ROOFWATER HARVESTING IN CALIFORNIA:

OBSTACLES AND OPPORTUNITIES

Supporting statewide adoption of this valuable water conservation strategy to increase community water security and stream flows for salmonid recovery

WATER INSTITUTE
OCCIDENTAL ARTS & ECOLOGY CENTER

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Cover photo: Residential roofwater system installed by the Gold Ridge RCD's Save Our Salmon (SOS) program in Bodega, CA www.goldridgercd.org/project/SOS.html

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EXECUTIVE SUMMARY

In response to California's declining salmonid populations, the worsening water crisis, climate change, and the need for greater community resiliency, Brian Cluer of the National Oceanic and Atmospheric Administration (NOAA) asked OAEC's WATER Institute to host a brainstorm session Nov. 13th, 2010. This meeting was called to discuss the obstacles to and opportunities for adoption of roofwater harvesting in California. The invitee list included representatives or staff from NOAA, non-governmental organizations, contractors, environmental non-profits and the state water board. This meeting produced a broad overview of the status of roofwater harvesting in California, which investigates obstacles, proposes solutions, offers recommendations for next steps and provides resources for further research. The views expressed in this report are those of the OAEC WATER Institute and do not necessarily reflect those of the meeting participants or NOAA. The findings were as follows.

While salmonids in California face extinction for many reasons, this report will focus on the seasonal extremes of available water quantity.

- Instream flows are lowest when human demand for water is highest, resulting in unsurvivable water levels for salmonids during the dry season.
- Excess winter runoff volume and velocity cause sedimentation and habitat destruction.

Ensuring salmonid recovery requires attenuation of this seasonal hydrograph.

Roofwater harvesting works because in salmonid-bearing areas of California winter rainfall volume is more than sufficient to support both human and salmonid needs, if water is retained during the winter and used during the dry season. Due to this availability of water, we consider these areas to be *storage scarce*, not water scarce. Roofwater harvesting is a proven solution that offsets human pressure on surface diversions and shallow gallery wells, improves base flows and reduces excess runoff and discharge in winter.

Despite its potential, roofwater harvesting faces significant obstacles to adoption, and we propose the following solutions:

- Citizens and regulators are unaware of roofwater harvesting and its potential for indoor and outdoor use. Education and advocacy are needed in all social and economic arenas.
- State regulations lack roofwater harvesting language, and agencies lack enforcement capacity. Add language to existing laws and improve enforcement capacity.
- Users perceive the permitting and design process as overly costly and time-consuming, while regulators worry that there are insufficient safeguards in place. Reduce permitting cost and time, and educate regulators about benefits and risks.
- Current data fails to prove the efficacy of roofwater harvesting for indoor use and improved instream flows. Provide funding and support to scientists, and prove efficacy.
- Costs can be prohibitive. Seek long-term funding from all available sources.

Our recommendations are: Support adoption of roofwater harvesting by users who negatively impact dry-season flows in salmonid-bearing watersheds, by conducting scientific studies, re-writing existing water rights law, amending or writing new public policy, educating individuals and agencies, creating statewide programs to fund development and installation, and creating a successful roofwater harvesting industry.

BACKGROUND

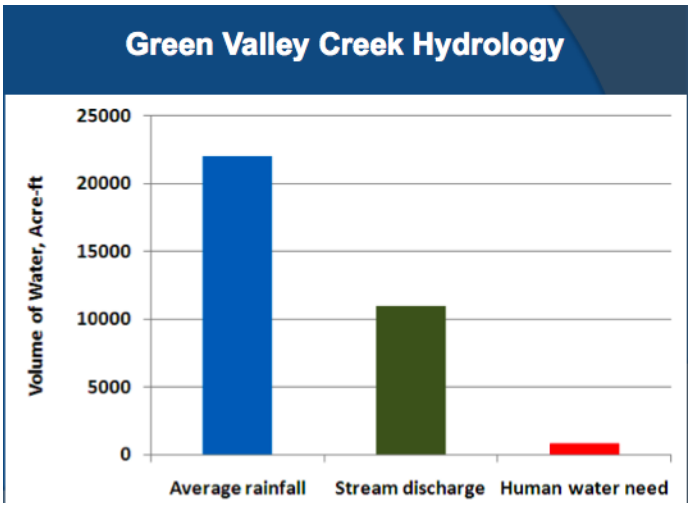
Salmonid populations throughout California have collapsed and are facing extinction, with many Evolutionary Significant Units listed as threatened and/or endangered by both the State of California and the Federal Government. This "death by a thousand cuts" has many convergent causes, including dams, over-appropriation, pollution, lack of beaver, winter flooding and catastrophically low summer flows in salmonid-bearing streams.

Such poor stream health, and the consequent destruction of salmonid populations, has occurred in the face of extensive recovery efforts. Many watershed assessments have been performed in the north coast of California, and restoration techniques have been applied including instream structures, passage barrier removal, and mitigation of sediment delivery. While certainly worthwhile, these measures are left high and dry in the summer when human demands deplete the instream flows of critical spawning and rearing tributaries.

Research has shown that demand reduction is the most effective and economical strategy for increased stream flows. But since demand cannot be reduced to zero, and human uses compete with salmonids when stream flows are lowest, water supply augmentation is critical.

Due to the numerous challenges water rights present, channel performance has been highlighted and supply ignored, to the detriment of salmonids. It was only after the total collapse of the salmon fisheries that alternative water supply strategies gained widespread recognition as critical components in salmonid recovery.

Exacerbating the problems of insufficient supply, what water is available in the dry season is over-appropriated. Land use planning agencies have permitted a level of subdivision that is far beyond the water supply's carrying capacity. The 1974 Joy Road Study states that, "A pilot water study conducted by the State Water Resources Board… indicates water consumption has reached its maximum and perhaps surpassed it in relation to water recharge… thus, the impact of increased parcelization into small lots would irreparably damage the life support capacity of this area's groundwater reserves" (Joy Road Study, Sonoma County Planning Department, 1974). An important note is that "groundwater" in this study may actually be underflow and springs that are hydrologically connected to salmonid-bearing streams, extraction of which further decreases base flows. In spite of these findings, Sonoma County continued to subdivide, as did hundreds of other areas all over California, resulting in severe dry-season water shortages.



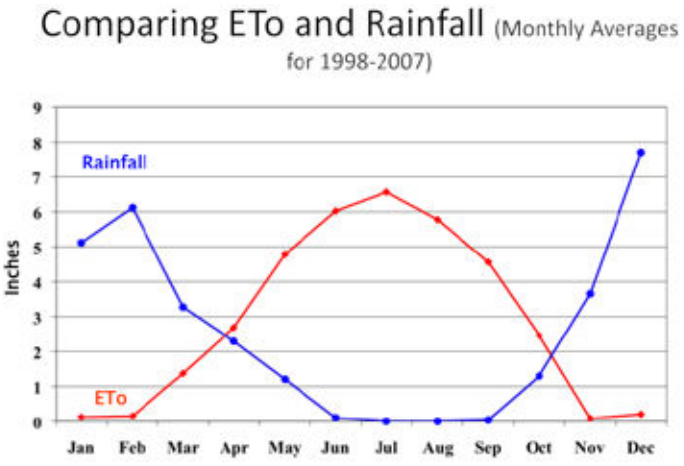
Graph 1: Comparison of average water availability and human water need in upper Green Valley Creek in Sonoma County, CA (Green Valley Creek Watershed Assessment, Gold Ridge RCD 2010)

Winter run-off is another area of concern. Watersheds that have historically supported Coho salmon receive significant winter rainfall. A number of studies in the region, including the Salmon Creek Water Conservation Plan, found that total rainfall and stream discharge in the winter is often several orders of magnitude greater than the total human demand for water in the dry season (www.salmoncreekwater.org/water-conservation-plan). An additional study in the Green Valley Creek Watershed demonstrates this relationship between average rainfall and human need (Graph 1).

There is plenty of water available annually, but current land use practices limit the ability of upland soils to infiltrate and retain winter rainfall and release it during the dry season to maintain base flows. Human-modified landscapes, almost without exception, become more impervious to rainfall. This lack of infiltration wastes the abundant winter supply, and increased water velocity results in sedimentation (which suffocates salmon eggs), incised streambeds and habitat destruction.

Properly managed, this currently problematic winter rainfall can be a key to salmonid recovery. If water could be retained and later released to the stream in the dry season, critical base flows could be sustained. Thus, storage is the problem, not supply.

California's current seasonal flow differential badly needs attenuation. See Graph 2 for an illustration of how evapotranspiration and thus irrigation demand is highest in the months when rainfall is the lowest. Any strategy that can intercept and retain winter flows for use in the dry season will benefit both extremes of the seasonal hydrograph, and potentially improve instream flows when fish need them most.



Graph 2: Comparison of average rainfall and evapotranspiration (ETo) in Santa Rosa, CA (City of Santa Rosa Utilities Department)

Roofwater harvesting—capturing, storing and using rainwater that falls on roofs—is ideally suited for this purpose. Roofwater harvesting technology is simple, replicable, and has been applied by numerous cultures for hundreds of years, but California has fallen behind in adoption of this useful strategy. Currently there are examples where roofwater comprises 100% of supply, and countries and US states with worsening drought conditions and increasing total demand on water are supporting roofwater regulation, legislation and implementation. See Appendix 1 for examples from places like Arizona, Hawaii, New Mexico, Texas, the US Virgin Islands and Australia.

Several innovative projects in Northern California (in Humboldt's Mattole River, SPAWN's Marin County projects and Sonoma's Salmon Creek) are demonstrating that roofwater harvesting is an effective means for meeting human needs while reducing demands on dry season stream flows, and warrants expansion into other regions. While proven worldwide, roofwater harvesting still faces significant obstacles to widespread adoption in California.

These obstacles can be loosely divided into two domains: public and private. The public domain is primarily concerned with *responsibilities and safeguarding resources*—keeping people safe, ensuring adequate flows for aquatic life, providing fair distribution of resources, preventing pollution, and so on. The private domain is primarily concerned with *rights and using resources*—the right to appropriate, convey and use water as individuals see fit without interference from government, other agencies, or other users. These differing concerns create a breeding ground for unnecessary tension that, almost without exception, requires a clear and obvious win-win situation to resolve.

These solutions do exist. One example is the adoption of roofwater harvesting by municipalities with combined stormwater/sewer systems. Here, roofwater harvesting acts as both a stormwater BMP and a supply augmentation strategy. Flood control, wastewater treatment, agencies supporting endangered salmonids, and water supply companies all share the financial and organizational burden of implementation. This drives cost down for individual agencies while supporting their missions, safeguards the public, and ensures that the private sector receives higher levels of service and supply.

More such solutions are needed in response to declining salmonid populations, climate change and the worsening water crisis. So, NOAA's Brian Cluer asked OAEC's WATER Institute to call a brainstorm session Nov. 13th, 2010 to discuss the obstacles to and opportunities for adoption of roofwater harvesting. Present were staff or representatives from NOAA, the state water board, non-governmental organizations, contractors and environmental non-profits.

This document is a result of that meeting, and will explore the obstacles to adoption of roofwater harvesting, and offer solutions to each.

CULTURAL ANALYSIS

Many people are unaware that roofwater harvesting is a legal and viable option here in California. Even with steadily worsening water supply and quality statewide, and escalating interstate feuds over diversions from the Colorado and other rivers, roofwater harvesting still has not become front-page news. Until it does, some means must be found to fill the awareness gap, so policy makers and end users both should be briefed on its potentials.

PROBLEM: Individuals, the business community, policy makers and regulatory enforcement agencies are not all aware that roofwater harvesting exists, or that it is a viable option.
SOLUTIONS: Continue promoting the benefits of roofwater harvesting to individuals, agencies and lawmakers by creating a series of targeted campaigns to drive awareness and prove the efficacy of roofwater harvesting. Have a working group conduct a Sonoma/Marin-wide education campaign to raise awareness of roofwater harvesting and its benefit (for humans *and* fish) that includes good maps with clear visuals, demonstration sites accessible to the public, and compelling case studies that substantiate value to land and business owners. Simultaneously, convince high profile figures to endorse the concept, driving acceptance. Conduct a talk/slideshow tour of coastal communities chosen for their readiness to adopt.
RESOURCES: www.salmoncreekwater.org/cs/Roofwater_Harvesting.pdf, http://www.oaecwater.org/education/roofwater-harvesting-booklet, www.sscrcd.org/rainwater.php, www.harvestingrainwater.com, www.harvesth2o.com, www.builditsolar.com/Projects/Water/Water.htm, http://raingardens.spawnusa.org/index.html

PROBLEM: The CA plumbing code and the State Public Health Department do not recognize the potential of rainwater as a potable source and therefore do not include roofwater harvesting language in their public resources for indoor use.
SOLUTIONS: Create a targeted education campaign for state building officials and the Department of Public Health to drive awareness of roofwater harvesting's ability to provide safe, potable water, while informing them of the risks inherent in the technology so they can adequately safeguard public health. Amend AB 275 (the Rainwater Capture Act of 2011) to support potable use of roofwater.

RESOURCES: Texas A & M's guidelines for In Home Use of Rainwater (see both reports on domestic use and public water systems) http://rainwaterharvesting.tamu.edu/inhome.html, California Department of Public Health Division of Drinking Water and Environmental Management http://www.cdph.ca.gov/programs/Pages/DDWEM.aspx

PROBLEM: Many people are not aware of how much water can be captured from their roof.
SOLUTIONS: Educate people about quantity—most people who do the math are surprised at just how much water they can catch, and awareness drives adoption.
RESOURCES: www.rain-barrel.net/rainwater-calculator.html, SPAWN's stormwater calculator http://raingardens.spawnusa.org/calculating-stormwater-runoff.html

Community members gather in Bodega, CA to learn about the efforts of the Salmon Creek Water Conservation Program

REGULATORY ANALYSIS

The questions of water rights and policy highlight the uncomfortable public/private divide, even though California does not currently assert water rights authority over roofwater harvesting. Individuals are justifiably concerned they will lose their pre-existing water rights or be burdened with excess bureaucratic processes and costs if they employ roofwater harvesting. Civil servants, with equal justification, are concerned that public resources will be harmed in the classic "tragedy of the commons" if roofwater harvesting is unregulated. To support responsible public agencies in managing water rights, new and existing legislation needs more explicit roofwater language. For a list of entities that exert power over water in California, see Appendix 2.

PROBLEM: Many people fear losing their riparian rights if they employ roofwater harvesting to reduce or stop surface diversions.
SOLUTIONS: Provide free legal advice, using grant funding to hire lawyers for people adopting roofwater harvesting and conservation measures. Publicize the benefits of registering riparian rights, and get agencies to fund development of a roofwater harvesting system in exchange for the landowner entering into a "Riparian to Rain" easement or conservation agreement. Include a forbearance agreement where landowners are allowed to store water for more than 30 days for use during summer months, while an NGO monitors stream flows and water usage. This is being successfully implemented in the Mattole watershed.
RESOURCES: www.sanctuaryforest.org **(**Water Storage and Forbearance brochure and Legal Options for Streamflow Protection brochure)

Gilardi Ranch Roofwater Tank - Gold Ridge RCD & Prunuske Chatham, INC. Photos by John Green
Underground tanks store rainwater from the roof of this dairy barn. Installed by SOS program in Bodega, CA

Front view of Bodega Volunteer Fire Department's new roofwater catchment system installed by the SOS program in Bodega, CA

PROBLEM: Some agencies are not exercising their authority in regulating appropriative and riparian rights and streambed alterations. Riparian users have a disproportionate impact on stream health, but their regulations are minimally enforced, thus they have no incentive to invest in tanks.
SOLUTIONS: Support implementation and enforcement of AB 2121 by the State Water Board, and 1602 permit requirements by the California Department of Fish and Game. Determine why agencies lack capacity to enforce these laws, and help them gain such capacity. For existing diversions, make the 1602 permit program retroactive.
RESOURCES: www.dfg.ca.gov/habcon/1600/qa.html, www.swrcb.ca.gov/waterrights/, http://www.ourstreamsflow.org/ab_2121.html

PROBLEM: Water has been over-appropriated in many basins.
SOLUTIONS: Create an adequate water budget for each watershed. For agencies with available mitigation funds, encourage them to apply these funds toward development of water right conservation easements. Allow end users who have a roofwater harvesting offset in place to dedicate their water right using the water trust or conservation easement model. Other incentives could include a reduced tax bill in exchange for temporarily relinquishing appropriative rights, following the model of the Williamson Act.
RESOURCES: USGS Water Budgets circular http://pubs.usgs.gov/circ/2007/1308/, Legal Options for Streamflow Protection brochure www.sanctuaryforest.org, Trout Unlimited's Liquid Assets by Steven Malloch http://www.tu.org/conservation/conservation-library/western-water-project, The Trust for Public Land's Water Acquisition Handbook: A Guide to Acquiring Water for the Environment in California (2003) http://www.tpl.org/publications/books-reports/

PROBLEM: Current and proposed legislation lacks roofwater language.
SOLUTIONS: All Senate and Assembly Bills specific to water rights need to include robust, appropriate language about roofwater harvesting. AB 275 (the Rainwater Capture Act of 2011) needs to be amended to support potable use of roofwater. AB 2121 needs to include existing storage and make roofwater harvesting a consideration for diversion structure permits. AB 3030 should promote roofwater harvesting as a demand reduction strategy (eg. Sonoma Valley Groundwater Management Planning Process). AB 1420 (water demand management measures) and AB 1560 (building standards) need rainwater harvesting language as well.
RESOURCES: Lists of statutes, regulations and incentives in USA and abroad: http://www.oaecwater.org/education/roofwater-harvesting-resources, http://www.harvesth2o.com/statues_regulations.shtml, http://www.harvestingrainwater.com/rainwater-harvesting-inforesources/water-harvesting-tax-credits/

TECHNICAL ANALYSIS

While roofwater harvesting technology is simple and has been implemented worldwide for millennia, California regulators have not yet fully accepted this useful strategy. As a result, end users perceive the permitting and design process as overly complex, while regulators worry that there are insufficient safeguards in place.

PROBLEM: A common belief is that roofwater harvesting will induce growth and sprawl.
SOLUTIONS: Work with land-use planning agencies to develop better growth-regulation tools and encourage the adoption of more serious water conservation measures countywide. Elect a board of supervisors friendly to roofwater harvesting, update city and county general plans to include roofwater harvesting language and hold elected officials accountable for upholding these general plans as passed (such as the Sonoma County General Plan's Water Resources Element that states "encourage…roof catchment of rainwater…minimizing the need to use potable surface water or groundwater").
RESOURCES: Sonoma County General Plan WRE Policy WR-4k www.sonoma-county.org/prmd/gp2020/wre.pdf

PROBLEM: Building codes and zoning requirements can add cost and complexity to the permitting process. State building codes require a building permit, and in some cases an engineering approval as well as a grading permit, for any tank larger than five thousand gallons.
SOLUTIONS: Marin and Sonoma Counties have adopted the state regulations and have the option to modify them to make roofwater harvesting easier. Since tanks smaller than five thousand gallons on flat ground for non-potable use require no permits, end users can install multiple small tanks to eliminate permitting requirements. For larger tanks, simplify the permitting process, or raise the size limit for tanks on flat sites. Waive fees for grading permits if the cut or fill is for roofwater harvesting. Counties could subsidize permit costs. Make zoning variances easier to get for roofwater harvesting tanks by educating and enlisting members of the zoning department. Dedicate a county employee to roofwater harvesting permits who will prioritize large storage systems and fast-track permits that include roofwater harvesting.

RESOURCES: Contact your local building department for permitting and zoning requirements, and review the State of Washington's attempt to streamline roofwater harvesting permits here: www.harvesth2o.com/statues_regulations.shtml#wa

PROBLEM: Backflow prevention device requirement—Any "auxiliary water supply" requires an annually certified double backflow prevention device if connected to municipal supply.
SOLUTIONS: Make the backflow prevention device part of the municipal system to free the end user from maintenance and certification, and put them in at the meter as standard practice for new construction. Consider using an air gap which can cost less, doesn't require inspection and is not prone to failure.
RESOURCES: American Backflow Prevention Association www.abpa.org, Backflow prevention Links www.nobackflow.com/backflow.htm, *On Tap Magazine's* "Controlling Cross Connections," Fall '07 issue www.nesc.wvu.edu/ontap.cfm

PROBLEM: Perception that tanks are ugly, too big and there is nowhere to put them.
SOLUTIONS: Provide information on all the options—tanks that snap together into fences, fit under decks or in basements, can be painted, wrapped in wood, poured out of concrete to look like rocks or have vines growing on them.
RESOURCES: *Water Storage: Tanks, Cisterns, Aquifers and Ponds* by Art Ludwig www.oasisdesign.net/water/storage, www.tank-depot.com/tanks/rainwater.aspx

PROBLEM: The design process is costly, time-consuming, and suffers from an absence of professionals experienced in roofwater harvesting design.
SOLUTIONS: Offer free site assessments with landowners to determine appropriate water conservation and harvesting strategies, conduct installer trainings

Rear view of the new Bodega Volunteer Fire Department and its roofwater harvesting storage tank installed by the SOS program in Bodega, CA

for builders, and provide assistance and resources to the DIY community. Direct people to the available knowledge base and create programs that offer free technical assistance, like SPAWN's Ten Thousand Rain Gardens program.

RESOURCES: www.oaecwater.org/education/roofwater-harvesting, www.raingardens.spawnusa.org/, http://raingardens.spawnusa.org/calculating-stormwater-runoff.html, ARCSA courses for builders www.arcsa.org/content.asp?pl=4&contentid=4

PROBLEM: Quality of roofwater is a concern, during both harvesting and storage over time.

SOLUTIONS: Promote water testing through education and providing free test kits. Build a highly visible public demonstration site and fill station where people can fill drinking water bottles and learn about water testing, first-flush technology and filtration systems. Make NSF 61 certification for tank materials affordable, require manufacturers to provide Materials Safety Data Sheets for roofing and tank materials, and help people decode this information. Generate a fact sheet demonstrating water quality differences between roofwater and untreated groundwater. Educate users about adequate pretreatment, filtration and disinfection methods. Educate people concerned with "stagnant" water and mosquito breeding about aeration, ozonators, and vector control.

RESOURCES: Oasis Design rainwater harvesting information on water testing and filtration www.oasisdesign.net/water/rainharvesting/index.htm, roofing materials and water quality http://www.thecenterforrainwaterharvesting.org/2_roof_gutters2.htm, Biological Sand Water Filters and Roof Water Harvesting www.enlight-inc.com/blog/?p=14, SPAWN's demonstration sites http://raingardens.spawnusa.org/public-demonstration-projects.html, Marin/Sonoma Mosquito and Vector Control District www.msmosquito.com

SCIENTIFIC ANALYSIS

General hydrologic illiteracy is pandemic—many end users cannot name their watershed or explain where their water comes from. This is especially pernicious given California's radically modified water systems. With ignorance the norm, building a case for adoption of roofwater harvesting will require solid science as a foundation, and clear messaging broadcast as widely as possible.

PROBLEM: Lack of science to prove need for offsets—Many people believe that wells do not impact creek flows, and the burden of proving the impact of extraction rests on under-supported scientific and regulatory bodies. Solid, actionable water analysis is lacking countywide and existing models are insufficient, while the Army Corps of Engineers' statewide water balance process is extremely slow and ignores sedimentation and unreported diversions.
SOLUTIONS: Secure funding for studies like the Estuary Study on lower Salmon Creek that prove the impact of subsurface extraction on dry season flows. Conduct studies that link ridge-top wells to decreased dry season flows and track the impact of trucking company's inter-basin transfers on source watersheds. Shift scientific burden to extractors, requiring them to prove their water extraction is *not* affecting instream flows.
RESOURCES: USGS Ground Water and Surface Water circular http://pubs.usgs.gov/circ/circ1139/, Salmon Creek Estuary Study www.oaecwater.org/research/salmon-creek-estuary-study

PROBLEM: Belief that tanks steal water from fish.
SOLUTIONS: Gather existing, and conduct new research to demonstrate the invalidity of this concept, and use it to create an ad campaign with public service announcements and fact sheets to help people understand how capturing water for use during the dry season helps fish.
RESOURCES: Prince George's County Department of Environmental Resources Low-Impact Development Hydrologic Analysis www.epa.gov/owow/nps/lid/lid_hydr.pdf

PROBLEM: California Fish and Game Salmonid Stream Habitat Restoration manual lacks protocols addressing water quantity and stream flow restoration.
SOLUTIONS: Fish and Game requires adherence to the protocols in the manual before providing funding for implementation of a stream restoration project, making this manual a key point for introduction of language mandating improved instream flows. Find funding to write and incorporate a new chapter on instream flow restoration strategies.
RESOURCES: To see current language, go to www.dfg.ca.gov/fish/REsources/HabitatManual.asp

Roofwater harvesting system at Salmon Creek Middle School in Occidental, CA

ECONOMIC ANALYSIS

Water is bulky, heavy, and requires that expensive tanks be purchased up front to retain it, and no technology currently exists to mitigate these factors. With all current water-pricing structures grossly undervaluing water statewide, taxpayers and the environment are subsidizing the externalized costs of "free" groundwater and "cheap" surface diversions. These externalities include reduced availability and degraded quality of water for both humans and endangered salmonids. With one-time purchase costs hovering around $1-2/gallon of installed storage, roofwater harvesting cannot compete on a purely economic basis with unregulated groundwater or surface flows, even factoring in the energy costs of pumping water. Therefore, any proposed solution must include a means to reduce the initial cost of a system.

PROBLEM: People believe they need a year-round water replacement, which will be too expensive and bulky.
SOLUTION: Educate people that in Northern California, we only need to create storage for a 6-8 month dry-season supply to improve water flows for fish.
RESOURCE: www.cohopartnership.org, www.spawnusa.org, www.sanctuaryforest.org

PROBLEM: General Cost—Large systems are expensive even if you have a flat site and no other problems, and people are concerned that the installation of a roofwater harvesting system will trigger a reassessment of property value and increase property taxes. Since roofwater cannot be used to permit a new build, but can only serve as an auxiliary water supply to a permitted well or diversion, adopters have significantly greater up-front costs than non-users.
SOLUTIONS: Help people take advantage of existing rebate and tax incentive programs and work to get more programs adopted (City of Santa Rosa offers $.25/gal for storage). Leveraging the energy benefits of roofwater harvesting to get these programs adopted county and statewide will help reduce up-front costs for users (like Sonoma County Energy Independence Program). Secure matching funds to further offset costs up to 100%. Lobby board of supervisors to waive tax reassessment of properties that install roofwater harvesting (see Bodega Pilot program). Offer fee waivers from planning/permitting departments. Making roofwater harvesting installation mandatory for new-build permits would ensure compliance (like Queensland state, AU).
RESOURCES: *Second Nature* by Treepeople http://www.treepeople.org/second-nature-adapting-las-landscape-sustainable-living, City of SR Incentive Program http://ci.santa-rosa.ca.us/departments/utilities/conserve/Pages/RainwaterHarvesting.aspx, Sonoma County Energy Independence Program http://www.sonomacountyenergy.org/water-conservation.php#waterconservation, Washington State stormwater offset program http://www.kitsapgov.com/sswm/pdf/ordinance 314-2004.pdf, Salmon Creek Bodega Pilot Program www.salmoncreekwater.org/bodega-pilot-program.html

PROBLEM: Many California municipalities are not developing roofwater harvesting as a stormwater BMP due to perceived excess costs.
SOLUTIONS: Educate agencies about the cost parity between installation of roofwater harvesting and stormwater mitigation, highlighting the double benefit of roofwater harvesting as supply augmentation and runoff reduction. Educate the public about the emergence of "stormwater utility fees", the comparative cost of roofwater harvesting, and the advantages of installing a system. Approach municipalities that discharge excess stormwater, and advocate for roofwater harvesting installation.
RESOURCES: http://stormwaterfinance.urbancenter.iupui.edu/SUother.htm

PROBLEM: Commercial—Cost may be prohibitive at the acre-foot scale agriculture needs.
Since 60-80% of California's developed water supply goes to agriculture, a win here would have tremendous impact, but there may be a volumetric boundary beyond which the cost of tanks is so extreme that

roofwater is not a practical solution. In these cases education is key, because numerous other options exist that will improve dry season flows. As an example, a possible solution for vineyards is to use their manufactured hardscape and subsurface drains to catch runoff in ponds that supply their irrigation needs.

SOLUTIONS: Evaluate the cost effectiveness of roofwater harvesting at varying scales and find the threshold above which it is no longer cost effective. Identify users with high impacts but relatively low volume use, and educate them about roofwater harvesting's potential—dairies are a potential target here. Finding large donors to finance large-scale systems could begin with including roofwater harvesting as a fundable project for the State Water Resources Control Board revolving fund, and making non-governmental organizations eligible.

RESOURCES: Gold Ridge RCD Save Our Salmon project http://www.goldridgercd.org/project/SOS.html, Rainfall Capture and Storage for Marin Agriculture http://groups.ucanr.org/GIM/Files/81887.pdf

PROBLEM: Commercial scale users are unaware of the benefits of roofwater harvesting.

SOLUTIONS: Educate business owners of the economic benefits of roofwater harvesting. Promote the marketing potential of roofwater harvesting for a lower carbon footprint, energy savings and better flows for fish—consider examples like Salmon Safe in Oregon. For organic operations, highlight how roofwater harvesting helps meet water quality standards. Agricultural operations facing frost protection limits and other legislation are potential early adopters and word-of-mouth advocates.

RESOURCES: www.salmonsafe.org/getcertified, www.cohopartnership.org

PROBLEM: Municipal—lack of compelling reasons for end users to change.

Water is too cheap and enforcement too lax, which makes it nearly impossible to compel users to conserve. Many users don't know where their water comes from or what the true cost is, but are attached to their pre-existing rights, making adjustments to existing water delivery systems or pricing difficult.

SOLUTIONS: Limiting the use of municipal water for landscaping like Tucson (50% must come from harvested rainwater for commercial buildings) is a good start. In areas where tiered pricing fails to change user's behavior, making the 2nd and 3rd tiers more expensive will help. Imposing an outright gallon limit on usage, and turning the water off when the limit is exceeded, would guarantee compliance. Increased enforcement for diversion violations would reduce over-extraction as well as providing revenue for State programs.

RESOURCES: Tucson's Code is available at http://www.tucsonaz.gov/ocsd/sustainability/water/rainwaterharvesting.php, The California Urban Water Conservation Council resource, on pricing structures www.cuwcc.org/resource-center/resource-center.aspx, AWWA's Tiered Water Rates Resources http://www.awwa.org/Resources/content.cfm?ItemNumber=56369

PROBLEM: Municipal—suppliers lose revenue when end users adopt roofwater harvesting.

When municipalities make money on supplying water, they are understandably reluctant to cut off their own revenue stream, much less to offer incentives to adopters.

SOLUTIONS: Stormwater is a better starting place for a win with municipalities than supply, since the value of roofwater harvesting is well understood as a BMP for stormwater management. Educating municipalities about the multiple benefits of roofwater harvesting, and the potential for multi-agency funding, will help build support. On the supply/revenue side, municipal suppliers need to be able to keep their revenue stream while selling less water, and decouple the cost of raw water from the cost of the infrastructure that captures, delivers and treats it. Implement a "decentralized production, centralized management and oversight" business model, where the municipality would be responsible for *quality* rather than quantity, and charge for management and infrastructure instead of raw water. This model will have a broad geographic influence, offer green jobs potential, and help communities build resilience by diversifying their water supply and storage. Bodega Bay, Stinson Beach, and some other coastal communities are under notice from the water board to shift to an appropriative right, which limits their time of diversion, and are good candidates for pilot programs.

RESOURCES: Refer to *Conservation Strategy* #7: *Water Rates for Rural Coastal California Communities* by Virginia Porter www.salmoncreekwater.org/cs/Water_Rate_Conservation.pdf, Aakash Ganga system in India www.si-usa.org/projects/rainwater-harvesting

RECOMMENDATIONS

Based on our findings during the meeting, we recommend the following actions:

1. Support the adoption of roofwater harvesting by those users whose water demand negatively impacts dry-season stream flows in salmonid-bearing watersheds, whether by direct diversion of surface water or extraction from shallow gallery wells hydrologically connected to the stream. These users should be the first to install a six to eight-month supply derived from roofwater harvesting to be used only during the dry season:
    a. Small coastal communities and municipal systems, whether privately-owned or as a part of the municipality's decentralized supply
    a. High-density rural residential private properties with large cumulative impact
    b. High-density or high-volume agricultural riparian users, especially those with pre-existing infrastructure that supports cost-effective adoption

2. Design and conduct studies that:
    a. Accurately assess and demonstrate the connections between groundwater, underflow, surface waters and instream flows
    b. Prove roofwater harvesting systems benefit instream flow restoration
    c. Prove efficacy and support adoption of roofwater harvesting for both indoor and outdoor use

3. Re-write existing water rights law to support land-owners in reducing impact on stream flows while protecting their water security.

4. Review and amend existing, or implement new public policy that includes roofwater harvesting language in:
    a. General plans, building codes, zoning and health department regulations
    b. California Department of Fish and Game Stream Restoration Manual
    c. Federal and State Coho Recovery plans
    d. Groundwater and stormwater management plans

5. Develop programs to fund statewide adoption of roofwater harvesting, including direct incentives, tax breaks or grants, from a diverse portfolio of sources including federal and state governments, non-governmental organizations, non-profits, and private philanthropy.

6. Create a successful roofwater harvesting industry by supporting product development, training installers, and creating demand through incentives and policy.

APPENDIX 1

ROOFWATER HARVESTING POLICY AND RESOURCES

The following is a list of websites, tax incentives, reports and publications for roofwater harvesting systems legislation, policy guidelines, design and installation. The resources are listed alphabetically by country, then state, then city or publication title. In the following resources, roofwater harvesting will frequently be referred to as rainwater harvesting, or rainwater catchment, and many states and countries use the terms interchangeably. This list was created by the Occidental Arts and Ecology Center's WATER Institute. To see the most up to date version go to www.oaecwater.org/education/roofwater-harvesting-resources

AUSTRALIA

• Gold Coast City Council – http://www.allconnex.com.au/community/waterconservation/Pages/Rainwater.aspx
This city council has created a Waterfuture Strategy to meet the water savings targets established by the Queensland State government in Dec. 2006 (see below). The Council mandates the installation of rainwater tanks for non-potable uses such as washing machines, toilets and outdoor uses on all new residential and commercial construction. This site has policy language and guidelines for homeowners, builders and planners.

• State of Queensland – http://www.dip.qld.gov.au/sustainable-housing/water-savings-targets.html. This is the main page for Queensland's Water Savings Targets. To view the code, go to www.dip.qld.gov.au/building/current-parts.html and refer to the following:

- MP 4.1 Sustainable Buildings, which sets the mandatory water and energy efficiency measures required for new Class 1 buildings (houses, townhouses, terrace houses) and Class 2 sole occupancy units (units).

- MP 4.2 Water Savings Targets, which requires that new Class 1 buildings meet prescribed water savings. This can be achieved through the installation of a rainwater tank, communal rainwater tank, dual reticulation, stormwater reuse, or a greywater treatment plant. To view a FAQ Sheet on this go to: http://www.dip.qld.gov.au/resources/factsheet/qld-development-code/water-saving-targets.pdf

- MP 4.3 Alternative Water Sources Commercial Buildings, which sets the mandatory requirements for all new commercial and industrial buildings to have an alternative water source. This can be achieved through the installation of a rainwater tank, water storage tank or a greywater treatment plant.

- To see all the guidelines and factsheets developed for these parts of the code go to: www.dip.qld.gov.au/guidelines/queensland-development-code.html

USA

NOTE: Much of the content in this section was excerpted or paraphrased from
http://www.harvesth2o.com/statues_regulations.shtml

Arizona

- For information on Arizona rainwater harvesting tax credits go to: http://www.tucsonaz.gov/ocsd/sustainability/water/rainwaterharvesting.php
- The City of Tucson's Commercial Rainwater Harvesting Ordinance went into effect in 2010. This ordinance applies to new commercial construction, whose facilities must meet 50% of their landscape demand using harvested rainwater, prepare a site water harvesting plan and water budget, meter outdoor water use and use irrigation controls that respond to soil moisture conditions at the site. http://www.tucsonaz.gov/ocsd/sustainability/water/rainwaterharvesting.php
- City of Tucson Water Harvesting Guidance Manual: www.ci.tucson.az.us/water/harvesting.htm

California

- AB 300 – Ensures that homebuilders receive credit for voluntary water demand measures: http://www.leginfo.ca.gov/cgi-bin/postquery?bill_number=ab_300&sess=0910&house=B&author=caballero
- AB 1408 – Ensures that water conservation measures continue when properties are sold: http://www.leginfo.ca.gov/cgi-bin/postquery?bill_number=ab_1408&sess=PREV&house=B&author=krekorian
- AB 275 (the Rainwater Capture Act of 2011) www.aroundthecapitol.com/Bills/AB_275/20112012/
- Berkeley Rainwater Harvesting Guidelines: http://www.ci.berkeley.ca.us/UploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/rainwater.pdf
- San Francisco's Rebate Program: http://sfwater.org/mto_main.cfm/MC_ID/14/MSC_ID/361/MTO_ID/559

Hawaii

- *Guidelines on Rainwater Catchment Systems for Hawaii* by Patricia S. H. Macomber. College of Tropical Agriculture and Human Resources Publication no. RM-12. ISBN: 1929325118 (revised 2010) www.ctahr.hawaii.edu/oc/freepubs/pdf/RM-12.pdf
- Senate Concurrent Resolution 128 to Promote Roof Water Harvesting: states that the water boards from each county are requested to study the feasibility of launching a water conservation program that promotes the installation of rainwater catchment systems: http://www.harvesth2o.com/HawaiiSCR172.pdf

New Mexico

- Albuquerque and Bernalillo Counties - www.uswaternews.com/archives/arcconserv/8waterule2.html These counties have mandated rainwater tank and water harvesting earthwork installation on new residential and commercial construction. They also have a rebate program at: http://www.abcwua.org/content/view/123/199/
- County of Santa Fe – http://www.santafecounty.org/growth_management/water_conservation/projects_and_programs. This county has passed water saving rules that mandate rainwater harvesting into tank and water harvesting earthwork installations on new residential and commercial construction. To download a copy of the ordinance, go to: http://www.santafecounty.org/userfiles/Water Harvesting Ordinance.pdf
- *Storm Water as a Resource: How to Harvest and Protect a Dryland Treasure* City of Santa Fe, New Mexico (2002) www.santafenm.gov/DocumentView.asp?DID=532

North Carolina

- The North Carolina Department of Environment and Natural Resources Division of Soil and Water has implemented a Community Conservation Assistance Program, a voluntary, incentive-based program designed to improve water quality through the installation of various best management practices (BMPs), including rainwater harvesting, on urban, suburban and rural lands, not directly involved in agricultural production. Go to: http://www.enr.state.nc.us/DSWC/pages/ccap_program.html

- To see the Division of Water Quality's technical assistance handout on Stormwater Treatment Credit for Rainwater Harvesting Systems, download: http://h2o.enr.state.nc.us/su/documents/RainwaterHarvesting_Approved.pdf

Ohio

- The State of Ohio has the most extensive rules on rainwater harvesting in the United States, with code on cistern size and material, manhole openings, outlet drains, overflow pipes, fittings, couplings, and even roof washers. Ohio's rules also address disinfection of private water systems. http://www.odh.ohio.gov/odhprograms/eh/water/water1.aspx

Oregon

- The Building Codes Division Oregon Smart Guide on Rainwater Harvesting: www.cbs.state.or.us/bcd/pdf/3660.pdf

Texas

- City of Austin Rain Barrel and Rainwater Harvesting Rebate Program: http://www.ci.austin.tx.us/watercon/rebatelist.htm
- HB 645, passed by the 78th Legislature in 2003, prevents homeowners associations from banning outdoor water-conserving measures such as composting, water-efficient landscapes, drip irrigation, and rainwater harvesting installations.
- *Rainwater Harvesting Potential and Guidelines for Texas* by the Texas Water Development Board (2006): www.twdb.state.tx.us/innovativewater/rainwater/doc/RainwaterCommitteeFinalReport.pdf
- Texas Commission on Environmental Quality Harvesting, *Storing and Treating Rainwater for Domestic Indoor Use:* http://rainwaterharvesting.tamu.edu/drinking/gi-366_2021994.pdf
- Texas Commission on Environmental Quality Guidelines for public water systems on regulations about using rainwater: http://rainwaterharvesting.tamu.edu/drinking/rg-445_1985136.pdf
- Texas Commission on Environmental Quality requirements for large water users to develop water conservation plans: http://www.tceq.state.tx.us/permitting/water_supply/water_rights/conserve.html
- *Texas Manual On Rainwater Harvesting 3rd Edition* by the Texas Water Development Board (2005): www.twdb.state.tx.us/publications/reports/RainwaterHarvestingManual_3rdedition.pdf

Utah

- While rain water in Utah is owned by the state, State Senate Bill 32, passed in 2010, permits rainwater catchment for maximum capacity of no more than 2,500 gallons: http://le.utah.gov/~2010/bills/sbillint/sb0032.pdf

Virginia

- A comprehensive guide to examining, designing and maintaining rainwater harvesting systems to abate stormwater runoff was published for Virginia (2007): http://www.harvesth2o.com/adobe_files/Virginia Rainwater Harvesting Manual.pdf
- The Virginia Stormwater Management Act states that localities covered under the Chesapeake Bay Preservation Act within the Tidewater area are required to adopt a local stormwater management program, for which one solution is rainwater harvesting: http://www.dcr.virginia.gov/soil_and_water/documents/vaswmlaw.pdf
- The 2009 Virginia's Stormwater Impact Evaluation lists rainwater harvesting as a BMP: http://harvesth2o.com/adobe_files/VI_Stormwater_BMP.pdf

Washington

- Passed the law RCW 36.89.080 that mandates the reduction in stormwater rates of at least 10% for installation of rainwater harvesting systems: http://www.mrsc.org/mc/rcw/RCW%20%2036%20%20TITLE/RCW%20%2036%20.%2089%20%20CHAPTER/RCW%20%2036%20.%2089%20.080.htm
- In October 2009, Washington State Department of Ecology issued an Interpretive Policy Statement clarifying that a water right is not required for rooftop rainwater harvesting. If and when the department determines that rooftop or guzzler rainwater harvesting systems are likely to negatively affect instream values or existing water rights, local restrictions may be set in place to govern subsequent new systems: http://www.ecy.wa.gov/programs/wr/hq/rwh.html
- The Department of Ecology is amending WAC 173-152-050 to specifically authorize priority permit processing for rainwater collection systems that do not fall under the permit exemption, and creating a streamlined rainwater collection permit.
- The city of Seattle allows rainwater harvesting and requires a permit: http://www.seattle.gov/util/About_SPU/Water_System/Projects/RainwaterPermit/index.htm

US VIRGIN ISLANDS

- Since the early 1930s, the US Virgin Islands (USVI) have had a law requiring private residences and businesses to construct cisterns for the capture and storage of rainwater from rooftops or dig wells for domestic water supply: http://www.oaecwater.org/usvi-cistern-code

BOOKS/PERIODICALS

Design For Water: Rainwater Harvesting, Stormwater Catchment and Alternative Water Reuse
by Heather Kinkade-Levario. Publisher: New Society Publishers. ISBN: 9780865715806. (2007)
www.newsociety.com/bookid/3954.

Rainwater Catchment Systems for Domestic Supply: Design, construction and implementation - by John Gould & Erik Nissen-Petersen. Publisher: ITDG Publishing. ISBN:1853394564 (1999)

Rainwater Collection for the Mechanically Challenged
by Suzy Banks with Richard Heinichen Publisher: Tank Town Publishing. ISBN: 0966417003 (1997)
https://rainwatercollection.com/store/index.php?searchkey=book

Rainwater Harvesting for Drylands, Volume 1: Guiding Principles to Welcome Rain Into Your Life and Landscape
by Brad Lancaster. Publisher: Rainsource Press ISBN: 097724640X (2006) www.harvestingrainwater.com

Rainwater Harvesting for Drylands, Volume 2: Water Harvesting Earthworks
by Brad Lancaster. Publisher: Rainsource Press ISBN: 0977246420 (2008) www.harvestingrainwater.com

Water From The Sky
by Michael Reynolds, http://earthship.com/books?page=shop.product_details&flypage=flypage.tpl&product_id=21&category_id=6

Water Storage: Tanks, Cisterns, Aquifers and Ponds
by Art Ludwig. Publisher: Oasis Design. ISBN: 0964343363 (2005) www.oasisdesign.net/water/storage

RELATED ORGANIZATIONS & WEBSITES

American Rainwater Catchment Systems Association
www.arcsa.org

Harvest H2O
http://www.harvesth2o.com
http://www.harvesth2o.com/statues_regulations.shtml

International Rainwater Catchment Systems Association
www.eng.warwick.ac.uk/ircsa

Oasis Design - Rainwater Harvesting/Coliform
http://oasisdesign.net/water/rainharvesting/index.htm
www.oasisdesign.net/water/quality/coliform.htm

Occidental Arts and Ecology Center's WATER Institute
www.oaecwater.org

Penn State School of Forest Resources – Water Facts #13 – Coliform Bacteria
http://pubs.cas.psu.edu/FreePubs/pdfs/XH0019.pdf

San Francisco Public Utilities Commission – Rainwater Harvesting
www.sfwater.org/mto_main.cfm/MC_ID/14/MSC_ID/361/MTO_ID/559

Salmon Protection and Watershed Network (SPAWN)
www.spawnUSA.org

The Rainwater Calculator
www.rain-barrel.net/rainwater-calculator.html

The Centre for Science and Environment - Rainwater Harvesting Technology and Systems
www.rainwaterharvesting.org

Tree People
http://www.treepeople.org/demonstrations-and-solutions

Wholly H2O
www.whollyh2o.org

APPENDIX 2

CALIFORNIA WATER AUTHORITIES & LEGISLATION

The following is a listing of agencies and legislation that exert power over water resource use in California. This list was created by the Occidental Arts and Ecology Center's WATER Institute. To see the most up to date version go to www.oaecwater.org/education/roofwater-harvesting-resources.

California Water Agencies

- **California Department of Water Resources (DWR)** http://www.water.ca.gov/
- **State Water Resources Control Board (SWRCB), Division of Water Rights (under CalEPA)** http://www.swrcb.ca.gov/

California State Legislation and Regulations Governing Water Resource Use

For a listing of much of this legislation, go to: http://www.swrcb.ca.gov/laws_regulations/

- **California Water Code (CWC)**
  http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=wat&codebody=&hits=20
- **Porter-Cologne Water Quality Control Act** http://www.swrcb.ca.gov/laws_regulations/
- **California Code of Regulations,**
  - *Title 27. Environmental Protection*

    http://www.calrecycle.ca.gov/Laws/Regulations/title27/
  - *Title 23. Water*
    - **NOTE:** It appears that during 2010 there has been a process to propose and ratify amendments to Regulations for Implementation of the California Environmental Quality Act (CEQA). The most recent event in this proceeding took place on November 16, 2010 (9 am) - Coastal Hearing Room; and the following documents were associated with this session:
      - Final Statement of Reasons
      - Final Text of Proposed Regulations
      - Final Text of Proposed Regulations (Comparison)

      ~ Some of the history of the CEQA amendment process ~
    - The State Water Board held a public hearing on Wednesday, February 17, 2010 to accept comments on proposed amendments to California Code of Regulations, title 23, division 3, chapter 27 (commencing with section 3720) relating to CEQA for all of its programs, including its certified regulatory programs.
      - Documents available for review are as follows:
        - Notice of Proposed Rulemaking

- Initial Statement of Reasons
- Proposed Regulations
- Comparison of Existing and Proposed Regulations

- Comments Received - Deadline February 15, 2010

- The State Water Board accepted written comment on additional proposed modifications to its draft amendments to California Code of Regulations, title 23, division 3, chapter 27 (commencing with section 3720) relating to CEQA for all of its programs, including its certified regulatory programs. The proposed modifications appear in Proposed Modifications Only in green single underline and green single strikeout, and also in Proposed Modifications (Comparison) in green double underline and green double strikeout.

  - Documents available for review:

    - Notice of Modifications to Text of Draft Amendments to Regulations
    - Proposed Modifications Only
    - Proposed Modifications (Comparison)
    - Comments - deadline September 8, 2010

NOTE: Questions or comments on any of the above legislation or regulations can be directed to Jeannette L. Bashaw, Legal Analyst, Office of Chief Counsel, by email: jbashaw@waterboards.ca.gov or telephone: (916) 341-5155

- **Recent Legislation Pertaining to the CA Water Plan (for more on the Water Plan see below)**

NOTE: *Content derived from* http://www.waterplan.water.ca.gov//technical/waterplancode.cfm

SB 1341 (Burton)
http://www.leginfo.ca.gov/pub/99-00/bill/sen/sb_1301-1350/sb_1341_bill_20000927_chaptered.html

SB 1341 was enacted following the California Water Plan Update in 1998. The Legislature asked DWR to make public all assumptions and estimates that were to be used in the next update. Sen. John Burton carried the legislation that was enacted in 2000. It requires a report about the Update's assumptions and estimates. At a minimum, the law says, the A&E Report will include information on all water categories specified by the California Water Code, in the Burton Bill. More information on this can be found in the Update's Reference Guide and Technical Guide.

SB 672 (Machado)
http://www.leginfo.ca.gov/pub/01-02/bill/sen/sb_0651-0700/sb_672_bill_20010920_chaptered.html

SB 672 requires the state to include in the California Water Plan, which is prepared every five years, a report on the development of regional and local water projects, within each region. Projects that use technologies such as desalinization, reclamation, and recycling will be included in the report. This is important because the capability to better utilize all water sources, such as rainfall, snow melt, surface water, groundwater, ocean water or reclaimed wastewater, can help these regions meet their own water needs without having to look elsewhere for water supplies.

SB 1062 (Poochigian)
http://www.leginfo.ca.gov/pub/99-00/bill/sen/sb_1051-1100/sb_1062_bill_19990728_chaptered.html

Senate Bill 1062 by Sen. Charles Poochigian requires the Department of Water Resources (DWR) to include various strategies for meeting the state's water supply needs in its updates to the California Water Plan. It also establishes an advisory committee to help DWR update the plan. SB 1062 describes California's need for reliable water supplies, estimates of expected population growth, and the integral role water conservation, recycling, conjunctive use, desalination, and water storage play in meeting those needs. SB 1062 requires DWR to include a discussion of various strategies and the potential advantages and disadvantages of the strategies that may be pursued in meeting the state's water supply needs in its update of Bulletin 160. Additionally the update must identify all federal and state permits, approvals or entitlements that might be required in order to implement the strategies. This narrative will serve as the basis for future informed discussions and decisions regarding California's water plan. Finally, SB 1062 requires DWR to establish an advisory committee, comprised of representatives of agricultural and urban water suppliers, local government, business, production agriculture, environmental interests, and other interested parties, to assist in the updating of Bulletin 160.

AB 2587 (Matthews)
http://www.leginfo.ca.gov/pub/01-02/bill/asm/ab_2551-2600/ab_2587_bill_20020917_chaptered.html

AB 2587 requires the California Department of Water Resources to consider scenarios in the California Water Plan Update that are consistent with substantial continued agricultural production in California. A key phrase in the law is that "neither the state nor the nation should be allowed to become dependent upon a net import of foreign food." In particular, the law specifies that DWR consider scenarios under which agricultural production in California is sufficient to assure that California is a net food exporter and that the net shipments out of state are enough to cover 25 percent of "table food" use in the United States plus "growth in export markets." The 25 percent share is taken to be the traditional share from California.

The Porter-Cologne Water Quality Control Act
http://www.waterboards.ca.gov/laws_regulations/index.shtml

The Porter-Cologne Water Quality Control Act (Section 13141, California Water Code) is California's comprehensive water quality control law and is a complete regulatory program designed to protect water quality and beneficial uses of the state's water. It requires the adoption of water quality control plans (basin plans) by the State's nine Regional Water Quality Control Boards (Regional Water Boards) for watersheds within their regions. The basin plans are reviewed triennially and amended as necessary by the Regional Water Boards, subject to the approval of the California Office of Administrative Law, the State Water Board and ultimately the federal EPA. Moreover, pursuant to Porter-Cologne, these basin plans shall become part of the California Water Plan, when such plans have been reported to the Legislature.

Bagley-Keene Open Meeting Act
http://www.waterplan.water.ca.gov//docs/watercode/BagleyKeeneAct(1-1-2002).pdf

The Bagley-Keene Open Meeting Act governs notice and open meeting requirements for state bodies and is given as it appeared on January 1, 2002. The act declares, "It is the public policy of this state that public agencies exist to aid in the conduct of the people's business and the proceedings of public agencies be conducted openly so that the public may remain informed."

Key California Water Planning Documents

- **California Water Plan** http://www.waterplan.water.ca.gov/

  NOTE:
  The CA Water Plan is currently being updated for 2013—For info on the 2013 update, including a list of stakeholder working groups, go to: http://www.waterplan.water.ca.gov//cwpu2013/index.cfm

  Advisory Committee: http://www.waterplan.water.ca.gov//ac/index.cfm

  From the CA Water Plan website:
  "The California Water Plan provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future. The Plan, which is updated every five years, presents basic data and information on California's water resources including water supply evaluations and assessments of agricultural, urban, and environmental water uses to quantify the gap between water supplies and uses. The Plan also identifies and evaluates existing and proposed statewide demand management and water supply augmentation programs and projects to address the State's water needs. Our goal for the California Water Plan Update is to meet Water Code requirements, receive broad support among those participating in California's water planning, and be a useful document for the public, water planners throughout the state, legislators and other decision-makers."

  Contact Info:
  E-mail: cwpcom@water.ca.gov
  Fax: 916-651-9289
  Postal mail: P.O. Box 942836, Sacramento, CA 94236
  Attn: Paul Massera, Program Manager
  CA Water Plan Update 2013

- **CA Drought Contingency Plan (DCP)** http://www.waterplan.water.ca.gov//index.cfm

  The California Drought Contingency Plan (DCP) represents the first State drought plan and was developed following the Governor's executive orders and drought proclamations in 2008 and 2009. The DCP has been prepared in conjunction with the California Water Plan (CWP) and will be updated every five years.

Other agencies with authority over water issues in California

- All county agencies that wholesale water such as Sonoma County Water Agency and Marin Municipal Water Agency

- All municipalities that retail water