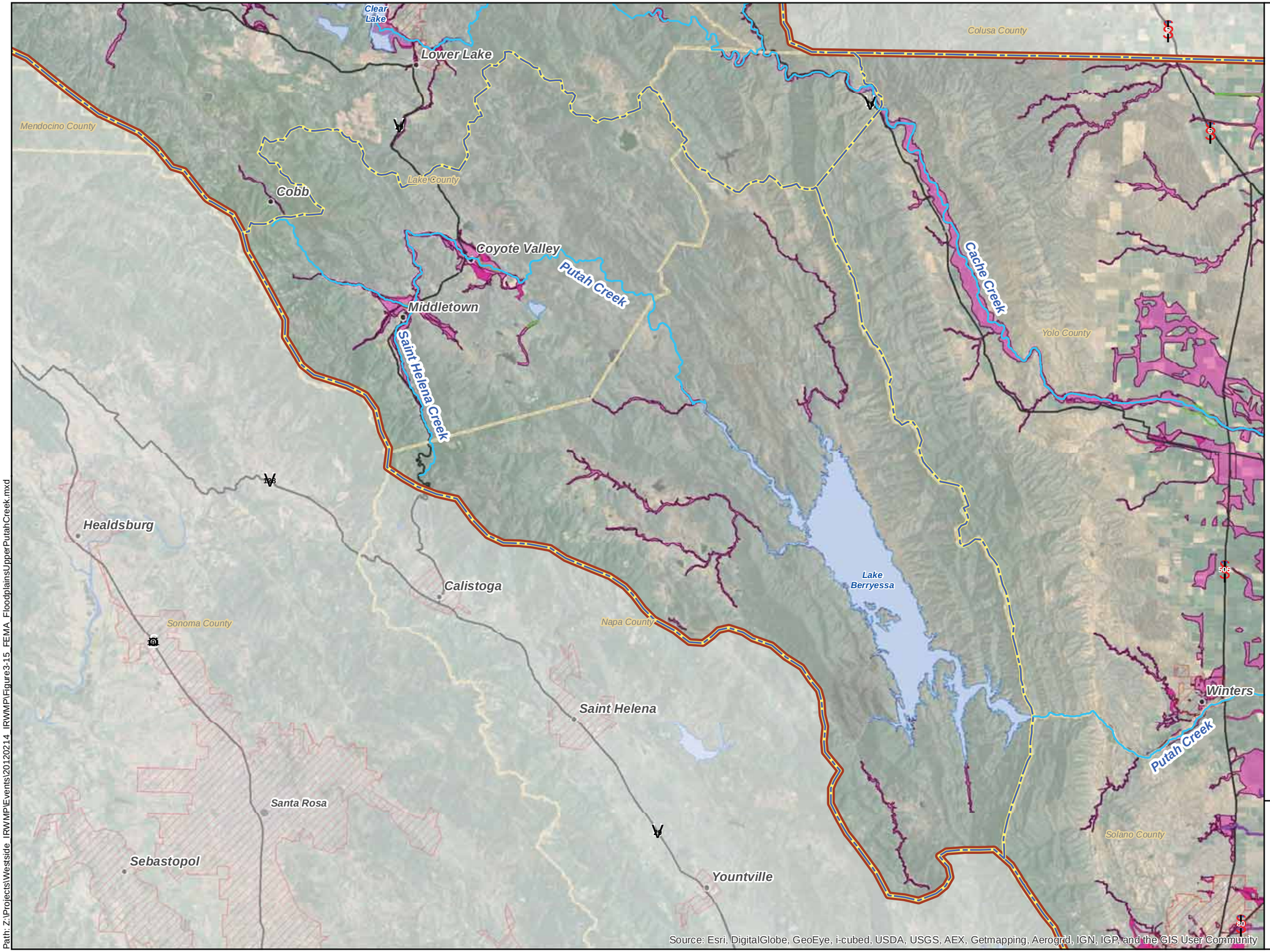
The maximum peak inflow to Clear Lake is estimated by the USACOE to be about 81,000 cfs for a 500-year return interval event. Lake County staff calculated a peak 6-hour average inflow in excess of 50,000 cfs during the January 1995 storms. The limited conveyance capacity in Cache Creek causes Clear Lake to rise rapidly during heavy, prolonged rainstorms and does not lower lake levels very quickly after the rains have stopped. Wind effects may increase the depth and extent of shoreline flooding, but the most relevant factor to flooding around Clear Lake is the limited outlet capacity, which results in and high lake stages that diminish slowly.

Orders of the Superior Court of the State of California perpetually forbid either increasing the outlet capacity of Clear Lake (Bemmerly Decree, 1940) or raising the lake level above 7.56 feet on the Rumsey Gage (at which elevation the lower limit of shoreline flooding occurs with unfavorable windset conditions), except during storms and floods, for longer than 10 days, and in no event over 9 feet on the gage (Gopcevic Decree, 1920). It is not physically possible to operate within these limits because outflow is impaired by the Grigsby Riffle, a natural restriction for the outlet channel upstream from the dam. In essence, one effect of the court orders that prevent increasing the outlet capacity of Clear Lake and restrict lake levels is to prolong flood stages surrounding Clear Lake and prevent their rapid reduction. Flood conditions along the lakeshore may continue for as long as 90 days.

Flooding of the lands surrounding Clear Lake is affected by both natural conveyance restrictions downstream of Clear Lake and legal limits placed on potential modifications to the Cache Creek channel as a result of the Gopcevic and Bemmerly Decrees discussed in Section 2. Pre-releases of water to create storage in Clear Lake in anticipation of storms are not always possible pursuant to the Decrees and with the limited channel capacity would provide minimal benefit. In combination with the high desirability of private ownership of lands along the lake shoreline, these restrictions have made reducing flood damages around Clear Lake challenging. Extensive studies by the USACOE through the latter part of the 20th century have indicated the most cost effective solution to the flooding may be implementation of non-structural flood damage reduction measures such as purchase of lands in flood zones.

3.3.3 Upper Putah Creek

A more detailed figure showing the 100-year and 500-year flood plains in the Upper Putah Creek planning area can be found in Figure 3-15. GIS analysis of FEMA FIRM information indicates that about 3,550 acres are located within the FEMA designated 100-year flood plain in unincorporated Lake County and 2,300 acres in the Napa County portion of this planning area. The Upper Putah Creek planning area is characterized by steep terrain that surrounds flatter valleys and lakes. Flooding occurs in the valleys as water that flows from the steep terrain spreads out quickly. Flooding can occur within hours of the onset of heavy rains and is typically of short duration.



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Legend

- Cities
- City Boundaries
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- Levees

FEMA Flood Hazard Zones

- 500-Year
- 100-Year

Source:
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Kennedy/Jenks Consultants

WESTSIDE SAC IRWM

FEMA Floodplains
Upper Putah Creek

K/J 1170019.00
May, 2013

Figure 3-15

3.3.3.1 People and Property at Risk in Upper Putah Creek – Napa and Lake Counties

As a rural community, development within designated floodplains in the Upper Putah Creek planning area is mostly agricultural except for the portion of Middletown subject to overflow from Putah Creek tributaries and around Hidden Valley Lake, a small water body surrounded by residences and a golf course. The agricultural nature of development within the floodplains in this planning area keeps the flood risk lower than if urban developments occur within the floodplain due to the discrepancy in economic consequences when floods occur. However, as agriculture converts to higher value permanent crops, flood risk increase commensurate to the increase in economic assets placed in harms way. In the Putah Creek basin, the principal flood problems occur in Coyote Valley and Collayomi Valley (the area around Middletown) as can be seen in Figure 3-15. Scour and erosion of creek channels during high flows also can have a negative impact on water quality.

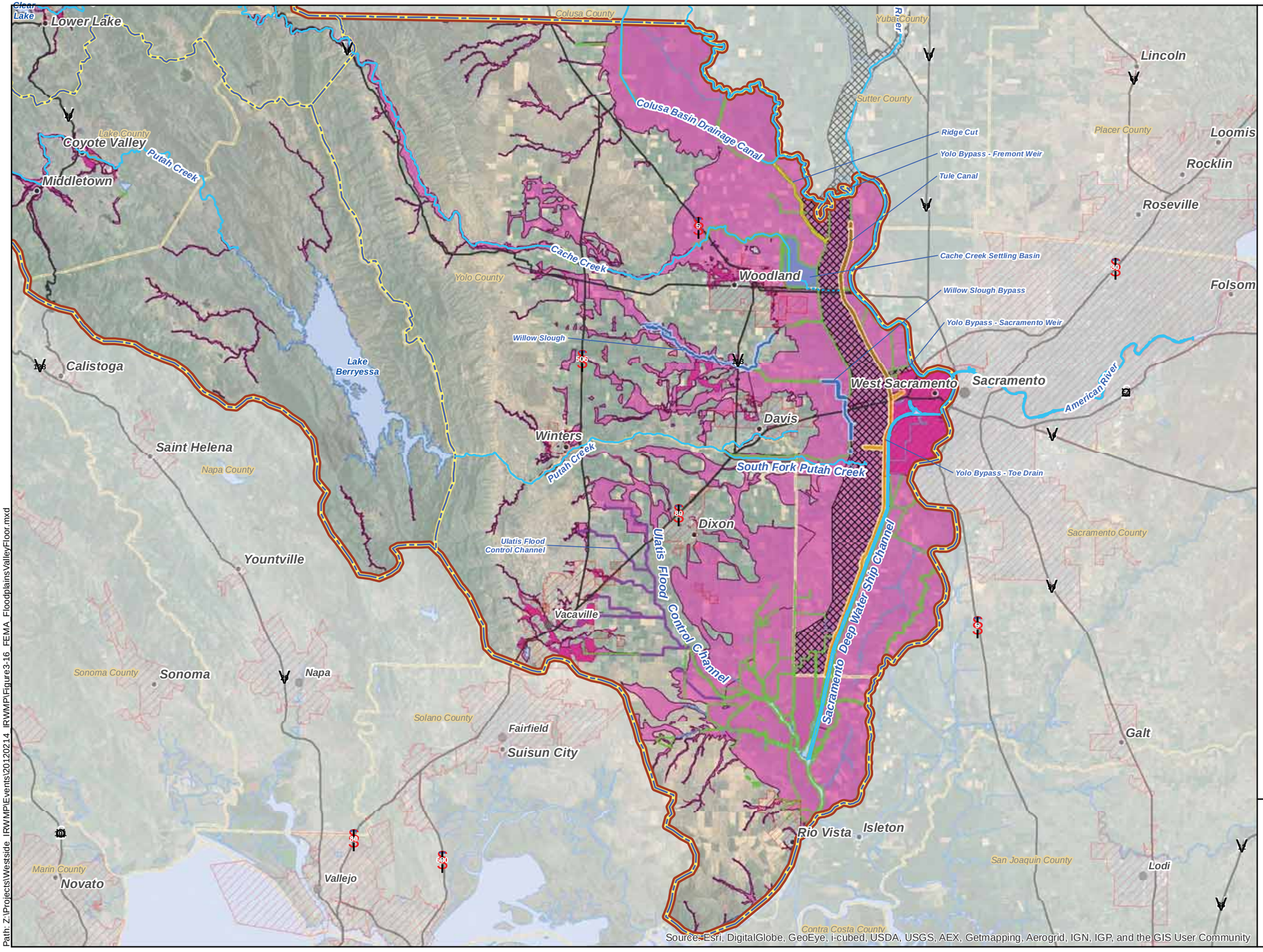
3.3.3.2 Description of Flood Hydrology and Facilities in Upper Putah Creek- Napa and Lake Counties

Precipitation of almost 44 inches (annual mean) occurs at the Napa River watershed divide to 80 inches in the highest areas of the Putah Creek basin which contributes to localized flooding as well as the productivity of the watershed for water storage in Lake Berryessa.

There are limited flood control improvements in the Putah Creek sector of the planning area. The USACE has studied flood problems and potential solutions in the Upper Putah Creek basin (FEMA, 2011). The study was completed in 1976 and concluded that no improvements in this watershed were economically feasible. Selected reaches were restudied to apply FEMA policy to a levee built around a portion of the Hidden Valley Lake subdivision and golf course within the old Coyote Creek floodplain. Coyote Creek diverts around the development before emptying into Putah Creek. An 8-foot-high levee called the Hidden Valley Lake levee, which is not certified by any governmental entity, exists on the left banks of both Coyote Creek and Putah Creek, The hydraulic analysis assumed that the left-bank levee along Putah and Coyote Creeks will fail under a 100-year flood event. There are approximately 260 properties at risk from flooding up to 10 feet deep in this area.

3.3.4 Valley Floor

Flood risk on the Valley Floor has been and is continuing to be extensively studied as part of a range of State and federal programs and actions. The Sacramento River Flood Control Project is comprised of extensive federal flood control facilities including the Yolo Bypass and was completed in 1924 on the south and west side of the Sacramento River. The Cache Creek Settling Basin was initially completed in 1938 with several subsequent improvements as late as 1992, and the Colusa Basin Drain was completed in the 1920s to address agricultural irrigation return flow issues. These facilities were constructed to help protect the City of Sacramento because the Sacramento River is estimated to convey only 18 percent of the flow generated by a 100-year flood event in the Sacramento Valley. These facilities provide limited flood risk reduction benefits to the Westside Region, primarily to the City of West Sacramento. These facilities as well as the FEMA designated 100-year and 500-year floodplains are shown in Figure 3-16. GIS analysis of FEMA FIRM information indicates that about 360,000 acres are located within the FEMA designated 100-year flood plains in Yolo County.



Legend

- Cities
- City Boundaries
- County Boundaries
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies
- Levees
- Ulatis Flood Control Channel
- Cache Creek Settling Basin
- Bypass

FEMA Flood Hazard Zones

- 500-Year
- 100-Year

Source:
FEMA DFIRM Database Effective Flood Hazard Zones (Colusa 5/2005; Lake 9/2005; Napa 9/2010; Solano 8/2012; Yolo 5/2012); Bypasses, SACOG.

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Kennedy/Jenks Consultants

WESTSIDE SAC IRWM

FEMA Floodplains Valley Floor

K/J 1170019.00
May, 2013

Figure 3-16

Path: Z:\Projects\Westside_IRWMP\Events\20120214_IRWMP\Figure3-16_FEMA_FloodplainsValleyFloor.mxd

Currently, many of these facilities and others are being evaluated as part of DWR's FloodSAFE California program which includes the Central Valley Flood Management Planning program which resulted in the preparation of three key documents that are intended to guide improvement of integrated flood management. These documents are: the SPFC Descriptive Document which inventories State and federal facilities; the Flood Control System Status Report (FCSSR) that evaluates SPFC facility integrity; and the Central Valley Flood Protection Plan that describes a system-wide approach to improving flood management for areas currently receiving protection from the SPFC. Regional planning intended to develop implementation details to fulfill the objectives of the CVFPP is underway with Yolo and Solano County interests participating with Sacramento County interests to provide local perspectives and preferences for implementation of the CVFPP. The FCSSR indicates that many urban and non-urban levees within the SPFC in the Valley Floor Planning area pose a high or medium hazard.

A locally focused program is the FloodSAFE Yolo pilot program which included elements of public outreach, flood emergency preparedness, watershed assessment, flood hazard mitigation, and project implementation and maintenance. However, it should be noted that many of the man-made and natural channels in the Valley Floor that are not part of the SPFC have not been evaluated for their capacity to convey flows resulting from large storm events. As these levees may not have been constructed for flood control purposes, they likely cannot convey 100-year storm events and are not constructed to withstand high flow conditions.

One of the many complexities of managing flood risk on the Valley Floor is integrating the extensive efforts already being made to manage flood risk and in coordination with drainage/agricultural conveyance facilities that occurs in both the lower Cache Creek and Lower Putah Creek drainages that occur in the Northern Valley Floor and Southern Valley Floor respectively. Each of these drainages is discussed separately in the narrative that follows.

3.3.4.1 People and Property at Risk in the Northern Portion of the Valley Floor – Yolo County

The northern portion of the Valley Floor is contained within Yolo County. Much of the flooding in this portion of the Valley Floor Planning Area generally occurs in the relatively flat agricultural lands in the eastern two thirds of Yolo County. Most of the runoff that causes flooding originates outside Yolo County either from the Upper Sacramento River watershed or Upper Cache Creek. Major flooding has occurred in Yolo County 13 times since 1937 with recent flooding occurring in Capay Valley from Cache Creek overflow, the low lying areas of the Hungry Hollow watershed (tributary to Cache Creek) and in Woodland.

Rural areas around Woodland have experienced shallow flooding as recently as 1995 and 1998 (return-interval unknown) and portions of Woodland are in the FEMA designated 100-year and 500-year floodplains. Portions of Woodland are estimated to have 10-year level of protection because of deficiencies in the existing Cache Creek levees and previously planned facilities in Upper Cache Creek have not been constructed. Upstream of Woodland, Cache Creek has overflowed its banks on several occasions with flows approaching Woodland along the elevated roadbed of I-5. Federal, state, and local agencies monitor and patch areas of dangerous seepage along levees to try and prevent levee breaks during periods of high flows.

The City of West Sacramento is surrounded by levees on all sides including the Yolo Bypass and the Sacramento River. Facilities at risk include: Union Pacific main railroad line, US-50, I-80, the regional United States Postal Service (USPS)mail processing center, the regional Department of Water Resources flood fight facility, the California Highway Patrol Academy (a

key facility in state emergencies), and the Port of West Sacramento. Work is currently underway to construct setback levees to modern engineering standards to improve flood protection in West Sacramento.

Other areas that experience flooding include Yolo – Zamora near the Colusa Basin Drainage Canal, and Esparto, Madison, and West Plainfield which are periodically flooded from runoff from the Cottonwood-Willow Slough watersheds. DWR's Flood Control System Status Report has identified several locations where State-federal levee instability and lack of freeboard along the Sacramento River and Yolo Bypass exists and may represent additional vulnerability to flooding for areas within the Region.

3.3.4.2 Description of Flood Hydrology and Facilities in Northern Portion of the Valley Floor – Yolo County

Even with the 40,000 acre-foot flood storage pool available in Indian Valley Reservoir, flood water from other tributaries to Cache Creek can cause flooding in the Capay Valley area which has experienced peak flows at Rumsey (upstream end of Capay Valley) as high as 59,000 cfs in 1965 which is close to the estimated 100-year flood flow of 61,810 cfs (with Indian Valley Reservoir). Further downstream on Cache Creek near Yolo (northwest of Woodland) peak flood flows have been measured as high as 41,400 cfs in 1956 whereby the estimated 50-year flood flow is about 57,100 cfs. Cache Creek is indirectly connected to the Sacramento River as it flows through the Cache Creek Settling Basin before overflowing into the Yolo Bypass which flows south and connects to the Sacramento River upstream of Rio Vista.

The Sacramento River forms the boundary of the Lower Cache Creek watershed and Yolo County's entire eastern boundary. Yolo County is 1,034 square miles (3.8 percent) of the 26,960 square mile Sacramento River Hydrologic Region and is located near the most downstream part of the Sacramento River before it flows into San Francisco Bay. Average annual flow on the Sacramento River at Verona (Northeast of Woodland) is about 14 million AF from 1924 – 2002 with a peak runoff of about 28 million AF in 1983. As described earlier, efforts to reduce flooding in the City of Sacramento and City of West Sacramento resulted in construction of the Yolo Bypass and the Cache Creek Settling Basin, each of which are described below.

The Yolo Bypass is a 41-mile-long stretch of agricultural land within Yolo and Solano Counties that is generally bounded by levees 7,000 to 16,000 feet apart. Completed in 1924 as part of the Sacramento River Flood Control Project, the Yolo Bypass is an important component of flood protection for the Sacramento River watershed. It conveys floodwaters diverted from the Sacramento River through Yolo and Solano Counties and reconnects with the Sacramento River a few miles upstream of Rio Vista.

The Cache Creek Settling Basin, which reduces sediments from Cache Creek entering the Yolo Bypass, makes Woodland area drainage difficult while offering limited benefit to Yolo County. The Colusa Basin Drain is a drainage channel that collects and conveys irrigation from a drainage area of nearly 1,620 square miles within Glenn, Colusa and Yolo Counties.

Numerous natural and man-made changes have occurred in the lower portion of Cache Creek including naturally occurring shifts of the stream channel due to eroding banks and large storm events. Man-made changes include embankment maintenance to reduce flood damage, irrigation and gravel mining. Furthermore, in some areas in Yolo County closest to the Sacramento River, tidal influences and lower land surfaces resulting from subsidence of peat

soils behind levees, some of which can be attributed to groundwater pumping, contribute to flood risk.

3.3.4.3 People and Property at Risk in the Southern Portion of the Valley Floor – Yolo and Solano Counties

The southern portion of the Valley Floor Planning Area includes portions of both Yolo and Solano Counties and similar to the northern portion of the Valley Floor, experiences periodic flooding. Flooding in this portion of the Valley Floor occurs especially in the areas of the Delta on the banks of the Sacramento River downstream of the discharge of the Yolo Bypass, occasional flooding in portions of the City of Davis, Dixon, Rio Vista, Winters, and Vacaville and in agricultural areas as described further below. Some flood risk along lower Putah Creek was reduced with the construction of Monticello Dam and the formation of Lake Berryessa which has controlled large upstream flows, although Lake Berryessa is not operated specifically for flood protection.

As agricultural lands represent much of the lands in the Southern Portion of the Valley Floor, major flooding can damage orchards, vineyards, pasturelands, and crop lands; deposit debris on agricultural land; destroy livestock and poultry; and damage farm equipment and agricultural improvements such as fences and irrigation systems. In more urbanized areas, floodwater has entered dwellings and commercial structures and deposited debris on lawns and gardens. Both urban streets and rural roads have been flooded with associated damage to bridges, roadbeds and culverts. Stream channels and flood protection facilities have also eroded. A small population within unincorporated Solano County is reported to experience repetitive flooding based on unknown return interval storms.

The City of Rio Vista is located on the banks of the Sacramento River and has experienced flooding since as early as 1892 when the town was washed away from a location 3 miles upstream from its current site. Local drainage surrounding Rio Vista is by Marina Creek and tributary and Industrial Creek that all flow towards the Sacramento River. Low ground elevations in parts of the City, high tides, combined with large stream outflow and onshore winds contribute to flood impacts. The most recent flood of February 1986 caused serious damage to the City. Rio Vista is particularly at risk under climate change conditions whereby flood stages are likely to be higher; high flood waters will be further exacerbated by higher tides that are expected to occur with climate change.

Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Study for Yolo County California, the City of Davis is expected to experience periodic flooding near the F Street culvert to the pump stations near H Street and Covell Boulevard and in areas south of Covell Boulevard west of the Southern Pacific Railroad near the H Street pump station. The City of Dixon does not have a well-documented flood history but minor flooding has been reported to occur in 1955, 1958 and 1965 but no damage has been reported. The City of Winters experiences flooding from overflow from Dry Creek, runoff from the Moody Slough watershed north and west of the City and runoff from business and residential areas south of Highway 128.

The City of Vacaville is drained by the Ulatis Flood Control Project which was constructed in 1964 by the Natural Resources Conservation Service (NRCS) and has significantly reduced flooding and damage. Flood events in 1967 and 1973 are considered the largest in recent years and resulted in street and lawn flooding, stranded residents, deposition of debris and garbage, and evacuation of several homes/apartments when flood waters covered lower floors. More recent storms have also caused damage to homes in certain flood prone areas of Vacaville as

described in the Solano IRWM Plan, the Ulatis Flood Control project faces increased runoff from urban development; encroachment from residences; increased flow and debris from poorly maintained streams and ditches; increased liability associated with multi-purpose use; and environmental concerns especially for maintenance. The Solano IRWM Plan identified that Flood control infrastructure in rural areas is not adequate and resident's awareness of flood hazards needs to be improved,

3.3.4.4 Description of Flood Hydrology and Facilities in the Southern Portion of the Valley Floor – Yolo and Solano County

As noted earlier, the construction of Monticello Dam in 1957 to form Lake Berryessa with a storage capacity of 1.5 million AF has reduced the risk of overbank flooding along lower Putah Creek even though the Dam is not operated specifically for flood management. Urbanization has increased areas of impervious coverage from roads, parking lots and buildings in Vacaville and other areas along I-80. These additional impervious areas have intensified flood problems by increasing the volume and peak flow of water and reduced the open land available to infiltrate rain and runoff.

The Ulatis Flood Control Project has provided some additional flood protection in the Vacaville area. Originally developed to improve protection of agricultural lands, portions of the Ulatis Flood Control Project within the City of Vacaville have been upgraded to provide 100-year protection Rio Vista, faces further uncertainty as the Central Valley Flood Protection Plan describes potential improvements along the Yolo Bypass that may change conditions upstream of Rio Vista that could affect flood protection for Rio Vista.

3.4 Environmental Resources

The Westside Region's vast ecosystem offers innumerable natural resources and supports a wealth of wildlife and special habitats, including important fisheries and waterfowl areas. Significant changes to the natural ecosystem function began to occur in some areas as the Region developed. Agricultural lands began to displace native habitat, and agricultural and urban land uses resulted in disturbance of habitats including aquatic and other water-dependent habitats. The changes to habitats types affect native species in the area and allow for spread of non-native, invasive species. Conservation efforts by entities throughout the Region help to preserve these existing resources and also aid in restoring important habitats.

3.4.1 Fisheries

Fisheries have been greatly influenced by the construction of dams, flood control facilities and other infrastructure in the Region. Current populations of anadromous fish that attempt to access the creeks of the Region for spawning must access the Region through the Yolo Bypass. The Yolo Bypass provides habitat for a variety of resident and seasonal fish species, including steelhead, spring-run and winter-run Chinook salmon, splittail, and delta smelt. Structures in the bypass such as agricultural impoundments and road crossing present reduce hydrologic connectivity and present significant barriers to fish passage into Cache and Putah Creek. Modifications to the Yolo Bypass to increase the frequency, duration, and magnitude of floodplain inundation have been discussed as part of a conservation plan addressing the Sacramento-San Joaquin River Delta region. These changes in floodplain management would improve passage and habitat conditions for splittail, Chinook salmon, sturgeon, lamprey and possibly steelhead (California Natural Resources Agency).

3.4.1.1 Cache Creek Fisheries

Historically the Cache Creek supported small populations of anadromous fish species including fall-run Chinook salmon, steelhead, Pacific lamprey and river lamprey. Because Cache Creek was historically an intermittent stream, it probably never supported a large run of salmon. At present the barriers to fish passage in the Yolo Bypass combined with the complete barrier imposed by Capay Dam hinder migration and spawning of these species.

Dams have served as impediments to both native and non-native migration. The Capay Dam has helped to keep non-native fish species, which are not intentionally introduced to the system, from spreading to the upstream reaches of Cache Creek. In Clear Lake, some non-native fish species have intentionally been introduced to support sport fishing. Introduction of non-native species has impacted the native species through predation and competition for food. Populations of native species such as the Clear Lake hitch and roach have been reduced through predation by bass and catfish that have been introduced to the system, and the Clear Lake splittail is believed to have become extinct from competition over food (Lake County, 2010). The introduction of non-native game fish has improved recreational opportunities but must be balanced with desires to maintain native populations. Of special concern is the Clear Lake hitch, a fish endemic to Clear Lake; while not federally or state listed, the Clear Lake hitch has been identified by the California Department of Fish and Wildlife as a species of special concern. Although not currently on the federal or state list, two petitions for State and Federal listing as threatened or endangered species were filed in September 2012.

3.4.1.2 Putah Creek Fisheries

Historically, the lower reaches of Putah Creek was surrounded by extensive riparian forest, covering the area from the Coast Ranges to the Yolo Basin. With the arrival of European settlers and the development of agricultural lands, the riparian vegetation began to be removed, and vegetation in the stream channel was also removed for flood control purposes. These changes resulted in warming of the water, and the altered environment favored introduced warm water species over the native species.

Another significant change to the fish communities in Putah Creek came with the completion of the Solano Project in 1959, which segregated the creek into three reaches: the upper watershed reach upstream of Monticello Dam, the interdam reach between Monticello Dam and the Putah Diversion Dam, and the lower Putah Creek downstream of the Putah Diversion Dam. When Monticello Dam was built in 1957, hundreds of miles of suitable habitat for anadromous fish in the upper watershed were disconnected from Sacramento River Basin. At the same time Department of Fish and Wildlife introduced largemouth bass, smallmouth bass and red-eared sunfish to Lake Berryessa. Over the years, cold-water species such as silver salmon, brown trout and rainbow trout and additional warm water species including channel catfish, white crappie and black crappie have been introduced to the lake. The Department of Fish and Wildlife now emphasizes warm water fish and trout populations in Lake Berryessa (Watershed Information Center & Conservancy of Napa County, 2005).

In the interdam reach, cold water releases from Lake Berryessa transformed this warm water reach to a cold water reach, and the availability of year-round flows and the lack of vegetative clearing have created some of the best riparian habitat in the Region. Native fish that still occur in the interdam reach include hitch, California roach, Sacramento pikeminnow, Sacramento sucker, three-spine stickleback, and riffle sculpin. These native fish persist in the interdam reach, despite management of this reach as a trout fishery.

In the lower Putah Creek, flow regulation that resulted from the implementation of Solano Project created a flow regime that reduced winter flood flows and provided some additional water during other times of the year. However during drought periods the required releases did not always provide for a flowing creek and there were instances of dewatering of portions of the creek resulting in fish die-offs. This resulted in litigation that was ultimately settled. In 2000, the Putah Creek Accord was established to create a release schedule that provided more flows to the Creek to benefit fish communities. Native special status species that still occur or have the potential to occur in Putah Creek include Steelhead – Central Valley Evolutionary Significant Unit (ESU), Sacramento splittail, Pacific lamprey, Sacramento-San Joaquin roach, hardhead and Sacramento Perch. The flow regime that was established favors native resident fish and anadromous fish. While flows have improved, the lack of suitable gravel spawning sites remains a challenge, and agricultural impoundments continue to present obstacles. The Los Rios Check Dam, is a seasonal check dam that allows for increased water impoundment for irrigation use and for flooding of the Yolo Basin Wildlife Area. This check dam is the first major obstacle to fish passage along the Putah Creek. Operation of the Los Rios Check Dam is currently being managed in conjunction with releases from the Putah Diversion Dam to improve migration of fall-run Chinook salmon into the lower Putah Creek (EDAW, 2005).

3.4.2 Waterfowl

Clear Lake, Lake Berryessa, the Yolo Bypass and the Colusa Basin support a wide variety of seasonal and resident water fowl. In Clear Lake, some of the impressive birds to observe include American white pelicans, osprey, western and Clark's grebes, and great blue herons; these birds forage for fish, invertebrates, and plants in the lake, nest in emergent vegetation such as tules, and use the lake as a stopover during migration (Lake County, 2010). The Lake Berryessa area provides habitat for numerous bird species, of which the greatest concentration are found along the shoreline of Lake Berryessa and its tributaries. The Yolo Bypass provides migratory and nesting habitat for numerous species of birds. Shorebirds migrating along the Pacific Flyway arrive in July and depart for northern nesting areas in March. Various species of raptors overwinter in the Yolo Bypass, and Neotropical migrant birds have begun to use the Yolo Bypass as a stop between their northern breeding grounds and wintering grounds in tropical America. The Colusa Basin is also a resting stop for millions of migrating waterfowl along the Pacific Flyway (Water Resources Association of Yolo County, 2007).

3.4.3 Important Ecologic Areas and Conservation Efforts

Various habitat and wildlife areas have been established by federal, state and local entities for the protection of the Region's ecologic resources. Among these protected lands are:

- Yolo Bypass Wildlife Area: The Yolo Bypass Wildlife Area is managed by the California Department of Fish and Wildlife (CDFW) to promote an increase in waterfowl and other bird populations in the Region. The area consists of 16,770 acres of wildlife habitat and agricultural land in the Yolo Bypass. The wildlife habitat is a mix of restored seasonal and permanent wetlands, grasslands and riparian forests, and the agricultural land consists of CDFW managed crops such as rice, corn and safflower which are grown for the benefit of the numerous waterfowl and upland bird species that inhabit the area. The Yolo Bypass Wildlife Area also serves as an important environmental education function through programs that are offered to schools and the general public through the Yolo Basin Foundation.

- Cache Creek Natural Area/Cache Creek Wilderness Area: The Cache Creek Natural Area is made up of 74,700 acres of lands managed by the Bureau of Land Management (BLM), State and Count and covers 35 miles of the main fork of Cache Creek and 2.5 miles of the north fork. Within the Cache Creek Natural Area is 27,245 acres of land designated the Cache Creek Wilderness Area. The area is managed for the protection of wildlife habitat and rare plants. Wildlife species found in the area include the bald eagle and tule elk. The tule elk population is one of the last free roaming herds in California. Low impact recreational activities such as hiking, hunting, fishing, wildlife viewing and river rafting are allowed throughout the Cache Creek Natural Area.

- Clear Lake Wildlife Area: At 97 acres, the Clear Lake Wildlife Area, located to the north of Clear Lake adjacent to Rodman Slough, is not an extensive preserve; however it protects one of the most diverse regions of Lake County. The area consists of a mix of oak woodland, tule marsh and riparian habitat, which provide habitat for a variety of aquatic and terrestrial species including herons, red-tailed hawks, osprey, songbirds, waterfowl, deer, gray fox, bobcat and coyote. The area is also an important breeding and nursery area for fish species (www.dfg.ca.gov).

- Mendocino National Forest: The Region encompasses the southern end of the Mendocino National Forest. The entire forest covers 913,306 acres and is notable for being the only national forest in California that is not crossed by a paved road or highway. The U.S. Forest Service (USFS) manages the resources of the Mendocino National Forest in order to maintain healthy watersheds and fire-adapted plant and animal communities.

- Anderson Marsh State Park: This Park is made up of 630 acres of oak woodlands, grass-covered hills and tule marsh. This state historic park is located in the Upper Cache Creek Planning Area in Lake County along the southeast corner of Clear Lake between the cities of Lower Lake and Clearlake.

- McLaughlin Natural Reserve: This reserve is located in Upper Cache and Putah Creek PAs and is made up of 6,940 acres of old McLaughlin gold mine property. The reserve is one of few sites in California that protects unusual serpentine habitats and the rare and endemic plants that they support. The reserve is managed by UC Davis and owned in part by the University of Homestake Mining Company.

- CDFW Knoxville, Cedar Rough, Lake Berryessa, and Putah Creek Wildlife Areas – These wildlife areas are located in Yolo, Lake and Napa Counties within the vicinity of Lake Berryessa. Knoxville Wildlife Area (21,417 acres) is located to the north of Lake Berryessa, Cedar Roughs Wildlife Area (413 acres) is located west of Lake Berryessa, Lake Berryessa Wildlife Area (2,000 acres) is located along the edge of Lake Berryessa along the eastern side of the lake, and Putah Creek Wildlife Area (670 acres) is located south of Lake Berryessa Wildlife Area. These habitat areas are owned by the California Department of Fish and Wildlife and have varying types of habitat including riparian, brush covered canyons, serpentine grasslands and oak woodlands (www.dfg.ca.gov).

An area that stakeholders in the Region are currently working to place into a National Conservation Area is the Berryessa Snow Mountain, which is comprised of 321,000 acres of federal public lands stretching from Lake Berryessa to the Mendocino National Forest. This area is one of the largest areas of public lands in California that has remained relatively undisturbed,

and stakeholders are working to maintain the area in its natural state. Goals for the Berryessa Snow Mountain National Conservation Area are protection of the diversity of the region through the maintenance of its natural processes, core habitats and migratory corridors; better management of recreational opportunities; and sustaining economic opportunities for neighboring communities. Among the core habitats that would be protected in Berryessa Snow Mountain is habitat supporting the second largest population of wintering bald eagles in the state.

Past stakeholder efforts were successful in adding Cache Creek to California's Wild and Scenic Rivers. The Wild and Scenic River designation is granted to rivers that possess extraordinary scenic, recreation, fishery or wildlife values and is designed to maintain free flowing conditions on these rivers and preserve the immediate environment around the rivers. The Wild and Scenic designation for Cache Creek applies to 31 miles of the river starting below Clear Lake dam and continuing to the upper end of the Capay Valley in Yolo County. The listing prohibits new dams and water diversions from being constructed along this portion of Cache Creek and mandates protection of the habitats along Cache Creek. Passage of the Cache Creek Wild and Scenic Rivers bill included provisions that allow for continued efforts to remove non-native vegetation and mercury contaminants along the creek.

Protection of the Region's important environmental resources extends beyond the formation of dedicated conservation areas. Current, large-scale planning efforts that address the interplay between water resource management and environmental resources of the area include the Solano Habitat Conservation Plan (HCP), Yolo Natural Heritage Program HCP/Natural Communities Conservation Plan (NCCP) and the Bay Delta Conservation Plan (BDCP).

3.4.4 Non-Native Species

Non-native species are species that have been introduced both intentionally and unintentionally into the Region. The major problem with some non-native species is they are often very successful at using the new habitat they are placed in. They have few or no natural controls on their populations and they can often out-compete the native species for the same habitat. Non-native species are classified as invasive when they pose challenges to the management of the Region's resources.

Invasive plant species that are common throughout the Region are: Giant reed (Arundo donax), Hoary cress (Cardaria draba), Water hyacinth (Eichhornia crassipes), Perennial pepperweed (Lepidium latifolium), Eurasian water milfoil (Myriophyllum spicatum), Himalayan blackberry (Rubus discolor), Ravenna grass (Saccharum ravennae) and Tamarisk (Tamarix ssp.). An analysis of the risk associated with each of the invasive plant species found in the Region is provided in Appendix C.

Invasive wildlife species, specifically aquatic invertebrates, present a significant challenge for management of the Region's water resources because they are extremely difficult to remove or control. The invasive species of greatest concern currently in the Region are quagga mussels, zebra mussels and New Zealand mud snails. They reproduce by tiny microscopic larvae that are transported with the flow of water to every interconnected water body and water user. There are currently no known treatments or pesticides that can remove these invasive invertebrates from an infested water body. Once the invertebrates secure themselves to a stationary object they can be removed, but the costs are very high and the invertebrates can easily re-colonize the cleared areas. In addition, the adult invasive mussels are very effective filter-feeders and

strip the water bodies of food and particulates, thereby extensively altering the food chain, starving out competing native species, and promoting growth of unwanted nuisance species of cyanobacteria.

The invasive mussel species are not known to inhabit Regional water bodies currently but the threat is extreme from the many boaters that use Regional lakes and can bring in these invasives. There are New Zealand mud snails in Lake Berryessa and they can spread by boat also. The current risks associated with the introduction and spread of these species include severe displacement and elimination of existing fish and wildlife, greatly increased costs of water supplies due to mussel-clogged delivery systems, and severe impacts to the quality of life adjacent to and recreational use of area water bodies.

Regional efforts must be made to prevent and control the plant and invertebrate invasive species. There have been and must continue to be programs for eradication of invasive plants. For the aquatic invertebrates, Lake County has implemented an Invasive Mussel Protection Program which includes a Water Vessel Inspection Ordinance requiring screening of any water vessel prior to launching into Lake County waters. Similarly, the US Bureau of Reclamation has implemented a Quagga and Zebra Mussel Prevention Program that requires self-certification of boats launched in Lake Berryessa. These programs are, however, not 100% effective and more must be done given the gravity of the threats.

3.5 Vulnerability to Climate Change

This section provides a discussion of the projected climate change impacts in the Region as well as a summary of the key vulnerabilities of the Region to climate change. The more detailed Climate Change Vulnerability Checklist is found in Appendix C.

3.5.1 Projected Climate Change Impacts

Changing climate has the potential to have significant impacts in the Westside Region. The U.S. Bureau of Reclamation (Reclamation), State of California (Cal-Adapt.org), and others have continue to study the potential future for climate change and its potential impacts on water and other resources in the western states. Reclamation has completed a Global Climate Model, which includes modeling and hydrologic modeling steps and released the results for several western U.S. rivers including the Sacramento River. Cal-Adapt.org has used four general circulation models (GCM) of climate with 2 emissions scenarios for each model to project 15 parameters for the state of California. Because the Westside Region is a part of the Sacramento River Basin, the projections for future temperature and precipitation developed by Reclamation for the Sacramento River watershed are considered to be representative of the likely changes to the Westside Region while the CalAdapt.org modeling provides wildfire risk, precipitation, evapotranspiration and other parameters.

Both Reclamation and CalAdapt project that temperature for the Sacramento River Basin will increase by 5 to 6 degrees Fahrenheit over the next 90 years as shown in Figure 3-17. The projected increases to temperature will likely result in a higher portion of rain over snow in the winter and earlier melting of the snowpack. While snow is not a significant part of the normal precipitation in the Westside Region, the Region is vulnerable to changes in snowfall patterns in the greater Sacramento River Basin. There is an overall decreasing trend in annual total precipitation and an increasing trend in winter time flows that could increase the flood flows entering the Region from the Sacramento River. Overall decreasing summer time flows resulting from earlier snowmelt could decrease the water available to users that rely on diversions from the Sacramento River and its tributaries. Increased temperature could lead to increased fishery stress, increased invasive species infestations, and increased wildfire risk, which is specifically shown in Figure 3-18. Additionally, increasing temperatures without an increase in precipitation could result in increased applied water requirements for crops, landscaping and instream ecosystems.

3.5.2 Summary of Climate Change Vulnerability Checklist

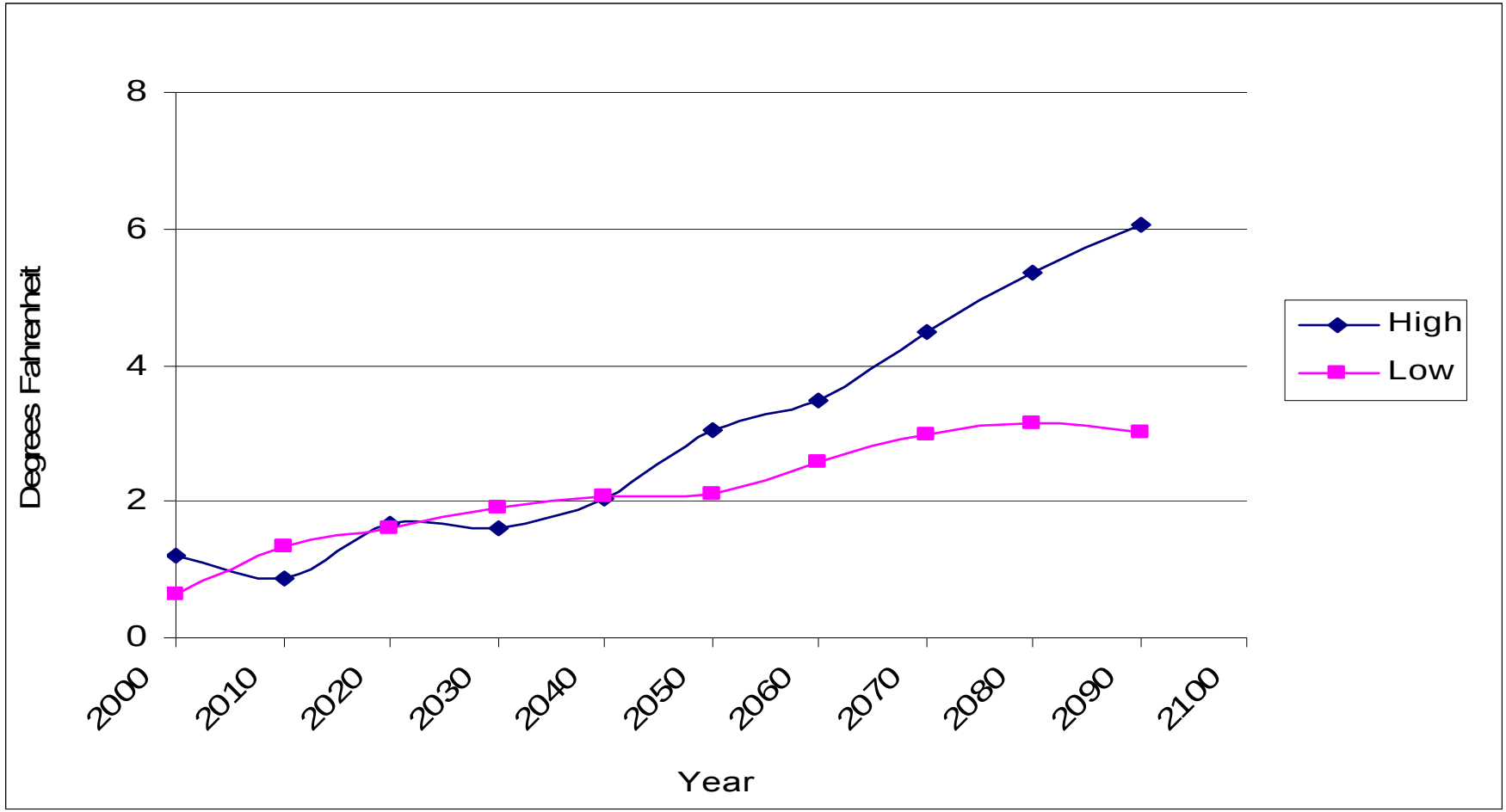
The Climate Change Vulnerability Checklist encompasses 7 major topic areas that include:

- Water Demand
- Water Supply
- Water Quality
- Sea Level Rise
- Flooding
- Ecosystem and Habitat Vulnerability
- Hydropower

Of these areas, flooding, water demand, water supply, water quality, and ecosystem and habitat vulnerability are likely to be of greatest concern to the Region. The completed checklist can be found in Appendix C while a summary of the vulnerabilities in these 5 topic areas follows. The prioritization of these vulnerabilities is found in Section 6: Goals and Objectives.

3.5.2.1 Flooding

Peak flood flows are likely to increase under projected climate change conditions. The Region has urbanized areas in West Sacramento, Rio Vista, Vacaville, and in and around Clear Lake that lie in the 200-year and 100-year floodplains. Some of the critical facilities at risk in West Sacramento include a major interstate highway, main railroad line, California Highway Patrol Academy, the regional DWR Flood Fight Facility as well as a USPS Mail processing center. Other facilities at risk in the region include roads and utilities such as pipelines and overhead electrical facilities as well as large areas of agricultural lands. In addition, in the Yolo and Solano County portions of the Region, if a flood event were coincident with a high-tide event, then for a short duration, the extent of flooding may be more widespread than predicted. A range of Federal agencies including US Army Corps of Engineers, state agencies including DWR and the Central Valley Flood Protection Board, as well as regional/local agencies are all working to improve flood protection and reduce flood risk in the region.



Note: from dapt.org. Based on average of 4 Climate Models for 2 Emission Scenarios (High, Low) using Base Period, 1951-1990

Kennedy/Jenks Consultants

WESTSIDE SAC IRWM
Integrated Regional Water Management Plan

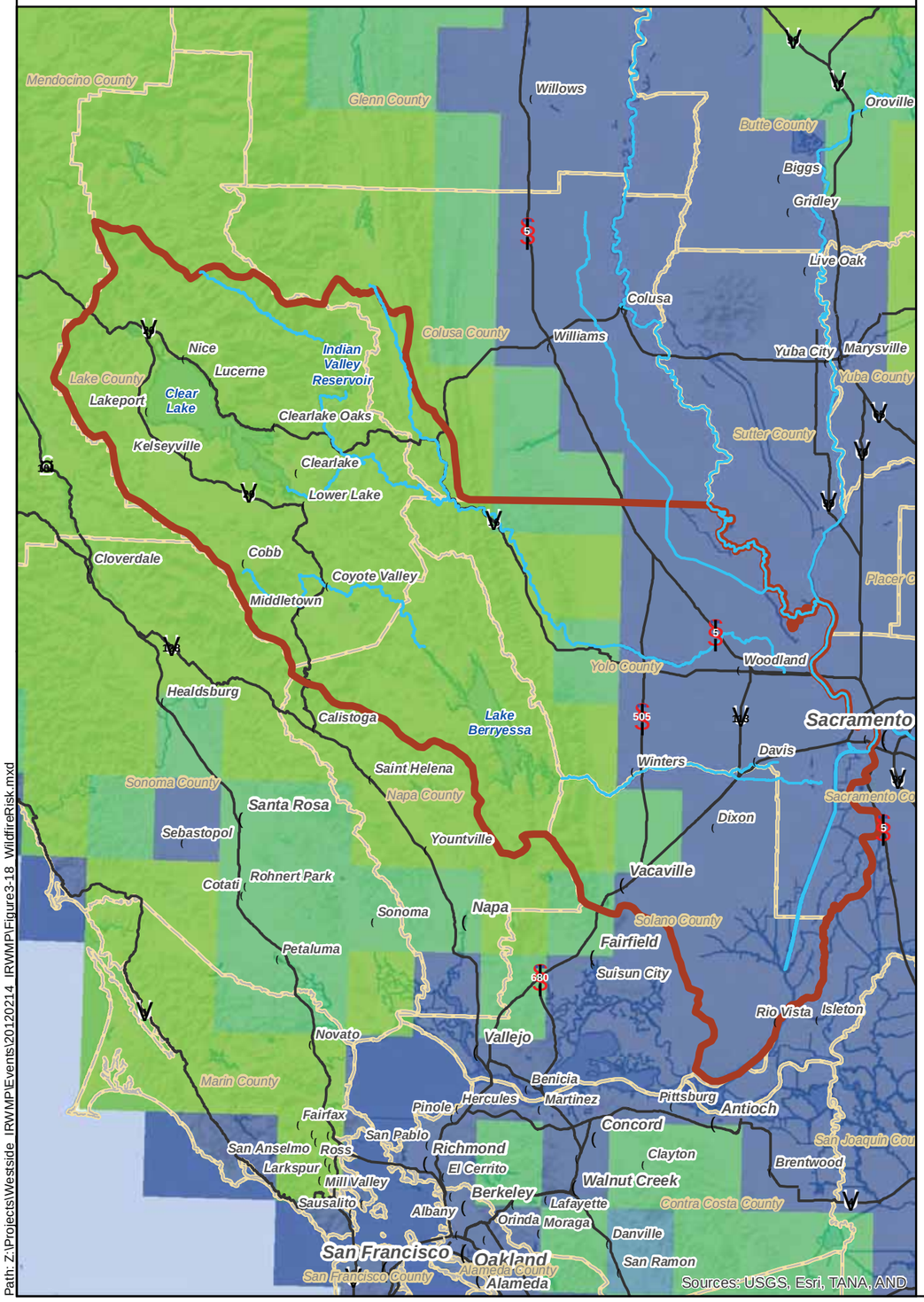
Projected Change in Temperature

KJ 1170019*00

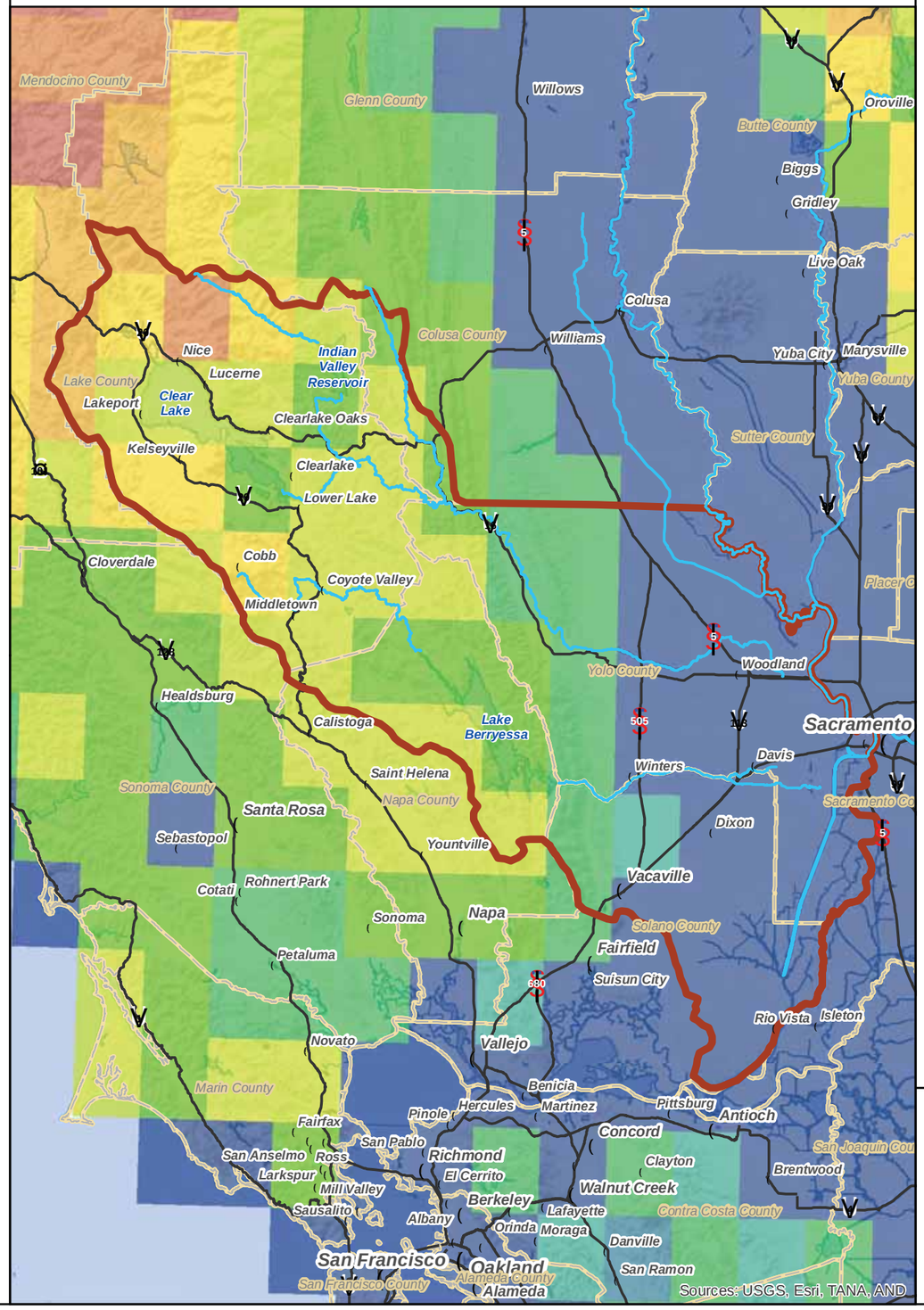
May, 2013

Figure 3-17

2020



2085



Legend

- (Cities
- County Boundaries
- Westside Region
- Streams
- Water Bodies

Projected Increase in Area Burned
(Base Period 1961-1990)

- 0.25
- 0.5
- 0.75
- 1.0
- 1.25
- 1.5
- 1.75
- 2.0
- 2.25
- > 2.25

Source:
Fire Risk Data. PCM1; A2. UC Merced Climate Application Lab, 2008

DRAFT

0 5 10
Miles

Kennedy/Jenks Consultants

WESTSIDE SAC IRWM

Increased Wildfire Risk

K/J 1170019.00
May, 2013

Figure 3-18

Path: Z:\Projects\Westside_IRWMP\Events\20120214_IRWMP\Figure3-18_WildfireRisk.mxd

3.5.2.2 Water Demand

As discussed in Section 3.1, about 95% of the water used in the Region is for agriculture which is seasonal and susceptible to the higher temperatures projected from climate change. Although it is difficult to quantify the expected climate-related changes to water demand, some changes are expected, most directly to the range of both annual and permanent agricultural crops in the area. There are a number of climate sensitive crops such as tomato, cucumber, sweet corn, and pepper, some of which may result in lower crop yields with higher summer temperatures; this is potentially balanced by higher winter temperatures that could favor winter crops that are not currently grown in the Region and/or a change to hotter season crops in the summer. Agriculture, in particular, has a range of water demand management options including fallowing fields of annual crops, changing water sources from surface water to groundwater, and/or changing the crop itself to one that may be less water intensive, yet economically viable.

3.5.2.3 Water Supply

The Region relies on both imported CVP and SWP water for both agricultural and M&I water supplies which are both snowmelt and climate-sensitive systems. The contract amounts for imported agricultural water is about 479,000 AFY and M&I contract amounts of about 95,000 AFY. In many parts of the Region, the availability of both imported as well as local surface water and groundwater improves the resilience of regional groundwater supplies. Local carryover storage in Indian Valley Reservoir and Lake Berryessa provide some measure of drought resiliency. However, the areas solely reliant on groundwater lack the resiliency of areas that can conjunctively manage surface supplies with groundwater. In addition, permanent crops, such as grapes and fruit and nut trees require more reliable water supplies because of the potential economic loss if sufficient water supply is not available.

3.5.2.4 Water Quality

Increased threat of wildfire and resultant threat to water quality from sediments containing mercury and nutrients, are a significant vulnerability in the Region although the water quality monitoring may not be sufficiently discrete to be able to discern trends. In addition, algal blooms and cyanobacterial toxins in Clear Lake with associated potential ecosystem impacts are already a recurring issue and are likely to be exacerbated with the expected increased temperatures.

3.5.2.5 Ecosystem and Habitat Vulnerability

Both terrestrial and aquatic invasive species pose a significant threat to the Region with water-consuming species such as giant reed, Himalayan Blackberry and tamarisk posing particular risks. Increased flows in aquatic habitats from increasingly intense precipitation events are likely to result in more erosion and sedimentation with associated negative impacts to fish habitats in the tributaries to Clear Lake which is home to the native Clear Lake hitch, a species of concern. Reduced spring runoff could impact Clear Lake Hitch spawning as well. Potential increases in temperature could impact fish survival for listed species such as steelhead and salmon as well as cold water fish such as trout in Clear Lake. Downstream tributaries of water storage reservoirs may be less vulnerable to high flood flows because of the controlled releases that occur from these facilities. Recreation flows from some of the storage reservoirs are currently managed in conjunction with hydropower and irrigation releases; however, changing priorities may require changes to operations in the future. Low lying estuarine areas in the Valley Floor may also be vulnerable to increasing salinity from sea level rise.

Section 4: Water and Land Use Planning

Water management and land use are inherently linked: activities and processes that occur on the land directly affect the use and movement of water within a watershed. These linkages between the hydrologic cycle and land use, and between water management and the ability to support particular land uses, are important to consider when making decisions about either land or water. The California Department of Water Resources (DWR) recognizes these linkages and requires that integrated regional water management (IRWM) plans describe the relationships between planning fostered by the regional water management group and local water and land use planning. This section describes how land use planning and decision-making are coordinated with water management planning and implementation within the Westside Sacramento Region (Region) and highlights opportunities for improved coordination.

As described in Section 2.1, much activity in the Region since the mid-1800s has altered the landscape significantly. These major changes in land use, including large conversions to agriculture and development of several towns and cities, were made possible by development of systems to manage water and redirect it toward the new uses. These changes have provided considerable human benefits, but they come with tradeoffs and in some cases have caused negative impacts to environmental health and other populations within the Region. As human activities within the Region have intensified, competition for available land and water supplies has also intensified.

More recently, several land and water management organizations have increased their collaboration and cooperation to try to support a growing economy within the Region in a way that is sustainable and preserves the values of the Region's citizens.

This *Integrated Regional Water Management Plan* (Plan) for the Region utilizes information from many other planning documents developed by various organizations throughout the Region. The Plan does not replace or supersede local planning; rather, it aggregates and synthesizes information from numerous local plans and perspectives. This Plan is consistent with and supports locally led planning and implementation of integrated water management. Appendix C provides additional detail about the planning documents that informed Plan development.

4.1 Plan Relationship to Local Water Planning and Implementation

This Plan can support local water management organizations in making local decisions and taking local actions that help accomplish a shared vision for the whole Region. The Plan also can help local organizations cooperate more effectively on actions they can accomplish better together than alone.

In the Region are 109 local organizations and Tribes and six state and federal organizations who have authority and responsibility for managing water resources, including water supply, water quality, flood protection, and watershed management. A subset of these organizations joined together to form the Westside Regional Water Management Group (RWMG) (see Section 1). The RWMG members have presented their perspectives along with inviting participation by all other local water management organizations during development of the Plan.

The governance approach developed for Plan implementation (see Section 11) will provide continuing opportunities for local water management organizations to discuss and coordinate planning and implementation actions within the context of the Plan and its updates.

In addition to the activities and forums of the Westside RWMG, the Water Resources Association of Yolo County (Yolo WRA), a member of the RWMG, provides a regional forum to coordinate and facilitate solutions to water challenges and opportunities in Yolo County. The Yolo WRA currently has 10 member agencies, which include agricultural water suppliers, urban water suppliers, groundwater managers, and flood protection providers.

Information and perspectives from local water planning are woven throughout the Westside IRWM Plan in several layers of detail. Plan development involved incorporating elements of local water resource management planning documents along with information gleaned from groundwater management (GWM) plans, county-level IRWM plans, and general plans. For example, the larger cities/agencies that deliver more than 3,000 acre-feet per year (AFY) or have more than 3,000 connections are required by state law to prepare urban water management plans (UWMPs). The UWMPs must include 20-year water demand forecasts and descriptions of water conservation programs intended to meet statewide goals to reduce per capita urban water use 20% by the year 2020; these forecasts and conservation planning efforts have been incorporated into this Plan. In another example, several water plans focused on improving conditions in Lake County, such as the *Lake County Water Inventory and Analysis* and the *Clear Lake Integrated Watershed Management Plan*. These and dozens of other water resources planning documents provided the basis for understanding the complex water supply and demand conditions in the Region, developing the water quality assessment, and identifying flood management systems. In particular, the information developed in such local planning activities was invaluable to development of the content in Section 3, “Existing and Future Conditions.”

Development of the water management challenges and opportunities (Section 5) and Plan goals and objectives (Section 6) involved careful consideration of information developed through local water planning. For example, goal 8, *promote reasonable use of water and watershed resources*, and goal 10, *provide reliable water supplies of suitable quality for multiple beneficial uses within the region*, emerged from the water management challenges and goals identified in local planning documents.

Climate change is a growing concern of water managers and could likely increase the variability of seasonal runoff and affect water quality, among other factors. The extent of planning related to climate change varies widely across the Region. Three of the five counties (Napa, Solano, and Yolo) in the Region have taken the first step to adapting to this significant concern by developing climate action plans (CAPs), which aim to mitigate climate change or reduce greenhouse gas emissions to reduce climate change as a result of human activities. Climate change adaptation is often included in other local planning efforts, such as water supply reliability planning in support of an UWMP. Climate action adaptation and mitigation strategies identified in local planning documents have been considered and incorporated into the Plan. For instance, they were considered during completion of the required *Climate Change Vulnerability Checklist* (Appendix C). Anticipated climate change factors also were woven into several of the challenges and opportunities listed in Section 5 (e.g., “Competing Need for Water Supplies Due to Environmental Regulations and Climate Change in the Future”) and were carried forward into the Plan goals and objectives (Section 6).

The Plan's sections on resource management strategies (Section 7) and project review and prioritization (Section 8) respond to the Plan's identified challenges and opportunities and the related goals and objectives. As the Plan was developed, each portion drew on information from local water management plans as well as current perspectives offered by local planners themselves. Furthermore, Section 10, which addresses coordination among involved entities, includes recommendations on regional coordination to address local water management challenges and climate change mitigation.

SBx7-7 also targets reduced urban water use, though in the Region, urban water use is a small portion of overall demand. SBx7-7 sets a goal of 20 percent reduction in per capita water use by year 2020.

Another opportunity for coordination of local water management planning activities with IRWM planning was created by passage of Senate Bill SBx7-7 in 2009. This legislation requires agricultural suppliers providing water to 25,000 irrigated acres or more to measure volumes of water delivered to customers, adopt pricing structures based on quantity delivered, implement efficient water management practices, and prepare agricultural water management plans. In the Westside Region, the water suppliers affected by SBx7-7 are the Yolo County Flood Control and Water Conservation District (YCFCWCD), Reclamation District 999, Knights Landing Ridge Drainage District, and the Solano County Water Agency (SCWA). As these agencies begin the agricultural water management planning process, local water managers can collaborate with each other and the RWMG in ways that will strengthen both local and regional planning. The RWMG encourages agricultural water managers to review this Plan and to coordinate with the RWMG during development of agricultural water management plans (AWMPs) to ensure their consistency with each other and Plan goals and objectives.

4.2 Plan Relationship to Local Land Use Planning

Land use planning within the Region is done by the nine cities, five counties, the Mendocino National Forest, Bureau of Land Management (BLM), U.S. Bureau of Reclamation (USBR), and the California Department of Fish and Wildlife (CDFW). As described above, land use planning and decision-making have a direct linkage to water management planning and implementation. Even with state policies that explicitly attempt to link land use decisions and water management decisions (such as Senate Bill 221 and Senate Bill 610, which formalize water supply planning requirements for developments over 500 dwelling units), collaboration among land use managers and water managers often remains a challenge. This section of the Plan describes the current land use management structure, characterizes the current relationship between land use planners and water managers, and identifies opportunities for more collaboration among the RWMG and land use planners.

Cities are the responsible agencies for land use planning in incorporated communities, while counties are the responsible agencies for land use planning in unincorporated areas. Public lands in the Region are managed by BLM, Mendocino National Forest, USBR, and CDFW. Cities make up a very small portion of land use in the Region, approximately 5%, but city governments represent the most people within the Region. The remaining 95% of lands in the Region are unincorporated and managed by the counties, federal agencies, and state agencies. Citizens within the Region have valued agricultural land uses and preservation of rural characteristics, as is reflected in the 530,000 acres in cultivation (28% of total land in the Region) and 1.2 million acres of native/open space (62% of total land in the Region). Appendix C gives detailed information on land use in the Region.

Land use planning agencies that have participated in the Plan include:

- Yolo County
- Napa County
- Solano County
- Lake County
- Colusa County
- Mendocino National Forest
- City of Clearlake
- City of Davis
- City of Dixon
- City of Lakeport
- City of Rio Vista
- City of Vacaville
- City of West Sacramento
- City of Winters
- City of Woodland

The agricultural sector in the Region has benefited widely from participation in the Williamson Act, which enables local governments to enter into restrictive contracts with private landowners of agricultural lands to preserve agriculture in exchange for reduced taxes. It is a non-mandated state program administered by counties and cities to preserve agricultural land and discourage the premature conversion of agricultural land to urban uses. As of 2010, approximately 415,000 acres in Yolo County, 270,000 acres in Solano County, and 50,000 acres in Lake County are under Williamson Act contracts (*California Land Conservation (Williamson) Act Status Report 2010,* California Department of Conservation). Although Colusa County and Napa County participate in the Williamson Act, most of their contracted lands are not located within the Region.

Until recently, the state offered financial support of the Williamson Act by providing subvention payments to county governments to help offset the impact to county property tax losses. Recent state budget cuts have eliminated this state funding, requiring county governments to either fund the program at the county level or refrain from renewing Williamson Act contracts. Recent legislation (SB863 and AB1265) implemented a new provision to the Williamson Act to allow counties to recapture some portion of the lost revenue as a result of state budget cuts. Counties that choose to implement SB863/AB1265 are allowed to shorten the duration of Williamson Act contracts and, in return, reduce the landowners' property tax relief by 10%, thereby increasing county tax revenues at the expense of landowners (Department of Conservation AB1265 Advisory Statement).

All counties in the Region have opted to continue the Williamson Act program in some form, indicating an ongoing commitment to preserving agricultural resources. Solano County and Napa County continue to subsidize existing Williamson Act contracts without moratoriums on new contracts and without implementing SB863/AB1265. Lake County has opted to continue the Williamson Act program but has implemented a moratorium on new contracts. Yolo County and Lake County have implemented SB 863/AB1265, such that Williamson Act contracts in these counties will be amended to be shorter and require landowners to pay higher property tax rates.

Within the Westside Region, most land use planning efforts focus on changes from agricultural to urban land uses. Most urban development within the Region occurs through infill of existing incorporated communities or annexation of unincorporated county lands. Currently, coordination between land use planners and water managers primarily occurs during the entitlement phase of an urban development project, including zoning decisions, water availability decisions, and stormwater management to reduce the impacts of urbanization when building permits are issued.

The gap between land use planning and water resource management has been addressed to some extent by State legislation. In 2001, two water supply planning bills, SB221 and SB610, were enacted that require greater coordination and more extensive data sharing between water suppliers and local land use agencies for large development projects and plans:

- SB221 requires projects including tentative tract maps for more than 500 dwelling units to obtain verification from the water system operator that will supply the project that it has a sufficient supply to serve the proposed project and all other existing and planned future uses, including agricultural and industrial, in its service area over a 20-year period, in normal, single dry, and multiple dry years.

- SB610, codified as Water Code Sections 10910 and 10911, requires the public water system that may supply water to a proposed residential development project of more than 500 dwelling units (or a development project with similar water use) or a project that will increase residential service connections by 10% or more (applicable for developments in water systems with fewer than 5,000 connections) to prepare a water supply assessment (WSA) for use by the lead planning agency in its compliance with the California Environmental Quality Act (CEQA). Such a WSA is to be performed in conjunction with the project's land use approval process and must include an evaluation of the sufficiency of the water supplies available to the water supplier to meet existing and anticipated future demands.

It should be noted that WSAs, which are often based on UWMPs, are performed only for developments that meet certain size criteria or increase in service connections by 10% or more. For instance, a residential development of more than 500 dwelling units requires a WSA. There is therefore no assured process in place for understanding and addressing the cumulative impact of multiple smaller developments that do not require WSAs.

As growth in the Region increases and development projects are proposed, the preparation of WSAs or written verifications pursuant to these bills may become increasingly common if large developments are proposed. In the absence of large developments, land use planning entities should require demonstration of water supply and infrastructure sufficiency by water purveyors for all projects, including an assessment of cumulative need for water by a range of small projects. This opportunity for better collaboration at the regional level is discussed further in Section 10.

A key limitation of relying on the requirements of SB221 and SB610 to mandate collaboration in water and land use planning is that this state legislation focuses on urban water use, whereas the majority of water used in the Region corresponds to agricultural demand.

This gap is partially addressed through general planning. Water resources play an important role in the land use decisions that are made under the guidance of general plans. While water

resources are typically not an “element” of a general plan, they are discussed within the context of the required general plan elements: land use, circulation, housing, conservation, open space, noise, and safety (one exception is the 2008 *Lake County General Plan*, which does include a focused water element). Therefore, general plan development, implementation, and updates provide a forum for coordination and collaboration between land use planning agencies and water managers. However, a challenge for land use planning is that general plan updates are not always prepared and can take a long time to complete.

The extent of collaboration in water management and land use planning varies throughout the Region, as each county has different strategies for water management in relation to land use planning:

- Colusa County – The portion of Colusa County that lies within the Region has a very small population, and there are no water districts supplying water in this area. Land use planning is managed by the County. No land use changes are anticipated, and the need for collaboration in land use and water supply planning is minimal because no water supply originates in this area.

- Lake County – Lake County requires close collaboration between planners of land use and water management. Water supply in Lake County is provided from more than 40 small water purveyors, including county-managed water utilities (special districts), City water departments, and about 10 small private water companies. Most of the purveyors are situated around Clear Lake. Water supply is either surface water, which is generally contracted for purchase from YCFCWCD’s storage in Clear Lake, or groundwater. Land use planning falls under the jurisdiction of the Lake County Community Development Department or the Cities of Lakeport or Clearlake. While some land use planning and water supply activities are both under the umbrella of county government, collaboration is not always built into the development process. Coordination between water purveyors and governmental agencies responsible for land use decisions could be improved to help ensure appropriate use of limited water sources. The County Special Districts Administration requires that any development of more than three units undergoes a water capacity analysis (*Lake County Special Districts Administration Capacity Analysis/Hydraulic Model Policy*, 2007, and *Water Connection Permit Checklist*). Furthermore, the County General Plan requires that adequate water supply must be identified before approval of new use permits (*Lake County General Plan*, Policies PSF-2.6, PSF-2.8, and WR-3.2). Several special districts and private water companies are operating under moratoriums against new service connections because of supply or system infrastructure and treatment limitations.

- Napa County – The portion of Napa County in the Region is unincorporated. Permits for development are routed through responsible departments to ensure that adequate supplies are available. Small water supply and treatment districts are notified of new development requests. Notification and coordination of land use permitting/entitlements ensure adequate water supply before project/permit approval. Coordination is conducted by responsible agencies when a water utility is involved. However groundwater use is currently not measured or regulated. The Napa County process is on a project-by-project basis that does not capture small ministerial projects and does not address the cumulative effect of water use or consumption over time. Other land use managers in the Napa County area of the Region include state and federal agencies and departments.

- Solano County – In Solano County, all urban development must be annexed to incorporated cities, which function as the water utilities and land use managers. City councils in Solano County are the governing bodies and decision makers for land use planning and also are responsible for ensuring that water supply is available to support land use changes.

- Yolo County – Development within Yolo County is directed towards infill of existing urban areas and away from unincorporated county lands. Therefore, most water supply planning is handled on a case-by-case basis by the water supply agency that has jurisdiction over the development area. Although there is no formalized analysis of countywide water inventories for land use planning, Yolo WRA is the primary forum for collaboration among water managers. Participation in the WRA is voluntary, and some agencies choose not to participate; however, the WRA has experienced increased participation in recent years, particularly since a recent initiative to centralize water management became politically controversial and faced practical challenges. One of the primary challenges faced by Yolo County with respect to collaboration for water management and land use planning is how to increase participation in the WRA and better utilize the WRA as a collaborative planning organization.

- Public Lands – approximately 379,000 acres of land in the Region are managed by federal and state agencies. Each agency has a unique set of land use and resource management directives and objectives, but all are interested in balancing water resources management with land use objectives. Currently, coordination among these public land use managers and the RWMG or local water managers is limited, as no formalized forums for collaboration are in place. The IRWM Plan can help by focusing on improving collaboration in land use management and water resources planning, as discussed further in Section 10.

Additional collaborative forums not specifically related to the IRWM have contributed to the IRWM program through meeting attendance, submitting projects and other collaborative efforts. Therefore, the common memberships provide opportunities for additional interaction and collaboration among land use planning entities and water managers in the Region:

- The Clear Lake Advisory Committee (CLAC) provides guidance and recommendations to the Lake County Board of Supervisors regarding Clear Lake. It currently includes members from cities, business interests, Native American tribes, CDFW, and Lake County Water Resources Department (Lake County 2013).

- The Cache Creek Watershed Forum comprises stakeholders who are committed to sustaining, protecting, and enhancing the natural, cultural, and economic vitality of the Cache Creek watershed through interest-based collaborative planning and stewardship.

- The Lower Putah Creek Coordinating Committee (LPCCC) is a watershed management group representing community interests in water resources and environmental protection.

Because much of the Region lies within the Sacramento River floodplain, flood management is a particularly important focus for the Region. Flood management is aimed at minimizing the threat of damage to property from flooding and improving preparedness for and response to floods. Flood management programs and projects impact water resources and land use

management, thereby providing forums for additional collaboration. For example, FloodSAFE Yolo is a program that emerged from the Yolo County IRWM Plan. Some of its objectives for flood control suggested include those in the Westside IRWM Plan, such as the Plan's objective 14, *Provide adequate flood protection for all urban and rural areas within the region by December 31, 2050*.

Stormwater management in more urbanized areas has recently attracted particular attention, especially as it relates to water quality improvements. Regulations require preparation and implementation of stormwater management plans by cities and counties with emphasis on implementation of low-impact development and pollution prevention measures.

The Westside IRWM Plan goal development process resulted in two goals that relate to land use planning:

- Goal 8, *promote reasonable use of water and watershed resources*. This goal relates to land use planning because of the impact of land use decisions on water resources.

- Goal 13, *support sustainable economic activities consistent with local and state government planning efforts within the region*. This goal involves land use because economic development intersects with how land is used and necessitates land use decisions.

The relationships among the Region's land use planning entities, other water management entities, and the RWMG are sturdy enough to serve as bases for increased collaboration. The RWMG and land use managers are considering ways to improve collaboration on a variety of topics and areas of focus through creation of subcommittees and other forums to track related issues such as: floodplain management, flood control planning, groundwater management, treatment and conveyance facilities, stormwater management, water conservation efforts, watershed management, recreational area management, land use changes, general plan updates, water supply for emergency planning, and habitat management.

As noted above, much of the collaboration and coordination on these issues in the past occurred through the development and implementation of formal documents, such as UWMPs, AWMPs, general plans, groundwater management plans, flood insurance studies, watershed assessments, watershed sanitary surveys, and stormwater management programs. The IRWM Plan provides an opportunity to improve collaboration by increasing public participation and by increasing awareness of these plans in the land use and water planning decision making processes. Going forward, the RWMG is committed to collaborate with land use managers in the planning and development of projects that address water resources-related objectives.

Section 5: Challenges and Opportunities Summary

This section describes the major challenges and opportunities related to integrated water management in the Westside Sacramento Region (Region). These challenges and opportunities were identified through multiple conversations with resource managers and other stakeholders and were informed by the material presented in Sections 2 through 4 of this *Integrated Regional Water Management Plan* (IRWM Plan). The term "challenges and opportunities" is used to mean the water-related items of interest or concern within the Region. The list does not distinguish whether a particular item is a challenge or an opportunity, because given the diversity of interests and values in the Region, one person's challenge may very well be another's opportunity. By including both challenges and opportunities, stakeholders were able to reach broad agreement on the topics that warrant consideration and focus within this Plan.

Identification and discussion of challenges and opportunities began early in the Plan development process, ultimately generating the Plan goals and objectives presented in Section 6. Over the course of several conversations, the project team began grouping the challenges and opportunities into 10 focus areas, which are listed below in no particular order:

- **Education and Awareness** – Fostering broader watershed stewardship in the community,
- **Habitat and Invasives** – Restoring and enhancing riparian habitat, protecting endangered and listed species, and reducing the spread of and preventing invasive species,
- **Infrastructure** – Ensuring appropriate investments in water-related infrastructure to provide a reliable water management system over time,
- **Reasonable Use** – Promoting reasonable use of water supplies and watershed resources,
- **Recreation** – Maintaining and expanding water-based recreational opportunities,
- **Risk Management** – Addressing the risks associated with water and natural resources management (e.g., flood, drought, fire, ineradicable invasive species, etc.),
- **Water Quality** – Providing appropriate quality water compatible with its intended use(s),
- **Water Supply** – Providing reliable water supply at the time and location needed for multiple beneficial uses in the region,
- **Understanding of Watershed Function** – Improving the information and knowledge base regarding watershed function and management, and
- **Land Use** – Integrating land use management and water management.

Each of these focus areas and their associated challenges and/or opportunities are described in more detail below. Sections 2, "Region Description," 3, "Existing and Future Conditions," and 4,

"Water and Land Use Planning" introduce important background information for each focus area and provide context for each challenge and opportunity.

5.1 Education and Awareness

Historical and ongoing human activities have had profound effects on the watersheds of the Westside Region. Many people may not realize that their actions may be negatively affecting the well-being of their communities and watersheds. Some examples of harmful actions are irresponsible application or discharge of stormwater that transports runoff pollutants (e.g., fertilizers, pesticides, oil and grease); illegal dumping of garbage and refuse near water bodies; and septic system overflows that can contaminate creeks, streams, and lakes, affecting critical fisheries and aquatic habitat. Boating-related activities that can impact watersheds adversely include improper disposal of trash or sanitary waste and the spread of invasive species from one water body to another.

Several participants in the Plan development process emphasized that water and associated resource management organizations should be conducting community outreach to engage with members of the public in practical and collaborative ways. A suggested focus for outreach includes helping citizens understand the importance of the watersheds and natural resources of the Region, how these vital resources affect them individually, and what they can do to help sustain them. This expectation for community outreach is based on the belief that increased awareness and understanding about sustainable management and the long-term impacts of unsustainable activities can foster better public involvement in, and financial support of, effective resource management and watershed protection.

Numerous watershed and environmental stewardship organizations are committed to continued enhancement of watershed public education throughout the Region. They include the Yolo Basin Foundation, Putah Creek Council, Sierra Club Lake Group, Tuleyome, Inc., Upper Putah Creek Stewardship, and the Clear Lake Advisory Committee. Ongoing support of these organizations and expansion of public outreach and education programs can considerably improve protection of the Region's critical waterways.

5.2 Habitat and Invasive Species

5.2.1 Supporting the Health and Biodiversity of Native Aquatic and Riparian Species

Maintaining the agrarian and rural character of the Region is a value that has been clearly articulated by stakeholders, and with it comes the desire to maintain the health and biological diversity of native aquatic and riparian species.

The lakes, creeks, wetlands, sloughs, Delta, and other water features throughout the Region provide key habitat for many of California's well-known fish and wildlife species. 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. More than 50 federally and state-listed wildlife and plant species are found in the Region, and hundreds of other species with special-status designations are supported by habitats. Populations of fish that are declining throughout the state can still be found in the Region. Of particular note is the Clear Lake hitch, a species endemic to the Clear Lake watershed. While not federally or state-listed, the Clear Lake hitch has been identified by the CDFW as a species of special concern. A

petition was submitted in 2012 to the State of California and U.S. Fish and Wildlife Service (USFWS) to have the Clear Lake hitch listed as a threatened or endangered species.

Multiple Regional conservation areas, such as the Yolo Bypass Wildlife Area, Cache Creek Natural Area/Cache Creek Wilderness Area, Clear Lake Wildlife Area, Berryessa Snow Mountain (proposed), and Mendocino National Forest, have been or will be established to protect important habitats and species. The Inner Dam Reach of Putah Creek is proposed by the CDFW as designated heritage trout waters. In addition, 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.

However, these conservation areas and designations do not cover the entire Region, and additional work is necessary to improve special status and endangered species habitat including:

- 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.

5.2.2 Conserving and Restoring Habitat

Protection of the Region's important environmental resources extends beyond the formation of dedicated conservation areas. Ongoing large-scale planning that addresses the interplay between water resource management and environmental resources within the Region are underway; they include the Solano Habitat Conservation Plan (HCP), Yolo Natural Heritage Program HCP/Natural Communities Conservation Plan (NCCP), and the Bay Delta Conservation Plan (BDCP). Design and implementation of such substantial programs is one of the many ways that critical habitat can be restored throughout the Region. The following efforts do not encompass the entirety of the Westside Region, but do provide a valuable foundation:

- **The Solano HCP** aims to promote the conservation of biological diversity and the preservation of endangered species and their habitats while allowing for activities that support the continued health of cities, agriculture, and industry in Solano County. This plan originated with the Solano Project Biological Opinion (BO), which suggested development of the HCP as a conservation measure. The BO was issued by the U.S. Fish and Wildlife Service as part of the renewal of the contract between the U.S. Bureau of Reclamation (USBR) and Solano County Water Agency (SCWA) to continue operation of the Solano Project.

  The Solano HCP provides Endangered Species Act incidental take authorization for activities associated with future water in the SCWA contract service area. The Solano HCP covers the conversion of species habitat for urban uses, new development, and water infrastructure; operations and maintenance of flood management and irrigation facilities; and activities undertaken to manage or enhance habitat or relocate covered species.

- **The Yolo Natural Heritage Program HCP/NCCP** (Yolo NHP) is being developed to protect and enhance biodiversity within Yolo County while facilitating permitting for activities that could affect protected species. The Yolo NHP is similar to the Solano HCP in that it covers infrastructure expansion and improvements as well as operations and maintenance for water facilities; also, it is intended to improve ecological conditions so as to allow incidental take authorization for activities supporting the preservation of the area's cities, agriculture, and industry. The main difference between the Yolo NHP and the Solano HCP is that the Yolo NHP also is pursuing an NCCP to cover take of unlisted state species.

- **The BDCP** is being planned to balance provision of a reliable water supply to those receiving it from the Sacramento-San Joaquin River Delta (Delta) with protection of ecosystem health. The BDCP is intended to improve ecological conditions to allow long-term regulatory authorization of the operations of the State Water Project (SWP) and Central Valley Project (CVP). The potential benefits and effects of the BDCP planning effort are relevant to the Plan, since a portion of the Westside Region falls within the Delta, and the Cache Creek and Putah Creek watersheds contribute flows to the Delta. In addition, imported surface water diversions from the Delta are a source of supply for several of the Westside water agencies.

5.2.3 Preserving Ultramafic Soils and Associated Habitat

Resource managers and other stakeholders within the Region have an ongoing interest in preserving ultramafic soils and their associated habitat types. Ultramafic soils contain high concentrations of iron and magnesium and low concentrations of phosphorus. The Region has one of the largest acreages in the world of unique serpentine botanical assemblages. Although not directly a water-related, ultramafic soils are recognized as important habitat in the Region and large areas of the Upper Cache, Upper Putah, and Bear Creek watersheds are covered by ultramafic (serpentine) soils. The habitats found over ultramafic soils often contain chaparral vegetation, including scrub oak, chaparral oak, chamise, and several species of manzanita and ceanothus. Many rare species (plant and animal) in the Bear Creek watershed are found on ultramafic soils (Bear Creek Watershed Assessment, 2010).

The largely rural character of Lake County provides an opportunity to protect this important habitat. Lake County has adopted a wide range of policies to ensure protection of sensitive species. Lake County development policies include clustering development, limiting development in areas with sensitive habitat, and requiring buffers between development and significant watercourses, riparian vegetation, and wetlands.

5.2.4 Addressing the Presence and Spread of Aquatic and Terrestrial Invasive Plant Species

Invasive plants present a significant challenge to the management of the Region'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.

From the late 19th century to today, development of urban communities, agriculture conducted across large areas, and disturbance of the stream channels through 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. Invasive plant species of concern include *Arundo donax* (giant reed), tamarisk, French and Scotch brooms, yellow star-thistle, water hyacinth, Eurasian milfoil, and ravenna grass.

The major risks to the watersheds from the spread of invasive aquatic and terrestrial plant species are described below.

- **Changes to water quality** generally result from temperature changes due to changes in river shading as well as chemical changes such as increased nutrient loading, increased pH, and decreased dissolved-oxygen content.

- **Impacts to water supply** include reduced local availability of surface water and groundwater due to excessive evapotranspiration needs of the invasive species and obstructions to water supply infrastructure through the unmanaged growth of invasive plant communities.

- **Flooding** risks may increase as a result of alterations to the stream channel conveyance capacity, raising water levels during high flows.

- **Increased erosion** occurs as a result of decreased bank stability due to differences in the root structures of invasive plant species, which cause undercutting and bank collapse. It also results from changes in flow patterns due to obstructions within waterways, which can cause constrictions, higher flow velocities in certain areas, and potentially increased erosion.

- **Increased fire hazards** result 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 lightly vegetated banks that are poor fire fuel.

- **Displacement of native habitats and associated wildlife** mainly occurs through the invasive species' ability to outcompete native plants, leading to the loss of food and habitat for native wildlife; additionally, water quality changes impact the habitat of native aquatic wildlife.

- **Adverse effects on recreational activities** can result from obstructions to waterways and upland areas, which hinder navigation.

5.2.5 Limiting and Preventing Colonization of Water Bodies by Quagga Mussels, Zebra Mussels, and Spread of New Zealand Mud Snails

A population of New Zealand mud snails (NZMS*), Potamopyrgus antipodarum*, was discovered in Putah Creek downstream of Monticello Dam in 2003. The Putah Creek discovery was the first appearance of the organism west of the Sierra Nevadas. NZMS are present in the Putah Creek inter-dam reach, between Monticello and the Putah diversion dams; the snails have spread approximately 6 miles downstream from a fishing access location after sustained high flood flows during the 2003-2004 winter, and it is very likely that the limit of infestation has moved

farther downstream because of flood flows in Putah Creek during the winter-spring of 2006. The infested reach includes the intake to the Putah South Canal.

The primary impact from NZMS is that they outcompete other invertebrates such as mayflies and deplete algae and periphyton, which support the anadromous fish food chain. However, no studies have been completed that directly link NZMS to significant ecosystem disruption or adverse fish impacts. Some fish will consume NZMS but retain no nutrient value, as the snails are able to pass through the digestion canal alive and intact. They are particularly difficult to eradicate because they are self-cloning females and a single individual can start a new population.

Dreissenid mussels, such as quagga and zebra mussels, pose a significant threat to the Region. These aquatic invertebrates have not been found in the Region but are found in nearby water bodies around California. The closest known infestation of zebra mussels is about 100 miles away, and it resulted in the closure of San Justo Reservoir to public use (San Benito County Water District website, 2013). These mussels have caused devastating impacts on municipal water systems, recreation, and fisheries in other areas of the country, and they have recently been discovered in reservoirs in the western U.S. and major water delivery systems in Southern California. Dreissenid mussels significantly alter lake ecology by displacing native species, destroying native habitats and the species that depend on natural habitats, blocking water delivery, disrupting recreational and commercial fishing, undermining docks and all other structures in the water, and impeding navigation and enjoyment of waterways.

Several water management agencies in the Region have already initiated activities to prevent the introduction of dreissenid mussels and control the spread of NZMS. The Region has taken some steps to address their continued threat to water supply infrastructure. For example, the Lake County invasive mussel prevention program at Clear Lake and USBR invasive mussel program require inspections or self-certifications that watercraft are mussel-free before they can be launched. Likewise, SCWA is collaborating with USBR to develop and implement an early detection and education plan for dreissenid mussels for the Solano Project (including Lake Berryessa). In mid-2012, nearby Sonoma and Mendocino Counties created the North Coast consortium program to prevent mussel infestation with support from the U.S. Army Corps of Engineers.

5.3 Water Supply

5.3.1 Sustaining Groundwater Resources

Groundwater is a key component of the Region's conjunctive water supply portfolio. Various challenges are associated with managing the Region's groundwater aquifers. A primary challenge is that very little data are available on the sustainable yield of the aquifers. Although agencies have tried to improve understanding of groundwater resources through preparation of groundwater management plans and monitoring programs, much work remains to truly quantify the reliable, sustainable supply available.

Groundwater makes up approximately 33% of the water supply for users in the Valley Floor PA in an average water year, and for many agricultural users and municipalities, groundwater is the only source of supply. Some agricultural areas, such as the Yolo Zamora area, are fully reliant on groundwater. Municipalities such as the Cities of Woodland, Davis, Dixon, and Rio Vista also currently obtain all of their drinking water supplies from wells. The Cities of Davis, Woodland,

and Vacaville obtain some of their water from the deeper Tehama formation, which is of high quality, but water managers are uncertain about the sustainable yield of the aquifer.

Furthermore, the groundwater basins in the Upper Cache Creek and Upper Putah Creek PAs do not provide a high level of drought protection. The shallow groundwater basins are generally drawn down over the summer months and recharged during the winter season, meaning that groundwater supplies are not a reliable source of supply during multiple-year drought periods. Some domestic and municipal wells are located in the volcanics formations, which are generally considered to be unreliable sources of supply because it is difficult to quantify the capacity of the formation.

Another challenge is subsidence (consolidation of the aquifer causing decreased ground levels) due to groundwater pumping. 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 to 3 feet. Experts have reported that in some areas around Clear Lake, such as Big Valley, subsidence could become a challenge.

Previous overdraft conditions in the subbasins of the Sacramento Valley groundwater basin led to the development of supplemental surface water delivery projects to offset groundwater demand. The current conjunctive use measures have reduced but not eliminated concerns about subsidence stemming from the previous overdraft and allow for increased reliance on groundwater supplies in the Valley Floor planning area (PA) during drought periods, when surface water supplies are sometimes restricted.

5.3.2 Ensuring the Availability of Reliable Water Supplies for Beneficial Uses during Drought Periods

The Region's water supplies offer innumerable beneficial uses, including ecosystem, municipal and industrial applications, and agricultural support. Generally speaking, the Region has access to sufficient quantities of water for most intended uses under typical conditions.

Some surface water leaves the Region and flows downstream into the Sacramento River and San Francisco Bay Delta; imported surface water is diverted from the Delta by some users in the Valley Floor PA. Despite its availability in most conditions, water is a finite resource and the quantity available under varying hydrologic conditions is not certain year to year. An abundance of water may be available during a wet year, while water users may not have access to sufficient quantities to meet all intended uses during a drought.

As a result, many of the Region's water users have developed water supply portfolios that provide more confidence in supply availability. However, not every water user in the Region has multiple supply options, and in some of the dryer years, some farmers fallow lands or plant different crops in response to water scarcity. Water scarcity during droughts may also negatively affect aquatic and riparian habitat quality and fisheries.

Local surface water sources, including the Cache Creek and Putah Creek systems, are operated by Region agencies. The major lakes and reservoirs including Clear Lake, Indian

Valley Reservoir, and Lake Berryessa provide additional stability in firm yield and carryover storage from year to year for the portions of the Region that can access this storage.

The reliability and availability of imported surface water supply is subject to water rights seniority and Term 91 curtailments, which is a provision that allows the State Water Resources Control Board (SWRCB) to reduce allowable diversions when water needs to be released from SWP or CVP storage to meet instream water quality standards (typically during dry hydrologic years). Additionally, imported surface water supplies can be curtailed because of environmental regulations that limit Delta diversions and changes in precipitation and snow pack from climate change.

5.3.3 Addressing Competing Need for Water Supplies due to Environmental Regulations and Future Climate Change

Agencies with required environmental flows must ensure they have adequate water storage to provide for their customers as well as minimum in-stream release requirements. Required releases from Indian Valley Reservoir, in Lake County and the Putah Creek Diversion Dam, in Solano County. Putah Creek environmental flow requirements at Monticello Dam are dictated by required instream flows for Lower Putah Creek established in the *Putah Creek Accord* (2000).

Imported surface water supplies are more vulnerable to environmental flow regulations and climate change than are local surface water supplies. Therefore, water supply reliability planning and alternative water resources planning should be considered as precautionary measures to the extent possible.

Sustainable, reliable water supplies are necessary to maintain the Region's economic viability and ecological health, but climate change could affect the availability of water supplies in the future. Large variations in the weather patterns would affect the municipalities, farmers, and streams receiving water from all of their sources. In many cases, improvements to infrastructure to better distribute surface water supplies around the Region to be used conjunctively with groundwater would improve resilient responses to the potential effects of climate change. However, the impacts of climate change on the Region are difficult to predict; current information from climate change models is not sufficiently precise to demonstrate specific impacts to water supply reliability within the Region.

5.4 Infrastructure

5.4.1 Maintaining and Modernizing Water System Infrastructure

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 Region, 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 Region are facing similar needs for investment in wastewater treatment facilities, and several are seeking to upgrade their flood protection infrastructure.

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

Many of the Region's disadvantaged communities (DACs) are faced with similar water infrastructure needs but cannot afford the required investments. In some cases, communities may not be able to meet basic bacteriological water quality requirements or fire flow requirements and need to improve treatment, upgrade undersized water lines, and increase tank storage to comply with current fire codes and California Department of Public Health (CDPH) waterworks standards.

5.5 Reasonable Use

As competition for water supplies throughout California grows more intense, water users are being asked to make use of limited resources in a reasonable way. Some recent regulatory requirements require additional steps towards reasonable water use; the Water Conservation Act of 2009 (SBx7-7) requires a 20% statewide reduction in per capita water use by 2020 for urban water suppliers. The Region's urban water suppliers, including the Cities of Davis, Dixon, Vacaville, and West Sacramento, are implementing plans to achieve their specific water use targets to comply with the direction provided by the state Department of Water Resources. Some of the methods being used by urban water suppliers include water conservation best management practices (BMPs) as defined by the California Urban Water Conservation Council.

Similarly, agricultural water suppliers (suppliers with more than 10,000 irrigated acres) were required by December 31, 2012 to adopt and implement cost-effective efficient water management practices in an effort to practice reasonable use of agricultural irrigation water at the farm level. The Region's many large agricultural water suppliers, such as Yolo County Flood Control and Water Conservation District (YCFCWCD), Solano Irrigation District, and others, may be subject to these regulations.

5.6 Risk Management

5.6.1 Providing an Appropriate Level of Flood Protection

Many areas within the Region have been affected by flooding and continue to face significant flood risk. Local governments and flood management agencies are attempting to provide an appropriate level of flood protection for each area. Decisions on what level of protection is appropriate and how to provide it vary with location; for example, the approaches to flood protection by the communities surrounding Clear Lake may be very different than those by the Cities of Woodland and West Sacramento, because the people and resources at risk and the flooding mechanisms vary. In addition, providing an appropriate level of flood protection requires close coordination and collaboration among a multitude of local, state, and federal agencies, similar to efforts underway for the Central Valley Flood Protection Program.

The impacts of climate change are expected to include more extreme weather events that could increase the frequency and duration of flooding in the Region. This will be exacerbated in the Valley Floor, because subsidence behind some of the levees could reduce their effectiveness. In addition, increasing development pressures continue to occur along the lakeshore of Clear Lake, as tourism and second homes are promoted, leading to increased flood risk for developing areas that are located within a floodplain.

5.6.2 Providing an Appropriate Level of Protection from Fire, Drought, and Other Natural Disasters

As noted in Sections 2 and 4, the vast acreage of federal lands predominantly in a natural state poses a significant chance for wildfires in the Region. In addition, fire tends to lead to the presence of terrestrial invasive species, which often are the first to establish themselves after a fire event. The likely results of wildfire are property damage, loss of life, and increased erosion and landslide potential with associated sediment loads to water bodies. Furthermore, drought events, which may be exacerbated by climate change, can increase fire risk by stressing vegetation, thereby increasing its vulnerability to insect infestations.

Funding for vegetation management to reduce fire risk is usually insufficient for to completely cover the large acreages in the Region. Recent philosophies regarding vegetation management using the available funding focus on targeting areas at the urban-wildland interface.

5.7 Understanding of Watershed Function

5.7.1 Responding to Potential Impacts of Climate Change

As discussed earlier, climate change could significantly impact the Region, impacting the ecological, environmental, and economic conditions. USBR has undertaken an extensive analysis of climate change and its potential impacts on water resources in the western states, completing global climate model modeling and hydrologic modeling steps for several western U.S. rivers, including the Sacramento River, and releasing the results. Because the Region is a part of the Sacramento River Basin, the projections for future temperature and precipitation developed by USBR for the Sacramento River watershed are representative of the likely changes to the Westside Region.

The potential impact of climate change should be studied and considered in planning for resource management and economic development. The following areas of concern, addressed in the climate change vulnerability assessment in Section 3, are particularly relevant to the Region:

- 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, and
- Decreased availability of water supplies.

5.7.2 Coordinating Data Acquisition, Management, and Access

Documentation of current and historical conditions is required to provide an understanding of changes occurring in the Region. Yet data collection and management can be challenging when different agencies and stakeholders are collecting and using data for different purposes. Close collaboration between entities that maintain data can help leverage limited resources to make data usable for regional planning. To support policy-making and public education, data must be

available from various sources and widely accessible but also managed to ensure data quality (accurate, up to date). There is an inherent difficulty in ensuring quality and consistency of data provide by, and interpreted by, multiple agencies, organizations, and the public.

5.7.3 Providing Better Data and Information to Support Decision-Making and More Sustainable Public Behaviors

The accessibility and dissemination of credible and coordinated data and information helps governing bodies make informed decisions about policies that can impact the health of watersheds and other resources in the Region. Also, meaningful educational activities and community outreach focused on the environmental impacts of public behaviors relies on the availability, credibility, and clarity of relevant data and information.

5.8 Water Quality

5.8.1 Complying with Applicable Discharge Requirements and Basin Management Objectives

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 water quality objectives that apply to the Region are mainly qualitative, but they have widespread effects throughout the ecosystem. Non-point source (NPS) pollution, such as urban stormwater runoff and sediments from roadways and parking lots, are some of the water quality issues addressed by that plan. More quantitative objectives, including waste load allocations, have been and will continue to be adopted as part of the development of total maximum daily loads (TMDLs) for waterways within the Region.

Managers and stakeholders express a shared desire to improve the quality of the lakes and waterways that are impaired by various water quality constituents. The Basin Plan identifies many water bodies within the Region as impaired (i.e., not meeting narrative or quantitative water quality objectives) under Clear Water Act Section 303(d). Some of the 303(d) listed constituents of primary concern are mercury, boron, pesticides, nutrients, and fecal coliform.

Mercury is a significant source of water quality impairment and is a legacy of the Region's mining history. Erosion of naturally mercury-enriched soils, geothermal springs, and atmospheric deposition contribute mercury to the watershed, but the major source of mercury is runoff from historic mines (Regional Water Quality Control Board, 2011). The mercury TMDLs that have been developed for Clear Lake, Cache Creek, Bear Creek, Harley Gulch, and Sulphur Creek prescribe cleanup of inactive mines and erosion control measures to decrease the transport of mercury. Mercury from the Upper Cache Creek flows through Cache Creek to the settling basin that drains into the Yolo Bypass, which in turn eventually drains into the Bay Delta. Cache Creek is a major contributor of mercury to the Bay Delta through this pathway. Putah Creek has also been identified as a major contributor of mercury; however, the construction of Lake Berryessa has greatly reduced this contribution.

A major surface water quality challenge specific to the Upper Cache Creek PA is the increased algae and harmful cyanobacteria blooms on Clear Lake. A U.S. EPA report published in 1994

identified nutrient-laden stormwater runoff from eroded soils in the Upper Cache Creek watershed as the primary cause of excessive algae production in Clear Lake (USEPA, 1994). High levels of nutrients in watershed soils created a naturally eutrophic lake before European settlement began; ensuing resource extraction and development practices contributed to accelerated degradation of the lake, leading to the current hyper-eutrophic condition. Increased algae growth is contributing to higher costs for lake water purveyors who filter the water, and the mat-forming cyanobacteria are causing aesthetic issues affecting recreation and other lake uses.

Wastewater discharges are regulated by the Regional Water Quality Control Board through the issuance of waste discharge requirements for land application or National Pollutant Discharge Elimination System (NPDES) permits for discharges to surface waters. Discharge requirements that were established in part to be consistent with the Basin Plan objectives are posing difficulties for many agencies in the Region. Some of the challenging new requirements in some permits include selenium discharge limits and potential future limits for boron and salinity in the Valley Floor PA. In the Upper Cache Creek PA, new requirements in the NPDES stormwater management permit include incorporation of TMDL compliance measures to achieve reductions of nutrient inputs thought to be causing excessive algal blooms in Clear Lake.

Many wastewater discharge permits at publically owned treatment works have been revised in recent years, increasing the level of treatment required and creating a need to modernize wastewater facilities. For example, the City of Davis is required to upgrade its wastewater treatment system by 2017 to a secondary biological treatment, clarification, and tertiary filtration process, replacing the current pond and overland flow treatment system. In the Upper Cache Creek PA, wastewater treatment plants have been updated, sewage removal systems are gradually being improved, and the majority of treated effluent is reused and/or conveyed to the geothermal steam fields near Cobb Mountain to facilitate power production. Programs to evaluate on-site septic systems that may be contributing to Clear Lake nutrient or other pollutant contamination (such as fecal coliform) are needed for future development of local watershed protection and ecosystem management programs.

5.8.2 Meeting Applicable Drinking Water Standards

Meeting applicable drinking water standards is becoming more difficult for some of the surface water and groundwater suppliers in the Region. Some of the suppliers that rely on water diverted from Clear Lake, for example, must deal with organics, *cryptosporidium*, pesticides, and other constituents to meet California Code of Regulations Title 22 and CDPH drinking water standards. Similarly, drinking water supplies diverted from the Delta often have naturally occurring contaminants such as organic carbon, which can cause undesired side effects during municipal water treatment.

Groundwater being used for drinking water supplies within the Region meets most drinking water standards, but it must be monitored continuously to ensure that the quality of the supplies is maintained. Some secondary constituents, such as manganese, have recently required treatment at municipal wells in the Region. Emerging contaminants such as hexavalent chromium, and potential tightening of the maximum contaminant levels for constituents such as arsenic, also present future challenges to ensuring that groundwater supplies meet drinking water standards. Treatment systems or alternative supply sources will be required at municipal wells that are impacted by current or future drinking water standards.

5.8.3 Providing Water of Suitable Quality for the Intended Beneficial Use

Surface waters in the Region must be managed to protect a multitude of beneficial uses including municipal, agricultural, and industrial water supply, recreation, fishing, and various habitat uses. The primary strategy for maintaining and improving the quality of water for beneficial use within the Region is to control both point and NPS of pollution of these surface waters. NPS pollution is inherently much more difficult to manage because of the broad geographic distribution of discharge points. Point source pollutants, such as wastewater discharges, are regulated through permitting to meet basin plan objectives, as described earlier. NPS pollution, such as urban stormwater and agricultural runoff, also is regulated, using BMPs as the primary water quality management mechanism.

Increasing public education and outreach focused on the impacts of human activities and the benefits of BMPs for agricultural operations could help reduce pollution from NPS. Groundwater must be managed to meet municipal and agricultural water quality needs; in most cases this requires understanding and promoting the responsible use of herbicides, pesticides, fertilizers, and septic discharges that can migrate into groundwater aquifers during recharge.

5.8.4 Understanding Salt Loading and the Implications on Water Quality and Land Use

Increasing salinity in both surface water and groundwater is a concern. As salinity rises in water supply sources, managers may have a harder time meeting wastewater discharge requirements. Rising salinity levels also may reduce the productivity of agricultural lands. The sources of salinity within the Region are dissolution of salts from rocks and soils in the watershed and various land use factors, such as the softening of domestic water that flows to wastewater treatment plants, agricultural irrigation using water with high levels of total dissolved solids, application of fertilizers to agricultural lands, and land-applied wastewater discharges. Recycled water applications in the Region are limited and have been developed mainly to meet disposal requirements. Increasing the use of recycled water as a supply source likely will require a better understanding of salt loading in the Region through the preparation of salt and nutrient management plans.

5.9 Recreation

Recreation and tourism provide significant economic benefits to the Region, particularly in the Upper Cache Creek area around Clear Lake and the Upper Putah Creak area around Lake Berryessa. Current recreational opportunities in the Region include camping, fishing, and boating as well as rafting on Class II to Class V white-water rapids. Tourism opportunities in the Region include gaming, resorts with entertainment, and wine tasting. The attraction of the area is its rural character and growth in tourism and recreational opportunities in the Region should be managed and guided with the intention to preserve its rural attributes. Conversely, improving water quality and maintaining sufficient water levels within recreational lakes and reservoirs will be critical to preserving and expanding recreation and tourism opportunities within the Region.

5.10 Land Use

5.10.1 Preserving Agricultural Lands and a Thriving Agricultural Economy

Urbanization poses a minimal threat to the existing agricultural character of the Region because of its vast acreages of prime agricultural soils and the Region-wide goal to maintain agricultural lands, as outlined in the county general plans. The urban growth that is anticipated through the planning horizon should continue to be guided, through appropriate land use planning, to prioritize preservation of agricultural lands.

5.10.2 Reducing the Degradation of Soils, Water Bodies, and Habitat Caused by Land Uses and Other Human Activities

The following land uses and human activities can contribute to the degradation of soils, water bodies, and habitat and can make watershed management more difficult. While some of the listed activities have been described under several earlier topics, they are emphasized here because of their importance to the stakeholders:

- Alteration of the natural landscape for any purpose, creating disturbed soils susceptible to erosion, and requiring installation of minimum control measures prescribed for NPDES stormwater 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 stormwater 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; and

- Potential for conflict between land and water use for: (a) recreation and tourism, (b) agriculture, and (c) opportunities to restore and preserve the environment.

5.10.3 Balancing Recreational Opportunities and Environmentally Responsible Commercial Activities with the Conservation of Natural and Cultural Resources on State and Federal Lands

Federal and state lands are intended to be managed to meet multiple, and sometimes conflicting, goals. Often the impacts of resource development must be balanced with environmental restoration and conservation efforts. On Bureau of Land Management (BLM) lands, the increase in activities such as livestock grazing, energy and mineral extraction, wind energy development, and recreational use may impact the preservation of cultural and natural resources, including wildlife and fish, vegetation, and riparian and wetland ecosystems.

One example of an effort to manage conflicting goals is the 2006 *Ukiah Resource Management Plan,* covering over 270,000 acres in Northern California, including BLM lands in the Region from Lake Berryessa through Lake County. The *Ukiah Resource Management Plan* describes the management areas and approaches used to protect and improve natural resources while allowing mineral extraction, livestock grazing and recreation to occur.

In the Mendocino National Forest, management of timber, rangeland, mineral, and energy resources, construction of transportation facilities, fire management, and increased recreational use may conflict with restoration and conservation efforts, such as improvements to fish and wildlife habitat, protection of threatened and endangered species, management of areas prone to mass soil movement and soil instability, enhancement of water quality and quantity, and watershed restoration. The *Mendocino Forest Management Plan* (1995) seeks to balance these potentially conflicting activities by creating management areas where various conservation and restoration activities can balance resource management and economic benefit.

CDFW seeks to protect natural habitats, such as grassland, riparian woodland, oak woodland, serpentine chaparral, and serpentine grassland, while also determining and guiding an appropriate level of public use, enjoyment, and benefit. CDFW manages these activities primarily through consultation and issuance of streambed alteration agreements.

5.10.4 Incorporating Federal and State Land Management Participation in Watershed Restoration and Water Quality Improvements

Federal and state agencies such as BLM, United States Forest Service, and CDFW operate as land managers in the Region. The use of federal and state lands often focuses on resource development activities like forestry, energy, and grazing. However, balancing resource development with environmental protection is essential to sustainable watershed management. The participation of federal and state land use agencies is crucial to the success of watershed restoration and water quality improvements.

Section 6: Goals and Objectives

The goals and objectives presented in this section represent the foundational intent of this *Integrated Regional Water Management Plan* (IRWM Plan). Formulating meaningful and relevant goals and objectives for the Westside Sacramento Region (Region) Plan required more collaboration and collective interaction than the work documented in any other section of this Plan. The goals and objectives were developed over an 11-month period, with about 15 conversations among various combinations of the Coordinating Committee, stakeholder group, and Consultant Team. The draft goals and objectives were circulated for review and comment to the stakeholders five times to allow for thorough consideration and refinement of what ultimately will direct the Plan.

6.1 Planning Terms

People familiar with the discipline of planning recognize that different agencies and organizations use similar terms in slightly different ways in their processes. During the overall IRWM planning process, the Consultant Team established and used the following terms:

- Planning process goals,
- Plan goals, and
- Plan objectives.

Within this Plan, the term "goal" means a desired outcome or result for which effort will be made to accomplish it.

The "planning process goals" set near the beginning of the Plan development process describe what the Coordinating Committee intended to accomplish by the time the Plan is adopted. These are presented in Section 1.3.1.

The "Plan goals," which are presented in Section 6.3, give a high-level perspective of what the Plan is intended to address (and by inference, what it is not intended to address). The Plan goals are written so that they will be relevant over the entire planning horizon and beyond, and they may never be fully realized. In other words, effort towards achieving the Plan goals is expected to continue indefinitely. For example, the first goal, "Acknowledge and respect the cultural values and resources of the Region," is one that the stakeholders should always strive to achieve and improve.

In contrast, the term "objective" means a specific and tangible outcome that is intended to be achieved by or during a designated time. The Plan objectives, presented in Section 6.4, were developed using "SMART" criteria, meaning that each objective should be specific, measurable, attainable, relevant, and time-based. When crafted properly, SMART objectives help to promote actions that lead to measurable results consistent with Plan goals. The Plan objectives allow people to measure and track progress toward improving integrated water management within the Region over time.

In some cases, the Plan objectives include specific dates for completion (for example, Objective 4). In other cases, they are to be worked toward throughout the planning period (for example, Objective 1). In a few cases, the intended completion date of an objective may depend on completing another objective (for example, Objective 6).

6.2 Process for Developing Goals and Objectives

The Plan goals and objectives were developed between January and December 2012 using an iterative and collaborative approach that included three phases:

- Identify challenges and opportunities within the Region,
- Propose draft Plan goals and discuss, review, and refine them, and
- Propose draft Plan objectives and discuss, review, and refine them.

The first step was to identify the water-related challenges and opportunities that stakeholders believed to be important in the Region now. Once the stakeholder group had identified a representative list of challenges and opportunities (see Section 5), Plan goals were proposed by individual stakeholders, the Consultant Team, and members of the Coordinating Committee. The draft Plan goals were discussed, reviewed, and refined over several months until broad agreement on them was reached.

6.3 Plan Goals

The Plan goals are listed alphabetically below:

1. **Acknowledge and respect the cultural values and resources of the Region.**
   In 2010, the Westside Region included in its nearly 3,000 square miles a diverse population of almost 400,000 people and nearly 530,000 acres of farmland. With a long history of changing culture and landscapes, the Region remains home to a number of Native American tribes. This goal is intended to highlight the diverse cultural values and resources in the Region and to promote collaboration to preserve that diversity.

2. **Improve education and awareness throughout the Region about water, watershed functions, and ecosystems and the need for sustainable resource management to protect community health and well-being.**
   Natural scientists and resource management professionals recognize the complex interdependencies between people, their use of water, watersheds, and associated ecosystems. Unfortunately, many others do not recognize or appreciate this interdependence. This goal underscores the importance of educating the citizens of the Region about their roles in this complex and dynamic water system and what they can do to help their communities and ecosystems to be healthy and thrive over the long term.

3. **Improve the collective understanding of watershed characteristics and functions (natural and human-induced) within the Region as needed to respond effectively to evolving water resources management challenges and opportunities (e.g., climate change).**
   As mentioned before in this Plan, the watersheds within the Region are complex and dynamic. As human activities and water uses have changed and continue to change, the watersheds and other resources have also changed. This goal highlights the importance of continuing to learn more about the characteristics and functions of the watersheds in order to respond strategically and skillfully to future changes.

4. **Improve the form and function of degraded natural channels.**
   Unfortunately, many of the natural channels in the Region have been altered significantly as land uses, water management, and flood protection practices have changed. In many cases, these changes have degraded important habitats and the water conveyance capacities of the channels. This goal emphasizes the need to improve the form and function of natural channels to allow them to provide multiple benefits and require less human intervention and maintenance over time.

5. **Improve water-related public health across the Region and emphasize improvements for populations most in need.**
   Water plays a critical role in the public health of citizens within the Region. Everyone relies on water supplies for household use, sanitation, and food production. Also, the quality of the water for drinking and recreation can affect the health of people suddenly and over time. Several of the areas within the Region include citizens who are considered economically disadvantaged. This segment of the population can be disproportionately challenged in achieving health. This goal emphasizes the need to continue to focus on improving public health, especially for those citizens who need support the most.

6. **Preserve and enhance water-related recreational opportunities.**
   People enjoy a wide variety of recreational opportunities related to the water features of the Region. This goal acknowledges that efforts to sustain and enhance recreational opportunities into the future are an important component of integrated water management.

7. **Preserve, improve, and manage water quality to meet designated beneficial uses for all water bodies within the Region.**
   A number of water quality concerns and challenges for surface water and groundwater exist throughout the Region. The level of concern or challenge about the water quality depends upon how the water is being used and the specific water body or aquifer being considered. This goal highlights the importance of improving the water quality within some water bodies as appropriate to water uses and of preserving water quality levels that are now within desirable ranges.

8. **Promote reasonable use of water and watershed resources.**
   Water and natural resources within the Region play a central role in the health and well-being of its citizens. As population grows, it becomes increasingly important to use water and natural resources sustainably. One way to support sustainability is to avoid wasting water and other natural resources and to continue to implement cost-effective conservation and efficiency improvements. Work towards achieving this goal will help reduce the Region's dependence on the Sacramento-San Joaquin Delta for water supply.

9. **Protect and enhance habitat and biological diversity of native and migratory species.**
   Much of the riparian habitats within the Region have been affected negatively by changes in land use, water management, and flood protection practices over the past 100 years. This goal underscores the importance of protecting and improving the remaining habitats in ways that benefit native and migratory species.

10. **Provide reliable water supplies of suitable quality for multiple beneficial uses (e.g., urban, agriculture, environmental, and recreation) within the Region.**
    As shown in Section 3, people within the Region have many different uses for water that produce a variety of benefits. Providing these water supplies at the desired time, place, quantity, and quality requires (and will continue to require) significant effort and investments in maintaining and improving infrastructure and other systems to conjunctively manage groundwater and surface water, which will reduce dry-year dependence on the Sacramento-San Joaquin Delta.

11. **Reduce the risks of disruptive natural and human-caused disturbances affecting the Region's water resources, including flooding, fire, and significant institutional interruptions that reduce resources management services.**
    People face numerous hazards within the Region that could harm their health and well-being. This goal highlights the importance of continuing to monitor, understand, and mitigate the range of hazards related to water and watershed management (such as floods, wildfires, budgetary crises, etc.) that could negatively impact the citizens of the Region.

12. **Support improved regional water management through governance throughout the Region that uses science and collaboration to make fair and equitable decisions and investments.**
    This goal acknowledges the wide array of stakeholders and diverse interests within the Region and commits water managers within the Region to continue to use science and open, fair, and collaborative approaches to managing water resources and making decisions about investments that affect many people.

13. **Support sustainable economic activities consistent with local and state government planning efforts within the Region.**
    This goal highlights the fact that all water management activities within the Region are carried out to support a stable and growing economy for citizens and communities over the long term. Among the many factors influencing economic stability and growth, integrated water management is one of the most crucial factors. Local and state government must continue to improve integrated water management to achieve the economic stability that is desired.

6.4 Plan Objectives

Once a draft list of Plan goals was formed, the Project Team began proposing potential Plan objectives that met the SMART criteria. The first-draft Plan objectives were presented in April 2012 and discussed, reviewed, and refined over seven months, leading to the 24 broadly supported Plan objectives listed below. The Plan objectives are organized according to the 10 focus areas identified for the challenges and opportunities (see Section 5).

Given the number of objectives and range of activities needed to meet them, the Project Team and stakeholders decided to prioritize the objectives to help focus efforts during Plan implementation. The Project Team set initial priorities for the objectives by evaluating their *importance* and *urgency*. The *importance* assigned to each objective reflects the significance or consequence to the Region as a whole of satisfying that objective compared with other objectives. The *urgency* assigned to each objective reflects the degree to which that objective

warrants speedy attention or action compared with other objectives. The preliminary prioritization was then presented during stakeholder meetings and reviewed, discussed, and refined.

Table 6-1 summarizes the objectives, which are grouped by focus area. The table also indicates the importance and urgency of each and the Plan goals they address. Table 6-2 shows the relationship between Plan goals and objectives. Table 6-3 presents the objectives according to importance and urgency, showing which have the highest priority.

The narrative that follows these tables presents the full statement of each objective, along with how to qualitatively and quantitatively measure whether it has been accomplished, which Plan goals it addresses, its importance and urgency, and other information.

Table 6-1: Summary of Objectives

Summary of Objective	Importance*	Urgency**	Plan Goals
Education and Awareness Focus			
1. Provide/promote use of educational curricula for K-12 students	Medium	Low	2, 3, 8, 12
2. Provide educational information to encourage stewardship by public	Medium	Low	2, 3, 8, 12
Habitat Focus			
3. Restore native vegetation/form/function in riparian/aquatic corridors	Medium	Medium	1, 4, 6, 9
4. Quantify extent of suitable life-cycle habitat for threatened/endangered/imperiled (T/E/I) native fish	High	Medium	3, 6, 9, 12
5. Prioritize/plan/schedule improvements to life-cycle habitat for threatened/endangered/imperiled native fish	High	Medium	3, 6, 9, 12
6. Increase availability of suitable life-cycle habitat for threatened/endangered/imperiled native fish	High	Medium	4, 6, 9
Invasive Species Focus			
7. Prevent colonization by quagga/zebra mussels and eliminate/prevent spread of New Zealand mud snail	High	High	6, 9, 10, 13
8. Establish invasive plant management plan	Medium	Medium	3, 4, 6, 9, 11, 12
9. Implement invasive plant management plan	Medium	Medium	4, 6, 9, 11
Infrastructure Focus			
10. Create asset management plan for key water management infrastructure	Medium	Low	2, 3, 7, 10, 11, 12, 13
Reasonable Use Focus			
11. Meet 20% by 2020 conservation targets	Medium	Medium	8, 10, 13
12. Increase adoption of agricultural best management practices (BMPs)	Medium	Medium	4, 7, 8, 10, 13
Recreation Focus			
13. Maintain and increase water-related recreational opportunities	Medium	Low	6, 13
Risk Management Focus			
14. Provide adequate flood protection	High	Medium	4, 5, 11, 13
15. Manage watershed activities to reduce large erosion events	Medium	Medium	4, 6, 7, 8, 11
Understand Watershed Function Focus			
16. Monitor state/federal Delta programs	Medium	High	3, 12

Summary of Objective	Importance*	Urgency**	Plan Goals
17. Monitor conditions/improve understanding to support sustainable groundwater basins	High	Low	3, 7, 10, 12, 13
18. Maintain and enhance watershed and natural resource monitoring network and information sharing	High	Medium	2, 3, 7, 10, 11, 12, 13
Water Quality Focus			
19. Address pollutant sources to meet runoff standards and total maximum daily load (TMDL) targets	High	Medium	5, 6, 7, 9
20. Minimize accidental wastewater spillage/discharges	Medium	Medium	5, 6, 7, 9, 13
21. Reduce public health risks by reducing contaminants in drinking water sources	Medium	Medium	3, 7, 10, 13
22. Meet all drinking water and wastewater discharge standards	High	High	5, 6, 7, 9, 13
Water Supply Focus			
23. Provide 100% reliability of municipal and industrial (M&I) water supplies	High	Medium	1, 7, 10, 13
24. Provide agricultural water supplies to support a robust agricultural industry	High	Medium	1, 10, 13

* The "importance" assigned to each objective reflects the significance or consequence to the Region of satisfying this objective compared with other objectives.

** The "urgency" assigned to each objective reflects the degree to which this objective warrants speedy attention or action compared with other objectives.

Table 6-2: Relationship between Plan Objectives and Plan Goals

Summary of Objective	Plan Goals												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Provide/promote use of educational curricula for K-12 students		●	●					●				●	
2. Provide educational information to encourage stewardship by public		●	●					●				●	
3. Restore native vegetation/form/function in riparian/aquatic corridors	●			●		●			●				
4. Quantify extent of suitable life-cycle habitat for T/E/I native fish			●			●			●			●	
5. Prioritize/plan/schedule improvements to life-cycle habitat for T/E/I native fish			●			●			●			●	
6. Increase availability of suitable life-cycle habitat for T/E/I native fish				●		●			●				
7. Prevent colonization by quagga/zebra mussels and eliminate/prevent spread of New Zealand mud snail						●			●	●			●
8. Establish invasive plant management plan			●	●		●			●		●	●	
9. Implement invasive plant management plan				●		●			●		●		
10. Create asset management plan for key water management infrastructure		●	●				●			●	●	●	●
11. Meet 20% by 2020 conservation targets								●		●			●
12. Increase adoption of agricultural BMPs				●			●	●		●			●
13. Maintain and increase water-related recreational opportunities						●							●
14. Provide adequate flood protection				●	●						●		●
15. Manage watershed activities to reduce large erosion events				●		●	●	●			●		
16. Monitor state/federal Delta programs			●									●	

	Plan Goals												
	1	2	3	4	5	6	7	8	9	10	11	12	13
17. Monitor conditions/improve understanding to support sustainable groundwater basins			●				●			●		●	●
18. Maintain and enhance watershed and natural resource monitoring network and information sharing		●	●				●			●	●	●	●
19. Address pollutant sources to meet runoff standards and 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					●	●	●		●				●
23. Provide 100% reliability of M&I water supplies	●						●			●			●
24. Provide agricultural water supplies to support a robust agricultural industry	●									●			●

Table 6-3: Objectives Arranged by Importance/Urgency

Summary of Objective	Importance*	Urgency**
7. Prevent colonization by quagga/zebra mussels and eliminate/prevent spread of New Zealand mud snail	High	High
22. Meet all drinking water and wastewater discharge standards	High	High
4. Quantify extent of suitable life-cycle habitat for T/E/I native fish	High	Medium
5. Prioritize/plan/schedule improvements to life-cycle habitat for T/E/I native fish	High	Medium
6. Increase availability of suitable life-cycle habitat for T/E/I native fish	High	Medium
14. Provide adequate flood protection	High	Medium
18. Maintain and enhance watershed and natural resource monitoring network and information sharing	High	Medium
19. Address pollutant sources to meet runoff standards and TMDL targets	High	Medium
23. Provide 100% reliability of M&I water supplies	High	Medium
24. Provide agricultural water supplies to support a robust agricultural industry	High	Medium
17. Monitor conditions/improve understanding to support sustainable groundwater basins	High	Low
16. Monitor state/federal Delta programs	Medium	High
3. Restore native vegetation/form/function in riparian/aquatic corridors	Medium	Medium
8. Establish invasive plant management plan	Medium	Medium
9. Implement invasive plant management plan	Medium	Medium
11. Meet 20% by 2020 conservation targets	Medium	Medium
12. Increase adoption of agricultural BMPs	Medium	Medium
15. Manage watershed activities to reduce large erosion events	Medium	Medium
20. Minimize accidental wastewater spillage/discharges	Medium	Medium
21. Reduce public health risks by reducing contaminants in drinking water sources	Medium	Medium
1. Provide/promote use of educational curricula for K-12 students	Medium	Low
2. Provide educational information to encourage stewardship by public	Medium	Low
10. Create asset management plan for key water management infrastructure	Medium	Low
13. Maintain and increase water-related recreational opportunities	Medium	Low

* The “importance” assigned to each objective reflects the significance or consequence to the Region of satisfying this objective compared with other objectives.

** The “urgency” assigned to each objective reflects the degree to which this objective warrants speedy attention or action compared with other objectives.

6.4.1 Education and Awareness Focus

1. **Provide and promote use of educational curricula for K-12 students designed to increase awareness of watershed and resource stewardship and how individual stewardship relates to community health and well-being, from July 2013 through the planning period.**

   Qualitative Measurement

   None

   Quantitative Measurement

   - Availability of curricula suitable to each grade and student population within the Region.
   - Number of schools contacted each year to promote use of curricula.
     - Target: Contact 50% of all schools in Region each year.
   - Number of students who receive instruction from grade-suitable curricula.
     - Target: Reach 30% of student population within the Region each year starting in 2014.

   Addresses Plan Goals

   2, 3, 8, and 12

   Priority

   Importance = Medium
   Urgency = Low

   Notes

   - One opportunity for the Region is to host an education summit as part of Plan implementation that could result in new targets that would replace the current ones.
   - A cooperative, statewide effort, called the California Education and Environment Initiative (EEI), is already in place to help K-12 students learn about the environment and how it relates to their everyday lives. Curriculum information provided by the California Department of Education can be found at http://www.dec.ca.gov/ci/sc/ee/.

2. **Provide educational information for the adult population designed to increase awareness of watershed and resource stewardship and how individual stewardship relates to community health and well-being within the Region, from July 2013 through the planning period.**

   Qualitative Measurement

   None

   Quantitative Measurement

   - Number of people who receive the educational materials/messages within the Region each year.
     - Target: 10% of population annually.

Addresses Plan Goals

2, 3, 8, and 12

Priority

Importance = Medium
Urgency = Low

Notes

Agencies in neighboring IRWM Regions who intend to conduct similar public education campaigns likely will be able to coordinate and share resources (e.g., the Regional Water Authority in the American River Basin Region has expressed interest in collaborating on this objective).

6.4.2 Habitat Focus

3. Restore native vegetation and form and function along riparian corridors, canals, and other aquatic sites throughout the Region through 2035 to provide stream shading, habitat enhancement, and increased biological diversity.

Qualitative Measurement

None

Quantitative Measurement

- Acres restored along corridors, canals, and ditches; number of native plants planted; improved connectivity of habitat corridors; etc.
    - Target: Support goals established within natural community conservation plans (NCCPs), habitat conservation plans (HCPs), and other habitat planning documents for the Region. (See Section 2 for a list of existing habitat planning documents and a summary of goals and targets within them.)

Addresses Plan Goals

1, 4, 6, and 9

Priority

Importance = Medium
Urgency = Medium

Notes

As habitat planning documents are added or updated, these targets need to be updated as well.

4. Quantify the extent of suitable life-cycle habitat currently accessible to T/E/I native fish within the Region by December 31, 2014.

Qualitative Measurement

None

Quantitative Measurement

Existence of documentation of extent of suitable life-cycle habitat currently accessible to T/E/I native fish within the Region.

Addresses Plan Goals

3, 6, 9, and 12

Priority

Importance = High
Urgency = Medium

Notes

- Will require compilation of a list of the T/E/I native fish species within the Region.
- Will require definition of criteria for "suitable habitat currently accessible" for each species.
- This objective is linked to Objectives 5 and 6.

5. Prioritize, plan, and schedule improvements in suitable life-cycle habitat accessible to T/E/I native fish within the Region by December 31, 2015.

Qualitative Measurement

None

Quantitative Measurement

The existence of a document with planned, prioritized, and scheduled improvements.

Addresses Plan Goals

3, 6, 9, and 12

Priority

Importance = High
Urgency = Medium

Notes

This objective is linked to Objectives 4 and 6.

6. Increase availability of suitable life-cycle habitat for T/E/I native fish identified by Objective 5.

Qualitative Measurement

None

Quantitative Measurement

Increase in area (such as number of acres of suitable spawning area) of suitable life-cycle habitat that is accessible to target species.

Addresses Plan Goals

4, 6, and 9

Priority

Importance = High
Urgency = Medium

Notes

This objective is linked to Objectives 4 and 5.

6.4.3 Invasive Species Focus

7. **Prevent colonization of any regional water body by quagga mussels or zebra mussels and eliminate or prevent the spread of New Zealand mud snails from Putah Creek during the planning period.**

Qualitative Measurement

None

Quantitative Measurement

Presence (or absence) of target invasive species by location within the Region.

Addresses Plan Goals

6, 9, 10, and 13

Priority

Importance = High
Urgency = High

Notes

A number of aquatic invertebrate prevention programs are operational within the Region now.

8. **Establish an invasive plant management plan (including specific and measurable targeted outcomes for species of concern and a schedule to accomplish target outcomes) for the entire Region by December 31, 2015.**

Qualitative Measurement

None

Quantitative Measurement

Existence of an invasive plant management plan for the Region or integration of existing plans.

Addresses Plan Goals

3, 4, 6, 9, 11, and 12

Priority

Importance = Medium
Urgency = Medium

Notes

- Lake County has a countywide plan that could be integrated with other plans or serve as a basis for a Region-wide plan.
- This objective is linked to Objective 9.

9. **Implement programs and projects to meet the outcomes defined in the invasive plant management plan developed through Objective 8 (according to the schedule provided in that plan).**

Qualitative Measurement

None

Quantitative Measurement

Measures appropriate to the targeted outcomes identified in the invasive plant management plan created through Objective 8.

Addresses Plan Goals

4, 6, 9, and 11

Priority

Importance = Medium
Urgency = Medium

Notes

This objective is linked to Objective 8.

6.4.4 Infrastructure Focus

10. **Create an asset management plan for key water management infrastructure within the Region consistent with the guidance provided in the *International Infrastructure Management Manual*, by December 31, 2015.**

Qualitative Measurement

None

Quantitative Measurement

Existence of asset management plan.

Addresses Plan Goals

2, 3, 7, 10, 11, 12, and 13

Priority

Importance = Medium
Urgency = Low

Notes

The California Emergency Management Agency “critical infrastructure protection” criteria and the work done for existing natural hazard mitigation plans may be useful bases for identifying key water management infrastructure within the Region and setting investment priorities.

6.4.5 Reasonable Use Focus

11. Meet 20% by 2020 statewide water conservation targets by December 31, 2020.

Qualitative Measurement

None

Quantitative Measurement

Water conservation measured in gallons per capita per day (gpcd) as defined by the Water Conservation Act of 2009 and California Department of Water Resources (DWR) guidance methodologies. Use Urban Water Management Plans (UWMPs) to measure progress. The 2015 interim and 2020 compliance targets for each urban water supplier in the Region are summarized in the following table:

Urban Water Supplier	Baseline (gpcd)	2015 Interim Target (gpcd)	2020 Compliance Target (gpcd)
City of Vacaville	172	169	166
City of Rio Vista	320	---	256
City of Davis	203	204	167
City of Dixon	166	168	164
City of West Sacramento	305	275	244
City of Woodland	289	260	231

Note: Rio Vista 2010 UWMP did not include a 2015 Interim Target.

Addresses Plan Goals

8, 10, and 13

Priority

Importance = Medium
Urgency = Medium

Notes

The UWMP compliance targets are subject to review and revision during the 2015 UWMP development cycle. Water use efficiency is important to all water agencies but particularly important to agencies that use imported water diverted from the Sacramento River; meeting this objective will be one of the primary means to reduce the Region's dependence on the Delta for water supply.

12. Increase adoption of locally cost-effective agricultural BMPs throughout the planning period.

Qualitative Measurement

None

Quantitative Measurement

- Compliance with Senate Bill SBX7-7.
- Number of required efficient water management practices (EWMPs) adopted.
- Number of optional EWMPs adopted.

- Number of BMPs adopted beyond EWMPs.

Addresses Plan Goals

4, 7, 8, 10, and 13

Priority

Importance = Medium
Urgency = Medium

Notes

- EWMPs are a subset of all potential BMPs.
- A list of EWMPs can be found in California Water Code §10608.48(c).
- Other agricultural BMPs include actions to protect or improve water quality, improve soil conservation, or reduce impacts on habitat.
- Since agricultural water users can divert up to 600,000 acre-feet per year (AFY) from the Sacramento River, use of EWMPs is critical to reducing the Region's dependence on the Delta for water supply.

6.4.6 Recreation Focus

13. Maintain and increase water-related recreational opportunities within the Region throughout the planning period.

Qualitative Measurement

None

Quantitative Measurement

- Describe maintenance activities that benefit water-related recreation performed annually.
- Describe additional or enhanced water-related recreational opportunities provided annually.

Addresses Plan Goals

6 and 13

Priority

Importance = Medium
Urgency = Low

Notes

Because some areas within the Region rely more heavily on water-related recreational opportunities as part of the local economy than other areas, actions to maintain water-related recreation may hold a higher priority for those areas (e.g., communities surrounding Clear Lake).

6.4.7 Risk Management Focus

14. Provide adequate flood protection for all urban and rural areas within the Region by December 31, 2050.

Qualitative Measurement

None

Quantitative Measurement

- Change in calculated level of flood protection.
    - Targets: Provide flood protection consistent with the Central Valley Flood Protection Plan. For urban and urbanizing areas, meet the urban level of flood protection; for other developed areas, meet the Federal Emergency Management Agency (FEMA) standard of flood protection; for rural areas, provide the level of protection warranted for the assets subject to damage.

Addresses Plan Goals

4, 5, 11, and 13

Priority

Importance = High
Urgency = Medium

Notes

While the completion date for this objective is 2050, projects that contribute toward meeting this objective are expected to be implemented within the current planning horizon of 2035.

15. Manage watershed activities and conditions to reduce the risk of large erosion events that could increase undesirable sediment loading to water bodies throughout the planning period.

Qualitative Measurement

None

Quantitative Measurement

- Number of large erosion events documented each year.
- Number of preventive measures taken and repairs made to reduce large erosion events.

Addresses Plan Goals

4, 6, 7, 8, and 11

Priority

Importance = Medium
Urgency = Medium

Notes

Tracking progress on this objective will require establishment of a definition of (and possibly criteria to identify) a "large erosion event."

6.4.8 Understand Watershed Function Focus

16. Monitor planning of state and federal water-related projects and programs in the Delta and estimate potential local impacts throughout the planning period.

Qualitative Measurement

- Scientific information and studies available that characterize potential impacts to Region.
- Active participation and engagement in identified state and federal water resources planning and projects.

Quantitative Measurement

None

Addresses Plan Goals

3 and 12

Priority

Importance = Medium
Urgency = High

Notes

None

17. Monitor conditions and improve understanding to support sustainable use of groundwater basins within the Region throughout the planning period.

Qualitative Measurement

- Sufficient information available to understand and predict status of aquifer functions over the long term.
- Understanding of opportunities to improve regional water supply portfolio through conjunctive management, which supports means to potentially reduce dry-year dependence on Delta Water supplies.

Quantitative Measurement

Prevent long-term declines in groundwater levels and quality throughout the Region.

Addresses Plan Goals

3, 7, 10, 12, and 13

Priority

Importance = High
Urgency = Low

Notes

- Potential long-term declines of groundwater levels can be assessed by computing and reporting a 10-year moving average of groundwater levels at key locations for active aquifers each year within the Region. Comparing the 10-year moving average for each year should filter out most effects of annual variability in local precipitation, groundwater use, and recharge.
- Potential long-term declines in water quality can be assessed by computing an annual average for key constituents from select groundwater wells in active aquifers. The aquifers and constituents to be tracked for each aquifer need to be identified.

18. Maintain and enhance monitoring network and information sharing to support management of watersheds and natural resources within the Region throughout the planning period.

Qualitative Measurement

- Availability of important information.
- Ease of access to data and information across agency boundaries.

Quantitative Measurement

None

Addresses Plan Goals

2, 3, 7, 10, 11, 12, and 13

Priority

Importance = High
Urgency = Medium

Notes

- See Section 10 for more detail related to data collection and management.

6.4.9 Water Quality Focus

19. Address pollutant sources to meet runoff standards and satisfy targets as described in specific TMDLs within the Region throughout the planning period.

Qualitative Measurement

Actions taken to address pollutant sources.

Quantitative Measurement

- Compliance with runoff standards described in stormwater permits.
- Progress toward meeting targets identified in TMDLs within the Region.

Addresses Plan Goals

5, 6, 7, and 9

Priority

Importance = High
Urgency = Medium

Notes

The following table summarizes the existing TMDLs within the Region:

Water Body	Pollutant	Resolution No.	Target	Compliance Date
Clear Lake	Nutrients	R5-2006-0060	87,100-kilogram (kg) average annual discharge to lake of phosphorus (five-year rolling average).	By 10 years after approval by Office of Administrative law (OAL).
Clear Lake	Mercury	R5-2002-0207	Methylmercury concentration in fish tissue shall not exceed 0.09 and 0.19 mg methylmercury/kg wet weight of tissue in trophic level 3 and 4 fish, respectively.	Regional Water Board will review the progress toward meeting the fish tissue objectives for Clear Lake every five years.
Cache Creek, North Fork Cache Creek, and Bear Creek	Mercury	2005-0146	Average methylmercury concentration shall not exceed 0.12 and 0.23 mg methylmercury/kg wet weight of muscle tissue in trophic level 3 and 4 fish, respectively.	Regional Water Board will review the progress toward meeting the water quality objectives and the basin plan requirements at least every five years.

20. Minimize accidental spillage/discharges of wastewater to receiving waters throughout the planning period.

Qualitative Measurement

None

Quantitative Measurement

- Number of spills reported per year.
- Volume of wastewater spilled that reached receiving waters.
    - Target: Zero spills per year of wastewater that reaches receiving waters.

Addresses Plan Goals

5, 6, 7, 9, and 13

Priority

Importance = Medium
Urgency = Medium

Notes

None

21. Reduce public health risks by reducing contaminants of concern in drinking water sources throughout the planning period.

Qualitative Measurement

None

Quantitative Measurement

- Improvements in source water quality for constituents of concern.
- Cost savings for meeting quality standards for drinking water at point of delivery.
- Reductions in concentration of constituents of concern in drinking water at point of delivery.

Addresses Plan Goals

3, 7, 10, and 13

Priority

Importance = Medium
Urgency = Medium

Notes

This objective highlights that there are multiple ways within a watershed to meet drinking water standards and that cleaner sources of water can reduce public health risk.

22. Meet all drinking water and wastewater discharge standards within the Region throughout the planning period.

Qualitative Measurement

None

Quantitative Measurement

Compliance with all relevant quality standards.

Addresses Plan Goals

5, 6, 7, 9, and 13

Priority

Importance = High
Urgency = High

Notes

Basin plans designate or establish for the waters within a specified area beneficial uses to be protected, water quality objectives to protect those uses, and a program of implementation to achieve the objectives. The basin plans containing the water quality standards for the Central Valley Region are:

- *Water Quality Control Plan for the Sacramento River Basin and the San Joaquin River Basin*.
- *Water Quality Control Plan for the Tulare Lake Basin*.

State Implementation Policy (SIP) establishes a standardized approach for permitting discharge of toxic pollutants to non-ocean surface waters in a consistent manner.

- *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays and Estuaries of California*, State Water Resources Control Board, California Environmental Protection Agency, 2005.

The U.S. Environmental Protection Agency (EPA) promulgated numeric water quality criteria for higher-priority toxic pollutants and other water quality standard provisions to be applied to waters of the State of California to protect human health and the environment.

- California Toxics Rule (CTR).

The California Safe Drinking Water Act authorizes the California Department of Public Health to protect the public from contaminants in drinking water by establishing maximum contaminant levels (MCLs) that are at least as stringent as those developed by the U.S. EPA.

- Title 22, California Code of Regulations Division 4, Environmental Health Chapter 15, Domestic Water Quality and Monitoring Article 4, Primary Standards A— Maximum contaminant levels.

6.4.10 Water Supply Focus

23. Provide 100% reliability of M&I water supplies of appropriate quality to meet forecasted demands within the Region throughout the planning period.

Qualitative Measurement

None

Quantitative Measurement

- Number of days in reporting year that M&I water suppliers invoke drought ordinances.
- Number of days rationing is required in reporting year.
    - Target: Zero days of rationing per year.

Addresses Plan Goals

1, 7, 10 and 13

Priority

Importance = High
Urgency = Medium

Notes

- "Forecasted demands" include the amount of water estimated to be necessary to satisfy fire suppression needs.
- Meeting this objective can be accomplished through a variety of approaches, such as increased supplies, conjunctive management, water transfers, long-term demand management, etc.
- Satisfaction of this objective should include consideration of availability of alternative supplies should a drinking water source become contaminated or otherwise disrupted.

24. Provide agricultural water supplies of appropriate quality to support a robust agricultural industry within the Region throughout the planning period.

Qualitative Measurement

Changes in agricultural outputs within the Region over time.

Quantitative Measurement

- Groundwater levels and quality throughout the Region.
    - Target: Prevent long-term declines in groundwater levels and quality throughout the Region.
- Annual surface water deliveries for agricultural use compared with contracted amounts.
    - Target: Provide 100% reliability for contracted annual deliveries by Solano County Water Agency.

Addresses Plan Goals

1, 10, and 13

Priority

Importance = High
Urgency = Medium

Notes

- This objective is written differently than Objective 23 for M&I water supplies primarily because there are no "forecasted demands" for agriculture within the Region.
- While it is true that "a robust agricultural industry within the Region" relies on many factors, a consistent water supply of appropriate quality is a major factor.
- Since agriculture uses a large proportion of the applied water in the Region, conjunctive management of surface water and groundwater is critical to achieving this objective as well as to reduction of dry-year reliance on Delta water supplies.

6.5 Prioritized Climate Change Vulnerabilities

The climate change vulnerabilities identified in Section 3 were prioritized according to their relative linkage to Plan objectives. The following table summarizes climate change vulnerabilities with associated objectives and objective priorities:

	Climate Change Vulnerability Area /Sub-topic	Associated Objectives	Priority
Water Demand	1.2 Water use varies more than 50% seasonally in parts of the Region.	12	Medium
	1.3 Climate sensitive crops are grown within the Region.	12	Medium
	1.5 Water use curtailment measures are effective and can harden demand.	12	Medium
	1.4 Groundwater supplies in parts of the Region lack resiliency after drought events.	17	High
Water Supply	2.1 A portion of the water supply comes from snowmelt through the CVP/SWP.	11 and 12	Medium
	2.5 The Region faced a drought which it failed to meet local water demands.	11 and 12	Medium
	2.6 The Region has invasive species management issues at facilities, conveyance structures or in habitat areas.	7, 8, and 9	High
Water Quality	3.1 Increased wildfires are a threat in the Region.	15	Medium
	3.2 Part of the Region relies on surface water bodies with current or recurrent water quality issues related to eutrophication, such as… algal blooms.	19	High
	3.4 Beneficial uses for some water bodies cannot always be met due to water quality issues.	19	High
	3.5 Part of the Region observes water quality shifts during rain events that impact treatment facility operation.	15, 23, and 24	High
Sea Level Rise	4.5 There's a portion of the Region that floods at extreme high tides or storm surges.	14	High

	Climate Change Vulnerability Area /Sub-topic	Associated Objectives	Priority
Flooding	5.1 The Region has critical infrastructure that lies within the 200-year floodplain.	14	High
	5.2 A part of the Region lies within the Sacramento-San Joaquin Drainage District.	14	High
	5.3 Aging critical flood protection infrastructure exists in the Region.	10 and 14	High
	5.4 Flood control facilities have been insufficient in the past.	10 and 14	High
	5.5 Wildfires are a concern in parts of the Region.	15	Medium
Ecosystem and Habitat Vulnerability	6.1 The Region includes inland aquatic habitats vulnerable to erosion and sedimentation issues.	3, 4, 5, and 6	High
	6.2 The Region includes estuarine habitats which rely on freshwater flow.	3, 4, 5, and 6	High
	6.3 Climate-sensitive fauna or flora populations live in the Region.	3, 4, 5, and 6	High
	6.4 Endangered and threatened species exist in the Region.	4, 5, and 6	High
	6.5 The Region relies on aquatic or water-dependent habitats for recreation.	13	Medium
	6.6 Rivers in the Region have quantified environmental flow requirements or known water quality/quantity stressors to aquatic life.	3, 4, 5, 6, and 15	High
	6.8 The Region includes the Bay-Delta which is a habitat described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change.	4, 5, and 6	High

Section 7: Resource Management Strategies

The goals and objectives presented in Section 6 of the *Integrated Regional Water Management Plan* (IRWM Plan) for the Westside Sacramento Region (Region) describe the foundational intent of the Plan. The goals represent broad focus areas for water management actions in the Region, and the objectives describe specific outcomes that will improve water-related conditions. These water management actions, which will need to be taken by resource managers and other stakeholders, could include projects, programs, and policies designed to help agencies and local governments manage water and related resources. The California Department of Water Resources (DWR) refers to these types of projects, programs, and policies as resource management strategies (RMSs). A broad list of RMSs was identified in the *California Water Plan Update 2009* (DWR 2009) and must be considered for applicability in an IRWM Plan.

This section introduces the 32 RMSs from the California Water Plan that were reviewed by the project team to determine which were applicable to help meet the goals and objectives of the Plan. The applicable RMSs were then considered during the project development phase of the planning process.

7.1 Resource Management Strategy Summary

The *California Water Plan Update 2009* groups the RMSs into six management outcomes, which are summarized in Table 7-1. RMSs determined to be applicable to the Region are followed by a ✓, and those not applicable to the Region are followed by an ×. Applicable RMSs are those which could help address the major water-related challenges and opportunities summarized in Section 5 and could contribute to achieving the Plan goals and objectives discussed in Section 6.

Table 7-1: Summary of Management Outcomes and RMS

CWP Management Outcome	Resource Management Strategies
Reduce Water Demand	Agricultural Water Use Efficiency ✓ Urban Water Use Efficiency ✓ Crop Idling for Water Transfers ✓ Irrigated Land Retirement ✓ Rainfed Agriculture ✓
Improve Operational Efficiency and Transfers	Conveyance – Delta ✓ Conveyance – Regional/Local ✓ System Reoperation ✓ Water Transfers ✓ Waterbag Transport/Storage Technology ×
Increase Water Supply	Conjunctive Management & Groundwater Storage ✓ Desalination × Precipitation Enhancement × Recycled Municipal Water ✓ Surface Storage – CALFED × Surface Storage – Regional/local ✓ Dewvaporation or Atmospheric Pressure Desalination × Fog Collection ×

CWP Management Outcome	Resource Management Strategies
Improve Water Quality	Drinking Water Treatment and Distribution ✓ Groundwater Remediation/Aquifer Remediation ✓ Matching Quality to Use ✓ Pollution Prevention ✓ Salt and Salinity Management ✓ Urban Runoff Management ✓
Practice Resources Stewardship	Agricultural Lands Stewardship ✓ Economic Incentives (Loans, Grants, Water Pricing) ✓ Ecosystem Restoration ✓ Forest Management ✓ Land Use Planning and Management ✓ Recharge Area Protection ✓ Water-Dependent Recreation ✓ Watershed Management ✓
Improve Flood Management	Flood Risk Management ✓

✓ RMS potentially applicable to Westside Region.
× RMS not applicable to Westside Region.

Each RMS is described below, with discussion of how it could contribute to meeting specific plan goals and objectives and whether the strategy is applicable to the Region.

7.2 Reduce Water Demand

7.2.1 Agricultural Water Use Efficiency (Applicable)

The agricultural water use efficiency strategy involves measures that reduce the amount of water used for agricultural irrigation while maintaining agricultural productivity. This strategy includes improvements in irrigation technology and water management that directly increase water use efficiency as well as education and training efforts that lead to improved water management.

This strategy aligns with plan goals 2, 8, 10, and 13; the reasonable use focus objective 12 of increasing the adoption of agricultural best management practices (BMPs); and the water supply focus objective 24 of providing water supply reliability to agricultural users. The strategy could be implemented in the Region through irrigation audits to identify ways to promote efficient water use and improvement of irrigation systems, among other approaches. This strategy is a key component of the Water Conservation Act of 2009 (SB x7-7), which requires agencies providing water to more than 25,000 irrigated acres to prepare Agricultural Water Management Plans (AWM Plans). One of the components of AWM Plans is identification of Efficient Water Management Practices to encourage measures involving better irrigation systems and on-farm reasonable water use.

7.2.2 Urban Water Use Efficiency (Applicable)

The strategy for improved urban water use efficiency addresses indoor and outdoor residential, commercial, industrial, and institutional water uses. It is a key component of SBx7-7, which requires all urban water suppliers (with more than 3,000 connections or supplying more than 3,000 acre-feet per year [AFY]) to increase water use efficiency in an effort to meet the statewide goal of a 20% reduction in per capita water use by 2020. This strategy includes improvements in technology or water management that lower water use or increase beneficial uses from existing water quantities. This strategy also includes educational programs and other

measures that cause adoption of technological improvements or behavioral changes that reduce water demand.

This strategy aligns with plan goals 8, 10, and 13; education and awareness focus objectives 1 and 2; the reasonable use focus objective 11 of increasing adoption of water conservation measures by municipal and industrial users; and the water supply focus objective 23 of providing 100% reliability of municipal and industrial supplies. Compliance with SBx7-7 will be required of urban water suppliers as part of urban water management planning, while smaller water suppliers will likely coordinate their efforts, as they are subject to no specific requirements.

7.2.3 Crop Idling for Water Transfers (Applicable)

With crop idling for water transfers, irrigated lands are removed from production or dry farmed to make water available for transfer. As discussed in Section 3, agricultural water demand and use is managed on a farm level, and while no formal programs for crop idling exist, individual farmers, particularly those who receive surface water, make choices on plantings and/or crop idling depending on the available water supply. If this program became more formalized, water resulting from crop idling could be transferred to help improve water supply reliability for beneficial uses that produce higher economic returns than the crops being idled. This RMS is applicable to plan goals 8, 10, and 13 and to water supply focus objectives 23 and 24.

7.2.4 Irrigated Land Retirement (Applicable)

The irrigated land retirement strategy permanently removes farmland from irrigated agriculture. This strategy may be pursued to make water available for transfer or to solve drainage-related problems. As in crop-idling, individual farmers may seasonally or annually retire land from irrigation based on available water supply, which could reduce water demand and improve water supply reliability for other beneficial uses in alignment with plan goals 8, 10, and 13 and water supply focus objectives 23 and 24. However, this strategy would need to be implemented in a way that avoids conflict with the goal of respecting Region cultural values, which includes preservation of a vital agricultural economy.

7.2.5 Rainfed Agriculture (Applicable)

Rainfed agriculture relies solely on rainfall to provide all crop consumptive water use. In California, where little precipitation occurs during the spring and summer growing seasons, the use of this strategy is limited. Implementation of rainfed agriculture, also known as dry farming, requires matching cropping patterns to precipitation patterns, likely resulting in single cropping, most often used with crops that produce low economic returns such as hay. Rainfed agriculture currently is a common practice throughout the Region for thousands of acres of farmland including grain and hay crops and, in the upper watersheds, orchards. This RMS supports plan goals 1, 8, and 13.

7.3 Improve Operational Efficiency and Transfers

7.3.1 Delta Conveyance (Applicable)

Delta conveyance refers to the movement of water within the network of streams, sloughs, and channels of the Sacramento-San Joaquin Delta and out of the Delta through constructed water conveyance systems. This strategy deals with the management of Delta inflows and exports to meet various demands, including municipal, industrial, and agricultural water supply, navigation,

recreation, habitat, and flood conveyance. This RMS is relevant to the Westside Region because it includes both entities that divert water from the Delta and entities that use and convey upstream water in tributaries flowing to the Delta. Stream flow in the Delta and its tributaries is important for the life-cycle of several species of native fish, for water quality, for recreation, and for other uses. This RMS is aligned with plan goals 1, 2, 4, 6, 9, 10, 11, and 13, habitat focus objectives 3, 5, and 6, understand watershed function focus objectives 16 and 18, and water supply focus objectives 23 and 24.

7.3.2 Regional/Local Conveyance (Applicable)

Regional/local conveyance means the use of both natural waterways and built infrastructure to move water to areas where it is needed or away from areas to protect existing resources. This strategy covers the distribution and conveyance of local sources of water and imported water to improve water supply, water quality, recreation, habitat, and flood management. For the Westside Region, this RMS addresses conveyance activities outside the Delta, including conveyance from the Upper Cache and Upper Putah watersheds through the valley floor. It is related to the conjunctive management and groundwater storage RMS. It aligns with plan goals 4, 6, 9, 10, 11, and 12, infrastructure focus objective 10, risk management focus objective 14, habitat focus objectives 3, 5, and 6, recreation focus objective 13, and water supply focus objectives 23 and 24.

7.3.3 System Reoperation (Applicable)

System reoperation involves changes to the operation of water systems to address existing problems, increase water supply reliability, or adapt to future changes. The strategy includes reoperation of surface water storage facilities, groundwater systems, and associated conveyance infrastructures, which is directly related to the conjunctive management and groundwater storage RMS. In the Westside Region, this RMS aligns with plan goals 1, 5, 6, 7, 8, 9, 10, 11, and 13 and likely will be integral to meeting the water supply focus objectives 23 and 24. This RMS is also aligned with infrastructure focus objective 10 to create an asset management plan.

7.3.4 Water Transfers (Applicable)

Water transfers are voluntary exchanges of water or water rights among water users. A water transfer can be a change in point of diversion, place of use, or type of use. Water transfers typically occur using one of the following: transfer of water from reservoirs that would otherwise have been carried over to the following year; use of groundwater instead of surface water deliveries and transfer of the surface water rights; transfer of previously banked groundwater; reduction of existing consumptive use and transfer of the resulting water savings; and reduction of water losses and transfer of the recovered water. This RMS aligns with plan goals 7, 9, and 12 and could help achieve water supply focus objectives 23 and 24.

7.3.5 Waterbag Transport/Storage Technology (Not Applicable)

The waterbag transport/storage technology strategy takes water from coastal areas with unallocated freshwater supplies, stores it in inflatable bladders, and delivers it to another coastal area. This technology currently has limited capacity for strategically addressing long-term regional water planning needs and may require further research and development before full-scale implementation. As a result of the current stage of this technology and the fact that the Region is not located in a coastal location, this RMS was deemed not applicable.

7.4 Increase Water Supply

7.4.1 Conjunctive Management and Groundwater Storage (Applicable)

Conjunctive management is the coordinated use of surface water and groundwater to maximize the water available to a region. This strategy involves recharge of groundwater basins when excess surface water is available. In some areas of the Region, the conjunctive management and groundwater storage RMS is already actively practiced because of the availability of surface water supplies. This RMS aligns with plan goals 8, 10, 11, and 13 and likely will be an important element of achieving water supply focus objectives 23 and 24.

7.4.2 Desalination (Not Applicable)

Desalination refers to treatment processes that remove salts from water to achieve salinity concentrations that are acceptable for municipal and agricultural uses. The desalination strategy covers treatment of seawater, brackish water, and wastewater. This RMS may eventually become viable in portions of the Region where groundwater has high salinity concentrations to achieve the objectives under the water supply focus and water quality focus. However, the use of desalination within the Region likely will present significant challenges, such as how to dispose of the resulting brine. Another drawback is that desalination tends to require significant energy use and could contribute to greenhouse gas emissions. While this strategy could reduce negative impacts during drought conditions in drier parts of the Region, this RMS is not being considered for Region implementation at this time because of the factors described above.

7.4.3 Precipitation Enhancement (Not Applicable)

Precipitation enhancement, commonly called “cloud seeding,” artificially stimulates clouds to produce more rainfall or snowfall than they would naturally. Cloud seeding injects special substances into the clouds that enable snowflakes and raindrops to form more easily. This RMS is not being considered at this time, as the feasibility of precipitation enhancement activities in the Region is not known and funding for research and implementation of such projects has been largely unavailable.

7.4.4 Recycled Municipal Water (Applicable)

Water recycling is the treatment and reuse of wastewater. The recycled municipal water strategy applies specifically to the application of municipal wastewater with the intention of putting the water to a beneficial use that would not occur through discharge of the wastewater. As discussed in Section 3, this RMS is implemented to a limited extent in the Region, largely as a means of wastewater disposal. In select instances where wastewater discharge requirements result in highly treated wastewater, this RMS could be expanded to help meet water supply focus objectives 23 and 24.

7.4.5 CALFED Surface Storage (Not Applicable)

The *Record of Decision* (2000) by Collaboration Among State and Federal Agencies to Improve California's Water Supply (CALFED, now called the Delta Stewardship Council) identified five potential surface storage reservoirs that are being investigated by DWR, the U.S. Bureau of Reclamation, and local water interests. Building one or more of the reservoirs would be part of the agency’s long-term comprehensive plan to restore ecological health and improve water

management of the Bay-Delta. The five surface storage investigations are Shasta Lake Water Resources Investigation, In-Delta Storage Project, Upper San Joaquin River Basin Storage Investigation, North-of-the-Delta Offstream Storage, and Los Vaqueros Reservoir Expansion. These potential projects are not located in the Westside Region and will not directly affect it.

7.4.6 Regional/Local Surface Storage (Applicable)

Surface storage consists of the collection and storage of water within on-stream or off-stream reservoirs for later release. This strategy includes the use of surface storage for water supply as well as flood management. The Region already implements this RMS through the water stored at Clear Lake, Indian Valley Reservoir, and Lake Berryessa. Surface water will continue to be an important component of the Region's water supply, and at least one additional surface water storage project is proposed (the Adobe Creek Conjunctive Use Project); other off-stream storage projects have also been considered. This RMS aligns with plan goals 6, 7, 9, 10, 11, and 13, and it is critical to meeting water supply focus objectives 23 and 24, recreation focus objective 13, and to a more limited extent, habitat focus objectives 3 and 6.

7.4.7 Dewvaporation or Atmospheric Pressure Desalination (Not Applicable)

Atmospheric pressure desalination involves evaporation of brackish water for collection of condensate across a heat transfer wall. This technology is still under development for small-scale applications and is not a feasible RMS for the Region.

7.4.8 Fog Collection (Not Applicable)

Fog collection involves the use of nets or other structures to collect the moisture in fog. While coastal vegetation naturally collects moisture from fog for a significant portion of water needs in California, fog collection has not been practiced as a management strategy in the state. The inland location and climatic conditions in the Region are not conducive to intense fog development throughout the year, rendering fog collection an infeasible RMS for the Region.

7.5 Improve Water Quality

7.5.1 Drinking Water Treatment and Distribution (Applicable)

This strategy focuses on ensuring that water provided for human consumption is safe for drinking. Drinking water treatment includes processes that treat, blend, or condition water to meet potable standards; drinking water distribution includes the storage, pumping, and delivery of potable water to customers. This strategy includes measures within both the treatment processes and distribution system that are necessary to produce and maintain safe drinking quality. One of the significant challenges discussed in Section 5 relates to providing drinking water treatment and distribution, particularly in the more rural areas. This RMS aligns with plan goals 5, 10, and 13 and can help achieve water quality focus objective 22 to provide high-quality source water, which is one of the highest-priority objectives for the Region.

7.5.2 Groundwater and Aquifer Remediation (Applicable)

Groundwater and aquifer remediation is the improvement of groundwater quality to meet intended beneficial uses. Groundwater impairment may be the result of naturally occurring constituents or anthropogenic contamination. The groundwater and aquifer remediation strategy

includes both passive techniques, which allow for *in situ* degradation, and dispersion of contaminants and active treatment, which remove the contaminants through chemical, biological, or physical processes. Groundwater in some parts of the region has high levels of naturally occurring chromium, which are being evaluated for treatability to implement this RMS. If successful, this RMS could contribute to achieving the water quality focus objectives 21 and 22 and water supply focus objectives 23 and 24.

7.5.3 Matching Water Quality to Use (Applicable)

This strategy aims to optimize water resources by directing higher-quality sources of water to end uses that require that higher quality, such as drinking water or certain industrial processes, and sources of lower-quality water to applications where the lower quality is adequate to the use. This strategy reduces the treatment costs associated with water supply. This RMS is not formally used within the Region at this time, but it could be more fully explored to achieve water quality focus objectives 21 and 22 and water supply focus objectives 23 and 24, in conjunction with the recycled water RMS.

7.5.4 Pollution Prevention (Applicable)

The pollution prevention strategy addresses both point sources, such as wastewater treatment plants, and nonpoint sources, such as municipal stormwater discharges, agricultural runoff, and unauthorized land uses. This strategy includes efforts to identify sources of pollutant load, reduce pollution-causing activities, and capture pollutants before they enter waterways. This RMS aligns with plan goals 1, 5, 6, 7, 8, 9, 10, and 13. It is important for the Region, as it is relevant to multiple objectives, including water quality focus objectives 19 and 20, particularly as they relate to meeting TMDLs for mercury and other contaminants, and all the habitat focus, recreation focus, and water supply focus objectives.

7.5.5 Salt and Salinity Management (Applicable)

Salt and salinity management requires an understanding of how salts enter a region and are diluted and displaced within the region; as such, the salt and salinity management strategy includes studies on regional salt loading and the extent and magnitude of a region's salt problems. It also includes steps that reduce salt inputs and sequester or dispose of salts. The highly agricultural nature of the Region may present a future challenge to salt and salinity management. Achieving the groundwater aspect of the Understand Watershed Function Focus objective 17 will contribute to applying this RMS successfully in ways that could help provide water supplies of appropriate quality, as described in water supply focus objectives 23 and 24.

7.5.6 Urban Runoff Management (Applicable)

The urban runoff management strategy involves the capture, conveyance, and treatment of stormwater and dry weather runoff to improve flood management, water quality, or water supply. This RMS aligns with goals 5, 6, 7, 8, 9, 10, and 13. The IRWM Plan acknowledges the importance of this RMS, particularly as it relates to the pollution prevention RMS. This strategy aligns with the several water quality focus objectives to improve the quality of urban runoff (objectives 19 and 22).

7.6 Practice Resources Stewardship

7.6.1 Agricultural Lands Stewardship (Applicable)

The agricultural lands stewardship strategy includes measures that promote the continued use of agricultural lands and protect natural resources through the maintenance of agricultural lands. Erosion control measures are an example of agricultural land stewardship practices that support the viability of croplands while offering water resource benefits. This is an important RMS for the Region because of the agricultural cultural values held throughout it. This RMS aligns with plan goals 1, 9, and 13. There are several organizations active in applying this RMS that will facilitate meeting the education and awareness focus objective 2 and water quality focus objectives 19 and 22.

7.6.2 Economic Incentives (Applicable)

Economic incentives are financial tools such as grants, loans, rebates, and water pricing to influence water management. Such incentives can promote implementation of projects that improve water management and protect water resources. In addition, water rate incentives can be used to promote more efficient use of water. This RMS aligns with plan goals 2, 7, and 8. Resource managers within the Region are evaluating opportunities to more fully develop this RMS to achieve reasonable use focus objectives 11 and 12 as well as water quality focus objectives 19 and 20.

7.6.3 Ecosystem Restoration (Applicable)

Ecosystem restoration addresses natural landscapes and biological communities that have been modified by past activities. This strategy aims to increase the diversity of native species and biological communities and the abundance and connectivity of habitats, particularly in aquatic, riparian, and floodplain ecosystems. The strategy includes protection and recovery of at-risk species, wetlands restoration and construction, floodplain reconnection, and invasive species removal. This RMS aligns with plan goals 4, 6, 7, 8, 9, and 11 and is a high priority to the Westside Region, especially because it helps meet invasive species focus objectives 7 through 9 and habitat focus objectives 3 through 6. This RMS also supports watershed management, decreasing pollution, and promoting water quality improvements.

7.6.4 Forest Management (Applicable)

The forest management strategy focuses on activities on both publicly and privately owned forest lands aimed at improving the availability and quality of water for downstream users. This RMS aligns with plan goals 7, 8, 9, 10, 11, and 13 and risk management focus objective 15 to reduce the risk of large erosion events. Ecosystem restoration, erosion control for pollution prevention, and watershed management preserve the productivity of fresh water resources in forested elevations and work toward meeting water quality objectives throughout the upper watersheds.

7.6.5 Land Use Planning and Management (Applicable)

The land use planning and management strategy incorporates consideration of water supply availability, water quality requirements, and flooding and drainage into land use decisions. This RMS aligns with plan goals 1, 2, 8, 12, and 13, education and awareness focus objective 2, and reasonable use focus objectives 11 and 12.

7.6.6 Recharge Area Protection (Applicable)

The recharge area protection strategy includes the protection and enhancement of groundwater recharge areas. Since much of the Region is not urbanized, access to recharge areas is often retained, and some agricultural areas are used, in part, for groundwater recharge. This strategy includes methods such as low-impact development and land conservation to help areas suitable for recharge remain accessible. It also includes measures to protect groundwater recharge areas from contamination. This RMS aligns with plan goals 7, 8, 10, 11, and 13. Further, as many portions of the Region are solely dependent on groundwater, this RMS aligns particularly well with the groundwater objective 17 within the Understand Watershed Function Focus which is of high importance to the Region.

7.6.7 Water-Dependent Recreation (Applicable)

This strategy seeks to maintain and increase recreational activities dependent on water, including fishing, swimming, waterfowl hunting and birding, boating, canoeing, and kayaking, as well as activities that do not require water but are enhanced by it, including wildlife viewing, picnicking, camping, hiking, biking, and riding on trails. This RMS aligns with plan goals 6 and 13 and meets recreation focus objective 13.

7.6.8 Watershed Management (Applicable)

The watershed management strategy uses watershed boundaries as the basis for managing natural resources. Watershed management is the process of creating and implementing plans, programs, projects, and activities to restore, sustain, and enhance watershed functions. This RMS aligns with all 13 plan goals and several of the objectives, including education and awareness focus objectives 1 and 2 as well as the Understand Watershed Function objective 18 and Risk Management Focus objectives 15. The IRWM planning process has established and enhanced relationships that seek to improve the sustainability and benefits derived from resources of the Region watersheds, particularly as they relate to meeting habitat and invasive species focus objectives 3 through 9.

7.7 Improve Flood Management

7.7.1 Flood Risk Management (Applicable)

The flood risk management strategy involves both structural and non-structural measures to manage flood flows as well as programs that improve flood preparedness, response, and recovery. Structural approaches to flood management include dams and reservoirs, levees, channel modifications, and diversions. Non-structural measures focus on land use management such as floodplain restoration and development policies. This RMS aligns with plan goals 4, 9, 10, 11, and 13 and objective 14 of the high-priority risk management focus, which specifically addresses flood risk and reflects the fact that, as discussed in Section 3, key areas in the Region are prone to flood damage. Implementation of this strategy involves the recognition that flood risk management is a complex topic requiring significant interaction with state and federal agencies, and that not all flooding is harmful, as there is a discrete relationship between natural floodplain operations related to groundwater recharge and ecosystem habitat restoration.

Section 8: Project Review and Prioritization

This section describes the process used to solicit, screen, review, and select projects for inclusion in the Westside Sacramento Region (Region) *Integrated Regional Water Management Plan* (IRWM Plan) and prioritize the projects. The process was designed to identify projects, programs, and actions that contribute towards achievement of the IRWM Plan goals and objectives.

This section also lists projects prioritized by importance and urgency. The "importance" assigned to each project reflects the significance or consequence of implementing this project compared with other projects within the Region. The "urgency" assigned to each project reflects the degree to which this it warrants speedy attention or action compared with other projects.

8.1 Project Solicitation and Integration Process

8.1.1 Development of the Project List

The process began with the project team creating a description to be included in a *Call for Projects* and a *Project Information Form* (see Appendix D) of how project submittals would be evaluated and considered for inclusion in the IRWM Plan. The project team determined that all potential projects, programs, or actions must be submitted using the *Project Information Form* in order to provide a way in which the characteristics of projects could be compared side by side. The team discussed and made available for comment a draft list of project evaluation criteria that would be included in the *Project Information Form*. These draft criteria were chosen to facilitate project comparison, review, selection, and prioritization. The Coordinating Committee reviewed the scoring criteria.

As noted in the description, the project team agreed that project review and selection would not be prescriptive. That is, projects would not be included or prioritized on the basis of a formulaic evaluation. While each project would be evaluated using the submitted *Project Information Form* and a compiled total criteria score, that score would be only one factor for determining whether to include the project in the Plan and its priority; it would be augmented by expert judgment of those on the project team about the relevancy of the submitted projects. The project team would receive, evaluate, and review all submitted *Project Information Forms,* then propose a list of projects to include in the IRWM Plan and recommend a priority level for each. The recommendations would be discussed with participants at a stakeholder input meeting before any final decisions were made.

The project team distributed *Project Information Forms* to all interested stakeholders and issued the initial *Call for Projects* at the June 12, 2012 stakeholder meeting. Also, the *Call for Projects* and *Project Information Form* were posted to the IRWM Plan website and emailed to the stakeholder distribution list. Stakeholders were given approximately two months to identify projects for potential Plan inclusion and submit completed forms to the Westside Regional Water Management Group (RWMG). The project forms were required to be submitted via email; after submission, the information was compiled in a database. No efforts were made to verify the information submitted by each project proponent. When the information submitted was not clear to the project team, one of its members contacted the proponent for clarification. All of the submitted information was provided for stakeholder review and comment on the Westside website.

Stakeholders were invited to submit any projects, programs, and action ideas they believed could contribute to fulfilling the Plan objectives irrespective of the project's current funding, level of development, or readiness to proceed. The project team wanted to identify projects and programs that were implementable and "ready to proceed" as well as other ideas that had not yet been developed into mature project proposals. This approach was intended to encourage stakeholders to share information and identify opportunities that could help contribute to fulfillment of the IRWM Plan objectives.

The project team received 132 project submittals during the first call for projects. The initial screening and review of the projects revealed that there were possible opportunities for additional integration and regionalization of project efforts. For example, several organizations submitted project ideas for an invasive species management program, which could potentially be combined into a single regional effort or a few collaborative efforts. Also, after the first call for projects, some stakeholders expressed confusion about what types of projects, programs, and actions the project team had asked to be submitted for consideration in the IRWM Plan.

For these reasons, a second *Call for Projects* was issued on October 22, 2012 to provide stakeholders with an opportunity to discuss, refine, and further integrate project ideas. A facilitated project integration workshop was held October 24, 2012 in Clearlake for interested stakeholders to ask questions about the process, identify and discuss opportunities for project integration, and get technical assistance with completing *Project Information Forms*. Some projects were modified and new projects were submitted during the second call for projects, yielding a final total of 141 projects.

8.1.2 Future Updates to the Project List

The Coordinating Committee plans to provide a number of opportunities for regional stakeholders to propose changes to the list of projects included in the Plan; the list is intended to be updated annually. New projects may be added, scored, and prioritized in accordance with the IRWM Plan objectives. Projects may also be removed at the request of that project's proponent or once the project has been completed. For these changes, the Coordinating Committee may choose to use the same project submittal, review, and selection process used during Plan development, or it may modify the process before inviting potential revisions. In any case, future project solicitations will include a specific request to identify the means in which projects will help reduce dependence on the Sacramento-San Joaquin Delta for water supply in accordance with the California Department of Water Resources (DWR) November 2012 IRWM Guidelines. Any future updates to the project list will be included in Appendix D to this Plan and also will be posted to the IRWM website: www.westsideirwm.com.

8.2 Project Scoring, Selection, and Prioritization Process

8.2.1 Project Scoring

As described above, the information submitted on the *Project Information Form* for each project was scored, and the sum of all factors yielded a total criteria score. This score was a useful tool to help the team understand and compare the attributes of the broad range of projects under consideration. The total criteria scores were never intended to be the basis for final decisions about inclusion or prioritization, but rather, were one indicator of how the projects compared with each other.

Twenty unique criteria were used and are listed below. They were grouped into the following categories:

- Readiness to proceed,
- Regional support and integration,
- Implementation feasibility, and
- Impacts and benefits.

The scores did not consider whether a potential project may be eligible to receive Proposition 84 or 1E grant funds.

The maximum possible score for a project was 22. The highest score assigned to a submitted project was 20; the average of all project scores was 11. The total criteria score for each of the 141 projects is provided as Table D-3 in Appendix D.

Readiness to Proceed (total points possible: 9)

- **Planning completed** – If the initial planning process for the project had been completed, it received 1 point.

- **California Environmental Quality Act/National Environmental Policy Act (CEQA/NEPA) requirements completed or not relevant** – Activities funded under Proposition 84 must be in compliance with CEQA/NEPA. Projects that have completed CEQA/NEPA analyses or do not require them received 1 point.

- **Permitting completed or not needed** – Permitting is an important element of most implementable projects and can be a critical path item in project implementation. Projects that have completed the required permitting or do not require permitting received 1 point.

- **Design partly completed or not needed** – Design is an important milestone in most implementable projects. Projects that have completed the design portion of the project or do not require design received 1 point.

- **Construction/implementation commenced** – Projects that have begun construction or implementation demonstrate their readiness to proceed with subsequent work phases. Such projects received 1 point.

- **Has a strong project proponent** – It is important for the success of a project to have a strong proponent committed to the project who has authority, capability, and funding (or qualify for match waiver as involving a disadvantaged community [DAC] for a critical water supply/quality project). Projects that indicated they had a strong project proponent received 1 point.

- **Has early implementation start date** – Stakeholders were encouraged to submit any water management project that is important to the Region, independent of readiness to proceed; however, for the purposes of scoring, projects planned to be implemented within 36 months received 1 point.

- **Cost estimates prepared (with some detail)** – Stakeholders were encouraged to submit project concepts, and thus cost estimates were not always well developed. If a detailed cost estimate was indicated to be available, the project received 1 point.

- **Source of funding identified** – Projects that have identified sources of funding for implementation received 1 point.

Regional Support and Integration (total points possible: 2)

- **Encourages or supports regional cooperation and collaboration** – Projects that encourage regional support received 1 point.

- **Integrates easily with other projects** – A key criterion for developing and implementing integrated projects is the ability of a project to work well with and maximize linkages between projects. Projects that could be integrated easily with other projects received 1 point.

Implementation Feasibility (total points possible: 3)

- **Consistent with general plans** – It is important that the Region's projects are consistent with the goals and objectives of the applicable county and city general plans. Such projects received 1 point.

- **Technically and economically feasible** – If a project was indicated to be both technically and economically feasible, it received 2 points. If the project was one or the other, it received 1 point.

Impacts and Benefits (total points possible: 8)

- **Addresses more IRWM Plan objectives** – The IRWM Plan objectives, which were described in Section 6, were used to evaluate projects. Integrated water management calls for projects that provide multiple benefits and meet more than one IRWM Plan objective. Therefore, if a project met more than 5 objectives, it received 2 points. If the project met between 2-5 objectives, it received 1 point. If the project met 0-1 objectives, it received 0 points.

- **Addresses more resource management strategies (RMSs)** – Section 7 described the RMSs selected for the Plan and how they compare with those included in the California Water Plan. Projects that include more than 5 RMSs received 2 points, those with 2-5 RMSs received 1 point, and those with 0-1 RMSs received 0 points.

- **Addresses more Statewide Program Preferences** – Statewide IRWM Program preferences and priorities are identified in the Public Resources Code Section 75026.(b) and California Water Code Section 10544. (See Section 12 – Glossary) Projects that addressed one or more Statewide Program Preference received 1 point.

- **Has potential negative impacts** – It is important to understand whether projects are creating negative impacts such as short-term construction impacts or longer-term environmental impacts. Projects that may cause a negative impact received -1 (minus 1) point; if no potential negative impact was identified, the project received 0 points.

- **Serves a DAC or tribal community or responds to environmental justice concerns** – Projects that serve a DAC or tribal community or answer an environmental justice concern received 1 point.

- **Contributes to climate change adaptation** – Projects that contribute to climate change adaptation received 1 point.

- **Helps reduce greenhouses gas (GHG) emissions** – Projects that contribute to a reduction in greenhouse gas emission received 1 point.

The Coordinating Committee reviewed the score sheets developed by the c Project Team, and then the results were shared with the stakeholder group.

8.2.2 Project Selection

The project team concluded that all of the submitted projects were consistent with the Plan objectives except for one, which is located outside the Westside Region and intended to produce benefits outside the Region. In addition to conducting the scoring described above, the project team considered whether the submitted projects would be too numerous to implement.

On the basis of these considerations, the consultant team recommended that all 141 submitted projects be included in the IRWM Plan except for the one located outside the Region. After discussion at stakeholder input meetings held in two different locations, the stakeholder group agreed with the consultant team's recommendation.

8.2.3 Project Prioritization

In addition to the total criteria score, projects were considered in terms of which IRWM Plan objectives they contributed to. This perspective helped identify projects, programs, and actions that water managers may choose to pursue first to address the Region's water-related challenges and opportunities.

Earlier in the planning process, the IRWM Plan objectives were prioritized based on their relative importance and urgency. The objectives received a ranking of high or medium for importance, and a ranking of high, medium, or low for urgency (as described in Section 6).

Now, the project team assessed which objective(s) each project most addressed and assigned an importance and urgency priority to the project that match the identified importance and urgency of the primary objective it addressed. Where projects are expected to contribute to multiple objectives, the consultant team used judgment in assigning a priority to the project.

8.3 Summary of Projects Received

The projects that were submitted by stakeholders in response to the two *Calls for Projects* demonstrate the breadth of activities needed to meet the Region's water management objectives. These 141 projects were submitted by 39 different organizations. They address, to some extent, all 24 of the IRWM Plan objectives. They range from large-scale drinking water supply projects to habitat restoration programs, flood management projects, and invasive species management initiatives. They suggest an even broader range of projects and programs presenting multiple opportunities for continued resource and project integration.

The submitted projects are summarized in Table 8-1 below by objective focus area. The table also helps to portray the broad variety of types of projects, programs, and actions submitted. Feasibility studies are project ideas where the proponent is not sure whether it will pencil out to proceed with full implementation. Implementable programs and projects are programs (such as a water conservation program) or on the ground-constructed projects that have been developed sufficiently to proceed with implementation in the near future. Planning projects are studies or evaluations of various actions, and do not include constructed or programmatic implementation.

Table 8-1: Summary of Project Submittals by Objective Focus Area and Project Type

	Project Types			
Objective Focus Areas	**Feasibility Study**	**Implementable Program**	**Implementable Project**	**Planning**
Education and Awareness		1	1	2
Habitat and Invasives	17	3	18	7
Infrastructure			19	10
Reasonable Use			1	2
Recreation			4	1
Risk Management	5		13	6
Understand Watershed Function	1		1	9
Water Quality		2	2	6
Water Supply	1	1	4	3
TOTAL[(a)]	**24**	**7**	**63**	**46**

(a) One project was removed from the list because it is outside the Region.

Figure 8-1 shows a map of the Region with locations for all of the submitted projects by project proponent. Projects were fairly well distributed throughout the Region's three planning areas (PAs). The majority of the projects were proposed for the Valley Floor PA, which is consistent with its large land area and higher population compared with the Upper Cache and Upper Putah Creek PAs, and which reflects the Valley Floor PA's extensive agricultural and ecosystem resources. The number of projects proposed for the Valley Floor, Upper Cache Creek, and Upper Putah Creek PAs are 95, 32, and 10, respectively. Three projects (nos. 76, 40, and 143) have not been designated to a specific PA, as they do not have an assigned project proponent and are Region-wide.

8.3.1 Projects and Objectives Met

One of the key elements of a successful IRWM Plan is the assessment of how much and how well its projects achieve the Plan objectives. Many of the projects are dynamic integrated actions and addressed in whole or in part multiple objectives; so in order to facilitate sorting and comparison, each project was assigned a "primary objective". Table 8-2 presents the projects submitted during the 2012 project prioritization process grouped according to the primary objective that the project would contribute towards when it is implemented. The project list was not reviewed to consider to what extent the objectives would be fulfilled by the current list of projects.

Project Locations

Lead Agency Organization

- Cache Creek Conservancy
- California Land Stewardship Institute
- City of Clearlake
- City of Davis
- City of Vacaville
- City of Woodland / floodSAFE Yolo Pilot Program
- Clearlake Oaks County Water District
- Colusa County Resource Conservation District
- County of Yolo
- Crescent Bay Improvement Company
- Dixon Regional Watershed Joint Powers Authority
- Dixon Resource Conservation District
- East Lake Resource Conservation District
- Knights Landing Ridge Drainage District
- Lake Berryessa Resort Improvement District
- Lake County Special Districts
- Lake County Water Resources Department
- Mendocino National Forest
- Napa Berryessa Resort Improvement District
- Napa County
- Putah Creek Council
- RWMG with selected Lead Agency
- Reclamation District 2035
- Reclamation District No. 2068
- Robinson Rancheria
- Rural Community Assistance Corporation
- Scotts Valley Band of Pomo Indians
- Solano County Water Agency
- Solano Resource Conservation District
- Tuleyome, Inc.
- West Lake Resource Conservation District
- West Sacramento Area Flood Control Agency
- Woodland-Davis Clean Water Agency
- Yolo Basin Foundation
- Yolo County
- Yolo County Flood Control and Water Conservation District
- Yolo County Parks
- Yolo County Resource Conservation District
- Yolo County Service Area #6
- Yolo County, Natural Resources Division
- Unknown

Note: Project Numbers 40,76 & 143 are not included as they do not have an assigned project proponent and are Region Wide.

Path: Z:\Projects\Westside_IRWMP\Events\20120214_IRWMP\Figure8-1_ProjectLocations.mxd

Legend

- Cities
- County Boundary
- Planning Areas
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies
- Watersheds

Median Household Income

- < $48,706

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

Note:
DAC areas are based on 2010 Census Block Group data for a Median Household Income (MHI) of $48,706 or less (California MHI in 2010 was =$60,883; 80% = $48,706)

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WESTSIDE SAC IRWM

Project Locations

K/J 1170019.00

May, 2013
Figure 8-1

Table 8-2: Projects Grouped by Primary IRWM Plan Objective Met

Primary Objective Number and Summary	Project No.	Lead Agency/Organization	Project Name
1	**Provide/promote use of educational curricula for K-12 students**		
	97	Lake County Water Resources Department for RWMG	Form Task Force/Subcommittee to Strategize and Implement Watershed Education and Outreach
2	**Provide educational information to encourage stewardship by public**		
	94	Lake County Water Resources Department	Increase Cache and Putah Creek Watershed Education and Outreach
	130	Putah Creek Council	Pollution Prevention and Watershed Education Project
	106	Solano Resource Conservation District	Waterway Management for Improved Water Quality and Wildlife Habitat
	131	Yolo Basin Foundation	Pacific Flyway Center/Delta Gateway
3	**Restore native vegetation/form/function in riparian/aquatic corridors**		
	52	Cache Creek Conservancy	Implementation of the Cache Creek Resources Management Plan
	142	City of Vacaville	Centennial Park Riparian Forest Restoration and Loop Trail Development Project
	56	East Lake Resource Conservation District	Upper Putah Creek Watershed Management Plan
	65	Lake County Water Resources Department	Collaborative Process to Update Clear Lake Integrated Watershed Management Plan
	68	Lake County Water Resources Department	Assess Stream Channel Hydrology And Related Riparian And Aquatic Habitats For Restoration
	62	Lake County Water Resources Department	Identify, Protect, and Restore Important Wildlife Habitat Areas in Clear Lake
	15	Lower Putah Creek Coord. Committee	Pleasants Creek Bank Stabilization
	2	Lower Putah Creek Coord. Committee	505-East Channel Restoration
	3	Lower Putah Creek Coord. Committee	Apricot Draw Bank Stabilization
	7	Lower Putah Creek Coord. Committee	Putah Creek Interdam Reach Invasive Weed Control
	14	Lower Putah Creek Coord. Committee	Pleasant Creek Wildlife Migration Corridor Plan
	20	Lower Putah Creek Coord. Committee	Thompson Canyon Bank Stabilization Design and Permits
	4	Lower Putah Creek Coord. Committee	Dry Creek Wildlife Migration Corridor Feasibility Study
	5	Lower Putah Creek Coord. Committee	Duncan-Giovannoni Channel Restoration Feasibility Study
	6	Lower Putah Creek Coord. Committee	Glide Ranch Channel Restoration Feasibility Study
	8	Lower Putah Creek Coord. Committee	Lower McNamara Pool Channel Reconfiguration Feasibility Study
	10	Lower Putah Creek Coord. Committee	Mace to Road 106A Channel Restoration Feasibility Study
	9	Lower Putah Creek Coord. Committee	MacQuiddy Channel Reconfiguration Feasibility Study
	11	Lower Putah Creek Coord. Committee	Nishikawa Channel Restoration Feasibility Study
	12	Lower Putah Creek Coord. Committee	Old Davis Road to Mace Channel Restoration Feasibility Study
	13	Lower Putah Creek Coord. Committee	Olmo-Hammond-UCD Channel Restoration Feasibility Study
	16	Lower Putah Creek Coord. Committee	Restoria Channel Restoration Feasibility Study
	17	Lower Putah Creek Coord. Committee	Road 106A to Yolo Bypass Channel Restoration Feasibility Study
	18	Lower Putah Creek Coord. Committee	Russell Ranch Channel Restoration Feasibility Study
	19	Lower Putah Creek Coord. Committee	Stevenson Bridge Channel Restoration Feasibility Study
	21	Lower Putah Creek Coord. Committee	Upper McNamara Pool Channel Reconfiguration Feasibility Study
	22	Lower Putah Creek Coord. Committee	Warren Weed Control
	129	Putah Creek Council	Native Plant Nursery to Support Putah-Cache Ecotype Restoration
	79	Scotts Valley Band of Pomo Indians	Eight Mile Valley Meadow Rehabilitation Project
	124	Yolo County Parks	Lower Cache Creek Campground and Habitat Restoration
	127	Yolo County Resource Conservation District	Agricultural Drain, Slough, and Canal Riparian Habitat Enhancement
	122	Yolo County, Natural Resources Division	Cache Creek Parkway Plan
4	**Quantify extent of suitable life-cycle habitat for threatened/endangered/imperiled (T/E/I) native fish**		
	78	Scotts Valley Band of Pomo Indians	Hitch Habitat Assessment
5	**Prioritize/plan/schedule improvements of life-cycle habitat for T/E/I native fish**		
	64	Lake County Water Resources Department	Develop a Native Fish Management Plan
6	**Increase availability of suitable life-cycle habitat for T/E/I native fish**		
	57	Lake County Water Resources Department	Restore Native Fish Spawning Areas in Clear Lake Tributaries
	135	Reclamation District 2035	Tule Canal Habitat Enhancement and Sediment Removal
	101	Reclamation District No. 2068	Levee Slope Modification
	73	Robinson Rancheria	The Restoration of the Clear Lake Hitch to Blue Lakes
	74	Robinson Rancheria	Spawning Hitch Fish and Reproduction Loss Correction Measures for an Artificial Trap
	80	Tuleyome, Inc.	Cache Creek Anadromous Fish Reintroduction Project
	132	Yolo Basin Foundation	Lower Putah Creek Restoration from Toe Drain to Putah Creek Diversion Dam
7	**Prevent colonization by quagga/zebra mussels and eliminate/prevent spread of New Zealand mud snail**		
	76	RWMG with selected Lead Agency	Regional Invasive Mussels Management Plan
	23	Solano County Water Agency	Aquatic Nuisance Vegetation Management
	32	Solano County Water Agency	Solano Invasive Species Program
8	**Establish invasive plant management plan**		
	53	California Land Stewardship Institute	Invasive Plant Removal in Ulatis Creek
	46	Colusa County Resource Conservation District	Bear Creek Habitat Enhancement
	40	RWMG with Selected Lead Agency	Regional Invasive Plants, Aquatic and Terrestrial Weeds Management Plan
	27	Solano County Water Agency	Invasive Plant Removal Program
9	**Implement invasive plant management plan**		
	105	Solano Resource Conservation District	Solano County Riparian Habitat Restoration and Enhancement Project
	82	West Lake Resource Conservation District	Non-Native Invasive Weed Management Project
	126	Yolo County Resource Conservation District	Implementation of the Cache Creek Watershed Invasive Weed Management Plan
10	**Create asset management plan for key water management infrastructure**		
	140	Reclamation District 2035	Cross Bypass Canal Modernization
	137	Reclamation District 2035	Installation of Groundwater Wells
	143	RWMG with Selected Lead Agency	Regional Capital Improvement Plan
	26	Solano County Water Agency	Improvements to Solano Project Facilities
	29	Solano County Water Agency	NBA Infrastructure and Capacity Improvements
	35	Solano County Water Agency	Risk Assessment of Delta Water Supplies
	119	Yolo County Flood Control and Water Conservation District	Moore Siphon Reliability/Restoration Project
11	**Meet 20% by 2020 water conservation targets**		
	72	Napa County	Regional Collaborative Water Conservation Program
	24	Solano County Water Agency	Commercial Washer Rebate Program
	28	Solano County Water Agency	Large Landscape Water Efficiency Program
12	**Increase adoption of agricultural best management practices (BMPs)**		
	100	Reclamation District No. 2068	Irrigation Billing/Irrigation Management System Improvements
	99	Reclamation District No. 2068	Agricultural Tail Water Reuse Program
13	**Maintain and increase water-related recreational opportunities**		
	61	Lake County Water Resources Department	Improve Water Dependent Recreation Opportunities
	115	West Sacramento Area Flood Control Agency	Sacramento River Recreational Trail
	1	West Sacramento Area Flood Control Agency	Bees Lakes Preserve
	133	Yolo Basin Foundation	Yolo Bypass Wildlife Area Public Use Improvements

Primary Objective Number and Summary

	Project No.	Lead Agency/Organization	Project Name
14	**Provide adequate flood protection**		
	45	City of Woodland / FloodSAFE Yolo Pilot Program	Lower Cache Creek Flood Risk Reduction Project
	49	Dixon Regional Watershed Joint Powers Authority	Dixon Main Drain / V-drain Enlargement Project
	50	Dixon Regional Watershed Joint Powers Authority	Eastside Drain
	51	Dixon Resource Conservation District	Storm Flow Reduction From Agricultural Lands North of Interstate 80
	96	Knights Landing Ridge Drainage District	Mid Valley, Knights Landing Repair Project
	59	Lake County Water Resources Department	Middle Creek Flood Damage Reduction and Ecosystem Restoration Project
	58	Lake County Water Resources Department	Reduce Flood Damage
	134	Proposed by RWMG	Climate Change Adaptation Study
	136	Reclamation District 2035	Levee Repairs/Maintenance - Segments 150, 173, and 297
	139	Reclamation District 2035	Floodway Corridor Project
	42	Solano County Water Agency	Ulatis Flood Control Channel Grade Control
	25	Solano County Water Agency	Gibson Canyon Creek Detention Basin
	114	West Sacramento Area Flood Control Agency	Sacramento River Levee Repair
	116	West Sacramento Area Flood Control Agency	Sacramento Bypass-Yolo Bypass Levee Repair Phase II
	83	West Sacramento Area Flood Control Agency	Lower Sacramento and Delta North Regional Flood Management Plan
	111	West Sacramento Area Flood Control Agency	Deep Water Ship Channel East Levee Repair
	113	West Sacramento Area Flood Control Agency	Port of West Sacramento North and South Levee Repair
	112	West Sacramento Area Flood Control Agency	Deep Water Ship Canal Navigation Levee Repair
	117	West Sacramento Area Flood Control Agency	West Sacramento South Cross Levee Repair
	121	Yolo County	Analysis of BDCP's Yolo Bypass Conservation Measure and Other Measures
	120	Yolo County	Yolo County Airport Drainage Plan
	123	Yolo County	Clarksburg Flood Protection Feasibility Study
	86	Yolo County Service Area #6	County Service Area (CSA) #6 Levee Repair Project
15	**Manage watershed activities to reduce large erosion events**		
	60	Lake County Water Resources Department	Improve Watershed Roads and Trails to Reduce Soil Erosion
	70	Mendocino National Forest	Lakeview Hazardous Fuels Reduction
	71	Mendocino National Forest	Hazardous Fuels Reduction in the Upper Lake Watershed
	77	Scotts Valley Band of Pomo Indians	Scotts Creek Watershed Assessment
16	**Monitor state/federal Delta programs**		
	33	Solano County Water Agency	Research on Hydrodynamics and WQ Interactions in the Delta.
17	**Monitor conditions/improve understanding to support sustainable groundwater basins**		
	138	Reclamation District 2035	Groundwater Studies
	103	Reclamation District No. 2068	Solano Subregion Groundwater Investigations
	37	Solano County Water Agency	Southwestern Sacramento Valley Basin/Solano Subbasin Groundwater-Surface Water Flow Model to Evaluate Recharge, Conjunctive Water Use, and Future Deep Zone Pumpage
	36	Solano County Water Agency	Solano Subbasin Conjunctive Use
18	**Maintain and enhance watershed and natural resource monitoring network and information sharing**		
	63	Lake County Water Resources Department	Develop and Implement a Comprehensive Watershed Monitoring Program
	104	Reclamation District No. 2068	Pump Station No. 1 and Upstream Drainage Tributary Inflow Metering
	98	Reclamation District No. 2068	Canal Headworks Metering
	102	Reclamation District No. 2068	SCADA Implementation
	75	Rural Community Assistance Corporation	DAC Community Wastewater Management Project
	31	Solano County Water Agency	Improve Solano Project SCADA infrastructure
	125	Yolo County	Methylmercury Impacts Analyses for the Yolo Bypass
19	**Address pollutant sources to meet runoff standards and total maximum daily load (TMDL) targets**		
	44	City of Clearlake	City of Clearlake Stormwater Management Plan (SWMP), Storm Drainage and Flood Control Project
	66	Lake County Water Resources Department	Clear Lake Water Quality Assessment
	39	Solano County Water Agency	Source Water Protection for Putah Creek Watershed
	108	Tuleyome, Inc.	Sulphur Creek Mercury and Sediment Reduction Project
	81	Tuleyome, Inc.	Comprehensive Mercury Assessment and Implementation for the Westside Region
	109	Tuleyome, Inc.	Elgin Mine Drainage Water Treatment Project
20	**Minimize accidental wastewater spillage/discharges**		
	128	Lake Berryessa Resort Improvement District	Program to Prevent Wastewater Discharges
	91	Napa Berryessa Resort Improvement District	NBRID Wastewater Storage Pond and Disposal Improvements
21	**Reduce public health risks by reducing contaminants in drinking water sources**		
	89	Lake County Special Districts	Soda Bay Water System Improvements
	38	Solano County Water Agency	Source Water Protection for Delta Water Sources
	43	Solano County Water Agency	Wetland Restoration Research and Impacts to Source Water Quality.
	85	Yolo County Flood Control and Water Conservation District	Abandoned Well Incentive Program
22	**Meet all drinking water and wastewater discharge standards**		
	54	City of Davis	Wastewater Treatment Plant Secondary and Tertiary Improvements
	55	Clearlake Oaks County Water District	Plant Intake
	48	Crescent Bay Improvement Company	Crescent Bay Improvement Company
	87	Lake Berryessa Resort Improvement District	LBRID Wastewater Storage Pond and Disposal Improvements
	69	Lake County Water Resources Department	Adobe Creek Conjunctive Use Project
	92	Napa Berryessa Resort Improvement District	NBRID Wastewater Treatment Plant Replacement
	90	Napa Berryessa Resort Improvement District	NBRID Water Treatment Plant Replacement
	93	Rural Community Assistance Corporation	Rural Disadvantaged Community (DAC) Partnership Project
	34	Solano County Water Agency	Research on Improving Water Treatment for Delta Sources
	110	Woodland-Davis Clean Water Agency	Davis-Woodland Water Supply Project
23	**Provide 100% reliability of municipal and industrial (M&I) water supplies**		
	88	Lake Berryessa Resort Improvement District	Water Tank Replacement Project
	67	Lake County Water Resources Department	Cache Creek Flow Enhancement Project
	95	Reclamation District 2035	Sacramento River Joint Intake Project
	30	Solano County Water Agency	North Bay Aqueduct Alternate Intake Project
	118	Yolo County Flood Control and Water Conservation District	Conjunctive Water Use Program
24	**Provide agricultural water supplies to support a robust agricultural industry**		
	141	Reclamation District 2035	Conjunctive Use Study
	84	Yolo County Flood Control and Water Conservation District	Winters Main Canal Modernization Project: Integrated Precision Water Mgmt.

Despite the large number of projects submitted, some additional projects or programs likely will be needed to fully satisfy all objectives. In response to this recognition, several projects or programs were included in the Plan by the RWMG to address objectives not covered by the submitted projects. Project proponents have not yet been identified for all of these, and the details of the projects or programs will need to be more developed in the future. These projects are:

- Regional Invasive Plants, Aquatic and Terrestrial Weeds Management Plan (project no. 40)
- Regional Invasive Mussels Management Plan (project no. 76)
- Climate Change Adaptation Study (project no. 134)
- Task Force to Strategize and Implement Regional Watershed Education and Outreach (project no. 97)
- Regional Capital Improvement Plan (project no. 143)

Other projects that may be needed in the future to address unfulfilled objectives include:

- Under Preparation: To be issued as separate tech memo; Insert list of project types/activities

8.3.2 Prioritized Project List

Using the process described in Section 8.2.3, the projects were ranked and sorted by urgency and importance. The project list sorted by importance and urgency was presented and discussed with the Coordinating Committee and in facilitated stakeholder meetings on December 13 and 18, 2012 in Woodland and Clearlake, respectively (both meetings covered the same agenda). The projects submitted are summarized in Table 8-3 by importance and urgency and grouped by PA. Table D-6 in Appendix D includes the list of projects sorted by importance and urgency.

Table 8-3: Summary of Projects by Importance, Urgency, and Planning Area

	Planning Area			
Importance, Urgency	**Upper Cache Creek**	**Upper Putah Creek**	**Valley Floor**	**TOTAL[(a)]**
High Importance, High Urgency	2	3	7	12
High Importance, Medium Urgency	15	3	34	52
High Importance, Low Urgency			4	4
Medium Importance, High Urgency			1	1
Medium Importance, Medium Urgency	13	4	36	53
Medium Importance, Low Urgency	2		13	15
TOTAL[(a)]	32	10	95	137

(a) Three projects (nos. 40, 76, and 143) are not included in this table as they do not have an assigned project proponent and are Region-wide.

All projects included in the IRWM Plan are important to meet the objectives of the Region. The Coordinating Committee will encourage and support actions that advance all of the projects, regardless of their priority. However, the Coordinating Committee expects to focus its attention on supporting the implementation of projects with high importance and high urgency first. Such projects identified during the 2012 project prioritization process are listed in Table 8-4.

Table 8-4: High-Importance/High-Urgency Projects

Project No.	Lead Agency/ Organization	Project Title	Planned Project/Program Types and Activities	Primary Objective	Project Type	Importance	Urgency	Earliest Expected Start Date
76	RWMG with Selected Lead Agency	Regional Invasive Mussels Management Plan	Formation of an invasive species task force/subcommittee to prepare a regional invasive mussels species prevention plan and identify supplemental programs to be developed to fill gaps in existing programs to prevent invasive species infestation.	7	Implementable Program	High	High	Mar. 2014
40	RWMG with Selected Lead Agency	Regional Invasive Plants, Aquatic and Terrestrial Weeds Management Plan	Formation of an invasive species task force/subcommittee to prepare a regional invasive plants, aquatic and terrestrial weeds management/eradication plan that documents the extent of invasive species that could be leveraged, and identify supplemental programs to be developed to fill gaps in existing programs to manage invasive species.	8	Implementable Program	High	High	Mar. 2014
32	Solano County Water Agency	Solano Invasive Species Program	Program will prevent colonization of any regional water body by quagga or zebra mussels and eliminate or prevent the spread of New Zealand mud snails from Putah Creek.	7	Planning	High	High	Jun. 2013
23	Solano County Water Agency	Aquatic Nuisance Vegetation Management	The goal of the *Aquatic Nuisance Species Management Plan* is to minimize the harmful ecological, economic, and social impact of aquatic nuisance species through prevention and management of introduction, population growth, and dispersal into, within, and from Solano County.	7	Implementable Program	High	High	Jun. 2013
54	City of Davis	Wastewater Treatment Plant Secondary and Tertiary Improvements	To meet new surface water discharge limitations at Willow Slough, the City of Davis must cease its surface water discharge to Willow Slough, all or in part, through upgrades to its existing treatment process to provide for tertiary treatment.	22	Implementable Project	High	High	Oct. 2013
55	Clearlake Oaks County Water District	Plant Intake	Install a new water intake in the lake that is capable of drawing water from different depths, with installation of an Amiad pre-filter at the pier where the intakes are located. This will allow greater control of influent turbidity and pH by controlling what depth the intake will be drawing water from.	22	Planning	High	High	Nov. 2014
48	Crescent Bay Improvement Company	Crescent Bay Improvement Company	Crescent Bay Improvement Company has been on a Boil Water Order since 1999. There are three objectives to this project: 1) replace the 80-year old distribution lines, which are leaking, 2) drill a well and replace surface water source with ground water, and 3) explore the feasibility of purchase of a neighboring water company and develop an intertie with that system.	22	Implementable Project	High	High	May 2013
87	Lake Berryessa Resort Improvement District	LBRID Wastewater Storage Pond and Disposal Improvements	This project will upgrade the wastewater storage ponds and disposal spray fields.	22	Implementable Project	High	High	Sep. 2012
92	Napa Berryessa Resort Improvement District	NBRID Wastewater Treatment Plant Replacement (WWTP)	This project will upgrade the existing WWTP. The project will also repair or replace all the existing sewer lift stations.	22	Implementable Project	High	High	Sep. 2012
90	Napa Berryessa Resort Improvement District	NBRID Water Treatment Plant Replacement	The existing water treatment plant will be replaced with a new, more technically advanced water treatment plant.	22	Implementable Project	High	High	Sep. 2012
95	Reclamation District (RD) 2035	Sacramento River Joint Intake Project	The project consists of a 400-cubic-feet-per-second (cfs) intake and integrally constructed pump station, new discharge pipeline and appurtenant structures, and demolition of the existing facilities.	23	Implementable Project	High	High	Mar. 2013
93	Rural Community Assistance Corporation	Rural Disadvantaged Community (DAC) Partnership Project	RCAC will manage the Prop. 84 grant funds to address inadequate water supply and water quality in rural disadvantaged communities (DACs) in the Westside Sacramento IRWM Region.	22	Planning	High	High	Jan. 2013
34	Solano County Water Agency	Research on Improving Water Treatment for Delta Sources	The project would build upon past research done at the NBA Treatment Facility, and by other Delta users, to improve water treatment methods, reduce disinfection byproducts, and improve water treatment for Delta water users, including the State Water and Central Valley Projects.	22	Planning	High	High	Jun. 2013
110	Woodland-Davis Clean Water Agency (WDCWA)	Davis-Woodland Water Supply Project	The project comprises four regional facility components: (1) a joint RD 2035/WDCWA Sacramento River Intake facility (up to 80-cfs capacity for the WDCWA); (2) 4.5-mile raw water pipeline(s) to convey untreated surface water to a water treatment facility; (3) a regional water treatment facility to treat the surface water before delivery; and (4) 10 miles of treated water pipelines to deliver treated water to local water systems.	22	Implementable Project	High	High	Aug. 2016

8.3.3 Project Lists Sorted in Other Ways

Because of the number of projects submitted and the variety of factors considered for prioritization, a number of lists were prepared to present the projects in multiple ways (see Appendix D). Stakeholders can examine them to find new perspectives on the projects and collaboration opportunities. The Coordinating Committee and stakeholder group participated in deciding the different ways to sort the project lists. The lists were sorted by these characteristics:

- Project number,
- Project type,
- Total criteria score,
- Agency, then project type,
- Project location by county,
- Importance, then urgency,
- Primary objective, and
- RMS.

Section 9: Impacts and Benefits

This section provides an overview of the potential impacts and benefits associated with implementation of the Westside Sacramento Region (Region) *Integrated Region Water Management Plan* (IRWM Plan). Because of the nature of the IRWM planning process, the impacts and benefits discussed here are preliminary and not intended to be a complete list; more extensive and project-specific evaluations of impacts and benefits usually occur through project implementation. This overview may be used as a guide for deeper consideration of and response to impacts and benefits during Plan implementation. Later, as plan performance is evaluated, the Westside Regional Water Management Group (RWMG) may utilize this preliminary assessment to better understand the benefits that have been realized and whether unanticipated impacts have occurred.

9.1 Benefits of Plan Implementation

9.1.1 Plan Benefits

The Westside IRWM Plan documents a shared vision for integrated water management and outlines a cooperative approach to achieve that vision. It provides regional water resources benefits largely by fostering improved coordination, collaboration, and communication among entities in the Region. Such collaboration is supported both by the Plan development process and the resulting, newly formed Plan framework.

Development of the Plan has helped strengthen the working relationships of water management professionals and interested stakeholders throughout the Region, along with facilitating partnerships between local, state, and federal entities. For example, several IRWM Plan projects are being jointly sponsored; the Woodland-Davis Clean Water Agency and the Lower Putah Creek Coordinating Committee are multi-agency efforts to implement projects within the Region. During the planning process, management agencies identified areas where cooperative efforts can lead to greater efficiencies and more effective service. Several agencies have described their ongoing research and data collection projects. Shared awareness of these research and data collection efforts will help other agencies avoid duplication of efforts and help expand understanding of information needs.

For example, agencies from all of the counties in the Region see the importance of sharing information on their individual invasive mussel prevention programs designed to keep quagga and zebra mussels out of lakes and reservoirs. The RWMG Coordinating Committee plans to form a joint work group to leverage resources and reduce the likelihood of infestation by aquatic invasive species. Another example of joint efforts to increase efficiency is the cooperative regional water use efficiency project developed and submitted as part of a grant application for Proposition 84 implementation funding.

This collaborative approach to regional planning helps ensure that multiple aspects of watershed planning are considered together rather than allowing one particular geographic area or project type to dominate. It helps share benefits and impacts instead of allowing one group or geographic area to reap benefits while another withstands impacts. Also, regional planning helps ensure that projects designed to achieve one particular objective (e.g., water supply) will be supportive of (or at least compatible with) other objectives (e.g., flood management, water quality, or habitat preservation).

The 140 projects identified by this Plan meet, at some level, all 24 plan objectives described in Section 6. While periodic updates and addition of projects will be needed, over the 25-year horizon, implementation of the planned projects will produce multiple benefits. Below is an overview.

- **Improve and Protect Water Quality** – Westside IRWM Plan projects include actions to reduce contaminants in water sources by addressing such causes as soil erosion and mercury contamination and by upgrading Region wastewater and water treatment plants. The primary benefit from these water quality projects is the reduced potential for human and ecological exposure to potentially harmful substances. These projects also will improve the effectiveness of both water and wastewater treatment processes and help meet established regulatory requirements. Besides improving drinking water quality, these projects will benefit other types of water users, such as agricultural users and water-dependent wildlife habitat.

- **Improve Resource Stewardship** – The Plan projects include invasive species removal programs and overall habitat improvement projects. Proposed projects will attempt to prevent infestation of non-native aquatic species, such as quagga/zebra mussels and New Zealand mud snail. Additional projects will improve overall habitat quality by restoring and rehabilitating native vegetation in riparian and aquatic corridors and improving fish habitat. Benefits of the Plan include broader-scale, regionally coordinated efforts to approach these complex challenges.

- **Improve Flood and Stormwater Management** – A large number of Plan projects focus on reducing flood damage and improving stormwater management. These include projects for levee repair/removal, ecosystem restoration to reduce flood risk, and new or better storm drainage. Implementation will help avoid damage to property from floods, reduce flood-related impacts to agricultural activities, and address some pollutant sources by improving stormwater management. The Plan also documents opportunities for agencies in the Region to coordinate with neighboring regions and state and federal agencies to improve flood management planning and response actions.

- **Improve Water Supply and Manage Demand** – Projects related to water supply and demand management include improving reliability of municipal supplies, implementing conjunctive use programs, studying groundwater basins, implementing agricultural water management strategies, and improving implementation of urban water conservation programs. These projects assist in maintaining the long-term sustainability of municipal and agricultural water supplies in the Region. Projects aimed at more efficient water use will result in lower unit demands, less energy use for treatment and delivery of water, and, potentially, a reduced need for expansion of water supply infrastructure.

- **Improve Public Awareness and Resource Stewardship** – Projects related to education focus on improving understanding of citizens' relationship with the watershed. These projects encourage citizens to be good resource stewards and to support the integrated watershed management actions necessary to provide public safety and support a stable economy.

Table 9-1 summarizes the benefits and impacts of Plan implementation.

Table 9-1: Potential Benefits and Impacts from Plan Implementation

	Within IRWM Region		Interregional	
	Potential Benefits	*Potential Impacts*	*Potential Benefits*	*Potential Impacts*
Projects to Improve and Protect Water Quality	• Reduced human and ecological exposure to pollutants • Improved drinking water supply and wastewater treatment regulatory compliance • Preservation of aquatic habitat • Better agricultural yields • Improvement of water-based recreation • Benefits extend to broad Region, including disadvantaged communities	Projects to improve water quality that involve construction could result in temporary impacts to aesthetics, air quality, biological resources, cultural resources, noise, soils, and transportation systems. No environmental justice or DAC impacts are anticipated.	Improved water quality in the Westside Region would also benefit the Sacramento-San Joaquin Delta and San Francisco Bay and associated groundwater basins.	No interregional impacts are anticipated.
Projects to Promote Resource Stewardship	• Improved habitat quality • Reduced risk to native species from invasives • Improved water supply • Improved water quality • Benefits extend to broad Region, including disadvantaged communities	Projects to remove invasive species could have temporary negative impacts to aesthetics, biological resources, cultural resources, and soils. No environmental justice or negative impacts to DACs are anticipated.	Prevention and removal of invasive species in the Region would reduce the transport and deposition of invasive species to the Sacramento-San Joaquin Delta and San Francisco Bay.	No interregional impacts are anticipated.
Flood and Stormwater Management Projects	• Reduced erosion • Reduced flood damages • Reduced agricultural loss • Reduced pollutants from stormwater • Benefits extend to broad Region, including disadvantaged communities	Flood risk reduction projects could result in ground disturbance and have temporary impacts to aesthetics, air quality, biological resources, cultural resources, noise, soils, and transportation systems. Depending on the location of the flood-related project, there could be inequitable distribution of impacts affecting disadvantaged or minority communities.	Flood risk reduction projects in the Region could benefit the Sacramento-San Joaquin Delta and San Francisco Bay through: • Reduced erosion • Reduced flood damages • Reduced pollutants from stormwater	Depending on the nature of the flood risk reduction and stormwater management project, impacts could be increased downstream.

	Within IRWM Region		Interregional	
	Potential Benefits	*Potential Impacts*	*Potential Benefits*	*Potential Impacts*
Water Supply and Conservation Projects	• Enhanced supply reliability • Improved groundwater management • Reduced water demands • Less energy usage for treatment and delivery of water • Avoided need to expand water supply infrastructure • Benefits extend to broad Region, including disadvantaged communities	Development of water supply projects could result in ground disturbance and have temporary impacts to aesthetics, air quality, biological resources, cultural resources, noise, soils, and transportation systems. No environmental justice or negative impacts to DACs are anticipated.	Improved water supply reliability and reduced water demands within the Region could improve regional and statewide water supply reliability.	No interregional impacts are anticipated.
Educational Projects	• Increased public involvement and awareness of resource stewardship and watershed protection • Increased public support of Plan projects • Benefits extend to broad Region, including disadvantaged communities	None	Improved public awareness about watershed protection and public support of IRWM projects could benefit public support of neighboring IRWM planning efforts.	No interregional impacts are anticipated.
Actions to Adapt to Climate Change	Actions to respond to climate change will occur in conjunction with the projects described above, as appropriate.			
Actions to Reduce Greenhouse Gas Emissions	Actions to help reduce greenhouse gas emissions will occur in conjunction with the projects described above, as appropriate.			

9.1.2 Plan Beneficiaries

Accomplishment of the IRWM objectives and projects will benefit the Region as a whole, not just areas in the vicinity of individual projects. The potential beneficiaries of the IRWM Plan are residents of the Region, water agencies, local, state, and federal agencies, businesses, wildlife and associated habitats, neighboring regions, Native American Tribes, and others within the jurisdictions served by Plan projects. These beneficiaries are represented by members of the RWMG and the larger IRWM stakeholder group.

Fifty-one projects were identified by project proponents as benefiting a disadvantaged community (DAC)[2]. These projects range from water supply and wastewater infrastructure projects to rehabilitation projects. DACs are expected to play a role in projects by sponsoring or cosponsoring some of them throughout Plan implementation.

Native American tribes have participated actively in Plan development, including development of goals and objectives, and have submitted projects (primarily for restoration of native fish and vegetation) for implementation. Tribes are encouraged to continue their participation and to submit additional projects for inclusion in the Plan that can further benefit the Tribes.

9.1.3 Interregional Benefits

The Westside Region 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. Therefore, projects implemented in the Region are likely to directly impact IRWM Plan efforts in the neighboring Bay Area and American River Regions, and particularly in the Delta. Projects to enhance and protect the watershed, and reduce consumptive water usage, will likely have downstream benefits.

Because the Region is bounded by the coastal mountains to the west, projects involving invasive plant management are one of the only types of project expected to directly benefit IRWM Plan efforts in the neighboring Napa Valley region (Napa County is also part of the Bay Area IRWM Planning Region). Although the Westside Region is part of the larger Sacramento River watershed, most of the Sacramento River watershed is upstream (to the north) of the Westside Region, thereby limiting the potential impact of Westside projects on the Northern Sacramento Valley Region. The Westside IRWM RWMG will continue to periodically contact neighboring IRWM Plan areas to coordinate and collaborate on where interregional benefits could accrue.

9.2 Impacts of Plan Implementation

Negative impacts that may be associated with the Plan projects include (1) short-term, site-specific impacts related to site grading and construction, and (2) long-term impacts associated with project operation. For the purposes of this Plan, impacts are discussed at a screening level below.

During project planning, project-specific and/or programmatic environmental compliance processes (consistent with California Environmental Quality Act [CEQA] and, if applicable, the National Environmental Policy Act [NEPA]) will be used to evaluate the significance of project

[2] As described in Section 2, a DAC is defined as having an annual median household income that is less than 80 percent of the statewide annual median household income.

impacts. Under CEQA, impacts determined to be significant must be mitigated to a level of non-significance (unless the lead agency makes findings of overriding consideration). The IRWM Plan itself does not lead directly to the implementation of any specific project; as a result, the IRWM Plan is exempt from CEQA. The following provisions of the State CEQA Guidelines apply:

- Statutory Exemption (15262 for Feasibility and Planning Studies)
- Categorical Exemption (15306-Information Collection)

CEQA review associated with specific projects by relevant agencies will evaluate impacts in much greater detail than is given in the discussion below.

- **Aesthetics** – Projects that include construction activities and new infrastructure could affect aesthetics. However, projects will likely be constructed in areas that are already disturbed or include mitigation measures to return disturbed areas to their pre-construction conditions.
- **Air Quality** – Short-term air quality impacts could result from construction of Plan projects. However, through the CEQA process, potential air emissions would be minimized through application of best management practices (BMPs) identified by the air quality management district or mitigation measures.
- **Biological Resources** – Short-term biological impacts could result from construction activities as well as non-native plant removal. Most of these negative effects would be avoided or minimized through mitigation efforts related to CEQA. Additionally, several of the IRWM Plan objectives focus on preservation and improvement of ecosystem health and would thus result in a net increase of benefits to biological resources.
- **Cultural Resources** – Impacts to cultural resources (historical, archeological, and paleontological resources) could result from construction of Plan projects. As part of the CEQA process, it will be necessary to develop mitigation measures to avoid or minimize any such impacts. In addition, participation of Tribes in the IRWM process could include informal consultation on projects that could impact cultural resources.
- **Geology and Soils** – Plan projects with the potential to impact geologic resources would be required to undergo geological feasibility studies, which would specify the appropriate engineering standards the contractor would have to comply with during construction to mitigate project site geological and soil impacts.
- **Hydrology and Water Quality** – Impacts to hydrology and water quality are anticipated to be generally beneficial because Plan projects are intended to improve water supply reliability and water quality in the long term. For short-term erosion or sedimentation, project-specific BMPs would be identified as part of the National Pollutant Discharge Elimination System (NPDES) or local permitting process.

  A number of proposed Plan projects involve flood and stormwater management that could impact flows in the Sacramento River and Delta. These issues merit particular analysis in project-specific CEQA documentation.

- **Land Use and Planning** – The Plan projects were screened for their compatibility with other planning documents for the Region, including local and regional general plans. No significant land use changes or inconsistencies with policies are anticipated. In fact, collaboration between land use and water management agencies could reduce incompatibilities in the future.

- **Noise** – Noise impacts could result from construction activities from some of the proposed projects. However, through the CEQA process, most of these impacts would be minimized by mitigation efforts. No long-term noise impacts are expected.

- **Population and Housing** – No adverse impacts to population and housing are anticipated. Plan implementation would help to meet the water demands of the existing and anticipated future population.

- **Public Services and Utilities** – Many of the Plan projects are intended to enhance water supply and water quality and improve storm water and flood management. Such projects would benefit the utilities and service systems in the Region.

- **Recreation** – One of the Plan objectives is to preserve and enhance water-dependent recreation; recreation impacts are likely to be beneficial.

- **Transportation and Circulation** – Transportation and circulation could be temporarily impacted during construction of some of the Plan projects. Construction can temporarily increase traffic congestion because of transportation of equipment and trips by workers. Construction near roadways can result in temporary lane closures and detours. However, through the CEQA process, most of these activities would be avoided or minimized. No long-term transportation and circulation impacts are expected.

Section 10: Coordination

As described in previous sections of this Plan, management of water and other related resources within this Region is complex and has many interdependencies. Furthermore, the authorities and responsibilities for managing water and related resources within the Region are spread across many different agencies, organizations, and other stakeholders. This complexity and the distributed network of shared responsibilities create the need for robust and effective coordination. This section describes how the Westside Regional Water Management Group (RWMG) plans to coordinate with local, state, and federal agencies and other stakeholders to improve integrated water management throughout the Region and neighboring areas.

Coordination is one of the most essential components of integrated regional water management, and coordination related to the Westside Region is described in several sections of this Plan. For example, Section 1, "Introduction," discusses the coordination, public outreach activities, and outreach to tribal entities and disadvantaged communities (DACs) that were conducted during the development of the Plan. Section 11, "Implementation Framework," describes the specific responsibilities of the RWMG, the Coordinating Committee, and others during Plan implementation. A central focus of the specific responsibilities of the RWMG and the Coordinating Committee is coordination.

10.1 Balanced Access and Opportunity for Participation

10.1.1 Coordination by RWMG and Coordinating Committee

One of the critical ingredients for improving water resources management is to provide multiple opportunities for water managers, community stakeholders, and other organizations with interests related to water resources to be informed about and participate in the IRWM program. A structured approach to coordination helps prevent conflicts and can help provide more effective and efficient management of resources. The Westside RWMG has committed to fostering improved coordination within the Region through the following activities (see Section 11 for more details):

- The Westside RWMG Coordinating Committee (CC) will conduct outreach, create meeting agendas and content, facilitate CC/stakeholder input meetings, organize and charter topic-specific workgroups, and help track and communicate progress toward Plan implementation. During the stakeholder input meetings all people who are interested will be invited to participate in a cooperative approach to help meet Plan objectives.

- The CC will continue to foster dialog with Tribes and representatives of the DACs within the Region to help meet Plan objectives. The CC will post meeting materials and other relevant information to the website and invite review and comment from any interested person or organization.

- The CC will conduct stakeholder input meetings as needed, meeting quarterly at a minimum. The meetings will be announced and open to any stakeholder. CC members will meet and coordinate with those active in neighboring IRWM planning efforts and other local, state, and federal agencies to accomplish the Plan objectives.

- The CC will continue to use the IRWM website, www.westsideirwm.com, to provide current information related to Plan implementation. This will include posting the status of proposed projects and providing notice of stakeholder meetings. As described in Section 8, as projects move into the implementation phase, the CC will encourage local agencies, Tribes, and other stakeholders to communicate and meet to address potential conflicts related to project implementation early on, assess opportunities for combining projects, and reduce redundant efforts.

10.1.2 Coordination among Local Agencies and Organizations

A collaborative approach to water management is essential to meeting regional goals for water supply and demand, conservation, and resource protection. Many of the local water management agencies within the Westside Region (including those agencies in the Westside RWMG) have developed cooperative relationships and processes for coordination. Some of those relationships have been strengthened during the collaborative development of this Plan. These strong working relationships and processes serve as a framework for local water managers to continue to collaborate in the future. Also, agencies with multiple responsibilities related to water (such as water quality, water supply, and flood risk management) have a built in incentive to coordinate across these different water management objectives. Some examples of existing coordination efforts among local agencies and organizations include:

- Water Resources Association of Yolo County – a consortium of 10 entities including cities, districts, and others that provides a regional forum to coordinate and facilitate solutions to water issues in Yolo County

- Clear Lake Advisory Committee – a committee of up to 23 members from local/state government, tribes, and other organizations appointed by the Lake County Board of Supervisors to provide guidance and recommendations on matters related to Clear Lake.

- Lake County Watershed Protection District and Yolo County Flood Control and Water Conservation District – coordinate in the management of Clear Lake's water level by operation of the Cache Creek Dam in accordance with the Gopcevic, Bemmerly, and Solano Decrees.

- Lower Putah Creek Coordinating Committee – brings together water agencies, city councils, Yolo and Solano Counties as well as other water and environmental interests to manage the Lower Putah Creek ecosystem through water flows, restoration, and other environmentally beneficial activities.

- The Climate Registry – a nonprofit organization that sets standards for reporting greenhouse gas emissions. Agencies in the Region who are members of The Climate Registry include the University of California, Davis, the Cities of Davis, Woodland, and Winters, and Yolo County.

Also, the RWMG is considering ways to foster improvement in the relationships between land use planners and water managers. To begin with, the RWMG encourages land use planners to explicitly consider the link between water resources planning and land use planning and to consider and evaluate water supply goals when carrying out the goals and policies of a general plan.

10.2 Coordination with State and Federal Agencies

Coordination among the RWMG and state and federal agencies has occurred during Plan preparation and will occur on an as-needed basis for implementation of specific projects and during future Plan updates. The following state and federal organizations received emails and notifications related to Westside Stakeholder meetings and opportunities to review and comment on IRWM Plan sections:

Federal

- Army Corps of Engineers
- Bureau of Land Management
- Bureau of Reclamation
- Congressional representatives
- Department of Agriculture
  - Forest Service - Mendocino National Forest
  - Natural Resources Conservation Service

State

- Department of Water Resources (DWR)
  - Environmental Sciences
  - FloodSAFE Environmental Stewardship and Statewide Resources Office (FESSRO)
  - Integrated Regional Water Management
  - North Central District
- Central Valley Flood Protection Board
- CalFire
- Caltrans
- Corrections – Solano
- Fish and Wildlife
- Public Health
- Regional Water Quality Control Board
- UC Davis

While the majority of projects included in the Westside Plan were submitted by local entities, several projects were submitted by the Mendocino National Forest, a federal agency.

Much of the RWMG's future interaction with state and federal agencies will occur during project planning and implementation, when consultation will occur during environmental document preparation and permitting prior to construction as well as the preparation of funding applications.

In addition, coordination with state and federal agencies will be conducted to satisfy Plan Objective 16, which states:

> "16. Monitor planning of state and federal water-related projects and programs in the Delta and estimate potential local impacts throughout the planning period."

This medium-importance, high-urgency objective will be measured, in part, by the Region's "active participation and engagement in identified state and federal water resources planning and projects."

10.3 Interregional Coordination

Beyond the need for internal coordination, the Westside Region also has interconnections with several other IRWM planning regions. The RWMG has identified a process for coordinating projects and activities with adjacent regions. Appropriate coordination among regions and agencies can help leverage shared activities, identify opportunities for cooperative projects, and reduce potential conflicts among IRWM projects. Members of the CC will continue to engage with neighboring IRWM regional water management groups and communicate with DWR on statewide IRWM issues that involve or could impact Plan objectives. Section 1.2.4 provides an overview of the IRWM Regions adjacent to the Westside Region and identifies the CC members assigned to coordinate with each region.

Three funding areas align with watershed areas in or near the Westside Region: the Bay Area IRWM Region, to the west, and the North Coast IRWM Region, to the north, both of which are their own Funding Areas, and the Sacramento Valley Funding Area. The Westside Region is one of eight IRWM groups within the Sacramento Valley Funding Area (Figure 10-1). Funding areas were established by DWR as the organizing IRWM regions and as the basis for distribution of both regional and interregional IRWM funds from Proposition 84. Within this latter funding area, the North Sacramento Valley and American River Basin IRWM Regions are immediately adjacent to the Westside IRWM Region. Discussions occurred with these Regions during Plan preparation to consider opportunities to collaborate on Plan elements and specific projects and to improve IRWM implementation efficiency. The key ongoing IRWM interregional coordination activities both within and outside the Sacramento Valley Funding Area are summarized in the sections that follow. It is anticipated that collaboration among these Regions will be enhanced over time, especially the North Sacramento Valley and American River IRWM regions, which share the Sacramento River watershed and Funding Area with the Westside Region.

10.3.1 Coordination within the Sacramento River Funding Area

10.3.1.1 Relationship with the North Sacramento Valley IRWM Region

The Westside Region is bounded to the north by the North Sacramento Valley (NSV) IRWM Region, which consists of the Sacramento River watershed downstream of Shasta Dam and within Butte, Colusa, Glenn, Shasta, Sutter, and Tehama Counties. The NSV and Westside Regions share portions of the Yolo County and Lake County lines as common boundaries. Both regions also use water supplies provided by the Sacramento River and associated conveyance infrastructure such as the Tehama-Colusa Canal.

The majority of Colusa County is located within the NSV Region, while the Bear Creek portion of Colusa County is included in the Westside Region; this is because Bear Creek is a tributary watershed to Cache Creek, which is one of the defining watersheds of the Westside Region. Colusa County, the Westside RWMG, and the NSV RWMG agreed early on that interregional coordination of projects within this overlapping area is appropriate and that it should occur through the participation of the Colusa County Resources Conservation District in both IRWM groups.

Other agency jurisdictions and organization membership across the Yolo County line provide opportunities for coordination with NSV. The Westside RWMG includes the Water Resources Association (WRA) of Yolo County and its 11 members, including the Yolo County Flood Control and Water Conservation District, which also participates in the NSV IRWM planning process.

North Coast Funding Area
Sacramento River Funding Area
Westside Sacramento
San Francisco Bay Area Funding Area
San Joaquin River Funding Area
Willits
Willows
Glenn County
Oroville
Sierra County
Butte County
Biggs
Gridley
Live Oak
Nevada City
Yuba County
Grass Valley
Nevada County
Colusa County
Colusa
Williams
Yuba City
Marysville
Mendocino County
Ukiah
Nice
Lucerne
Indian Valley Reservoir
Lake County
Lakeport
Clear Lake
Clearlake Oaks
Kelseyville
Clearlake
Point Arena
Lower Lake
Cobb
Cloverdale
Coyote Valley
Middletown
Sutter County
Colfax
Wheatland
Placer County
Lincoln
Auburn
Loomis
Rocklin
Roseville
Placerville
El Dorado County
Folsom
Woodland
Yolo County
Lake Berryessa
Healdsburg
Calistoga
Sonoma County
Saint Helena
Napa County
Santa Rosa
Sebastopol
Cotati
Rohnert Park
Yountville
Winters
West Sacramento
Sacramento
Davis
Dixon
Sacramento County
Plymouth
Amador City
Sutter Creek
Ione
Jackson
Amador County
Vacaville
Sonoma
Napa
Solano County
Fairfield
Suisun City
Petaluma
Galt
Rio Vista
Isleton
Lodi
Calaveras County
Novato
Vallejo
Benicia
Marin County
Hercules
Pittsburg
Pinole
Martinez
Concord
Fairfax
San Pablo
San Anselmo
Ross
Richmond
Pleasant Hill
Clayton
Antioch
Corte Madera
El Cerrito
Brentwood
Larkspur
Walnut Creek
Stockton
Mill Valley
Belvedere
Orinda
Lafayette
Sausalito
Albany
Berkeley
Moraga
Emeryville
Contra Costa County
Alameda County
Danville
Oakland
Piedmont
San Francisco County
San Joaquin County
Stanislaus County
Cache Creek
Putah Creek
South Fork Putah Creek
Sacramento River
Feather River
American River
Colusa Basin Drainage Canal
Sacramento Deep Water Ship Channel
North Fork Cache Creek
Bear Creek
Legend
Cities
County Boundaries
Planning Areas
Westside Region
Streams
Projected Flow Pathway
Water Bodies
Funding Areas
Neighboring Regions
Yuba County
San Francisco Bay Area
San Joaquin
Northern Sacramento Valley
North Coast
East Stanislaus
Eastern San Joaquin
East Contra Costa County
Cosumnes American Bear Yuba
American River Basin
Source:
DWR's IRWM Grant Programs 2012.
DRAFT
0 3 6 9
Miles
Kennedy/Jenks Consultants
WESTSIDE SAC IRWM
Neighboring IRWM Regions
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Figure 10-1
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Flood risk management related to the Sacramento River is a shared challenge within both the NSV and Westside Regions. The Sacramento River Flood Control Project (SRFCP) was developed in the early 1900s to control flooding along the Sacramento River. Of the six SRFCP weirs that allow flood flows in excess of the downstream channel capacity to escape into a bypass channel or basin, the Moulton, Colusa, and Tisdale Weirs are located within the NSV IRWM planning area while the Fremont, Sacramento, and Cache Creek Weirs are located in and critical to management of the Sacramento River flood flows within the Westside Region.

Both the NSV and Westside Regions are part of the *Upper/Mid-Sacramento Region Regional Flood Management Plan* (RFMP) process led by a group of agencies including Butte, Colusa, Lake, Sutter, and Yolo Counties, who also participate in their respective IRWM efforts. This effort, started in February 2013, is part of an overall approach to implementing the state's *Central Valley Flood Protection Plan* (CVFPP). DWR has provided local funding and support for development of the RFMP. When completed in mid-2015, the RFMP will identify a list of high-priority regional flood projects, which will then be incorporated into DWR's *Sacramento River Basin-wide Feasibility Study*, as well as the NSV and Westside IRWM planning processes. Efforts to increase NSV-Westside IRWM collaboration in flood management have been initiated and are expected to continue.

10.3.1.2 Relationship with the American River Basin IRWM Region

On the east, the Westside Region shares a common boundary (the Sacramento River) with the American River Basin (ARB) IRWM Region. As for the NSV, the Sacramento River is both a flood management challenge and a source of water for the ARB. Some coordination between agencies within the Westside and ARB Regions already occurs through local agency participation in the Regional Water Authority (RWA). The RWA is a joint powers agency which has 22 members, including the Woodland-Davis Clean Water Agency (WDCWA). The WDCWA is a Joint Powers authority whose agencies include the City of Woodland and City Davis. The City of Woodland and the City of Davis are also members of the Water Resources Association (WRA) of Yolo County and therefore part of the Westside RWMG. The cities of Davis and Woodland have independently participated in RWA-led water efficiency programs in the past.

The focus of the WDCWA is to implement and oversee a regional **surface water supply** project that will serve more than two-thirds of the urban population of Yolo County, including UC Davis. The primary WDCWA goals are providing a new water supply to help meet existing and future needs, improving drinking water quality, and improving the quality of treated wastewater. The goal to improve the quality of treated wastewater is of particular interest to the Sacramento Regional County Sanitation District (SRCSD) located with the ARB Region. The SRCSD also serves the City of West Sacramento located within the Westside Region. SRCSD discharges treated wastewater effluent to the Sacramento River and this discharge is increasingly regulated. Improvements to the quality of treated wastewater effluent for the City of Woodland and the City of Davis will benefit agencies within the Westside and ARB Regions, as well as users downstream of these two regions.

As noted above, **flood risk management** is a common challenge on both sides of the Sacramento River. Agencies from the ARB and Westside Regions are participating in the Lower Sacramento/Delta North Region RFMP process, being funded and supported by DWR, and led by the West Sacramento Area Flood Control Agency (WSAFCA). When completed, the RFMP will identify a list of high-priority regional flood projects, which will then be incorporated, with NSV projects, into DWR's *Sacramento River Basin-wide Feasibility Study* as well as the ARB and Westside planning processes. In addition, DWR initiated a public engagement process for

the Central Valley Flood Protection Plan (CVFPP) *Basin-wide Feasibility Study and Conservation Strategy* that began in March 2013. WSAFCA, and its counterpart, the Sacramento Area Flood Control Agency, and other flood-related agencies have been coordinating actively through these and other flood planning efforts.

While collaboration is sought, the ARB and the Westside regions may have different goals for flood management efforts. Under the CVFPP, the Yolo Bypass is planned to be expanded west into current agricultural land in Yolo County, while discussion regarding changes to agricultural lands has created some tension in the Westside Region. Also, higher water stages in the Yolo Bypass could increase flood risk for lands adjoining the bypass. For the ARB region, however, expansion of the Yolo Bypass creates benefits by allowing for more efficient conveyance of flood waters away from Sacramento's urban areas.

Other multi-regional efforts have occurred during the past 10 years with the completion of numerous Sacramento River Basin **watershed assessments and watershed management plans**. Both ARB and Westside are incorporating watershed restoration projects into their IRWM Plans, particularly projects that can affect conditions on the ground, that is, that can implement actions to protect or improve watershed resources and overall watershed conditions. Watershed improvement work is being done by locally directed non-governmental management groups, local, state, and federal agencies, and other public and private entities. Planned projects are intended to benefit water quality, stream flow and aquatic habitat, fish passage, fire and fuels management, habitat for wildlife and waterfowl, eradication of invasive plant species, flood management, and watershed stewardship education. Support for this work has come from a broad spectrum of public and private sources.

In addition to sharing projects and institutional arrangements, Westside and ARB share stakeholders from the environmental, agricultural, and business sectors as well as DAC representatives. Organizations like the Resource Conservation Districts which are state-authorized organizations whose purpose is addressing local soil and water resources needs, have provided leadership in both sharing projects and providing institutional support.

10.3.2 Adjacent Funding Area Coordination

10.3.2.1 Bay Area IRWM Region Coordination

Several IRWM planning efforts involving the San Francisco Bay Area that were initiated in 2005 were ultimately found to overlap. The original Napa County IRWM Plan (2005) focused on the Napa River which flows to Suisun Bay while the Napa Berryessa Area, which includes upper Cache Creek did not have an IRWM Plan. The Solano Agencies IRWM Plan (2005) included areas that drain towards both Suisun Bay and the Sacramento River. The Napa River portion of Napa County and the southwest portion of the Solano Agencies IRWM Plan Region were included in the Bay Area IRWM Region, while the Upper Cache Creek portion of Napa County and the Vacaville portion of the Solano Agencies IRWM Plan were included in the Westside IRWM Region (located within the Sacramento River Funding Area).

These IRWM boundaries were reconfigured as a result of direct communication between the leaders of the other involved regions, through email, phone conversations, and invitations to participate in CC meetings. The approach taken to reconfigure the planning region boundaries was for the local agencies to determine for themselves if partnering and integrating with the Bay Area IRWM planning effort was beneficial to them. Each reached their decision

independently after participating in CC meetings and discussing the proposed mergers with their organizing committees.

Similarly, during development of the revised IRWM planning boundaries, representatives of the Bay Area IRWM Region contacted and coordinated with SCWA to establish the shared regional boundaries. Representatives from SCWA and Napa County Flood Control and Water Conservation District participate in both the Bay Area and Westside RWMGs, providing direct opportunities to share information between the two planning groups as well as the potential for developing interregional projects. Both agencies are targeted reviewers for the Bay Area IRWM plan and, as such, receive each draft chapter prior to public release for review and input. Both agencies are also members of the Westside IRWM CC

10.3.2.2 Relationship with the North Coast IRWM Region

The Westside Region is bounded to the northwest by the North Coast IRWM Region and Funding Area. The North Coast Region is made up of watersheds that drain to the Pacific Ocean, from Marin County in the south to the Oregon border in the north, and includes the counties of Modoc, Siskiyou, Del Norte, Trinity, Humboldt, Mendocino, and Sonoma. The Lake Pillsbury watershed in Lake County, which takes up less than 10% of the North Coast Region area, drains to the Eel River.

The major challenges in the North Coast Region are primarily related to timber harvesting, management and enhancement of anadromous fisheries, protection of wild and scenic rivers, and meeting the needs of DACs. The Lake County Watershed Protection District participates in both the Westside and North Coast Region IRWM processes and therefore offers an opportunity to coordinate and collaborate directly between the two regions. The most obvious challenge that could benefit from direct collaboration is the prevention of infestation by invasive aquatic invertebrate species.

Section 11: Implementation Framework

This section documents the relationships and decision-making structure used during the development of the Westside Sacramento Region (Region) *Integrated Regional Water Management Plan* (IRWM Plan). It also sets forward a proposed framework for Plan implementation and guidelines for 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 Region must take to ensure IRWM program success into the future.

One of the key considerations for an IRWM Plan is the governance structures to both develop and implement it over the next 20 years. This section describes those structures, which are consistent with the *Integrated Regional Water Management Guidelines for Proposition 84 and Proposition 1E* published by the California Department of Water Resources (DWR) in November 2012.

11.1 Governance Structure Used for Plan Development

In 2010, four agencies and one association (one organization from each of the five counties within the Region) agreed to create an IRWM Plan for the Westside Region of the Sacramento River Funding Area.

The Colusa County Resource Conservation District, Lake County Watershed Protection District, Napa County Flood Control and Water Conservation District, Solano County Water Agency, and Water Resources Association (WRA) of Yolo County[3] entered into a Memorandum of Understanding (MOU) to develop an integrated regional water management plan for the Westside Region of the Proposition 84 Sacramento River Funding Area (called the Westside Region or simply Region in this Plan) in September 2010. The agencies and association participating in the MOU are referred to collectively as regional public agencies within the MOU. They designated themselves the Westside regional water management group (RWMG).

The regional public agencies that signed the MOU established a coordinating committee (CC) comprising staff members of the MOU signatories to lead the development of the Plan. The CC entered into a charter on March 1, 2012 to further clarify the agreements made in the MOU. The MOU and the charter established the overall parameters of governance for developing the Plan; and can be found in Appendix A.

The RWMG decided that the Plan would be developed by a project team with public input. The project team includes the technical, public outreach, and facilitation consultants (collectively referred to as the consultant team, which is led by Kennedy/Jenks Consultants) as well as the CC.

The project team's activities to develop the IRWM Plan were funded by contributions from members of the RWMG and by a planning grant awarded by the DWR to the Westside RWMG.

[3] The current member agencies of the Water Resources Association of Yolo County include the 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 in Davis, and Yolo County Flood Control & Water Conservation District.

11.1.1 Roles and Responsibilities

The consultant team was responsible for leading the efforts to develop the Plan with guidance and oversight by the CC. Their responsibilities are described below.

Coordinating Committee Responsibilities

1. Manage the funds being used to develop the IRWM Plan.
2. Provide guidance and oversight to the consultant team.
3. Participate in CC and stakeholder input meetings.
4. Communicate with the regional public agencies and other interested parties throughout Plan development.
5. Review and comment on draft materials prepared by the consultant team.
6. Make decisions as described throughout this section

Consultant Team Responsibilities

1. Design the process for Plan development.
2. Engage with potential participants.
3. Gather information and synthesize it into Plan content that meets the IRWM guidelines.
4. Design, prepare for, and facilitate meetings with the CC and stakeholder group to develop the information needed for the IRWM Plan.
5. Draft content for the Plan and circulate it for review.
6. Review comments and revise draft sections of the Plan as appropriate.

11.1.2 Public Involvement Processes

As described in Section 1, the project team developed and implemented a broad public involvement process to ensure that interested stakeholders had multiple opportunities to inform the Plan development process and help shape its content. The project team posted public notices of its intent to prepare the Westside IRWM Plan in several newspapers within the Region. It also created an email distribution list of almost 700 individuals that includes representatives from all potentially affected agencies, nongovernmental organizations, and other interested parties. The email list was used to circulate an electronic newsletter periodically, to send invitations to upcoming meetings, and to invite comments on draft sections of the Plan as they were posted for public review.

The project team also developed and maintained an IRWM Plan website at www.westsideirwm.com. The website included meeting announcements, meeting agendas and materials, draft sections of the Plan, and summaries of meetings already conducted.

The project team contacted representatives of Tribes and disadvantaged communities within the Region by telephone, letters, emails, and in person meetings.

The project team also designated a Westside public information coordinator and provided an email address and phone number that anyone could use to learn more about, and to provide feedback during, the Plan development process.

Representatives of other agencies, nonprofit groups, nongovernmental organizations, government organizations, and the public were invited to participate as equals during stakeholder input meetings to inform the content of the Plan. This group of participants is referred to as the stakeholder group. All interested participants were encouraged to participate in stakeholder input meetings, discuss draft content of the IRWM Plan, and disseminate information from the stakeholder input meetings to the general public.

The project team also formed a technical subcommittee to assist with performing a water balance for the Region and individual planning areas within the Region. People were invited to participate in the subcommittee if they wanted to assist the consultant team to locate and organize water balance information for the Region for use in the Plan.

11.1.3 Decision Making

The approach to decision making used during the development of the Plan is called “facilitated broad agreement.” All interested participants were invited to participate as equals during stakeholder input meetings. The project team presented content through an interactive process with the intent to reach broad agreement with the stakeholder group on Plan content. The project team presented and discussed draft information in public meetings and also provided draft documents for review, comment, and discussion. All decisions related to the draft Plan content were made successfully using this approach.

If for some reason broad agreement on specific items could not be reached between the project team and the stakeholder group with a reasonable amount of time and effort, the consultant team was prepared to request that the CC discuss the item(s) and then vote to direct the consultant team on how to proceed. The CC agreed at the beginning of the Plan update that if they were to vote, unanimous agreement would be required in order to proceed with a specific decision.

11.1.4 Balanced Access and Opportunity for Participation

The consultant team conducted outreach, created content, and facilitated CC meetings and stakeholder input meetings. During the latter, some of which have been webcast and/or recorded for review, all interested participants were invited to participate as equals in the interaction to reach broad agreement on the content to be included in the Plan.

The consultant team also conducted targeted outreach intended to foster dialog with Tribes and representatives of the disadvantaged communities within the Region.

The consultant team has also been posting draft materials and Plan sections to the website and invited review and comment from any interested person or organization.

11.1.4.1 Internal and External Communication

The consultant team prepared communication materials regarding development of the IRWM Plan for distribution, posted it on the project website, and made the materials available for use by the CC in meetings with governing boards and other interested parties.

The consultant team communicated regularly with the CC via calls or in-person meetings that were announced and open to any stakeholder.

11.1.4.2 Coordination with Neighboring IRWM Efforts, State Agencies, and Federal Agencies

Project team members have met and coordinated with neighboring IRWM planning efforts by other local, state, and federal agencies, participating in coordination calls or in-person meetings. Members of the project team also have met or talked with DWR staff a number of times. Members of the consultant team have corresponded with and phoned a number of staff within federal agencies that have interests within the Region.

11.2 Governance Structure for Plan Implementation

Once the Westside IRWM Plan has been adopted, the focus of the RWMG will change significantly. Some of the activities conducted during Plan development will continue, but the emphasis will shift from planning toward implementation and tracking of progress.

The current structure of the RWMG, which was established through an MOU with a staff-led CC as described in Section 11.1, has functioned well for managing the funding and providing guidance and oversight to the consultant team during Plan development. Therefore, the CC recommended and the stakeholder group agreed that the Region will continue with a similar RWMG model through the initial phases of Plan implementation. A draft MOU amendment has been prepared (see Appendix A) to establish a RWMG responsible to support the implementation of the adopted Westside IRWM Plan. It is anticipated that the MOU amendment will be executed around the same time the IRWM Plan is adopted and that the MOU will include the terms described below:

- The RWMG intends to support the activities of existing agencies and organizations within the Region to accomplish the objectives in the adopted Westside IRWM Plan. The primary roles of the RWMG are to foster collaboration to accomplish Plan objectives, track and report on implementation progress, and provide a mechanism to revise and update the Westside IRWM Plan.

- The RWMG will endeavor to continue to include one representative from an agency/organization in each county within the Westside Region that has authority to manage water or related resources within it. Representatives of water management organizations within each county will be responsible to select their representative agency or organization, and may choose not to participate in the RWMG. However, the RWMG must have at least three agencies or organizations, two of which have authority over water, in order to form and function.

- Each signatory agrees to designate a primary and alternate representative to serve on the RWMG CC.

- Regular participation in CC activities is required.

- The CC will provide leadership to support implementation of the Westside IRWM Plan and may elect to establish an implementation support team (described in the following section).

- CC/stakeholder input meetings will be held quarterly or as needed.

- CC will lead preparation of an annual report as well as an annual work plan and budget.

- CC activities will be conducted in accordance with the Brown Act (Government Code § 54950-54960.5).

See Table 11-1 for more details about the anticipated activities, participants, and roles for implementing the Plan.

11.2.1 Roles and Responsibilities

Implementation of the Westside IRWM Plan will rely on actions taken by existing agencies and organizations within the Region. The RWMG, as represented by the CC, will provide leadership for fostering cooperation, continuing coordination, tracking Plan performance, and updating the Plan. The CC may form stakeholder subcommittees to help focus collaboration and progress on specific topics or objectives. (Note: the tracking of Plan performance does not replace required regulatory reporting by specific agencies within the Region; it is being done to monitor progress on Plan implementation and provide information that can be useful for continuing implementation of, updates to, or amendments to the Plan.)

Some of the key groups that will be involved in implementation of the Westside IRWM Plan are:

- **Westside Regional Water Management Group (RWMG)** – A group of up to five agencies or associations with authority to manage water or related resources within the Region (up to one for each county within the Region with a minimum of three required) who are signatories to an MOU to establish the RWMG as described above. It is initially intended that the RWMG for Plan implementation will include Lake County Watershed Protection District, Napa County Flood Control and Water Conservation District, Solano County Water Agency, and the WRA of Yolo County.

- **The Westside Coordinating Committee (CC)** – A committee of designated representatives (primary and alternate) of each organization within the RWMG. The CC will select a chair and vice-chair, who must be from different organizations, each year. The chair (and in the absence of the chair, the vice-chair) will be responsible to lead the efforts of the CC during the year. The chair and vice-chair will be selected each year by unanimous approval of the CC.

- **Westside Implementation Support Team (IST)** – The CC may choose to organize one or more administrators or professionals who have the necessary skills to support the actions listed below. This group can include individuals who are hired for this role or designated to serve in this role while employed within another agency or organization within the Region or employed by retaining consultants.

- **Stakeholder Group** – A collection of people who choose to participate in the Westside implementation activities.

- **Subcommittees** – The CC may choose to organize one or more small group(s) of people chartered to focus on a particular topic related to implementation of the Westside Plan (e.g., to support accomplishing objectives 1 and 2 within the education and awareness focus area). Subcommittees may include members from both the RWMG and regional stakeholders. Subcommittees will report and provide recommendations to the CC depending on the topic that is being discussed. It is recommended that subcommittees have a chairperson and a written charter and that the subcommittee composition and charter be reviewed at least every two years, or as needed

- **Project Proponents** – Agencies or organizations who are serving as a project proponent/project implementer in the Plan. Projects included and tracked by the Westside IRWM Plan may include projects funded (in whole or in part) by IRWM grant funds, as well as projects and programs funded independently

Table 11-1: Activities, Participants, and Roles for Implementing the Westside IRWM Plan

	Activities	RWMG	CC	IST	Stakeholder Group / Subcommittees	Project Proponents
1.	**Promote Progress on Plan Objectives**					
	Foster Collaboration	Authorize	Lead	Support	Participate	Participate
	Gather Data Related to Progress	"	"	"	"	"
	Synthesize Data Related to Progress	"	"	"	"	"
	Report On Plan Progress	"	"	"	"	"
2.	**Conduct Stakeholder Meetings**					
	Schedule Meetings	Authorize	Lead	Support	Support	Support
	Prepare Agendas	"	"	"	"	"
	Prepare Content	"	"	"	"	"
	Facilitate Meetings	"	"	"		
	Prepare Meeting Summaries	"	"	"		
3.	**Engage Public**					
	Maintain Email List	Authorize	Lead	Support	Support	Support
	Develop Content	"	"	"	"	"
	Send Announcements / Invitations	"	"	"	"	"
4.	**Maintain Westside Website**					
	Update Content	Authorize	Lead	Support	Support	Support
	Administer Site	"	"	"	"	"
5.	**Update Westside IRWM Plan**					
	Receive Project Submittals	Authorize	Lead	Support	Support	Submit Potential Projects
	Review and Update Objectives	Authorize	Lead	Support	Participate	Participate
	Revise Project List	"	"	"	"	"
	Revise Project Priorities	"	"	"	"	"
	Revise Plan Content	"	"	"	"	"

	Activities	RWMG	CC	IST	Stakeholder Group / Subcommittees	Project Proponents
6.	**Pursue Grant Funds for Implementation**					
	Identify Grant Opportunities	Authorize	Lead	Support	Support	Support
	Select Projects for Inclusion in Grant Applications	Authorize	Lead and Decide if Necessary[(a)]	Support	Participate	Participate
	Prepare and Submit Grant Applications	Authorize	Lead	Support	Participate	Participate
	Identify One or More Willing Fiscal Agent(s) to Manage Grant Funds (If Received) on Behalf of the RWMG	Authorize	Lead	Support	Support	One or More Agency Or Organization Serve As Fiscal Agent
7.	**Coordinate with Related Efforts**					
	Coordinate with Neighboring IRWM Regions	Authorize	Lead	Support	Support	Support
	Coordinate with Local, State, and Federal Agencies	"	"	"	"	"
8.	**Foster Effective Communication**					
	Facilitate Efficient and Effective Communication Within Implementing Agencies and Stakeholders	Authorize	Lead	Support	Support	Support
	Facilitate Efficient and Effective Communication Outside of Westside Region	"	"	"	"	"
9.	**Manage and Share Related Data and Information**					
	Identify Data and Operational Data That Should Be Measured and Managed To Meet Plan Goals and Objectives [(b)]	Authorize	Lead	Support	Support	Support
	Gather The Needed Data and Information		Coordinate with Existing Agencies	Support	Support	Support
	Store and Manage Needed Information		"	"	"	"
10.	**Finance Implementation Coordination Activities**					
	Set Annual Operating Budget for Implementation Coordination	Authorize and possibly provide funds	Lead	Support	Support	Support
	Manage Expenditures of Implementation Coordination Activities	Authorize	Lead	Support		

(a) "Decide if Necessary" means that the project team and the stakeholders were not able to reach broad agreement and the CC will decide based on majority vote.
(b) This topic will focus on data that are currently collected.

11.2.1.1 Responsibilities of Project Proponents

Project proponents include agencies or entities that have submitted projects that they intend to sponsor during implementation and that have been included in the Westside IRWM Plan. Information on and a summary list of all IRWM Plan projects is maintained at www.westsideirwm.com (Projects tab). It is envisioned that the project proponents will have the following roles and responsibilities:

1. Provide project-specific information for the regional project database that may aid in advancing the Plan's regional objectives.

2. Seek opportunities to integrate, where possible and practical, Plan projects in the database to most efficiently achieve the regional objectives. This process may be initiated and facilitated at stakeholder meetings, but it is expected that project proponents will further develop these opportunities outside of that forum.

3. Provide updated project-specific information for the regional project database as necessary to reflect major project milestones (e.g., CEQA completion, 100% design, construction underway, construction complete, and project completion). This particular role is a critical element of Plan implementation and is in the best interest of the project proponents, since having updated information available will help projects when applying for financial assistance.

4. Participate in stakeholder meetings to educate others about the proponent's project(s) in the database. This will happens naturally as a result of casual collaboration with others but may also be in the form of presentations at stakeholder meetings

5. Identify a point person for each project who will provide, in a timely manner, to the RWMG and/or consultant, requested information for projects for inclusion in a grant application.

6. Identify a point person for each project who will provide, in a timely manner, to the grantee and/or consultant, requested information for projects selected for funding through a funding agency.

7. Comply with grant requirements, as identified by the funding agency, to qualify for grant funding.

11.2.2 Public Involvement Processes

One of the most important aspects of Plan implementation is processes to ensure that the public and interested stakeholders continue to be involved. This will be accomplished through multiple avenues of communication and engagement between the CC and stakeholders, including, at minimum, the following:

- The CC Chair will lead CC /stakeholder input meetings as needed, meeting quarterly, at a minimum, to discuss relevant topics of progress on implementation. The CC may convene additional meetings to support fulfilling the objectives of the Plan or other key activities

- To accommodate participation despite the large geographic extent of the Region, the CC will provide an opportunity for stakeholders to participate remotely in the stakeholder meetings. This could include conference calls, web interface, or other technologies that allow for reasonable interaction while the meeting is in progress.

- The CC will maintain and update content to the Plan website.

- The CC will maintain a contact email and phone number for people to send comments or ask questions about the Plan.

- The CC will maintain the Westside stakeholder email list and send updates and meeting invitations as appropriate.

- The CC will coordinate the activities of subcommittees including tracking of subcommittee membership and scope and maintaining documentation of subcommittee recommendations.

11.2.3 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 Westside IRWM meetings, including CC 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 CC and RWMG stakeholder meetings. Meetings are required to be held within the Region 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 RWMG but are not otherwise agendized. All votes of the RWMG 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.

11.2.4 Decision Making

Decisions during implementation authorized by the RWMG 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 CC will set agendas, interact with stakeholders, and foster collaborative decisions as described in Table 11-1. If for some reason broad agreement cannot be reached between the CC and the stakeholder group related to specific items within a reasonable amount of time and effort, the CC will discuss such item(s) and then decide by majority vote how to proceed.

11.3 Plan Performance and Monitoring

Another important element of successful Plan implementation is a well-developed approach to performance and monitoring. Section 11.3 describes such an approach, including monitoring, adjustments, and to data sharing.

11.3.1 Project-Focused Performance Monitoring

The Region's vast geography, complex relationships among the many water-related entities, and breadth of projects require a multi-faceted performance monitoring strategy. This strategy focuses on measuring progress towards achieving Plan goals and objectives, Resource Management Strategies (RMS), and, ultimately, projects.

Changes to the goals and objectives may affect the types of RMS that need to be implemented by stakeholders, which could also have implications on the types of projects that are included in the Plan.

Many of the 24 plan objectives have unique quantitative and/or qualitative targets that need to be tracked to ensure full implementation of the Plan. As this initial Plan represents a fairly ambitious undertaking, some of the objective targets were not fully articulated in the goals and objectives described in Section 6. As a result, an *Information Needs and Data Sources Technical Memorandum* (provided in Appendix E) was developed to identify additional information needs and steps that stakeholders can implement to fully define, understand, and implement targets for each objective.

Better definition of measurable planning targets for many of the objectives may result in the need for additional projects to fully complete the plan. For example, objective 7, prevention of quagga and zebra mussel infestation in the Region's water bodies, is a high-importance/high urgency objective, but specific quantifiable measurement targets cannot be readily developed until a regional invasive mussels prevention plan is developed and implemented Although many tracking activities can begin immediately, it is recommended that the RWMG begin with proactive implementation of High Importance and High Urgency objectives and related projects

Project proponents will be responsible for developing and implementing most projects and then collecting performance monitoring data and reporting it to the RWMG. Updated data likely will be collected from project proponents annually.

Below are outlined several considerations for monitoring efforts as articulated in the Proposition 84/1E guidelines (required for Proposition 84/1E grant-funded projects and recommended for all other projects in the Plan) and answered for purposes of this Plan:

- How will lessons learned be used to improve implementation of future projects? Response: Lessons learned will be applied to future project implementation by evaluating the extent to which the Plan objectives and targets are accomplished, and reviewing and refining the types of projects or targets themselves based on the various experiences. For example, technical information and data collected will contribute to a greater body of understanding about certain challenges faced by the Region. Likewise, financial performance and reporting experiences will help inform more efficient ways of planning and implementing important projects. These experiences will be shared through

the quarterly interactions with the RWMG and stakeholders, and through project reporting mechanisms.

- Who is responsible for development of project-specific monitoring plans and monitoring activities? Response: As described in Section 10.2.1.1, project proponent responsibilities include development of project-specific monitoring plans and monitoring of project performance after implementation. Project proponents must report this information to the RWMG and to any lead agency responsible for grant or loan funding contributions.

- At which stage of project development will a project-specific monitoring plan be prepared? Response: Project-specific monitoring plans will be developed before the start of project implementation.

- What is typically required to be included in the monitoring plan for each project? Response: Monitoring plans will include delineation of the following components:

    - Description of what will be monitored for each project,

    - Methods for monitoring problems and their correction,

    - Monitoring location(s),

    - Monitoring frequency,

    - Monitoring protocols, procedures, and responsibilities,

    - Reporting of data collected to the data management system (DMS) described in Section 11.3.2. as well as to statewide databases, and

    - Procedures and funding assurances to document that the monitoring will take place during the entire monitoring period.

11.3.2 Data Management

Data management includes the collection, storage, processing, and sharing of information that is developed from project-specific performance monitoring. The DMS is simply a reference to the tools and strategies that the RWMG will use to organize, maintain, and share this vast amount of data. Water-resources data are generated in this Region from multiple sources, in countless formats, and is reported in varying frequencies to jurisdictional bodies, nongovernmental agencies, water agencies, and regulators. The Plan's DMS is not intended to serve as the central clearinghouse for this vast amount of information; rather, it has been developed to meet the Proposition 84/1E IRWM guidelines in performing the following functions:

- Support the CC in its responsibilities by collecting and sharing information related to:

    - Westside IRWM project implementation and

    - Westside IRWM objective progress,

- Providing means for interested stakeholders both inside and outside the Region to locate needed information concerning IRWM project implementation, and

- Consideration of means to simplify the interconnection and sharing mechanisms between local and statewide data sources.

11.3.2.1 Near-Term Data Management Approach

Several DMS options were considered and reviewed by the project team to select a system that will serve the near-term needs (i.e., within the Plan's first several years) of the Region. The DMS options are summarized in a Technical Memorandum in Appendix E.3. The data management approach in the near term for the Plan is to use existing data sources and processes to minimize new work and incorporate them into a simple database system. It is envisioned that an on-line GIS map-based project tracking system developed in Napa County will be adapted for use in the Westside IRWM Region in a phased approach.

The initial phase of the DMS system will include the information gathered during the call-for-projects phase along with the following:

- Procedures to update and add new projects and/or activities by project proponents and/or data administrators,

- Data fields to align projects and activities with specific Westside IRWM Plan objectives and qualitative/quantitative measures,

- Simple reporting and/or data export for preparation of annual reports regarding both project progress and meeting objectives,

- Identification of responsibilities of stakeholders, CC members, committee leads, local technical experts, and others for data collection, input, and update, including quality assurance/quality control reviews, and reporting, and

- Other information.

The benefits of an on-line data management system – single location for information, ease of adding/modifying information, and ease of preparation of reports, among others – was acknowledged by the CC. It is anticipated that in the early phases, information will be shared and transferred formally through the annual report and informally during the quarterly meetings. The data contained in the annual report will be shared with local, state, and federal agencies through posting to the Westside IRWM website. More detailed information can be available through contact with the Westside CC.

The system is planned to be flexible enough to meet the immediate needs of the Region, but it could be expanded in future phases for additional functionality, including collection of technical data that could be shared with state databases such as Water Data Library (WDL) and California Environmental Resources Evaluation System (CERES).

11.3.2.2 Potential Long-Term Data Management Options

It is envisioned that future phases of the data management system will continue to focus on projects and objectives tracking but could be expanded to include:

- Project-specific monitoring, especially for projects funded through implementation grant funds,

- Tracking of additional data to more specifically monitor objectives,
- Distribution of data to state databases including WDL, CERES, California Environmental Data Exchange Network (CEDEN), California Statewide Groundwater Elevation Monitoring (CASGEM), and California Environmental Information Catalog (CEIC),
- Viewing of project and objectives data for adjacent IRWM regions to improve interregional collaboration,
- Addition of other projects beyond those submitted in the Westside IRWM (e.g., from Yolo WRA), and
- Other information.

Future data management needs will be evaluated periodically by the Westside CC and ways to meet them will be incorporated, likely including many of the above-noted measures.

11.4 Plan Financing

Financing of an IRWM Plan is an enormous undertaking and requires the contributions and attention of local, state, and federal agencies to ensure success. Financing of this Westside IRWM Plan involves two distinct tracks: funding of IRWM Plan 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 CC and others will employ to secure additional funding.

11.4.1 Funding Needs

11.4.1.1 Implementation Coordination Funding

Development of the IRWM Plan was funded by the RWMG and an IRWM Planning grant from the DWR. However, these funds cannot be spent on plan implementation activities, so one of the first steps to implement the IRWM Plan is to establish a budget and funding source to support implementation coordination. These include activities undertaken by the CC and/or IST 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 CC will establish an annual operating budget to conduct its activities. This budget will be presented and discussed at a stakeholder input meeting. Members of the RWMG (and potentially other agencies/organizations within the region) may provide funds or in-kind services to ensure that the activities of the CC are fulfilled. The CC may direct the expenditure of implementation coordination funds for any of the roles defined for the CC. It is expected that the specific activities and associated budgets will be prepared on an annual basis, initially as implementation begins and the MOU is implemented. Many of the roles and activities could be handled by either CC staff or the IST; therefore the specific budgetary requirements may change as implementation progresses.

11.4.1.2 Project Implementation Funding

As of May 2013, 140 project are included in the IRWM Plan. One hundred four of the projects provided funding information, with a total estimated funding need of $1.77 billion. Of the 140 projects, 24 are feasibility studies and 47 are 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 IRWM plan. Table 11-2 summarizes financing needs and the availability of capital and operations and maintenance funding sources based on information provided by project proponents for high-urgency/high-importance projects. The table includes only such high-priority projects and near-term implementation priority projects, as these are some of the projects that are anticipated to be implemented first by regional proponents. It is recommended that this table be updated and included in the annual report each year.

11.4.2 Potential Funding Sources

11.4.2.1 Stakeholder Funding

Funding sources are rarely assured far in advance of project implementation. Additionally, many agencies have encountered challenges to securing project funding as grant programs have become more competitive and agency budgets have tightened significantly during the recent economic downturn. It is understood that funding is required to implement (that is, to construct) projects, as well as operate and maintain the project after initial construction is completed. In most cases, it will be the responsibility of the project proponents to ensure that initial construction and operations and maintenance funding needs are met for specific projects. Despite limited funds, most agencies do have a variety of funding tools available including:

- Ratepayers,
- Operating funds,
- Water enterprise funds,
- Special taxes, assessments, and fees,
- State or federal grants and loans,
- Private loans, and
- Local bonds.

11.4.2.2 Grants and other Sources (See Also Section 10.5.5)

Funding from multiple sources will be needed to ensure projects are funded and can proceed to implementation. To that extent, the CC will undertake a number of steps identify and support obtaining alternative funding, including grants.

- The CC will research, identify, and pursue grant funds that could help implement the projects and meet the objectives included in the Plan.

- The RWMG will not serve as a fiscal agent for grant funds, but rather will identify a willing agency or organization with the appropriate authority and financial conditions to serve as a fiscal agent on behalf of the region for each specific grant opportunity that is pursued.

Table 11-2: High-Importance/High-Urgency Projects and Near-Term Implementation Projects

Activity Description	Lead Agency / Organization	Project Title	Approximate Total Cost	Funding Source and % of Total Cost	Funding Certainty / Longevity	O&M Finance Source	O&M Finance Certainty
Project No. 110	Woodland-Davis Clean Water Agency	Davis-Woodland Water Supply Project	$258,000,000	Ratepayer Revenue; 100%	Secure - Part of Agency Budget	Ratepayer Revenue	Secure - Part of Agency Budget
Project No. 95	Reclamation District 2035	Sacramento River Joint Intake Project	$42,646,000	Ratepayer Revenue; 93%	Not specified	Ratepayer Revenue	Secure - Part of Cities of Woodland and Davis Existing Rates
				U.S. Bureau of Reclamation & Dept. of Fish and Wildlife; 7%	Security of Funding Not Specified	N/A	N/A
Project No. 92	Napa Berryessa Resort Improvement District	NBRID Wastewater Treatment Plant Replacement	$1,500,000	None	Unsecure	None	Unsecure
Project No. 90	Napa Berryessa Resort Improvement District	NBRID Water Treatment Plant Replacement	$2,500,000	None	Unsecure	Ratepayer Revenue	Secure - Part of Water and Sewer Rates
Implementation Project No. 76	RWMG with selected Lead Agency	Regional Invasives Management Plan	$0	N/A	N/A	Ratepayer Revenue	Secure – Ratepayer-Adopted Rates
				Existing Funds; 35%	Secure - Existing Agency Funding	N/A	N/A
Project No. 54	City of Davis	Wastewater Treatment Plant Secondary and Tertiary Improvements	$85,000,000	SRF; Unknown	Applied or Will Apply for Funding through State Revolving Fund	N/A	N/A

Activity Description	Lead Agency / Organization	Project Title	Approximate Total Cost	Funding Source and % of Total Cost	Funding Certainty / Longevity	O&M Finance Source	O&M Finance Certainty
Implementation Project # 55	Clearlake Oaks County Water District	Plant Intake	$0	LAFE account / USDA Funding; Not Specified	Secured	None	Unsecure
Project No. 48	Crescent Bay Improvement Company	Crescent Bay Improvement Company	$1,000,000	None	Unsecure	None	Unsecure
Project No. 34	Solano County Water Agency	Research on Improving Water Treatment for Delta Sources	$100,000	None	Unsecure	None	Unsecure
Project No. 32	Solano County Water Agency (SCWA)	Solano Invasive Species Program	$100,000	SCWA; 50%	Medium Security - SCWA to Potentially Fund 50% Project Cost through Ratepayer Revenues	None	Unsecure
Project No. 23	Solano County Water Agency	Aquatic Nuisance Vegetation Management	$100,000/year	SCWA; 50% O&M	Medium Security - SCWA to Fund 50% Project Cost through Ratepayer Revenues	SCWA	Medium Security - SCWA to fund 50% Project Cost through Ratepayer Revenues
Project No. 87	Lake Berryessa Resort Improvement District	LBRID Wastewater Storage Pond and Disposal Improvements	$3,000,000	None	Unsecure	Ratepayer Revenue	Secure - Part of Agency Budget
Project No. 93	Rural Community Assistance Corporation	Rural Disadvantaged Community (DAC) Partnership Project	$127,753	None	Unsecure	N/A	N/A

- The fiscal agent(s) may distribute grant funds to other project proponents within the region according to the specific terms of the grant program that provides funds. The project proponents who receive grant funds will be responsible to complete their project(s) as described in the relevant grant application and/or grant agreement. The fiscal agent will not be responsible to fund or complete projects for other project proponents outside of the specific commitments made in a particular grant agreement.

- The CC will track the amount of grant funds brought into the Region to support implementation of the Plan and the specific projects being funded (or partially funded) with grant funds. The CC will include this information in its annual report of Plan performance.

11.5 Recommendations for Plan Implementation

The broad recommendations for plan implementation summarized below are intended to serve as a road map to the CC. The following sections address in more detail the following recommendations:

1. Help form subcommittees or other mechanisms that will foster collaboration for Plan implementation.

2. Define what it will focus on for the next two years.

3. Track progress for IRWM Plan implementation.

4. Research other grant opportunities for Plan implementation.

11.5.1 Proposed Year 1 (FY 2013/2014) Focus Topics

1. Develop and execute a new MOU to establish a RWMG according to the terms described in this section) and select a chair, vice chair, and individuals/entities to support IRWM implementation. MOU preparation is planned to occur before IRWM Plan adoption.

2. Set annual operating budget for implementation coordination and manage expenditures of implementation coordination activities

3. Prepare materials for and conduct stakeholder input meetings as needed with a plan to meet at least quarterly. Institute conference call accessibility so that meetings are announced and open to any stakeholder; update website with meeting information and meeting summaries. Potential topics/locations should include:

   Q1 – Vacaville – Topics: Chair/vice-chair selection, operating budget discussion; set schedule/location/topics for Q2, Q3, Q4 meetings; identify which subcommittees to establish during this year, initiate efforts to establish identified subcommittees

   Q2 – Clearlake – Standing Topics: Objectives/project updates (including implementation status) and integration; coordination/funding opportunities; reports from subcommittee activities; presentation from a topical expert relevant to the region objectives

Q3 – Woodland – Standing Topics: Objectives/project updates (including implementation status) and integration; coordination/funding opportunities; reports from subcommittee activities; presentation from a topical expert relevant to the region objectives

Q4 – Vacaville – Standing Topics: Objectives/project updates (including implementation status) and integration; coordination; funding opportunities; year 2 planning; reports from subcommittee activities; presentation from a topical expert relevant to the region objectives

4. Facilitate progress on high-importance/high-urgency projects listed in Table 11-3 and objectives with near-term due dates. Establish subcommittees as needed to support high-importance/high-urgency projects.

Table 11-3: High-Importance/High-Urgency Projects

Project Number	Lead Agency/Organization	Project Title
110*	Woodland-Davis Clean Water Agency	Davis-Woodland Water Supply Project
95	Reclamation District 2035	Sacramento River Joint Intake Project
92	Napa Berryessa Resort Improvement District	NBRID Wastewater Treatment Plant Replacement
90	Napa Berryessa Resort Improvement District	NBRID Water Treatment Plant Replacement
76	RWMG with selected Lead Agency	Regional Invasives Management Plan
54	City of Davis	Wastewater Treatment Plant Secondary and Tertiary Improvements
55	Clearlake Oaks County Water District	Plant Intake
48	Crescent Bay Improvement Company	Crescent Bay Improvement Company
34	Solano County Water Agency	Research on Improving Water Treatment for Delta Sources
32	Solano County Water Agency	Solano Invasive Species Program
23	Solano County Water Agency	Aquatic Nuisance Vegetation Management
87	Lake Berryessa Resort Improvement District	LBRID Wastewater Storage Pond and Disposal Improvements

* Round 2 Implementation Grant funding request cost is for a portion of the project.

5. Work toward objectives 4 (due 12/31/14), 8 (due 12/31/15), 10 (due 12/31/15), and 16 (monitor ongoing state and federal planning programs in the Delta).

6. Review Plan for update/amendment including review of objectives; issue call for projects; and review and update project list.

7. Coordinate with neighboring IRWM regions and local, state, and federal agencies

11.5.2 Proposed Year 2 (FY 2014/2015) Focus Topics

1. Select chair and vice chair and individuals/entities to support IRWM implementation.

2. Set annual operating budget for implementation coordination and manage expenditures of implementation coordination activities.

3. Prepare materials for and conduct stakeholder input meetings as needed with a plan to meet at least quarterly, with conference call accessibility so that meetings are announced and open to any stakeholder; update website with meeting information and meeting summaries.

   Q1 – Vacaville – Topics: Review progress made toward Plan objectives in year 1 through preparation of an annual report and adjust year 2 accordingly; chair/Vice-chair selection, operating budget discussion; set schedule/location/topics for Q2, Q3, and Q4 meetings.

   Q2 – Clearlake – Objectives/project updates (including implementation status) and integration; coordination/funding opportunities.

   Q3 – Woodland Standing Topics: Objectives/project updates (including implementation status) and integration; coordination/funding opportunities.

   Q4 – Vacaville – Objectives/project updates (including implementation status) and integration; coordination/funding opportunities; year 3 planning.

4. Continue progress on year 1 projects.

5. Review Plan for update/amendment including review of objectives; issue call for projects; and review and update project list.

6. Identify 10 high-importance/medium-urgency projects out of the 53 listed in Table 11-4 for focused CC attention for the next three years.

Table 11-4: High-Importance/Medium-Urgency Projects

Project Number	Lead Agency/Organization	Project Title
114	West Sacramento Area Flood Control Agency	Sacramento River Levee Repair
116	West Sacramento Area Flood Control Agency	Sacramento Bypass-Yolo Bypass Levee Repair Phase II
84	Yolo County Flood Control and Water Conservation District	Winters Main Canal Modernization Project: Integrated Precision Water Mgmt.
59	Lake County Water Resources Department	Middle Creek Flood Damage Reduction and Ecosystem Restoration Project
75	Rural Community Assistance Corporation	DAC Community Wastewater Management Project
86	Yolo County Service Area #6	County Service Area (CSA) #6 Levee Repair Project
49	Dixon Regional Watershed Joint Powers Authority	Dixon Main Drain / V-drain Enlargement Project
88	Lake Berryessa Resort Improvement District	Water Tank Replacement Project
104	Reclamation District No. 2068	Pump Station No. 1 and Upstream Drainage Tributary Inflow Metering
63	Lake County Water Resources Department	Develop and Implement a Comprehensive Watershed Monitoring Programs
44	City of Clearlake	City of Clearlake Stormwater Management Plan (SWMP), Storm Drainage and Flood Control Project Proposal
96	Knights Landing Ridge Drainage District	Mid Valley, Knights Landing Repair Project
83	West Sacramento Area Flood Control Agency	Lower Sacramento and Delta North Regional Flood Management Plan
69	Lake County Water Resources Department	Adobe Creek Conjunctive Use Project
98	Reclamation District No. 2068	Canal Headworks Metering
108	Tuleyome, Inc.	Sulphur Creek Mercury and Sediment Reduction Project
50	Dixon Regional Watershed Joint Powers Authority	Eastside Drain
67	Lake County Water Resources Department	Cache Creek Flow Enhancement Project
66	Lake County Water Resources Department	Clear Lake Water Quality Assessment
102	Reclamation District No. 2068	SCADA Implementation
30	Solano County Water Agency	North Bay Aqueduct Alternate Intake Project
42	Solano County Water Agency	Ulatis Flood Control Channel Grade Control

Project Number	Lead Agency/Organization	Project Title
81	Tuleyome, Inc.	Comprehensive Mercury Assessment and Implementation for the Westside Region
111	West Sacramento Area Flood Control Agency	Deep Water Ship Channel East Levee Repair
113	West Sacramento Area Flood Control Agency	Port of West Sacramento North and South Levee Repair
64	Lake County Water Resources Department	Develop a Native Fish Management Plan
141	Reclamation District 2035	Conjunctive Use Study
136	Reclamation District 2035	Levee Repairs/Maintenance- Segments 150, 173 and 297
101	Reclamation District No. 2068	RD 2068 Levee Slope Modification
78	Scotts Valley Band of Pomo Indians	Hitch Habitat Assessment
107	Tuleyome, Inc.	Abandoned Mines Remediation Plan for the Cache Creek and Putah Creek Watersheds
112	West Sacramento Area Flood Control Agency	Deep Water Ship Canal Navigation Levee Repair
117	West Sacramento Area Flood Control Agency	West Sacramento South Cross Levee Repair
132	Yolo Basin Foundation	Lower Putah Creek Restoration from Toe Drain to Putah Creek Diversion Dam (Yolo Bypass Wildlife Area Element)
58	Lake County Water Resources Department	Reduce Flood Damage
57	Lake County Water Resources Department	Restore Native Fish Spawning Areas in Clear Lake Tributaries
45	City of Woodland / FloodSAFE Yolo Pilot Program	Lower Cache Creek Flood Risk Reduction Project
51	Dixon Resource Conservation District	Storm Flow Reduction From Agricultural Lands North of Interstate 80
134	Proposed by RWMG	Climate Change Adaptation Study
139	Reclamation District 2035	Floodway Corridor Project
135	Reclamation District 2035	Tule Canal Habitat Enhancement & Sediment Removal
73	Robinson Rancheria	The Restoration of the Clear Lake Hitch to Blue Lakes
31	Solano County Water Agency	Improve Solano Project SCADA infrastructure
25	Solano County Water Agency	Gibson Canyon Creek Detention Basin
39	Solano County Water Agency	Source water protection for Putah Creek watershed
40	Solano County Water Agency	Suisun Valley Flood Management
80	Tuleyome	Cache Creek Anadromous Fish Reintroduction Project

Project Number	Lead Agency/Organization	Project Title
109	Tuleyome, Inc.	Elgin Mine Drainage Water Treatment Project
121	Yolo County	Analysis of BDCP's Yolo Bypass Conservation Measure and Other Measures
125	Yolo County	Methylmercury Impacts Analyses for the Yolo Bypass
120	Yolo County	Yolo County Airport Drainage Plan
123	Yolo County	Clarksburg Flood Protection Feasibility Study
74	Robinson Rancheria	Spawning Hitch fish and reproduction loss correction measures for an artificial trap

7. Coordinate with neighboring IRWM Regions and with local, state, and federal agencies.

11.5.3 Track Progress for IRWM Plan Implementation

1. Track progress on Plan objectives:
    a. Gather data related to progress,
    b. Synthesize data related to progress,
    c. Report on Plan progress, and
    d. Manage and share related data and information.
2. Identify the data and operational data that should be measured and managed to meet the goals and objectives of the IRWM Plan with a focus on data that are currently collected:
    a. Gather the needed data and information,
    b. Store and manage it, and
    c. Provide access to it.

11.5.4 Research Other Grant Opportunities for Plan Implementation

1. Pursue grant funds for implementation;
    a. Identify grant opportunities,
    b. Select projects for grant applications, and
    c. Prepare and submit grant applications.

11.6 Plan Updates and Changes

The Westside IRWM Plan 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 RWMG and stakeholders continue to develop. Changes to the Plan will follow the similar, publically open and accessible process followed by this plan development process. Specific protocol for changes and updates to the plan is documented in the following descriptions.

11.6.1 Making Changes to the IRWM Plan

Changes to the plan include revisions or updates to the section narratives. Changes are expected. While the specific frequency for Plan updates is not defined, it will be reviewed at minimum as follows:

- The CC will review the Plan at least once every five years 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 as described below.

- If significant changes are needed, the CC will lead the process for revising the Plan. Once substantial revisions are made, the CC will request that RWMG members and project proponents adopt the revised plan.

11.6.2 Updating and Amending the IRWM Plan

Minor updates or amendments to the IRWM Plan will not require a complete re-adoption of the entire IRWM plan. Instead, specific changes will be submitted to the RWMG for consideration to adopt as an amendment to the existing Plan. Updates or amendments specifically include changes to the project lists and refinements to the Plan objectives.

The CC will invite stakeholders and project proponents at least once per year to submit additional projects for consideration to be included in the IRWM Plan or updates to projects already included in the IRWM Plan. The CC will publicize the opportunity and process to make these submissions. The CC will present and discuss the potential amendments to the project list in one or more stakeholder input meetings.

Changes to the project list or Plan objectives will be decided as described above and published as Plan amendments. The CC will request that members of the RWMG and project proponents adopt the Plan amendments as an addendum to the previously adopted Westside IRWM Plan.

Section 12: Acronyms and Glossary

12.1 Acronyms and Abbreviations

Acronym	Definition
µg/L	Micrograms Per Liter
AF	Acre-Feet
AFY	Acre-Feet Per Year
AWM	Agricultural Water Management
ABAG	Association of Bay Area Governments
Basin Plan	Sacramento River and San Joaquin River Basins Basin Plan
BDCP	Bay-Delta Conservation Plan
BLM	Bureau of Land Management
BMO	Basin Management Objective
BMPs	Best Management Practices
BO	Biological Opinion
BRBNA	Blue Ridge Berryessa Natural Area
CAP	Climate Action Plan
CASGEM	California Statewide Groundwater Elevation Monitoring
CC	Coordinating Committee
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFS	Cubic Feet Per Second
CIMIS	California Irrigation Management Information System
CSA	Community Service Area
CSD	Community Service Districts
CVP	Central Valley Project
CWA	Clean Water Act
CWC	California Water Code
DAC	Disadvantaged Community
Delta	Sacramento-San Joaquin River Delta
DWR	Department of Water Resources
EC	Electrical Conductivity

Acronym	Definition
EIR	Environmental Impact Report
EJ	Environmental Justice
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
ET	Evapotranspiration
ETAW	Evapotranspiration of Applied Water
ETo	Reference Evapotranspiration
EWMP	Efficient Water Management Practice
FC&WCD	Flood Control and Water Conservation District
FEMA	Federal Emergency Management Agency
FESSRO	FloodSAFE Environmental Stewardship and Statewide Resource Office
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GCM	General Circulation Model
GCM	Global Climate Model
GCPD	Gallons Per-Capita-Per-Day
GHG	Greenhouse Gas Emissions
GIS	Geographic Information System
GWM	Groundwater Management Plan
HCP	Habitat Conservation Plan
HUC	Hydrologic Unit Code
IE	Irrigation Efficiency
IFM	Integrated Flood Management
IRWIS	Integrated Water Resources Information System
IRWM Plan	Integrated Regional Water Management Plan
IWRMPF	Integrated Water Resource Management Planning Framework
JPA	Joint Powers Agreement
LBRID	Lake Berryessa Resort Improvement District
LPCCC	Lower Putah Creek Coordinating Committee
MCL	Maximum Contaminant Level
mg/L	Milligrams Per Liter
M&I	Municipal and Industrial
MHI	Median Household Income
MOU	Memorandum of Understanding

Acronym	Definition
MPO	Metropolitan Planning Organization
NBA	North Bay Aqueduct
NBRID	Napa Berryessa Resort Improvement District
NCCP	Natural Communities Conservation Plan
NCFCWCD	Napa County Flood Control and Water Conservation District
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGO	Non-Governmental Organization
NPDES	National Pollutant Discharge Elimination System
NPS	Non-Point Source
NQ	Not Qualified
NSV	Northern Sacramento Valley
NZMS	New Zealand Mud Snails
OWTS	On-Site Wastewater Treatment System
PA	Planning Area
ppb	Part Per Billion
ppm	Part Per Million
PHG	Public Health Goal
POTWs	Publically-Owned Treatment Works
PSC	Putah South Canal
RAP	Region Acceptance Process
RCAC	Rural Community Assistance Corporation
RCD	Resource Conservation District
RD	Reclamation District
RMS	Resource Management Strategies
RWA	Regional Water Authority
RWQCB	Central Valley Regional Water Quality Control Board
RWMG	Regional Water Management Group
SACOG	Sacramento Area Council of Governments
SCWA	Solano County Water Agency
SDWA	Safe Drinking Water Act
SOI	Sphere of Influence
SPFC	State Plan of Flood Control
SWP	State Water Project

Acronym	Definition
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
USACOE	U.S. Army Corps of Engineers
USBR	United States Bureau of Reclamation
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
UWM	Urban Water Management
VOC	Volatile Organic Compound
WDRs	Waste Discharge Requirements
Westside Region, Region	Westside Sacramento Region
WPD	Watershed Protection District
WRA	Water Resources Association
WSA	Water Supply Assessment
WWTP	Wastewater Treatment Plant
YCFCWCD	Yolo County Flood Control and Water Conservation District
Yolo NHP	Yolo Natural Heritage Program

12.2 Glossary

100-year Flood Event – A 100-year flood is the flood event having a 1-percent (or 1/100) chance of being equaled or exceeded in any given year.[1]

303(d) List – Refers to Section 303(d) of the Clean Water Act that requires each state to periodically submit to the United States Environmental Protection Agency, a list of impaired waters.[2]

500-year Flood Event – A 500-year flood is the flood event having a 0.2-percent (or 1/500) chance of being equaled or exceed in any given year.[1]

Acre-Foot (AF) – The volume of water that would cover one acre to a depth of one foot; equal to 43,560 cubic feet or 325,851 gallons.[1]

Adjudication – The act of judging or deciding by law. In the context of an adjudicated groundwater basin, landowners or other parties have turned to the courts to settle disputes over how much groundwater can be extracted by each party to the decision.[3]

Adopted IRWM Plan – An Integrated Regional Water Management (IRWM) Plan that has been formally accepted, as evidenced by a resolution or other written documentation by the governing bodies of each agency that is part of the regional water management group responsible for the development of the Plan and have responsibility for implementation of the Plan. At a minimum, each project proponent named in an IRWM grant application must also adopt the IRWM Plan. Adoption of an IRWM Plan must follow the notification process in California Water Code (CWC) §10543.[2]

Agency – A public entity, be it a special district, city, county or other governmental entity, responsible for providing one or more services in the areas of water supply, water quality, wastewater, recycled water, water conservation, storm water/flood control, watershed planning and aquatic habitat protection and restoration.[4]

Alluvial/Alluvium – A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water, as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, as a cone or fan at the base of a mountain slope.[1]

Anadromous Fish – Fish that live a majority of time in the ocean, and breed in fresh water.[1]

Anthropogenic – Of human origin or resulting from human activity.[2,5]

Applied Water – The total amount of water that is diverted from any source to meet the demands of water users without adjusting for the quantity of water that is consumed, returned to the developed supply, or irrecoverable. It is the quantity of water delivered to the intake for a city water system or factory, or a farm headgate, or direct or incidental flows to a marsh or wetland for wildlife areas. For existing instream use, applied water is the portion of the streamflow dedicated to instream use.[2]

Applied Water Factor – The quantity of water typically applied to a specific crop per unit area (sometimes expressed in inches of depth). The applied water factors for specific crops can vary by region.[1]

Appropriative Right – The legal right to use water that is diverted or extracted by a non-riparian or non-overlying party for non-riparian or non-overlying beneficial uses. In California, surface water appropriative rights are subject to a statutory permitting process, while groundwater appropriation is not.[1]

Aquifer – A body of rock or sediment that is sufficiently porous and permeable to store, transmit, and yield significant quantities of groundwater to wells and springs.[1]

Artificial Recharge – The addition of water to an aquifer by human activity, such as irrigation or induced infiltration from streams, wells, or recharge/spreading basins. *See also* Groundwater Recharge.[1]

Association of Bay Area Governments (ABAG) – Comprehensive planning agency for the 100 cities and 9 counties of the San Francisco Bay Area including Solano and Napa Counties; serves as the Metropolitan Planning Organization (MPO) for these counties; primarily addresses issues relating to land use, circulation, and air quality.[6]

Average Annual Runoff – The average value of total annual runoff volume calculated for a selected period of record, at a specified location, such as a dam or stream gage.[1]

Average Year Water Demand – Demand for water under average hydrologic conditions for a specific level of development.[1]

Basin Management Objectives (BMOs) – See also Management Objectives.[1]

Basin Plan – Also referred to as a Water Quality Control Plan, identifies 1) beneficial uses to be protected; 2) water quality objectives for the reasonable protection of beneficial uses; and 3) a program of implementation for achieving the water quality objectives as established by the Regional Water Quality Control Boards or State Water Resources Control Board.[2]

Bedrock – Solid rock that underlies loose material, such as soil, sand, clay, or gravel.[7]

Beneficial Uses – The uses of streams, lakes, rivers, and other water bodies, have to humans and other life. Beneficial uses are outlined in a Water Quality Control Plan (Basin Plan). Each body of water in the State has a set of beneficial uses it supports.[2]

Best Management Practices (BMPs) – A set of actions widely recognized by a group of experts to be state-of-the-art technologies, techniques, etc. within a particular domain (such as water quality management, water conservation, agricultural practices, etc.).[7]

Bioaccumulation – The increase in concentration of a substance, such as the pesticide DDT, that occurs in a food chain.[7,8]

Bulletin No. 118 – Department of Water Resources' (DWR's) report California's Groundwater Bulletin 118, updated in 2003.[1]

California Environmental Quality Act (CEQA) – A state law requiring state and local agencies to regulate activities with consideration for environmental protection. If a proposed activity has the potential for a significant adverse environmental impact, an Environmental Impact Report (EIR) must be prepared and certified as to its adequacy before action can be taken on the proposed project.[8]

California Irrigation Management Information System (CIMIS) – CIMIS is a network of automated weather stations that are owned and operated cooperatively between the Department of Water Resources (DWR) and local agencies. The stations are installed in most of the agricultural and urban areas in the State and provide farm and large landscape irrigation managers and researchers with "real-time" weather data to estimate crop and landscape evapotranspiration (ET) rates and make irrigation management decisions.[1]

California Native American Tribe – All Indigenous Communities of California, which are on the contact list maintained by the Native American Heritage Commission, including those that are federally non-recognized and federally recognized, and those with allotment lands, regardless of whether they own those lands.[2]

Catchment – The area of land which catches and collects water above a reservoir or other storage structure.[1]

Census – The official decennial enumeration of the population conducted by the federal government.[5]

Central Valley Project – Water storage and delivery system that is operated by United States Bureau of Reclamation to provide irrigation and municipal water to communities in and around California's Central Valley.[1]

Channelization – The mechanical alteration of a stream which includes straightening or dredging of the existing channel, or creating a new channel to which the stream is diverted.[7]

Chaparral – A biological community characterized by hot dry summers and cool moist winters and dominated by a dense growth of mostly small-leaved evergreen shrubs.[7]

CIMIS – *See also* California Irrigation Management Information System (CIMIS).[1]

Climate Change – Changes in average annual temperature and precipitation and their temporal patterns in the future compared to today.[1]

Commercial – A land use classification that permits facilities for the buying and selling of commodities and services.[5]

Community Service Area (CSA)/Community Service Districts (CSD) – A geographic subarea of a city or county used for planning and delivery of parks, recreation, and other human services based on an assessment of the service needs of the population in that subarea.[9]

Confined Aquifer – An aquifer that is bounded above and below by formation of distinctly lower permeability than that of the aquifer itself.[3]

Conjunctive Use – The coordinated and planned management of both surface and groundwater resources in order to maximize the efficient use of the resource.[7]

Conservation (Water) – Urban water conservation or water use efficiency includes reductions realized from voluntary, more efficient, water use practices promoted through public education and from state-mandated requirements to install water-conserving fixtures in newly constructed and renovated buildings. Agricultural water conservation or agricultural water use efficiency means reducing the amount of water applied in irrigation through measures that increase irrigation efficiency.[1]

Consumptive Use – A quantity of applied water that is not available for immediate or economical reuse. It includes water that evaporates, transpires, or is incorporated into products, plant tissue, or animal tissue. Consumptively used water is removed from available supplies without return to a water resource system.[1]

Contaminant – Any substance or property preventing the use or reducing the usability of water for ordinary purposes such as drinking, preparing food, bathing, washing, recreation, and cooling. Any solute or cause of change in physical properties that renders water unfit for a given use. (Generally considered synonymous with pollutant.)[1]

Conveyance Losses/Evaporative Losses– The quantity of water that becomes unavailable for use from major water supply conveyance systems due to irrecoverable leaks, evaporation and evapotranspiration by vegetation in and near canals.[4]

Conveyance Facilities – Canals, pipelines, pump lifts, ditches, etc. used to move water from one area to another.[1]

Crop Coefficient – A numerical factor (normally identified as Kp or Kc) that relates the evapotranspiration (ET) of the individual crop (Etc) to reference evaporation or some other index.[1]

Cubic Feet Per Second (CFS) – A unit of measurement describing the flow of water. A cubic foot is the amount of water needed to fill a cube that is one foot on all sides, about 7.5 gallons.[1]

Cyanobacteria – A phylum of bacteria that obtain their energy through photosynthesis. Found in unicellular and colonial forms. Some Cyanobacteria produce toxins.[7]

Detention Dam/Basin/Pond – A basin that stores stormwater flows for a limited amount of time thereby reducing the rate of flow downstream of the basin while the detention basin is being filled.[6,9]

Direct Deliveries – The amount of water diverted from streams and rivers directly that is not withdrawn from storage in reservoirs.[7]

Disadvantaged Community – A community with an annual median household income that is less than 80 percent of the statewide annual median household income.[2]

Dissolved Oxygen – The concentration of oxygen dissolved in water, expressed in milligrams per liter or as percent.[7]

Domestic Well – A water well used to supply groundwater for the domestic needs of an individual residence or systems of four or fewer service connections.[1]

Downcutting – Downward erosion caused by a flowing stream. Can result in deepening and often steepening of the stream channel.

Drinking Water Standards – State and federal regulations regarding water delivered by water purveyors that is used as a potable supply.[1]

Drinking Water Treatment and Distribution – Treatment is the physical, biological, and chemical processes that make water suitable for potable use. Distribution includes storage, pumping, and pipe systems to protect and deliver the treated water to customers.[1]

Drought Condition – Hydrologic conditions during a defined period, greater than one year, when precipitation and runoff are much less than average.[1]

Drought Preparedness – Long-term and short-term measures that are to be used to prepare for the effects of drought. These may include implementation of such measures as water conservation and conjunctive use.[1]

Efficient Water Management Practices – Reasonable and economically justifiable programs to improve the delivery and use of water used for agricultural purposes.

Electrical Conductivity (EC) – The measure of the ability of water to conduct an electrical current, the magnitude of which depends on the dissolved mineral content of the water.[1]

Elevation – The vertical reference of a site location above mean sea level, measured in feet or meters.[7]

Emerging Contaminants – *See also* Emerging Pollutants.[1]

Emerging Pollutants – Some unregulated chemicals and pollutants are being discovered to have unexpected health and environmental effects. Chemicals found in pharmaceuticals and personal care products, by-products of fires and fire suppression, and discarded elements of nanotechnology are emerging as actual or potential water contaminants. Air deposition of a whole host of pollutants is now seen as a significant contributor to water pollution.[1]

Endemic – Native species found only in a particular geographic area with comparatively restricted habitat and distribution.[7]

Environmental Justice – The fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (California Government Code §65040.12[e]).[2]

Environmental Water – Minimum flow levels of a specific quality that is needed in order to assure the continued viability of fish and wildlife resources for a particular water body. This is water that is used to maintain and enhance the beneficial uses related to the preservation and enhancement of fish, wildlife, and other aquatic resources or preserves as specified in the Porter/Cologne Water Quality Control Act, 2008.[1]

Ephemeral – An ephemeral water body is one that exists for only a short period of time following precipitation or snow-melt. This is not the same as an intermittent or seasonal water body which exists for a longer period of time.[1]

Erosion – (1) The loosening and transportation of rock and soil debris by wind, rain, or running water. (2) The gradual wearing away of the upper layers of the earth. [5,7]

ETAW – *See also* Evapotranspiration of Applied Water (ETAW).[1]

ETo (Reference Evapotranspiration) – The evapotranspiration rate from an extended surface of 3- to 6-inch (8 to 15 cm) tall green grass cover of uniform height, actively growing, completely shading the ground, and not short on water (the reference evapotranspiration [ET] reported by California Irrigation Management Information System [CIMIS]).[1]

Eutrophication – The process of increasing nutrient and decreasing oxygen supply within a water body. Usually detrimental to aquatic life.[7]

Evaporation – The physical process by which a liquid or solid is transformed to a gaseous state.[1]

Evapotranspiration (ET) – ET is the amount of water transpired by plants, retained in plant tissues, and evaporated from plant tissues and surrounding soil surfaces.[1]

Evapotranspiration of Applied Water (ETAW) – ETAW is the amount of consumptive use by crops, landscapes, or other vegetation.[1]

Firm Yield – The maximum annual supply of a given water development that is expected to be available on demand from year to year.[1]

Flood Attenuation – When flood levels are lowered by water storage in floodplains and wetlands.[7]

Flood Fight – The emergency measures used to prevent levee failure from seepage, erosion or overtopping during high water.[1]

Flood Insurance Rate Map (FIRM) – For each community, the official map on which the Federal Emergency Management Agency has delineated areas of special flood hazard, areas of moderate risk, and the risk premium zones applicable to that community.[9]

Flood Protection – A level of risk protection that is necessary to withstand flooding that may occur in any given year. Flood protection is most frequently used to refer to an urban level of flood protection which corresponds to the level protection that is necessary to withstand flooding that has a certain probability of occurring in any given year using criteria consistent with, or developed by the Department of Water Resources.

Flood Risk – The combination of the magnitude and probability of consequences that likely would occur as a result of flood-induced damages under a specific level of development.[1]

Floodplain – The flat area adjoining a river channel constructed by the river in the presence of climate, and overflowed at times of high river flow.[7]

Floodway – The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the "base flood" without cumulatively increasing the water surface elevation more than one foot.[9]

Fluvial – The processes associated with rivers and streams comprising the motion of sediment and erosion of, or deposition on, the river bed.[1]

Form and Function – A waterway's form refers its morphology or structure and its function refers to the flood behavior and sediment transport characteristics. Alterations in the natural form and function of a waterway can, in some cases, degrade important habitats and water conveyance capacities of the channels.

Funding Match – Funds made available by the applicant to assist in financing a project. Funding match consists of non-State funds and can include in-kind services. In-kind services must relate directly to the scope of work funded in the grant proposal.[2,3,7]

General Plan – The General Plan is a legal document, adopted by the legislative body of a City or County, setting forth policies regarding long-term development. California law requires the preparation of seven elements or chapters in the General Plan: Land Use, Housing, Circulation, Conservation, Open Space, Noise, and Safety. Additional elements are permitted, such as Economic Development, Urban Design and similar local concerns.[5,9]

Geothermal – Of or related to the internal heat of the earth.[7]

Geographic Information System (GIS) – The combination of hardware and software used to store and analyze features located on the earth's surface.[7]

Greenhouse Gas Emissions (GHG) – Also referred to as carbon intensity or carbon footprint.[2,7]

Groundwater – Water that occurs beneath the land surface and fills the pore spaces of the alluvium, soil, or rock formation in which it is situated. It excludes soil moisture, which refers to water held by capillary action in the upper unsaturated zones of soil or rock.[1]

Groundwater Basin – An alluvial aquifer or a stacked series of alluvial aquifers with reasonably well-defined boundaries in a lateral direction and having a definable bottom.[1]

Groundwater Management – The planned and coordinated management of a groundwater basin or portion of a groundwater basin with a goal of long-term sustainability of the resource.[1]

Groundwater Management Plan – A comprehensive written document developed for the purpose of groundwater management and adopted by an agency having appropriate legal or statutory authority.[1]

Groundwater Overdraft – The condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions.[1]

Groundwater Recharge – Groundwater recharge is the mechanism by which surface water moves from the land surface, through the topsoil and subsurface, and into de-watered aquifer

space, or through injection of water directly into the aquifer by wells. Groundwater recharge can be either natural or managed.[1]

Groundwater Storage – Groundwater storage can be defined in three different ways depending on the context of its use: (a) the quantity of water that occurs beneath the land surface and fills the pore spaces of the alluvium, soil, or rock formation beneath the land surface; (b) the volume of usable physical space available to store water in the pore spaces of the alluvium, soil, or rock formation beneath the land surface; (c) the act of storing water in the pore spaces of the alluvium, soil, or rock formation beneath the land surface.[1]

Groundwater Storage Capacity – Volume of void space that can be occupied by water in a given volume of a formation, aquifer, or groundwater basin.[1]

Groundwater Subbasin – A subdivision of a groundwater basin created by dividing the basin using geologist and hydrologic conditions or institutional boundaries. *See also* Groundwater Basin.[1]

Groundwater Subsurface Inflow – The amount of water that flows into a region underground.[1]

Groundwater Subsurface Outflow – The amount of water that flows out of a region underground.[1]

Groundwater Table – The upper surface of the zone of saturation in an unconfined aquifer.[1]

Hazardous Waste – Waste that poses a present or potential danger to human beings or other organisms because it is toxic, flammable, radioactive, explosive, or has some other property that produces substantial risk to life.[7]

Headgate - a gate for controlling the water flowing into a channel (as an irrigation ditch)[1]

Headwaters – Small streams and upland areas that are the source of larger streams and rivers.[7]

Hydrograph – A graph that shows some property of groundwater or surface water as a function of time at a given point.[7]

Hydrologic Cycle – The circulation of water from the ocean through the atmosphere to the land and ultimately back to the ocean.[1]

Hydrologic Region – A geographical division of the state established by the California Department of Water Resources based on the local hydrologic basins.[1]

Hydrologic Unit – The United States is divided and subdivided into successively smaller hydrologic units which are classified into four levels: regions, subregions, accounting units, and cataloging units. The hydrologic units are arranged within each other, from the smallest (cataloging units), to the largest (regions). Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system. (*See* http://water.usgs.gov/GIS/huc.html for more information.)[1]

Hydrology – The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.[7]

Hydromodification – Channel modification (channelization), flow alterations, levees, and dams.[1]

Impaired Water Body – A water body that does not attain water quality standards due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment. A list of impaired water bodies is compiled by the State Water Resources Control Board (SWRCB) pursuant to Section 303(d) of the Clean Water Act.[2,7]

Imperiled Fish – Fish species that are on the Endangered Species List, are considered a special status species, as well as other species that are considered threatened or otherwise at risk of significant population decline.

Implementation Strategy – A coherent approach to implementing integrated and individual water management actions, based upon priority, readiness, funding opportunities, and other considerations.[3]

Indirect Reuse – When a downstream entity withdraws water from a stream and a portion of that water is wastewater from an upstream discharge that has commingled with the ambient streamflow, the reuse is termed “indirect reuse”.[2]

Industrial – The manufacture, production, and processing of consumer goods. Industrial is often divided into “heavy industrial” uses, such as construction yards, quarrying, and factories; and “light industrial” uses, such as research and development and less intensive warehousing and manufacturing. [3,5]

Infiltration – The flow of water downward from the land surface into and through the upper soil layers.[1]

Infiltration Rate – The rate at which water penetrates the earth's surface.[7]

Infrastructure – The underlying foundation or basic framework of a system. For water systems, this includes the canals, pipelines, pumps, reservoirs, and treatment plants that make up the treatment and delivery system.[1]

En-Lieu Recharge – The practice of providing surplus surface water to historical groundwater users, thereby leaving groundwater in storage for later use.[2]

Instream Uses – The beneficial uses of water within a stream for river without diversion from the stream.[1]

Integrated Flood Management (IFM) – IFM is a comprehensive approach to flood management that considers land and water resources at a watershed scale within the context of integrated water management, employs both structural and non-structural measures to maximize the benefits of floodplains and minimize loss of life and damage to property from flooding, and recognizes the benefits to ecosystems from periodic flooding.[3]

Integrated Regional Water Management – A multi-objective approach to managing water and associated resources that encourages using a mix of resource management strategies to provide benefits to regions.[1]

Integrated Regional Water Management Plan (IRWM Plan) – Defined in CWC§10534 as "a comprehensive plan for a defined geographic area, the specific development, content, and adoption of which shall satisfy requirements developed pursuant to this part. At a minimum, an Integrated Regional Water Management Plan describes the major water-related objectives and conflicts within a region, considers a broad variety of resource management strategies, identifies the appropriate mix of water demand and supply management alternatives, water quality protections, and environmental stewardship actions to provide long-term, reliable, and high-quality water supply and protect the environment, and identifies disadvantaged communities in the region and takes the water-related needs of those communities into consideration." (CWC §10530 *et seq*,)

Integrated Water Resources Information System (IRWIS) – IRWIS, released by the Department of Water Resources (DWR) in 2008, is the first centralized groundwater data management system developed to help local and regional water management entities integrate and analyze existing data about their groundwater system and potential value of current groundwater management in their integrated planning processes. It serves as a centralized information system for accessing the data about groundwater, as well as groundwater management and some DWR grant program funding statewide.[1]

Intermittent Stream – A stream that ceases to flow for periods of time.[4,7]

Interties – An interconnection permitting passage of utility service (water, electricity) between two or more systems such as electric and water utility systems.[9]

Invasive Species – Non-indigenous plants or animals that adversely affect the habitats they invade economically, environmentally, or ecologically.[1]

Irrigation Efficiency (IE) – The efficiency of water application and use, calculated by dividing a portion of applied water that is beneficially used by the total applied water, expressed as a percentage. The two main beneficial uses are crop water use (evapotranspiration, etc.) and leaching to maintain a salt balance.[1]

Irrigation Return Flow – Applied water that is not transpired, evaporated, or deep percolated into a groundwater basin, but that returns to a surface water supply.[1]

Irrigation Water Requirements – The quantity of water exclusive of precipitation that is required from various uses.[1]

IRWM Plan – See Integrated Regional Water Management Plan.[1]

Coordinating Committee – Serves as the governing and decision making body for the Westside Integrated Regional Water Management (IRWM) Plan Funding Region (on behalf of the Regional Water Management Group) during development and implementation of the Plan.[4]

Joint Powers Agreement (JPA) – An agreement entered into by two or more public agencies that allows them to jointly exercise any power common to the contracting parties. JPA is defined

in Chapter 5 (commencing with Section 6500) of Division 7 of Title 1 of the California Government Code.[3]

Lacustrine – Natural lakes, ponds, and human-made reservoirs ecosystems.[1]

Land Subsidence – The lowering of the natural land surface due to groundwater (or oil and gas) extraction.[1]

Land Use – A group of similar on-the-ground human uses described as a single category.[7]

Life Cycle Habitat – An area that provides appropriate habitat to support the entire life cycle of a species. For some species such as anadromous fish this may span a large geographical area including both freshwater and the ocean.

Load Reduction (of Pollutant) – The decrease of a particular contaminant in the impaired waterbody resulting from the implementation of a project.[7]

Local Agency – Any city, county, city and county, special district, joint powers authority, or other political subdivision of the State, a public utility as defined in Sections 216 of the Public Utilities Code, or a mutual water company as defined in Section 2725 of the Public Utilities Code (California Water Code [CWC] §10535).[2]

Low Impact Development (LID) – LID is a stormwater management strategy aimed at maintaining or restoring the natural hydrologic functions of a site or project to achieve natural resource protection objectives and fulfill environmental regulatory requirements. LID employs a variety of natural and built features that reduce the rate of runoff, filter pollutants out of runoff, and facilitate the infiltration of water into the ground and/or onsite storage of water for reuse.[2]

M&I – Municipal and industrial water use; generally urban uses for human activities.[1]

Management Objectives – Objectives that set forth the priorities and measurable criteria of water management. Examples include improve water quality, augment water supplies, improve use efficiency. This use of the term often refers to its use within a Water Quality Control Plan. Management Objectives are different than the IRWM Plan objectives.[7]

Maximum Contaminant Level (MCL) – The highest drinking water contaminant concentration allowed under federal and State Safe Drinking Water Act regulations.[4]

Median Household Income – The amount which divides the annual income for households within a region into two equal groups. Half of the households in the region have incomes above the median and half have incomes below the median.[9]

Memorandum of Understanding – An agreement that documents the mutual understanding between two or more parties with an intended common line of action. The Westside MOU documents the mutual understanding of the Lake County Watershed Protection District, Napa County Flood Control and Water Conservation District, Colusa County Resource Conservation District, Solano County Water Agency and Water Resources Association of Yolo County with respect to their joint efforts towards developing an IRWM Plan that will increase regional coordination, collaboration, communication and assist in obtaining funding for IRWM Plan development, flood management and water related projects.

Micrograms per Liter (µg/L) – A unit of measurement describing the concentration of a constituent in water. It is equivalent to one part per billion (ppb).[7]

Milligrams Per Liter (**mg/L)** – A unit of measurement describing the concentration of a constituent in water. It is equivalent to one part per million (ppm).[1]

Municipal Wastewater – Primarily from domestic sources, but includes wastewater from commercial, industrial, and institutional sources that discharge to a common collection system where it mixes with domestic wastewater before treatment.[7]

National Environmental Policy Act (NEPA) – An act passed in 1974 establishing federal legislation for national environmental policy, a council on environmental quality, and the requirements for environmental impact statements.[9]

National Flood Insurance Program – A federal program that authorizes the sale of federally subsidized flood insurance in communities where such flood insurance is not available privately.[9]

National Pollutant Discharge Elimination System (NPDES) Permit Program – Controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Since its introduction in 1972, the NPDES Permit Program has been responsible for significant improvements to our Nation's and State's water quality.[7]

Natural Channel – A waterway created by the erosive forces of water moving over land that has not been altered by human interference.

Natural Recharge – Replenishment of an aquifer generally from snowmelt and runoff; through seepage from the surface. Recharge of an aquifer that occurs without human interference. Also referred to an unintentional recharge.[1]

Non-Consumptive Environmental Water Use – Water dedicated to instream environmental benefit which does not reduce the available water supply downstream for other uses.[1]

Non-Governmental Organization (NGO) – Private sector cause-based (and usually not-for-profit) organization.[7]

Non-Native Species – Plant or animal species brought into an area from another geographic region.[7]

Non-Point Source Pollution – Sources for pollution that are less definable and usually cover broad areas of land, such as agricultural land with fertilizers that are carried from the land by runoff, or automobiles.[2]

On-Site Wastewater Treatment System (OWTS) – System for wastewater disposal typically consisting of a septic tank and soil absorption field, commonly called a septic system.[2,7]

Open Space – An area with few or no paved surfaces or buildings, which may be primarily in its natural state or improved for use as a park.[6]

Ordinance – A law set forth by a governmental authority.[1]

Outflow – The amount of applied water and conveyance water leaving the service area. Also conveyance outflow.[4]

Overdraft – *Also see* Groundwater Overdraft.[1]

Parts per Billion (ppb) – A ratio of two substances, usually by mass, expressing the number of units of the designated substance present in one billion parts of the mixture. For water solutions parts per billion is equivalent to micrograms per liter.[3]

Parts per Million (ppm) – A ratio of two substances, usually by mass, expressing the number of units of the designated substance present in one million parts of the mixture. For water solutions, parts per million is equivalent to the milligrams per liter.[1]

Peak Flow – The maximum instantaneous rate of flow during a storm or other period of time.[7]

Per-Capita Water Use – The amount of water used by or introduced into the system of an urban water supplier divided by the total residential population; normally expressed in gallons per-capita-per-day (GCPD).[1]

Percolation – The act of surface water infiltrating into and through the ground and into an aquifer.[7]

Perennial Stream – A stream that flows year-round.[7]

Pesticide – Any of a class of chemicals used for killing insects, weeds, or other undesirable entities most commonly associated with agricultural activities, but has significant domestic use in California.[1]

Planning Area – A designated geographic subset of the Westside Region used for planning purposes. The Planning Areas (PA) for the Westside IRWM Plan consists of the Upper Cache Creek, Upper Putah Creek, and the Valley Floor. These PAs were developed based on hydrologic watersheds within the Region.

Planning Horizon – The period of 2013-2035 for which the IRWM Plan covers.

Plan Goal – A desired outcome or result of which effort will be made to accomplish. These goals describe a high-level perspective of what the IRWM Plan is intended to address and were developed to be relevant over the entire planning horizon and beyond.

Plan Objective – A specific and tangible outcome that is intended to be achieved by or during a designated time. The plan objectives were developed using the “SMART” criteria, meaning that each objective should be specific, measurable, attainable, relevant and time-based.

Point Source – Source of pollution that involves discharge of wastes from an identifiable point, such as a sewage treatment plant.[7]

Pollution (of Water) – The alteration of the physical, chemical, or biological properties of water by the introduction of any substance into water that adversely affects any beneficial use of water.[3]

Pollution Prevention – Improving water quality for all beneficial uses by protecting water at its source, reducing the need and cost for other water management actions and treatment.[1]

Population Density – The average number of people per square mile for a planning area.[7,9]

Potable Water – Water suitable for human consumption without undesirable health consequences. Drinkable. Meets Department of Health Services drinking water requirements.[1]

Precipitation – The liquid equivalent of rainfall or snow that falls on an area.[7]

Prioritization – A quantitative or qualitative method to compare the relative importance and urgency of desired actions.[3]

Privately Owned Water Systems – Include investor-owned utilities, mutual water companies, mobile home parks, and water associations, and may also include various commercial enterprises, such as restaurants, hotels, resorts, employee housing, etc. that have their own water supply.[1]

Program Preferences – Components of an Integrated Regional Water Management (IRWM) plan that will be given preference by the Integrated Regional Water Management funding process.[2,3]

Proposition 1E – The "Disaster Preparedness and Flood Prevention Bond Act of 2006" passed by California voters on November 7, 2006, and as set forth in Division 5 of the PRC.[2,3,4]

Proposition 50 – "Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002" passed by California voters in November 2002, and as set forth in Division 26.5 of the California Water Code (CWC).[2]

Proposition 84 – "Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006" passed by California voters on November 7, 2006, and as set forth in Division 43 of the PRC.[2]

Public Water System – A system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. *See also* Community Water System.[4]

Rare or Endangered Species – A species of animal or plant listed in: Sections 670.2 or 670.5, Title 14, California Administrative Code; or Title 50, Code of Federal Regulations, Section 17.11 or Section 17.2, pursuant to the Federal Endangered Species Act designating species as rare, threatened, or endangered.[5]

Rate Structure – Designates the rate basis for cost recovery (e.g., flat, uniform, tiered). Block/Tiered rates are assumed to provide cost signals to consumers. Costs can include capital,

operation and maintenance, financing, environmental compliance (documentation, permitting and mitigation), etc.[1]

Recharge (Groundwater) – A hydrologic process where water moves downward from surface water to groundwater.[7]

Recreation – Water-dependent recreation activities that are consumptive (e.g., parks), flat-water (e.g., boating), or flow-based (e.g., whitewater rafting) as well as non-consumptive uses such as hiking, biking etc.[1]

Recycled Water – Water which, as a result of a high level of treatment of wastewater, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is, therefore, considered a valuable resource.[1]

Region – Refers to the Westside Sacramento Subregion which encompasses all of Yolo County and portion of Lake, Napa, Solano and Colusa Counties.[2]

Regional Water Management Group (RWMG) – A group in which three or more agencies; at least two of which have a statutory authority over water supply or water management, as well as those persons who may be necessary for the development and implementation of an Integrated Regional Water Management (IRWM) Plan that meets the requirements in California Water Code (CWC) §10540 and §10541. The Westside RWMG responsible for preparing this Plan was composed of Lake County Watershed Protection District, Napa County Flood Control and Water Conservation District, Colusa County Resource Conservation District, Solano County Water Agency and Water Resources Association of Yolo County.[2,4]

Regulatory Agencies – Agencies with authority to control activities in the Region. These agencies include but are not limited to the Central Valley Regional Water Quality Control Board, State Water Resources Control Board, California Department of Public Health, National Marine Fisheries Service, Federal Emergency Management Agency, and the Department of Fish and Game.[4]

Required Instream Flow – The amount of water required for instream use by agreement, water rights permit, or State/federal Acts.[2,7]

Residential – Land designated in the City or County General Plan and zoning ordinance for buildings consisting only of dwelling units. May be improved, vacant, or unimproved.[5]

Return Flow – The portion of water from agricultural or landscape irrigation that returns to surface flows or percolates into the aquifers and is later recoverable.[1]

Riparian Area – Interface between land and streams or other water bodies.[7]

Riparian Right – A right to use surface water, such right derived from the fact that the land in question abuts the banks of streams or other water source (lake or pond). These rights are senior to most appropriative rights. *See also* Appropriate Rights.[1]

Riparian Vegetation – Vegetation growing on or near the banks of a stream or other body of water in soils that are wet during some portion of the growing season.[7]

Riverine Habitat – Habitat characterized by intermittent or continually running freshwater.[7]

Runoff – Water that runs across the top of the land without infiltrating into the soil.[7]

Sacramento Area Council of Governments (SACOG) – An association of local governments in the six-county Sacramento Region including Yolo County.[1]

Safe Yield – The maximum quantity of water that can be continuously withdrawn from a groundwater basin without adverse effect on groundwater levels.[1]

Salinity – Generally, the concentration of mineral salts dissolved in water. Salinity may be expressed in terms of a concentration or as electrical conductivity.[1]

Salts –Materials that originate from dissolution or weathering of the rocks and soil, including dissolution of lime, gypsum and other slowly dissolved soil minerals.[1]

Saturated Zone – The zone within an aquifer in which all interconnected openings are filled with water, usually underlying the unsaturated zone.[1]

Secondary Treatment – Secondary treatment refers to treatment of sewage at a wastewater treatment plant to substantially degrade the biological content. The majority of municipal plants use aerobic biological processes for secondary treatment.[2,7]

Sedimentation – The deposition or accumulation of sediment.[7]

Seepage – The gradual movement of water into, through, or from a porous medium. Also, the infiltration of water into the soil from canals, ditches, laterals, watercourse, reservoir, storage facilities, or other body of water, or from a field.[2,8]

Septic System – A sewage-treatment system that includes a settling tank through which liquid sewage flows and in which solid sewage settles and is decomposed by bacteria in the absence of oxygen. Septic systems are often used for individual-home waste disposal where an urban sewer system is not available. See On-Site Wastewater Treatment System (OWTS).[7,9]

Service Area – The geographic area served by a water or other agency.

Special-Status Species – Plants and animals that are legally protected under the federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), or other federal, state, or local regulations, or are considered sufficiently rare by the scientific community to deserve protection.[6,7,8]

Specific Yield – The ratio of the volume of water a rock or soil will yield by gravity drainage to the total volume of the rock or soil.

Stakeholder – An individual, group, coalition, agency or others who are involved in, affected by, or have an interest in the goals, objectives, projects, or other implementation activities shown in this Plan.[2]

State Plan of Flood Control (SPFC) – State and Federal flood management works, lands, programs, plans, conditions, and mode of maintenance and operation for the State-federal flood protection system in the Central Valley.[2,4]

State Water Project (SWP) – Water storage and delivery system that is operated by the California Department of Water Resources and serves to urban and agricultural water suppliers throughout California.[1]

State Waters – Also known as "Waters of the State", means all surface water, groundwater, and saline waters within the boundaries of the State of California (California Water Code [CWC] §13050[e]).[2]

Stormwater – Water generated by runoff from land and impervious surfaces during rainfall and snow events.[2]

Stream Gage – The site on a stream where hydrologic data is collected.[7]

Stream Gradient – The change of a stream in vertical elevation per unit of horizontal distance.[7]

Streamflow – The active flow of water within a stream, river, or creek.[7]

Subsidence – *See* Land Subsidence. [7,9]

Surface Storage – Use of above ground reservoirs to collect water for later release and use.[1]

Surface Water – Water that is flowing across or contained on the surface of the earth, such as in rivers, streams, creeks, lakes, and reservoirs.[7]

Surplus Water – Water that is not being used directly or indirectly to benefit the environment, agricultural or urban use sectors.[1]

Sustainable – Capable of being maintained over the long term without significant environmental, social or economic damage.[7]

Tailwater – Surface runoff water from irrigated agriculture.[1]

Technical Reviewers – A group of agency representatives assembled to evaluate the technical competence of a proposed project and the feasibility of the project being successful if implemented.[2]

Tertiary Treatment – Tertiary treatment provides effluent polishing to further improve the water quality of the effluent discharged from a wastewater treatment plant.[7]

Threatened – A species likely to become endangered within the foreseeable future if certain conditions continue to deteriorate.[7]

Total Capital Cost – Total monetary cost of option required for "turnkey" implementation, including environmental and third party impact mitigation, storage, conveyance, energy, capitalized operations and maintenance, administrative, planning, legal and engineering costs.[1]

Total Dissolved Solids (TDS) – A quantitative measure of the residual minerals dissolved in water that remain after evaporation of a solution.[1]

Total Irrigated Crop Area – The total area of irrigated crops (by type) planted in a planning area during a given year. This number includes consideration of multiple cropping practices.[1]

Total Maximum Daily Load (TMDL) – Identifies the maximum quantity of a particular pollutant that can be discharged into a water body without violating a water quality standard, and allocates allowable loading amounts among the identified pollutant sources.[2]

Transpiration – An essential physiological process in which plant tissues give off water vapor to the atmosphere.[1]

Tributary – A smaller river or stream that joins a larger one and contributes to its water flow.[7]

Turbidity – A measure of cloudiness and suspended sediments in water. Water high in turbidity appears murky and contains sediments in suspension. Turbid water may also result in higher concentrations of contaminants and pathogens, that bond to the particles in the water.[7]

Unaccounted for Water – Deteriorated and aging infrastructure can play an important role in unaccounted for water (sometimes referred to as water losses), contributing to significant water leakage and a high rate of main breaks.[1]

Unconfined Aquifer – An aquifer in which there are no confining beds between the top of the aquifer and land surface.[7]

Urban Sprawl – Haphazard growth or outward extension of a city resulting from uncontrolled or poorly arranged development.[6]

Urban Water Management Planning Act – Sections 10610 through 10657 of the California Water Code (CWC). The Act requires urban water suppliers to prepare urban water management plans which describe and evaluate sources of water supplies, efficient uses of water, demand management measures, implementation strategies and schedules, and other relevant information and programs within their water service areas. Urban water suppliers (CWC §10617) are either publicly or privately owned and provide water for municipal purposes, either directly or indirectly, to more than 3,000 customers or supply more than 3,000 acre-feet of water annually.[1]

Urban Water Supplier – Supplier, either public or privately owned, that provides water for municipal purposes, either directly or indirectly, to more than 3,000 customers, or supplying more than 3,000 acre-feet of water annually (California Water Code [CWC] §10617).[2]

Urban Water Use Efficiency – Methods or technologies resulting in the same beneficial, residential, commercial, industrial, and institutional uses with less water or increased beneficial uses from existing water quantities.[1]

Usable Storage Capacity – The quantity of groundwater of acceptable quality that can be economically withdrawn from storage.[1]

Vernal Pools – Subset of wetlands that occur in shallow foothill and valley depressions. Water usually remains in the pools and swales from only a few days to a few months. The presence of low permeability soils (e.g., clay, hardpan) generally limit water filtration.[1]

Volatile Organic Compound (VOC) – A human-made organic compound that readily vaporizes in the atmosphere. These compounds are often highly mobile in the groundwater system and are generally associated with industrial activities.[8]

Waste Discharge Requirements (WDRs) – Requirements that are adopted by the Regional Water Quality Control Boards to protect the waters of the state for the use and enjoyment of the people of California.[7]

Waste Water Treatment Facility – Facilities that store and process municipal sewage before release.[7]

Water Balances – An analysis of the total developed/dedicated supplies, uses, and operational characteristics for a region; when there is sufficient information, the water balance shows what water was applied to actual uses so that the use equals supply.[1]

Water Demand – The desired quantity of water that would be used if the water is available and a number of other factors, such as price, do not change. Demand is not static.[1]

Water Quality – A term used to describe the chemical, physical, and biologic characteristics of water with respect to its suitability for a particular use.[1]

Water Recycling – The process of treating wastewater for beneficial use, storing and distributing recycled water.[1]

Water Reliability – Dry: A measure of a system's ability to sustain the social, environmental, and economic systems that it serves during a dry year. Wet: A measure of a system's ability to sustain the social, environmental, and economic systems which it serves during a wet year.[1]

Water Reuse – The additional use of previously used water, with our without treatment.[3]

Water Rights – In water law, refers to the right of a user to use water from a water source, e.g., a river, stream, pond or source of groundwater.[1]

Water Service Area – Geographic area in which a water agency is the designated water service provider.[1]

Water Transfer – A voluntary change in the way water is usually distributed among water users in response to water scarcity. Compare to water exchanges, which are typically water delivered by one water user. The receiving water will return the water at a specified time or when the conditions of the parties to the agreement are met.[1]

Water Year – A continuous 12-month period for which hydrologic records are compiled and summarized. Different agencies may use different calendar periods for their water years. The Department of Water Resources (DWR) water year is October 1 through September 30.[1]

Watershed – The land area from which water drains into a stream, river, or reservoir.[7]

Watershed Management – The process of evaluating, planning, managing, restoring, and organizing land and other resource use within an area that has a single common drainage point.[1]

Weir – A low dam placed across a stream or river to raise its level or divert its flow.[7]

Wet Season – The period of time on an annual cycle in which the majority of rainfall occurs.[1]

Wild and Scenic River – State- and federal-designated river system based on 1968 Wild and Scenic Rivers Act, and the California Wild and Scenic Rivers Act of 1972.[1]

Wildfire – A sweeping and destructive conflagration, especially in a wilderness or a rural area.[7]

Williamson Act – Known formally as the California Land Conservation Act of 1965, it was designed as an incentive to retain prime agricultural land and open space in agricultural use, thereby slowing its conversion to urban and suburban development. The program entails a 10-year contract between the City or County and an owner of land whereby the land is taxed on the basis of its agricultural use rather than the market value. The land becomes subject to certain enforceable restrictions and certain conditions need to be met prior to approval of an agreement.[6]

Windset – A phenomenon whereby high winds result in increased water levels to occur on downwind shores.

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