

Section 7: Resource Management Strategies

The goals and objectives presented in Section 6 of the *Integrated Regional Water Management Plan* (IRWM Plan) for the Westside Sacramento Region (Region) describe the foundational intent of the Plan. The goals represent broad focus areas for water management actions in the Region, and the objectives describe specific outcomes that will improve water-related conditions. These water management actions, which will need to be taken by resource managers and other stakeholders, could include projects, programs, and policies designed to help agencies and local governments manage water and related resources. The California Department of Water Resources (DWR) refers to these types of projects, programs, and policies as resource management strategies (RMSs). A broad list of RMSs was identified in the *California Water Plan Update 2009* (DWR 2009) and must be considered for applicability in an IRWM Plan.

This section introduces the 32 RMSs from the California Water Plan that were reviewed by the

project team to determine which were applicable to help meet the goals and objectives of the Plan. The applicable RMSs were then considered during the project development phase of the planning process.

7.1 Resource Management Strategy Summary

The *California Water Plan Update 2009* groups the RMSs into six management outcomes, which are summarized in Table 7-1. RMSs determined to be applicable to the Region are followed by a ✓, and those not applicable to the Region are followed by an ✖. Applicable RMSs are those which could help address the major water-related challenges and opportunities summarized in Section 5 and could contribute to achieving the Plan goals and objectives discussed in Section 6.

Table 7-1: Summary of Management Outcomes and RMS

CWP Management Outcome	Resource Management Strategies
Reduce Water Demand	Agricultural Water Use Efficiency ✓ Urban Water Use Efficiency ✓ Crop Idling for Water Transfers ✓ Irrigated Land Retirement ✓ Rainfed Agriculture ✓
Improve Operational Efficiency and Transfers	Conveyance – Delta ✓ Conveyance – Regional/Local ✓ System Reoperation ✓ Water Transfers ✓ Waterbag Transport/Storage Technology ✖
Increase Water Supply	Conjunctive Management & Groundwater Storage ✓ Desalination ✖ Precipitation Enhancement ✖ Recycled Municipal Water ✓ Surface Storage – CALFED ✖ Surface Storage – Regional/local ✓ Dewvaporation or Atmospheric Pressure Desalination ✖ Fog Collection ✖

CWP Management Outcome	Resource Management Strategies
Improve Water Quality	Drinking Water Treatment and Distribution ✓ Groundwater Remediation/Aquifer Remediation ✓ Matching Quality to Use ✓ Pollution Prevention ✓ Salt and Salinity Management ✓ Urban Runoff Management ✓
Practice Resources Stewardship	Agricultural Lands Stewardship ✓ Economic Incentives (Loans, Grants, Water Pricing) ✓ Ecosystem Restoration ✓ Forest Management ✓ Land Use Planning and Management ✓ Recharge Area Protection ✓ Water-Dependent Recreation ✓ Watershed Management ✓
Improve Flood Management	Flood Risk Management ✓

✓ RMS potentially applicable to Westside Region.
 ✗ RMS not applicable to Westside Region.

Each RMS is described below, with discussion of how it could contribute to meeting specific plan goals and objectives and whether the strategy is applicable to the Region.

7.2 Reduce Water Demand

7.2.1 Agricultural Water Use Efficiency (Applicable)

The agricultural water use efficiency strategy involves measures that reduce the amount of water used for agricultural irrigation while maintaining agricultural productivity. This strategy includes improvements in irrigation technology and water management that directly increase water use efficiency as well as education and training efforts that lead to improved water management.

This strategy aligns with plan goals 2, 8, 10, and 13; the reasonable use focus objective 12 of increasing the adoption of agricultural best management practices (BMPs); and the water supply focus objective 24 of providing water supply reliability to agricultural users. The strategy could be implemented in the Region through irrigation audits to identify ways to promote efficient water use and improvement of irrigation systems, among other approaches. This strategy is a key component of the Water Conservation Act of 2009 (SB x7-7), which requires agencies providing water to more than

25,000 irrigated acres to prepare Agricultural Water Management Plans (AWM Plans). One of the components of AWM Plans is identification of Efficient Water Management Practices to encourage measures involving better irrigation systems and on-farm reasonable water use.

7.2.2 Urban Water Use Efficiency (Applicable)

The strategy for improved urban water use efficiency addresses indoor and outdoor residential, commercial, industrial, and institutional water uses. It is a key component of SBx7-7, which requires all urban water suppliers (with more than 3,000 connections or supplying more than 3,000 acre-feet per year [AFY]) to increase water use efficiency in an effort to meet the statewide goal of a 20% reduction in per capita water use by 2020. This strategy includes improvements in technology or water management that lower water use or increase beneficial uses from existing water quantities. This strategy also includes educational programs and other measures that cause adoption of technological improvements or behavioral changes that reduce water demand.

This strategy aligns with plan goals 8, 10, and 13; education and awareness focus objectives 1 and 2; the reasonable use focus objective 11 of increasing adoption of water conservation measures by municipal and industrial users; and the water supply focus objective 23 of providing 100% reliability of

municipal and industrial supplies. Compliance with SBx7-7 will be required of urban water suppliers as part of urban water management planning, while smaller water suppliers will likely coordinate their efforts, as they are subject to no specific requirements.

7.2.3 Crop Idling for Water Transfers (Applicable)

With crop idling for water transfers, irrigated lands are removed from production or dry farmed to make water available for transfer. As discussed in Section 3, agricultural water demand and use is managed on a farm level, and while no formal programs for crop idling exist, individual farmers, particularly those who receive surface water, make choices on plantings and/or crop idling depending on the available water supply. If this program became more formalized, water resulting from crop idling could be transferred to help improve water supply reliability for beneficial uses that produce higher economic returns than the crops being idled. This RMS is applicable to plan goals 8, 10, and 13 and to water supply focus objectives 23 and 24.

7.2.4 Irrigated Land Retirement (Applicable)

The irrigated land retirement strategy permanently removes farmland from irrigated agriculture. This strategy may be pursued to make water available for transfer or to solve drainage-related problems. As in crop-idling, individual farmers may seasonally or annually retire land from irrigation based on available water supply, which could reduce water demand and improve water supply reliability for other beneficial uses in alignment with plan goals 8, 10, and 13 and water supply focus objectives 23 and 24. However, this strategy would need to be implemented in a way that avoids conflict with the goal of respecting Region cultural values, which includes preservation of a vital agricultural economy.

7.2.5 Rainfed Agriculture (Applicable)

Rainfed agriculture relies solely on rainfall to provide all crop consumptive water use. In California, where little precipitation occurs during the spring and summer growing seasons, the use of this strategy is limited. Implementation of rainfed agriculture, also known as dry farming, requires matching cropping patterns to precipitation patterns, likely resulting in

single cropping, most often used with crops that produce low economic returns such as hay. Rainfed agriculture currently is a common practice throughout the Region for thousands of acres of farmland including grain and hay crops and, in the upper watersheds, orchards. This RMS supports plan goals 1, 8, and 13.

7.3 Improve Operational Efficiency and Transfers

7.3.1 Delta Conveyance (Applicable)

Delta conveyance refers to the movement of water within the network of streams, sloughs, and channels of the Sacramento-San Joaquin Delta and out of the Delta through constructed water conveyance systems. This strategy deals with the management of Delta inflows and exports to meet various demands, including municipal, industrial, and agricultural water supply, navigation, recreation, habitat, and flood conveyance. This RMS is relevant to the Westside Region because it includes both entities that divert water from the Delta and entities that use and convey upstream water in tributaries flowing to the Delta. Stream flow in the Delta and its tributaries is important for the life-cycle of several species of native fish, for water quality, for recreation, and for other uses. This RMS is aligned with plan goals 1, 2, 4, 6, 9, 10, 11, and 13, habitat focus objectives 3, 5, and 6, understand watershed function focus objectives 16 and 18, and water supply focus objectives 23 and 24.

7.3.2 Regional/Local Conveyance (Applicable)

Regional/local conveyance means the use of both natural waterways and built infrastructure to move water to areas where it is needed or away from areas to protect existing resources. This strategy covers the distribution and conveyance of local sources of water and imported water to improve water supply, water quality, recreation, habitat, and flood management. For the Westside Region, this RMS addresses conveyance activities outside the Delta, including conveyance from the Upper Cache and Upper Putah watersheds through the valley floor. It is related to the conjunctive management and groundwater storage RMS. It aligns with plan goals 4, 6, 9, 10, 11, and 12, infrastructure focus objective 10, risk management focus objective 14, habitat focus

objectives 3, 5, and 6, recreation focus objective 13, and water supply focus objectives 23 and 24.

7.3.3 System Reoperation (Applicable)

System reoperation involves changes to the operation of water systems to address existing problems, increase water supply reliability, or adapt to future changes. The strategy includes reoperation of surface water storage facilities, groundwater systems, and associated conveyance infrastructures, which is directly related to the conjunctive management and groundwater storage RMS. In the Westside Region, this RMS aligns with plan goals 1, 5, 6, 7, 8, 9, 10, 11, and 13 and likely will be integral to meeting the water supply focus objectives 23 and 24. This RMS is also aligned with infrastructure focus objective 10 to create an asset management plan.



Westside Region

7.3.4 Water Transfers (Applicable)

Water transfers are voluntary exchanges of water or water rights among water users. A water transfer can be a change in point of diversion, place of use, or type of use. Water transfers typically occur using one of the following: transfer of water from reservoirs that would otherwise have been carried over to the following year; use of groundwater instead of surface water deliveries and transfer of the surface water rights; transfer of previously banked groundwater; reduction of existing consumptive use and transfer of the resulting water savings; and reduction of water losses and transfer of the recovered water. This RMS aligns with plan goals 7, 9, and 12 and could help achieve water supply focus objectives 23 and 24.

7.3.5 Waterbag Transport/Storage Technology (Not Applicable)

The waterbag transport/storage technology strategy takes water from coastal areas with unallocated freshwater supplies, stores it in inflatable bladders, and delivers it to another coastal area. This technology currently has limited capacity for strategically addressing long-term regional water planning needs and may require further research and development before full-scale implementation. As a result of the current stage of this technology and the fact that the Region is not located in a coastal location, this RMS was deemed not applicable.

7.4 Increase Water Supply

7.4.1 Conjunctive Management and Groundwater Storage (Applicable)

Conjunctive management is the coordinated use of surface water and groundwater to maximize the water available to a region. This strategy involves recharge of groundwater basins when excess surface water is available. In some areas of the Region, the conjunctive management and groundwater storage RMS is already actively practiced because of the availability of surface water supplies. This RMS aligns with plan goals 8, 10, 11, and 13 and likely will be an important element of achieving water supply focus objectives 23 and 24.

7.4.2 Desalination (Not Applicable)

Desalination refers to treatment processes that remove salts from water to achieve salinity concentrations that are acceptable for municipal and agricultural uses. The desalination strategy covers treatment of seawater, brackish water, and wastewater. This RMS may eventually become viable in portions of the Region where groundwater has high salinity concentrations to achieve the objectives under the water supply focus and water quality focus. However, the use of desalination within the Region likely will present significant challenges, such as how to dispose of the resulting brine. Another drawback is that desalination tends to require significant energy use and could contribute to greenhouse gas emissions. While this strategy could reduce negative impacts during drought conditions in drier parts of the Region, this RMS is not being considered for

Region implementation at this time because of the factors described above.

7.4.3 Precipitation Enhancement (Not Applicable)

Precipitation enhancement, commonly called “cloud seeding,” artificially stimulates clouds to produce more rainfall or snowfall than they would naturally. Cloud seeding injects special substances into the clouds that enable snowflakes and raindrops to form more easily. This RMS is not being considered at this time, as the feasibility of precipitation enhancement activities in the Region is not known and funding for research and implementation of such projects has been largely unavailable. Precipitation enhancement has been attempted in the past by Lake County Watershed Protection District and YFCWCD in February 1986; the attempt was disrupted by a flood event and did not provide results in the watershed.

7.4.4 Recycled Municipal Water (Applicable)

Water recycling is the treatment and reuse of wastewater. The recycled municipal water strategy applies specifically to the application of municipal wastewater with the intention of putting the water to a beneficial use that would not occur through discharge of the wastewater. As discussed in Section 3, this RMS is implemented to a limited extent in the Region, largely as a means of wastewater disposal. In select instances where wastewater discharge requirements result in highly treated wastewater, this RMS could be expanded to help meet water supply focus objectives 23 and 24.

7.4.5 CALFED Surface Storage (Not Applicable)

The *Record of Decision* (2000) by Collaboration Among State and Federal Agencies to Improve California's Water Supply (CALFED, now called the Delta Stewardship Council) identified five potential surface storage reservoirs that are being investigated by DWR, the U.S. Bureau of Reclamation, and local water interests. Building one or more of the reservoirs would be part of the agency's long-term comprehensive plan to restore ecological health and improve water management of the Bay-Delta. The five surface storage investigations are Shasta Lake Water Resources Investigation, In-Delta Storage Project, Upper San Joaquin River Basin Storage

Investigation, North-of-the-Delta Offstream Storage, and Los Vaqueros Reservoir Expansion. These potential projects are not located in the Westside Region and will not directly affect it.

7.4.6 Regional/Local Surface Storage (Applicable)

Surface storage consists of the collection and storage of water within on-stream or off-stream reservoirs for later release. This strategy includes the use of surface storage for water supply as well as flood management. The Region already implements this RMS through the water stored at Clear Lake, Indian Valley Reservoir, and Lake Berryessa. Surface water will continue to be an important component of the Region's water supply, and at least one additional surface water storage project is proposed (the Adobe Creek Conjunctive Use Project); other off-stream storage projects have also been considered. This RMS aligns with plan goals 6, 7, 9, 10, 11, and 13, and it is critical to meeting water supply focus objectives 23 and 24, recreation focus objective 13, and to a more limited extent, habitat focus objectives 3 and 6.



7.4.7 Dewvaporation or Atmospheric Pressure Desalination (Not Applicable)

Atmospheric pressure desalination involves evaporation of brackish water for collection of condensate across a heat transfer wall. This technology is still under development for small-scale applications and is not a feasible RMS for the Region.

7.4.8 Fog Collection (Not Applicable)

Fog collection involves the use of nets or other structures to collect the moisture in fog. While coastal vegetation naturally collects moisture from fog for a significant portion of water needs in California, fog collection has not been practiced as a management strategy in the state. The inland location and climatic conditions in the Region are not conducive to intense fog development throughout the year, rendering fog collection an infeasible RMS for the Region.

7.5 Improve Water Quality

7.5.1 Drinking Water Treatment and Distribution (Applicable)

This strategy focuses on ensuring that water provided for human consumption is safe for drinking. Drinking water treatment includes processes that treat, blend, or condition water to meet potable standards; drinking water distribution includes the storage, pumping, and delivery of potable water to customers. This strategy includes measures within both the treatment processes and distribution system that are necessary to produce and maintain safe drinking quality. One of the significant challenges discussed in Section 5 relates to providing drinking water treatment and distribution, particularly in the more rural areas. This RMS aligns with plan goals 5, 10, and 13 and can help achieve water quality focus objective 22 to provide high-quality source water, which is one of the highest-priority objectives for the Region.

7.5.2 Groundwater and Aquifer Remediation (Applicable)

Groundwater and aquifer remediation is the improvement of groundwater quality to meet intended beneficial uses. Groundwater impairment may be the result of naturally occurring constituents or anthropogenic contamination. The groundwater and aquifer remediation strategy includes both passive techniques, which allow for *in situ* degradation, and dispersion of contaminants and active treatment, which remove the contaminants through chemical, biological, or physical processes. Groundwater in some parts of the region has high levels of naturally occurring chromium, which are being evaluated for treatability to implement this RMS. If successful, this RMS could contribute to achieving the water quality focus objectives 21 and 22 and water supply focus objectives 23 and 24.

7.5.3 Matching Water Quality to Use (Applicable)

This strategy aims to optimize water resources by directing higher-quality sources of water to end uses that require that higher quality, such as drinking water or certain industrial processes, and sources of lower-quality water to applications where the lower quality is adequate to the use. This strategy reduces the treatment costs associated with water supply. This RMS is not formally used within the Region at this time, but it could be more fully explored to achieve water quality focus objectives 21 and 22 and water supply focus objectives 23 and 24, in conjunction with the recycled water RMS.

7.5.4 Pollution Prevention (Applicable)

The pollution prevention strategy addresses wastewater treatment plants, stormwater discharges, agricultural runoff, and unauthorized land uses. This strategy includes efforts to identify sources of pollutant load, reduce pollution-causing activities, and capture pollutants before they enter waterways. This RMS aligns with plan goals 1, 5, 6, 7, 8, 9, 10, and 13. It is important for the Region, as it is relevant to multiple objectives, including water quality focus objectives 19 and 20, particularly as they relate to meeting TMDLs for mercury and other contaminants, and all the habitat focus, recreation focus, and water supply focus objectives.

7.5.5 Salt and Salinity Management (Applicable)

Salt and salinity management requires an understanding of how salts enter a region and are diluted and displaced within the region; as such, the salt and salinity management strategy includes studies on regional salt loading and the extent and magnitude of a region's salt problems. It also includes steps that reduce salt inputs and sequester or dispose of salts. The highly agricultural nature of the Region may present a future challenge to salt and salinity management. Achieving the groundwater aspect of the Understand Watershed Function Focus objective 17 will contribute to applying this RMS successfully in ways that could help provide water supplies of appropriate quality, as described in water supply focus objectives 23 and 24.

7.5.6 Urban Runoff Management (Applicable)

The urban runoff management strategy involves the capture, conveyance, and treatment of stormwater and dry weather runoff to improve flood management, water quality, or water supply. This RMS aligns with goals 5, 6, 7, 8, 9, 10, and 13. The IRWM Plan acknowledges the importance of this RMS, particularly as it relates to the pollution prevention RMS. This strategy aligns with the several water quality focus objectives to improve the quality of urban runoff (objectives 19 and 22).

7.6 Practice Resources Stewardship

7.6.1 Agricultural Lands Stewardship (Applicable)

The agricultural lands stewardship strategy includes measures that promote the continued use of agricultural lands and protect natural resources through the maintenance of agricultural lands. Erosion control measures are an example of agricultural land stewardship practices that support the viability of croplands while offering water resource benefits. This is an important RMS for the Region because of the agricultural cultural values held throughout it. This RMS aligns with plan goals 1, 9, and 13. There are several organizations active in applying this RMS that will facilitate meeting the education and awareness focus objective 2 and water quality focus objectives 19 and 22.

7.6.2 Economic Incentives (Applicable)

Economic incentives are financial tools such as grants, loans, rebates, and water pricing to influence water management. Such incentives can promote implementation of projects that improve water management and protect water resources. In addition, water rate incentives can be used to promote more efficient use of water. This RMS aligns with plan goals 2, 7, and 8. Resource managers within the Region are evaluating opportunities to more fully develop this RMS to achieve reasonable use focus objectives 11 and 12 as well as water quality focus objectives 19 and 20.

7.6.3 Ecosystem Restoration (Applicable)

Ecosystem restoration addresses natural landscapes and biological communities that have been modified by past activities. This strategy aims to increase the diversity of native species and biological communities and the abundance and connectivity of habitats, particularly in aquatic, riparian, and floodplain ecosystems. The strategy includes protection and recovery of at-risk species, wetlands restoration and construction, floodplain reconnection, and invasive species removal. This RMS aligns with plan goals 4, 6, 7, 8, 9, and 11 and is a high priority to the Westside Region, especially because it helps meet invasive species focus objectives 7 through 9 and habitat focus objectives 3 through 6. This RMS also supports watershed management, decreasing pollution, and promoting water quality improvements.



PHOTO: KEN DAVIS

Fish Rescue in the Westside Region Water Conveyance in the

7.6.4 Forest Management (Applicable)

The forest management strategy focuses on activities on both publicly and privately owned forest lands aimed at improving the availability and quality of water for downstream users. This RMS aligns with plan goals 7, 8, 9, 10, 11, and 13 and risk management focus objective 15 to reduce the risk of large erosion events. Ecosystem restoration, erosion control for pollution prevention, and watershed management preserve the productivity of fresh water resources in forested elevations and work toward meeting water quality objectives throughout the upper watersheds.

7.6.5 Land Use Planning and Management (Applicable)

The land use planning and management strategy incorporates consideration of water supply availability, water quality requirements, and flooding and drainage into land use decisions. This RMS aligns with plan goals 1, 2, 8, 12, and 13, education and awareness focus objective 2, and reasonable use focus objectives 11 and 12.

7.6.6 Recharge Area Protection (Applicable)

The recharge area protection strategy includes the protection and enhancement of groundwater recharge areas. Since much of the Region is not urbanized, access to recharge areas is often retained, and some agricultural areas are used, in part, for groundwater recharge. This strategy includes methods such as low-impact development and land conservation to help areas suitable for recharge remain accessible. It also includes measures to protect groundwater recharge areas from contamination. This RMS aligns with plan goals 7, 8, 10, 11, and 13. Further, as many portions of the Region are solely dependent on groundwater, this RMS aligns particularly well with the groundwater objective 17 within the Understand Watershed Function Focus which is of high importance to the Region.

7.6.7 Water-Dependent Recreation (Applicable)

This strategy seeks to maintain and increase recreational activities dependent on water, including fishing, swimming, waterfowl hunting and birding, boating, canoeing, and kayaking, as well as activities that do not require water but are enhanced by it, including wildlife viewing, picnicking, camping, hiking, biking, and riding on trails. This RMS aligns with plan goals 6 and 13 and meets recreation focus objective 13.

7.6.8 Watershed Management (Applicable)

The watershed management strategy uses watershed boundaries as the basis for managing natural

resources. Watershed management is the process of creating and implementing plans, programs, projects, and activities to restore, sustain, and enhance watershed functions. This RMS aligns with all 13 plan goals and several of the objectives, including education and awareness focus objectives 1 and 2 as well as the Understand Watershed Function objective 18 and Risk Management Focus objectives 15. The IRWM planning process has established and enhanced relationships that seek to improve the sustainability and benefits derived from resources of the Region watersheds, particularly as they relate to meeting habitat and invasive species focus objectives 3 through 9.

7.7 Improve Flood Management

7.7.1 Flood Risk Management (Applicable)

The flood risk management strategy involves both structural and non-structural measures to manage flood flows as well as programs that improve flood preparedness, response, and recovery. Structural approaches to flood management include dams and reservoirs, levees, channel modifications, and diversions. Non-structural measures focus on land use management such as floodplain restoration and development policies. This RMS aligns with plan goals 4, 9, 10, 11, and 13 and objective 14 of the high-priority risk management focus, which specifically addresses flood risk and reflects the fact that, as discussed in Section 3, key areas in the Region are prone to flood damage. Implementation of this strategy involves the recognition that flood risk management is a complex topic requiring significant interaction with state and federal agencies, and that not all flooding is harmful, as there is a discrete relationship between natural floodplain operations related to groundwater recharge and ecosystem habitat restoration.