

3. Policies, Goals, Objectives, and Strategies

Integrated Regional Water Management (IRWM) Plans must:

- Document plan objectives and describe the process used to develop the objectives.
 - The objectives must address major water-related issues and conflicts within the region and they must be measurable so they can be monitored.
 - The objectives may be prioritized. If they are, the IRWMP must contain an explanation of or reason for the prioritization.
- Present the range of Resource Management Strategies (RMS) considered to meet the IRWMP objectives previously discussed and identify which RMS were incorporated into the IRWMP.

3.1. Policies, Goals and Objectives

The policies, goals and objectives of the MAC region were formed through a collaborative stakeholder process. These policies, goals and objectives form the backbone of the MAC Plan and provide the rationale for IRWM decision-making. This chapter discusses the MAC region's hierarchy of water resource policies, goals and objectives and the process used to develop them.

Development of regional policies, goals and objectives is an essential step in the IRWM planning process. Broad based water resource policies sit at the top of the hierarchy employed in this plan. The region's goals, which are next in the hierarchy, are statements of intended outcomes which serve to broadly outline the IRWMP direction. The region's objectives are actions that support fulfillment of the goals. Performance measures represent the final level in the hierarchy and are used to track the progress that is being made to achieve the objectives. Goals and objectives were initially established for the MAC region as part of the process leading to the development of the 2006 IRWMP. Those initial goals and objectives have been revisited and revised in conjunction with the MAC Plan updating process described below.

3.1.1. Process for Setting Policies, Goals and Objectives

A consensus-based approach was used to develop the MAC region's goals and objectives. During development of the 2006 IRWMP, all of the regional participants were invited to submit goals and objectives, regardless of whether or not they were signatories to the Plan MOU. The ideas submitted by the Regional Participants Committee (RPC) were reflective of the needs of the regional conflicts, issues, and priorities. These goals and objectives were then refined by the group over several months, resulting in a collaboratively-developed set of regional goals and objectives that were included in the 2006 IRWMP.

For each overall goal, several regional specific goals were identified, and measurable objectives were established for each specific goal. While the MAC region has made progress towards achieving these goals, the region's overall goals continue to evolve. As part of the MAC Plan update process, these regional goals and objectives were reviewed and revised to reflect current water resources management conditions in the region. In doing so, the RPC, representing a broad set of stakeholder interests, was the primary venue for developing and vetting the water resource policies, goals and objectives contained in this updated IRWM Plan.

As part of the MAC Plan update the RPC elected to also consider the Statewide Priorities as described in the Propositions 84 & 1E Guidelines (DWR, 2010) in the development of policies, goals and objectives. Considering these priorities now will align the region's planning efforts with those of the State and help facilitate coordination with and integration into larger regions and projects. In addition, the RPC considered objectives detailed in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (also referred to as the Basin Plan), the 20x2020 water efficiency goals, and the requirements of CWC §10540(c).

After reevaluation of the MAC region's present day needs and conflicts (as described in Section 1.4), and consideration of the other factors discussed, the goals and objectives developed as part of the 2006 IRWMP were reviewed and consolidated under four new regional water resource policies.

Policy 1: Maintain and Improve Water Quality

Policy 2: Improve Water Supply Reliability and Ensure Long-term Balance of Supply and Demand

Policy 3: Practice Resource Stewardship

Policy 4: Focus on Areas of Common Ground and Avoid Prolonged Conflict

For each policy multiple goals and objectives were established. The goals (i.e. intended outcomes) and objectives (i.e. actions to achieve the goals) associated with each of the four policies are presented below. To measure the extent to which the region's objectives are being achieved, and thus to track progress in meeting the region's goals, performance measures are also specified and discussed in detail in Section 3.1.2, Measuring Objectives.

POLICY 1: MAINTAIN AND IMPROVE WATER QUALITY

- *Goal:* Reduce sources of contaminants.
 - *Objectives:*
 - Reduce abandoned mine flows and sediments.
 - Reduce leakage from septic systems.
 - Increase bulky waste pickup programs, avoid illegal dumping, and increase collection of illegally dumped trash.
 - Identify informal recreation and camping sites with recurring waste issues and initiate remedial actions.
 - Manage fire fuels to reduce wildfire impacts.
 - Increase public awareness of how contaminated water resources affect quality of life.
 - Track increase of small county-monitored water systems.

- *Goal:* Manage stormwater flows and transport of sediment and contaminants.
 - *Objectives:*
 - Reduce stormwater runoff from peak storm events.
 - Promote development of community-based flood protection strategies.
 - Reduce water quality impacts from vehicle uses and road maintenance practices.
 - Minimize water quality impacts from livestock grazing.

POLICY 2: IMPROVE WATER SUPPLY RELIABILITY AND ENSURE LONG-TERM BALANCE OF SUPPLY AND DEMAND

- *Goal:* Ensure sufficient firm yield water supply.
 - *Objectives:*
 - Promote comprehensive water supply planning including climate change.
 - Encourage diverse water supply portfolios to meet agency demands.
 - Plan and develop water supply projects that optimize water right entitlements and county of origin protections.
 - Ensure that demand projections are supportable and realistic.
 - Balance long-term regional supply and demand in water supply plans.
- *Goal:* Maintain and improve water infrastructure reliability.
 - *Objectives:*
 - Implement leak detection and repair and replacement programs.
 - Develop regional water treatment and transmission projects.
 - Construct water system interties where appropriate.
- *Goal:* Promote water conservation, recycling and reuse for urban and agricultural uses.
 - *Objectives:*
 - Establish and implement water conservation programs based on best management practices.
 - Maximize use of recycled water from wastewater treatment plants.
 - Move toward a reduction in demands through water-neutral development.
- *Goal:* Develop appropriate drought mitigation measures.
 - *Objectives:*
 - Promote preparation and adoption of drought contingency plans.

POLICY 3: PRACTICE RESOURCE STEWARDSHIP

- *Goal:* Protect, conserve, enhance, and restore the region's natural resources.
 - *Objectives:*
 - Integrate natural resource conservation into water resource planning projects and programs.
 - Promote water resource projects that achieve an equitable balance between conflicting interests while minimizing harm to natural resources and incorporating natural resource protection, mitigation, and restoration.
 - Identify opportunities to protect, enhance or restore aquatic and terrestrial habitats in the Mokelumne and Calaveras river watersheds.
- *Goal:* Maintain or improve watershed ecosystem health and function.
 - *Objectives:*
 - Avoid, minimize or mitigate adverse effects on or improve or restore watershed and ecological processes, systems, structures, and resources when implementing projects.
- *Goal:* Minimize adverse effects cultural resources.
 - *Objectives:*

- Avoid, minimize or mitigate adverse effects on cultural resources when implementing projects.
- *Goal:* Identify opportunities for public access, open spaces, and other appropriate recreational benefits and avoid harm to existing or planned recreational uses.
 - *Objectives:*
 - Promote inclusion of public access, non-motorized trails, open space and other suitable and feasible recreational features in new and existing water resource projects and associated lands while avoiding harm to existing or planned recreational uses.

POLICY 4: FOCUS ON AREAS OF COMMON GROUND AND AVOID PROLONGED CONFLICT

- *Goal:* Prioritize projects that have the best likelihood of being completed in the planning horizon.
 - *Objectives:*
 - Identify high controversy projects and work towards common ground solutions.

3.1.2. Measuring Objectives

To track the extent to which the MAC Region’s objectives are being achieved, a series of performance measures have been established. These performance measures and their associated water resource goals and objectives are presented below in Table 3-1, Table 3-2, Table 3-3 and Table 3-4.

Table 3-1: Policy 1 - Maintain and Improve Water Quality Goals, Objectives and Performance Measures

Goal: Reduce sources of contaminants.		
Objectives	Performance Measures	Monitoring/Reporting Agency
Reduce abandoned mine flows and sediments.	Number of mines known to cause water quality issues for which remedial actions are implemented. Abandoned mines are defined as those in the Office of Mine Reclamation database plus other locally known mines.	U.S. Forest Service (USFS), Bureau of Land Management (BLM), California Department of Conservation, California Department of Toxic Substances Control
Reduce leakage from septic systems.	Number of problem septic systems identified; number of problem septic systems corrected; number of problem septic systems eliminated	County Environmental Health
Increase bulky waste pickup programs, avoid illegal dumping, and increase collection of illegally dumped trash.	Number of new bulky waste pickup dates; estimated tons of illegal waste picked up; number of campaigns or other measures undertaken to stop illegal dumping.	BLM, USFS, County Solid Waste Management Departments, Sierra Pacific Industries, PG&E
Identify informal recreation and camping sites with recurring waste issues and initiate remedial actions.	Number of identified problem sites; number of identified sites for which remedial actions are initiated.	USFS, BLM, Counties, EBMUD

Manage fire fuels to reduce wildfire impacts.	Number of acres on which fire fuel reduction measures are implemented.	USFS; CAL FIRE, Sierra Pacific Industries, Amador-Calaveras Consensus Group, Amador Fire Safe Council, Calaveras Foothills Fire Safe Council
Increase public awareness of how contaminated water resources affect quality of life and public health.	Number of school classrooms, articles in local newspapers and water agency newsletters, and other programs that receive water quality-related curriculum.	CSRCD; UMRWA , CAMRA, AWA, CCWD
Track increase of small county-monitored water systems.	Number of small water supply systems monitored annually by the counties.	County Environmental Health Departments
Goal: Manage stormwater flows and transport Of sediments and contaminants.		
Objectives	Performance Measures	Monitoring/Reporting Agency
Reduce stormwater runoff from peak storm events.	Number of local jurisdictions adopting low impact design (LID) measures; number of public education actions taken to encourage the reduction of stormwater runoff (e.g., newspaper articles, water agency newsletters, NGO newsletters)	City and county land use agencies, AWA, CCWD, JVID
Promote development of community-based flood protection strategies.	Number of acres affected by adopted protection strategies; presence of floodplain development avoidance measures in city and county general plans.	City and county land use agencies
Reduce water quality impacts from vehicle uses and road maintenance practices.	Number of public works agencies implementing road design and maintenance BMPs; actions to address water quality impacts of concentrated OHV sites.	CalTrans; County PW Departments; USFS, BLM
Minimize water quality impacts from livestock grazing.	Number of grazing permits requiring off-stream watering; livestock management actions taken to prevent meadow compaction, overgrazing, etc.	BLM, EBMUD, USFS, Cattlemen's Association

Table 3-2: Policy 2 - Improve Water Supply Reliability Goals, Objectives and Performance Measures

Goal: Ensure sufficient firm yield water supply.		
Objectives	Performance Measures	Monitoring/Reporting Agency
Promote comprehensive water supply planning including climate change.	Number of local water supply plans that consider climate change and incorporate best available climate science into their planning process.	AWA, CCWD, CPUD, JVID, EBMUD
Encourage diverse water supply portfolios to meet agency demands.	Number of water agency plans which consider multiple supplies and conjunctive use operations, including for example but not limited to, demand management, water reuse, and water neutral development .	AWA, CCWD, CPUD, JVID, EBMUD
Plan and develop water supply projects that optimize water right entitlements and county of origin protections.	Number of supply projects in planning that optimize entitlements and protections.	AWA, CCWD, CPUD, JVID, EBMUD
Ensure that demand projections are supportable and realistic.	Number of water demand projections that use the best available land use, demographic, and other data.	Cities, counties, water purveyors, RPC members
Balance long-term regional supply and demand in water supply plans.	Number and/or percent of water agency plans that seek to balance supply and demand in their long range planning processes.	AWA, CCWD, CPUD, JVID, EBMUD
Goal: Maintain and improve water infrastructure reliability.		
Objectives	Performance Measures	Monitoring/Reporting Agency
Implement leak detection and repair and replacement programs.	Number of water agencies with established leak detection and repair programs.	AWA, CCWD, CPUD, JVID, EBMUD
Develop regional water treatment and transmission projects.	Number of regional treatment and transmission projects constructed.	AWA, CCWD, CPUD, JVID, EBMUD
Construct water system interties where appropriate.	Number of newly constructed interties between qualified systems.	AWA, CCWD, CPUD, JVID, EBMUD
Goal: Promote water conservation, recycling, and reuse for urban and agricultural uses.		
Objectives	Performance Measures	Monitoring/Reporting Agency
Establish and implement water conservation and efficiency programs based on best management practices.	Percent of agencies meeting SB X7-7's 20 percent reduction in per capita by 2020. If reduction target is not being met, percent of measures that are being implemented.	AWA, CCWD, CPUD, JVID, EBMUD's local use, County agriculture departments

Maximize use of recycled water from wastewater treatment plants.	Number of wastewater treatment plants producing and delivering recycled water; number of efforts to promote increased use of recycled water; percent of wastewater reclaimed.	AWA, CCWD, ARSA, EBMUD
Movetoward a reduction in demands through water-neutral development.	Number of new water-neutral commercial, industrial, or residential development projects; number of land use agencies that are working towards developing water neutral results within the watershed .	County and city land use agencies
Goal: Develop appropriate drought mitigation measures.		
Objectives	Performance Measures	Monitoring/Reporting Agency
Promote preparation and adoption of drought contingency plans.	Number of water agencies with adopted drought contingency plans.	AWA, CCWD, CPUD, JVID, EBMUD

Table 3-3: Policy 3 – Practice Resource Stewardship Goals, Objectives and Performance Measures

Goal: Protect, conserve, enhance, and restore the region’s natural resources.		
Objectives	Performance Measures	Monitoring/Reporting Agency
Integrate natural resource conservation into water resource planning projects and programs.	Number of agencies with policies requiring incorporation of principles and standards for resource conservation in project planning; number of projects that have implemented an optional natural resource conservation component.	Cities, Counties, AWA, CCWD, CPUD, JVID, EBMUD
Promote water resource projects that achieve an equitable balance between conflicting interests while minimizing harm to natural resources and incorporating natural resource protection, mitigation, and restoration.	Percent of fully mitigated impact by projects.	AWA, CCWD, CPUD, JVID, EBMUD, cities and counties, community organizations
Identify opportunities to protect, enhance, or restore aquatic and terrestrial habitats in the Mokelumne and Calaveras river watersheds.	Number of projects and/or land area identified that target habitat improvements in Mokelumne and Calaveras river watersheds.	Cities, counties, AWA, CCWD, CPUD, JVID, EBMUD
Goal: Maintain or improve watershed ecosystem health and function.		
Objectives	Performance Measures	Monitoring/Reporting Agency

Avoid, minimize, or mitigate adverse effects on or improve or restore watershed and ecological processes, systems, structures, and resources when implementing projects.	Number of projects and/or land area that avoid, minimize, or mitigate adverse impacts; number of projects and or land area that improve or restore watershed ecosystem function.	Cities, Counties, AWA, CCWD, CPUD, JVID, EBMUD, USFS, BLM
Goal: Minimize adverse effects on cultural resources.		
Objectives	Performance Measures	Monitoring/Reporting Agency
Avoid, minimize, or mitigate adverse effects on cultural resources when implementing projects.	Number of projects which avoid, minimize, or mitigate adverse cultural resource impacts.	Cities, counties, AWA, CCWD, CPUD, JVID, EBMUD
Goal: Identify opportunities for public access, open spaces, and other appropriate recreational benefits and avoid harm to existing or planned recreational uses		
Objectives	Performance Measures	Monitoring/Reporting Agency
Promote inclusion of public access, non-motorized trails, open space, and other suitable and feasible recreational features in new and existing water resource projects and associated lands while avoiding harm to existing or planned recreational uses.	Number of projects which include feasible open space and recreational features.	Cities, counties, AWA, CCWD, CPUD, JVID, EBMUD, Calaveras Parks and Recreation Commission, Amador County Recreation Agency, California Department of Boating and Waterways, Coast to Crest Trail Council

Table 3-4: Policy 4 – Focus on Areas of Common Ground and Avoid Prolonged Conflict

Goal: Prioritize projects that have the best likelihood of being completed in the planning horizon.		
Objectives	Performance Measures	Monitoring/Reporting Agency
Identify high controversy projects and work towards common ground solutions.	Percent of projects that have parties working on common ground solutions	AWA, CCWD, CPUD, JVID, EBMUD, resource agencies

3.1.3. Prioritizing Objectives

The RPC chose not to prioritize the MAC Plan objectives because all are equally important and implementation of projects that contribute to any of the objectives would benefit the Region.

3.2. Resource Management Strategies

A resource management strategy (RMS), as defined in the *California Water Plan 2009 Update* (DWR 2009), is a project, program, or policy that helps local agencies and governments manage their water and related resources. A wide range of RMS will be required to achieve the MAC Region’s goals and objectives, identified in Section 3.1. A comprehensive range of RMS, including all of the RMS covered in the *California Water Plan 2009 Update*(DWR 2009), were evaluated for their ability to assist the region in achieving its goals and objectives. Those RMS which are feasible to implement and will assist the Region in achieving its goals and objectives were incorporated into the MAC Plan Update. Those RMS that will not assist the region in achieving its goals and objectives, or are not feasible to implement, have been eliminated from further consideration. As part of the MAC Plan Update, each RMS in the *California Water Plan Update 2009* was considered. The following sections document the RMS which have been evaluated and incorporated into the IRWM Plan.

3.2.1. Strategies Evaluated

The MAC IRWM Plan considered each RMS listed in the *California Water Plan Update 2009* for its ability to assist the region in achieving its goals and objectives. The *California Water Plan Update 2009* identified seven categories of RMS applicable to water management in California.

Table 3-5 presents the seven categories of RMS considered for the MAC IRWM Plan. These strategies include all the resource management approaches identified by the *California Water Plan Update 2009*. A variety of approaches to water management must be considered to fully address the regional goals and objectives. Though all the RMS identified by the *California Water Plan Update 2009* were considered, not all are appropriate for meeting the Region’s goals and objectives.

Table 3-5: RMS from the CWP Update 2009

Reduce Water Demand	Agricultural Water Use Efficiency Urban Water Use Efficiency
Improve Operational Efficiency and Transfers	Conveyance – Delta Conveyance – Regional/local System Reoperation Water Transfers
Increase Water Supply	Conjunctive Management & Groundwater Storage Desalination Precipitation Enhancement Recycled Municipal Water Surface Storage – CALFED Surface Storage – Regional/local
Improve Water Quality	Drinking Water Treatment and Distribution Groundwater Remediation / Aquifer Remediation Matching Quality to Use Pollution Prevention Salt & Salinity Management Urban Runoff Management
Improve Flood Management Practice Resources Stewardship	Flood Risk Management Agricultural Lands Stewardship Economic Incentives (Loans, Grants, Water Pricing) Ecosystem Restoration Forest Management Recharge Area Protection Water-Dependent Recreation

Other Strategies	Watershed Management Crop Idling for Water Transfers Dewvaporation or Atmospheric Pressure Desalination Fog Collection Irrigated Land Retirement Rainfed Agriculture Waterbag Transport / Storage Technology
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Table 3-6 presents the RMS and how they contribute to meeting each of the IRWM Plan regional objectives. Most objectives have multiple strategies that can be integrated to form a successful project to fulfill one or multiple regional goals. Table 3-6 illustrates which strategies can be integrated to achieve a specific objective. Additional information on the applicability of each RMS is provided below.

Agricultural Water Use Efficiency

Agricultural water use efficiency can achieve reductions in the amount of water used for agricultural irrigation. This strategy could increase the MAC region’s net water savings, improve water quality, provide environmental benefits, improve flow and timing, and increase energy efficiency.

Several strategies recommended by the *California Water Plan Update 2009* to achieve agricultural water savings and benefits include:

- improving irrigation system technology and management of water, both on-farm and at the irrigation district level to minimize water losses;
- adjusting irrigation schedules to decrease the amount of water applied;
- installing remote monitoring to allow districts to measure flow, water depth, and improve water management and controls; and
- developing community educational conservation activities to foster water use efficiency.

Although the extent of agricultural water uses in the Region is limited, agricultural water use efficiency will be an important component of the MAC region’s future water resources portfolio. This RMS is consistent with the overall regional goal to Improve Water Supply Reliability and has been included in the IRWM Plan.

Urban Water Use Efficiency

Urban water use efficiency strategies can assist in managing increasing water needs of growing populations in the MAC region. Urban water use efficiency strategies can reduce water demand through technological and behavioral improvements by decreasing indoor and outdoor residential, commercial, institutional, and industrial water use. Several approaches recommended by the *California Water Plan Update 2009* to increase urban water use efficiency include:

- implementing programs such as Best Management Practices (BMPs);
- reviewing the Urban Water Management Plan to ensure 20 percent water use reductions are achieved by 2020;
- installing water efficient landscapes;
- encouraging gray water and rain water capture to increase water conservation and improve water quality;
- increasing public outreach and encouraging community involvement; and
- funding incentive programs for small districts and economically DACs.

This RMS is consistent with the overall regional goal to Improve Water Supply Reliability and has been included in the IRWM Plan.

Table 3-6: Resource Management Strategies - Applicability, Feasibility, and Contribution to IRWM Plan Goals

Resource Management Strategy	Regional Goals										
	Strategy is Applicable and Feasible	Reduce sources of contaminants.	Manage stormwater flows and transport of sediments and contaminants	Ensure sufficient firm yield of water supply.	Maintain and improve infrastructure reliability.	Promote water conservation, recycling and reuse for urban and agricultural uses.	Develop appropriate drought mitigation measures.	Protect, conserve, enhance, and restore the region's natural resources	Maintain or improve watershed ecosystem health and function	Maintain or improve watershed ecosystem health and function	Identify opportunities for public access, open spaces, and other appropriate recreational benefits and avoid harm to existing or
Agricultural Water Use Efficiency	●	●		●			●		●	●	●
Urban Water Use Efficiency	●	●		●			●		●	●	●
Conveyance – Delta											
Conveyance – Regional/local	●			●	●	●	●				●
System Reoperation	●			●	●	●	●				●
Water Transfers	●			●	●	●	●				●
Conjunctive Management & Groundwater Storage	●			●		●	●				●
Desalination											
Precipitation Enhancement	●			●		●	●				●

Watershed Management	●	●	●			●	●	●	●	●	●
Crop Idling for Water Transfers					●	●					
Dewvaporation or Atmospheric Pressure Desalination Fog Collection											
Irrigated Land Retirement		●	●	●	●	●	●			●	□
Rainfed Agriculture				●	●	●					
Waterbag Transport/Storage Technology											

Conveyance - Delta

Water suppliers in the MAC Region do not depend on Delta conveyance for water supply. As such, this RMS has been excluded from further consideration.

Conveyance - Regional/local

Several strategies identified by the *California Water Plan Update 2009* for improving regional/local conveyance of water supplies include:

- improving aging infrastructure, increasing existing capacities, and/or constructing new conveyance facilities;
- replacing or improving canal structures to improve an irrigation district's ability to manage and control water in the district and reduce spillage; and
- constructing alternative water conveyance pipelines to improve water supply reliability.

The MAC region has identified improved interregional connectivity as a strategy to assist in achieving the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

System Reoperation

System reoperation strategies change existing operation and management procedures for existing reservoirs and conveyance facilities to increase water related benefits from these facilities. Some of the potential benefits of system reoperation strategies include: increasing water supply reliability, additional flexibility to respond to extreme hydrologic events, and improving the efficiency of existing water uses.

Several system reoperation strategies identified by the *California Water Plan Update 2009* include:

- establishing a baseline hydrology and enhanced description of present water management system components;
- considering possible climate change effects in reoperation projects; and
- collaborating between federal, state, and local agencies on system reoperation studies.

System reoperation could assist the MAC region in achieving the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Water Transfers

Water Transfers are defined in the California Water Plan as temporary or long-term change in the point of diversion, place of use, or purpose of use due to transfer or exchange of water or water rights in response to water scarcity. Benefits to establishing water transfers include improving economic stability and environmental conditions for receiving areas. Compensation for water transfers can fund beneficial projects/activities for the IRWM region, reduce water rates, and/or improve facilities.

Several water transfer strategies identified by the *California Water Plan Update 2009* include:

- developing and implementing groundwater management plans, monitoring programs;
- allowing community participant for identifying and responding to conflicts caused by transfer;
- refining current methods of identifying and quantifying water savings for transfers using crop idling, crop shifting, and water use efficiency measures; and
- improving coordination and cooperation among the local, state, and federal agencies to facilitate sustainable transfers.

Water transfers could assist the MAC region in achieving the overall goal to Improve Water Supply Reliability in dry years. As such, this RMS has been included for further consideration.

Conjunctive Management & Groundwater Storage

Conjunctive Management and Groundwater Storage 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. This strategy assists in improving water supply reliability and sustainability, reducing groundwater overdraft and land subsidence, protecting water quality, and improving environmental conditions. Conjunctive management and groundwater storage strategies identified by the *California Water Plan Update 2009* include:

- implementation of monitoring, assessment, and maintenance of baseline groundwater levels;
- encouraging local water management agencies to coordinate with tribes and other agencies involved in activities that might affect long term sustainability of water supply and water quality; and
- local groundwater monitoring and management activities and feasibility studies to increase the coordinated use of groundwater and surface water.

Conjunctive Management and Groundwater Storage will assist the MAC region in achieving the overall goal to Improve Water Supply Reliability in dry years. As such, this RMS has been included for further consideration.

Desalination

Because the MAC region is not located near any brackish or saline water supplies, this strategy is not feasible and has been excluded from further evaluation.

Precipitation Enhancement

Precipitation enhancement artificially stimulates clouds to produce more rainfall or snowfall than would naturally occur, potentially increasing water supply. Recommendations identified by the *California Water Plan Update 2009* for implementing precipitation enhancement projects include:

- seeking State support for development and funding of new projects;
- collecting data and evaluations of existing California precipitation enhancement projects to perform research on the effectiveness of the technology; and
- investigating the potential of augmenting Colorado River Water supply through cloud seeding.

Precipitation enhancement has been implemented in the MAC region in the past, with uncertain benefits. However, assuming precipitation enhancement is effective in increasing precipitation, it would assist the region in achieving the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Recycled Municipal Water

Use of recycled municipal water provides a drought-resistant water supply that offsets the use of potable supplies for non-potable demands. Water recycling has been implemented throughout the MAC region, and increased recycled water use is projected in future years. Recycled municipal water strategies identified by the *California Water Plan Update 2009* and *Water Recycling 2030: Recommendations of California's Recycled Water Task Force* include:

- increasing funding availability for water reuse/recycling facilities and infrastructure;
- creating education curriculum for public schools and institutions of higher learning to educate on recycled water;
- engaging the public in an active dialogue and encouraging participation in the planning process of water recycling projects,
- providing resources (i.e. funding) to agencies that will perform comprehensive analysis of existing water recycling projects to estimate costs, benefits, and water deliveries; and

- assessing water recycling technology to determine least costly and environmentally appropriate technology based on location and need.

Recycled municipal water will be a key strategy for achieving the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Surface Storage - CALFED

The MAC region does not benefit from surface storage in the Delta. As such, this RMS will not benefit the region and has been screened from further consideration.

Surface Storage - Regional/Local

This RMS focuses on regional and local surface storage alternatives to expand surface storage capacity. Benefits of expanding regional/local surface storage include: improved flood management, ecosystem management, emergency water supply, river and lake recreation, capture of surface water runoff, and water supply reliability against catastrophic events and droughts. Regional/local surface storage strategies identified by the *California Water Plan Update 2009* include:

- developing a comprehensive methodology for analyzing project benefits and costs by local agencies;
- continued studies, research, and dialogue to identify a common set of tools for determining cost and benefits of surface storage projects;
- adaptively managing operations of existing surface storage facilities;
- rehabilitating and/or enlarging existing surface storage infrastructure; and
- developing water purchasing agreements to buy water from other agencies that own storage reservoirs with substantial water supplies.

Regional/local surface storage could assist the region in achieving the overall goals to Maintain and Improve Water Quality through reduced flood impacts, and Improve Water Supply Reliability through enhanced storage. As such, this RMS has been included for further consideration.

Drinking Water Treatment and Distribution

The MAC region provides high-quality drinking water that meets all State and Federal water quality regulations. However, aging infrastructure must be continually rehabilitated and/or replaced to continue to provide high quality drinking water supplies. Several drinking water treatment and distribution strategies identified by the *California Water Plan Update 2009* include:

- Working closely with CDPH to quantify the total needs for water system infrastructure improvement and replacement;
- regionalizing and consolidating public water systems;
- developing incentives to allow water systems to reduce waste of limited water resources;
- researching and developing of new treatment technologies;
- providing additional funding for water supply, water treatment, and infrastructure projects to ensure safe and reliable supply of drinking water for individuals and communities;
- public water systems joining the California WARN program which provides mutual aid and assistance more quickly than through SEMS; and
- creating source control and reduction programs to address pharmaceuticals and personal care products.

Drinking water treatment and distribution projects are critical to providing high quality drinking water to the region's residents. As such, this RMS has been included for further consideration.

Groundwater Remediation/Aquifer Remediation

Several groundwater remediation/aquifer remediation strategies identified by the *California Water Plan Update 2009* include:

- limiting potentially contaminating activities in recharge areas;
- identifying historic commercial and industrial sites with contaminated discharges and responsible parties to remediate sites;
- implementing source water protection measures; and
- establishing and supporting funding for detecting emerging contaminants by commercial laboratories and installing wellhead treatment systems.

Groundwater sources in the MAC region are of high quality. However, as development pressures increase in the future, protection of groundwater recharge areas and groundwater quality will become more and more important to preserving these high quality water supplies. As such, this RMS has been included for further consideration.

Matching Quality to Use

Matching water quality to use involves utilizing water for suitable end uses based on water quality. This includes reserving high quality potable supplies for potable use, while using lower quality recycled water supplies for non-potable use. As a result, this RMS is directly related to the following RMS: Pollution Prevention, Recycled Municipal Water, Salt and Salinity Management, and Groundwater/Aquifer Remediation. Several strategies for matching water quality to use identified by the *California Water Plan Update 2009* include:

- managing water supplies to optimize and match water quality to the highest possible use and to the appropriate technology;
- encouraging upstream users to minimize the impacts of non-point urban and agricultural runoff and treated wastewater discharges;
- supporting the development of salt management plans;
- reviewing projects to determine the potential impacts from wastewater elimination into local streams; and
- supporting research into solutions to the potential conflicts between ecosystem restoration projects and the quality of water for drinking water purposes.

This RMS may assist the region in achieving its goals to Maintain and Improve Water Quality and to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Pollution Prevention

Pollution prevention assists in maintaining and improving source water quality. Benefits of pollution prevention include reduced water treatment requirements, enhanced habitat and natural resource conditions, and improved water supply reliability resulting from decreased variability. Pollution prevention strategies identified by the *California Water Plan Update 2009* include:

- developing proper land management practices that prevent sediment and pollutants from entering source waters;
- establishing drinking water source and wellhead protection programs to protect drinking water sources and groundwater recharge areas from contamination;
- identifying communities relying on groundwater contaminated by anthropogenic sources for drinking water and take appropriate regulatory action; and
- addressing improperly destroyed, sealed and abandoned wells that can serve as potential pathways for groundwater contaminants.

Pollution prevention is a critical component of the region's overall goal to Maintain and Improve Water Quality. In addition, this RMS will assist in achieving the overall goal to Practice Resource Stewardship. By reducing water quality variability, this RMS may further assist in addressing the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Salt and Salinity Management

Salinity management assists in protecting water resources from accumulation of salts which can impair water quality. Several salt and salinity management strategies identified by the *California Water Plan Update 2009* include:

- developing a regional salinity management plan, and interim and long-term salt storage, salt collection, and salt disposal management projects;
- monitoring to identify salinity sources, quantifying the level of threat, prioritizing necessary mitigation action, and working collaboratively with entities and authorities to take appropriate action;
- reviewing existing policies to address salt management needs and ensure consistency with long-term sustainability;
- collaborating with other interest groups to optimize resources and effectiveness;
- identifying environmentally acceptable and economically feasible methods for managing salt; and
- providing funding for research and projects and prioritizing funding based on greatest needs.

While salinity management is not an issue for the MAC region in the near term, enacting sound management practices can assist in protecting water resources in the long-term, contributing to the overall goal to Maintain and Improve Water Quality. As such, this RMS has been included for further consideration.

Urban Runoff Management

Urban runoff management strategies seek to manage both stormwater and dry weather runoff to minimize soil erosion and sedimentation problems, reduce surface water pollution, protect natural resources, protect and augment groundwater supplies, and improve flood protection. Urban runoff management strategies identified by the *California Water Plan Update 2009* include:

- coordinating efforts with agencies, stakeholders, and the public to decide how urban runoff management should be integrated into work plans;
- encouraging public outreach and education concerning funding and implementation of urban runoff measures;
- designing recharge basins to minimize physical, chemical, or biological clogging;
- working with community to identify opportunities to address urban runoff management;
- providing incentives for the installation of low impact development features on new and existing developments; and
- emphasizing source control measures and strong public education/outreach efforts as being the most effective way to manage urban runoff in this highly arid region.

Successful implementation of this RMS could assist the MAC region in achieving all four of its overall policies. As such, this RMS has been included for further consideration.

Flood Risk Management

The MAC region does not currently experience significant flooding impacts. However, flood waters can create erosion problems, which directly impact water quality. In addition, degraded flood waters can transport pollutants to receiving waters. Several flood risk management strategies identified by the *California Water Plan Update 2009* include:

- Structural approaches that can consist of:
 - Setting back levees
 - Modifying channels to include lining (i.e. concrete, rip rap) to improve conveyance of floodflows
 - High flow diversions into adjacent lands to temporarily store flows
 - Improved coordination of flood operations
 - Maintaining facilities to secure the long-term preservation of flood management facilities
- Land use management approaches that consist of:
 - Floodplain function restoration to preserve and/or restore the natural ability of undeveloped floodplains to absorb, hold, and release floodwaters
 - Floodplain regulation
 - Development and redevelopment policies
 - Housing and building codes
- Disaster Preparedness, Response, and Recovery for flood risk management approaches such as:
 - Information and education
 - Disaster preparedness
 - Post-flood recovery

Flood risk management may assist the region in achieving its goals to Maintain and Improve Water Quality and to Practice Resource Stewardship. As such, this RMS has been included for further consideration.

Agricultural Lands Stewardship

Agricultural lands stewardship involves conserving and improving land for conservation purposes as well as protecting open spaces and rural communities. This can assist in protecting environmentally sensitive lands, recharging groundwater, improving water quality, providing water for wetland protection and restoration, and increasing carbon sequestration within soil. Agricultural land stewardship strategies identified by the *California Water Plan Update 2009* include:

- stabilizing streambanks to slow bank erosion and filter drainage water from the fields;
- installing windbreaks (i.e. trees and/or shrubs) along field boundaries to help control soil erosion, conserve soil moisture, improve crop protection among many other benefits;
- performing conservation tillage to increase water infiltration and soil water conservation and reduce erosion and water runoff; and
- encouraging irrigation tailwater recovery to help capture and reuse irrigation runoff water to benefit water conservation and off-site water quality.

Agricultural lands stewardship can assist the MAC region in achieving its goals to Maintain and Improve Water Quality and Practice Resource Stewardship. As such, this RMS has been included for further consideration.

Economic Incentives (Loans, Grants and Water Pricing)

Economic incentives including low interest loans, grants, and water rates and rate structures can influence water management, amount of water use, time of use, wastewater volume, and source of supply. Several urban runoff management strategies identified by the *California Water Plan Update 2009* include:

- instituting loans and grant programs that support better regional water management;
- adopting policies that promote long-run water use efficiency;
- developing modeling tools for economic analyses of economic incentives as well as guidelines and ranking criteria for grant and loan awards; and
- exploring innovative financial incentives.

Economic incentives can help to further projects and programs, assisting the region in achieving all four of its overall policies. As such, this RMS has been included for further consideration.

Ecosystem Restoration

Ecosystem restoration strategies are key to enhancing the region's rich natural resources. Potential benefits of ecosystem restoration include improved water quality and quantity for aquatic species and human consumption. Several ecosystem restoration strategies identified by the *California Water Plan Update 2009* include:

- increasing the use of setback levees and floodwater bypasses;
- creating programs that support and funds the identification of stream flow needs;
- establishing biological reserve areas that connect or reconnect habitat patches;
- expanding riparian habitat;
- devising climate change adaptation plans that benefit ecosystems, water, and flood management;
- reproducing natural flows in streams and rivers;
- controlling non-native invasive plant and animal species; and
- filtering of pollutants and recharging aquifers.

This RMS is fundamental to achieving the region's goal to Practice Resource Stewardship, and it may assist in achieving the goals to Maintain and Improve Water Quality and Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Forest Management

Much of the MAC region is characterized by forest, making forest management a critical strategy in the region. Forest management strategies focus on improving the availability and quality of water for downstream users on both publicly and privately owned forest lands. Potential benefits of forest management strategies include interception of rainfall, reduction of urban runoff, increased energy-efficient shade during hot weather, reduced flooding and increased dry-season base flows, and protection from surface erosion and filtering pollutants. Forest management strategies identified by the *California Water Plan Update 2009* include:

- establishing long-term monitoring to understand hydrologic changes resulting from possible climate change effects through the installation of stream gages, precipitation stations, water-quality and sediment monitoring stations, and long-term monitoring wells;
- increasing research efforts into identifying effective BMPs for forest management and the effects of wildfires;
- assessing sediment sources and erosion processes in managed and unmanaged forested watersheds;
- increasing multi-party coordination of forest management;
- improving communication between downstream and upstream water users; and
- developing public education campaigns for water users.

Forest management will be critical to achieving all four of the region's overall policies. As such, this RMS has been included for further consideration.

Recharge Area Protection

Recharge area protection protects recharge areas from pollution, which protects and maintains the water quality of groundwater supplies. Several recharge area protection strategies identified by the *California Water Plan Update 2009* include:

- expanding research into surface spreading and the fate of chemicals and microbes in recharge water;
- increasing funding for the identification and protection of recharge areas;

- creating education and media campaigns to increase public awareness and knowledge on the importance of recharge areas and relevancy to groundwater;
- requiring source water protection plans; and
- developing methods for analyzing the economic benefits and costs of recharge areas.

Recharge area protection is an important component to protecting the region's groundwater supplies, and will assist the region in achieving its overall goal to Maintain and Improve Water Quality. As such, this RMS has been included for further consideration.

Water-Dependent Recreation

This strategy provides for adequate access to water-related recreation activities. Water-dependent strategies identified by the *California Water Plan Update 2009* include:

- using existing data and new surveys to determine recreational needs;
- partnering with schools to provide drowning prevention programs primarily aiming at youth from urban and low income families;
- developing partnerships with universities to coordinate monitoring of public recreation use, equipment, and emerging water recreation trends;
- developing a procedure to incorporate climate change assessments within all infrastructure planning, budgeting, and project development;
- researching, identifying, and mitigating impacts of stream flows that prevent Native Americans from participating in their traditional cultural activities; and
- developing invasive species preventative measures.

Water-based recreation holds significant value to the residents and stakeholders in the MAC region, and this RMS will assist in achieving the region's overall goal to Practice Resource Stewardship. As such, this RMS has been included for further consideration.

Watershed Management

Watershed management involves coordinating and integrating the management of numerous physical, chemical, and biological processes at the watershed level to generate multiple benefits. Watershed management strategies identified by the *California Water Plan Update 2009* include:

- creating a scientifically valid tracking and reporting method to document changes in the watershed;
- assessing the performance of projects and programs;
- providing watershed information to better inform local land use decision makers on how to maintain and improve watershed functions; and
- using watershed approaches in which all RMS strategies are coordinated.

Watershed management has been - and will continue to be – an important framework for managing the water resources in the MAC region, and this strategy will assist the region in achieving all four of its overall policies. As such, this RMS has been included for further consideration.

Crop Idling for Water Transfers

Agriculture in the MAC region is primarily limited to small-scale operations, and the potential benefit associated with crop idling for water transfers is limited. As such, this RMS has been screened from further evaluation.

Dewvaporation or Atmospheric Pressure Desalination

Dewvaporation or atmospheric pressure desalination would heat brackish water until deposits of fresh water as dew are collected from the opposite side of a heat transfer wall. Because brackish supplies are not

present in the MAC region, this strategy is not considered feasible. As such, this RMS has been screened from further evaluation.

Fog Collection

Fog collection is a form of precipitation enhancement that has not yet been implemented in California. This strategy is generally most appropriate for coastal regions that experience significant fog cover. Because the MAC region does not experience significant fog cover, this RMS is not considered feasible and has been screened from further evaluation.

Irrigated Land Retirement

Irrigated land retirement involves removing farmland from active use to increase water availability for other uses. Because agriculture in the MAC region is primarily limited to small-scale operations, the potential benefit associated with irrigated land retirement is limited. As such, this RMS has been screened from further evaluation.

Rainfed Agriculture

Rainfed agriculture involves performing all crop irrigation with rainfall. Rainfall quantity is difficult to predict, and rainfall is typically experienced in winter months, as opposed to during the summer growing season. Further, because agriculture in the MAC region is primarily limited to small-scale operations, the potential benefit associated with rainfed agriculture is limited. As such, this RMS is considered infeasible and has been screened from further evaluation.

Waterbag Transport/Storage Technology

Waterbag transport/storage technology involves storing water from areas with unallocated freshwater supplies in large inflatable bladders, and towing them to an alternate region. Because the MAC region is not located in an area which could receive towed waterbags, this strategy is considered infeasible and has been screened from further evaluation.

3.2.2. Strategies Selected

The following RMS from the *California Water Plan Update 2009* were selected for inclusion in the MAC Plan Update for their ability to assist the MAC region in achieving its overall goals.

- Agricultural Water Use Efficiency
- Urban Water Use Efficiency
- Conveyance – Regional/local
- System Reoperation
- Water Transfers
- Conjunctive Management & Groundwater Storage
- Precipitation Enhancement
- Recycled Municipal Water
- Surface Storage – Regional/local
- Drinking Water Treatment and Distribution
- Groundwater Remediation/Aquifer Remediation
- Matching Quality to Use
- Pollution Prevention
- Salt and Salinity Management
- Urban Runoff Management
- Flood Risk Management
- Agricultural Lands Stewardship

- Economic Incentives (Loans, Grants and Water Pricing)
- Ecosystem Restoration
- Forest Management
- Recharge Area Protection
- Water-Dependent Recreation
- Watershed Management