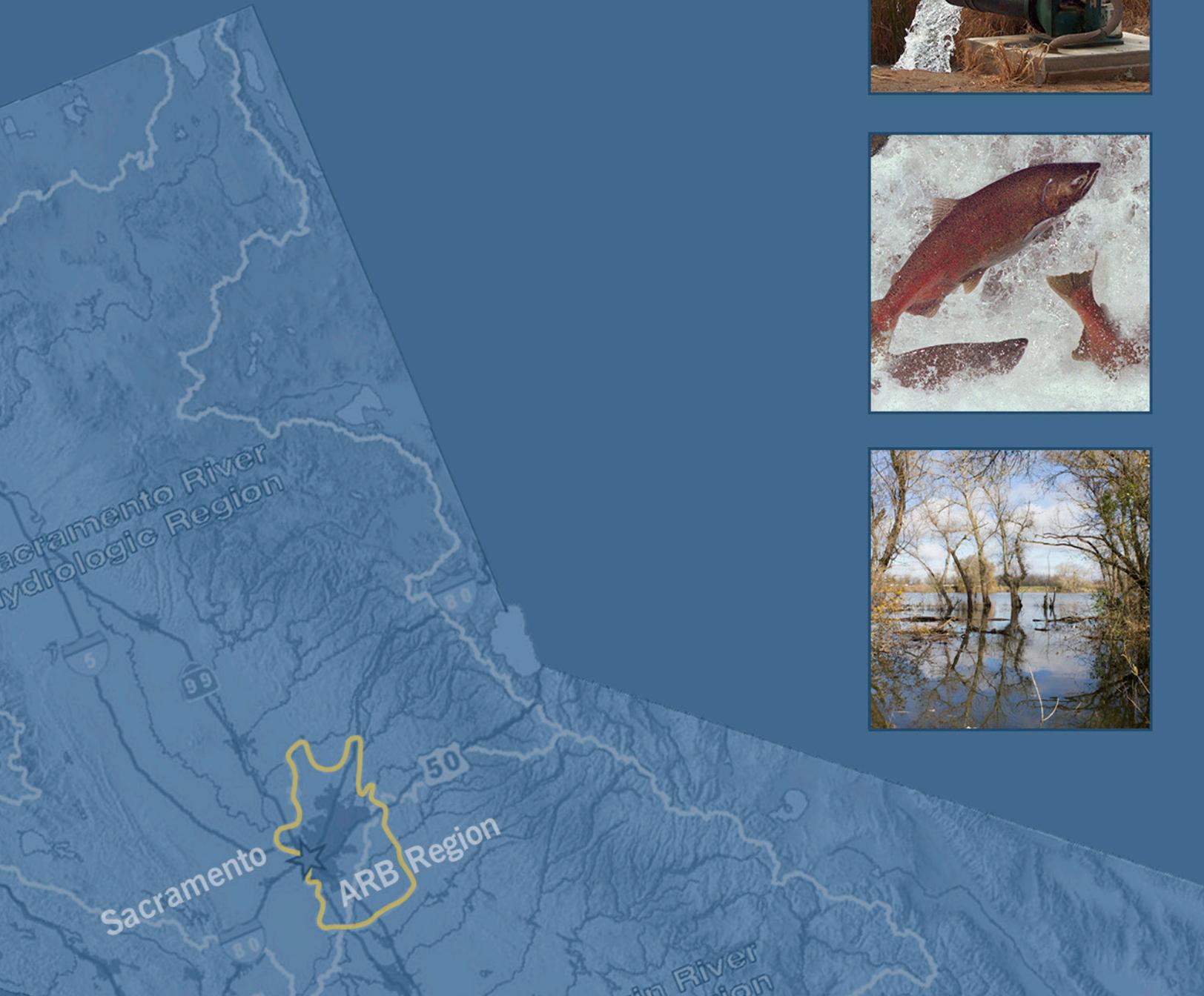


APPENDIX C

Climate Change Vulnerabilities and Water Agency Mitigation Actions



Appendix C. CLIMATE CHANGE VULNERABILITIES AND WATER AGENCY MITIGATION ACTIONS

Appendix C includes a checklist of climate change vulnerabilities identified in the American River Basin (ARB) Region as well as the results of a survey that involved water supply and sanitation agencies within the Regional Water Management Group (Regional Water Authority) asking about their climate change mitigation efforts. This appendix supports **Section 2.10** of the main Integrated Regional Water Management Plan (IRWMP) document.

C.1. Vulnerability Checklist

The *Climate Change Handbook for Regional Water Planning* (U.S. Environmental Protection Agency/California Department of Water Resources [DWR] 2011) provides a useful checklist for qualitatively determining areas of potential vulnerability within the Region. Indicators of potential vulnerability include currently observable climate impacts, presence of climate-sensitive features, and adaptive capacity of regional resources.

Prioritization of vulnerabilities was accomplished qualitatively, with issues assigned a low, medium, or high priority. Prioritization was conducted based on three factors:

1. Information provided by stakeholders based on two meetings to discuss climate change mitigation and adaptation. These meetings were held on March 25, 2011, and May 9, 2011.
2. The assessed likelihood of vulnerabilities based on checklist responses.
3. ARB regional values, as represented by the vision and goals, principles, and objectives (see **Section 5**).

The results of applying the vulnerability checklist to the ARB Region and prioritizing these identified vulnerabilities are presented in **Table C-1**.

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Table C-1. Climate Change Vulnerability Checklist and Prioritization

| Question | Response | Priority | Justification | Vulnerability |
|---|----------|----------|---|--|
| I. Water Demand | | | | |
| Are there major industries that require cooling/process water in your planning region? | Yes | Low | The largest water-intensive industry in the Region is agriculture. | Increased potential for summer water shortage. |
| Does water use vary by more than 50% seasonally in parts of your region? | Yes | High | Summer months are as much as 50% higher than the average month and winter months are as much as 50% lower than the average month. Warming temperatures and increased extreme events will likely exacerbate summer demand. | Increased potential for summer water shortage. |
| Are crops grown in your region climate sensitive? Would shifts in daily heat patterns, such as how long heat lingers before nighttime cooling, be prohibitive for some crops? | Yes | High | A variety of crop types are grown in the Region, including row crops, tree crops, and irrigated grains. Agricultural production in Sacramento County has a value of approximately \$300 million dollars (Sacramento County Department of Agriculture 2002). Many of these crops are sensitive to climate change (Sacramento County Climate Action Plan 2011). | Increased potential for summer water shortage. |
| Do groundwater supplies in your region lack resiliency after drought events? | No | Low | Groundwater supplies in the Region have proved resilient after past drought events. | N/A |
| Are water use curtailment measures effective in your region? | Yes | Low | Water conservation BMPs are used effectively throughout the Region, as detailed in various UWMPs. | Potential for demand hardening and limited opportunities for further conservation. |
| Are some in-stream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet? | No | Low | Minimum in-stream flow requirements are generally met in both the American River and the Sacramento River. However, climate change is expected to place additional stress on summer low flows. | Reduced summer low flows. |
| II. Water Supply | | | | |
| Does a portion of the water supply in your region come from snowmelt? | Yes | Medium | American River runoff from April through July is dominated by snowmelt. This provides water supply throughout the dry summer and fall. | Reduced water supply reliability. |
| Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region? | No | N/A | Currently, there is no use of imported water in the Region, and use of this supply is not anticipated in the future. | N/A |
| Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past? | No | N/A | There are no coastal aquifers within the Region. | N/A |
| Would your region have difficulty in storing carryover supply surpluses from year to year? | Yes | Medium | Current regional reservoir operating conditions limit storage opportunities during winter runoff season; increased winter runoff would not necessarily translate into increased storage of water leading into the spring season. In the ARB Region, the ratio of storage to annual runoff is approximately 0.64, indicating that this is likely to be the case (Roos 2005). In addition, less spring snowmelt could make it more difficult to refill winter reservoir flood control space during late spring and early summer of many years, which could potentially reduce the amount of surface water available during the dry season (Roos 2005). Conversely, storage capture of snowmelt runoff has traditionally occurred during the late spring and early summer seasons. Reductions in runoff during these seasons likely would translate into reductions in storage capture and, likewise, reductions in water supply for warm season delivery. | Reduced water supply reliability. |
| Has your region faced a drought in the past during which it failed to meet local water demands? | No | High | The Region has not failed to meet local water demands during drought years. However, the potential effects of climate change make this a possibility. The Region is projected to have more frequent, longer, and more-extreme heat waves and longer periods of drought (Sacramento County 2011). | Reduced water supply reliability. |
| Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas? | Yes | Medium | Invasive species, including various nonnative fish and plant species, are an ongoing issue within the Region (Appendix B). | Invasive species impacts on infrastructure. |

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Table C-1. Climate Change Vulnerability Checklist and Prioritization (contd.)

| Question | Response | Priority | Justification | Vulnerability |
|---|----------|----------|--|--|
| III. Water Quality | | | | |
| Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby that could pose a water quality concern from increased erosion? | No | Low | Increased frequency of wildfires is a relatively low threat in this Region (CEC 2011). However, Folsom reservoir could be vulnerable to water quality impairments resulting from increased erosion. | Reduced beneficial use of water from degraded water quality. |
| Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change? | Yes | High | Surface water bodies in the Region do not have current water quality issues related to eutrophication. However, surface water temperature in the Region is highly likely to rise and adversely impact beneficial uses in the Region. Additionally, several water bodies have beneficial uses impaired by invasive species, which are likely to be exacerbated by climate change (State Water Resources Control Board 2012). | |
| Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity? | No | Medium | Seasonal low-flows are not currently decreasing; however this is a potential impact from climate change. | |
| Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues? | Yes | Low | Beneficial uses on surface water bodies throughout the Region are listed as impaired on the CWA 303 (d) list for various water quality constituents, including mercury and pesticides. Climate change may increase impairments of beneficial uses in the Region's surface water bodies. | |
| Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation? | Yes | Medium | Disinfectant byproduct precursors tend to spike during storm events (DWR 2001). Storm events currently contribute to high turbidity in area rivers and streams (Sacramento County, et. al. 2010). | |
| IV. Sea-Level Rise | | | | |
| Has coastal erosion already been observed in your region? | No | N/A | The Region does not contain any coastal areas. | N/A |
| Are there coastal structures, such as levees or breakwaters, in your region? | Yes | High | There are tidally influenced levees on the Sacramento River on the western boundary of the Region. | Increased tidal flood risk. |
| Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than 6 feet above mean sea level in your region? | Yes | Medium | There is infrastructure adjacent to the lower Sacramento River that is at or near 6 feet above mean sea level, including transportation (Interstate 5), residences, and recreational facilities. | |
| Are there climate-sensitive low-lying coastal habitats in your region? | No | N/A | There are no coastal habitats within the Region. | N/A |
| Are there areas in your region that currently flood during extreme high tides or storm surges? | No | Medium | The areas adjacent to the lower Sacramento River do not currently flood during extreme high tides alone, but are threatened when extreme high tides occur in conjunction with extreme storm events. | Increased tidal flood risk. |
| Is there land subsidence in the coastal areas of your region? | Yes | Low | Land has subsided from 0 to 10 feet below mean sea level in limited areas along the lower Sacramento River in the southwestern portion of the Region (USGS 2000). | |
| Do tidal gauges along the coastal parts of your region show an increase over the past several decades? | Yes | Low | In recent decades, the mean sea level trend has been an increase of 2.08mm/year at the nearest tidal gage to the Region (Port Chicago, located in the San Francisco Bay) (NOAA 2012). | |

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Table C-1. Climate Change Vulnerability Checklist and Prioritization (contd.)

| Question | Response | Priority | Justification | Vulnerability |
|--|----------|----------|---|--|
| V. Flooding | | | | |
| Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/ . | Yes | High | Major Infrastructure in floodplains includes major Interstate highways and water/wastewater infrastructure (DWR 2012b). | Increase riverine flood risk. |
| Does part of your region lie within the Sacramento-San Joaquin Drainage District? | Yes | High | The Region lies entirely within the Sacramento-San Joaquin Drainage District. | |
| Does aging critical flood protection infrastructure exist in your region? | Yes | High | Major metropolitan areas, small communities, and rural areas are protected by aging levees, weirs, bypasses, and other flood management infrastructure. An inventory of the infrastructure deficiencies is detailed in the Flood Control System Status Report (DWR 2011). | Increase riverine flood risk. |
| Have flood control facilities (such as impoundment structures) been insufficient in the past? | Yes | Medium | Portions of the Region are vulnerable to five flood types: localized flooding, riverine flooding, flash flooding, levee overtopping/failure, and dam failure. | |
| Are wildfires a concern in parts of your region? | Yes | Low | Wildfires are a low priority concern, and, per Cal-Adapt are not likely to become a substantially higher priority concern in the near future. | |
| VI. Ecosystem and Habitat Vulnerability | | | | |
| Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues? | Yes | Medium | Wetland and riverine habitats are vulnerable to erosion and sedimentation issues. | Increased adverse impacts to habitats and species. |
| Does your region include estuarine habitats that rely on seasonal freshwater flow patterns? | Yes | Low | The Delta portion of the Region relies on seasonal freshwater flow patterns. | |
| Do climate-sensitive fauna or flora populations live in your region? | Yes | High | Climate sensitive populations include salmonid species, migratory bird species, and wetland species (CEC 2008) | |
| Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region? | Yes | High | Yes, a number of state-listed and federally listed threatened and endangered species exist in the Region (Appendix B). Changes in aquatic and terrestrial ecosystems have already been observed (DWR 2009). | |
| Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities? | Yes | Low | Boating, hunting, fishing, and bird watching are important recreational and economic activities that rely on aquatic or water-dependent habitats in the Region. | |
| Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life? | Yes | High | The American River and the Lower Sacramento River have quantified environmental flow requirements. The majority of waters in the Region are listed on the CWA 303(d) list for impairments to aquatic habitat beneficial uses. | |
| Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region? | Yes | Low | The Bay-Delta estuary, marshes, and seasonal and emergent wetland habitats exist in the Region, particularly in the southwestern portion. However, coastal storms are not frequent in the Region. | |
| Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change (http://www.itsgettinghotoutthere.org/)? | Yes | High | The Region contains portions of two Endangered Species Coalition's Top 10 vulnerable habitats: the Bay-Delta and the Sierra Nevada. | |
| Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement? | Yes | Medium | The combined effect of various stressors has fragmented and/or eliminated extensive areas of wetland and riparian habitat and impeded movement corridors (DWR 2012b). | |

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Table C-1. Climate Change Vulnerability Checklist and Prioritization (contd.)

| Question | Response | Priority | Justification | Vulnerability |
|--|----------|----------|--|---|
| VII. Hydropower | | | | |
| Is hydropower a source of electricity in your region? | Yes | Low | Folsom Lake and Camp Far West Reservoir provide hydroelectric power for the Region. | Potential decrease in hydropower potential. |
| Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region? | Yes | Low | Based on data collected by SACOG in 2012, the Region's population is expected to continue to grow significantly between now and 2025. Sacramento County is expected to grow about 37% between 2008 and 2035, Placer County is expected to grow about 49%, and El Dorado County is expected to grow about 24%. As a whole, the three-county Region (excluding the Tahoe basin) is expected to grow about 38%, with the most aggressive growth occurring between 2020 and 2035 (Section 2.5.2). | |

Key:
 ARB = American River Basin
 Bay-Delta = Sacramento-San Joaquin River Delta and San Francisco Bay
 BMP = Best Management Practices
 CEC = California Energy Commission
 CWA = Clean Water Act
 Delta = Sacramento-San Joaquin River Delta
 DWR = California Department of Water Resources
 IRWMP = Integrated Regional Water Management Plan
 N/A = not available/ not applicable
 NOAA = National Oceanic and Atmospheric Administration
 SACOG = Sacramento Area Council of Governments
 USGS = U.S. Geological Survey
 UWMP = Urban Water Management Plan

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C.2. ARB Water Agency Mitigation Actions

Many counties and cities in the ARB Region have developed climate change mitigation and adaptation plans, as described in **Section 2.10**. Because water supply and treatment systems are heavy energy users and have high greenhouse gas (GHG) emissions, several water supply and wastewater treatment agencies have also been engaged in climate change mitigation efforts. These agencies were sent a survey to document the existing and future efforts for inventorying and reducing GHG emissions from water and wastewater operations. Eight agencies filled out the survey, the results of which are presented in **Table C-2**. This list of mitigation actions is not exhaustive, but rather highlights some of the major components of ARB water agency efforts, in terms of GHG inventories, reduction in energy consumption, renewable energy, carbon offsets, and other mitigation-related actions.

Table C-2. Survey Responses Regarding Mitigation Actions Within the Region

| Agency | GHG Inventory | Reduction in Energy Consumption | Renewable Energy | Carbon Offsets | Other Mitigation-Related Actions |
|-------------------------------|---|--|---|--|--|
| City of Sacramento | The City participated in a county-wide GHG inventory of community-wide GHG in 2009 (baseline year: 2005), and is currently updating that inventory. | <p>Past Actions:</p> <ul style="list-style-type: none"> • Established and Energy Efficiency Revolving Loan Program for City Facilities (formerly known as Performance Contracting): City facility assessments have resulted in ten Energy Conservation Measures being evaluated and engineered at Sam Pannell Community Center, Central Library, and the Downtown Plaza Parking Garage. Building permits, equipment orders and installation will be forthcoming in 2011 funded through the Energy Efficiency and Conservation Block Grant Program of the American Recovery and Reinvestment Act of 2009. • Established Property Assessed Clean Energy Program (PACE): The City entered into an agreement with Ygrene Energy Fund in 2012 to develop and administer a PACE program. The Clean Energy Sacramento program was launched in early 2013. The program provides privately funded financing to local property owners for energy efficiency, renewable energy, and water conservation upgrades at no upfront cost. To date, \$9.2 million has been invested into projects that are either approved or under construction, and more than \$1.0 million has been invested in construction that will be complete by the end of June. <p>Planned Actions:</p> <ul style="list-style-type: none"> • Implement PACE program for at least 5 years. Continue to improve performance of City facilities. | Solar for City Buildings: The City is currently in negotiations with SolarCity to develop a Power Purchase Agreement and Service Level Agreement for installation up to five megawatts of solar on City facilities. | The Convention Center has purchased carbon offsets for events. | <p>Past Actions:</p> <ul style="list-style-type: none"> • Adoption of Sacramento Climate Action Plan on Feb. 14, 2012. <p>Planned Actions:</p> <ul style="list-style-type: none"> • Implementation of Climate Action Plan measures and actions. Please note that we are also in the process of integrating the Climate Action Plan into the 2035 General Plan. |
| Del Paso Manor Water District | N/A | N/A | N/A | N/A | N/A |

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Table C-2. Survey Responses Regarding Mitigation Actions Within the Region (contd.)

| Agency | GHG Inventory | Reduction in Energy Consumption | Renewable Energy | Carbon Offsets | Other Mitigation-Related Actions |
|-------------------------------|--|--|---|----------------|----------------------------------|
| El Dorado Irrigation District | Registered for California Climate Action Registry in 2007. Developed and reported GHG Inventory for a few years but the District discontinued this effort in 2010. | <p>Past Actions:</p> <ul style="list-style-type: none"> • Participate in PG&E Demand Response Programs for El Dorado Hills raw water pump station and El Dorado Hills Wastewater Treatment Plant (i.e., Peak Day Pricing, Demand Bidding) • Constructed additional water storage at Oak Ridge Tanks to reduce energy costs (pumping) during peak demands • Purchased and operate several hybrid vehicles as part of fleet <p>Planned Actions:</p> <ul style="list-style-type: none"> • Continue PG&E Demand Response Programs • Implement plan to develop gravity water supplies to eliminate additional pumping costs from Folsom Lake as water demands increase | <p>Past Actions:</p> <ul style="list-style-type: none"> • Operate a 20 MW hydroelectric power plant (FERC Project 184) • Installed and operate a 1 MW solar photovoltaic (PV) system at the El Dorado Hills Water Treatment Plant since 2004. • Participated in study to evaluate in-conduit hydroelectric options within the water system. • Board approved design contract for a 370 kW in-conduit hydroelectric facility at Reservoir 7 <p>Planned Actions:</p> <ul style="list-style-type: none"> • Construction of 370 kW in-conduit hydroelectric facility at Reservoir 7 • Evaluation of expansion of solar PV systems at EDHWWTP and Deer Creek Wastewater Treatment Plant • Evaluation of expansion of in-conduit hydroelectric facilities at Reservoir 3 and Reservoir B | N/A | N/A |

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Table C-2. Survey Responses Regarding Mitigation Actions Within the Region (contd.)

| Agency | GHG Inventory | Reduction in Energy Consumption | Renewable Energy | Carbon Offsets | Other Mitigation-Related Actions |
|----------------------------|---|---|---|--|---|
| Placer County Water Agency | <p>The PCWA Board of Directors has a strong interest in being a regional leader among water agencies on the issues of climate change, carbon footprint, greenhouse gas emissions, and energy efficiency, just as it has been with water use efficiency.</p> <p>In late 2007 and early 2008, the PCWA Board of Directors had discussions concerning energy efficiencies and cost containment strategies which led to funding efforts for PCWA's <i>Energy and Greenhouse Gas Benchmark Study</i>. PCWA officials wanted to gain a more thorough understanding of the energy use by PCWA, the energy costs that are embedded in the costs of water delivery, and the implications of climate change to PCWA. This study was completed in July 2009 and gave background information, benchmarked PCWA's energy use, inventoried GHG emissions, and developed energy and GHG emissions options.</p> <p>Since that time, PCWA has voluntarily reported years 2006—2008 GHG emissions to the California Climate Action Registry. In 2009 the Climate Action Reserve became the parent company of the California Climate Action Registry. PCWA began reporting GHG emissions for years 2009—present to its sister company, The Climate Registry, which tracks entity-wide GHG emissions inventory reporting and verification for all of North America.</p> | <p>Past Actions: This is a summary of the existing energy conservation measures currently being utilized at PCWA. These measures include the use of efficient motors, electrical load management, and water storage, and the practice of a conservation ethic within PCWA.</p> <ul style="list-style-type: none"> • Premium efficient motors and right sizing pumps are being utilized at several facilities. PCWA currently utilizes Variable Frequency Drive (VFD) motors at many of the major water treatment plants (WTPs) and pump stations. The utilization of VFD technology allows an electric controller to adjust the speed of an electrical motor by modulating the frequency of electrical power being delivered. VFD's provide continuous controls, matching motor speed to the specific demands of the amount of pumping being performed. VFD's have "soft start" capability that gradually ramp up the motor to operating speed, which lessens the startup electrical load. • Energy efficient motors are utilized at the Auburn and Foothills WTP. Energy efficient motors, also called premium or high-efficiency motors, are on average up to 8% more efficient than standard motors. These motors meet or exceed the efficiency levels listed in the National Electric Manufacturers Associations MG1-1993 publication. • PCWA implements vehicle fuel efficiency measures for example: retires old and under-used vehicles, purchases fuel efficient (e.g., hybrid) and/or smaller fleet vehicles, implements engine idling reduction programs and installs automatic idle shut-offs. • Energy smart lighting and electrical load management are being utilized to reduce energy consumption during peak demand periods. Electrical load management has also been used in shifting electrical loads to off-peak schedules. Reducing operational functions, unnecessary lighting, heat, ventilation and air conditioning (HVAC), and pumping during peak hours are ways PCWA has performed electrical load management to reducing electrical energy consumptions. Electrical load management is being performed at the staff level. PCWA staff is making a conscious effect in electricity conservation awareness. Staff members are making sure lights in office complexes and other buildings are turned off when there is no occupancy. Use of HVAC is minimized when building space is unoccupied. HVAC and lighting use is minimized for nominal usage during working hours. Electricity use at the PCWA Business Complex, the Auburn, Bowman, and Foothill WTPs, and unoccupied or partial use facilities benefit from conservation awareness. • Water storage and gravity flow operations are utilized to reduce energy consumption. Water storage is currently being utilized throughout PCWA water systems providing raw and treated water storage for providing adequate system pressure and eliminating the need for numerous booster pump stations. Water storage provides PCWA the ability to pump and store water during off-peak hours. Gravity flow operations allow PCWA to capture water from high elevations and transport the water through canal systems to water storage or WTPs without the assistance of pumps. <p>Planned Actions:</p> <ul style="list-style-type: none"> • Electricity, gasoline, and diesel use account for approximately 95% of PCWA GHG emissions. Consequently, PCWA planned efforts to reduce energy include electricity conservation measures and solar photovoltaic installation. • Vehicle efficiency and operational efficiency can be increased in the future by converting to new, more efficient technologies as they become available. | <p>Past Actions:</p> <ul style="list-style-type: none"> • PCWA currently has solar panels on its Business Center to offset the energy usage of its main office. <p>Planned Actions:</p> <ul style="list-style-type: none"> • PCWA is currently in the process of constructing solar photovoltaic panels and small hydroelectric electricity generation facilities. • PCWA is installing solar photovoltaic panels at three facilities. Additional photovoltaic panels are planned as it becomes more economically feasible. • In-conduit hydroelectric facilities are planned for two of PCWA facilities. The incorporation of hydroelectric generation equipment in pipelines and other PCWA sites will provide PCWA with a source of "Green Energy." There are plans to install additional small hydroelectric facilities at several PCWA facilities in the future. | <p>PCWA is a member of The Climate Registry, and that organization may adopt verification standards in the future for offsets.</p> | <p>Past Actions:</p> <ul style="list-style-type: none"> • PCWA generates electricity at five hydropower facilities, generating electricity without emitting GHG into the atmosphere. Electricity generated by PCWA hydropower is used by PCWA and other PG&E electrical customers. If PG&E were to replace PCWA generated hydropower from another source, the other source could have associated GHG emissions. <p>Planned Actions:</p> <ul style="list-style-type: none"> • PCWA will continue to investigate energy efficiency funding opportunities such as utility rebates and government programs. |

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Table C-2. Survey Responses Regarding Mitigation Actions Within the Region (contd.)

| Agency | GHG Inventory | Reduction in Energy Consumption | Renewable Energy | Carbon Offsets | Other Mitigation-Related Actions |
|---|---------------|---------------------------------|------------------|----------------|----------------------------------|
| Rio Linda/ Elverta Community Water District | N/A | N/A | N/A | N/A | N/A |

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Table C-2. Survey Responses Regarding Mitigation Actions Within the Region (contd.)

| Agency | GHG Inventory | Reduction in Energy Consumption | Renewable Energy | Carbon Offsets | Other Mitigation-Related Actions |
|-------------------------|--|---|---|----------------|---|
| San Juan Water District | Current work plan scheduling includes initiating a GHG Inventory in Fiscal Year 2013/14. | <p>Past Actions: SJWD continuously looks for opportunities to reduce energy consumption. Design and maintenance opportunities are reviewed and implemented on every available occasion. Representative projects have included the following:</p> <ul style="list-style-type: none"> • Time of day operational changes at booster pump stations resulting in significant peak electrical load reduction associated with pump operation. • Replacement of climate/AC units with higher efficiency units. • Replacement of lighting fixtures and bulbs with higher efficiency units. • Implementation of enhanced SCADA systems to facilitate remote monitoring and thereby reduce some driving to perform site visits. • Review and modification of equipment control programming to enhance energy saving. • Installation of motion sensing light switches in various rooms in buildings to automatically shut off lighting when rooms are not occupied. • Use of passive techniques in the maintenance areas to allow for space cooling and heating. • Replacement of motors on pumps, fans, and other devices with high-efficiency units to reduce energy demand. • Use of rechargeable electrical vehicles for meter reading and corporation yard transportation, and performing recharging during off-peak demand periods. • Implementation of leak detection and pipeline and service repair and replacement projects to eliminate water loss, thereby reducing energy demand. • Application on new motors, and conversion of existing motors, to incorporate VFDs to reduce overall energy demand and peak time loading. • Expansion of gravity supplied pressure zone boundaries into pressure zone areas to reduce the need for pumping to supply. • Reduction of system pressures in pumped pressure zones to reduce overall energy demand. • Off-peak time filling of storage reservoirs. • Use of propane-powered rather than gasoline- or diesel-powered forklifts. • Replacement of older standby and emergency generators with higher efficiency units. • Replacement of electronic devices such as computers and monitors with higher efficiency units. • Application of soft start systems on electrical motors to reduce high amperage start-up loads. <p>Planned actions:</p> <ul style="list-style-type: none"> • Periodically re-evaluate installation of turbine power generation units in gravity pipelines to recover available energy normally "burned" as lost head. Implement if/when benefit to cost ration exceeds one. • Application of LEED into new/future building design. • Investigation of applicability of alternative fuel and electrical powered vehicles. • Investigation and application of other energy-saving techniques and equipment as new opportunities arise. | <p>Past Actions:</p> <ul style="list-style-type: none"> • SJWD installed a 795 kW solar power field that became operational in 2010. | N/A | <p>Past Actions:</p> <ul style="list-style-type: none"> • Recycling of paper products, waste chemicals and lubricating oils, and e-waste. • SJWD intends to work with other interested parties and stakeholders to investigate and implement energy reduction and renewable energy sources whenever the opportunity is presented. <p>Planned Actions:</p> <ul style="list-style-type: none"> • SJWD intends to comply with energy and GHG regulatory mandates. |

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Table C-2. Survey Responses Regarding Mitigation Actions Within the Region (contd.)

| Agency | GHG Inventory | Reduction in Energy Consumption | Renewable Energy | Carbon Offsets | Other Mitigation-Related Actions |
|--|--|---|--|----------------|---|
| Sacramento Regional County Sanitation District | A draft GHG inventory for 2010 was created following the <i>Local Government Operations Protocol for the quantification and reporting of GHG emissions inventories</i> guidance. | <p>Past Actions: Numerous energy optimization projects and process improvements have been made at the Sacramento Regional Wastewater Treatment Plant (SRWTP). A few examples include the following:</p> <ul style="list-style-type: none"> • Energy use monitoring, trending and analysis. • Audits identify energy saving projects. • Maintenance procedures that provide guidelines for repair and replacement of inefficient equipment and systems. Cost savings examples include: (1) Utility/Service air leak reduction program; (2) Influent pump coating application and wear ring replacement; (3) Primary Odor Removal Tower exhaust fan removal; (4) Digester circulation pump replacement; (5) Tunnel lighting reduction. • New control strategies and standard operating procedures for energy efficient operation under various conditions (e.g., winter/summer, wet/dry weather, in-service and out of service equipment, on or off peak). Cost savings examples include: (1) Grit Pump runtime reduction; (2) Digester mixers runtime reduction; (3) Solids Storage Basin mixer runtime reduction; (4) Influent Pump run-order change; (5) Oxygen plant compressor run-order change; (6) Digester mixed sludge feed pump/control valve replacement. <p>Planned Actions:</p> <ul style="list-style-type: none"> • The District is implementing an Energy Master Plan that will govern all projects associated with the new EchoWater projects. Every piece of equipment that uses electricity will be examined in detail to make sure it conforms to the District's energy requirements. As part of the equipment selection process, business case evaluations were performed that compared electrical consumption of various technologies, with the goal of selecting the lowest life cycle cost. Due to the business case evaluations' span of 60 years energy was heavily weighted. | <p>Past Actions:</p> <ul style="list-style-type: none"> • Investigation of solar, wind and biofuel. The only cost effective technology evaluated to date was wind energy. However, due to the sensitive environmental habitats and species that exist in the 2,400 acres of Bufferlands that surround the SRWTP, the SRCSD Board of Directors declined the wind energy proposal in March 2012. • The digestion of solid waste, which is part of the sewer treatment process at the SRWTP, creates methane gas, which is sold to the Sacramento Municipal Utilities District (SMUD) and used at their cogeneration facility at the SRWTP site. The methane is used as fuel in the gas turbine duct burner, which uses the methane to generate steam and electricity. The electricity is used by SMUD and the steam is used by the SRWTP and the Glacier Ice Production Company. • Recently, SRCSD and SMUD finished the Biogas Enhancement Project. This project built a facility to directly inject Fats, Oils, and Grease and Soda Pop wastes directly into the anaerobic digesters, bypassing the sewer collection system and the primary treatment processes, producing methane gas more efficiently and resulting in greater methane production. Overall, this project will 1) generate enough renewable energy for up to 700 homes, 2) reduce the fuel and fleet costs associated with transporting the waste to distant disposal sites such as Oakland, CA and 3) reduce greenhouse gas emissions associated with organic waste in landfills. <p>Planned Actions:</p> <ul style="list-style-type: none"> • Continue in a partnership with SMUD regarding cogeneration with methane and continue to monitor and evaluate solar, biofuel, and other renewable energy technologies that may be more compatible with our site than wind. | N/A | <p>Past Actions: N/A</p> <p>Planned Actions:</p> <ul style="list-style-type: none"> • The new EchoWater project will employ state-of-the-art electrical consumption monitoring equipment for the purpose of fine tuning and decreasing plant energy usage. |

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Table C-2. Survey Responses Regarding Mitigation Actions Within the Region (contd.)

| Agency | GHG Inventory | Reduction In Energy Consumption | Renewable Energy | Carbon Offsets | Other Mitigation-Related Actions |
|------------------------------------|---|--|--|----------------|----------------------------------|
| Sacramento Suburban Water District | <p>In 2009, the District contracted with Kennedy/Jenks Consultants (KJC) to create a greenhouse gas (GHG) inventory/carbon footprint calculation for calendar year 2008, consistent with the District's Sustainability Policy. To create the GHG inventory, KJC used the General Reporting Protocol developed by the California Climate Action Registry (CCAR). The spreadsheets prepared and used by KJC were provided to SSWD so that District staff could update the GHG inventory calculations in subsequent years. Using the spreadsheet templates originally prepared by KJC, District staff has now completed GHG inventories for 2009, 2010 and 2011.</p> | <p>Past Actions:</p> <ul style="list-style-type: none"> • In 2008, the District hired HDR Engineering to prepare a Strategic Energy Management Plan. This study looked at the District's water system and facilities, including buildings, and recommended specific energy conservation measures. HDR's final report was completed in February 2009. As a result of this study, various energy saving measures have been implemented at the District's office buildings (Administration Building and Corporation Yard) including: installation of programmable thermostats, installation of occupancy sensors to control lights, purchase of a hybrid fleet vehicle, all indoor office lighting converted to fluorescent T8, installation of a cool roof at the Administration Building, and a reduction in the number of diesel fleet vehicles. • The District is certified as a Sacramento Area Sustainable Business. This program promotes businesses that take voluntary actions to prevent pollution and conserve resources. <p>Planned Actions:</p> <ul style="list-style-type: none"> • Proposed purchase of another hybrid vehicle (for the Water Conservation department). | <p>Past Actions:</p> <ul style="list-style-type: none"> • In 2007, the District looked at the feasibility of installing solar panels on the roofs of buildings or on the ground at unused properties. However, the project was not found to be economically feasible with a payback period approaching 30 years. • More recently, the District has looked at the feasibility of in-conduit hydro project which would install a small turbine inside a pressurized water pipeline to create electricity. This included a pre-design study, negotiations with SMUD, and economic analyses. <p>Planned Actions:</p> <ul style="list-style-type: none"> • The District will continue to look at the feasibility of the in-conduit hydro project. If surface water can be made available every year this project would become economically feasible. | N/A | N/A |

Key:
ASCE = American society of Civil Engineers
CA = California
CCAR = California Climate Action Registry
GHG = Greenhouse Gas
KJC = Kennedy/Jenks Consultants
kW = kilowatt
LEED = Leadership in Energy and Environmental Design
PACE = Property Assessed Clean Energy Program
PCWA = Placer County Water Agency
PG&E = Pacific Gas and Electric
PV = Photovoltaic
SMUD = Sacramento Municipal Utility District
SJWD = San Juan Water District
SRCSD = Sacramento Regional County Sanitation District
SRWTP = Sacramento Regional Wastewater Treatment Plant
VFD = Variable Frequency Drive
WTP = Water Treatment Plant

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