# Improve Water Quality

**Improving California's Water Quality**

The Water Quality Resource Management Strategies are designed primarily to protect, enhance and improve water quality for all uses in ways that typically result in multiple benefits. While many of the strategies could be utilized to support increased supplies, environmental stewardship or a variety of other goals, the principle focus is on maintaining or enhancing quality and providing for sustainable water use.

**Included in this strategy are:**

1) **Drinking Water Treatment and Distribution**
2) **Groundwater Remediation**
3) **Matching Water Quality to Use**
4) **Pollution Prevention**
5) **Salt and Salinity Management**
6) **Urban Runoff Management**

## 1. Drinking Water Treatment and Distribution

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

## 2. Groundwater Remediation

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

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

removal of the contaminant. Extracting and treating contaminated groundwater can involve physical, chemical, and/or biological processes.

Active groundwater remediation systems that extract, treat and discharge the treated groundwater to a water body or inject it back into the aquifer are commonly termed “pump and treat” systems. Remediation systems that extract and treat contaminated groundwater for direct potable, irrigation or industrial use are commonly termed “wellhead treatment” systems. Any wellhead treatment prior to direct potable use must be permitted by the California Department of Public Health (CDPH).

## 3. Matching Water Quality to Use

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

## 4. Pollution Prevention

Pollution prevention can improve water quality for all beneficial uses by protecting water at its source and therefore reducing the need and cost for other water management and treatment options. An important pollution prevention strategy is implementation of proper land use management practices to prevent sediment and pollutants from entering the source water. By preventing pollution throughout a watershed, water supplies can be used, and reused, for a broader number and types of downstream water uses. Improving water quality by protecting source water is consistent with a watershed management approach to water resources problems. In addition, the legal doctrine of “public trust” demands that the State protect certain natural resources for the benefit of the public, including uses such as fishing, protection of fish and wildlife, and commerce, all of which are affected by pollution.

## 5. Salt and Salinity Management

Ayers and Westcot define salts as materials that “originate from dissolution or weathering of the rocks and soil, including dissolution of lime, gypsum and other slowly dissolved soil minerals.” “Salinity” describes a condition where dissolved minerals, of either natural or anthropogenic origin and carrying an electrical charge (ions), are present. In water, salinity is usually measured as electrical conductivity (EC) or total dissolved solids (TDS); and the major ionic substances found in water are calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, and nitrate. Both salinity measurement methods give an indication of how concentrated salts are in water or soils, but since mineral ions do not all carry the same electrical charge and organic dissolved solids can skew

TDS readings, these measurement methods must either be placed into context (was the sample collected in a tidal estuary, at a municipal outfall or from a domestic supply well, for example) or used in tandem with additional analyses.
With the exception of freshly fallen snow, salt is present to some degree in virtually all natural water supplies, as soluble salts in rocks and soil begin to dissolve as soon as water reaches them. Water reuse increases salinity since each use subjects the water to evaporation. If reused water passes through soil, additional dissolved salts will be picked up. Most salts provide some benefit to living organisms when present in low concentrations; however, salinity very quickly becomes a problem when consumptive use and evaporation concentrate salts to levels that adversely impact beneficial uses. Salts are essential to plant, human and animal nutrition;, salts are present in our food, in our soils and in the cleaning and personal care products we use every day; and all Californians make choices that contribute to or compensate for salinity problems, whether they are aware of it or not.

## 6. Urban Runoff Management

Urban runoff management is a broad series of activities to manage both storm water and dry weather runoff. Dry weather runoff occurs when, for example, excess landscape irrigation water flows to the storm drain. Traditionally, urban runoff management was viewed as a response to flood control concerns resulting from the effects of urbanization. Concerns about the water quality impacts of urban runoff have led water agencies to look at watershed approaches to control runoff and provide other benefits (see Box 19-1, Objectives of Urban Runoff Management), resulting in urban runoff management now being linked to other resource management strategies including Pollution Prevention, Land Use Planning and Management, Watershed Management, Urban Water Use Efficiency, Recycled Municipal Water, Recharge Area Protection, and Conjunctive Management.

# Improve Water Quality: Recommendations

**FUNDING and INCENTIVES**

**Funding: Drinking Water Treatment & Distribution**

- Additional funding should be provided to CDPH to provide increased technical assistance to small water systems related to asset management and rate setting.

- State government should continue to develop funding for small water systems and disadvantaged communities to assist in complying with drinking water standards.

- State government should continue to encourage conservation and develop additional incentives, such as expanded rebate programs, to allow water systems to reduce the waste of limited water resources.

- State government should consider providing incentives that would encourage water systems to adopt rate structures that encourage conservation and discourage the waste of water.

- The CDPH Operator Certification Expense Reimbursement Grant Program for small water system operators should be expanded to include medium size water utility operators, focusing on training for entry-level operators.

## Funding: Groundwater Remediation/Aquifer Remediation

- The State should fund and provide technical assistance to small public water systems including those located on tribal lands that rely on poor quality groundwater.

**Funding: Matching Water Quality to Use**

**Funding: Pollution Prevention**

- The State should prioritize grant funding for source water protection activities, including building institutional capacity for watershed planning and wastewater treatment facilities.

**Funding: Salt and Salinity Management**

- Collect a salt fee on wholesale water deliveries to fund mitigation of the impacts of imported and displaced salts.

- Collect an annual salt fee for water rights permits to implement mitigation for lost dilution flows, environmental salinity impacts and salinity impacts to other water rights holders.

- Collect a salt surcharge on water diversions within adjudicated basins to provide funding for projects that will restore a salt balance in the basin.

- Collect a salt fee on transfers of surface water or groundwater that adversely affect the salt balance in the basin of origin to fund mitigation actions.

- Grant and loan programs (including Prop. 84) should address salt management differently than other constituents, favoring projects that coordinate with a regional salt management plan and are supported by the entities maintaining the salt plan.

- When not explicitly prohibited by statute, public funding proposal solicitations should welcome projects with community-, watershed-, and regional-scale planning (specifically salt management planning) and water quality monitoring components.

- Award caps should be consistent with implementation of community-, watershed- and regional-scale salt management projects.

- All projects receiving state money for salt management should be required to follow appropriate quality assurance protocols and submit salt data to a publicly accessible database.

- All salt projects receiving public funding should be required to provide the awarding agency with an assurance that sufficient funding will be available to maintain the project during its life and close the project in an environmentally acceptable manner at its termination.

- The federal government must, at a minimum, ensure that all federal facilities are contributing their fair share to mitigate federal contributions to salt imbalances in California's communities, watersheds and regions. The country as a whole has an interest in California's economic and environmental well-being, so additional federal funding should be earmarked for California's salt management efforts.

- Business, industry, agriculture, development and the general public should contribute financially to sustainable salt management. Californians will be paying for salt management either reactively as rates increase, equipment wears out prematurely, food costs soar (loss of farmland means higher transportation costs for imports), fish and wildlife habitat is lost and business and development opportunities disappear as operations leave the area for states with more favorable water conditions; or proactively, through adequate, continuous funding of sustainable salt management. With so much at stake on a statewide, community and personal level, funding for salt management cannot be solely a State or federal responsibility.

**Funding: Urban Runoff Management**

- Lead by example by incorporating LID into projects to showcase the use, utility and cost of the features. Site design should be given the same attention that indoor environmental quality, energy usage, etc., are given in the design, funding and construction of public projects.

- Provide funding and develop legislation to support development of urban runoff and watershed management plans, enable local agencies and organizations to pursue joint venture, multipurpose projects, and collect information on regional urban runoff management efforts.

**RESEARCH/ DATA DEVELOPMENT**

**Research/Data Development: Drinking Water Treatment & Distribution**

- State government should support research and development of new treatment technologies through expansion of the funding provided through Proposition 50 for demonstration of new treatment technologies. Additional program funding is also needed by CDPH to adequately address the review and acceptance of these new treatment technologies.

**Research/Data Development: Groundwater Remediation/Aquifer Remediation**

- The State should establish and support research funding at California universities for wellhead treatment systems.

- The State should establish and support research for detecting emerging contaminants by commercial laboratories.

**Research/Data Development: Matching Water Quality to Use**

- The State, local agencies, and regional planning efforts should review potential impacts on streams by projects aimed at eliminating discharge of wastewater or causing changes to the natural timing and quality of water and make recommendations on how to mitigate these impacts.

- The State should support research into solutions to the potential conflicts between ecosystem restoration projects and the quality of water for drinking water purposes.

**Research/Data Development: Pollution Prevention**

- The CWQMC should include a focus on emerging, unregulated contaminants in order to provide an early warning system of future water quality problems, as well as identify trends in water quality using multiple indicators of health. Drinking water supplies should have

outcome-based monitoring, such as bio-monitoring and waterborne disease outbreak surveillance.

**Research/Data Development: Salt and Salinity Management**

- Additional options for salt collection, salt treatment, salt disposal and long-term storage of salt must be developed. University researchers should work with regulatory agencies and stakeholders to identify environmentally acceptable and economically feasible methods of closing the loop on salt for areas of the state that do not currently have sustainable salt management options. Funding for this sort of research should be prioritized to ensure that areas with the greatest needs (i.e. high salt and few or no feasible management options) are targeted first.

**Research/Data Development: Urban Runoff Management**

- Assist agencies with developing recharge programs with appropriate measures to protect human health, the environment, and groundwater quality.

**GOVERNANCE: POLICY AND LAW**

**Governance: Policy and Law: Drinking Water Treatment & Distribution**

- The legislature should take steps necessary to develop a more sustainable source of funding of water supply, water treatment, and infrastructure projects to ensure a safe and reliable supply of drinking water for individuals and communities.

- State government should support enactment of a federal water infrastructure trust fund act that would provide a reliable source of federal assistance for the construction and repair of water treatment plants.

- The legislature should develop a reauthorization bill to extend the funding benefits of both Proposition 50 and Proposition 84 for drinking water systems.

- CDPH should evaluate the inclusion of funding for water meters for each water system service connection for all drinking water projects funded under the DWSRF program, Proposition 50 and Proposition 84. Additional funds may need to be allocated for this purpose from future water bonds.

- The legislature should establish a requirement for all public water systems (whether in urban areas or other areas of the state) to install a meter on each service connection and charge a metered rate for actual volume of water used.

- The legislature should adopt statutes authorizing the development of regulations addressing the use of POU treatment for small water system applications for some specific contaminants.

**Governance: Policy and Law: Groundwater Remediation/Aquifer Remediation**

- The Legislature should fund State regulatory agencies to: (a) identify historic commercial and industrial sites with contaminant discharges and (b) identify viable responsible parties to investigate and remediate those sites.

**Governance: Policy and Law: Matching Water Quality to Use**

**Governance: Policy and Law: Pollution Prevention**

- Regional, Tribal, and local governments and agencies should establish drinking water source and wellhead protection programs to shield drinking water sources and groundwater recharge areas from contamination. These source protection programs should then be incorporated into local land use plans and policies.

**Governance: Policy and Law: Salt and Salinity Management**

- Over the next 5 years, entities with water policymaking authority should review existing policies, including those related to water use efficiency and funding of water projects, for consistency with sustainable salt management. Revisions should be made where necessary to ensure consistency with long-term sustainability objectives. Effective salt management is not a stand-alone strategy, but should be paired with other strategies. Every water use, water reuse, and waste disposal decision should include consideration of how the decision will affect the local and regional salt balance. Projects that propose to introduce saline water that will eventually mix with groundwater should be evaluated in the context of the basin's assimilative properties and California's anti-degradation policy.

**Governance: Policy and Law: Urban Runoff Management**

- Coordinate their efforts to develop appropriate site design requirements that can be incorporated into either local building codes or statewide building standards.

- Work with federal policy makers and industry to create research and development incentives and to develop standards to reduce urban runoff from transportation related sources including lubricant systems, cooling systems, brake systems, tires, and coatings.

**EDUCATION/OUTR EACH**

**Education/Outreach: Drinking Water Treatment & Distribution**

- California’s regulatory agencies, such as the State Water Resources Control Board and California Department of Public Health, must be able to maintain internship programs for college students to continue the interest of the next generation in the water and environmental regulatory agencies.

- CDPH should develop a partnership with the Employment Development Department (EDD) to establish an employment and training program for water utility operators. This should include development of a retraining program to fill the coming shortage of workers in the public/private water sector.

**Education/Outreach: Groundwater Remediation/Aquifer Remediation**

**Education/Outreach: Matching Water Quality to Use**

**Education/Outreach: Pollution Prevention**

- The Department of Water Resources should collaborate with the State Water Board to integrate the Basin Plans and other statewide water quality control plans and policies into a comprehensive Water Quality Element of the Water Plan.

**Education/Outreach: Salt and Salinity Management**

- Salt moves with water; therefore, effective salinity management must address the routes water takes within and between basins. Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) is an initiative aimed at developing and implementing sustainable regional salinity management plans for the Delta and Central Valley regions. Because water operations in the Delta and Central Valley and the beneficial uses the operations support are critical to the State, policy makers and stakeholders should support and participate in the CV-SALTS effort. (See Case Study 3 [Box 18-3]). Salinity stakeholder groups should conduct outreach aimed at educating specific target audiences with the ability to influence salinity decisions (legislature, interest groups, general public, etc.) about the need for sustainable salinity management.

**Education/Outreach: Urban Runoff Management**

- Coordinate their efforts to develop a single message to the public and local government regarding managing urban runoff through the use of Low Impact Development (LID) techniques.

- Maintain a publicly accessible clearinghouse of information regarding practices that can be used to address water quality issues associated with urban runoff management.

- State agencies should work with local government to seek legislative fixes to the limitations imposed by Prop 218.

- Work with the development community to identify opportunities to address urban runoff management, including LID, in development and redevelopment projects.

- Communicate with citizens about pollution of urban runoff and what can be done about it.

- Create lists of locally accepted practices that could be used at the homeowner level to address urban runoff.

- Understand how land use affects urban runoff.

- Communicate with other municipalities regarding how land use will change the hydrologic regime on a regional basis and how this change is being addressed.

- Look for opportunities to require features that conserve, clean up, and reduce urban runoff in new development, and in more established areas, when redevelopment is proposed.

- Be aware of technological advances in products and programs through communications with other municipalities, branches of local government and with professional organizations.

- Learn about urban runoff and watershed ordinances already in place. For example, the city of Santa Monica and the Fresno Metropolitan Flood Control District already have extensive urban runoff management programs in place.

- Integrate urban runoff management with other resource strategies including land use planning, watershed planning, water use efficiency, recycled water, protecting recharge areas, and conjunctive management, and coordinate both within and across municipal boundaries.

- Be sensitive to the fact there are going to be sites where it is not appropriate to infiltrate urban runoff and storm water flows.

- Integrate urban runoff management with development goals and strategies in the community.

- Review codes and ordinances to determine if there are impediments to managing urban runoff and amend these as needed or appropriate.

- Coordinate urban runoff management with local water purveyors to ensure the goals and activities each complement rather than conflict.

- Seek opportunities to provide incentives for the installation of LID features at the lot level for new and existing developments.

**PLANNING**

**Planning: Drinking Water Treatment & Distribution**

- CDPH should work closely with public water systems to quantify the total needs for water system infrastructure improvement and replacement.

**Planning: Groundwater Remediation/Aquifer Remediation **

- State agencies should assist local governments, tribes, and local agencies to implement source water protection measures based on the source water assessments that were completed as of 2003 to protect recharge areas from contamination and prevent future contamination.

- State agencies should assist local agencies and tribes with authority over land use to prevent contamination of recharge areas.

- Local government, tribes and local agencies with responsibility over land use should limit potentially contaminating activities in areas where recharge takes place and work together with entities which propose potentially contaminating activities to develop a sustainable good quality, long-term water supply for beneficial uses.

**Planning: Matching Water Quality to Use**

- The State should support the development of salt management plans for all watersheds where salt is a constituent of concern.

- The State and local agencies should better incorporate water quality into reservoir, Delta, and local water supply operations, as well as facility reoperation and construction. For example, the timing of diversions from the Delta, and thereby the concentrations of salinity and organic carbon in those waters, could be better matched to domestic, agricultural, and environmental uses. Alternatively, the timing and location of urban and agricultural discharges to water sources, including the Delta, could also be coordinated with the eventual use of water conveyed by potentially impacted diversions. Facilities conveying municipal and industrial water could also be separated from those conveying water for irrigation.

- The State, local water agencies, and regional planning efforts should manage water supplies to optimize and match water quality to highest possible use (eg. drinking water) and appropriate treatment technology.

- Consistent with the watershed-based source-to-tap strategy recommended in the Pollution Prevention chapter, the State should help facilitate system-wide partnerships between upstream watershed communities and downstream users along the flow path, in order to seek ways to better match water quality to use. Ongoing IRMP efforts are facilitating system-wide partnerships to better match water quality to use

**Planning: Pollution Prevention**

- Identify communities that rely on groundwater contaminated by anthropogenic sources as their drinking water source, and take appropriate regulatory or enforcement action against the responsible party. Address improperly destroyed, abandoned, or sealed wells in these communities that may serve as potential pathways for contaminants to reach groundwater.

**Planning: Salt and Salinity Management**

- An implementation strategy for offsetting/reducing salt loads relocated to salt-stressed interior basins as a result of water project operations

- A funding strategy that supports the implementation strategy

- A stakeholder participation process to increase the likelihood of successful, collaborative salt management within water project service areas and to ensure transparency in project planning and implementation.

- A monitoring program to track the success of the implementation strategy

- An adaptive management strategy that will ensure the plan can be modified to respond to climate change, drought, catastrophes and other changes appropriately

- Investigation of the feasibility of constructing a California Brine Line roughly along the same north-south alignment as the proposed high-speed rail transportation corridor to

convey salt from the interior of the state to existing ocean discharge points in Southern California.

**Planning: Salt and Salinity Management**

**Planning: Urban Runoff Management**

- Coordinate their efforts to decide how urban runoff management should be integrated into their workplans.

- Provide leadership in the integration of water management activities by assisting, guiding, and modeling watershed and urban runoff projects.

- Work with local government agencies to evaluate and develop ways to improve existing codes and ordinances that currently stand as a barrier to implementing and funding urban runoff management.

- Seek opportunities to include Low Impact Development techniques in public works projects.

**OTHER**

**Other: Drinking Water Treatment & Distribution**

- Additional programs should be developed to encourage regionalization and consolidation of public water systems. Regionalization and consolidation are useful both in achieving compliance with water quality standards and in providing an adequate economy of scale for operating and maintaining existing facilities as well as planning for future needs.

- In view of the increased costs and other issues associated with disposal of residual wastes, water systems should fully evaluate residual disposal issues in the planning of new water treatment facilities.

- All public water systems should be encouraged to join the California WARN program. This program will be able to provide mutual aid and assistance more quickly than the normal resource requests through SEMS. CDPH will encourage this recommendation as part of security training and emergency response exercises conducted with water utilities.

- The control of pharmaceuticals and personal care products in our environment should be addressed initially via source control programs and reduction through wastewater treatment.

**Other: Groundwater Remediation/Aquifer Remediation**

**Other: Matching Water Quality to Us**

- The State should facilitate and streamline water quality exchanges that are tailored to better match water quality to use, while mitigating any adverse third-party impacts of such transfers including the increase or decrease in net energy use and greenhouse gas emissions.

- To facilitate water reuse downstream, the State should encourage upstream users to minimize the impacts of non-point urban and agricultural runoff and treated wastewater discharges.

**Other: Pollution Prevention**

**Other: Salt and Salinity Management**

- The State and federal water project operators should implement projects that will allow the state's communities, watersheds and regions to achieve a sustainable salt balance. Public interests should work with industry, environmental interests, agriculture and other stakeholder groups to develop both long term and interim salt management projects so that salts are safely collected, stored and managed over the short term and disposed in an environmentally acceptable manner over the long term. Options that should be considered include but are not limited to:

- Avoid/minimize salt importation

- Upgrade existing conveyance structures, and if planning efforts determine that new structures are warranted, invest in new structures to safely collect, transport and dispose of salts.

- Invest in research and development of environmentally acceptable means of storing salts for extended periods (decades) and sequestering salts (100+ years). Research should include identification of areas within the state where such facilities can be sited with least environmental impacts.

- Additional research into more feasible means of utilizing collected salts should be encouraged.

- Displaced salt impacts should be acknowledged and mitigated. Mitigation could involve ceasing the activity that is causing the impact or provision of financial assistance to help the impacted community deal with the problem on an ongoing basis, or mitigation might take some other form as agreed to by the parties dealing with the salt impact and those causing it.

**Other: Urban Runoff Management**

- Design recharge basins to minimize physical, chemical, or biological clogging, periodically excavate recharge basins when needed to maintain infiltration capacity, develop a groundwater management plan with objectives for protecting both the available quantity and quality of groundwater, and cooperate with vector control agencies to ensure the proper mosquito control mechanisms and maintenance practices are being followed.