

## No Rain Insight: Practical, low-cost, easy-to-install solutions to California's continuing drought

By Judy Adler June 2015

The need for a 21<sup>st</sup> century water management policy for California is abundantly clear. Not only is a vision required, but also the leadership to overcome myriad bureaucratic and political obstacles to develop the necessary legislation to support the policy and implement it. The resort to emergency mode earlier this year underscores the lack of a clear long-term plan to guide the competing demands for water in this state. The issue is daunting and its complexity has immobilized decision-makers. The purpose of this paper is to suggest one pathway out that is quickly and easily achieved and can serve as a starting point i.e. the immediate introduction of incentives for graywater and rainwater harvesting in California.

I have tried both of these methods of water capture and reuse and have found them to be so compelling that I believe they should be integral to any effective water management scheme for California. These easy solutions will not only minimize water wastage and protect the environment, but they will also create jobs, empower citizens to proactively manage their water use and lead to statewide savings of water and money.

Both rainharvesting and graywater are intended for water uses other than drinking water (at present). Yet, the actual effect of their use this way is to reduce the reliance on drinking water for purposes for which it is neither beneficial nor appropriate. It leaves treated water for the ever increasing numbers of Californians (according to population projections) who will need it for drinking purposes. The energy cost of treated water is high so if we can keep the energy cost fixed while serving more people we are ahead of the game.

### Rain from the sky not from the road

Public utilities are not currently capturing, creating or otherwise making available the full complement of water possible. At the present time drinking water is derived about equally from surface water (freshwater streams) and groundwater in our state. The mere act of using less of a utility company's water is not the same as capturing additional water through rainharvesting

and graywater systems (despite the fact that both situations would be considered water conservation measures).

What if the water companies captured rainwater and treated it for drinking purposes? Done correctly, technologically speaking, treatment might not even be necessary or could be accomplished very simply.

In response to predictable droughts, we need to reconsider the definition of water. All types of water are not equal. Heiner Markhoff, president and CEO of GE Water and Process Technologies states in a recent article related to a forum on water reuse ("The Economic Power of Water") sponsored by his company and the Wharton School of Business West:

"Permitting requirements often mandate that all water must be potable, regardless of its intended use. Yet we don't need the most pure, drinking-water-quality water for everything. Treated wastewater can be used to irrigate golf courses and parks, leaving more potable water available for drinking water and home use. An industrial plant or a refinery's cooling systems can use treated wastewater as effectively as potable water.

In many cities, building and plumbing codes prohibit the installation of dual plumbing systems that would allow for recycled water use for functions such as waste disposal. After all, do we really need drinking-quality water in our toilets?" Dealing with water scarcity, he notes, requires a forward-looking approach that builds on conservation, reuse and improved technology.

Other advantages of the low-tech water capture measures I advocate are that they help keep water on site (now required by developers for new construction under stormwater codes), restore groundwater levels (critical in our sinking state), reduce creek pollution and minimize drainage and flooding concerns.

They serve as a bridge to the larger scale projects that will be needed to replace California's aging water infrastructure - projects that require a huge investment of time and money and are long-term actions. Finally, low tech water capture by everyone, in some form, truly focuses the water issue on a local level by demonstrating manageable solutions on the basis of a single

household or business as compared to the overwhelming- often ambiguous - all-encompassing state level.

### ***The "Phew" Effect...***

There is urgency now to all of this because meaningful long-rang planning that began in the early 1980s with a conference in Monterey of a diverse group of stakeholders (see Department of Water Resources Report 213) did not result in a state-wide water management plan. When the drought of the late 1970s ended so did the motivation to encourage water conservation

Some topics to be considered in developing a sound water policy that is equitable for a diversity of users are listed below. An easy way to remember the competing demands for water is with the acronym BARRIE

Biology\* Agriculture/Fishing, Recreation, Recycling, Industry & Energy.

\*Biology includes our own personal water needs and those of other living things.

- 1) should water-intensive crops be allowed in an arid state (almonds, walnuts, citrus, cotton) and what criteria will be used to evaluate their economic and environmental impacts relative to other food sources (e.g. water/unit of protein when comparing almond growing to cattle raising)
- 2) should fracking be considered a legitimate use of water?
- 3) what type of water distribution system will replace the broken storm drain system?
- 4) how can we greatly increase the use of non-potable water e.g. to keep dust down at construction sites or maintain plantings along city streets?
- 5) how will we replenish groundwater levels and insure the quality of this water? Groundwater is currently being used up faster than it can be replenished?
- 6) when will tax incentives for water conservation systems finally be broadly implemented?

7) when will pesticides and other toxic substances be forbidden entirely from entering the state's waters from a variety of sources?

8) will water from California continue to be permitted to leave the state in plastic bottles?

Excessive use of surface water by pot growers is a problem for the Department of Fish and Game with regard to maintaining stream health during this drought). Requiring rainwater capture in ponds and tanks coupled with incentives for these could be an important answer for protecting streams and promoting a growing industry in the state.

These are but a few of the questions of concern. Regardless of where we live in the state or how we are employed, we are all stakeholders in this one. When it comes to water we simply cannot live without it!

**One Homeowner's Experience: A gutter break results in a sustainable solution**

For approximately \$6,000 including gravel, pipes, tanks and installation costs I am able to capture somewhere between 11,000 and 15,000 gallons of water per year in my suburban home where the annual precipitation is 18" per year and my catchment area (roof in this case) is 2700 sq. ft. I can only store half of what is available off my roof in a typical year. Using a conservative 12,000 gallon/year figure for captured and stored water annually, my investment was \$.50/gallon. The storage tanks I use (your basic durable plastic rural tanks) are said to have a 40-year life. Spreading this investment over their life, the \$6,000 cost is a minimal \$150/year. Compare this to the operating cost of a smartphone. The scale of this system is not necessarily for everyone, but some capture and reuse of water should be on everyone's agenda.

If we were to calculate the square footage of all existing structures in California using the same formula, the water capture would be astounding! For every 3000 sq. ft. of water catchment area one could capture 30,000 gallons/year for 40 years for a cost of \$6,000 in reasonably dry, non-desert parts of California.

### A bit of history....

California's climate history, with allowances for climate change, must be the starting point for a sound water policy. That we live in an arid state is a truth derived not only from written records on climate and weather patterns in the state. Now, long-term nature-based sources of information in the form of tree rings and sediment cores confirm it (*The West without Water*, Ingram et al). The evidence from nature points to a California model consisting of lengthy periods of drought (yes, longer than 4 years) that are punctuated by periods of flooding. An intimate knowledge of place and how nature functions are keys to meaningful long-range planning for water. With this in mind, wisdom would dictate policy devoted to capturing as much water as possible when it is available and storing it for use when water is in short supply. From such a policy would emanate legislation that acknowledges a future with long periods of water scarcity.

Governor Brown declared a ***drought state of emergency*** in January and the State Water Resources Control Board ordered new restrictions on water use. Then in April the Governor mandated 25% water reductions in cities and towns. We are now in the 4<sup>th</sup> year of drought and there seems to be no end in sight to our state's water shortfall. We are experiencing the worst dry period in 1,200 years. Applying the term "emergency" somehow makes the problem real. The state's reservoirs are a fraction of their usual size due to the diminishing snowpack in the Sierras.

The entire issue is complicated by the lack of a central body responsible for decision-making on water matters in our state and outdated water rights laws that permit property rights to trump the public good. In a recent Wall Street Journal editorial entitled "Slaking California's Thirst - if Politics Allows" a CEO explained why it took 10 years to build a single desalination plant near San Diego. The author makes a good case for how this state's politics is a roadblock to good planning for water.

### Crisis Management

The governor's crisis plan calls for a substantial cutback in water use statewide. This is reminiscent of Washington's attempt to pass a budget that makes cuts across the board regardless of specific need. The

immediate focus of the emergency plan will be reducing landscape and extravagant uses of water. The response thus far has been narrow and negative in focus. It uses punishing fines for excesses in water use and even "ratting" on neighbors. Yes, water will have to be more expensive since supplies are more limited now. Higher costs will serve as a deterrent to waste as well. But the fees fall unevenly on different segments of the population.

My approach is to give all citizens a stake in capturing the water they need. Those who govern us and manage the state's natural resources on our behalf must provide the tools and mechanisms to make water conservation happen in a meaningful way. It is time to reconvene diverse stakeholders as was done at Monterey, locate, resurrect and update AB 1150 passed after the last drought and signed by the Governor. This law made possible significantly less water wastage by providing tax incentives for low-tech water conservation actions. It also addressed the educational message for consumers that water is precious and should not be wasted.

## Summary

The ways to make massive amounts of water that would otherwise escape the system available to us quickly, relatively inexpensively and relying on existing resources and technologies are:

- 1) low-tech water capture and storage installations for new and old structures of all types (i.e. rainwater harvesting and graywater systems to gather water for irrigation purposes)
- 2) the addition to existing smart water saving landscape practices as lawn removal, drip irrigation and the use of native plants: fall tree planting, mulching, building ponds on farms and ranches to capture and store rainwater and using permaculture techniques on landscapes of all types. Such best landscape management practices not only help retain moisture in the ground and improve soils, but they reduce carbon in the atmosphere! This is a win-win in an era of climate change and extreme weather events (including our drought).

*These ideas reflect an understanding of how nature works and a desire to work with nature on the part of humans. They also show an appreciation of our place on earth physically and spiritually.*

### **Water Security in California - Technology and Politics**

There is no better place to look than Israel for insights on cultivating water security in California. Our state shares not only a Mediterranean climate with that nation, but the technological capabilities for responding to the problem of water scarcity. In 5 years Israel went from water scarcity to water security through a combination of water conservation measures, an incredible water reuse program and numerous desalination plants. They lead the world in water reuse. The Global Water Forum estimates the country recycles 75% of its wastewater and is predicted to hit 95% by 2017. Spain recycles 13% and the US, 1%.

It is time for a dramatic increase in our reuse of water in this state and for creating the framework for adapting advanced water technologies of others worldwide to our needs and promoting our own innovations.

I can imagine digitally directed management of water capture and storage and computer monitoring systems that eliminate leakages and other forms of waste. I envision a new generation of entrepreneurs running start-ups in California whose missions are to solve water storage, capture, distribution and conversion problems. Just as the oil industry is considering Carbon Storage ventures, why couldn't there be public/private partnerships for water capture and storage.

The nation's largest government collaboration to create solar energy is in California. The West Winton Landfill project involves 19 agencies in Alameda, Santa Clara, Contra Costa and San Mateo counties pooling resources to reduce costs and create jobs. What about a similar collaboration for water capture, storage and distribution? Why not piggyback water capture and storage pipes with solar panels on the very same roofs?

A project funded by the Bill Gates Foundation in Washington State converts sewage water to drinking water, creating its own energy as steam in the process. This was intended to benefit countries in which safe drinking water

is not readily available. California could certainly benefit from this sort of technology with the proper mindset.

Low tech conservation needs to be part of the solution to California's water with across the board consistency. Developers of new projects are now required to drain water onsite. What about the rest of us? The new stormwater codes apply to new developments, those still in the planning stages, but do not address existing housing stock, commercial and industrial structures which are in the majority of things built. If we add existing structures to new projects, the amount of water captured would be utterly amazing and accomplished easily and with little cost, relatively speaking. The result will be new opportunities for plumbers, roofers, architects, landscape designers and building and landscape contractors. There will certainly be more jobs for lawyers to handle water rights cases and hydrological engineering consultants to sort out the water wastage mess we now have in California.

Some areas of the state, L.A. for one, are now providing rain barrel rebates. Perhaps this should be a state-wide phenomenon? A nonprofit organization in Marin County (SPAWN) in collaboration with various agencies and businesses has introduced the 10,000 Rain Gardens Initiative. Such initiatives need to be more widespread and could be with appropriate state-wide incentives administered through water districts. The city of Irvine has a water reuse program. Homebuilders in the City of Lancaster are installing a graywater system from Australia in new homes. Retrofits are the answer for older homes. Tech startups are a means to develop the systems.

### **Dwelling in Possibilities**

I have taken a  $\frac{1}{2}$  acre section of public land and created a dry climate garden that is biodiverse, diverts massive amounts of organic waste, is wildlife-friendly, uses no water and relies on human energy. I have installed rainwater harvesting and graywater systems. I know what is possible for an ordinary citizen with no special skills in engineering.

### **Consider:**

**What the individual can do:** invest in rainwater and graywater systems  
plant region-appropriate trees to reduce desertification and sequester carbon from the atmosphere

**What educators can do:** link rainwater catchment with school garden projects; teach the preciousness of water and the role trees play in the water cycle. Schools can partner with businesses as in Benicia (Contra Costa Sunday Times, May 24, 2015) for projects that inspire green careers and further curriculum goals.

**What businesses can do:** Incorporate low-tech water systems. Invest in innovative water projects. Banks, financial institutions and alternative lending sources can make loans available for start-ups promoting water conservation and efficient delivery systems.

**What legislators at state and local levels in collaboration with water agencies can do:** Develop a long-range water management policy for our state which incorporates new thinking on water rights and new technologies that are founded upon the realities of California's climate.

Offer a challenge grant like the one USAid offered for the best designed Ebola suit for, in this case, the design of the most efficient water distribution system. In this way a team of scientists, engineers, university students, hydrogeologists and others would be engaged in a collaborative effort.

Change municipal codes to reflect new thinking about water conservation, recovery, recycling and reuse. In Arizona, rainharvesting has taken hold in a significant way. Brad Lancaster works collaboratively with public agencies on street design projects to capture and hold what rainwater is available in a desert environment. He has planted native trees and returned 25 species of wildlife to his modest neighborhood in Tucson [www.rainwaterharvesting.com](http://www.rainwaterharvesting.com)

**What business/government partnerships can do:** Develop the water equivalent of the LEED organization serving the green building industry by setting standards for "green" water projects

**What plumbers and roofers can do:** Learn the new systems and apply the techniques in order to expand the services their businesses provide.

**What retired engineers can do:** Under the auspices of Compatible Technology International, CTI, based in Minnesota ([www.Progressiveengineer.com](http://www.Progressiveengineer.com)), a group of retired food industry engineers used their skills in developing simple chlorination devices to purify water in developing countries. Engineers in California, retired or not, could have a role in inventing simple systems related to protecting water quality and supporting conservation here.

**What water agencies can do:** Provide incentives for water capture and storage equivalent to "removing the lawn" rebates. Rethink BMPs to enable capture of otherwise wasted water from water main breaks for reuse elsewhere (pump into a truck or onto bare land rather than into the storm drain system).

Time and water are running out.

People attending my sustainable gardening classes respond with amazement over how much water I am able to capture from my roof in a typical year here in dry Walnut Creek. Imagine if all new and existing structures were retrofitted to capture water. Imagine if landscapes were designed to slow, spread and sink water ultimately replenishing groundwater sources. These innovations must be encouraged and incentives offered. The results will be more clean, green jobs for California - jobs that are, by the way, not only desirable but higher paying than conventional ones. (Schlesinger, KPIX news)

Solar installations are subsidized. Why can't the same be done with water capture and storage features?

**Other ideas involving personal choices with regard to water use:**

Plant food crops suitable for dry land farming and give food and habitat supporting plants priority over purely ornamentals.

Introduce rain garden techniques into public and private landscapes.

Mandate permaculture and ecology education with the same enthusiasm as Common Core or No Child Left Behind paradigms. Let the school buildings and structures serve for water capture and storage and engage students in

doing the math and construction with community support. This would promote sustainable thinking and doing.

The adjustments I propose cost little and can be accomplished quickly. I dream of living in a state in which practicality and respect for nature dictate policy. In California we need to see the drought as an opportunity to get long-term (and short-term) public policy related to water management right. I look forward to some implementation of the measures I suggest in anticipation of at least some rain this fall.

Nor can we continue to allow existing supplies to become degraded.

Examples of how to manage water effectively abound world-wide and not only in the developed world. It is time for those who govern us to meet with the developers of the models and adapt them to our needs. They must as well foster innovations here, otherwise, we will experience a drought of vision, leadership and human energy that is greater than the drought we have in terms of water scarcity.

In the words of author, Oberlin College professor and Bioneer, David Orr,

*It makes better sense to reshape ourselves to fit a finite planet than to attempt to reshape the planet to fit our infinite wants.*



Author, Judy Adler with a backdrop of 3000 gallon rain tanks used for water capture to maintain her food plants and a natural pond intended to restore amphibian populations

Judy Adler is an environmental educator and passionate gardener. Visit [www.diablonature.com](http://www.diablonature.com) to learn of her classes and other activities.

Other photos available: rain barrel use in a state park; graywater distribution elements at home installation; shade cover at a school site suitable for water capture; traffic circle water capture feature