

Resource Management Strategies

The DWR's 2012 IRWM Guidelines direct the IRWM regions to document the range of Resource Management Strategies (RMS) considered to meet the region's IRWM objectives and identify which RMS are to be incorporated into the IRWM Plan. We will be working with the RMS contained in the California Water Plan Update 2013 (CWP).

The RMS are separated into seven categories, which may help guide consideration of additional resource strategies not listed in the CWP, but that may be locally appropriate, for inclusion in the IRWM Plan. The 2013 Water Plan identifies the following categories:

1. Reduce water demand
2. Improve flood management
3. Improve operational efficiency and transfers
4. Increase water supply
5. Improve water quality
6. Practice resource stewardship
7. People and water

Additional information about the RMS can be found in the CWP 2013 at the following URL:

<http://www.waterplan.water.ca.gov/cwpu2013/final/index.cfm>

The intent of including RMS in the IRWM is to document the range of strategies considered by the RWMG to meet the Goals and Objectives of the UFR IRWM, and to ensure diversification of the water management strategies and projects as a way to mitigate for uncertain future circumstances, per requirements in the DWR IRWM Guidelines (DWR 2012). All projects identified through the UFR process will address at least one of the RMS. The table below identifies the RMS contained in the CWP that are suggested as most appropriate for consideration by the Municipal Services Workgroup. Also note that other RMS may be identified by the RWMG later in the Update process for consideration by the Workgroups and inclusion in the IRWM Update.

The combination of RMS utilized will depend on multiple variables, including the project type, climate and population projections, existing infrastructure, environmental and social conditions, and the UFR's objectives.

Note that the 2005 Goals and Objectives will be brought before the RWMG for consideration and updating during its Meeting No. 3 on January 28, 2015.

SUMMARY OF RESOURCE MANAGEMENT STRATEGIES

The *California Water Plan Update 2013 (CWP)* presents 30 resource management strategies (RMS) designed to help meet the water-related goals and objectives of IRWM Plans across the state. An RMS is a technique, program, or policy that helps local entities manage their water and water-related resources. For example, to reach the goal of reduced agricultural water use, an applicable RMS might be reducing evapotranspiration in the water delivery infrastructure by lining or encasing canals.

The combination of RMS developed for the Upper Feather IRWM will depend on climate, projected growth, existing water systems, environmental and social conditions, and regional goals. The proposed strategies should also complement the operation of existing water systems. Some strategies identified below from the statewide *CWP* may have little value in certain regions of the Upper Feather area. For example, desalination is likely not relevant in the Sierra Nevada. Other strategies may have little value in particular conditions.

RMS outlined in the *CWP* are shown below, along with a short description of each. The RMS are numbered for the sake of discussion, but are not prioritized.

Table of RMS from the <i>California Water Plan 2013</i>				
#	RMS	Definition of RMS	Examples of Possible Approaches	California Water Plan 2013 Chapter Link
Objective: Reduce Water Demand				
1	Agricultural Water Use Efficiency	The efficient management of water resources for beneficial uses, preventing waste, or accomplishing additional benefits with the same amount of water.	<ul style="list-style-type: none"> • Hardware – improving irrigation and water delivery systems • Water management – reducing evapotranspiration and improving management of irrigation and water delivery systems • Agricultural technology – Breeding, GMO crops, fertilizers, technology, etc. 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch02_AgWUE.pdf
2	Urban Water Use Efficiency	The efficient management of water resources for beneficial uses, preventing waste, or accomplishing additional benefits with the same amount of water.	<ul style="list-style-type: none"> • Rate restructuring, incentive policies including for efficient appliances • Developing water budgets for homeowners • Identifying excessive water users and offer water audits • Installing water metering infrastructure • Improving water delivery infrastructure 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch03_UrbanWUE.pdf

			<ul style="list-style-type: none"> • Utilizing alternative water sources • Public outreach 	
Objective: Improve Flood Management				
3	Flood Management	Policies and practices related to educating the public, preparing for, mitigating damages related to, responding to, and recovering from flooding, as well as protecting the natural and beneficial functions of floodplains	<ul style="list-style-type: none"> • Nonstructural – Land use planning, floodplain mapping, risk assessment, land acquisitions and easements, building codes and floodproofing, permanent relocation, flood insurance, flood risk awareness • Structural – levees and flood walls, channels and bypasses, retention and detention basins, culverts and pipes, streambank stabilization, reservoir and floodplain storage, inspection and vegetation management, sediment removal, repair of structures • Restoration of natural floodplain functions – promoting natural hydrologic, geomorphic, and ecological processes, protecting and restoring floodplain habitats, invasive species reduction • Flood emergency management – flood preparedness, emergency response, post-flood recovery 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch04_Flood-Mgmt.pdf
Objective: Improve Operational Efficiency and Transfers				
4	Conveyance - Delta	The conveyance of water through the Sacramento-San Joaquin River Delta, which is a confluence point of the Sacramento and San Joaquin Rivers that drains to the Pacific Ocean	<ul style="list-style-type: none"> • Dual water conveyance delivery system comprised of the existing (through-Delta) conveyance and a new conveyance system that will route water through an isolated facility conveyance system to be exported via the SWP and CVP • Restoring natural communities to promote improved ecosystem function • Providing increased climate change adaptation in the area • Reducing north to south flows for export 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch05_Conveyance-Delta.pdf

5	Conveyance - Regional/Local	The conveyance or distribution of water from locally developed sources to the end users located within the same watershed or river system	<ul style="list-style-type: none"> • Improving conveyance capacity by widening bottlenecks that constrict the movement of water • Improving water quality by transporting more river water when water quality conditions are high (minimal turbidity and contaminants) and reducing water diversions when water quality is poor • Providing the operational flexibility to divert and move water at times that are less harmful to fisheries 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch06_Conveyance-Regional-Local.pdf
6	System Reoperation	The improvement of existing operations and management procedures of water facilities to meet needs more efficiently and reliably, rather than relying solely on infrastructure improvements (though minor physical modifications to existing facilities may be necessary)	<ul style="list-style-type: none"> • Conveying additional water supply from above-ground reservoirs to groundwater basins when supplies are high in order to bank water and prevent flooding in the reservoirs. 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch07_System-Reoperation.pdf
7	Water Transfers	Water delivered from one water user to another with the water returned at some specified future date, either in-kind or at a specified ratio	<ul style="list-style-type: none"> • Transferring previously banked groundwater (from wet years) by pumping and transferring the groundwater, or by pumping the groundwater and using it locally and transferring surface water that would have been used locally • Transferring water conserved by crop idling or crop shifting • Transferring water that is conserved through measures that reduce seepage to saline sinks (such as canal lining) 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch08_Water-Transfers.pdf
Objective: Increase Water Supply				
8	Conjunctive Management	The coordinated and planned use and management of both surface water and groundwater resources to maximize the availability and reliability of water	<ul style="list-style-type: none"> • Recharging groundwater storage when surface water supplies are available and affordable • Recharging groundwater storage using 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch09_ConjMgmt-GW-Storage.pdf

		supplies	recycled water	
9	Desalination (Brackish and Sea Water)	The removal of salts from saline waters	<ul style="list-style-type: none"> Desalinating groundwater and sea water; various technologies available 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch10_Desalination.pdf
10	Precipitation Enhancement	Also called cloud seeding, a form of weather modification that artificially stimulates clouds to produce more rainfall or snowfall than they would produce naturally by injecting substances into the clouds that enable snowflakes and raindrops to form more easily	<ul style="list-style-type: none"> Cloud seeding to offset reduced snowpack Cloud seeding in mountain meadows to delay start of fire season 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch11_Precip-Enhancement.pdf
11	Municipal Recycled Water	The recycling and reuse of water originating from a municipal treatment plant	<ul style="list-style-type: none"> Using recycled municipal water treated to less-than-tertiary levels for agricultural and domestic irrigation purposes 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch12_Municipal-Recycled-Water.pdf
12	Surface Storage - CALFED/State	CALFED is a joint federal-state effort created to coordinate activities in the Sacramento-San Joaquin Delta. The state and federal governments have funded investigations into five sites for surface storage that would meet the goals of water supply reliability, water quality, and ecosystem restoration	<ul style="list-style-type: none"> Expanding or developing large new surface storage facilities to improve ecosystem functions and conditions for targeted species, or to improve water quality or supply reliability for water users 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch13_Surface-Storage.pdf
13	Surface Storage - Regional/Local	The use of human-made, above-ground reservoirs to collect water for later release when needed	<ul style="list-style-type: none"> Expanding existing regional or local facilities Developing new regional or local facilities 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch14_Surface-Storage-Regional-Local.pdf
Objective: Improve Water Quality				
14	Drinking Water Treatment and Distribution	Drinking water in this context is via a public water system; a public water system is defined as having 15 or more service connections or regularly serving at least 25 individuals daily at least 60 days of the year	<ul style="list-style-type: none"> Improving treatment facilities to include more sophisticated methods of treatment such as membrane filtration, ultraviolet light, and ozonation Upgrading aging water storage and distribution systems, which may have an 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch15_Drinking-Water-Treatment-Distribution.pdf

			<p>impact on water quality pose public health risks</p> <ul style="list-style-type: none"> Improving water system to prevent cross-connections and backflow in distribution systems 	
15	Groundwater Remediation/ Aquifer Remediation	The removal of constituents (or contaminants) that affect beneficial use of groundwater; groundwater remediation systems can employ passive or active methods to remove contaminants	<ul style="list-style-type: none"> Treating contaminated groundwater while it is still in the aquifer (in situ); active in situ methods generally involve injecting chemicals into the contaminant plume to obtain a chemical or biological removal of the contaminant Extracting contaminated groundwater from the aquifer and treating it outside of the aquifer (ex situ) 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch16_Groundwater-Aquifer-Remediation.pdf
16	Matching Water Quality to Use	A management strategy that recognizes that not all water uses require the same water quality and that suitability for one use may not be suitability for another use; a water quality constituent often is only considered a contaminant when that constituent adversely affects the intended use of the water	<ul style="list-style-type: none"> Matching high quality water that does not require as much treatment to municipal and industrial uses Matching water to agricultural uses that does not contain certain constituents that would reduce crop yields Matching water of certain temperatures to instream and ecosystem uses 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch17_Matching-Water-Quality-to-Use.pdf
17	Pollution Prevention	Reducing or eliminating waste at the source by modifying production processes, promoting the use of non-toxic or less toxic substances, the implementation of practices or conservation techniques including activities that reduce the generation and/or discharge of the pollutants, and the application of innovative and alternative technologies which prevent pollutants from entering the environment prior to treatment	<ul style="list-style-type: none"> Agricultural uses: Erosion and sediment controls, wastewater and runoff from confined animal feeding operations, nutrient management, pesticide application, grazing management Urban uses: Runoff from developing areas, septic tank systems, transportation development runoff Forestry uses: Preharvest planning, streamside management, road construction and management, forest regeneration and revegetation, fire management, chemical 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch18_Pollution-Prevention.pdf

			<p>applications, postharvest evaluation</p> <ul style="list-style-type: none"> • Marinas and recreational boating: Marina facility assessment, siting, and design (water quality assessment, marina flushing, shoreline stabilization, fueling station design, sewage facilities); and operation and maintenance (solid waste control, fish waste control, liquid material control, petroleum control, boat cleaning and maintenance, boat operations) 	
18	Salt & Salinity Management	<p>Management of salts (including dissolved minerals such as lime, gypsum, and other slowly dissolved soil minerals) and salinity (a condition where dissolved minerals are present and carry an electrical charge (ions); human causes of salinity include use of home water softeners, groundwater pumping causing seawater intrusion, and the use of fertilizers or soil amendments</p>	<ul style="list-style-type: none"> • Source control – minimizing soil amendments in crop production, using alternate water sources to lower initial concentrations, reusing the same volume of water to decrease overall salt loads • Dilution and displacement – Dilution with lower salinity water, reusing salt in industries that require it, such as energy production • Treatment – membrane or distillation technologies • Export – moving salt to the ocean via brine lines • Real-time salinity management – improving coordination of salt loading from upstream point and non-point sources to manage a maximum load of salts that does not exceed water quality objectives • Salt recycling – using the excess salts from agricultural drainage water for products such as soaps and detergents, glass, pulp and paper, textiles, and highway de-icing 	<p>http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch19_SaltSalinity-Mgmt.pdf</p>
19	Urban Stormwater Runoff Management	<p>A range of activities to manage both stormwater and dry-weather runoff; dry-weather runoff occurs when, for example, excess landscape irrigation water flows to the storm drain</p>	<ul style="list-style-type: none"> • Runoff from roofs and parking areas draining to vegetated areas and landscaped areas with permeable soils • Using dry wells and permeable surfaces • Collecting and routing stormwater runoff to 	<p>http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch20_Urban-Stormwater-Runoff-Mgmt.pdf</p>

			basins	
Objective: Practice Resource Stewardship				
20	Agricultural Land Stewardship	Farm and ranch landowners producing public environmental benefits (conservation of natural resources and protection of the environment) in conjunction with the food and fiber they have historically provided while keeping land in private ownership	<ul style="list-style-type: none"> • Managing cropland or rangeland to avoid streambank erosion or rapid stormwater runoff • Streambank stabilization, which may include a buffer strip of riparian vegetation to slows bank erosion and filters drainage water from the fields • Modifying grazing intensity and timing to prevent overgrazing • Cover crops to prevent soil erosion • Public outreach and education on these strategies • Land use planning to avoid agricultural land fragmentation • Land conservation through easements or conservancies 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch21_Ag-Lands-Stewardship.pdf
21	Ecosystem Restoration	Improvement of modified natural landscapes and biological communities to provide for their sustainability and for their use and enjoyment by current and future generations	<ul style="list-style-type: none"> • Reproducing natural flows in rivers and streams • 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 • Recovering wetlands so that they can store floodwater, recharge aquifers, filter pollutants, and provide habitat 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch22_Ecosystem-Restoration.pdf
22	Forest Management	The application of forestry principles, practices, and business techniques to the management of a forest to achieve the owner's objectives; different forest landowners have different goals and	<ul style="list-style-type: none"> • Meadow restoration (form of groundwater banking) • Conserving riparian forests (high biological diversity) • Managing some riparian stands for fire 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch23_Forest-Mgmt.pdf

		objectives and different strategies to accomplish them; the water produced by these forests has economic value that equals or exceeds that of any other forest resource	<p>protection purposes</p> <ul style="list-style-type: none"> • Managing grazing in or near riparian forests • Selective thinning of young, small trees to improve streamflow regimen • Fuels and fire management • Road management for erosion control purposes • Managing illegal marijuana cultivation 	
23	Land Use Planning and Management	The orderly and planned use of land, resources, facilities and services with a view to securing the physical, economic and social efficiency, health and well-being of urban and rural communities	<ul style="list-style-type: none"> • Directing development away from agricultural lands, which permits multi-objective management of these agricultural lands for agricultural preservation, floodplain management, water quality, habitat conservation, and sustainable development. • Planning for more compact and sustainable communities, both urban and rural, which will assist in reducing reliance on the state's water supply, and result in more efficient use of California's water resources • Planning for growth in a way that considers availability of water supplies, water resource features such as streams, wetlands, and groundwater recharge areas, and policies and regulations about water quality, drainage, and flooding • Increased and enhanced communication between land use planners and water managers 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch24_Land-Use-Planning.pdf
24	Recharge Area Protection	Natural recharge areas are those where good quality surface water is able to 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	<ul style="list-style-type: none"> • Protecting existing and developing new recharge areas, including instream recharge areas, which allow water to percolate through the stream bed itself, offstream recharge areas, which use suitable sites outside the streambed, and detention dams, urban detention basins and low-lying parks 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch25_Recharge-Area-Protection.pdf

		storage or use	<ul style="list-style-type: none"> • Pre-treating storm water runoff • Water quality monitoring • Low Impact Development (LID) or best management practices (BMPs) for storm water filtration and reuse 	
25	Sediment Management (Draft 2013)	The management of fine solid fragmented material such as silt, sand, and clay, which is suspended in or settled on the bottom of a water body; sediment is used for beach restoration, renewal of wetlands and coastal habitats, maintenance of spawning beds and riparian habitat, and is useful in agricultural applications – but excessive sediment can lead clouded water, degraded wildlife habitat, barriers to navigation, and decreased storage capacity on reservoirs, among other things	<ul style="list-style-type: none"> • Source management – preventing soil loss and movement of sediment into waterways from recreational uses, roads, grazing, farming, forestry, and construction • Sediment transport management – sand bypass structures • Sediment deposition management – deconstruction of dams, dredging 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch26_Sediment-Management.pdf
26	Watershed Management	The process of creating and implementing plans, programs, projects, and activities to restore, sustain, and enhance watershed functions	<p>(The following watershed management strategies are examples from the <i>Feather River Watershed Management Strategy</i>. Watershed management strategies are as diverse as the RMS strategies listed in this table.)</p> <ul style="list-style-type: none"> • Improving upland vegetation management • Improving water retention for baseflow in streams • Improving water quality and streambank protection • Wetland restoration • Improving groundwater and retention and storage in major aquifers 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch27_Watershed-Mgmt.pdf
Objective: People and Water				
27	Economic	Financial assistance, water pricing, and	<ul style="list-style-type: none"> • Low interest loans, grants, and water rates 	

	Incentives	water market policies intended to influence water management; economic incentives can influence the amount of use, time of use, wastewater volume, and source of supply	and rate structures <ul style="list-style-type: none"> • Free services, rebates, and the use of tax revenues to partially fund water services • Government financial assistance • Fines (economic disincentive), used to discourage undesirable water user behavior 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch28_Economic-Incentives.pdf
28	Outreach and Engagement (Draft 2013)	The use of public communication tools and practices by water agencies that provide the opportunity for public groups and individuals to contribute to positive water management outcomes	<ul style="list-style-type: none"> • The Ranch Water Quality Planning Short Course, which promotes the California Rangeland Water Quality Management Plan • Outreach and education on the Central Valley's General Order for Existing Milk Cow Dairies • The Education and the Environment Initiative (EEI) 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch29_Outreach-Engagement.pdf
29	Water & Culture (Draft 2013)	Increasing the awareness of how cultural values, uses, and practices are affected by water management, and how these have an effect on water management as well; even regulations reflect cultural values such as when water is viewed as a commodity rather than as a cultural resource	<ul style="list-style-type: none"> • Enhanced communication and consultation with local tribes on fishery, forest, and watershed issues • Consideration and incorporation of Tribal Ecological Knowledge (TEC) and cultural connections to water and water-dependent resource activities in the development of watershed management plans, policies, and water-related structures/infrastructure • Preservation and protection of historical/pre-historic features 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch30_Water-and-Culture.pdf
30	Water-Dependent Recreation	Recreation activities in or on water, including fishing, swimming, skiing, and snowboarding, waterfowl hunting, motor boating, surfing, kayaking, activities that can be enhanced by water, such as wildlife viewing (including birding), picnicking, biking, relaxing on the beach, camping, and hiking	<ul style="list-style-type: none"> • Allowing public access to all navigable waterways, lakes, and beaches • Integrating recreational components into flood management projects, climate adaptation projects, and other water-related projects 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch31_Water-Dependent-Recreation.pdf

31	Other Strategies (Draft 2013)	Management strategies that can potentially generate benefits that meet one or more water management objectives, but have limited capacity to strategically address long-term regional water planning needs	<ul style="list-style-type: none"> • Crop idling • Dew vaporization (process of humidification-dehumidification desalination) • Fog collection • Irrigated land retirement • Rainfed agriculture • Waterbag transport (diverting water in areas that have unallocated freshwater supplies, storing the water in large inflatable bladders, and towing them on the ocean by a tug boat to an alternate coastal region) 	http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch32_Other-RMS.pdf
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