SECTION 6.0 - Resource Management Strategies Used to Achieve IRWM Plan Goals

New Requirements Related to Climate Change from 2016, Proposition 1, IRWM Plan Standards:

- *Identify and implement, using vulnerability assessments and tools such as those provided in the Climate Change Handbook, Resource Management Strategies (RMS) and adaptation strategies that address region-specific climate change impacts*
- *Demonstrate how the effects of climate change on the region are factored into the RMS*
- *An evaluation of RMS and other adaptation strategies and ability of such strategies to eliminate or minimize those vulnerabilities, especially those impacting water infrastructure systems*

6.1 Overview

The purpose of this section is to describe the diversification of water management approaches taken in the WCVC IRWM Region to address future water management needs in an uncertain future and help meet IRWM Plan goals. This section describes how the Region considers and implements the Resource Management Strategies (RMS) required by the 2016 Proposition 1 IRWM Guidelines (Volume 2, Plan Standards). The 32 RMSs, as defined in the California Water Plan Update 2013, are tools to help develop appropriate projects and programs for implementation of the IRWM Plan and to help mitigate, or adapt to, climate change. These strategies can be mixed and matched to provide multiple water and resource benefits, diversify the local water portfolio, and help the Region become more self-sufficient.

The RMSs are tools that help achieve water reliability, climate resilience, and efficient resource management. The combination of strategies varies from region to region, depending on climate, projected growth, existing water system, environmental and social conditions, and regional goals. At the local level, it is important that the proposed strategies complement the operation of existing water systems.

Most of the Resource Management Strategies are being implemented in the WCVC IRWM Region and through implementation of other local plans addressing the following: urban water management (demand management measures), watershed management/protection, facility master planning, capital improvement, habitat conservation, flood and stormwater management, water conservation and efficiency, water quality improvement, groundwater management and other plans which address water supply, water resources, and related issues. These plans have been developed and implemented for a variety of purposes based on local needs and priorities, grant funding availability, regulatory requirements, mitigation for environmental impacts and/or conditions placed on land use development approval. See Section 11 for more information about local water plans.

Section 6.2 includes a brief description of each RMS, excerpted from the California Water Plan Update 2013, Volume 3. Section 6.3 contains examples of programs and projects being implemented in the WCVC IRWM Region which address one or more RMS. Section 6.4 describes the process for determining which RMSs are appropriate for future implementation in the Region and Section 6.5

includes a brief discussion about how each RMS helps adapt to or mitigate for climate change impacts and minimize identified vulnerabilities – especially those impacting water infrastructure systems.

6.2 Description of Resource Management Strategies

The Resource Management Strategies (RMS) are grouped according to management objectives and are briefly described below. The descriptions are adapted from excerpts from the California Water Plan Update 2013, Volume 3.

6.2.1 Reduce Water Demand

Agricultural Water Use Efficiency

The Agricultural Water Use Efficiency Strategy describes the use and application of methods and technologies to control agricultural water delivery and achieve a beneficial outcome. Considerations include: an estimation of net-water savings resulting from implementation of efficiency measures as expressed by the ratio of output to input, resulting benefits; and strategies (i.e. techniques, equipment, management approaches) to achieve efficiency and benefits.

The estimation of net-water savings is the reduction in the amount of water used that is then available for other purposes, while maintaining or improving crop yield. Net-water savings recognizes uptake and transpiration of water for crop water use; the role, benefits, and quantity of applied water that is recoverable and reusable in the agricultural setting; and the quantity of irrecoverable applied water that flows to salt sinks, such as the ocean and inaccessible or degraded saline aquifers, or evaporates to the atmosphere, and is unavailable for reuse.

Below is a general list of BMPs aimed at improving agricultural water efficiency compiled from various sources:

The Agricultural Water Management Council has three classifications for Efficient Water Management Practices (EWMP): (1) Generally Applicable EWMP that all water suppliers who are signatories to the agricultural MOU must complete; (2) Conditionally Applicable EWMP; and (3) practices subject to detailed net benefit analysis without exemption. A list of these EWMP is provided in the 2009 California Water Plan, Volume II.

Agricultural water suppliers that sign the MOU voluntarily commit to implementing locally cost effective EWMPs, these include:

1. Prepare and adopt a farm water-management plan.
2. Designate and train the irrigation supervisor to be a water-conservation coordinator.
3. Perform regular checks of water-system hardware to check for leaks and proper water placement.
4. Where appropriate, replace faulty sprinkler heads, turnouts, and valves.
5. Evaluate the need, if any, for changes in watering policies or procedures.
6. Facilitate alternative land use and/or drainage practices.
7. Use recycled water (if available) that otherwise would not be used beneficially.

8. Utilize low-cost financing of capital improvements (when available) for on-farm irrigation systems.
9. Participate in voluntary water transfers that do not unreasonably affect the water user, water supplier, the environment, or third parties.
10. Construct improvements (lining and piping) to control seepage from ditches, pipeline, and canals.
11. Within operational limits, increase flexibility in water ordering and delivery from the water supplier.
12. Construct and operate spill and tailwater recovery systems.
13. Optimize conjunctive use of surface and groundwater supplies.
14. Automate water supply control structures to prevent waste.
15. Install and maintain water-measurement devices and track water use with accurate reports.
16. Take advantage of special pricing or other incentives to efficient water use.

Urban Water Use Efficiency

Urban water use efficiency results in benefits to water supply and water quality through technological and behavioral improvements that decrease indoor and outdoor residential, commercial, industrial, and institutional water use. Water use efficiency has multiple benefits. At the individual level, the benefits of water use efficiency are often small and incremental; but as a community works together to conserve water, the cumulative effect is clear, and the benefits are widespread. Excessive urban water use results in urban runoff, groundwater overdraft, groundwater contamination, excessive flows to wastewater treatment plants, and increased green waste in the landfills. The volume and timing of surface-water diversions to meet the excessive use of water can produce environmental impacts. The impacts have substantial economic and financial consequences for water suppliers and consumers. Urban water use efficiency practices and standards (best management practices or demand management measures) are embodied in the urban water management plans prepared by urban water suppliers and are widely implemented throughout California and through implementation of the California Water Action – Make Conservation a California Way of Life initiative and regulations described below

In 2018, new landmark water conservation legislation was signed into law. Together, AB 1668(Friedman) and SB 606(Hertzberg), lay out a new long-term water conservation framework for California. This new framework is far-reaching for both the urban and agricultural sectors of California and represents a major shift in focus. Programs and initiatives are organized around four primary goals:

(1) Use water more wisely

(2) eliminate water waste

(3) strengthen local drought resilience, and

(4) improve agricultural water use efficiency and drought planning

6.2.2 Improve Flood Management

Flood Risk Management

Flood risk management is a strategy specifically intended to protect people and property from the negative impacts of flooding. It includes projects and programs that assist individuals and communities to manage flood flows and to prepare for, respond to, and recover from a flood. This strategy is a key element of integrated flood management, a comprehensive approach to flood management that considers land and water resources at a watershed scale within the context of integrated regional water management, employs both structural and nonstructural 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. Flood risk management includes a wide range of projects and programs, which may be generally grouped into three categories: Structural approaches, land use management, and disaster preparedness, response, and recovery.

6.2.3 Improve Operational Efficiency and Transfers

Conveyance — Delta

Conveyance provides for the movement of water. Conveyance infrastructure includes natural watercourses as well as constructed facilities like ditches, canals, and pipelines, including control structures such as weirs. Examples of natural watercourses include streams, rivers, and groundwater aquifers. Conveyance facilities range in size from small local end-user distribution systems to the large systems that deliver water to or drain areas as large as multiple hydrologic regions. Conveyance facilities may also require associated infrastructure such as pumping plants and power supply, diversion structures, fish ladders, and fish screens.

Conveyance through the Delta, located at the confluence of the Sacramento and San Joaquin rivers, naturally carries water westward from the upstream water drainage basins to the bays connected to the Pacific Ocean. The Delta, however, is also a highly manipulated network of natural streams and sloughs as well as constructed channels bordered by levees to prevent flooding of adjacent islands. The Delta is a critical element of both regional and interregional water conveyance systems and is essential to sustaining the state's economy.

Conveyance — Regional / Local

As stated above, conveyance provides for the movement of water. Regional, or local, conveyance refers to how water is distributed from locally developed sources to the end users located within the same watershed or river system. Existing regional, multi-agency conveyance projects exist in all urban regions of California, particularly the San Francisco Bay Area and the Southern California regions surrounding the Los Angeles and San Diego areas. These systems often include emergency interconnects between various agencies, which can be used in events such as earthquakes and fires to transport water to meet emergency needs.

System Reoperation

System reoperation means changes to existing operation and management procedures for existing reservoirs and conveyance facilities which increase water-related benefits from these facilities. System reoperation may improve the efficiency of existing water uses (e.g., irrigation) or it may increase the emphasis of one use over another. Although reoperation is generally regarded as an alternative to construction of major new water facilities, physical modifications to existing facilities may be needed in some cases to expand the reoperation capability. Legal changes also may be needed. Changes in water demands and the changing climate are the primary reasons to consider reoperation of existing facilities to increase project yield or address climate change impacts.

To date, most assessments and actual reoperations in California solve a specific problem or provide for a specific need. Reoperation is often considered as one strategy in an integrated water management plan or one alternative among a set of alternatives in a feasibility study. Reoperation to address specific needs often applies to a single project or facility such as reoperation of a reservoir in anticipation of large inflows, which will provide greater protection to the surrounding area from large floods and benefit other reservoir users by enabling water storage in part of the current flood storage space by using forecast-based operations. Reservoir reoperation can also provide ecosystem benefits through changes in the timing or amount of releases to downstream waterways.

Water Transfers

Water transfers involve voluntary changes in the way water is distributed among water users in response to water scarcity; for example, transfers among State Water Project (SWP) or Central Valley Project (CVP) contractors. California Water Code defines a water transfer as a temporary or long-term change in the point of diversion, place of use, or purpose of use due to a transfer or exchange of water or water rights. Temporary water transfers typically last one year or less. Long-term water transfers typically last more than one year.

Transfers can be between neighboring water districts or across entire regions or the state, provided there is a means to convey and/or store the water. Water transfers can be a temporary or permanent sale of water or a water right by the water-right holder; a lease of the right to use water from the water-right holder; or a sale or lease of a contractual right to water supply. Water transfers can also take the form of long-term contracts for the purpose of improving long-term supply reliability. Generally, water is made available for transfer by five major methods:

1. Transferring water from storage that would otherwise have been carried over to the following year. The expectation is that the reservoir will refill during subsequent wet seasons.

2. Pumping groundwater (groundwater substitution) instead of using surface water delivery and transferring the surface water rights.
3. Transferring previously banked groundwater either by directly pumping and transferring the banked groundwater or by pumping the banked groundwater for local use and transferring surface water that would have been use locally.
4. Reducing the existing consumptive use of water through crop idling or crop shifting, or water use efficiency measures to make water available.
5. Reducing return flows or seepage from conveyance systems that would otherwise be irrecoverable to make water available.

Water transfers are sometimes seen as merely moving water from one beneficial use to another. However, in practice, many water transfers become a form of flexible system reoperation linked to many other water management strategies including surface water and groundwater storage, conjunctive management, conveyance efficiency, water use efficiency, water quality improvements, and planned crop shifting or crop idling. These linkages often result in increased beneficial use and reuse of water overall. Transfers also provide a flexible approach to distributing available supplies for environmental purposes.

6.2.4 Increase Water Supply

Conjunctive Management and Groundwater

Conjunctive management (use) refers to the coordinated and planned use and management of both surface water and groundwater resources to maximize the availability and reliability of water supplies in a region to meet various management objectives. Surface water and groundwater resources typically differ significantly in their availability, quality, management needs, and in their development and use costs. Managing both resources together, rather than in isolation, allows water managers to use the advantages of both resources for maximum benefit.

Conjunctive management (use) thus involves the efficient use of both resources through the planned and managed operation of a groundwater basin and a surface water storage system combined through a coordinated conveyance infrastructure. Water is stored in the groundwater basin for later and planned use by intentionally recharging the basin when excess water supply is available; for example, it's used during years of above-average surface water supply or using recycled water. Well-planned conjunctive management not only increases the reliability and the overall amount of water supply in a region, but provides other benefits such as flood management, environmental water use, and water quality improvement.

Desalination

Desalination comprises various water-treatment processes for the removal of salt from water for beneficial use. Desalination is used to treat seawater as well as brackish groundwater (water with a salinity that exceeds normally acceptable standards for municipal, domestic, and irrigation uses, but less than that of seawater). Desalination technologies are also used to treat polluted and impaired waters and as an advanced treatment of wastewater to produce high quality recycled water. In California, the principal method for desalination is reverse osmosis (RO). This process can be used to remove salt as well as specific contaminants in water such as trihalomethane precursors, volatile organic carbons, nitrates, and pathogens.

Precipitation Enhancement

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. Precipitation enhancement is the one form of weather modification used in California, mostly along the central and southern Sierra Nevada with some in the Coast Range. The projects generally use silver iodide as the active-seeding agent, supplemented by dry ice if aerial seeding is done. Silver iodide can be applied from ground generators or from airplanes.

Historically, the number of operating projects has increased during droughts but are less common in more normal years. Most of the projects suspend operations during the very wet years once enough snow or rainfall has accumulated to meet their water needs.

Municipal Recycled Water

A significant means to meet current and future water demands is to recycle water – through treatment and reuse of wastewater. Wastewater which is treated to a specified quality in order to be able to use it again is called recycled water. Although there are varied sources of wastewater, this strategy only addresses recycling of municipal wastewater from treatment plants.

Municipal wastewater originates primarily from domestic sources, but also includes wastewater from commercial, industrial, and institutional sources that discharge to a common collection system where it mixes with domestic wastewater before treatment. The California Water Code provides the following definition for recycled water: "water which, as a result 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." "Recycled water" and "reclaimed water" have the same meaning.

Recycled water use can serve many purposes:

- an additional water source, which may also offset the need for additional freshwater supplies.
- a drought resistant water supply.
- a green alternative for treatment and disposal of wastewater.
- a natural treatment through land application and a reduction in discharge of excess nutrients into surface waters.
- a source of nutrients for crops or landscape plants.
- a means to enhance environmental features, such as wetlands.

Surface Storage

Water resource planning has changed significantly over the past several decades. New approaches to planning for surface storage have resulted in a new era of project formulations designed to address a new era of water resources needs. New construction of dams to create on-stream reservoirs built primarily for agricultural and urban users and flood protection is not the best approach to solving today's California's water challenges. In fact, these approaches would likely exacerbate many of the state's water resources problems, especially perceptions about winning and losing in California's water battles. Consequently, new on-stream storage proposals are considered untenable.

Projects that would provide off-stream storage or expansion of existing storage are being considered in several areas of the state, but the potential environmental effects can be significant. Successful projects would emphasize multi-objective storage, combining newer objectives associated with ecosystem restoration and water quality with more traditional purposes of water supply reliability, hydropower, and flood control. More specifically, these new projects would need to support aquatic and riparian ecosystem restoration focused on the Delta and its tributaries; improved drinking and habitat water quality; and water supply reliability improvements that ultimately support California's growing population and diverse economy.

Surface Storage — Regional/Local

Surface storage uses reservoirs to collect water for later release and use. Surface storage has played an important role in California where the pattern, timing, and location of water use does not always match the natural runoff pattern. Many California water agencies rely on surface storage as a part of their water systems, and reservoirs also play an important role in flood control and hydropower generation. Similarly, surface storage is often necessary for, or can increase the benefits from, other water management strategies such as water transfers, conjunctive management, and conveyance improvements. Some reservoirs contribute to water deliveries across several regions of the state while others only provide local water deliveries within the same watershed.

There are two general categories of surface reservoirs: those formed by building a dam across an active river, and those called off-stream reservoir storage where the actual reservoir is in a separate geographic location away from the river supply, with water diverted or pumped into storage to improve water quality

6.2.5 Improve Water Quality

Drinking Water Treatment and Distribution

Providing a reliable supply of safe drinking water is the primary goal of public water systems in California. To achieve this goal, public water systems must develop and maintain adequate water treatment and distribution facilities. In addition, the reliability, quality, and safety of the raw water supply are critical to achieving this goal. In general, public water systems depend greatly on the work of other entities to help protect and maintain the quality of the raw water supply. Many agencies and organizations have a role in the protection of water supplies. For example, the basin plans developed by the Regional Water Quality Control Boards (Regional Boards) recognize the importance of this goal and emphasize the protection of water supplies in California—both groundwater and surface water.

Most groundwater wells used for drinking water are constructed in a manner to intercept only high-quality groundwater. However, some groundwater wells require some level of treatment to achieve the high level of quality mandated by state and federal regulations for a safe, reliable supply of water. All surface water supplies used for drinking water must receive a high level of treatment to remove dirt, pathogens, and other contaminants before they are suitable for consumption. Once the water is treated to drinking water standards, this high level of water quality must be maintained as the water passes through the distribution system to customer taps.

Groundwater and Aquifer Remediation

Portions of aquifers in many groundwater basins in the state have degraded water quality that does not support beneficial use of groundwater. In some areas of the state, groundwater quality is degraded by constituents that occur naturally (e.g., arsenic). In many urban and rural areas, groundwater quality degradation has resulted from a wide range of human activities. Groundwater remediation is necessary to improve the quality of degraded groundwater for beneficial use. Drinking water supply is the beneficial use that typically requires remediation when groundwater quality is degraded.

Groundwater remediation removes constituents, often called "contaminants," that affect beneficial use of groundwater. Groundwater remediation systems can employ passive or active methods to remove contaminants. Passive groundwater remediation allows contaminants to biologically or chemically degrade or disperse in place over time. Active groundwater remediation involves either treating contaminated groundwater in place (while it is still in the aquifer) or extracting contaminated groundwater from the aquifer and treating it. Active in-place methods generally involve injecting chemicals into the contaminant plume to obtain chemical or biological removal of the contaminant. Extracting and treating contaminated groundwater can involve physical, chemical, and/or biological processes.

Matching Water Quality to Use

Matching water quality to use is a management strategy that recognizes that not all water uses require the same quality water. One common measure of water quality is its suitability for an intended use; a water quality constituent often is only considered a contaminant when that constituent adversely affects the intended use of the water. High quality water sources can be used for drinking and industrial purposes that benefit from higher quality water, and lesser quality water can be adequate for some uses. An example of this would be a water supplier choosing to use a groundwater source for municipal use, which requires less treatment before delivery, over a natural stream. The benefit to the municipal user potentially could be reduced disinfection byproducts in the delivered drinking water source. A secondary benefit would be that water left in-stream would be available to enhance or maintain the natural riparian system. Further, some new water supplies, such as recycled water, can be treated to a wide range of purities that can be matched to different uses. The use of water sources such as recycled water, can serve as a substitute for potable water, by meeting water needs not requiring potable water quality. In-stream uses are directly influenced by discharges from wastewater treatment plants and stormwater flows, and these source discharges can provide benefits - and challenges - to aquatic life and recreation.

Human uses can be categorized as consumptive—such as municipal, agricultural, and industrial supplies—and non-consumptive—such as navigation, hydropower generation, and recreation. In-stream uses include aquatic ecosystems, fish migration, spawning, and preservation of rare, threatened, and endangered species. Matching water quality to most of these uses is important because except for municipal and industrial uses, water is generally used as-is, i.e., without treatment. In addition, aquatic organisms are more sensitive to some pollutants than humans. For example, the presence of dissolved metals at low concentrations can be lethal to sensitive fish species.

Pollution Prevention

Pollution prevention can improve water quality for all beneficial uses by protecting water at its source and therefore reducing the need for and cost of additional water management and treatment.

An important pollution prevention strategy is implementation of proper land use management practices to prevent sediment and pollutants from entering the source water. By preventing pollution throughout a watershed, water supplies can be used and reused for a broader number - and more types - of downstream water uses. Improving water quality by protecting source water is consistent with a watershed management approach to water resources challenges. In addition, the legal doctrine of "public trust" demands that the state protect certain natural resources for the benefit of the public, including uses such as fishing, protection of fish and wildlife, and commerce, all of which are affected by pollution.

Salt and Salinity Management

Salt and salinity management are a critical component of water quality protection in many parts of the state. Except for freshly fallen snow, salt is present to some degree in virtually all-natural water supplies because soluble salts in rocks and soil begin to dissolve as soon as water reaches them. Salts are essential to plant, human, and animal nutrition; salts are present in our food, in our soils, and in the cleaning and personal care products we use every day.

While most salts provide some benefit to living organisms when present in low concentrations, salinity very quickly becomes a problem when consumptive use and evaporation concentrates salts to levels that adversely impact beneficial uses. Salinity levels increase with reuse since each use subjects the water to evaporation. If reused water passes through soil, additional dissolved salts accumulate in the water.

Salts may be defined as materials that "originate from dissolution or weathering of the rocks and soil, including dissolution of lime, gypsum, and other slowly dissolved soil minerals" (Ayers and Westcot 1994). "Salinity" describes a condition where dissolved minerals of either natural or anthropogenic origin and carrying an electrical charge (ions) are present. In water, salinity is usually measured as electrical conductivity (EC) or total dissolved solids (TDS), and the major ionic substances found in water are calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, and nitrate.

Historically, dilution and displacement have been used to deal with excess salinity. Agricultural operations typically displace soil salts by applying more irrigation water than the crop can take up to flush salts out of the root zone and relocate them in a lower part of the soil profile or in groundwater (the leaching fraction). The salt may then wick upwards again if evaporation exceeds recharge. These factors and more must be considered, and dilution and displacement strategies must be coupled with long-range water, ecosystem, and land resource management planning. Of significant note is the adoption by the State Water Resources Control Board of its 2009 Recycled Water Policy, which includes a requirement that local water and wastewater entities, together with local salt/nutrient contributing stakeholders, prepare salt and nutrient management plans and that those plans be completed and proposed for adoption by the Water Board within five years.

Other salt management strategies have included treatment using membrane or distillation technologies (discussed in more detail in the Desalination RMS section). Treatment, however, generates a highly saline solid or liquid waste product that must be managed appropriately and has a significant energy demand.

Urban Stormwater Runoff Management

Urban stormwater runoff management is a broad series of activities to manage both storm water and dry weather runoff. Dry weather runoff occurs when, for example, excess landscape irrigation water flows to a storm drain. Traditionally, urban runoff management was viewed as a response to flood control concerns resulting from the effects of urbanization. Concerns about the water quality impacts of urban runoff have led water agencies to look at watershed approaches to control runoff and provide other benefits, resulting in urban runoff management now being linked to other resource management strategies including Pollution Prevention, Land Use Planning and Management, Watershed Management, Urban Water Use Efficiency, Recycled Municipal Water, Recharge Area Protection, and Conjunctive Management.

6.2.6 Practice Resources Stewardship

Agricultural Lands Stewardship

Agricultural lands stewardship means farm and ranch landowners—the stewards of the state's agricultural lands—producing public environmental benefits in conjunction with the food and fiber they have historically provided while keeping land in private ownership.

Agricultural lands stewardship broadly means the conservation of natural resources and protection of the environment. Land managers practice stewardship by conserving and improving land for food, fiber and biofuels production, watershed functions, soil, air, energy, plant and animal and other conservation purposes. Agricultural lands stewardship also protects open space and the traditional characteristics of rural communities.

Moreover, it helps landowners maintain economically viable farms and ranches and minimize the pressure sell their land for urban development. Farmland, or "working landscapes" – in addition to maintaining ongoing primary productivity of food and fiber - will be increasingly important to attenuate peak precipitation runoff and conserve water, to provide critical habitat at key locations and to sequester carbon.

Ecosystem Restoration

Ecosystem restoration can improve the condition of our modified natural landscapes and biological communities to provide for their sustainability and for their use and enjoyment by current and future generations. Few, if any, of California's ecosystems can be fully restored to their pristine, pre-development condition. Instead, efforts focus on rehabilitation of important elements of ecosystem services, structure, and function. Successful restoration increases the diversity of native species and biological communities and the abundance and connectivity of habitats. This can include reproducing natural flows in streams and rivers, curtailing the discharge of waste and toxic contaminants into water bodies, controlling non-native invasive plant and animal species, removing barriers to fish migration in rivers and streams, and recovering wetlands so that they can store floodwater, recharge aquifers, filter pollutants, and provide habitat.

This strategy focuses on restoration of aquatic, riparian, and floodplain ecosystems because they are the natural systems most directly affected by water and flood management actions and are likely to be affected by climate change. Today, water and flood planning must aim to prevent ecosystem damage and reduce long-term maintenance costs. Future water and flood management projects that fail to protect and restore their ecosystems will face reduced effectiveness, sustainability, and public support.

Restoration generally emphasizes recovery of at-risk species and natural communities, usually those whose abundance and geographic range have greatly diminished. These include several fishes, such as Delta smelt, longfin smelt, green sturgeon, Chinook and Coho salmon, and steelhead-rainbow trout; and riparian and wetland habitats and their member species, including valley elderberry longhorn beetle, giant garter snake, and several migratory bird species.

Forest Management

California's major water development projects rely on water produced in forested watersheds. The state's major rivers and a substantial portion of its runoff originate in these high-elevation forests. Forests in California are used for sustainable production of resources such as water, timber, native vegetation, fish, wildlife, and livestock, as well as outdoor recreation. The economic value of water produced by forests equals or exceeds that of any other forest resource (Krieger, 2001; CDF, 2003).

Almost all forest-management activities can affect water quantity and quality. This strategy focuses on those forest-management activities that are designed to improve the availability and quality of water for downstream users on both publicly and privately-owned forest lands.

Land Use Planning and Management

More efficient and effective land-use patterns promote integrated regional water management (IRWM). Integrating land use and water management consists of planning for the housing and economic development needs of a growing population while providing for the efficient use of water, water quality, energy, and other resources. The way in which we use land—the pattern and type of land use and transportation and the level of intensity—has a direct relationship to water supply and quality, flood management, and other water issues. For example, compact development patterns in existing urban areas can limit the amount of development in floodplains, leading to improved flood management and safety. California's projected growth and urban development increases the pressure on natural resource conservation and amplifies the need for a comprehensive land use decision-making process. Sustainable land use decisions can improve water supply and quality, increase flood protection, conserve vital natural habitat, and lead to more efficient energy use.

Land use planning and management cuts across many resource management strategies. More efficient and effective land use is linked to several resource management strategies including watershed management, water use efficiency, agricultural lands stewardship, as well as to helping adapt to climate change. Directing development away from agricultural lands permits multi-objective management of these agricultural lands for floodplain management, water quality, habitat, and sustainable development. Land use planning affects and is affected by consideration of air quality, mobility, affordable housing, and economic development though this strategy focuses on water resources.

Recharge Areas Protection

Recharge areas are those areas that provide the primary means of replenishing groundwater. The best natural recharge areas are those where good quality surface water can percolate through the sediments and rocks to the saturated zone, which contains groundwater. If recharge areas cease functioning properly, there may not be sufficient groundwater for storage or use. Protection of recharge areas requires several actions based on two primary goals. These goals are (1) ensuring that areas suitable for recharge continue to be capable of adequate recharge rather than covered by impermeable urban infrastructure, such as buildings and roads; and, (2) preventing pollutants from entering groundwater to avoid expensive treatment that may be needed prior to potable, agricultural, or industrial beneficial uses.

Protection of recharge areas is necessary if the quantity and quality of groundwater in the aquifer are to be maintained. However, protecting recharge areas by itself does not provide a supply of water. Recharge areas only function when aquifer storage capacity is available, and when regional and local governments and agencies work together to secure an adequate supply of good quality water to recharge the aquifer. Protecting existing and potential recharge areas allows them to serve as valuable elements of a conjunctive management and groundwater storage strategy.

Sediment Management (New Strategy)

Sediment is composed of materials such as sand, silt, gravel, and chemical precipitates suspended in or settled on the bottom of a water body. Sediments include both organic and inorganic material that can become bits of matter tiny enough to be picked up and carried along with flowing water. Organic sediments are made up of mostly plant and animal debris. Inorganic sediments are divided into two main groups — coarse-grained sediments and fine-grained sediments. Coarse-grained sediments are boulders, cobbles, gravel, and sand. Fine-grained sediments are silts and clays.

An important distinction regarding sediments is whether they are clean or contaminated, as this greatly affects whether they can be used as beneficial material or must be isolated from their surrounding environment.

Clean sediment can be a valuable resource, resulting in multiple water benefits, environmental health, economic stability, and coastal safety. Sediment has many positive uses, such as beach restoration and renewal of wetlands and other coastal habitats. Also, sediment is needed to renew stream habitat. Flood deposits of fine-grained sediment into floodplains can produce rich and productive farmland. Sediments also can be used for habitat restoration projects, beach nourishment, levee maintenance, and construction material.

The key to effective water-sediment management is to address excessive sediment in watersheds, which can build up over time, or be deposited quickly through mud or debris flows occurring during flooding events – such as occurred in Montecito during a high-intensity rainfall event immediately following the Thomas Fire.

Pollutants, including those from stormwater, may also be absorbed onto fine-grained sediments and complicate management of contaminated sediment. Concentrated pollutants can greatly impair water quality and aquatic life if they are remobilized from this sediment back into the environment.

Effective management of both clean and contaminated sediment must consider the sources, transport, and deposition of sediments to assure that beneficial uses of water are protected.

Watershed Management

Watershed management is the process of creating and implementing plans, programs, projects, and activities to restore, sustain, and enhance watershed functions. These functions provide the goods, services, and values desired by the community affected by conditions within a watershed boundary. In California, the practice of community-based watershed management has evolved as an effective approach to natural resource management practiced in hundreds of watersheds throughout the state. These community-based efforts are carried out with the active support, assistance, and participation of numerous state agencies and programs.

A primary objective of watershed management is to increase and sustain a watershed's ability to provide for the diverse needs of the communities that depend on it, from local to regional to state and federal stakeholders. Using watersheds as an organizing unit has proven to be an effective scale for natural resource management as well as also providing a basis for greater integration and collaboration among those policies and actions. The watershed is an appropriate scale to coordinate and integrate management of the numerous physical, chemical, and biological processes that make up a river basin ecosystem. It serves well as a common reference unit for the many different policies, actions, and processes that affect the system.

6.2.7 People and Water

Economic Incentives

Economic incentives include financial assistance, water pricing, and water-market policies intended to influence water management decisions. Economic incentives can influence the amount of use, time of use, wastewater volume, and source of supply. Examples of economic incentives include low-interest loans, grants, and water rates and rate structures. Financial assistance to water users, such as free services, rebates, and the use of tax revenues to partially fund water services, can also have a direct effect on water use, as well as the prices paid by water users. Government financial assistance (i.e., grants and low-interest loans) provide incentives for integrated resource planning and implementation by regional and local agencies. These government sponsored financial assistance programs can help water suppliers provide financial incentives to their water users for a specific purpose. On a broader scale, financial assistance programs can also help align the economic and financial drivers (e.g., marginal costs) affecting local, regional, and statewide water management decisions. Another economic incentive that can improve water management outcomes comes in the form of a disincentive, such as fines or surcharges for excessive use, which can be used to discourage undesirable water-user behavior.

Incentives for water-market transfers can be made possible by creating market opportunities where they didn't exist; by expanding opportunities where they currently exist; or by reducing market transaction costs. In each case, new or greater opportunity costs can influence water management decisions. For example, if the opportunity to sell water is forgone to maintain it in its current use, then the opportunity cost is the lost sales income.

Outreach and Engagement (New Strategy)

As the demands on water management systems have increased and understanding of the complexity of the water systems has grown, the need for public education and engagement in achieving optimum results has become more apparent. The Outreach and Engagement RMS addresses the tools and practices used by water agencies and resource managers to facilitate active engagement by public individuals and groups toward positive water resource management outcomes. This essentially refers to the need to expand the capacity of the human aspect of water management, sometimes referred to as "human infrastructure". Successful water resource management depends on a knowledgeable and engaged citizenry.

Public stakeholders and water managers can work together to improve the local water management by:

- Providing insight to decision makers on the best approaches for water management.
- Adopting/implementing water-wise use practices.
- Supporting activities that result in beneficial water management outcomes, including the resource management strategies in this plan.
- Promoting collaboration and interdisciplinary approaches to solving problems, as well as resolving conflicts and addressing multiple interests and needs.
- Ensuring access to water management information and decision making.

Outreach and engagement can engage cross-disciplinary groups to resolve water issues and result in significant water policy decisions as multiple interests work collaboratively to solve problems. Integrated regional water management (IRWM) is now the policy direction of the state. To qualify for grants, regional water managers must coordinate with managers in related fields and local citizen groups. As they form new ways of working together to write plans, implement grant projects, and raise matching funds, they have had to employ collaboration techniques and build new capacity. The emphasis on regional management also creates new demands for engagement tailored to local needs and practices.

Water and Culture (New Strategy)

This new strategy is based on a recognition of the importance of linking cultural considerations to water resource management. Water and culture are connected in many ways, with subtle and complex implications for water management in California. Some cultural relationships to water are so pervasive, they may be easy to overlook. Increasing the awareness of how cultural values, uses, and practices are affected by water management, as well as how they affect water management, will help inform policies and decisions. Even regulations reflect cultural values, particularly by how they are put into practice when water is viewed as a commodity, and all the more by the sum total of laws, regulations, and policies intended to control water.

Water resources have shaped the history of California, contributing to the current social, cultural, and economic patterns across the state. The presence of freshwater sources has influenced the location of settlements and communities for hundreds, even thousands, of years. Water resources have also been pivotal to key economic activities, such as fishing, mining, agriculture, manufacturing, tourism, and recreation. These historic aspects of development continue to have ramifications for water managers today.

Water and water-dependent resources also shape individual and collective experiences that contribute to individual and community well-being, sense of identity, and connection with the natural world. These experiences are inextricably linked to values, traditions, and lifestyles, which in turn inform perspectives and expectations regarding water resources and conditions. Cultural considerations by their nature are inherently linked to every resource management strategy. More importantly, the consideration of culture in water management decisions is, in many cases, legally mandated by state and federal laws. Utilizing cultural considerations in the framing, development, and promotion of management decisions is vital to ensuring legal compliance and sustainable practices.

Water-Dependent Recreation
With its temperate climate, over 1.3 million acres of water surface, 2,600 miles of waterways, and 3,427 miles of coastline, California offers a variety of water-dependent recreation opportunities in any season. Each year millions of California residents and visitors come to California waterways seeking recreation experiences. In 2006, beach and waterfront activities helped make California one of the most visited states in the nation. California residents and visitors can choose from a variety of water-dependent recreation activities. They may enjoy recreation activities that are dependent on water, including fishing, swimming, waterfowl hunting and birding, boating, canoeing, and kayaking.

They also may participate in recreation activities that can be enhanced by water, such as wildlife viewing, picnicking, camping, and hiking, biking, and riding on trails. While the latter activities do not depend on water, they are frequently enjoyed near water.

Water-Dependent Recreation in Ventura County:
With its temperate climate, acres of water surface, miles of waterways, and miles of coastline, Ventura County offers a variety of water-dependent recreation opportunities in any season. Each year thousands of residents and visitors come to Ventura County waterways seeking recreation experiences.

Residents and visitors can choose from a variety of water-dependent recreation activities. They may enjoy recreation activities that are dependent on water, including fishing, swimming, waterfowl hunting and birding, boating, canoeing, and kayaking. They also may participate in recreation activities that can be enhanced by water, such as wildlife viewing, picnicking, camping, and hiking, biking, and riding on trails. While the latter activities do not depend on water, they are frequently enjoyed near water. Ventura County also has a variety of water-dependent recreation facilities with differing levels of public access. Protected status designations for the state's reservoirs, for example, range from prohibiting all public access, prohibiting body contact with the water, to allowing swimming, fishing, and boating.

6.2.8 Other Strategies

The California Water Plan, Update 2013 includes one final category of RMSs – titled "other strategies" which highlights a variety of water management strategies that can potentially generate benefits that meet one or more water management objectives, such as water supply augmentation or water quality enhancements. However, these management strategies are currently limited in their capacity to strategically address long-term regional water planning needs. In some cases, such as Dewvaporation, the strategy involves emerging technologies that will require more research and development. In other cases, such as Crop Idling and Irrigated Land Retirement, they involve voluntary and often temporary tradeoffs from one sector of use to another (i.e., agricultural to urban) that will likely be unpredictable and limited in scope over the time horizon of this California Water Plan Update. Finally, implementation of strategies such as Rainfed Agriculture will have limited applicability in California due to the variability and uncertainty of precipitation patterns within the state from year to year.

These strategies are listed and briefly described below:

Crop Idling for Water Transfers: Crop idling is removal of lands from irrigation with the aim of returning the lands to irrigation later. Crop idling for water transfers is done to make water available for transfer. Crop idling may be done for a certain time or can be episodic. Land retirement for water transfer and for solving drainage and drainage-related problems is discussed in the land retirement strategy later in this section. Crop idling, with the intent of soil and crop management and for soil and crop sustainability and productivity, is further discussed in CWP Update 2009, Volume 2, Chapter 20 - Agricultural Lands Stewardship.

Dewvaporation for Atmospheric Pressure Desalination: Dewvaporation is a specific process of humidification-dehumidification desalination. Brackish water is evaporated by heated air, which deposits fresh water as dew on the opposite side of a heat-transfer wall. The energy needed for evaporation is supplied by the energy released from dew formation. Heat sources can be combustible fuel, solar or waste heat. The tower unit is built of thin plastic films to avoid corrosion and to minimize equipment costs. Towers are relatively inexpensive since they operate at atmospheric pressure. The technology of dewvaporation is still being developed.

Fog Collection: Precipitation enhancement also includes other methods, such as physical structures or nets to induce and collect precipitation. Precipitation enhancement in the form of fog collection has not been used in California as a management technique but does occur naturally with coastal vegetation; fog provides an important portion of summer moisture to our coastal redwoods.

Irrigated Land Retirement: Irrigated land retirement is the removal of farmland from irrigated agriculture. Permanent land retirement is perpetual cessation of irrigation of lands from agricultural production, which is done for water transfer or for solving drainage-related problems.

Rainfed Agriculture: Rainfed agriculture is when all crop consumptive water use is provided directly by rainfall on a real-time basis. Due to unpredictability of rainfall frequency, duration, and amount, there is significant uncertainty and risk in relying solely on rainfed agriculture. This is especially true in California where there is little or no precipitation during most of the spring and summer growing season. Climatic conditions in California provide excellent conditions for crop production. Little cloud cover provides ample solar radiation during the spring and summer growing season. Precipitation in the form of rainfall and snow occurs mainly during the fall and winter months. However, the lack of sufficient and timely rainfall during the spring and summer in much of California severely limits the potential for expansion of rainfed agriculture.

Snow Fences: Snow fences have been used extensively by state transportation departments to reduce snow drifting over roadways. To improve watershed management, snow fencing could be strategically placed in small openings (clear-cut tree harvest areas or high-elevation meadows) of 1.25 acres or less. Effective snow fences are 6-12 feet high. When positioned perpendicular to the prevailing wind, snow fencing intercepts the wind to reduce snowflake velocity and create a snow sedimentation basin downwind of the fence. Snow mass collected behind the fence is distributed over a longitudinal area that can be up to 25 times the fence height.

Waterbag Transport/Storage Technology: The use of waterbag transport/storage technology involves diverting water in areas that have unallocated freshwater supplies, storing the water in large inflatable bladders, and towing them to an alternate coastal region. Fresh water is lighter than seawater, which makes the bags float on the surface. This makes them easier to tow. After discharging their contents, empty bags are then reeled to the deck of the tug allowing for a quick return to the source water area. Although this strategy is not currently being used in California, there have been several proposals to implement this technology throughout the world, including San Diego.

6.3 Local Implementation of RMS

There are many examples of RMS implementation across the County. Table 6-1 below includes a checklist of the 32 strategies and whether they are being implemented or considered for implementation within each of the three local watersheds, as well as regionally.

See Table 2-1 in Section 2 – Highlights of Program Accomplishments Since 2006 for a list of implemented projects and programs. See below for some examples of regional implementation of RMS.

TABLE 6-1

Summary of Resource Management Strategies Implemented in WCVC Region

Resource Management Strategy	Calleguas Creek Watershed	Santa Clara River Watershed	Ventura River Watershed	Regional
Reduce Water Demand				
Agricultural Water Use Efficiency	✓	✓	✓	✓
Urban Water Use Efficiency	✓	✓	✓	✓
Improve Flood Management				
Flood Risk Management	✓	✓	✓	✓
Improve Operational Efficiency and Transfers				
Conveyance — Delta	**Not applicable**	**Not applicable**	**Not applicable**	**Not applicable**
Conveyance — Regional / Local	✓	✓	✓	✓
System Reoperation	✓	✓	✓	✓
Water Transfers	✓	✓	✓	✓
Increase Water Supply				
Conjunctive Management and Groundwater	✓	✓	✓	✓
Desalination (includes brackish water)	✓	✓		✓
Precipitation Enhancement				
Municipal Recycled Water	✓	✓	✓	✓
Surface Storage — CALFED	**Not applicable**	**Not applicable**	**Not applicable**	**Not applicable**
Surface Storage — Regional/Local	✓	✓	✓	✓
Improve Water Quality				
Drinking Water Treatment and Distribution	✓	✓	✓	✓
Groundwater and Aquifer Remediation	✓	✓	✓	✓
Matching Water Quality to Use	✓	✓	✓	✓
Pollution Prevention	✓	✓	✓	✓
Salt and Salinity Management	✓	✓	**Not applicable**	✓
Urban Stormwater Runoff Management	✓	✓	✓	✓

Resource Management Strategy	Calleguas Creek Watershed	Santa Clara River Watershed	Ventura River Watershed	Regional
Practice Resource Stewardship				
Agricultural Lands Stewardship	✓	✓	✓	✓
Ecosystem Restoration	✓	✓	✓	✓
Forest Management	✓	✓	✓	✓
Land Use Planning and Management	✓	✓	✓	✓
Recharge Areas Protection	✓	✓	✓	✓
Sediment Management	✓	✓	✓	✓
Watershed Management	✓	✓	✓	✓
People and Water				
Economic Incentives	✓	✓	✓	✓
Outreach and Engagement	✓	✓	✓	✓
Water and Culture	✓	✓	✓	✓
Water-Dependent Recreation	✓	✓	✓	✓
Other Strategies				
Crop Idling for Water Transfers				
Dewvaporation/Atmospheric Pressure Desalination				
Fog Collection				
Irrigated Land Retirement				
Rainfed Agriculture				
Snow Fences	**Not applicable**	**Not applicable**	**Not applicable**	**Not applicable**
Waterbag Transport/Storage Technology				

6.3.1 Agricultural Water Use Efficiency

The following include examples of agricultural water use efficiency projects and programs that have been implemented in Ventura County.

Fox Canyon Groundwater Management Agency:

The Fox Canyon Groundwater Management Agency (FCGMA) manages and protects both confined and unconfined aquifers within several groundwater basins underlying the southern portion of Ventura County. The FCGMA has prepared groundwater sustainability plans for several of the basins under its management and is implementing two new mandatory programs: installation of advanced metering infrastructure (AMI) on all metered wells and establishment of a water market (trades and exchanges) program. It is hoped that these programs will improve the efficiency of irrigation water drawn from the basin. The Water Market is designed for agricultural pumpers in the Oxnard and Forebay basin to either buy additional pumping allocation or sell unused pumping allocation.

Ventura County Farm Water Coalition:
A group of more than 70 large agricultural water users, environmental organizations, and several wholesale and retail water districts make up the Ventura County Farm Water Coalition. The Coalition's goal is to improve water use efficiency and conservation through implementation of efficient water management practices. The agricultural water suppliers voluntarily commit to implementing locally cost effective and efficient EWMP's and BMPs. These agricultural water suppliers and users represent a significant number of total acres of irrigated agricultural land and the majority of the annual water volumes supplied by retail water purveyors and private well owners in Ventura County.

Ventura County Agricultural Irrigated Lands Group:
The Ventura County Agricultural Irrigated Lands Group (VCAILG) is a program run by the Ventura County Farm Bureau that monitors water quality effluent associated with agricultural runoff and offers training in on-farm water efficiency practices. VCAILG consists of individual agricultural members that work collectively as a "discharger group" to manage their agricultural runoff and implement water efficiency standards. The program requires the owners of irrigated farmland to measure and control discharges from their property, including irrigation return flows, flows from tile drains and stormwater runoff. On a farm level, landowners and growers are asked to provide VCAILG with information on their management practices, participate in education efforts, and implement BMPs to reduce or eliminate contaminated discharges.

Irrigation Evaluations:
The Resource Conservation District (RCD) offers free irrigation evaluations to growers with orchards and row crops or nurseries by evaluating the efficiency of their irrigation system and recommending BMPs to improve system efficiency. RCD is also implementing a cost-share program that assists producers in obtaining water-efficiency technologies through connections with cost-sharing programs sponsored by water purveyors.

Mobile Water-Energy Efficiency Laboratory Program:
With the assistance of the IRWM program, the RCD has also implemented a Mobile Water-Energy Efficiency Laboratory program. This program provides on-site evaluations of agricultural irrigation systems looking for potential improvement in water distribution, irrigation uniformity, energy usage, and pump efficiency. The irrigation and energy audit results are also accompanied by recommendations to increase performance.

6.3.2 Urban Water Use Efficiency

There are numerous examples of urban water-efficiency projects being implemented in Ventura County. The following is a short list of some of these projects and programs:

State Water Resources Control Board Urban Water Use Restrictions – Related to Drought in 2014-15:
The State Water Board instituted mandatory urban water use restrictions affecting the 400 larger water utilities and agencies in the state to address critical water supply shortages during the most recent severe drought. In part, as a result of these requirements, urban water demand in the state and within Ventura County was substantially reduced. The restrictions required urban water providers to reduce per-capita demand in their service areas by a minimum of 14% to a maximum of 30%, depending on the area and the baseline per-capita demand rates in those areas.

Ventura County Regional Urban Landscape Efficiency Program:
The Ventura County Regional Urban Landscape Efficiency Program (VC-RULE) is a partnership of water-management entities led by the City of Oxnard focused on implementing water efficiency best practices. The program is funded by Proposition 84 and matches appropriate water-saving technologies that are provided by professional vendors based on landscape irrigation surveys. Water-saving technologies include weather-based irrigation controllers, low precipitation rate irrigation nozzles, and rain shut-off sensors. All residential, commercial, and industrial customers with landscape irrigation needs are eligible to participate in the program. The program targets approximately 1,000 customer properties and aims to reduce customer water usage by 20 percent.

Multi-Agency Turf Removal and Replacement Program:
Funded in part through a Proposition 84 IRWM grant, the City of Ventura, Casitas MWD, and the City of Santa Paula are working together to develop the Water Wise Convert and Save Incentive Program which provides rebates to customers to remove their lawns and replace them with alternative, low water-demand landscaping materials.

Regional Water Use Efficiency Group:
This group consists of water-conservation coordinators from throughout Ventura County who meet annually or semi-annually to share information and discuss joint projects. The Regional Water Use Efficiency Group is responsible for the implementation of the Water Wise Gardening website which provides water efficient gardening and irrigation information.

Water Wise Gardening Website:
The Water Wise Gardening website offers water efficient landscape-design information and an irrigation guide to residential and commercial users. The program is being implemented by the Regional Water Use Efficiency Group and Casitas MWD, and the website contains a catalog of water efficient plants and trees and offers examples of water efficient landscape design. The goal of this project is to decrease irrigation demand through education and water-efficient landscapes.

6.3.3 Flood Risk Management

Flood risk management is a vital water-management issue in Ventura County, and numerous projects and strategies are being employed to address this issue area. The following are a few recent projects that address flood management:

Natural Floodplain Protection Plan:
The Nature Conservancy is implementing the Natural Floodplain Protection Program to preserve a critical section of the floodplain in the Santa Clara River Watershed. This project involves the purchase of agricultural conservation easements that will prevent future development in the floodplain. Purchasing the development rights of these lands will preserve open space and wildlife habitat and sustain the agricultural lands that currently maintain the natural floodplain and its associated flood control benefits.

Cooperating Technical Partners Flood Mapping Project:
FEMA, County of Ventura, Ventura County Watershed Protection District, and affected cities have commenced a project to conduct hydrologic modeling and mapping of select floodplains throughout Ventura County. These maps will better inform resource-management agencies about flood risks and infrastructure needs in the future.

State Local Levee Assistance Program Grant-Funded Projects:
The Ventura County Watershed Protection District and affected cities have obtained state funding to conduct technical evaluations of seven (7) levees and critical repairs of three (3) levees located throughout Ventura County to protect these areas from flood risks.

North Simi Drain Retrofit:
The Ventura County Watershed Protection District and City of Simi Valley completed a project to relocate and increase flood conveyance capacity of the North Simi Drain. The drain improvements were required to protect against flooding in adjacent areas. The project was completed in 2009 with funding from FEMA and the Watershed Protection District.

Santa Clara River Watershed Feasibility Study – Modeling Efforts:
The U.S. Army Corps of Engineers, Los Angeles County Flood Control District, and Ventura County Watershed Protection District implemented a feasibility study in order to develop technical data required to identify and understand the flood protection and water-resource challenges and opportunities present in the Santa Clara River Watershed. The feasibility study identified project opportunities that can be further developed with more detailed studies and led to federal action and funding for construction projects. The study will be complete, pending following development of a sediment transport model.

6.3.4 Conveyance — Regional / Local

Camarillo/Camrosa Recycled Water Interconnection:
This project expands the use of recycled municipal water through the construction of an interconnection that will distribute treated water more widely amongst Camarillo Sanitary District and Camrosa customers. Thus, this project provides infrastructure to convey water supply to regional areas that normally would not have access to this source.

Freeman Diversion:
The Freeman Diversion Facility in Saticoy was constructed in 1991 to divert Santa Clara River flow to spreading ground to enhance recharge of local groundwater supplies for subsequent use by

municipal and agricultural pumpers. The facility is comprised of a concrete dam, a fish ladder, a screened fishbay, a downstream migrant trap, various canals, and spreading grounds.

6.3.5 System Reoperation

Lake Casitas:
Casitas Dam was originally constructed to form Lake Casitas for flood management and as a water supply reservoir. Due to the importance of in-stream flows for aquatic habitat, releases from the reservoir are conducted to support aquatic habitat for the endangered southern steelhead trout and other wildlife that depend on in-stream flows. The National Marine Fisheries Service has required Casitas MWD to guarantee flows to accommodate fish passage at the Robles Fish Ladder downstream of the reservoir.

Lake Piru:
Lake Piru and the Santa Felicia Dam were originally constructed in 1956 for the purposes of water supply enhancement. United Water Conservation District captures a portion of rainy season runoff from the Piru Creek Watershed and releases it later in the year to enhance the recharge of the groundwater basins downstream. These releases replenish groundwater supplies for both drinking water and for agriculture through conjunctive management for Piru, Fillmore, Santa Paula, Ventura and the Oxnard Plain.

6.3.6 Water Transfers

The following are a few examples of water-transfer projects being implemented in Ventura County:

Freeman Diversion In-Lieu Deliveries:
In addition to surface-recharge ponds, the Freeman Diversion also supplies river water to two pipeline systems that deliver this water to agricultural pumpers in lieu of their pumping groundwater. The Pleasant Valley Pipeline delivers this river water to Pleasant Valley County Water District for distribution to pumpers. The Pumping Trough Pipeline conveys diverted river water to agricultural pumpers on the Oxnard Plain, thus reducing the amount of groundwater extractions in areas susceptible to seawater intrusion. When river water is not available, United Water Conservation District uses five lower aquifer system wells to pump water into the pipeline.

Groundwater In-Lieu Deliveries:
In a different type of in-lieu delivery, United Water Conservation District also pumps and delivers groundwater to the cities of Oxnard and Port Hueneme and Naval Base Ventura County. This water is pumped from wells adjacent to the surface spreading ponds, where the aquifers are readily recharged. The cities and Naval Bases in Ventura County use this water in lieu of pumping their own wells closer to the coastline where pumping could pull seawater into the aquifers.

Conejo Creek Diversion Project:
A newer in-lieu system operated by Camrosa Water District diverts flows from Conejo Creek and delivers the water to Pleasant Valley County Water District to meet local irrigation demands within the overdrafted Pleasant Valley basin. The Conejo Creek Diversion Project diverts a combination of natural stream flow and recycled water released into the creek from wastewater treatment plants

upstream. Thus, creek water is transferred to Pleasant Valley for use instead of overpumping existing groundwater.

6.3.7 Conjunctive Management and Groundwater

In addition to example projects listed above which also offer conjunctive-management benefits, the following are a few more examples of conjunctive management and groundwater projects being implemented in Ventura County:

Water Level Measurements
District staff and several water districts and purveyors measure water levels in production and monitoring wells throughout the County. Changes in water levels are tracked and help determine change in storage and to track trends in groundwater extraction and recharge. Last year, water levels were measured quarterly in approximately 200 wells throughout the County. In the southern half of the County, water levels were measured four times, while in the more remote northern half, wells are monitored twice each year. "Key" wells for seventeen of the largest groundwater basins in the County have been established. A key well is a well selected as one giving the most representational data for the basin or for a specific aquifer in a basin. Key wells are chosen based on their location in the basin and availability of construction information and historical water-level data.

GREAT Project – Groundwater Recovery and Treatment Program:
The City of Oxnard's GREAT Program combines wastewater recycling, brackish groundwater desalination, groundwater injection, storage and recovery, and restoration of local wetlands to provide an additional water-supply source to the Oxnard Plain.

San Antonio Creek Spreading Grounds Rehabilitation Project:
This project augments the Ojai Valley's water supply by diverting a portion of the precipitation that is typically lost downstream to spreading grounds and the newly constructed aquifer recharge wells. Thus, water that is typically lost downstream is diverted to areas where it can percolate into groundwater where it can be used as water supply.

6.3.8 Desalination

Major efforts in Ventura County are being made to address excessive salt in water supplies through desalination. The following are some of these projects:

Calleguas Regional Salinity Management Project (SMP):
The SMP is a cornerstone project integral to the construction of pipelines and desalter facilities that treat and reuse brackish water and dispose of brines to the ocean. The SMP also plays an important role in the overall salt management in the Calleguas Watershed. The SMP provides brine disposal for several local desalters within the Calleguas Municipal Water District service area, including the Round Mountain Desalter described below. Additional desalters are planned in the future. These projects cannot be implemented without the SMP since it provides the sole mechanism for brine disposal in the Watershed.

Round Mountain Desalter:
The Camrosa Water District constructed a desalter facility to treat local brackish groundwater using reverse osmosis technology. This provides a new source of potable water, improves local supply reliability, and helps reduce purchases of water imported from the State Water Project.

North Pleasant Valley Desalter:
The City of Camarillo constructed a desalter facility that treats brackish groundwater from the northern portion of the Pleasant Valley (PV) Basin using reverse osmosis technology to produce a new source of potable water.

6.3.9 Municipal Recycled Water

There are numerous examples of recycled municipal water projects being implemented in Ventura County. The following is a short list of some of these projects:

Piru Wastewater Treatment Plant Upgrade:
Ventura County Waterworks District No. 16 is constructing a tertiary treatment upgrade for the existing Piru Wastewater Treatment Plant (PWWTP). After tertiary treatment, effluent from the PWWTP will meet California Code of Regulations, Title 22 requirements for unrestricted recycled water, and will be available for use as a new lower cost irrigation supply for up to 600 acres of nearby agricultural property. The recycled water supply will offset a portion of the existing agricultural irrigation water demand that is currently met with groundwater, local surface water diverted by the Piru Mutual Water Company, and local irrigation wells.

Camarillo/Camrosa Recycled Water Interconnection:
This project expands the use of recycled municipal water through the construction of an interconnection that will distribute treated water more widely to Camarillo Sanitary District and Camrosa customers.

Fillmore Integrated Recycled Water and Wetlands Project:
The project delivers tertiary level treated wastewater to wetland ponds adjacent to the treatment plant. Recycled water from the facility is distributed to school grounds, parks, and landscaped areas throughout the community where subsurface (underground) drip-irrigation systems water turf and landscaping from below while any excess seeps into the underground water basin. The subsurface drip system places recycled water in the top 10-inches of soil to maximize uptake by vegetation, and it is pulsed into the soil to preserve aerobic conditions to maximize further treatment. Subsurface drip systems for recycled water are believed to provide the best treatment process for human hormones and pharmaceuticals that cannot be removed even with reverse osmosis. The project eliminates discharge of effluent to the Santa Clara River, reduces demands on local groundwater supplies, distributes trace pollutants over a wider area, reduces the use of chemical fertilizers by providing recycled water with nutrients, and creates and maintains a small demonstration wetland area.

6.3.10 Surface Storage — Regional/Local

Local examples of surface storage projects at the regional and local level include two primary reservoirs.

Lake Piru:
Lake Piru is the primary water-supply reservoir serving the lower Santa Clara River Watershed. It is held by Santa Felicia Dam and is managed by United Water Conservation District. Lake Piru can receive State Water Project water released from Pyramid Reservoir upstream. This water can then be released downstream of Piru where it can be diverted to spreading grounds operated by the United Water Conservation District.

Lake Casitas:
Casitas Lake is located in the Ventura River Watershed and is managed by the Casitas Municipal Water District. The lake is held in by an earthen dam, Casitas Dam, and provides potable water for numerous uses, including drinking and irrigation water to users in the Ventura River Watershed.

6.3.11 Drinking Water Treatment and Distribution

Drinking water is highly regulated. All community-water systems are required to serve drinking water that meets all drinking water standards and to conduct routine sampling and analysis of their drinking water supplies to certify compliance.

There are numerous projects that directly or indirectly benefit drinking water and its distribution, primarily by ensuring that there is an adequate supply of potable-water supply that meets water-quality standards. In general, water-quality monitoring and water treatment conducted by local agencies assures that water-quality standards are met. In addition, other studies and plans such as the Basin Plan prepared by the Los Angeles Regional Water Quality Control Board for this area, address long-term availability of high-quality water for drinking water purposes. A few of these include:

Urban Water Management Plan Updates:
Urban Water Management Plans address future water supply and demand by accounting for relevant water sources including imported water, recycled water, and groundwater. They also describe the demand management measures each water purveyor intends to implement. Drinking water and its delivery infrastructure is an important demand that is assessed in these plans.

Ventura River Watershed - Water Supply and Demand Study:
Graduate students in the Bren School at UCSB Bren School completed a comprehensive assessment of the water supply and demand balance in the Ventura River Watershed with recommendations to bring the watershed into balance with best management practices. The project was completed in 2013 and incorporated an assessment of supply and demand for numerous water sources and demands, including drinking water.

City of Ventura Potable Water Reuse Demonstrations Project
The City of Ventura is pursuing development of an advanced wastewater treatment project (Ventura Water Pure) that would augment the City's drinking water supplies. According to the City's Water Pure website: "The City of Ventura relies entirely on local water supplies: the Ventura River, Lake Casitas, and local groundwater basins. In times of minimal rainfall and drought, water levels drop, and these supplies become limited. Ventura, like other water providers throughout California, is looking for safe and sustainable ways to meet long-term water supply demands. Supplementing

water supply with potable reuse is a proven, drought-resistant locally developed and reliable water supply."

6.3.12 Groundwater and Aquifer Remediation

The following are examples of IRWM projects being implemented in Ventura County which have groundwater and aquifer remediation benefits:

Simi Valley Tapo Canyon Groundwater Treatment Plant:
The City of Simi Valley (Ventura County Waterworks District No. 8) constructed a groundwater treatment plant which treats non-potable groundwater supplies are treated for potable use. Prior to implementation of this project, the City of Simi Valley imported all its potable water from the State Water Project. The existing aquifer has high levels of total dissolved solids, but after treatment, the plant will produce up to 1-million gallons per day of potable water for Simi Valley residents.

Las Posas Basin Conjunctive Use Study:
The objective of this study was to develop a system to deliver water of a suitable water quality to users throughout the eastern and southern Las Posas Basins with a combination of wells, desalters, and related infrastructure. The study, spearheaded by the Calleguas Municipal Water District, evaluated current conditions including deteriorating water quality and rising groundwater levels high in chlorides, use levels, and the feasibility of developing shallow groundwater basin with new wells to lower the currently high groundwater levels. Lowering groundwater levels allows rainwater with low chlorides to partially recharge the shallow basin. Brackish water desalters are being used to treat existing or new shallow aquifer wells to provide a source of water for blending.

6.3.13 Matching Water Quality to Use

The following are examples of projects that match water quality to use that are being implemented in Ventura County:

Salt and Nutrient Management Plan for Lower Santa Clara River Watershed:
A Salt and Nutrient Management Plan was developed for the lower Santa Clara River groundwater basins including the Fillmore, Mound, Piru, Santa Paula, and Oxnard Forebay. The objective of the plan was to manage salts and nutrients from all sources on a basin-wide or watershed-wide basis in a manner that ensures attainment of water-quality objectives and protection of beneficial uses.

Ocean Friendly Gardens:
This program, led by the Surfrider Foundation, retrofits the gardens of Ventura County residents with permeable surfaces to allow rain and irrigation infiltration and replacement of water-intensive lawns with water-efficient landscapes. Less potable water delivered through the water supply system is used to maintain these gardens since they can take advantage of local rainfall and rain-barrel water. In addition, the gardens don't produce nutrient-rich runoff preventing water quality degradation downstream.

6.3.14 Pollution Prevention

There are numerous examples of pollution prevention projects throughout Ventura County, the following are a few examples:

Bio-Digester Focused Feasibility Study:
This technical study provides specifications for the use of a bio-digester, along with complementary material handling processes, which are designed to convert local organic wastes (including green waste, food waste, and horse and cattle manure) generated in the Ventura River Watershed into energy and other useful byproducts. The construction of a bio-digester would allow the diversion of a waste stream that often find its way into creeks, streams, and the Ventura River, causing water quality issues.

County Government Center Parking Lot Green Streets Urban Retrofit Project:
This project involves the implementation of innovative Low Impact Design (LID) to reduce parking lot runoff volumes, pollutant loads, and recharge groundwater that takes stormwater runoff and irrigation water and allows it to percolate into the underlying soils. The project provides stormwater pollution prevention outreach and education opportunities due to the County Government Center parking lot's high visitation frequency and visibility.

Oxnard and El Rio Septic-to-Sewer Conversion Projects:
This project, completed in 2011 by the City of Oxnard in the El Rio Community, connected Oxnard residents to a sewer-treatment facility and removed them from septic systems, thus reducing degradation to local groundwater supplies.

6.3.15 Salt and Salinity Management

Because excessive salt in soils and water is a pervasive issue in much of Ventura County, numerous projects have been developed that utilize this RMS – see Desalination RMS in Section 6.3.8. See below for another example of local salinity management:

Chloride TMDL Development:
The purpose of establishing a Total Maximum Daily Load (TMDL) is to identify the total load of a pollutant that a water body can receive without causing exceedances of water quality standards and to protect agricultural supply and groundwater recharge beneficial uses. Chloride is one of many salts that has detrimental impacts on crops and water supply. Chloride TDMLs have been developed for several watersheds including the Calleguas Creek and portions of the Santa Clara River Watershed.

6.3.16 Urban Stormwater Runoff Management

There are numerous examples of urban runoff-management projects throughout Ventura County, the following are a few examples:

Ventura Countywide Stormwater Management Program:

The Ventura Countywide Stormwater Quality Management Program includes the Cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, Simi Valley, Santa Paula, Thousand Oaks, Ventura, the County of Ventura, and the Ventura County Watershed Protection District. These partners work together to improve stormwater quality, monitor the health of local watersheds, and meet the compliance requirements of the Ventura Countywide National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit (Permit), adopted by the state under the Clean Water Act. The Ventura Countywide Stormwater Quality Program initiated and funded development of the Ventura Countywide Municipal Stormwater Resource Plan which was adopted by County and cities in 2017 and subsequently added to the WCVC IRWM Plan as Appendix J.

Hydromodification Control Plan:
This plan, implemented by the Ventura County Watershed Protection District, provides design guidance to minimize hydromodification (changes to runoff patterns) impacts to natural streams associated with applicable new development and redevelopment in Ventura County. By providing design principles and requirements that minimize erosion and preserve natural percolation, new development and redevelopment can minimize urban runoff.

Ventura River Watershed Protection Project:
Project implementation elements include the development of a watershed runoff model, surface water-quality monitoring, groundwater monitoring, removal of invasive plants, and reporting. The goal of the project is to understand and monitor runoff and how it influences surface and groundwater quality and develop strategies to minimize these impacts.

MS4 Stormwater Permit Reissuance:
Ventura County and the ten cities are covered under a countywide NPDES Stormwater Permit in compliance with the Clean Water Act. The permit was reissued by the RWQCB in 2010 and requires treatment of stormwater discharges to the Maximum Extent Practicable. The County of Ventura and local co-permittees (cities) are responsible for implementing the plan and related best management practices and land use regulations. Though the Permit technically expired in 2015, the Regional Board provided an administrative extension to allow more time for the County and the other Permittees to develop a watershed approach for the next Permit. Subsequently, the Regional Board determined that Los Angeles and Ventura County should be combined into a Regional Permit, which they are scheduled to adopt in 2020.

6.3.17 Agricultural Lands Stewardship

There are numerous examples of agricultural lands stewardship projects being implemented in Ventura County. Below are some examples:

Horse and Livestock Stormwater Quality BMPs:
The Ventura County Resource Conservation District assists the agricultural community in implementing BMPs for livestock and equine operations to minimize impacted runoff and improve water quality.

Natural Floodplain Protection Plan:
The Nature Conservancy is implementing the Natural Floodplain Protection Program to preserve a critical section of the floodplain in the Santa Clara River Watershed. This project involves the purchase of agricultural conservation easements that will prevent future development in the floodplain. Purchasing the development rights of these lands will preserve open space and wildlife habitat and sustain the agricultural lands that currently maintain the natural floodplain and its associated flood control benefits.

Hillside Erosion Control Ordinance (HECO):
To reduce erosion and improve water quality from runoff caused by new agriculture in critical erosion areas, in 1981 the County adopted Ordinance No. 3539, known as the Hillside Erosion Control Ordinance or HECO. The HECO Ordinance was later amended in 1984 by Ordinance No. 3683. Both ordinances are administered by the Resource Conservation District (RCD) and enforced by Ventura County Public Works Agency. HECO requires grading for new agriculture or change in agricultural uses located in specific areas designated on the County's Erosion Hazard Maps to obtain and comply with an approved HECO Plan from the RCD. A HECO Plan is essentially a grading permit issued by the RCD.

6.3.18 Ecosystem Restoration

There are numerous examples of ecosystem restoration projects being implemented in Ventura County. Below are some examples:

Calleguas Creek Arundo/Tamarisk Programmatic EIR, EA, Permits, and Pilot Removal Project:
This project, implemented in 2012 by the Resource Conservation District, involved the assessment of impacts of invasive plant species in the watershed such as Arundo and Tamarisk. This was followed by CEQA analysis and the development of a master permit for current and future removal. A pilot removal project has been completed.

Matilija Dam Ecosystem Restoration Project:
The Matilija Dam is slated for removal partially because of the benefits its removal will allow restoration of aquatic habitat for the endangered southern steelhead trout. This project involves pre-construction elements of the larger project goal to restore the ecosystem throughout the Ventura River Watershed. This includes preparing detailed design reports for several project elements; some of these include designing Santa Ana Boulevard and Camino Cielo Bridges, sediment studies, and the purchase of Matilija Hot Springs.

Phase II Santa Clara River Estuary Special Studies:
This study evaluated a variety of opportunities for diverting discharge from a wastewater treatment plan to the Santa Clara River Estuary for the purposes of developing recycled water as an additional source of water supply. The project goal is to improve water-quality conditions for people and wildlife in the estuary. One component of the project is the creation of treatment wetlands that may be used by wildlife.

6.3.19 Forest Management

A significant portion of the Santa Clara River Watershed and a portion of the Ventura River Watershed are located within the Los Padres National Forest. The U.S. Forest Service has numerous plans, projects, and best management practices that seek to maintain water-quality standards for the waters located within the forest. The following are some examples of how the Forest Service is minimizing impacts to water quality.

Soil and Water Conservation Handbook- Water Quality Management Handbook:
Issued in 2011, The Forest Service has developed numerous BMPs for Los Padres and other forests it manages. These include BMPs for mining operations, timber harvests, recreational areas, fuels management, and rangeland management. It also states requirements to incorporate provisions of adaptive management, restoration, and water-quality monitoring.

Water Quality Management for Forest Lands in California Best Management Practices:
This document was published by the U.S. Forest Service in 2000 and is applicable to all federal forests in the southwest region. It establishes objectives, implementation, and evaluation criteria for each BMP. BMPs are intended to minimize disturbance to soils, vegetation, and wildlife habitat, and include timber management, road and building site construction, vegetation manipulation, etc.

Watershed Condition Classification Technical Guide:
The U.S. Forest Service established a guide in 2011 to establish a systematic process for determining watershed condition class that is applied to all national forests. The guide improves Forest Service reporting and tracking of watershed condition and strengthens the effectiveness of restoration efforts and management of aquatic systems. Thus, watersheds in the Los Padres National Forest are systematically assessed for watershed health and disturbances impacting water quality are identified.

6.3.20 Land Use Planning and Management

There are numerous examples of projects that incorporate land use planning and management that are being implemented in Ventura County; the following are a few of those projects:

Ventura County General Plan Update:
The County of Ventura is engaged in a multi-year process to develop a comprehensive update to the County's General Plan for the unincorporated area. This process involves updating the County's vision for future development, preparing important background information, and developing new goals, policies, and programs to carry out the vision articulated by the public and decision makers. The resulting update will shape future development in the County for the next twenty years. How the County's land-use decisions address climate change and manage water resources are central considerations in the update.

City County Planning Association:
Planners from local cities and the county meet monthly to discuss regional planning and implementation of specific land use planning strategies. This group addresses urban water management and integrated regional water-management topics as needed.

Study on Aligning Water Quality and Land Use Planning in Ventura County:
This study provides a comprehensive analysis of local land use planning measures and their impact on water quality, including recommendations for future policies and ordinances. It is being implemented by the Local Government Commission and will help integrate land-use pattern BMPs such as compact development with site-specific strategies referred to as low impact development.

6.3.21 Recharge Areas Protection

The following are a few examples of projects that offer recharge-area protection that are being implemented in Ventura County:

Water Quality Monitoring:
Water quality monitoring ensures that recharge areas do not become degraded and jeopardize the use of groundwater resources. Ongoing water quality monitoring is being conducted by the County Watershed Protection District, local water purveyors, citizen groups, and others at numerous locations throughout the county to protect surface water and groundwater.

San Antonio Spreading Grounds Rehabilitation:
This project involves the rehabilitation of abandoned diversion works and spreading basins adjacent to San Antonio Creek to increase groundwater recharge in the Ojai Valley Groundwater Basin. The spreading grounds are located on a 10-acre parcel owned by the Ventura County Watershed Protection District (District). These spreading grounds were destroyed when they were filled with sediment in conjunction with the District's construction of a debris basin on San Antonio Creek. The project also improves fish passage past the point of the current damaged diversion structure and low-flow crossings.

6.3.22 – Sediment Management

Sediment accumulation and transport are a concern in several watersheds within the region impacting flows, habitats, and the capacity of one local reservoir.

Matilija Dam Ecosystem Restoration Project:
This project is considering options for removal of the Matilija Dam to restore habitat areas adjacent to and downstream of the dam. This dam can no longer be used to store water due to the accumulation of sediments. This is a long-term project requiring substantial study and financial investment. The County of Ventura is working with local, state, and federal entities to implement this project and related studies.

Santa Clara River Watershed Feasibility Study:
The Army Corps of Engineers, Los Angeles County Department of Public Works, and the Ventura County Watershed Protection District have partnered together to prepare a feasibility study of the Santa Clara River Watershed to support comprehensive flood risk management, ecosystem restoration, and other water resources decision-making throughout the watershed so that the river, its natural resources, the economic activities it supports, and the ecosystem services it provides are protected for generations to come. To date, this unified watershed planning approach has developed comprehensive hydrologic and hydraulic models for over 300 miles of the Santa Clara River and

tributaries. A geomorphic assessment of the watershed has also been completed. A sediment transport model is being prepared at this time.

6.3.23 Watershed Management

There are numerous projects that implement the watershed management RMS, below are some of those projects:

Coordination of Watershed Management in Ventura County:
Each of the three major watersheds in Ventura County is being managed through close coordination with diverse stakeholder groups. The Ventura River and Santa Clara River Watersheds have created staff positions for watershed coordination. The Calleguas Creek Watershed has long been managed through the Calleguas Creek Steering Committee. Each of these efforts have resulted in, or will result in, development of a watershed management plan containing an action plan for implementation.

Watershed Signs:
The Ventura County Watershed Protection District has erected multiple watershed identification signs in public places reminding them to "Keep it Clean." Raising public awareness about potential impacts to local waterways is an important component of watershed management.

Ventura River In-Stream Flow Study:
The State Water Resources Control Board is working with local entities in the Ventura River Watershed to develop improved information regarding in-stream flows in the Ventura River. The goal of the study is to determine current flow regimes and identify strategies to increase flow to benefit riparian habitats, recreation, and water supply.

Assessment of Southern Steelhead Population:
This assessment is an ongoing study of steelhead populations in the Ventura River Watershed. This phase of the project, completed in 2009, was funded by a California Department of Fish and Wildlife grant with a local match and project management by the Ventura County Watershed Protection District.

Public Events Celebrating Local Watersheds:
In the past 15 years, there have been multiple events across the region focused on raising public awareness about our watersheds. Events have included festivals, workshops, fun-runs, restoration work days, and multi-day Watershed Universities conducted by the UC Cooperative Extension in 2005 and 2010 in two local watersheds. These events conducted by groups such as the Sierra Club, Friends of the Santa Clara and Ventura Rivers, local municipalities, the County and water agencies, provide information to the public as well as opportunities to connect and collaborate on water-management issues within the watershed.

6.3.24 Economic Incentives

Financial incentives being used in Ventura County to improve management of water include rebates, grants, low interest-loans, and conservation pricing. Rebates for installation of efficient-plumbing devices or other water-using appliances are offered periodically by local water purveyors. Grants or low interest loans have assisted farmers and urban users to improve water use efficiency are often provided by state and federal agencies and administered by local agencies such as the Resource Conservation District. See the examples below:

IRWM Implementation Grants:
The region has been successful in receiving more than $94 million in IRWM grants to supplement local investments in projects that increase water supply, improve water quality, enhance habitat, minimize flooding impacts, provide public access and recreation, minimize invasive species, and help the region adapt to climate change. Entities within the region have also received grants and low-interest loans from other state and federal sources to implement projects.

6.3.25 – Outreach and Engagement

Watersheds Coalition of Ventura County:
Outreach and engagement on water management issues in Ventura County occurs in several ways. The Watersheds Coalition of Ventura County (WCVC) offers many opportunities for interested stakeholders and community members to learn about complex water issues and participate in regional efforts to enhance water management. WCVC is a diverse and inclusive entity comprised of three watershed committees, a steering committee and the general membership body. Membership is open to anyone interested. Outreach and engagement activities include regular meetings, workshops, a website, and periodic special events. For more information about WCVC stakeholder engagement, please see Section 4 – Stakeholder Involvement, Governance, and Coordination.

Other Entity Efforts:
Many local agencies and organizations conduct active public outreach and engagement regarding water use and management, climate change, environmental restoration, flood protection, and recreation and access related to water. One specific example of public education and outreach conducted in the region is the film contest sponsored by the City of Ventura (Ventura Water) called Water - Take 1. This annual contest and film festival draws entries from all over the world. Some of these are referenced in RMS 6.2.23 – Watershed Management. Protection and management of local water resources is an important topic of interest in the Region.

6.3.26 – Water and Culture

Ventura County has a rich cultural and historical heritage. Native American tribes and early settlers thrived on the plentiful water and the rich aquatic plant and animal species available in local creeks and rivers. This heritage is celebrated today through protection of sacred sites and artifacts, traditional ecological knowledge, consultations with Tribal representatives, and recognition of the role previous human inhabitants played in respecting and managing local natural resources. More consideration is being given in recent years to the natural functions provided in our creeks, rivers, and groundwater basins and planning when possible to allow for enhancement of those natural functions; ecosystem services, natural protection of floodplains and rivers courses, and protection of fisheries – which were – and are today -–part of the Native American way of life. Additionally, as described below in more detail, access to recreation related to local lakes, creeks and rivers – and the ocean - is a defining element of the culture of the area. These experiences (i.e. through parks, trails, boating, etc.) are inextricably linked to local residents' and visitors' values, traditions, and lifestyles, which in turn inform perspectives and expectations regarding water resources and conditions.

6.3.27 Water-Dependent Recreation

Lake Casitas and Lake Piru offer a variety of recreational opportunities such as boating, hiking, fishing, picnicking, and camping. In addition, several other projects and programs offer public access and recreational opportunities adjacent to local creeks and rivers in Ventura County:

Ventura River Parkway Project:
A coalition of local groups, state agencies, and a national conservation organization are working together to reclaim the river and reconnect the community to its greatest resource. Their vision—The Ventura River Parkway—would create a continuous network of parks, trails, and natural areas along the lower 16 miles of the river from Ojai to the estuary. This will help preserve this historic waterway and protect water quality, conserve streamside and aquatic habitat, and restore sensitive floodplains. It will link neighborhoods to nature.

Ventura River Trailhead and Trail Improvements:
This project involved the construction of an ADA compliant trailhead and trail, and it improved an equestrian, biking, and hiking trail on Ojai Valley Land Conservancy land at Old Baldwin Road. Completed in 2011, the Ventura County Watershed Protection District, Ojai Valley Land Conservancy, and Ventura County Resource Conservation District partnered together to develop the project. The trail and trailhead improvements provide scenic recreational areas adjacent to the Ventura River.

The Santa Clara River Parkway Project:
The primary goal of the Santa Clara River Parkway Project is the acquisition, conservation, and restoration of floodplain lands within the Santa Clara River corridor. The project is being implemented and funded by the State Coastal Conservancy and protects and restores floodplain areas, many of which are or will be open to the public for recreational opportunities.

6.4 Selection of Resource Management Strategies for Future Implementation in IRWM Plan

There is active implementation of RMSs in the WCVC IRWM region, as evidenced by the description in this section of selected projects and programs underway or recently completed. In consideration of future implementation, WCVC stakeholders in each of the watershed committees and the WCVC Steering Committee reviewed the RMSs to determine the level of effort and applicability for future implementation. This was done in conjunction with the process for developing goals and objectives and priority projects for implementation.

Please see each watershed section for more information regarding how these strategies will be implemented in the future.

6.5 Implementation of Resource Management Strategies to Adapt to Climate Change

IRWM regions must consider which strategies offer the best opportunities to adapt to the impacts of climate change. Those likely impacts include changes in precipitation, temperature, and a rise in sea level which can result in changes to water supply, water quality, habitats, and flooding impacts. Some of the RMS, such as urban and agricultural water use efficiency, use of recycled wastewater, and flood risk management can serve to directly mitigate for, or adapt to climate change impacts. Other RMS, such as land use management, may help to achieve the IRWM goals and adapt to climate change more indirectly.

Selection of RMSs for implementation in the IRWM Plan Update includes consideration of how each one would help the region adapt to likely climate change impacts, as well as opportunities for reducing Greenhouse Gas Emissions (GHG).

Addressing Climate Vulnerabilities in the WCVC Region:

As described in Section 13 – Climate Change – given the coastal geography, development patterns, importance of agriculture, and natural-resource values in the region, and projected changes in climate, the following vulnerabilities are considered to be of highest priority:

Very High Priority:

- Impacts to agriculture – the largest commercial contributor to the local economy - due to drought-driven water shortages, increasing temperatures and evapotranspiration rates, and variation in precipitation (i.e., longer periods without rain).
- Impacts to coastal infrastructure and communities including Naval Base Ventura County and local groundwater resources due to sea level rise and increased incidences of coastal flooding.
- Impacts to in-stream flows and riparian habitats due to more frequent/intense droughts, increasing maximum temperatures and evapotranspiration rates, and changes in precipitation.

High Priority:

- Impacts to local urban communities, human populations, and natural resources due to more intense wildfires, increasing maximum and minimum temperatures, and increased flooding resulting from more intense rainfall events and sea level rise.

Table 6-2 identifies whether each Resource Management Strategy chosen for implementation in the WCVC IRWM Region may help mitigate climate change or help adapt to climate change impacts. Table 6-3 identifies potential GHG impacts (reduction or increase).

Climate change adaptation and mitigation are defined below:

Climate Change Adaptation refers to efforts that respond to the impacts of climate change – adjustments in natural or human systems to actual or expected climate changes to minimize harm or take advantage of beneficial opportunities**.**

Climate Change Mitigation includes actions which can limit the magnitude and/or rate of long-term climate change. Climate change mitigation generally involves reductions in human-generated activities such as emissions of greenhouse gases (GHGs). Mitigation may also be achieved by increasing the capacity of carbon sinks, e.g., through reforestation. By contrast, adaptation to global warming can include actions taken to manage the eventual (or unavoidable) impacts of global warming, e.g., by moving water-related infrastructure in response to sea level rise.

Examples of mitigation include converting to low-carbon energy sources, such as renewable wind or solar energy, and expanding forests and other "carbon sinks" to remove greater amounts of carbon dioxide from the atmosphere. Energy efficiency can also play a major role, for example, through the reduction in energy use associated with reduced pumping and water delivery that results from reducing water demand.

Table 6-2

Potential Climate Change Impact Mitigation or Adaptation Related to Resource Management Strategies Implemented in WCVC IRWM Region

Resource Management Strategy Implemented in WCVC Region	Mitigates Climate Change Impacts	Adapts to Climate Change Impacts	Addresses Critical Vulnerabilities in the Region*
Reduce Water Demand			
Agricultural Water Use Efficiency	✓	✓	✓
Urban Water Use Efficiency	✓	✓	✓
Improve Flood Management			
Flood Risk Management		✓	✓
Improve Operational Efficiency and Transfers			

Resource Management Strategy Implemented in WCVC Region	Mitigates Climate Change Impacts	Adapts to Climate Change Impacts	Addresses Critical Vulnerabilities in the Region*
Conveyance — Regional / Local		✓	✓
System Reoperation	✓	✓	
Water Transfers		✓	✓
Increase Water Supply			
Conjunctive Management and Groundwater	✓	✓	✓
Desalination		✓	✓
Municipal Recycled Water	✓	✓	✓
Surface Storage — Regional/Local		✓	✓
Improve Water Quality			
Drinking Water Treatment and Distribution			✓
Groundwater and Aquifer Remediation		✓	✓
Matching Water Quality to Use	✓	✓	✓
Pollution Prevention		✓	✓
Salt and Salinity Management		✓	✓
Urban Stormwater Runoff Management		✓	✓
Practice Resource Stewardship			
Agricultural Lands Stewardship		✓	✓
Ecosystem Restoration		✓	✓
Forest Management	✓	✓	
Land Use Planning and Management	✓	✓	✓
Recharge Areas Protection		✓	✓
Sediment Management		✓	
Watershed Management	✓	✓	✓
People and Water			
Economic Incentives		✓	✓
Outreach and Engagement	✓	✓	✓
Water and Culture	✓	✓	✓
Water-dependent Recreation			

*Critical Vulnerabilities in WCVC Region: Impacts to agriculture, impacts to coastal infrastructure, impacts to in-stream flows and riparian habitats, and impacts to local urban communities, human populations, and natural resources.

Table 6-3
Potential Greenhouse Gas Impacts of
Resource Management Strategies Implemented in WCVC IRWM Region

Management Objectives	Resource Management Strategy	Potential GHG Impacts
Reduce Water Demand	• Agricultural Water Use Efficiency • Urban Water Use Efficiency	• Reduces dependence on energy to transport and/or heat water supplies – lowers GHG.
Improve Flood Management	• Flood Risk Management	• Control flooding so recharge can be redirected efficiently. Redirecting to reservoirs and groundwater recharge can prevent droughts and reduce the region's dependence on energy-intensive water importation and improve water supply reliability in dry seasons.
Improve Operational Efficiency and Transfers	• Conveyance – Delta • Conveyance – Regional/local • System Reoperation • Water Transfers	• *Decrease* emissions by reducing operational efficiency/transfer vehicle use and energy required for operations/transfers.
Increase Water Supply	• Conjunctive Management & Groundwater Storage • Desalination • Precipitation Enhancement • Municipal Recycled Water • Surface Storage – CALFED • Surface Storage – Regional/local	• Localized water supply reduces imported water use, which requires additional energy and increases GHG emissions. • Water recycling and desalination can *increase* energy/GHG
Improve Water Quality	• Drinking Water Treatment and Distribution • Groundwater Remediation/Aquifer Remediation • Matching Quality to Use • Pollution Prevention • Salt and Salinity Management • Urban Stormwater Runoff Management	• Matching quality to use could reduce need for water treatment, which requires energy and results in greenhouse gas emissions. • Higher levels of water quality treatment can *increase* energy use.
Practice Resource Stewardship	• Agricultural Lands Stewardship • Ecosystem Restoration • Forest Management • Land Use Planning and Management • Recharge Area Protection Watershed Management	• Provides opportunities for carbon sequestration, reforestation, and restoration/maintenance of urban land surfaces which *decrease* GHG.

Management Objectives	Resource Management Strategy	Potential GHG Impacts
. People and Water	• Economic Incentives (Loans, Grants, and Water Pricing) • Outreach and Engagement • Water and Culture • Water-Dependent Recreation	• Public education can result in reduced GHG due to awareness of efficiency benefits.
Other	• Crop Idling for Water Transfers • Dewvaporation or Atmospheric Pressure • Fog Collection • Irrigated Land Retirement • Rainfed Agriculture • Waterbag Transport/Storage Technology	• Reduce energy requirements and GHG emissions through decreased demand on imported water.

Source: DWR, 2013