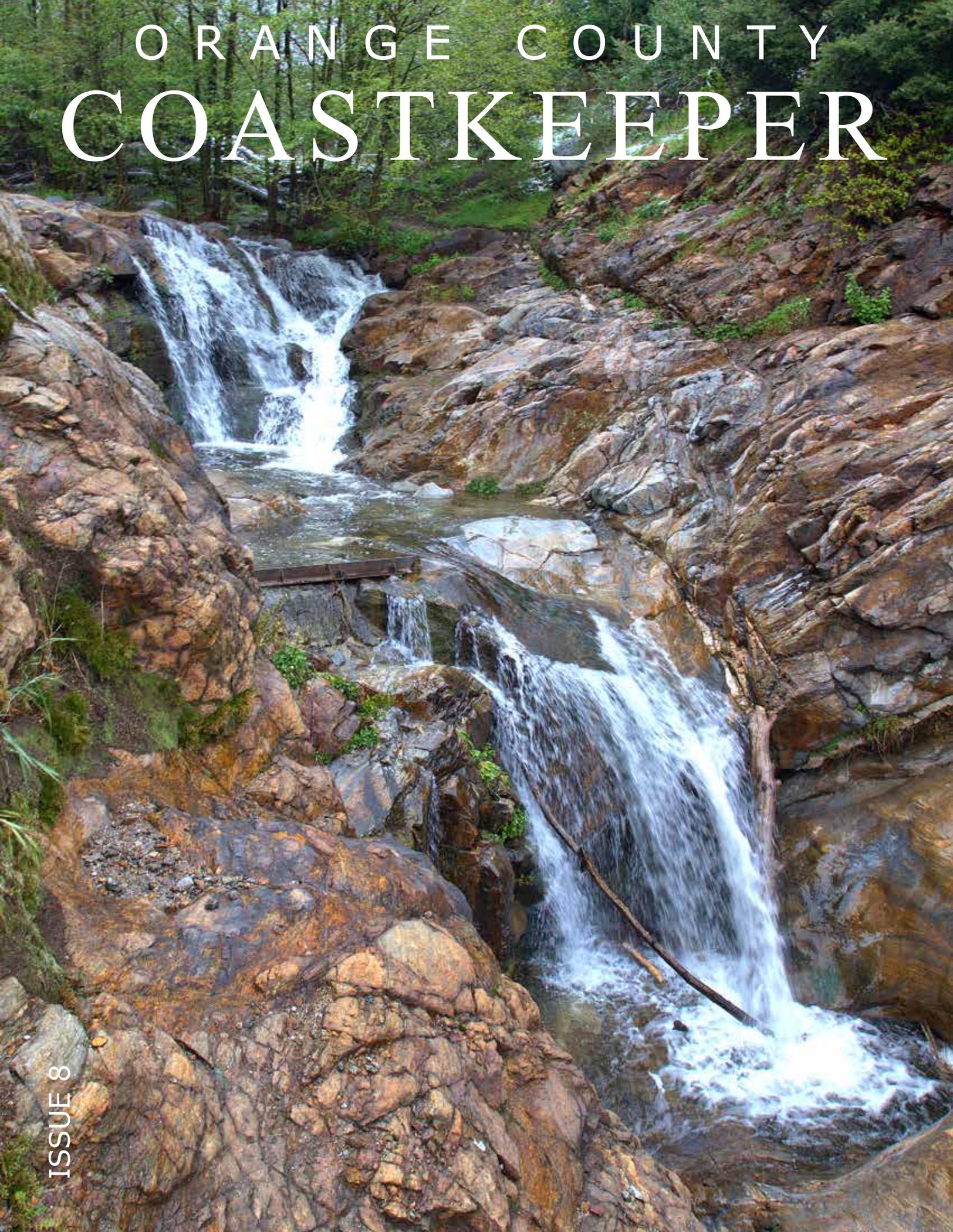


ORANGE COUNTY COASTKEEPER

ISSUE 8





Santa Ana Watershed Project Authority

Facilitating Watershed Consensus Since 1968

www.sawpa.org



Coming soon to an O.C. beach near you...



THE CLEAN WATER Fund

A unique fund to ensure clean water for our waterways, harbors and coastal waters.

Coastkeeper: Sustaining the Drive Toward Water Resilience

Welcome to *Coastkeeper Magazine*. We are happy and proud to keep the tradition going by publishing this issue as we jump into our 16th year. In it, you will find sustainability and resilience is a unified theme.

It starts with water. Our drought isn't going to go away soon. In fact, as Coastkeeper board member Larry McKenney expresses in the Voices article on page 48, perhaps we should stop calling it a drought and consider it the new normal.

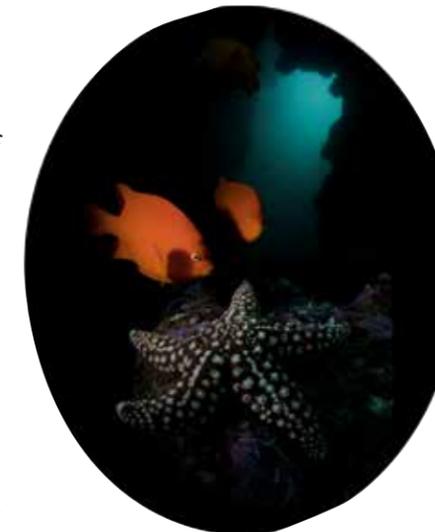
Southern California's water supply can become sustainable and not rely on imported water as the primary source, but we need a realistic long-range plan for water resilience. The components of a successful plan are all known—the answers are there. We need leadership and the desire of the stakeholders to make it happen. The issues are complex but not insurmountable. Here we unravel the puzzle.

We must also sustain our sea life for future generations. We can do this through preservation and innovation. As Marine Protected Areas expand, we see positive results for marine life and for the people who enjoy it. The photo on this page, titled, "The Crevice" by Michael Zeigler, is one of the award-winning photos we highlight in this issue from the Laguna Blue Coalition photo contest. Coastkeeper, a member of the Coalition, has been a prominent leader in preservation efforts. Coastkeeper spent a decade reforesting our giant kelp and is now growing eelgrass and aqua culturing Olympia Oysters.

Sea Ranching—Sustaining our sea life doesn't mean that we completely leave it alone, but if we are going to consume fish and seafood, we need to do it more responsibly. In this issue, we highlight a new model that

may help to sustain our overfished and overstressed sea life while saving space in our estuaries. Sea ranching of shellfish is on the verge of becoming a new industry off our Southern California coast. If the concept becomes viable here, we could see it grow to a number of stressed species and throughout the globe.

Coastkeeper Garden—We can also assist you in doing your part for water resilience. Visit the Coastkeeper Garden. You can enjoy nature and learn great landscaping ideas. Don't let anyone tell you that you have to sacrifice beauty for water savings. Native- and drought-tolerant landscapes are breathtaking and add value to your property with proper planning and creative landscape revitalization. Let us show you how to transform your own property and have some fun.



Coastal and Creek Cleanups—Speaking of combining fun with making a difference, you can also help keep our beaches and waterways clean throughout the year by joining one of our coastal and creek cleanups in Southern California. See our cleanup article on page 68 and keep tabs on our events by visiting our website and Facebook.

Coastkeeper is committed to achieving resilience in water supply, water quality, and the quality of life for Southern Californians. Our advocacy, education, enforcement, research and restoration efforts continue in full force with your support. Sustainability and resilience are big jobs, but they are attainable. We can do this, and you must be part of the solution.

Please enjoy this issue of Coastkeeper Magazine. We hope you will support and join us in our work.

Garry Brown, Founder and President

Note: Orange County Coastkeeper is a non-profit corporation dedicated to the mission of promoting and restoring water resources that are drinkable, fishable, swimmable and sustainable. The cost of producing "Coastkeeper Magazine" does not come from the general funds of Coastkeeper. We are blessed with generous sponsors and advertisers who contribute directly to the production and printing of the magazine, along with grant funds that are earmarked specifically for public outreach.

ORANGE COUNTY COASTKEEPER



10

Sustainable Water Future



17

Ranching Offshore



22

The Coastkeeper Garden



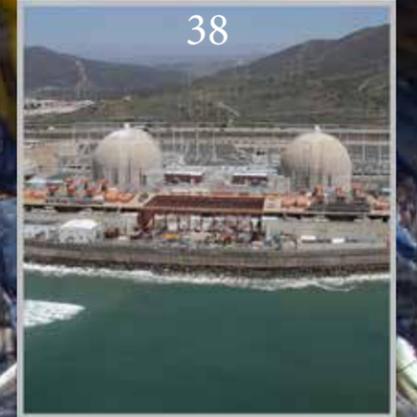
27

Living With Our Wildlife



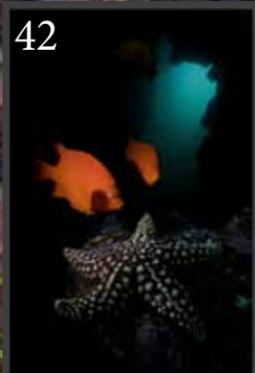
33

Marine Protected Areas



38

Plant Decommissioning



42

Laguna Bluebelt



48

Voices: Water Resilience



54

Coastkeeper Restoration



57

Stormwater Quality



62

Orange County Parks

ALSO...

7

Education

Creating Water Stewards

61

Did You Know?

Hot Secret in the OC

68

Keeping Beaches Clean

Coastal and Creek Cleanups

Cover: Etiwanda Falls in the foothills of the San Gabriel Mountains. Photo by Lee Reeder

The mission of Orange County Coastkeeper is to protect and promote water resources that are swimmable, drinkable, fishable and sustainable.

ORANGE COUNTY COASTKEEPER

Orange County Coastkeeper

Garry W. Brown
Executive Director & CEO

Ellen A. Orange-Brown
Associate Director

Ray Hiemstra
Associate Director of Programs

Colin Kelly, Sr.
Staff Attorney

Sara Briley
Marine Restoration Director

Dyana Peña
Education Director

Vanessa Andronaco
Education Coordinator

Courtney James
Coastal Cleanup Director

Austin Brown
Garden Project Manager

Simon Paskin
Garden Technician

Megan Brousseau, Program Director
Inland Empire Waterkeeper

Coastkeeper Magazine Team

Publisher
Garry W. Brown

Executive Editor/Creative Director
Lee Reeder

Associate Editor
Ray Hiemstra

Membership, Sponsorship and Advertising
Ellen A. Orange-Brown

Board of Directors

Steve Bone, Board Chairman
Orange County Coastkeeper

Garry W. Brown, Founder & Executive Director
Orange County Coastkeeper

Frank Tolerico, Board Vice-Chairman
CEO, Alpha Consulting

James Parkhurst, Board Treasurer
President, Newport Bay Hospital

Bob King, Board Secretary
CPA, Robert King Certified Public Accountant

Ellen Orange-Brown, Assistant Board Secretary
Associate Director, Orange County Coastkeeper

Kara Adams
Senior Manager,
Ernst & Young

Penelope Bryan
Dean,
Whittier Law School

Alan Freeman, Sr. Vice President of
Investments, UBS Financial Services

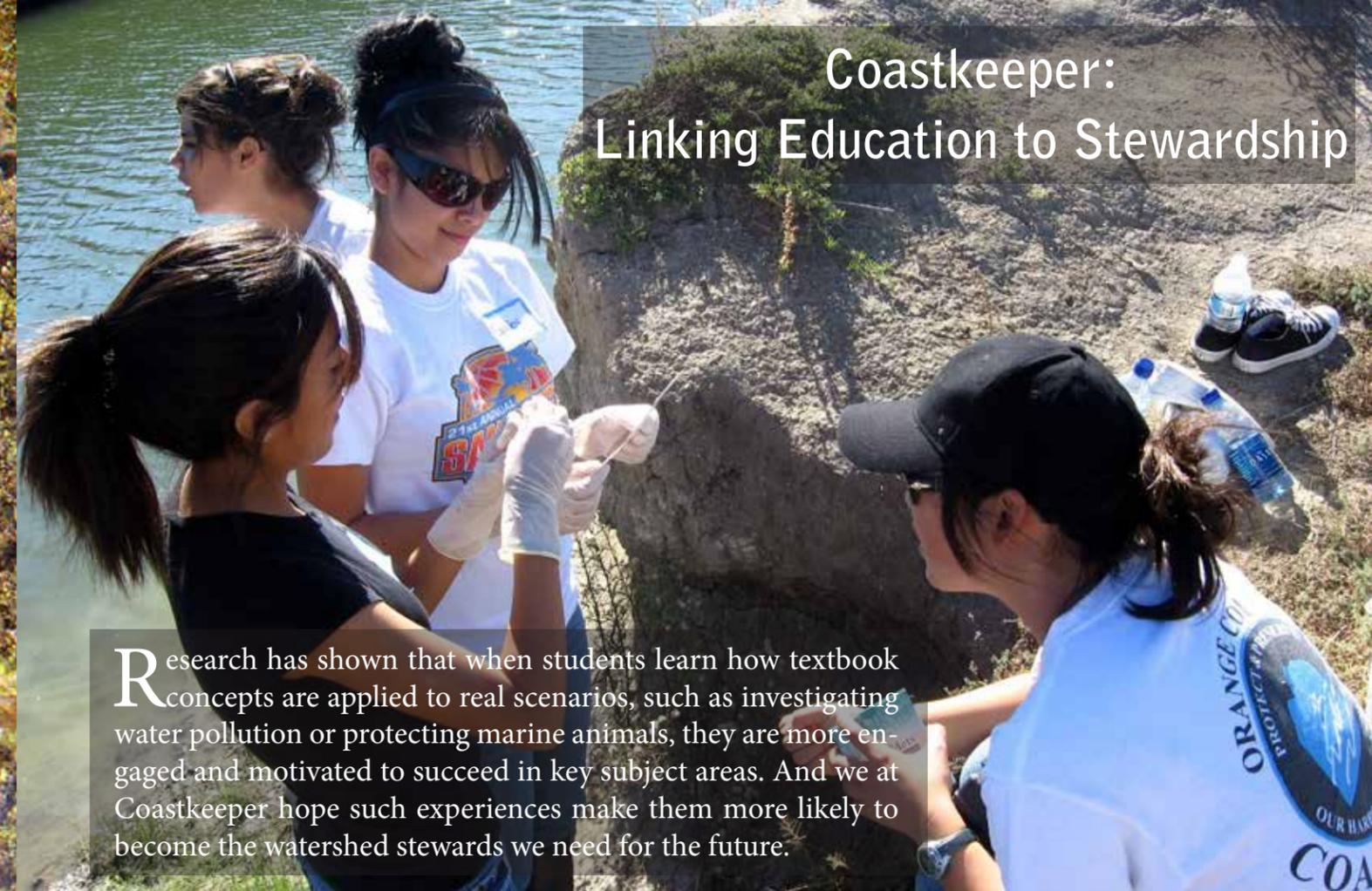
Mandana Massoumi
Partner,
Manatt, Phelps & Phillips, LLP

Larry McKenney
Counsel,
Santa Ana Watershed Project Authority

Richard Nicholson
President,
West Pacific Medical Laboratory

John Weispfenning
President,
Santiago Canyon Community College

Coastkeeper: Linking Education to Stewardship



Research has shown that when students learn how textbook concepts are applied to real scenarios, such as investigating water pollution or protecting marine animals, they are more engaged and motivated to succeed in key subject areas. And we at Coastkeeper hope such experiences make them more likely to become the watershed stewards we need for the future.

In 2005 Coastkeeper launched the WHALES program (Watershed Heroes—Actions Linking Education to Stewardship). WHALES introduces junior high and high school students to ecological and watershed concepts. We provide in-class and field experiences at no cost to local schools, enabling students to apply concepts taught in the classroom to real-world environmental issues.

Because of tight budgets in California schools, many teachers would not be able to offer their students field trips like those provided through the WHALES program if Coastkeeper did not coordinate the trips, and provide equipment, transportation and, in some cases, money to pay substitute teachers.

The need for innovative ways to conserve and reuse water, and reduce water pollution will only increase in the years to come. This is

why Coastkeeper is working to prepare our young people to step into these roles. We aim to foster environmentally literate students with motivation to meet these challenges. Through the WHALES program, we expose local students to complex watershed issues, and challenge them to think critically to solve environmental problems.

The goals of the WHALES program are to:

- provide field-based STEM (Science, Technology, Engineering, and Math) education
- increase environmental literacy through the study of local coastal issues
- foster in our students environmental stewardship and community involvement

- encourage students to explore water-related career opportunities

Coastkeeper also provides a more specialized program called Watershed Explorers. While most WHALES schools do some type of watershed monitoring with Coastkeeper, it is typically a one-time event during a field trip. Some lucky students at WHALES schools are within walking distance of a local creek or channel, giving them a unique opportunity to do more of a citizen science program. Since these schools can conduct watershed monitoring within a class period, they have the opportunity to conduct regular monitoring throughout the year.

continued...

...continued from page 7

To help schools take full advantage of this situation, Coastkeeper has partnered with the County of Orange Watersheds Department and the Council for Watershed Health (based in Los Angeles) to facilitate student watershed monitoring across Orange County.

“We’ve found that when students explore and study an aquatic ecosystem in their own backyard, it creates a strong connection with the material learned in class,” says Education Director Dyana Peña.

In the Watershed Explorers program, their field trips are geared toward, and take place in, their specific watershed.

“The sites they visit will all be in that watershed,” says Peña. “So they’ll visit the upper watershed, where it is a little more natural, and they get to see the [Santa Ana] River before it becomes channelized. Then they follow the watershed all the way down to the ocean.”



Members of the Summer Coastkeeper Club learn how to test water in Fountain Valley.

Coastkeeper’s programs have been expanded to include the Summer Coastkeeper Club. In this program Coastkeeper engages with children in YMCAs and Boys’ and Girls’ Clubs with an abridged version of the WHALES program in which they become “Coastkeepers” by the end of the summer. Through the program, participants conduct water quality testing, visit sanitation

districts, and do a beach and a neighborhood cleanup.

“Through the neighborhood cleanups we try to connect them to the environment around them rather than taking them to a far-off place,” says Pena.

The Summer Coastkeeper Club participants also do a celebration event at the end where they create their own projects, which include murals made from trash they’ve picked up during their cleanups.

The goals of the Summer Coastkeeper Club are to:

- increase children’s knowledge of how urban areas are connected to the ocean
- connect students to their environment to cultivate a sense of stewardship
- empower students to make a difference by changing behaviors and educating others
- kindle excitement for science through hands-on activities



Students from Shorecliffs Middle School in San Clemente test water at Trestles Beach.

More Than 17,000 students Reached!

In 2014 Coastkeeper’s education programs reached 4,050 students:

- 2,500 through WHALES
- 1,250 through Kids Ocean Day
- 300 through its Summer Coastkeeper Club

From 2005 through 2014, Coastkeeper’s education programs have reached 17,394 students:

- 10,258 through WHALES
- 5,870 through Kids Ocean Day
- 1,266 through the Summer Coastkeeper Club

Education Through Inland Empire Waterkeeper

Orange County Coastkeeper’s inland chapter, called Inland Empire Waterkeeper, also provides educational programs, such as River KATS. Developed in 2006, River Kid Activism Through Science is an environmental education and men-



Sifters help our Kids Ocean Day participants find the smaller pieces of trash.



AP environmental science students from Orange High School visit an Orange County Sanitation District facility.

toring program that introduces students to watershed concepts through in-class activities and hands-on field trips, provided at zero cost. IEWK offers a unique service by providing opportunities that bring textbook pages to life at a time when budget cuts have eliminated these important learning experiences. We believe that getting kids “to the field” enriches the curriculum for AP environmental science, environmental science, general science, life science, biology and chemistry classes.

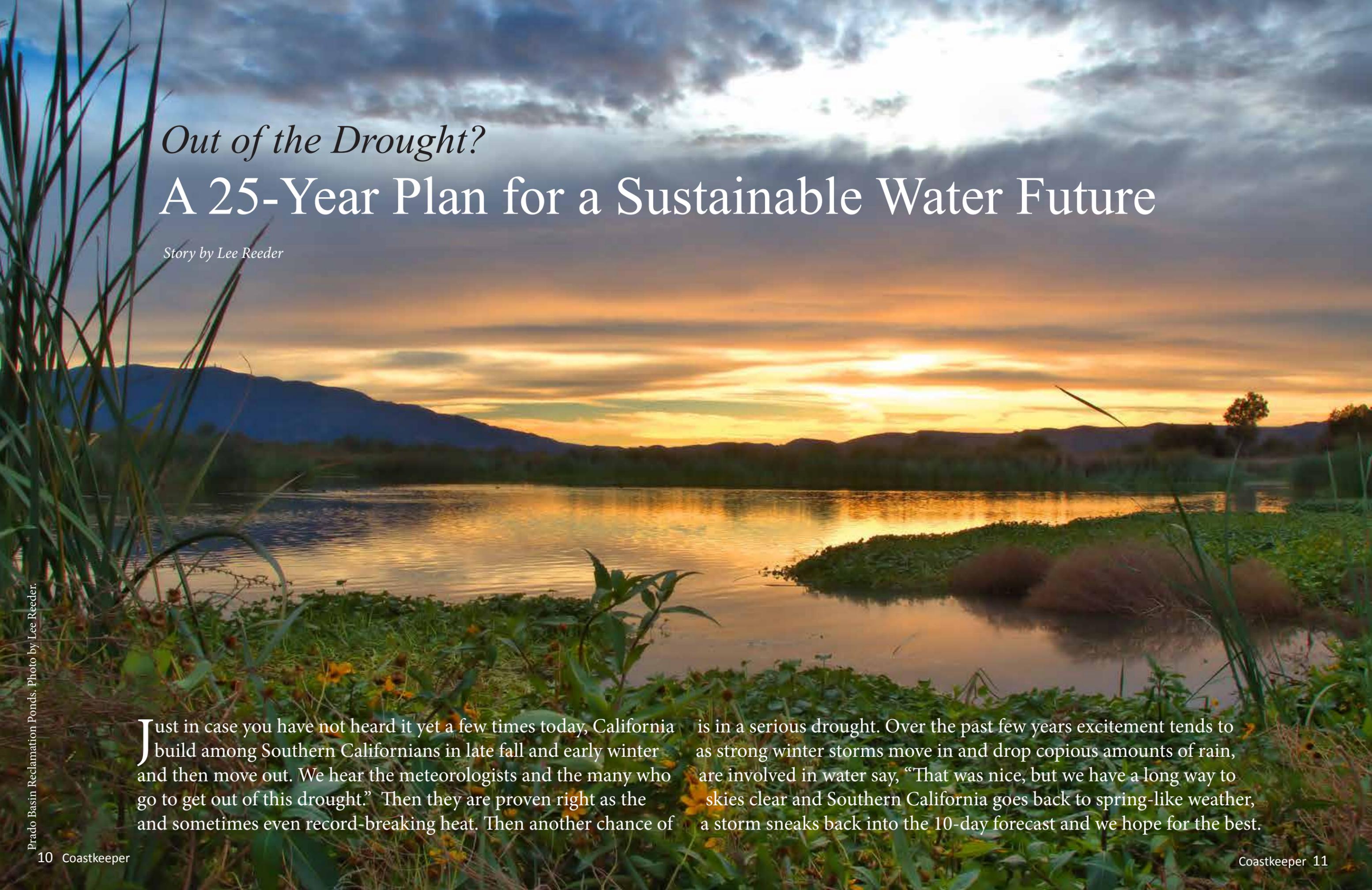
River KATS also promotes environmental/science career development and hands-on lessons in water quality issues and watershed protection. Through past work, we have found students consistently lack awareness on the pure existence of their local waterways. There also seems to be a void in understanding basic connections in water quality issues; many do not realize how urban runoff travels to storm drains which lead to rivers, and eventually downstream to our oceans. Further-

more, as local schools face budget cuts, funds for schools have been shifted away from excursions, leaving school districts unable to fund any field trips. Waterkeeper works to fill this opportunity through River KATS by reestablishing valuable field trip opportunities that allow students the ability to use the surrounding watershed as a living laboratory.

You can help support all of Coastkeeper’s educational programs. For more information about how you can contribute, contact Education Director Dyana Peña.



A young scientist uses a turbidity tube to test water clarity.



Out of the Drought?

A 25-Year Plan for a Sustainable Water Future

Story by Lee Reeder

Just in case you have not heard it yet a few times today, California build among Southern Californians in late fall and early winter and then move out. We hear the meteorologists and the many who go to get out of this drought.” Then they are proven right as the and sometimes even record-breaking heat. Then another chance of

is in a serious drought. Over the past few years excitement tends to as strong winter storms move in and drop copious amounts of rain, are involved in water say, “That was nice, but we have a long way to skies clear and Southern California goes back to spring-like weather, a storm sneaks back into the 10-day forecast and we hope for the best.



Hoping for the best is not going to cut it anymore. It seems things are not getting better on the water front, or on the waterfront, for that matter.

“I have been suggesting to people that perhaps we shouldn’t be referring to this as a drought,” says Coastkeeper and Metropolitan Water District Board Director Larry McKenney in our “Voices” article on page (). “Maybe this is just the way it is, and certainly there is some evidence that the 20th Century was an unusually wet period, rather than normal, and we may just be returning to normal.”

The term “water conservation” is increasingly being replaced with “water resilience” nowadays. That’s because, as McKenney points out, simply conserving water is not going to get Southern California to where it needs to be anymore. We not only have to conserve water—we have to recycle it vigorously, reuse it more frequently, capture it religiously, move it smartly, restore it deliberately, and cherish it eternally. We have to begin to treat water with the respect it deserves as the most precious resource it is. Because we can’t survive without it—economically or physically.

Where We Stand

The only thing we seem to be knee-deep in is trouble when it comes to assuring water resilience, and the bad news keeps coming, the latest being that the Sierra snow pack was measured at 8 percent of normal on April 1—an all-time low.



The Prado Constructed Wetlands are a key part of Orange County Water District’s system that recharges the Orange County drinking water aquifers. These ponds naturally filter significant amounts of nitrates and other pollutants out of Santa Ana River water before it reaches settling areas miles downstream of the Prado Dam. This area also provides diverse plant and wildlife habitats. *Photo by Lee Reeder*

Coastkeeper President and founder Garry Brown has spoken at various venues around the region recently about the pressing need for a concrete, 25-year plan for water resilience in Southern California. There are many elements that go into such a plan, but there are at least five that he believes are very necessary:

1. Moving from indirect potable reuse of water to direct potable reuse
2. Aggressively restoring contaminated aquifers
3. Getting serious about transitioning residential and commercial landscapes
4. Moving water more efficiently within regions from where it is located to where it is needed
5. Promoting best available technologies (BAT) in emerging water technologies such as ocean desalination

1. Indirect Potable Re-use: A Good First Step



Indirect potable re-use (IDPR) was once hotly debated as a method for meeting our water resilience goals because of the aversion to the once-novel concept of taking highly treated wastewater and pumping it directly back into our drinking

water aquifers. Once called “toilet to tap” by detractors who fought it vigorously, the practice has been proven safe, efficient and effective, and is saving millions of gallons of water per day that would have been discharged into the ocean.

The now world-famous Groundwater Replenishment System (GWRS) of Orange County Water District is an example of one pipeline we need to be going down to ensure water resilience. The GWRS takes treated wastewater from an Orange County Sanitation District sewage treatment plant and then treats the water with a high-tech process beyond the tertiary level. Water treated to this level is so clean it is devoid of minerals, which makes it corrosive to pipes. After some minerals are added back to this water, it is injected back into Orange County’s underground aquifers, where it eventually ends up being used again by consumers or serves as a seawater barrier in coastal aquifers.

“Indirect potable re-use demonstrates that we truly have one water,” Brown says. “However, there is an additional level that we still need to get to, and that is direct potable reuse.” With direct potable reuse, recycled water is entered directly

back into the water delivery system, or it is entered just upstream of a wastewater treatment plant into a reservoir, or other body of water, that is used as the supply for the water treatment plant. Brown says science and technology should be able to get California to direct potable reuse by 2025 at the latest.

2. Aggressively Restore Contaminated Aquifers



Contaminated aquifers are a big problem from the upper reaches of the San Gabriel, Santa Ana and Los Angeles River watersheds to the coastal urban plains of Los Angeles County. Parts of Southern California’s aquifers have been contaminat-

ed or damaged from a wide range of industries and activities over the years, including aerospace, pyrotechnics, agriculture, construction and even recycling.

Brown says that these areas represent an opportunity for the region to reclaim more of its historical water storage capacity. However, cleaning up our aquifers must become a funding priority if we are to reclaim as much of our historical groundwater storage capacity as possible.

Historically, movement has been slow to clean up Southern California aquifers, sometimes because of battles that drag on for years over who has the responsibility for the pollution and cleaning it up. One example is the Rialto Superfund Site, which is also known as the B.F. Goodrich site, or the Rockets, Fireworks and Flares (RFF) site, for the source of much of the contamination that has plagued the 160-acre area in Rialto in San Bernardino County. Assigning responsibility for contamination can be difficult at sites that have been occupied over many years by multiple tenants involved in polluting activities. The Rialto site is contaminated mostly with perchlo-



Any plan for water resilience must include transitioning our residential and commercial landscapes, as we demonstrate at the Coastkeeper Garden. See more information about our garden in the article on page (). *Photo by Lee Reeder.*



Reverse osmosis: the final processing step in the indirect potable reuse process. *Photo by Lee Reeder*

rate salts and solvents used in various production processes by fireworks manufacturers, defense contractors and other businesses.

After years of research, hearings, public outcry and lobbying, three settlements were reached, which, according to the U.S. Environmental Protection Agency, will result in a comprehensive cleanup of the site with funds totaling as much as \$100 million. For information about all of the Superfund sites in the EPA’s Pacific Southwest Region, go to <http://www.epa.gov/region9/superfund/>

3. Transition Our Landscapes



A huge amount of the water used (and wasted) in Southern California goes onto our landscaping. Nobody in Southern California urban areas should be watering more than twice a week. People generally use two to four times the amount of water

they need to keep their lawns green and healthy. Brown says that water purveyors, cities and counties should become involved in aggressively incentivizing commercial and residential property owners to transition their landscapes to native and other drought-tolerant plants. He adds that their work should not stop at merely providing incentives because rebates alone cannot ensure success. They must also provide guidance for the two-year establishment period, which most of these landscapes need.

In addition, Brown says incentives and assistance need to be backed up by public education of the need for transitioning, enforcement of ordinances against wasting water, and ordinances that actually *allow* people to transition their landscapes.

Ordinances need to be created for new developments and redevelopment projects that mandate the concept of “net zero water.” This means that if a development uses more water than the use that existed previously, the developer should



A 25-Year Plan for Sustainable Water, continued...

be required to conserve double the amount of that increase at another site to offset the imbalance.

The state Regional Water Quality Control Boards whose regions have responsibility over urban areas of the state should also take a greater role in reducing water waste, according to Brown. He urges the state to consider hiring, and to place in each urban Regional Board, a Water Use Efficiency Officer to:

- Enforce water efficiency regulations and coordinate with water agencies and municipalities to ensure potable water is not wasted and unreasonably used.
- Coordinate model landscape ordinances and work with municipalities to adopt them for new development, and retrofit landscapes, commercial properties, and large residential complexes that have homeowners associations.
- Ensure municipalities have ordinances that are compatible with drought-tolerant landscapes and allow transitioning to them
- Develop and promote training programs for the establishment of drought tolerant landscapes
- Coordinate and promote training programs for homeowners. Landscape contractor employees, and municipal and commercial landscape maintenance personnel

Replacing Turf and Upgrading Technology

In 2014 and 2015 Metropolitan Water District and selected water purveyor partners offered a rebate program for turf replacement at \$2 per square foot. Homeowners cannot qualify for the rebates if they replace their turf with gravel or pave the removed area over with asphalt or concrete. They must replace the turf with drought-tolerant landscaping.

Turf replacement is not the only rebate item. Purchasing and installing rain barrels fetched a \$75 rebate, while \$80 rebates were given for putting in an irrigation controller or soil moisture sensors. There was also a \$35 rebate per station for properties that have more than an acre of irrigation. For rotating sprinkler nozzles, which apply water more slowly and uniformly to prevent over-watering and encourage healthy plant growth, the rebates start at \$4 per nozzle, with a minimum quantity of 15.

Large turf removal projects have resulted in hefty rebate checks for commercial enterprises. The MillerCoors brewing

company plant in Irwindale recently removed approximately two acres of turf and replaced it with native plantings, decomposed granite pathways and river rock courses, resulting in a rebate check of \$187,000.

One big benefit to the MWD rebate program is that there is no limit to the amount of turf that can be removed. The Rancho Santa Fe Association in the San Diego area may get an estimated \$1.62 million rebate for its turf removal project, and several golf courses around the Southland will be receiving large rebates for removing turf around the periphery of their fairways and greens as well.

Metropolitan Water District is also providing incentives to help commercial, industrial, institutional, and agricultural customers with custom projects that result in reduction in water use. For more information about these programs, go to <http://www.socalwatersmart.com/>

4. Move Water Efficiently Within Regions



When people in California talk about moving water from place to place they often think about the State Water Project, which moves water from various locations in Northern California southward through the state and from the Colorado River to Southern California. Brown says that in the interest of future water resilience, people need to start thinking about the issue of efficiently moving water on a more regional basis.

“The issue of how to move water around the state from where it is located to where it is needed is overarching and controversial,” Brown said. “But even within Southern California we have areas where we have more need than we have water, such as in parts of Orange County and in San Diego County. In the future we will need to do a more efficient job in our own region of moving water from where it is located to where it is needed.”

Brown said there are many water districts around the region that could combine resources and infrastructure to meet water resilience objectives.

“We need to take a more holistic approach in the future to water distribution around Southern California,” Brown said. “There is an opportunity to do a lot of consolidation to make the whole system more efficient and cost effective.”

Efficient distribution means that groundwater must be managed better. California’s 2014 Sustainable Groundwater Management Act was a good start toward protecting the groundwater basins that provide more than half of the water people use in dry years. There is currently a draft plan that outlines actions the State Department of Water Resources will undertake to support local agencies in achieving sustainable groundwater management. To keep informed of this effort, go to <http://groundwater.ca.gov/cagroundwater/>

Being more efficient with water supply within regions also means making the most of the water that naturally falls there, ensuring there is more available to distribute within the region. When you are looking at any water-resilience plan for a region, you have to start with where the water is and where it needs to get. In Southern California you have to look toward the mountains. In the 2,600-square-mile Santa Ana River watershed, 75 percent of the precipitation every year falls on Forest Service lands in the mountains and foothills of the San Gabriel, San Bernardino and Santa Ana mountain ranges.

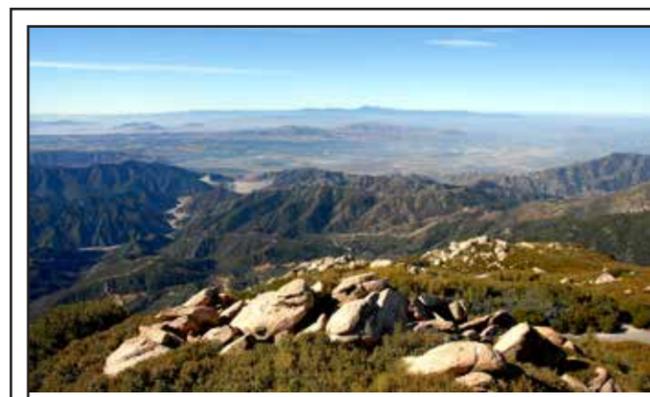
Most urban dwellers in the watershed would be surprised to learn how much of that local water (rather than the imported variety) goes into their taps and onto their landscaping. However, Southern California as a whole could do much better at moving local water from where it falls and collects, to where it is consumed.

One effort to get the best use of the annual rainfall and snowfall in our mountains is called Forest First—an ecosystem restoration project that involves road reconstruction, meadow rehabilitation and vegetation removal and thinning. The project is a collaboration among the U.S. Forest Service, San Bernardino Valley Municipal Water District, County of San Bernardino Department of Public Works, Western Municipal Water District and the Santa Ana Watershed Project Authority. The project will receive \$1 million in Proposition 84 funding from the state and it is being augmented with funds from the U.S. Forest Service.

The following is an official description of the project:

“The Forest Service and its partners propose to implement a planned ecosystem restoration (thinning/vegetation removal and road reconstruction) project in the San Bernardino National Forest to quantify benefits on water quality (sediment reduction), water supply (less evapotranspiration), and reducing operations and maintenance costs (sediment reduction). Modeling of sediment production impacts due to a severe wildfire in the project area indicate that the amount of sediment and debris that could flow downstream following a large rain event could be up to four million cubic yards. This project also restores hydrologic function and increases habitat interconnectivity within the region.”

According to Forest Hydrologist Robert Taylor of the San Bernardino National Forest, the cost of the project overall is approximately \$5 million. The Forest Service money has been used primarily for the boots-on-the-ground forestry



This photo, taken from Keller Peak in the San Bernardino Mountains, encompasses a majority of the 2,600-square mile Santa Ana River Watershed, the major natural water supply for a large portion of Southern California. Photo by Lee Reeder

work, while the Proposition 84 money will help greatly with the monitoring and measurement aspects of the project—trying to determine whether returning meadows to their natural, historical state will result in more water retention and potentially more water for downstream users.

Approximately \$2.7 million of the appropriation is being put into forestry contracts that include handwork such as thinning with chainsaws, and limbing. For tree removal around the outskirts of meadows, the trees were first dropped by hand and then helicopters were brought in to remove the cut trees and vegetation so damage to sensitive meadow habitat was minimized.

Because of the environmental restrictions on the project caused by endangered species and other factors, the project proponents determined that they would be able to remove approximately 50 percent of the vegetation, meaning that water flow downstream could potentially be increased significantly.

The proof will come in the measurement. “We haven’t gotten through the grant agreement aspects yet of the Prop 84 money, so generally the Forest doesn’t treat these types of projects as research projects.” Taylor said. “So we’re waiting on the grant funding to have better ways to monitor it.”

5. Use Best Available Technologies



Coastkeeper advocates using the best available technologies, especially when it comes to new, emerging water sources such as desalination. Coastkeeper has been perceived by some as being anti-desalination, just as some have perceived the organization in the past as being anti-industry.

“It is true that Coastkeeper has been the tip of the spear in opposition to the Poseidon desalination proposal in Hun



A 25-Year Plan for Sustainable Water, Cont...

tington Beach for many years,” Brown said, “but we are neither anti-desalination nor anti-business.”

According to Brown, if a business is going to make a pitch for desalination, they need to be able to first make a good business case for it, and second, propose a method that is environmentally responsible and sustainable. “So far, Poseidon has done neither, despite having invested 16 years, and now \$50 million in a political campaign to get desalination approved in Huntington Beach,” Brown said. “And so far, they also don’t have a permit.”

Aside from the cost, Coastkeeper will continue to oppose any project that uses outdated technology such as directly putting a straw into the ocean and sucking up water, impinging and entraining sea life and larvae on the screens, Brown says.

“Poseidon will argue that only seven pounds of larvae will be impinged and entrained, but that amount negatively impacts several square miles of ocean habitat.”

“Coastkeeper looks at desalination as one of the tools in the toolbox of water sustainability,” Brown says. “However, we acknowledge that among all of those tools, it has the greatest environmental impacts, it takes three times the energy to produce potable water as traditional treatment methods, and it is three to five times more expensive to the consumer.”

He added that the energy cost is enormous. “A billion-dollar plant has to be built at the bottom of the hill and water has to be pumped back up the hill to the consumers.”

Brown also argues the financial explanation. “Poseidon has broken the cost equation down to the smallest denomination—the household level,” he said. “In that scenario you are paying \$7 more per month on average for water. But imagine you are Leisure World and you’re getting an annual water bill for \$1 million. A 35-percent increase on that adds \$350,000 to your bill. Large commercial customers will see huge increases.”

Brown said that Poseidon has not deviated technologically from the plan it presented to Coastkeeper 16 years ago, and that the plan should be changed to reflect new technologies.

“Desalination will likely be part of the future of water sustainability for Southern California, but let’s use more advanced technology that doesn’t use so much energy and methods such as subsurface slant wells (shown at left on the

facing page) that take the water in through the sand,” Brown said. “Metropolitan Water District has a demonstration diagonal well system in Dana Point that has been proven effective. Such as system takes in water that has already been filtered by the sand and is of higher quality than water taken directly from the ocean, all without impinging and entraining sea life.”

Moving Forward Toward Water Resilience

Solutions need to be found to ensure water resilience for Southern California for the long term. Coastkeeper believes imported water will continue to be needed, but as a secondary source, so that Metropolitan Water District can continue to be a wholesaler even if all of the water is not imported.

The elements of a water resilience plan go far beyond the five major issues outlined here.

Brown said he believes governments, regulators and water purveyors should collaborate with local non-governmental organizations—such as the California Waterkeepers, Heal the Bay and Sierra Club—to provide public outreach and education regarding the State Board’s mandatory conservation measures.

He believes green infrastructure and water efficiency should be higher priorities in the Clean Water State Revolving Funds, which are low-interest loans that serve as the nation’s largest source of water quality financing.

Brown says also that care must be taken in order to make the most of the opportunity that Proposition 1 presents with its \$7.5 billion in bond funding for water projects. He also believes we should ensure that future stormwater permits maximize stormwater retention and integrated watershed management. He urges Metropolitan Water District and other water districts to provide financial incentives for stormwater capture projects.

Coastkeeper continues to push for an integrated, comprehensive water resilience plan that aspires to the mission to promote and restore water resources that are drinkable, fishable, swimmable, and, most importantly, sustainable.



Head ‘em Up, Move ‘em Out

Underwater Ranching on the San Pedro Shelf

Story by Lee Reeder, Illustration by Brett Weston

When you think of ranching in Southern California you might imagine grassy expanses with widely spaced, giant oaks and sycamores. There are not many places like this left in the Southland. They’re in our past and not easy to visualize in our urbanized environment.

However, three partners and their investors are trying to bring ranching back to Southern California in a big way. But where are they going to find the room for it? Where are they going to get all the water they’ll need?

No problem. These high-tech wranglers believe they have figured that all out and they have all the space they need. They’ll also have an unlimited water supply.

Why? Because they’re not ranching cattle or sheep. They’re going to be ranching mussels and scallops, and they’ll be doing it six miles offshore in sight of Catalina Island. Ranching mussels and scallops? Who ranches shellfish out in the open ocean?

The answer: nobody. Not yet, anyway.

Phil Cruver is on the verge, though. He is not only starting a new business in California but he intends to create a whole new industry, and a new way of looking at the sustainability of our seafood supply.

Cruver and his partners Debbie Johnson and Roger O’Brien are developing Catalina Sea Ranch—the first open ocean shellfish ranch in United States Federal Waters, and it is being created pursuant to the new aquaculture policy of the National Oceanic and Atmospheric Administration (NOAA).

Global and national momentum for sustainable aquaculture is growing, and the United States lags far behind on this opportunity, especially when it comes to shellfish farming.

The United Nations is a big promoter of aquaculture as a way to achieve global-scale prosperity and food security. However, the Food and Agriculture Organization (FAO) of the UN wants to ensure that fisheries and aquaculture are operated using responsible methods that are sustainable, and that means protecting the environment.

In the UN’s 2014 “State of World Fisheries and Aquaculture” report, FAO Director-General Jose Graziano de Silva laid out the challenge: “In a world where more than 800 million continue to suffer from chronic malnourishment and where the global population is expected to grow by another 2 billion people by 2050—with a concentration in coastal urban areas—we must meet the

challenge of feeding our planet while safeguarding its natural resources for future generations.”

De Silva pointed out that fish and seafood are not only extremely nutritious but are also a great potential source of wealth for developing nations, providing jobs for tens of millions of people and supporting the livelihoods of hundreds of millions.

“However, we need to look beyond the economics and ensure that environmental well-being is compatible with human well-being in order to make

long-term sustainable prosperity a reality for all,” de Silva wrote. “To this end, promoting responsible and sustainable fisheries and aquaculture is central to our work and purpose. We recognize that the health of our planet and as well as our own health and future food security all hinge on how we treat the blue world.”

On a national scale, NOAA has acknowledged the importance of this industry by developing its Marine Aquaculture Policy. The introduction of the policy explains its significance: “This policy reaffirms that aquaculture is an important component of NOAA’s efforts to

maintain healthy and productive marine and coastal ecosystems, protect special marine areas, rebuild over-fished wild stocks, restore populations of endangered species, restore and conserve marine and coastal habitat, balance competing uses of the marine environment, create employment and business opportunities in coastal communities, and enable the production of safe and sustainable seafood.”



Ranching, cont...

Currently, according to NOAA, the United States has a \$10.4 billion seafood trade deficit that continues to grow. We import up to 90 percent of our seafood and half of these imports are produced from aquaculture.

Starting a New Industry

Catalina Sea Ranch President and CEO Phil Cruver believes he has found not only a way to profit from putting a dent in our shellfish trade deficit but also a method of shellfish farming that will meet the environmental and sustainability challenges as well. The effort has met some hurdles, but Cruver looks at his vision as more of a technology company than a shellfish farming operation, because innovative technology will be key to meeting the environmental and sustainability challenges.

Catalina Sea Ranch operations are currently located at the Southern California Marine Institute on Terminal Island but eventually, all of its operations and headquarters will be located at the 36-acre City Dock 1 project I San Pedro—a 10-year, \$500 million non-profit project that will be finished in 2017.

In March 2012, Cruver posted his permit application to create Catalina Sea Ranch on the Army Corps of Engineers Web site, since the Corps has jurisdiction over “Waters of the U.S.” where the operation will be located. During the 30-day comment period there were 17 responses, which Cruver said were all positive, except for one, which was a general comment about all farms being dirty. At the time, the Corps representative told Cruver that if there was not an inordinate amount of negative responses, the Corps would write the permit.

OFFSHORE MONITORING PROGRAM

Catalina Sea Ranch is developing the “First Offshore Shellfish Ranch in U.S. Federal Waters” which will be monitored by independent scientists and research institutions. The data from this 100-acre project will provide science-based solutions for marine spatial planning in a sustainable and responsible manner that protects the environment.

OFFSHORE RANCHING

A shellfish industry in Southern California would expand the state's economy in a clean and sustainable way while also putting a dent in our nation's \$10 billion seafood deficit.

This 100-acre ranch will grow about 2.5 million pounds of sustainable mussels, which blanket the nearby oil platforms by filter-feeding single-celled phytoplankton that are the basis of the sea's food chain. Mussels grow in pristine open ocean waters to harvest size in 8 months.

SHARING THE SCIENCE

Catalina Sea Ranch is leveraging Verizon's network to develop a proprietary automated offshore aquaculture monitoring system for producing real time data available for collaborative and transparent web-based scientific analysis.

NOMAD BUOY sensors collect bathymetric environmental data including temperature, salinity, pH, dissolved oxygen and phytoplankton density. A real time radar provides ranch security.

RECEIVER AND CONTROLLER

collects data from all sources for transmission to shore

Verizon's shore-based CELLULAR TOWER

located in Huntington Beach transmits the raw data to its cloud server for scientists to analyze via the internet.

MUSSELS

attach to ropes suspended 30 feet below the surface.

REMOTELY OPERATED VEHICLES (ROVs)

patrol the underwater ranch, inspecting infrastructure and collecting scientific data.

A MINI ROV

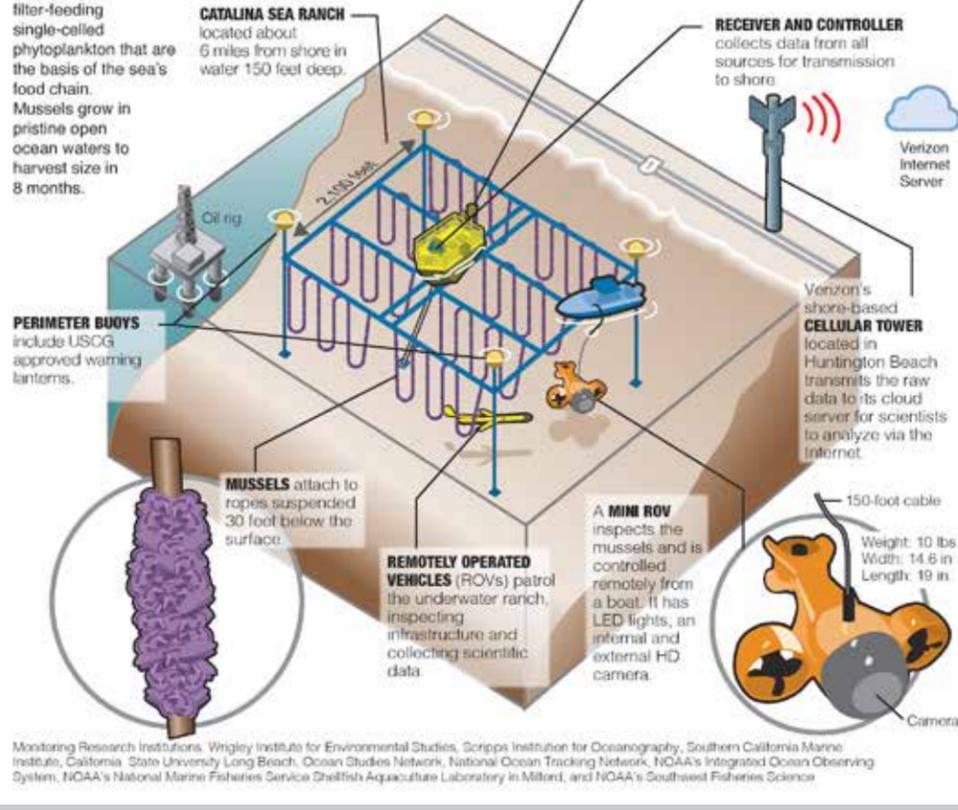
inspects the mussels and is controlled remotely from a boat. It has LED lights, an internal and external HD camera.

150-foot cable

Weight: 10 lbs.
Width: 14.6 in
Length: 19 in

Camera

Monitoring Research Institutions, Wrigley Institute for Environmental Studies, Scripps Institution for Oceanography, Southern California Marine Institute, California State University Long Beach, Ocean Studies Network, National Ocean Tracking Network, NOAA's Integrated Ocean Observing System, NOAA's National Marine Fisheries Service Shellfish Aquaculture Laboratory in Milford, and NOAA's Southwest Fisheries Science



from all of those boats out there, a case can be made that offshore sustainable shellfish aquaculture has the least environmental impact,” Cruver said.

According to NOAA's policy, aquaculture is not without environmental impacts: “Environmental challenges posed by aquaculture, depending upon the type, scope, and location of aquaculture activity, may include nutrient and chemical wastes, water use demands, aquatic animal diseases and invasive species, potential competitive and genetic effects on wild species, effects on endangered or protected species, effects on protected and sensitive marine areas, effects on habitat for other species, and the use of forage fish for aquaculture feeds.”

The key statement here is, “depending on the type, scope and location of aquaculture activity...” According to Cruver, many of these challenges are overcome by the way in which offshore marine shellfish aquaculture will be conducted.

So How Do They Do It?

First, it is important to point out the difference between how shellfish aquaculture is conducted now compared to the concept Cruver is proposing. Much of the shellfish aquaculture that feeds the U.S. market currently takes place in estuaries on the east coast of Canada. In California, growing shellfish in bays and estuaries would take up considerable space in those valuable natural wetlands and also would make the shellfish vulnerable to predation, invasive organisms and pollution from urban runoff.

Catalina Sea Ranch, however, is going to be the first entity to perform offshore shellfish aquaculture in federal waters, well offshore in the ocean.

The site takes up 100 acres on the San Pedro Shelf—a large underwater plateau about 150 feet to 200 feet deep that quickly drops off to about 3,000 feet, creating natural upwelling that delivers an abundance of nutrient-rich phytoplankton from the deeper water. On the San Pedro Shelf alone there are about 26,000 acres (40 square miles) in Federal waters that are suitable for growing shellfish, according to marine biologist



Hatchery Manager Kelly Stromberg shows the difference in size between the local scallops and mussels.

Kelly Stromberg, who is Catalina Sea Ranch's hatchery manager.

Stromberg explained that in traditional onshore shellfish farms you would see floats with ropes dangling down for the shellfish to cling to. Because the Catalina Sea Ranch apparatus will be subjected to larger swells and currents, the platform will be different. The structure will be approximately 2,100 feet by 2,100 feet and will consist of surface floats to mostly mark the location of the sea ranch. About 30 feet below the surface, where the water is

considerably calmer, a series of anchor buoys will hold 40 long lines that are each 600 feet long. From these long lines, 30-foot mussel ropes are draped. Each long line will contain a total of 12,000 feet of mussel ropes.

The anchor buoys are made of fiber-reinforced high-density polyethylene (HDPE) and are pressurized with air. Cruver said, “This is a new technology, and they're guaranteed to last 20 years, so you won't find them washing up on the beach like their cheap predecessors.”

The ranch is also using a new technology called screw anchors, which screw into the bottom surface. Stromberg says these are better for the sea floor than more conventional anchors, which are usually large barrels filled with ballast that drag around on the seafloor, causing disruption and damage to sea life.

The long-lines suspend the shellfish, preventing predation and infestation by parasites that often impact their cultivation in coastal estuaries. Sea cucumbers will be suspended from the bottom of the lines to consume the detritus and other waste from the shellfish.

Catalina Sea Ranch is cultivating the Mediterranean mussel, which has been introduced to coastal environments



Phil Cruver explains the benefits of these next-generation fiber-reinforced high-density polyethylene buoys, which are made to last 20 years.

Ranching, cont...

worldwide and is not considered a new invasive species. These large, fast growing mussels have greater meat content than the blue mussel and tolerate heat and salinity better. They are not importing stock. They are breeding their stock from mussels found on the legs of the old oil rig platforms.

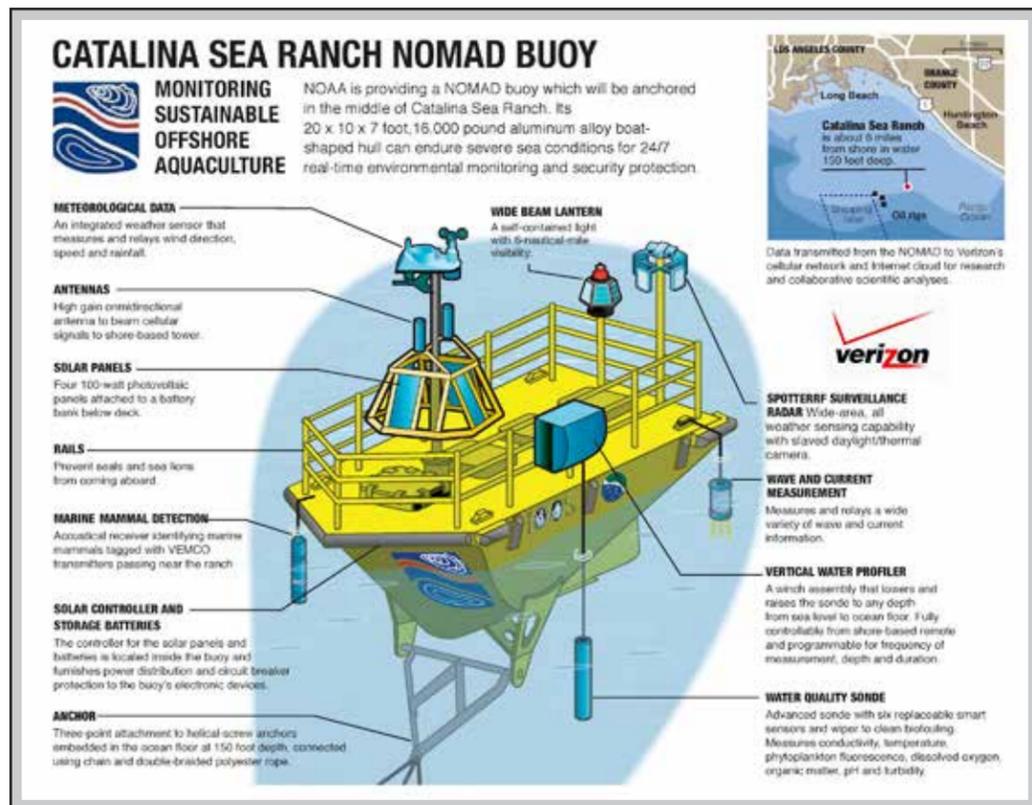
"These rigs are not only good because they are loaded with mussels, but they also are loaded with our native purple-hinged rock scallops," Stromberg said. "They are different from most other scallops you see on the menu because they attach onto things, and here they attach to the legs of the oil rigs, whereas other scallops clap their shells and swim around on the bottom to forage." She said that because they attach to objects they haven't been used commercially. However, they are also known as giant scallops, and they contain a large amount of meat.

Once the structure and the shellfish are in place, the ocean itself takes care of much of the rest.

"Shellfish are low maintenance; once they are out of the hatcheries you don't have to feed them because they feed off of the natural phytoplankton in the water," Stromberg said. "When you're raising fish, for example, 60 percent of your cost is in just feeding them."

The ready supply of food offshore is not the only advantage of being able to raise these bivalve feeders in the ocean. "This is good for us because in California and all around the coasts of the United States we are running out of space," Stromberg said. "Also, you have a lot more polluted runoff, and these are filter feeders, so they are picking up whatever is in that water. They clean up the pollutants in the water, so water around shellfish is actually cleaner than without them."

Unfortunately, this also means that if you are raising shellfish in areas prone



to pollution from urban runoff, such as all of the estuaries in Southern California, the shellfish you are raising for consumption could also be ingesting a wide range of pollutants, including fertilizers, nitrates and pesticides. Low salinity and heavy siltation following torrential rains can kill shellfish harvested from congested and contaminated bays and estuaries, and lead to quality problems.

"The water out there at our site is pristine, and you have a lot of currents and upwelling," Stromberg said.

Stromberg says that Prince Edward Island production may be in jeopardy because of the invasive tunicate, commonly called a sea squirt, a small invertebrate filter feeder that is infesting about 90 percent of the mussel lines there and putting the long-term sustainability of those estuary-based farms in question.

Making Sure the Environment is Protected

One of the 13 special conditions of the Coastal Commission was that 18 months after commencing operations Catalina Sea Ranch must submit a detailed report so that any adverse im-

pacts can be mitigated. Cruver plans go beyond that requirement by providing data reporting in real-time that is available to regulators.

"We don't want to have a year-and-a-half of negative impact," Cruver said. "If we see a negative impact, the next day we can employ our adaptive management plan and change things around. It's going to be transparent. We're not going to taint the data and it's going to be independently gathered, it will go into the Verizon Network, and independent experts, who are not on our payroll, will evaluate the impacts."

All of this reporting takes a fleet of new technology that includes remotely operated vehicles and aircraft, autonomous underwater vehicles, probes and a sophisticated, 17 X 20 X 10, solar-powered buoy called the Nomad that acts as a hub for collecting and disseminating information.

"All of this stuff we're talking about would not have been feasible last year," Cruver said. "They are making dramatic improvements in this area."

The concepts of Big Data and predictive modeling will be central to the success, sustainability and value of the operation. Cruver has been in talks

with the chief technology officer and the lead environmental manager at IBM, which has been working on similar endeavors. IBM has just concluded a project in Lake George, New York to use Big Data in an environmental monitoring project and another Smart Buoy project in Galway Bay, Ireland.

Verizon Communications is the communications carrier for Catalina Sea Ranch. The company will provide cellular network and cloud connectivity for independent and transparent scientific analysis.

Independent research institutions that specialize in marine science and spatial planning, will develop scientific data for evaluating the environmental and social impacts of this type of aquaculture. These institutions include The Wrigley Institute for Environmental Studies, Scripps Institution for Oceanography, National Ocean Tracking Network, NOAA's Integrated Ocean Observing System, NOAA's National Marine Fisheries Center, and Southwest Fisheries Science Center.

Cruver said that at Verizon they are working not with low level executives, but with CEO Lowell McAdam. "He loves sustainable projects. We're having the senior executives of these major technology firms seeing the potential—not necessarily from a monetary standpoint but in terms of Big Data—for a new sustainable industry that may be setting the standards for not only the United States, but for the world."

Scaling Up to Viability

Currently, according to the U.S. Marine Fisheries Service, the United States imports 33.7 million pounds of live mussels. The vast majority of that (32.9 million pounds) comes from Prince Edward Island in eastern Canada, approximately 3,500 miles from California.

"Shipping that shellfish all the way from eastern Canada to the western U.S. makes a huge carbon footprint," Stromberg said. "With our 100 acres we should be able to produce about 2.7 million pounds a year, and cut down on a lot on that footprint."

Cruver believes that a globally competitive Southern California mussel industry could be created within a decade. In six years from 1995 to 2000, Prince Edward Island went from producing 9 million pounds of mussels per year to 37.5 million pounds per year. Chile, another major producer, scaled its production up from 140 million pounds to 400 million pounds from 2004 to 2008.

Catalina Sea Ranch projects that with its 100-acre farm, it will increase production from 2.7 million pounds on 100 acres to 17 million pounds on 600 acres to reduce about one half the imports from Prince Edward Island.

In New Zealand, where mussels are plentiful and available, annual per capita consumption is 37 pounds. In Europe it is about 4 pounds and in the United States it is .15 pound. Cruver believes changing these numbers is all about availability.

When he visited New Zealand, Cruver saw many recipes made from mussels, including sausage and pizza. He said one of the advantages of mussels is that they take on the flavor of whatever they are cooked in. Cruver believes that if people start seeing more mussels in major markets and in restaurants they will catch on quickly.

They intend to put a dent in the seafood deficit and to create jobs, not a great amount with the ranch itself but peripherally including jobs in restaurants and in seafood distribution.

Keeping a steady supply is another challenge, according to Stromberg. Catalina Sea Ranch is looking into



Phil Cruver aboard the Captin Jack, which will be used as the research vessel for scientists.

cryo-banking mussel sperm, eggs and larvae. Mussels only spawn a few times a year. If you have cryo-banking you can have steady production throughout the year. Stromberg says this has been done in the past but not in a commercial setting.

USC and Catalina Sea Ranch are working together to accelerate genetic gains in mussels with a selective breeding program that may be applied to other bivalves such as scallops, oysters and clams. Stromberg stresses that this is not GMO.

Catalina Sea Ranch has filed eight provisional patent applications with the United States Patent and Trademark Office for protecting its inventions related to methods and systems for offshore monitoring and shellfish hatchery and cultivation innovations, and intends to have 25 to 30 provisional patents by the end of 2015. These are for the technological aspects of the business, where the real value lies to Cruver and his investors.

"You get a lot more bang for your buck as technology company than you do as a mussel farmer," Cruver said. "I believe we are going to be setting the precedent for offshore aquaculture for the United States and perhaps globally, but certainly for California. We want to be the gold standard on the environmental side."



The Ivan drone, which will be used for above-water monitoring of the ranch.

COASTKEEPER GARDEN

Story by Austin Brown and Marianne Hugo



GROWING IN BEAUTY, PURPOSE AND IMPACT



Something has been growing at Coastkeeper now for 10 years.

For the first three years it was an idea. As it moved slowly through channels and approvals, the idea in the Coastkeeper minds grew into a greater vision. Seven years ago the real work started and the vision started becoming tangible, with shapes and contours. Not long after that it started springing to life. We want to welcome you to Coastkeeper Garden—which was built not for us, but as a community resource for everyone in Southern California. It’s a learning place, no matter your age. And now that it is all grown up, it is advancing in beauty, purpose and impact.

The Beauty

Visitors often tell us they are struck first by the beauty and variety they see in our drought-tolerant presentations. Many seem to expect to be greeted with gravel and cactus and a few spindly bushes. Instead their senses are bombarded with color and textures and hummingbirds whizzing back and forth over their heads from the moment they walk through the entrance.

The plant palette of the garden features a California friendly combination of native plants and Mediterranean drought-tolerant vegetation. The master plan of the Coastkeeper Garden was designed for “Aha!” moments, so people could discover a spot they can connect with and realize possibilities in for their own properties.

The garden’s central features are six vignettes modeled after traditional garden architectural styles that have been popular in Southern California. These “garden rooms” are: Spanish Revival, California Bungalow/Craftsman, Italian/Tuscan, Ranch, Traditional (English, French, Colonial) and California Native Garden. Coastkeeper created these

vignettes to showcase California friendly vegetation in a way that complements the adjacent native plant habitat’s colors and textures.

The garden also highlights six native southern California habitats: Chaparral, Coastal Sage Scrub, Desert Scrub, Grassland, Riparian and Southern Oak Woodland. The local plant community, Coastal Sage Scrub, is presented as the introduction for interpretive areas that provide settings for those plants best suited for use in Southern California home landscapes, streetscapes and parks.

The Purpose

The Coastkeeper Garden’s overarching purpose is educating the public. Garden staff and volunteers host many educational events for the community. On the first Saturday of each month the garden is open to the community for informative workshops. The Coastkeeper Garden workshops highlight gardening practices and current topics relevant to Southern California. Regional experts provide hands-on experience and knowledge for all skill levels.



On the third Saturday of every month Coastkeeper conducts its fun Family Workshops. *Eluzion Photography.*

Past topics for the workshops have included water-wise gardening, synthetic turf, how to convert your yard from grass to water-wise landscaping, how to grow strawberries in Orange County, and how to attract Monarch butterflies.

Also, on the third Saturday of each month the garden hosts its Family Workshop, which features a nature theme. Families participate in an interactive, fun event, in which they explore the garden together while discovering the diversity and importance of plants and nature. Workshops are designed to spark creativity and learning, and offer families a hands-on opportunity to experience the natural world. Each Family Workshop focuses on a creative theme and features activities, songs and stories. Topics have included insects, birds, butterflies and strawberries. Participants are able to create a craft or project to take home with them, such as a bird feeder, or seeds that will soon become plants.

The Coastkeeper Garden is home to the Orange County Plant Trading Group, which meets monthly at the garden

to discuss and trade plants. This event has proved to be very popular and provides a way for people to get new plants for their home gardens.

In addition, the garden welcomes many community groups, including scouts, garden clubs, students and mom's clubs. The garden is busy every day with homeowners visiting to gain knowledge of plants that will grow and thrive in their yard.

The Coastkeeper Garden also features the Donation Store, at which visitors can donate to take a variety of items home with them. The donation store features honey collected from the garden, coffee roasted on the premises, fish fertilizer bottled at the garden, locally made jewelry, and a variety of decorative succulent planters.

The Coastkeeper Garden showcases two growing mediums for the community to

see: traditional soil and a hydroponic system. The garden features a "snackable" garden planted with delicious snacks. Currently the Snackable Garden features strawberries and kale. In the garden's hydroponic area strawberries, basil and tomatoes are sprouting for a spring crop.



The Coastkeeper Garden is an educational and relaxing place to spend the day. *Photo by Lee Reeder.*

The Impact

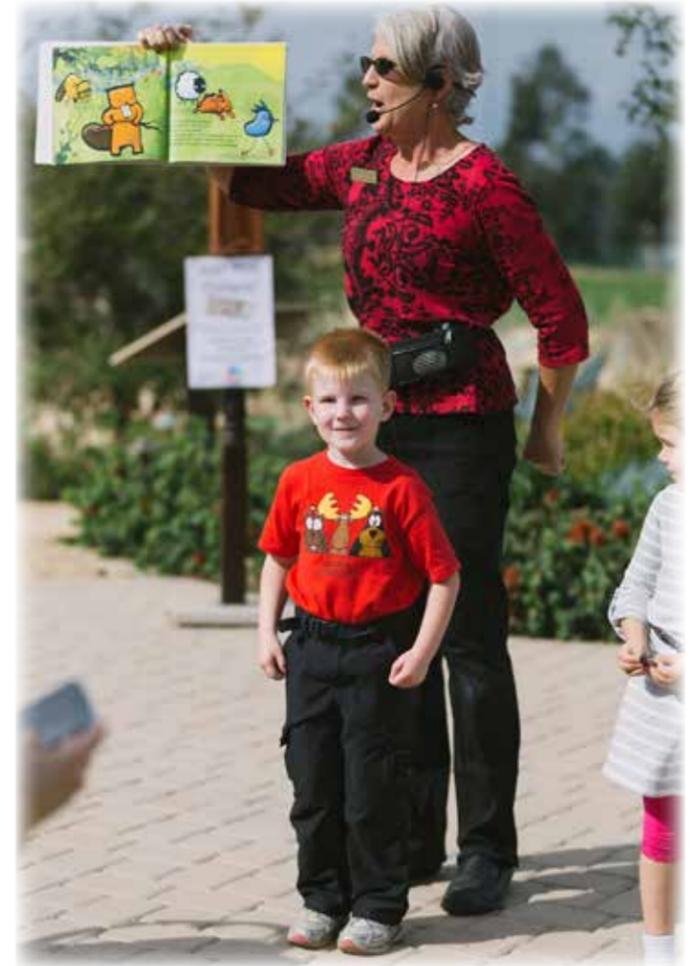
Since officially opening on May 4, 2013, the Coastkeeper Garden has served the mission of the organization to protect Southern California's water resources. Urban landscapes contribute significantly to coastal pollution, mainly through inappropriate gardening practices such as over-watering, poor run-off management, and over-use of pesticides and fertilizers. The California Friendly and native plants featured at the Coastkeeper Garden require less water, fertilizers, and herbicides than our typical landscaping choices. The Coastkeeper Garden also highlights the best available technologies such as evapotranspiration (ET) controllers, drip irrigation, alternative turf, and reservoir-style patio containers that decrease water use.

Coastkeeper Garden teaches community members about the importance of individual stewardship in protecting our natural resources. Activities range from field trips for school children to college research projects, drought tolerant landscape demonstrations and classes on local natural history. Other features that help maximize the impact of the garden are extensive interpretive signage, an organic garden, take-home literature, a greenhouse, a composting display and guided tours.

Coastkeeper's sustainable garden promotes self-sufficiency with regard to materials and maintenance, increases public access to open space and gathering places, increases urban canopy cover and ecological habitats, reconnects residents to our native habitats, and create new standards for aesthetic and landscape management in parks and urban landscapes.



Interpretive signage in the garden educates visitors about water-wise landscaping. *Photo by Lee Reeder.*



Coastkeeper Garden volunteer Marianne Hugo helps conduct the garden's regular nature-themed Family Workshop. *Photo by Eluzion Photography.*

Some of the impact-related objectives of the Coastkeeper Garden are to preserve the natural heritage, promote drought-tolerant landscaping and reduce urban runoff.

As Orange County moves closer to build-out, native species of plants, birds, butterflies, and wildlife are being negatively impacted and local residents are becoming more disconnected from the natural environment. The Coastkeeper Garden increases public awareness of the importance of preserving our native habitats. It is our hope that garden visitors will encourage their public leaders to utilize public space in order to preserve our natural heritage.

Beach postings and closures due to bacterial laden urban runoff have plagued Orange County for years. Visitors to the Coastkeeper Garden learn how their current behaviors could be negatively impacting our coast and corrective actions that can be taken to improve the environment.

More than 50 percent of Orange County's water is used for landscaping, including parks, urban lawns and golf

Garden *continued from page 25*

courses. Experts agree that outdoor use can be reduced by up to 40 percent with proper irrigation technology and drought-tolerant plants. The staff and the garden itself offer practical landscaping advice on how residents and public agencies can significantly reduce their water use.

We invite you to visit the Coastkeeper Garden, at Santiago Canyon College in the city of Orange. The Garden is adjacent to Santiago Canyon College and has its own entrance at 1560 E. Santiago Canyon Road Orange 92869. You can enter this address into your smart phone and it takes you directly to the entrance of the garden. It is open to the public from 8:00 a.m. to 4:00 p.m., Tuesday through Saturday.

Austin Brown's true love is the water as he has lived near the ocean for most of his life both in California and Hawaii, and can often be found diving or boating. For the past six years Austin has enjoyed being the Manager of the Coastkeeper Garden and has become a "plant expert."

Coastkeeper Garden Community Outreach/Programming Volunteer Marianne Hugo is a fourth generation native Californian and has lived in Southern California her entire life. Marianne is an avid plant lover and gardener and enjoys spending her free time volunteering at the Coastkeeper Garden.

Special thanks to Eluzion Photography for donating some of the photos for this feature story, including the opening photograph and the photo of the girl somersaulting. You may find them at www.eluzionphotography.com



Mother and daughter enjoying a walk in the garden.
Photo by Eluzion Photography.

Please keep in mind that the Coastkeeper Garden is supported through the generous donations of individuals and businesses throughout Southern California. Please visit our donation page at coastkeeper.org or donate when you visit. Our garden has enjoyed the support of a wide range of organization and individuals, including:

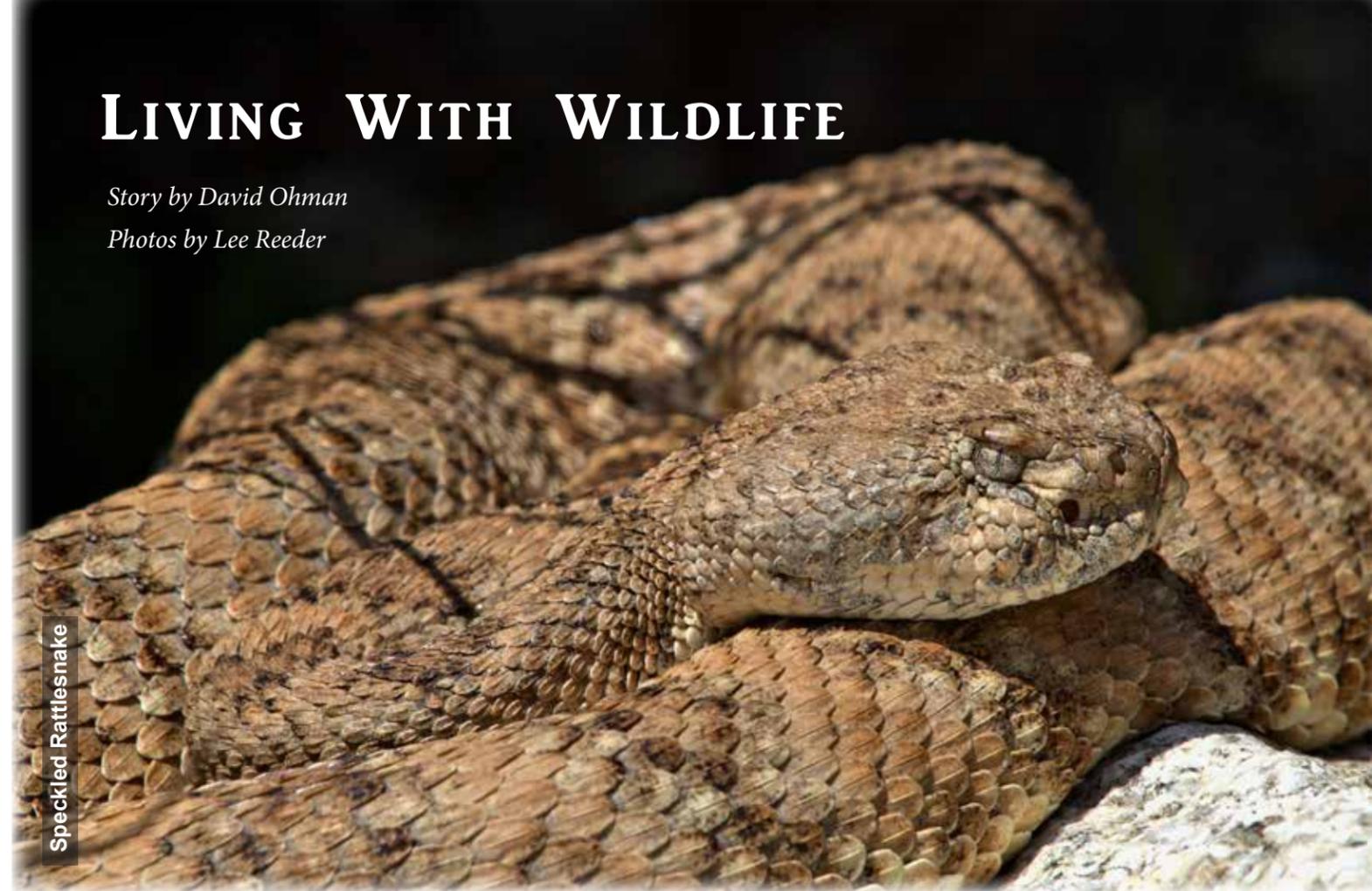
Allergan Foundation
Beckman Coulter Foundation
Brent Harris & Lisa Meulbroek
California Dept. of Forestry & Fire Protection
California State Parks
Cox Communications
Employees Community Fund of Boeing CA
ET Water
Hunter Industries, Inc.
Hydropoint Data Industries, Inc.
Irvine Ranch Water District
The Irvine Company
James Cox Foundation
Kenneth Lester Foundation
Lowes Foundation

Metropolitan Water District
Mountain States Wholesale Nursery
Orange County Community Foundation
Orco Block
Pacific Life Foundation
Rhino Concrete Pumping Corp
SA Recycling Company
Sams Club
Southern California Edison
Steve Bone
Toro Company
Walmart Foundation
Wells Fargo Foundation
Western Digital Foundation

LIVING WITH WILDLIFE

Story by David Ohman

Photos by Lee Reeder



Speckled Rattlesnake

During the course of my protracted and convoluted career, I have accepted interesting employment in interesting places. I grew up in West Los Angeles at a time when a local creek had yet to be lined in concrete as part of a flood control project. As preteens, my chums and I loved to ride our cruiser-style bikes down to the muddy creek lined lush with moss, lichens and tall grasses and check out the frogs, pollywogs, garter snakes and the miniscule fish riding the current west toward the ocean.

Fast forward to about 10 years ago. It was during a short hike along a cliff-top trail in Northern California. While watching some rather large waves rearing up against an offshore breeze to pounce upon the rocks below me, I felt a nearly imperceptible bump against the side of my foot. A juvenile California king snake, less than a foot long, had apparently decided the trail was just not big enough for the two of us. In a snap, its mouth was attached to the side of my nylon-mesh trail sneaker, partly because his rows of

little teeth were caught. (I had considered wearing some open hiking sandals but fortunately thought the better of it.) I stood there, patiently waiting for this little snake to reconsider its motives, and eventually it released its grip to slither off, no doubt feeling proud expressing its truth to power. Well, no harm, no foul; rather amusing, actually. But it was a clear warning shot from one of Nature's smaller emissaries that I was the interloper.

While living in Durango, Colorado a few years back, I was working



Living With Wildlife, cont...

at my computer one very dark, late night. My desk was blessed with an enviable view of the mountains and forest. In any event, in that dark night, I had no idea a black bear was watching me through the window in front of me until it slammed its front paws against the thick, double-layer glass. To say I was startled would be a major understatement. The next morning, I found large paw prints and nose smudges on the window. Suddenly I felt like I had been inside the deli case looking out.

Well, you get my point. These are just a few examples of my contact with wildlife over the years. Which brings me to the point: Quite simply, we are guests among the wildlife in Southern California and they occupy a lot of territory.

Consider this. The highest point of land in Orange County sits 5,690 feet above sea level overlooking about 948 square miles of mountains, canyons, hills, wetlands, flatlands and the coast. The 40 mile-long coastline is festooned with placid, secret coves with sultry tide pools



These little guys may look cute, but don't get too close!



A rufous hummingbird heads for Mexican sage, one of its favorite foods.

brimming with life, estuaries, wetlands, and sprawling, yacht-infested harbors, rocky cliffs, sandy beaches and a sprawling, magnificent ocean featuring gray whales commuting 10,000 to 12,000 miles round trip from their mating and calving home in a warm-water lagoon in Mexico to the feeding grounds in the Bering Sea. It's a star-studded show if ever there was one.

Despite all of the agriculture, and the development that replaced most of it, Southern California's geology has always been, with the exception of the Ice Age, defined as a coastal desert that if supplied with just enough water, anything will take root. And holding its own, against all odds, is an extraordinary collection of wildlife. They swim, fly, leap, pounce, hop, crawl, run, slither, screech, howl, growl, squeak and grunt, each in their own unique way. Some hunt, others are hunted and they occupy a huge, living diorama co-starring countless songbirds, sea

birds, birds of prey, marine mammals, opossums, reptiles, rodents, amphibians, skunks, deer, bobcats, mountain lions, foxes and coyotes, and that doesn't include the supporting cast of invertebrates and fish found in watersheds and coastal waters.

For those with little or no experience encountering wildlife outside an animated film, I regret to inform you that members of the wildlife community don't dance, sing or talk, at least not with us. Don't crowd them or attempt to feed them, especially by hand. Either they fear you, hate you, love your garden, or consider you an essential food group. Let's just take a few examples of Southern California wildlife to make the point.

Raccoons, masked-but-mischievous-looking, may look cute and rather amusing for their size but don't be lulled. Behind that visage is an unpredictable determination to frighten the unwary. Do not ap-



An Osprey surveys the water, then heads into a dive. After a splash and a grab, he flies off to a branch with his prize.

proach a raccoon, especially to hand-feed. They may feign an attack to show their lack of fear but then again, they may just follow through with the threat. With very sharp teeth, the bite will not only be painful, you may be vulnerable to rabies.

Opossums are quite common and, quite frankly, not all that attractive. Think of them as Nature's version of an Ugly Dog contestant. Opportunistic omnivores, when they're not cleaning your barbecue hours after the patio party is over, they will also devour pet food if left outside. Did I mention the teeth? For defense and feeding, the bite is painful and, as with raccoons, can transmit rabies.

Skunks, too, love pet foods left on a back porch or patio. Found in residential neighborhoods, as well as open space, nothing seems to bring as much joy to a skunk's heart than sharing a bountiful spritz of skunkness into the night air to be carried into every open window in the neighborhood. Short of giving an odorous home back to the bank, some homeowners have rid their houses of just about every stick of furniture and shred of carpet and rug to cleanse the house. Now, if your dog or cat has the misfortune of meeting a skunk up close and personal, rumor has it that bathing your unfortunate pet in tomato juice is the best method of decontamination. Perhaps, but keep a haz-mat suit handy, just in case.

Though bears no longer inhabit Orange County, black bears still live in the mountains of Southern California, which makes this segment more about living in the mountains and foothills. Despite their shy ways, these bears are curious omnivores ready to capitalize on your mistakes. They tend to frequent the communities in the area when they come out of hibernation in the spring, thinner and very hungry. Sow bears with cubs are also going to be very protective of their little ones. So stay away. From early August, bears prepare for winter hibernation by packing on the fat. Although they normally feast on oak acorns, berries, small animals, insects, plants and vegetation, they've also discovered that humans provide a menu of options such as, birdseed, fruit, pet food, barbecue grill scraps and trash. If you have not been the victim of a bear attack on your outdoor barbecue, count yourself lucky.

Though black bear attacks are rare, they can become bold and aggressive when defending food sources or their cubs. So respect them at all times. Never approach or harass bears, and don't allow bears to feel comfortable being near your home as a food source. Some bears have made home burglary an art form, and a safety risk, in the hunt for your food. Extensive and expensive property damage often results from such intrusions. If you see a bear in

a tree, stay away to avoid stressing an already unpredictable animal. Take a few photos if you must and move on so it will come down and leave on its own.

This is also coyote territory, as is most of the entire country. In the search for food, they are at once equally relaxed and comfortable in the wild or around your home. At first glance, these scrawny canines, even with their jaunty air, appear to have seen better days. But, they're opportunistic and versatile hunters. Whether hunting solo, or as a pair, if it looks edible, they will check it out. Lithe and lean, they have a knack for climbing over backyard fences in pursuit of small dogs and cats with nowhere to hide and limited defensive skills. So bring your pets indoors before sunset. If you and a coyote spot each other at close range, and he does not retreat right away, make yourself look as dangerous as possible by making a lot of noise and waving your arms in a threatening manner. That will usually persuade a coyote to leave you alone. Supposedly, this usually works on mountain lions, too. Which is to say, it may not. 'Sounds a bit like "famous last words," doesn't it?

For all of the species of snakes found around Southern California, I am fixated on the southern Pacific rattlesnake, well known for its deadly, unpredictable demeanor. Herpetologists (snake experts) tell



At first glance, these scrawny canines, even with their jaunty air, appear to have seen better days, but coyotes are known to be opportunistic and versatile hunters.

As you can differentiate a venomous snake from a non-venomous type by looking into their eyes, up close, I presume. They say the safer of the two has round pupils like ours. They may bite but you'll live to tell about it. Venomous varieties, on the other hand, have eyes likened to that of a cat. And since a rattlesnake has a striking distance equal to its entire body length, and that it all happens in a blur, this seems a rather risky vantage point to my way of thinking. Here is a rule that may be hard to follow: if you suddenly encounter a rattlesnake on the trail, or the back porch, don't make a sudden move. (I find this rule a bit presumptuous.) Slowly drift away to avoid triggering the snake's defensive nature to quickly coil and strike. (Since this snake has a tail rattle wagging noisily, you can eliminate the need to look into its eyes for proper indentify.) Incidentally, and just for the record, even a baby rattlesnake has the goods to kill you as soon as it leaves its shell.

Case in point: Several years ago, I was riding my mountain bike, from the heart of Irvine down to Corona del Mar, with plans for lunch at Crystal Cove with friends. On the paved trail just south of Corona del Mar, I was rounding a bend when a gaggle of hikers began wildly waving their arms commanding me to



If you see an agitated southern Pacific rattlesnake like on the trail, don't make any sudden moves.

immediately move to my left. Since their concerns were excited and unanimous, I pulled over to grasp the curiosity and terror in their eyes. All fingers were pointing, in unison, to a four-foot-long rattlesnake on the other side of the path, roughly 15 feet away. Though it slithered off into the brush, without the group's warning, I would have pedaled within a foot or two of a startled snake, easily within striking distance. Farther down the trail, I asked a park ranger if this snake sighting was common. "Oh, yes," he said. "The early rains have produced a bumper crop of baby squirrels and rabbits and that has brought the rattlesnakes out in



These brown pelicans were flying in formation while hunting for fish at Bolsa Chica Ecological Reserve in Huntington Beach.



Great horned owl in Sycamore Canyon Wilderness Park in Riverside.

droves. Eight sightings just today! Be careful!" Point taken, believe me.

Birds of prey, most notably eagles, ospreys, various hawks and owls, are a beautiful sight for their flying style as well as their hunting skills. In particular, owls are designed to fly nearly virtually without making a sound. Unfortunately, that also means they can silently swoop down upon your cat or small dog and

pluck them off the ground like so much take-out food. And the hours of dawn and dusk are the most dangerous for your pets so bring them inside for safety. Most of my sightings have been during bike rides around the Upper Newport Bay as the ospreys pluck fish from those shallow waters. They rarely miss.

If you drive frequently on our canyon roadways, you may have seen deer on a hillside or darting across the road. Or, perhaps, tragically, one that did not make it across the road. As migratory grazers, they pose some sticky challenges, especially when they come in contact with cars and trucks. Owing to their camouflaged coloring, as well as their famously capricious nature, they can go unseen until the last second when it's too late to avoid an accident. The dim light of pre-dawn and the sunset hours makes it particularly difficult to see them crossing or standing in the highway. One old saying goes, "Where there is one deer, there are usually others." So it's vital to always



Mountain lion at the Orange County Zoo in Irvine Park.

remain vigilant while driving at any hour of the day or night.

In the wide world of big cats, two call this home: the mountain lion and the much smaller and equally shy bobcat. At the top of the food chain in wild Orange County, the mountain lion, rather smallish for a "big cat" (about the size of a cheetah) is without exaggeration, the most elegant and efficient predator in the region, able to bring down an adult deer and anything else within that weight class (unfortunately, that includes large dogs, hikers and mountain bikers). While living in Connecticut during the 1990s, I had the good fortune of meeting wildlife naturalist Jim Fowler. He shared some important advice about all cats, from Bengal tigers to lap cats. To paraphrase, cats do four things better than just about any other animal: they hunt, chase, kill and eat.

Though mountain lions are generally calm and reclusive, their moods may change without notice. An attack can happen in an instant so always be alert when hiking or mountain biking in remote areas. They always have the advantage of surprise so it would be best not to wear headphones on the trail, as that will reduce your level of awareness of the immediate area. Presume you are being watched and measured.

Along the Coast

As with all of the entire Pacific Coast, Orange County is blessed with some unique ecosystems including the Bolsa Chica wetlands (reopened with great applause to the ocean tides about seven years ago) and the Upper Newport Bay and Back Bay. The latter is fed from two directions: Newport Harbor from the west and San Diego Creek from the east. The Back Bay is home



A spinner dolphin chases fish off of the coast near San Diego Harbor.

to fish and nesting sea birds, which attracts egrets, blue herons, osprey, foxes, coyotes and bobcats. On rare occasions, dolphins have been spotted fishing in Upper Newport Bay, a task requiring some determination and skill avoiding collisions with boats in the harbor.

California sea lions are a common and entertaining sight along our shores and harbors. Whether putting on a show of swimming skills, or just basking aboard the lonely moored boats bobbing in our harbors, sea lions seem quite comfortable in their role as one of Neptune's ambassadors. Pelicans glide and swoop effortlessly before diving into the water for a meal, emerging with a wiggling fish in their bill's pouch. The ever-ubiquitous sea gull, and there are many versions spread out over land and sea, is both an entertaining flier and efficient predator. A nest of eggs left unattended by another bird specie is an easy target for hungry gulls, and they are always hungry.

California gray whales in migration, orcas (killer whales) on the

hunt (sometimes to ambush newborn gray whales), and dolphins with their knack for showing off with a leap out of the water, can be spotted from shore. Perhaps you were waiting for some information on sharks along our coast. There are several, but I will leave that discussion to someone (a shark expert) less squeamish than this old surfer.

One needn't be a marine biologist to explore below the ocean's surface. As a sport or hobby, this is an immensely rewarding and visually



California sea lions are a common and entertaining sight along the shores and harbors of Southern California..

stunning thing to do, especially if you take a camera with you. If you are planning to take your air supply with you, you will need to invest in formal training with a qualified diving instructor. But it's all worth it. Kelp beds and reefs swarm with fish and sea mammals awaiting your arrival.

As you can see, Orange County is more than lattes, boats, surfing or golf (though I heartily endorse the first three; I tried golf and I will leave it at that). Southern California in general, and Orange County in particular, is home to a lavish collection of animal life, on land and sea, demanding our admiration, respect and protection in perpetuity. Love and appreciate them will all your heart.

Just don't crowd them to extinction.

About the Author

David Ohman is the former Editor and Creative Director for Coastkeeper Magazine. He is now living in Denver, Colo., where he works as a freelance photojournalist and feature writer.

MARINE PROTECTED AREAS

Preserving Our Ocean Life for the Future



This view, looking southward from Shaw's Cove, encompasses three Marine Protected Areas that stretch from north Laguna Beach to Dana Point and make up the Laguna Bluebelt.

By Ray Hiemstra * Photos by Lee Reeder

Have you visited one of Orange County's Marine Protected Areas yet? If you have been to the ocean or one of its estuaries during the past few years, you might have enjoyed one or more of them without being aware of it. Crystal Cove, Bolsa Chica, Upper Newport Bay, Dana Point, and all of Laguna Beach are just some of the locations that are included in these new sanctuaries, which are intended to preserve our marine life heritage for future generations.

A 13-year process that started in 1999 finally came to fruition in 2012 when the MPA network all along the California Coast was finally completed, providing increased protection for large swaths of coastal and estuary waters up and down the state, many of them in Southern California.

Coastkeeper took a lead role in providing recommendations for the Orange County MPAs. We continue to monitor them through the MPA Watch program and through our other advocacy and enforcement efforts.

What is an MPA?

A Marine Protected Area is essentially a piece of the ocean or an estuary where human activities are more strictly regulated than they are in non-MPA areas. The equivalent on land

might be a state park or wilderness area where hunting or collecting of firewood is limited or not allowed at all. The California Department of Fish and Wildlife is the agency responsible for the MPAs. Detailed information and maps of all of them may be found at <http://www.dfg.ca.gov/marine/mpa/index.asp>

There are seven MPAs on and just offshore of the Orange County coastline. The following are the Orange County MPAs and their basic regulations:

- Bolsa Bay State Marine Conservation Area—Take is prohibited, except the recreational take of finfish by hook and line from shore is allowed in designated areas.
- Bolsa Chica Basin No-Take State Marine Conservation Area—No take allowed.



Marine Protected Areas, continued...

- Upper Newport Bay State Marine Conservation Area—Take is prohibited, except the recreational take of finfish by hook and line from shore is allowed in designated areas only.
- Crystal Cove State Marine Conservation Area—Take is prohibited, except the recreational take of finfish by hook and line or by spearfishing is allowed, as well as take of lobster and sea urchin. The commercial take of coastal pelagic species (northern anchovy, jack mackerel, pacific sardine, pacific mackerel and market squid) by round haul net, spiny lobster by trap, and sea urchin are allowed. No take is allowed from tide pools.
- Laguna Beach State Marine Reserve—No take is allowed.
- Laguna Beach No-Take State Marine Conservation Area—No take is allowed.
- Dana Point State Marine Conservation Area—Take is prohibited, except the recreational take of finfish by hook and line or by spearfishing, and take of lobster and sea urchin is allowed below the mean lower low tide line only. The commercial take of coastal pelagic species (northern anchovy, jack mackerel, pacific sardine, pacific mackerel and market squid) by round haul net, spiny lobster and sea urchin are allowed. No take is allowed from tide pools.

It is important to note that MPA regulations only restrict taking of marine life. All other activities such as swimming, surfing, boating diving and wildlife watching are allowed in MPAs.

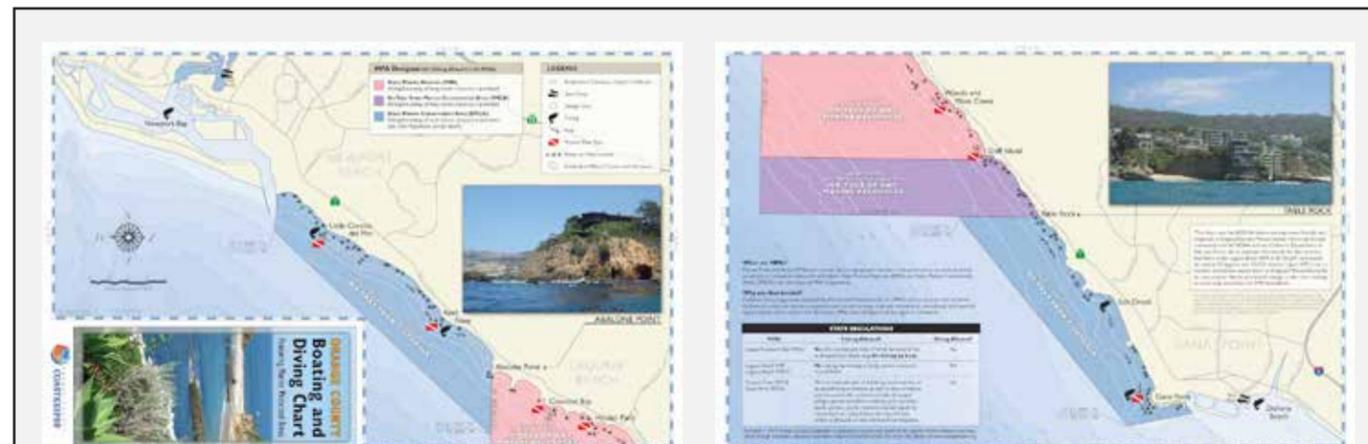


A diver prepares to explore the waters of the Laguna Beach State Marine Reserve.

Since the MPAs went into effect, they have enjoyed great support from the community, cities and non-profit organizations along the coast, especially in Orange County. The public has also been widely accepting and respectful of these new protected areas.

MPA Watch Program

When Coastkeeper was involved in creating these marine protected areas there was a lot of specific information available on each site, including the types of fish and other marine life that existed, how much rocky reef there was, and other basic information. However, we didn't have a lot of data on what people do and where. The human use data was sorely lacking. We knew generally that people surfed in this one spot or people dive in



Coastkeeper created its Orange County Boating and Diving Chart featuring MPAs in 2012. This chart was developed for offshore users and is available online, and every year Coastkeeper prints and distributes 2,500 copies.



this other area. However, we didn't know to what extent these activities were taking place, and how many people were doing them, and where these activities were going on in other places.

To close this information gap, MPA Watch was started by the Monterey Coastkeeper, followed closely by Orange County Coastkeeper and Heal the Bay. Since that time it has been expanded statewide, so there are now MPA Watch programs up and down the state. The statewide MPA Watch website is www.mpawatch.org.

A technical advisory team of scientists is helping MPA Watch to ensure the data collected is valid and useful. MPA Watch worked with this team to develop monitoring protocols and a data sheet to standardize the way data are collected at all of the Marine Protected Areas throughout the state. Training manuals have been developed so that all MPA Watch personnel and volunteers everywhere are collecting and recording data in the same way. MPA watch surveys are done by citizen volunteers who have gone through a training course to ensure the accurate collection of human use data. After training, volunteers conduct that MPA Watch surveys at their own convenience on any day of the week. This unscheduled survey regime results in a set of random surveys that covers all times of day and all days of the week, ensuring that we capture the variety of human uses that are occurring in MPAs.

The information is entered into a statewide database, from which Coastkeeper pulls the Orange County in-

formation and analyzes it to produce quarterly and annual reports. Currently the database application can't self-generate reports, but that is an immediate goal for the mpawatch.org site. Members will soon be able to click on a map of a given MPA anywhere along the coast and get a summary report on activities and measurements that have taken place recently in that area.

One of the major reasons for ensuring the validity of the data and building functionality into the web site



is to encourage and allow the California Department of Fish and Wildlife to use the human use data collected by MPA Watch for their management and enforcement activities for MPAs. The web site and associated database will also allow the public and other entities to access information on human use in the MPAs.

Educating the Public

Public education is a critical component of the local support and outreach in Orange County. To help explain MPAs there are three locally produced MPA maps available to the public.

Coastkeeper created our Orange County Boating and Diving Chart featuring MPAs in 2012. This chart was developed for offshore users and is available online, and every year Coastkeeper prints 2,500 copies and distributes them for free through diving stores and other sporting goods stores. On holiday weekends Coastkeeper sends out volunteers to distribute the guides at selected boat ramps. The chart is an especially import

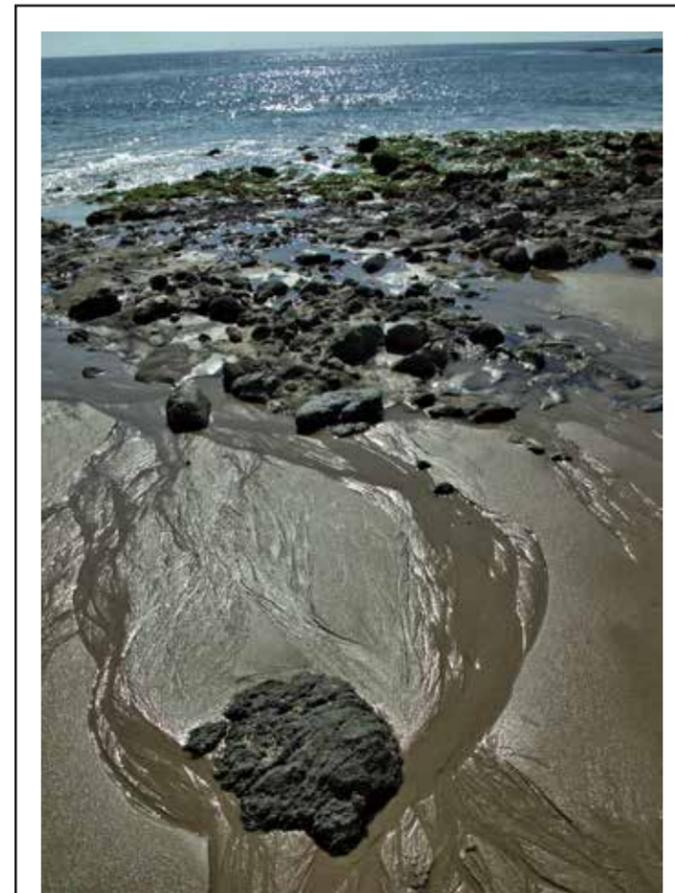
continued on next page...

Marine Protected Areas, continued...

ant tool for boaters from inland areas who occasionally bring their boats to the ocean for fishing and may not be familiar with MPA regulations.

Coastkeeper is part of a coalition called the Orange County Marine Protected Area Council (OCMPAC). Members of the council also include Cal State Fullerton, Cal Poly Pomona, Santa Ana College, the County of Orange and the cities of Dana Point, Newport Beach and Laguna Beach and the Crystal Cove Alliance and Laguna Ocean Foundation. The council meets quarterly to discuss issues of education, research and enforcement in Marine Protected Areas. OCMPAC also has created a map that includes all of the Orange County MPAs. For more information about OCMPAC, go to www.oc-marineprotection.org.

The third map is published by the Laguna Blue Belt Coalition, and it is Laguna-specific, highlighting the Laguna Reserve, Laguna State Marine Conservation Area and the northern portion of the Dana Point State Marine Conservation Area. That map can be found at <http://lagunabluebelt.org/laguna-smr/>



Shaw's Cove in the Laguna Beach Marine Reserve.



Brown Pelicans fishing at Bolsa Chica.

Keeping An Eye On Activities

Coastkeeper monitors activities in or near all of the MPAs of Orange County. For example, if there is new development near an MPA such as the construction of a new dock in the Upper Newport Bay, Coastkeeper will take a look at the project to ensure that it complies with MPA regulations.

A recent example of Coastkeeper's involvement came when the National Pollutant Discharge Elimination System (NPDES) permit for the AES Power Plant in Huntington Beach came up for renewal. Coastkeeper made sure that MPAs were specifically mentioned in the permit to ensure that MPAs could not be harmed under that permit. Coastkeeper is also working to ensure that MPAs are considered as part of the new MS4 (Municipal Storm Water) permit that is being developed by the Regional Water Quality Control Board.

Coastkeeper's long-term goal is for MPAs to be recognized and considered in all permits for projects may impact them and have all of the Orange County MPAs designated as State Water Quality Protection Areas to increase the water quality protections for them.

In the meantime, Coastkeeper is attending Coastal Commission, city council and local planning commission meetings. If for example, someone is making modifications to a house that is adjacent to a marine protected area, we will take a look at that. Coastkeeper recently commented on two construction projects in Upper Newport Bay near the Pacific Coast Highway bridge. The project proponents proposed construction over the



Young, exhausted sea lion at Shaw's Cove.

water in that MPA. Although the project proponents can create new water on their own land, they are not allowed to build out over the water into the MPA.

The Evolution Continues

The Marine Life Protection Act requires that MPAs are adaptively managed through five-year reviews of their effectiveness, so the first such review for the system will come in 2017. After only five years it is unlikely that enough scientific data will be available about the MPAs to support shrinking, expanding or eliminating any of the MPAs. The most likely scenario is that everything will remain the same for this first round.

Through the MPA Watch program, Coastkeeper and others continue to monitor our Marine Protected areas and eventually hope to demonstrate the value of pre-

serving our marine life for the future. For more information or to become involved go to the Coastkeeper MPA Watch page at http://www.coastkeeper.org/mpa_watch or the statewide MPA Watch program web page at mpawatch.org.

Ray Hiemstra is Associate Director of Programs for Orange County Coastkeeper and Enforcement Committee Chair for the Orange County Marine Protected Area Council. Hiemstra was one of the eight Orange County residents who were members of the South Coast Regional Stakeholder Group, which was formed to make recommendations for the South Coast MPAs.



Mussel shells in a Laguna tide pool.



The maps above show the seven Marine Protected Areas in Orange County, On the left are the Bolsa Chica MPAs. The map at center shows the Upper Newport Bay and the map to the right shows the Laguna and Dana Point areas.

Decommissioning San Onofre

By Garry Brown

Hey, what could possibly go wrong?

As a native of Orange County, seeing the iconic twin domes at the San Onofre Nuclear Generating Station as I drove the I-5 was as natural to me as seeing the blue water of our Pacific Coast. Like the Big A, the Castle or Matterhorn at the magic kingdom, or the piers at the beach, looking at the domes at

San Onofre was a part of growing up here. Everyone knew it was nuclear powered, but it operated safely for so many years that not many people had concerns.

Sometime in 2010, the commonplace was interrupted when we heard there was a problem at the San Onofre Nuclear Generation Sta-

tion, of which Southern California Edison is the major owner and operator. The alert was about excessive wear being discovered on some recently replaced cooling tubes.

The vigilant Southern California news media scrambled, and we watched a Southern California Edison spokesman on television saying they didn't know what was causing the problem. While I appreciated their honesty, it was disconcerting to hear the local nuclear power czar say, "they didn't know..." This is nuclear power and is potentially catastrophically dangerous. They are supposed to know and have all the answers, aren't they?

I just assumed the "problem" would get fixed and Southern California Edison would apply to the State for an extension of its operating permit to continue on for another few decades producing electricity for the thirsty energy grid. Then I

was invited to attend a symposium at University of California, Irvine for a discussion on the divergent opinions as to the problem, solution, and future of San Onofre Nuclear Generating Station.

That day I learned there were serious issues with the excessively worn cooling tubes, the proposed solution, and future operation. The representative from Southern California Edison was insulted that he had to deal with such cynics, never mind their facts and PhDs.

On June 7, 2013, an announcement from Southern California Edison made everyone take pause for a quiet moment to grasp its meaning. It was the headline on all the channels all day and night: SAN ONOFRE NUCLEAR GENERATING STATION WAS SHUTTING DOWN, PERMANENTLY! This seemed out of the blue. Nobody expected it—Southern California Edison employees didn't even have a warning.

For Transparency:

Over the 16 years of building Orange County Coastkeeper, I developed a productive partnership with Southern California Edison and got acquainted with many of the people there. Our partnership centered on solving polluted runoff issues coming from the nursery operations under Southern California Edison power line corridors. That partnership was successfully completed and Southern California Edison asked if we had other ideas for a new partnership. I suggested a partnership that would demonstrate and prove the many benefits of drought tolerant non-discharging landscapes at their substations. The result is the three-acre drought-tolerant landscape at the Villa Park Substation on Tustin Av-

enue in the City of Orange.

We value the partnership with Southern California Edison; however, our advocacy on issues such as Once Through Cooling for coastal power plants has not been to Southern California Edison's favor. Our relationship has survived divergent opinions and opposite positions on some issues.

Back to the Story...

Early in 2014, I received an arranged telephone call from Ron Litzinger, then president of Southern California Edison. He said Southern California Edison was putting together a panel of community leaders to compose what he called the "Community Engagement Panel" for San Onofre Nuclear Generating Station and asked if I would agree to participate. The mission was to engage the community through the

Nuclear Power Plant Decommissioning Fun Facts

There have been numerous surprising facts revealed through the Community Engagement Panel process.

- The Federal Nuclear Regulatory Agency allows fifty years for a nuclear power plant to decommission. Yes, that is 50 years.
- Southern California Edison has set a goal to decommission San Onofre Nuclear Generating Station in 20 years, which apparently is warp speed for decommissioning. Keep in mind that many nuclear power plants have been decommissioned in the United States over the years and this is not a beta test.
- There was regular highly enriched uranium fuel that has fueled nuclear generating plants for decades, but now there is low-enriched uranium that is called "high burn-up" fuel. It burns hotter and generates more electricity and has only been used to generate nuclear power plants since the early '90s. Not a lot of data exists on storing high-burn-up fuel in dry storage canisters designed for the older, less heated fuel.
- After the rods (which are not rods at all, they are really pellets that go into long tubes, called cladding, that are put together into what are called assemblies) are removed from the reactor, they must be stored in a refrigerated pool of water about 30 feet deep. They must be stored in the cold water for a minimum of five to seven years just to cool down enough to be then placed in dry storage.
- The Federal Government has completely failed to provide a national depository for spent nuclear fuel. Currently, there does not appear to be an attempt to identify a site, much less develop it. In absence of a national repository, the law provides that spent fuel be stored on site of the nuclear power plant where it was utilized as fuel.
- Spent fuel would need to be stored on site for at least 50 years and probably much longer—possibly 200 years. To make it interesting, canisters are only certified for 20 years.

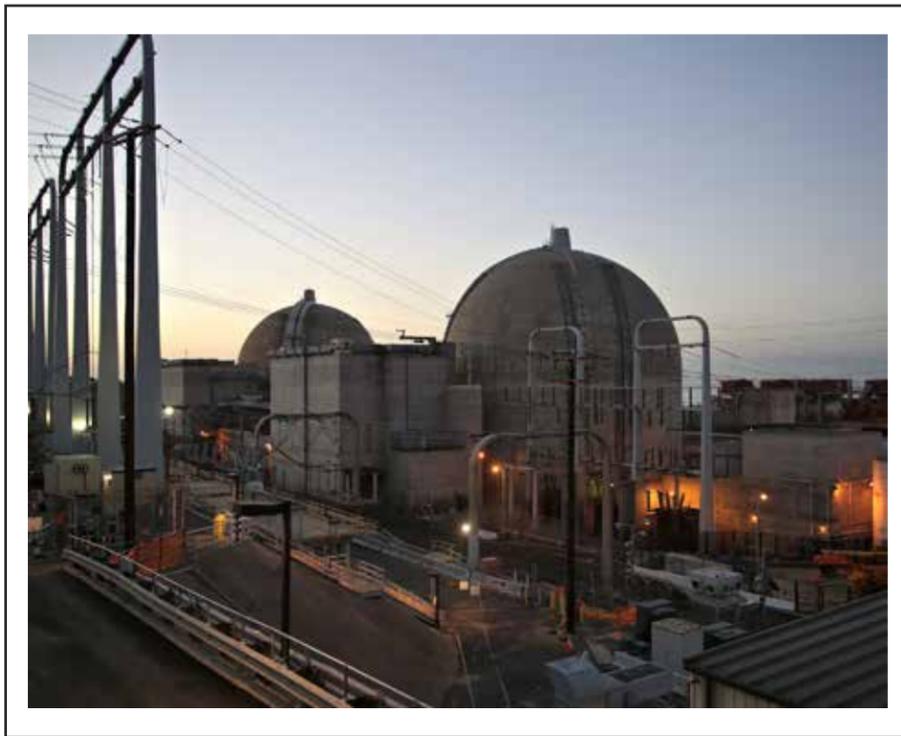


San Onofre, continued...

decommissioning process at San Onofre Nuclear Generating Station. I agreed to serve and now the real story starts....

The first meeting of the Community Engagement Panel was in April 2014. There were approximately 150 members of the public present, numerous video cameras, and a rather large contingent of appointed panel members. At the second half of the meeting, members from the public were given time at the microphone to give comments. A general appeal from the speakers was that we, as panel members, should be very diligent in our deliberations and actions to protect the public from nuclear harm.

By the second meeting it was evident that the Community Engagement Panel was carefully designed to be a “strawman” for the public and would never deliberate on anything or make a recommendation. The only role of the Community Engagement Panel is to ask questions and express individual opinions to solicit answers from Southern California Edison on issues related to decommissioning.



My frustration began when members of the public were lining up making it clear they were looking to the Community Engagement Panel to protect their safety. At the first two meetings, neither the appointed chairman, nor anyone else clarified this conflict.

I wrote a letter to the Community Engagement Panel suggesting that before each meeting, and particularly before the public comments, a prepared statement be read to clearly state the role of the Community Engagement Panel and clarify that we had no authority to even make a recommendation, much less protect their safety. Another clarifying point in my letter was, since the Community Engagement Panel has no authority, there should never be an implication or suggestion made by Southern California Edison that the Community Engagement Panel has concurred with any action related to decommissioning.

The two major issues with decommissioning that we have spent the

majority of our meeting time and discussion on are:

1. Where to store dry spent fuel
2. And in what type of dry storage container.

Where to Store Spent Fuel

Regarding storing spent fuel on site, it is clear why San Onofre Nuclear Generating Station was located waterfront; it needed huge amounts of seawater for cooling. This location is also freeway front to 120,000 cars passing each day, railroad front to an active commuter rail line and neighboring 8.4 million residents within a 50-mile evacuation radius. However, now that San Onofre Nuclear Generating Station has not produced a kilowatt of electricity since June 2013, the seawater is no longer needed. Stored canisters of spent nuclear fuel seemingly should NOT be stored waterfront, freeway front, railroad front, and in close proximity to millions of people.

There are five nuclear generating stations in California—four closed



Members of the Community Engagement Panel at a recent meeting. The role of the panel is to ask questions and express individual opinions to solicit answers from Southern California Edison on issues related to decommissioning.

and only one still operating (Diablo Canyon). Why can't California collaborate with the Federal Government to find a California solution for depositing spent fuel? California does have lots of isolated land areas. This certainly makes more sense than five separate storage locations in California. Is anybody working on this? The answer is NO.

Spent fuel can only be transferred into a storage canister while it is submerged in a cold water pool. If we find a problem with one of the dry storage canisters in say 25 years, and it is determined that the fuel must be removed and placed in a new or reconditioned canister, how do we accomplish this task when we have decommissioned and removed the cold water pools that are required in which to transfer spent fuel?

What Type of Dry Storage Container Should Be Used for Spent Fuel?

Let's talk about storage canisters. The United States-manufactured aluminum canisters are not to be opened once sealed, meaning the fuel inside can never actually be inspected. Conversely, there are European manufacturers that make

canisters out of heavy steel that are sealed and bolted closed and can be reopened. In Europe, there is much more transporting of spent fuel and these can be loaded on trucks and taken down the road. United States canisters, on the other hand, are not

“Southern California Edison is well intentioned but minimizing the costs of decommissioning is without question the driving force.”

big on transporting distances more than hundreds of yards from the pools to the dry storage area. Many believe the European canisters to be safer and preferable.

The Reality of the Decommissioning San Onofre Nuclear Generation Station

One very real and prevalent factor throughout this process is that Southern California Edison has made all the major decisions prior to the Community Engagement Panel. Participating in this process reminds me of being a kid standing along a railroad track when a locomotive is passing...you can shout, jump up and down, and maybe even throw something at it, but one thing for sure, you are not going to make any difference at all. It will not even know you are there.

Southern California Edison is well intentioned but minimizing the costs of decommissioning is without question the driving force. Anything other than what they have already decided to do would cost more money, even though ratepayers are paying most of these costs. There is \$4.3 billion already collected over the years from ratepayers. This will cover decommissioning costs. However, more money will be needed for the long-term storage costs. This will be a continuing financial burden to ratepayers in the future.

While the Community Engagement Panel was discussing where to store spent fuel and in what type of canister, SCE announced they had already selected a canister manufacturer and made the decision the decision of where to store spent fuel on site at San Onofre—water front, freeway front, and railroad front. So much for any real influence of the Panel and the motivation to find a California solution for long-term storage.

But hey, what could possibly go wrong?



LAGUNA BLUEBELT

Sharing its beauty with award-winning photographs



The Bluebelt. Mitch Ridder

In this pictorial feature we celebrate the Laguna Bluebelt by highlighting many of the award winning photographs from the first four years of the Laguna Bluebelt Coalition's annual photo contest. Coastkeeper encourages you to enjoy and support our Marine Protected Areas.





Laguna's Anemone of Life. Patsee Ober

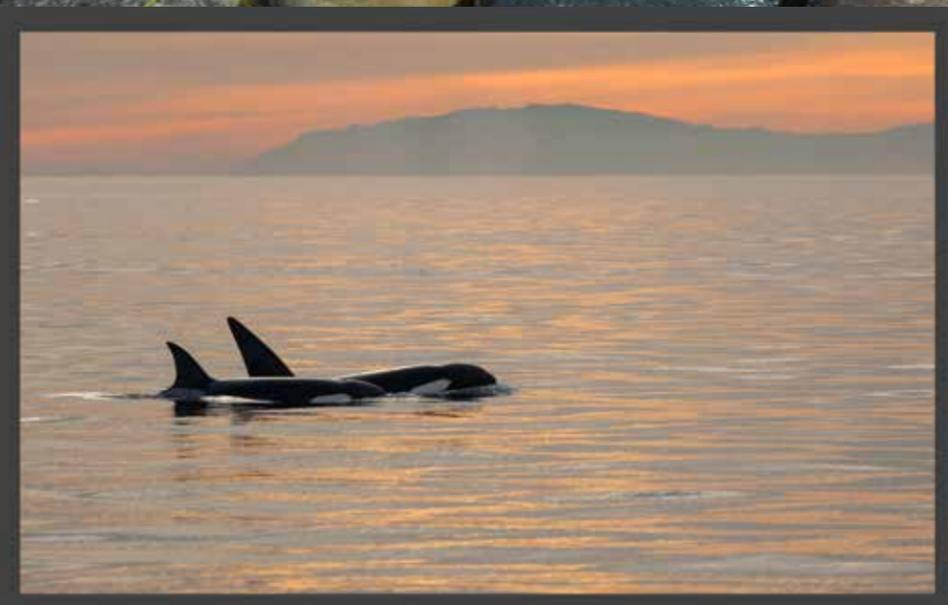
A LAGUNA BLUEBELT

The concept of protecting the ocean shores has been part of the vision 25 years. This vision formed before its start. Along the way, these two other, resulting in the seven Marine great achievement for marine life third, make up what is known as the Laguna Reserve, Laguna State tion of Dana Point State Marine article on all of the Orange County

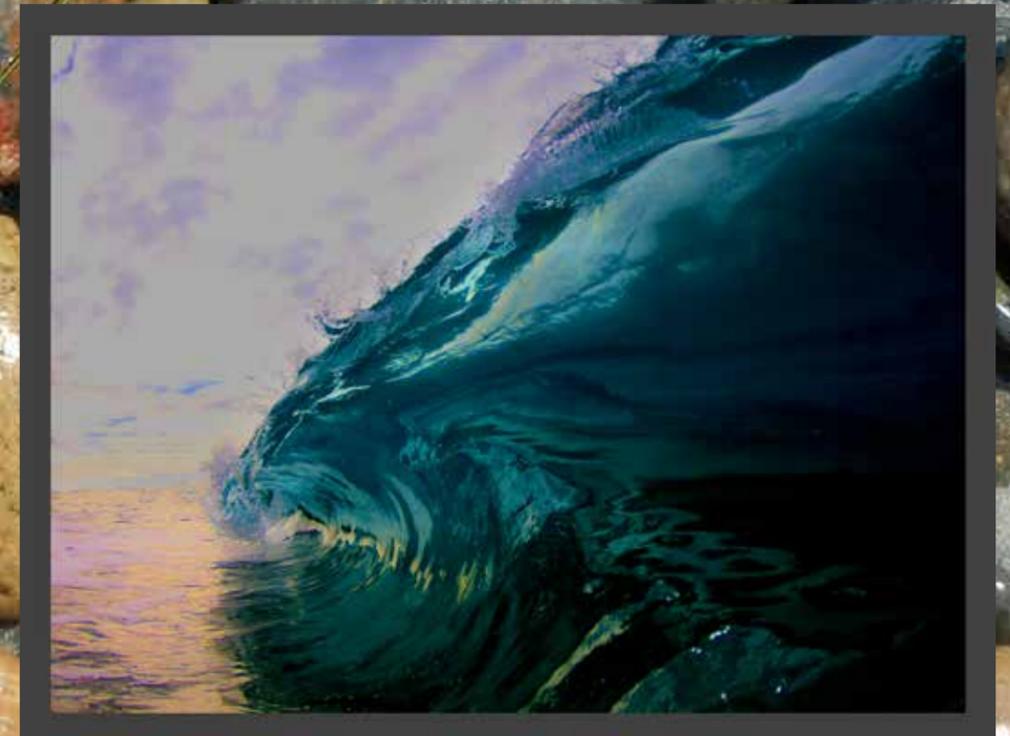
and sea life along the Laguna plan of the city of Laguna Beach for the Marine Life Protection Act got efforts began to complement each Protected Areas in Orange County, a and people. Two MPAs, and part of a the Laguna Bluebelt. These areas are Marine Conservation Area and a por- Conservation Area. For more, see our MPAs on page 33.

The Many Colors of the Kelp Forest
Michelle Hoalton

Healthy Kelp Forest Continues to Grow
Jean-Yves Coulead



Orcas at Sunset. Cliff Wassman



Falling Waters. Lucas Austin

BLUEBELT CONTEST

Every year since 2012 the Laguna Bluebelt Coalition has sponsored a photo contest that attracts talented amateur and professional photographers to the Laguna shores, tide pools and reefs. Photos can be taken on the beach with family and friends, underwater, on a kayak or SUP, and of any subject the entrants wish. It can be of anything within one of our MPAs that interests you. It could include your family & friends enjoying the beach, the tidepools or ocean, the birds or marine life that depend on it, just any part of this special place. Judges place emphasis upon photos that celebrate a healthy ocean environment and promote awareness and respect for the Laguna Bluebelt. For more information, go to www.lagunabluebelt.org.



Tide Pool. Sean Brown



The Crevice. Michael Zeigler



Western Willet Foraging in Sea Grass.
Foster Eubank



Tweeting. Jenny Andrew



Shaw's Cove. Dan Stensland

VOICES

Moving Southern California Toward

WATER RESILIENCE

An interview with Larry McKenney

Water supply and quality are becoming major issues throughout California, necessitating a change of mindset in the public, government, business and industry. To highlight these complicated issues, Coastkeeper interviewed Larry McKenney, a member of the Coastkeeper Board of Directors and a recently appointed member of the Metropolitan Water District board. Larry has served as the director of the Watershed and Coastal Resources Division of Orange County, where he was responsible for the county's implementation of water quality programs, including the county's stormwater program, water quality science, and watershed management. He also served as a board member of the Moulton Niguel Water District. He is currently Executive Counsel for the Santa Ana Watershed Project Authority.



Coastkeeper: *It appears more and more that drought will be a fact of life from now on in California. What are some of the vital elements of a long-term water resilience plan for California?*

I have been suggesting to people that perhaps we shouldn't be referring to this as a drought. Maybe this is just the way it is, and certainly there is some evidence that the 20th Century was an unusually wet period, rather than normal, and we may just be returning to normal.

We need diversity in supply. Everyone, down to the retail water agencies, should have multiple sources of supply. We need more storage closer to the users, so that means we need more storage in our big distribution systems throughout the state. Storage is always difficult because there are so many environmental trade-offs with it, particularly with dams and surface storage, so it makes a lot of sense for us to make very aggressive use of our groundwater basins for storage, and more on a systems basis than we have in the past.

We need to clean up our contaminated basins. In a more efficient way than we have in the past, we need to make economic deals about storage and banking in groundwater basins, and have other people invest in the use of basins in order to get the most benefit out of them.

Resilience also means that you have distribution and treatment system redundancy. You need to be able to withstand earthquakes, storms and fires and still deliver water. You need to have diversified power systems and backup power supplies.

From a bigger perspective, to be more resilient we need to re-emphasize that it's a statewide proposition and a statewide policy issue. We are talking about making the best economic use of a shared, statewide resource. So the efforts toward resiliency and the solutions always need to work within the context of the entire state of California, and no region can go it alone.

Lastly, it seems pretty obvious but it has to be said, that the biggest thing we can do to be water-resilient is to improve our water use efficiency. There is no source of supply that is cheaper or more reliable than what you don't have to use. If you don't need it, then it's assured—you'll always have what you need.

Coastkeeper: *How do you define and implement water use efficiency?*

I always emphasize water use efficiency as opposed to water conservation. Water conservation to me connotes immediate, short-term actions and reductions in use. While that can be valuable in responding to a particular shortage problem, that's really a short-term concept and it's not always fair in terms of investments people have made in improving their

systems, while other people may not have done as much.

Across-the-board use reductions can be effective in the near term, but if you want to be resilient, you need to focus on efficiency of use, which is an all-the-time proposition, and there is a hardware and a software part of it. The hardware part of it is making sure you use all of the most efficient water-saving devices. All of your nozzles and washing machines and toilets should be water-use efficient devices. The software component of it is all of your ordinances and policies. You need to have ordinances that allow people to have water-efficient landscaping, and you need to subject them to penalties when they water their lawns excessively during a shortage. Public awareness also needs to be a big part of it.

The bottom line is you need to have the most efficient use of the resource by every user of the resource. This involves every member of the community changing their relationship with the resource. Our relationship with the resource is distant, at least in Southern California. People don't know where their water comes from, what it takes to get it to them, and what consequences their actions have. So we need to change that relationship to the resource and create an ethic of valuing water, and that, over the long-term, is going to drive all the hardware and software solutions.



Coastkeeper: *You mentioned that the solutions must come in the context of the entire state and they must be consistent. How can that be implemented fairly and consistently?*

That is the value of talking about water-use efficiency rather than use reduction. In this drought emergency the governor called for an across-the-board 25-percent reduction in use. I understand why he called for that, because we are in a drought emergency, but for the longer term that is not really fair or appropriate.

The concept of water-use efficiency is not a perfect comparison but it is a more fair comparison statewide because it compares who is efficient and who is not, as opposed to who is using how much and who has reduced how much. Some people have already done water conservation in some parts of the state and people have different types of supply portfolios in different areas, and different needs and different climates. I think the concept of efficiency can include a lot of those factors and allow for a comparison about who is really using the communal, statewide resource appropriately and who is not.

Coastkeeper: *Some new technologies are emerging that might help Southern California water become more sustainable. What are some of the more promising of these?*

The pace of technological advancement right now is phenomenal and none of us can say where we are going to be

continued...

in 20 years in terms of our treatment and information technology. When it comes to water resilience, the advances that hold promise may not be in what we think of traditionally with water, but in energy. This includes renewable energy development, recovery of energy from waste products, and improved efficiency in our equipment.

For example, in Metropolitan's Colorado River system, each of the pumping stations, starting at Lake Havasu and coming all the way across the aqueduct, has nine pumps. In the past, to run the aqueduct systems at maximum conveyance, they ran all nine pumps. Recently they upgraded the equipment with more efficient turbines, and now they run at peak times with eight pumps because of efficiency improvements. That phenomenon is happening across all types of technology, and when that efficiency happens on the energy side and the equipment side, it enables other advances, such as desalination, where the feasibility largely hinges on the energy cost factors.

Because we are getting better at the way we do filtration—reverse osmosis, microfiltration, nanotechnology—I expect there is going to be a great effect. With these developments, desalination of seawater and brackish groundwater, cleanup of contaminated groundwater basins and recycling all become more feasible, more reliable and more trustworthy.



Part of Orange County Water District's GWRS

We've invested a lot in Southern California in purple pipe recycling for landscape irrigation, and that's all been laudable. The Groundwater Replenishment System [of Orange County Water District] is a perfect example of the next frontier, which we are in right now—indirect potable reuse, where the water is reused for municipal use, not just for landscape irrigation. When you broaden the way you use the water,

you greatly multiply the benefit of the recycling. In the long run, from a water use efficiency perspective, we want to significantly cut back on how much landscape irrigation we do at all, because we don't want

all of our recycled water going to that.

Indirect potable reuse is a great step forward, but it still relies on having significant storage capacity. So the next frontier, which I believe will come in the next decade, will be to move toward direct potable reuse, especially in systems where they don't have a lot of storage available to them. The big impediments to that now are energy and regulatory challenges. We need to be able to demonstrate that we can overcome these.

With direct potable reuse you don't need to have seasonal storage for recycled water. You should produce recycled water all the time and put it directly back into the system. Then, instead of seasonal storage, the big system challenge will be salt management. This becomes more and more important the more recycling you do.

We're starting to have discussions within the water industry in Southern California about how much data are available through NASA, NOAA and JPL. They have satellites that collect enormous amounts of data about weather and rainfall, and geology and storage. This is information that could help us manage our statewide system and we don't make much use of it. The information we can develop now should be used to look at the entire system and show people how we affect one another so we can manage the systems on a much larger scale.

To bring it right down to the home level on a technological basis, we're producing smart meters that allow people, in real time, to see their energy use. For the past 20 years I have believed that we will have a significant effect on the end users of water when there is a dashboard on the wall next to your kitchen sink where you can see what your water use is. We have the technology to do that, and when that becomes popular it will have a big effect.

Coastkeeper: *On the environmental side, as water purveyors recycle and reuse water more efficiently and discharge less water back to the environment, what happens to watercourses and wetlands in places like the Santa Ana River?*



Big Bear Lake at the top of Southern California's biggest watershed in 2014 showing effects of prolonged drought.

This is something we've been grappling with and we haven't perfected the solutions, but I believe we've come to realize in the past 30 or 40 years that our original conception of water rights was flawed, because we focused on human-beneficial use. We are recognizing that's not the only beneficial use—there are ecological beneficial uses that need to be protected. We've made some inroads, but we certainly haven't made a major wholesale reform of our water rights system to account for that in a way that's entirely satisfactory. But at least we're recognizing the problem is there and we're not ignoring it anymore. As human demands harden and we continue to have population growth and drought cycles, the question is how do we survive those, but we obviously have to build the ecological needs and demands into our planning.

Ecological resilience is a lot like water cycle resilience. It's not just a matter of saying you have this one source of supply. You need a diversified source of supply. In the ecological perspective that means that you can't have this enclave of the population of a species and expect that is going to be resilient. You need to have broader areas of preserved habitat for the habitat to be resilient.

Particularly in Southern California, with our seasonal streams, the riparian species on those streams have proven to be very vulnerable, so you end up with listed species, such as the least Bell's vireo [an endangered migratory songbird]. Part of the challenge in managing for that is that those habitat systems are dynamic aquatic environments that are adapted to seasonal and flood/drought cycle changes, so you can't just set aside a piece and preserve it and say you're done. The system has to be periodically wiped out and reset, and that's part of the resilience. You have to leave enough of it alone for that to be able to happen. Part of the challenge is you have to preserve enough area of different types of habitat for it to be resilient through natural processes.

Another part of the challenge is where you have habitat that you've created, sometimes you have to actively man-

age it, and we have a regulatory system that doesn't always recognize that, and they treat every management action as a detriment that has to be compensated for with mitigation. Sometimes you're doing things for the habitat that you have to do because you haven't allowed nature to do it.

A good example is when the County of Orange did a lot of vegetation thinning along San Diego Creek. This is a completely artificial creek that was created as a drainage ditch and later as a flood control channel. Riparian vegetation was growing in a buffer strip alongside of this stream that was artificially created as mitigation for other projects, and then once that buffer strip is there it will grow. It will be riparian habitat for a while, but it will eventually mature past the stages where it's reasonable least Bell's vireo habitat, for example, and if you don't let flood scour wash it out, it's not going to stay habitat. So you have to go in and thin it to try and mimic what nature would have done. I used to tell people, 'It's too late to stop playing God.' It's a challenge. Sometimes you have to leave enough of it alone and let it work, and sometimes you have to realize you touched it, so now you own it, and you have to take care of it.

Coastkeeper: *So how do we maintain that balance among water needs, environmental sustainability, quality of life and economic growth?*

When you're talking about maintaining that kind of balance, a key thing for someone in my business to realize is that the water agencies aren't going to do that on their own. You need to involve a lot more stakeholders and you need a lot broader community input to talk about that kind of balancing. You especially need to very actively involve non-water agency elected officials—in the cities and counties—people who are making decisions about land use, and whose job it really is to do that kind of macro balancing.

continued...

Water agencies want to be responsible, but they also recognize that it is the general-purpose government's job to watch out for the health and safety of the entire community, and it's the water agency's job to respond to demand that is created by land-use decisions. We need those elected officials to be much more aware of the water issues we're grappling with. We need a lot of people who are concerned about fire, police protection and those sorts of is-

“When you talk about maintaining balance among the environment and the economy and the quality of life, it's all about vision.”

ssues to also be aware of the implications for water and water resources for the actions they're taking and they need to take.

The other side of that coin is that water agency leaders need to recognize that engaging in that kind of collaborative process about water resources, which helps it fit into the larger picture, doesn't mean that they're giving up their turf. It's actually allowing those water agency officials to play a larger role in taking care of their communities than they could do by themselves.

We have to reverse the idea of the silos. This is deep in our water agency culture: we're very efficiency oriented. In our culture we take an engineering mindset to things. We view the world as a machine. We think everything should be managed efficiently because that's cheaper, and we think everything should be divided up into its component parts, having experts manage each component part. I think what we've learned in the 21st Century is that we've overdone that and it can't work. To be resilient instead of just efficient, we need to blur those lines. We need to have more collaboration, and people need to understand that we can achieve more by crossing those lines and working together than by dividing up the work and having an assembly line approach to things.

When you talk about maintaining balance among the environment and the economy and quality of life it's about vision. All of these elected officials and stakeholders who are making decisions about where we're going to be in the future need to come to some consensus about where it is we want to be, not just arguing about the component steps of how we get there. Whenever I have asked someone “Do you want to live in a First World country?” I've never had anyone say no.

So what does a First World country look like? It's reliable water service, adequate shelter, affordable food, police protection and all of those basic things, but it also has to be a healthy ecology because the natural world around us being healthy is part of our quality of life, and if we recognize that we can all work toward it. If you get people recreating outdoors they will both reconnect with the natural resource and gain a better understanding of it and, therefore, will use it more wisely and get healthier.

Coastkeeper: *You have broad experience in Southern California watershed management, coastal preservation and environmental affairs. How can you put that experience to work most effectively in your role as an MWD director?*

The first thing to note is the Metropolitan mission, which has evolved. Originally Metropolitan was formed to import water to Southern California to supplement local supplies that were thought to be inadequate, and it was expected that communities were going to have local supplies and Metropolitan was going to augment that.

If you think about imported water and Metropolitan's role in that way, it leads you to very different conclusions about policies and what can be achieved than where we are today, where you have huge communities that have developed in reliance on imported water, and with very limited local supply.

As Metropolitan grew over the years it voluntarily took on a greater role in water management across the region. Whether you think that is stepping up to do something good, or taking over power or authority they didn't have, the fact is that Metropolitan has put itself in the position of assuring the entire region that it will have adequate water supplies. That means Metropolitan is plugged in to local resources as well as importing water and trying to look at total demand and how we meet total demand through this portfolio of local resources, recycling, water-use efficiency and imports. There are many member agencies at Metropolitan and they have very diverse situations in local supplies and demands. The Metropolitan board is 37 members with very diverse backgrounds, both professionally and personally, and who have different levels of involvement. So it's a very complicated machine.

Because of the breadth of my experience on the water side, what I hope I can bring to the board is to help the board members see a lot of the ways that we affect one another that might not be immediately obvious. I think the board members do a pretty good job of stepping out of their member agency roles to some extent to consider what is best for Metropolitan and for all of Southern California. And that mindset is promoted when everyone understands how connected all of these issues are. Because I have worked in water supply, flood management, coastal protection and endangered species, I believe I have a broad enough experience so that I can help people see where those connections are.

Another concept I may be able to help advocate at the Metropolitan board is that water use efficiency is good for Southern California because of the system benefits it brings, even though it runs counter, on its face, to the business model of the organization. Metropolitan does a lot of good work in an integrated way, but all of that is funded by selling imported water. I don't think water use efficiency and sales of imported water are mutually exclusive. There is always work that can be done to improve how that functions.



Late Winter 2015: Not only is there no ice, but there is no water to be seen anywhere in this Big Bear Lake view.

We are always going to need some importing as part of a diversified portfolio, and we are probably always going to need all the imported water we're getting now. There is a lot of debate around whether we need more, and around the Bay-Delta there is controversy over Southern California taking more water. It's clear that the current Bay-Delta conservation proposal is not about taking more water than the project is designed for, but it's about more reliability and better quality. It will result in more water because of using the system better but it's not more than the system has historically delivered.

So we're always going to need Metropolitan, but the board needs to be mindful that it is not an elected body, and it can't make some of these big policy decisions on its own.

Coastkeeper: *How do we get business and industry passionately involved in supporting water resilience and water quality?*

I think it is happening but it needs to accelerate. In the discussions about state water policy, the bond and the Bay-Delta conservation plan, we've seen an increase in some of the large industries entering into the debate. The Orange County Business Council, the REAL Coalition, some Silicon Valley interests, and some of the economic development councils are starting to become more educated and more engaged at a policy level.

One of the challenges for businesses is not just thinking about price. There are other values in the way we run the system than price—reliability, for example. It seems hackneyed to say this but we need more communication. We do a lot of outreach to the public and we've started to do more outreach aimed at business and industry.

Metropolitan has a committee on agriculture and business outreach and we need more of that. We in the water industry, which in California is largely governmental, need to go to business and industry leaders and talk to them, and not talk in government speak. We need to talk with them, in their world, about the business impact of good water policy. At the same time, we don't want to act like a business and say that our job is to give you the lowest possible price.

With the tools we have now we are getting better at monetizing the value of water and monetizing risk. It's not only the value of not having water, but the costs you incur in facing the risk of not having water. Venture capitalists and credit rating agencies are starting to factor in the risk associated with water supply in their investment decisions.

We need to talk with them about the importance of water in terms of their commercial processes and the value to their business, their work force and the community. This goes back to the quality of life because that is valuable to them if they want to maintain a good work force. A healthy community with resilient water resources is also a value to their marketplace because people in healthy communities, wherever they may be, are good customers better able to afford to buy and use their products. People in communities that are unhealthy because their water supply is in a crisis aren't going to be thinking about buying their products.

I believe there is a real opportunity in our global economy for industry leaders to think on a larger system scale about water policy, even more than the people in the water industry do. You have major industries headquartered in Southern California that are doing business all over the globe. They should be worried about water policy in India and China.

Coastkeeper: *What do we need to keep in mind as we look to the future of water in Southern California?*

Again, we need to stop thinking about drought and conservation and look toward water use efficiency. Even with the recent storms we are not out of the woods on this current drought, and there is certainly no reason to relax the efforts we have been taking to become more resilient. Just like in the financial world, that means not living beyond your means. That's what we need to do from a natural resources perspective and a water perspective as well. We don't want to rob our grandchildren to do what we need to do now. Instead, we need to be making investments so we can leave them a world they can live in. That means being able to withstand the ups and downs of our weather cycle and still be able to deliver water reliably, in adequate quantity and quality.

Providing Healthy, Sustainable Marine Environments

By Sara Briley,
Marine Restoration Coordinator



Restoration has always been a vital part of Coastkeeper's mission and we continue to seek funding and partnership opportunities in restoring aquatic and riparian habitat. In order to provide healthy marine environments we need to provide adequate habitat for fish, marine mammals and all ocean organisms. The goal is to help our fisheries rebound and protect our oceans for future generations.

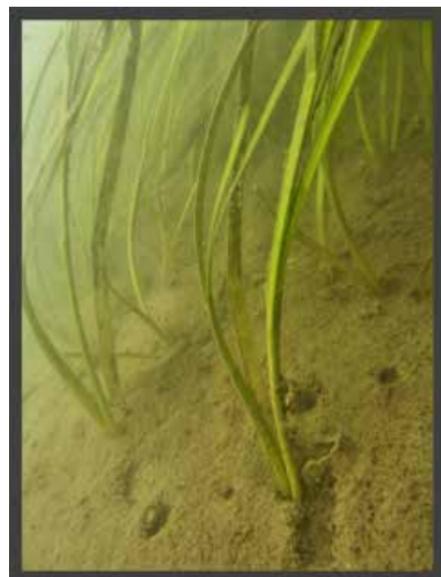
Elgrass on the Rebound

Coastkeeper, in partnership with the Back Bay Science Center and the California Department of Fish and Wildlife, has worked since 2008 to protect critical eelgrass habitat in Newport Bay by combining public education, research and long-term restoration efforts.

Eelgrass (*Zostera marina*) is one of 60 species of seagrasses – a unique group of aquatic flowering plants that grow fully submersed in shallow coastal waters worldwide. Eelgrass meadows provide many important ecological services, including nutrient cycling, carbon sequestration, sediment stabilization, water quality improvement, and habitat and foraging grounds for many invertebrates, fish, and bird species.

Over the past 40 years, however, eelgrass habitat, especially in Upper Newport Bay, has undergone dramatic declines due to a combination of increased urban runoff and coastal development activities. Eelgrass has

extremely high light requirements and significant decreases in light reaching beds has been a consistent problem as a result of increased water turbidity from sediment inputs and the persistence of harmful algal blooms resulting from excess nutrients. This combination of threats has most likely been the cause of the decline of eelgrass habitat in Upper Newport Bay.



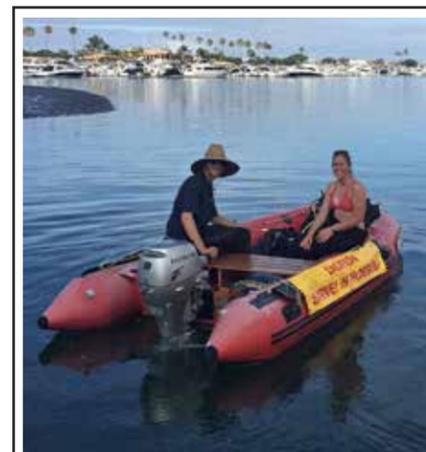
The primary goal of the restoration project is to restore eelgrass throughout its historical range in Upper Newport Bay. In addition, we will evaluate the success and cost-effectiveness of three different methods of restoration that have been successful elsewhere: 1) traditional method - eelgrass is bundled on land by volunteers and transplanted by hand by divers into the soft, nutrient rich mud; 2) TERFS (Transplanting Eelgrass Remotely with FrameS) - eelgrass is tied to wire frames by volunteers and can be lowered into the water from a boat; and 3) BuDS (Buoy-Deployed Seeding) - eelgrass flowers are collected by hand without removing the plant from the mud and placed in mesh bags tied to buoys and anchored to the bay floor. Seeds are eventually dispersed through the bags and fall to the seafloor to produce new seedlings.

During the spring of 2012, Coastkeeper, in partnership with Coastal Resources Management, Inc (CRM), implemented the first community-based eelgrass restoration project in Upper

Newport Bay. With the help of over 40 land-based volunteers and volunteer divers, we planted and seeded 240 square meters of eelgrass along De Anza Peninsula in Upper Newport Bay using these three transplant methods.

We completed the next years of restoration in the summers of 2013 and 2014 by working with more than 110 committed volunteers to plant an additional 550 square meters of eelgrass along the peninsula in two areas where eelgrass has not been seen in the past decade.

Our restoration efforts appear to be working. Eelgrass transplants are taking root and spreading to fill out more area. Animals—such as fish, snails, clams and worms—are finding homes in our eelgrass beds and increasing the biological diversity of the area. We are observing eelgrass densities equivalent to nearby reference eelgrass beds within a year of transplantation, and the total area is also expanding. Before restoration in 2010, there was approximately 0.002 acres along the northwest main channel side of the peninsula where our restoration took place, and currently there are more than 1.5 acres of eelgrass habitat there, which is likely the result of a combination of our intensive restoration activities and some natural recolonization.



Coastkeeper SCUBA divers take off to prepare for eelgrass planting.



Coastkeeper volunteers prepare collected eelgrass into bundles to be transplanted.

To further the project's goal to involve the public in the restoration and preservation of eelgrass in the Upper Newport Bay Ecological Reserve, we continue to develop our strong community-based eelgrass restoration program, which relies on the participation and experience of local community members. We have been highly successful in recruiting both land-based volunteers and volunteer divers to complete restoration activities in a timely and cost-effective manner. We will continue to grow this program at the Back Bay Science Center so that future restoration work can draw upon this volunteer base and utilize the guidance of Coastkeeper marine biologists to proactively manage eelgrass habitat throughout Newport Bay. We will be undertaking the fourth year of eelgrass restoration starting in late Spring 2015 to further increase the area covered by this important habitat forming species.

Olympia Oyster Restoration

Olympia oysters were once an important food source for native Californians and an ecologically important habitat for numerous other aquatic organisms. Oysters provide habitat and refuge for other organisms, such as octopus, crabs and juveniles fishes, which find shelter on the reefs and beds. Thus, they not only increase habitat complexity, but also increase biodiversity. Here in California, you might notice that the endangered California least tern uses oyster shell to line its nest. Oysters are filter feeders, improving water clarity, and helping to stabilize mudflats.

Beginning in the 1900s, overharvest of this species, increased coastal development, destruction of wetlands, and increased water pollution led to significant declines of the Olympia oyster. Today, native oysters exist primarily as small remnant populations in bays



Scientists from project partner, California State University Fullerton, survey the density of oysters on the restored beds. Photo by Danielle Zacherl.

and estuaries. However, we have lost an entire native habitat as well as the critical ecological and economic benefits provided by once healthy, fully-functioning components of our estuarine ecosystems. More than 85 percent of the world's oyster reefs have been lost since the 1900s and they are one of the most severely impacted marine habitats on the planet.

At a local level, field surveys of Alamitos Bay in 2010 revealed that native oysters are present; however, there were no natural intertidal "beds" of oysters anywhere in Alamitos Bay for oyster larvae to settle and grow in large communities. Oysters are gregarious settlers and while they will settle on many hard substrates, they prefer oyster shell. This is how oyster reefs/beds are created. In June 2012, Coastkeeper, in partnership with California State University Fullerton, CSU Long Beach, and KZO Education, constructed a restored oyster bed at the Jack Dunster Marine Reserve in Alamitos Bay, CA. Teams of scientists, students, and community volunteers laid a new oyster bed using "dead" oyster shell to provide the impetus for future settlement of baby oysters, or oyster spat. Since then, we have seen the bed grow in size, and began to see significant increases in oyster settlement, survival, and growth within the first year. Current surveys estimate that the density of Olympia oysters on the restored bed greatly exceeds the density at other locations around the bay.

We will continue to monitor this habitat and have plans to continue these efforts not only in Alamitos Bay but also throughout other bays and estuaries in Southern California in an attempt to restore oyster beds to fully-functioning habitats. These beds will provide

habitat for other fish and invertebrate species, may help improve water clarity, particularly for sunlight-loving eelgrass beds that often occur adjacent to or in and around oyster beds, and will help inform other shellfish and habitat restoration projects in Southern California.



Volunteers work together in an assembly line to lay out the shell foundation of the oyster restoration bed. Photo by: Danielle Zacherl.



Photo by Lee Reeder

Fishable, Swimmable, Sustainable

Coastkeeper Aggressively Monitors Progress on Regional Stormwater Permits

Part of Coastkeeper's efforts to protect our drinkable, fishable, swimmable and sustainable waters is keeping a close eye on regulatory processes that affect those waters. We want to ensure that the governmental agencies that oversee environmental regulation effectively execute the jobs they are entrusted to do.

By Colin Kelly, Coastkeeper Staff Attorney

When an environmental regulator revises its procedures or modifies its restrictions, Coastkeeper is deeply involved in the process. This is especially true when a Regional Water Quality Control Board (Regional Board) renews a county's MS4 Permit. These permits lay the foundation for county and municipal government for at least five years and are intended to build on the successes of the permits they replace.

Despite this goal, many Regional Boards are adopting or considering MS4 permits Coastkeeper believes promote a different goal. As such, we have engaged the Regional Boards in a private and public dialogue, arguing for stronger protections and highlighting the deficiencies in the adopted Los Angeles and

south Orange County MS4 Permits, and the draft north Orange County MS4 Permit.

First of all, let's explain what an MS4 permit is and why we believe you should be concerned about it. An MS4 (Municipal Separate Storm Sewer System) is defined by the EPA to include any conveyance or system of conveyances that is owned or operated by a state or local government entity, that is designed or used for collecting and conveying stormwater, with some exceptions. These systems collect stormwater from streets, walkways, parking lots, business properties, industrial sites, landscapes and many other surfaces. That water is usually discharged, untreated, into a stream, river, bay or the Pacific Ocean. In essence, when you hear about an MS4, think about a storm drain.

In Orange County, MS4 permits are issued by a Regional Board to the county and each city in the Regional Board's jurisdiction. These permits require the permittees to: (1) effectively prohibit non-stormwater from entering the storm sewers; and (2) require controls to reduce the discharge of pollutants to the "maximum extent practicable," which includes management practices; control techniques; system, design and engineering methods; and other provisions as the state or EPA determines is appropriate for the control of pollutants. In practice, permittees seek to accomplish this by developing a stormwater management plan, which may require inspections, public education, street sweeping, identifying and repairing non-stormwater discharges (such as sprinkler overspray or im-

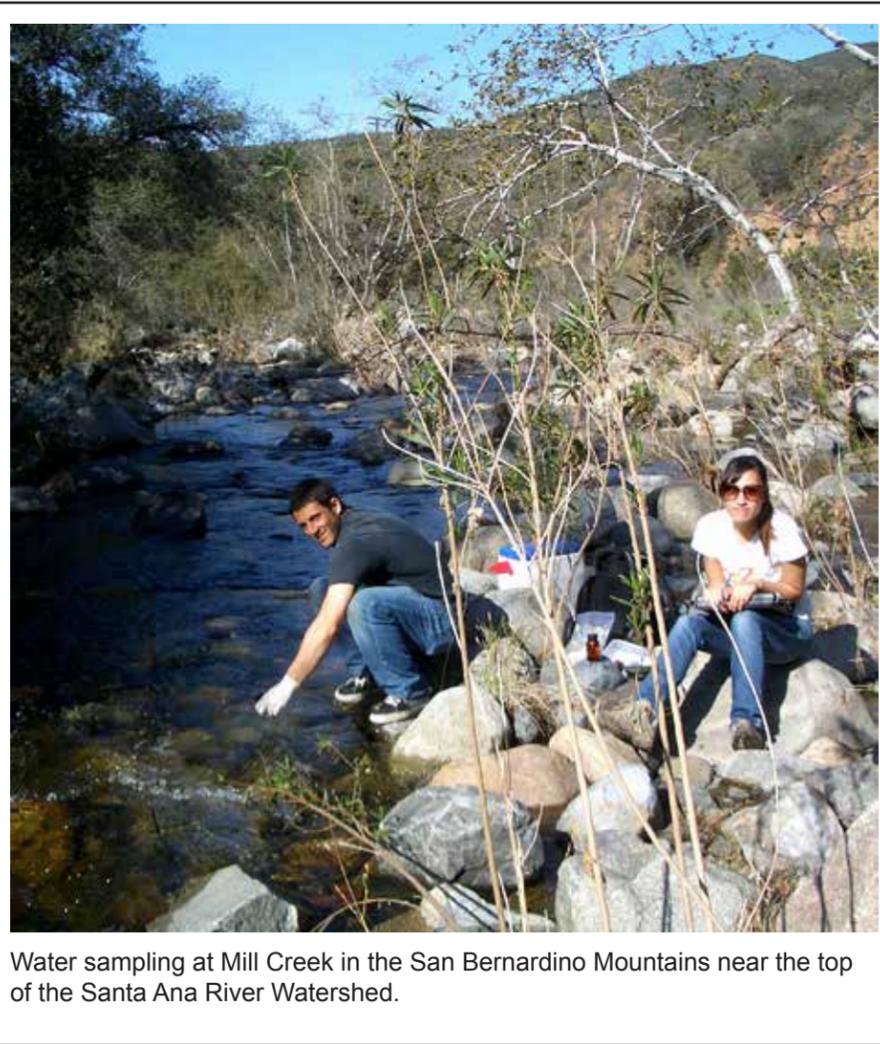
MS4 Permits, continued...

connected plumbing that connects toilets or drains to the MS4 system), and mandated Low Impact Development requirements on landscape and water efficiency. So, in a nutshell, MS4 permits are the method government uses to control the discharge of stormwater—America’s largest single source of surface water pollution—to our creeks, rivers, bays, coast and ocean.

Our stormwater problem

Stormwater pollution is Orange County’s number one water quality problem. When our increasingly rare storms release rain, it comes into contact with impervious surfaces, such as asphalt, concrete, or roofs, and transports the pollutants found on these surfaces untreated into the MS4 system and our waterbodies. This stormwater, or runoff, commonly increases flooding and erosion, and decreases groundwater infiltration. It also contains heavy metals (such as copper, lead, and iron), nutrients, sediment, pathogens, pesticides, insecticides, herbicides, trash, bacteria (such as E. coli), and pH-affecting contaminants. Stormwater is widely considered to account for more than half of the total pollution entering surface waters annually. In Orange County, many of our waterbodies are listed by the Regional Boards as impaired for many of these pollutants either year-round or only during the rainy season.

If you grew up in Orange County, or simply watch the local television news before or after a major or even moderate winter storm, you will likely see advisories, warnings, beach closures or a news story warning about water quality after a storm up and down the Southern Califor-



Water sampling at Mill Creek in the San Bernardino Mountains near the top of the Santa Ana River Watershed.

nia coast. Locally, the Orange County Health Care Agency issues a public advisory warning people to avoid entering waterways, including the ocean, for three days after a storm to avoid stormwater-related illness.

Which MS4 permits impact Orange County?

Five MS4 permits affect Orange County waters, because the waterways of Southern California don’t follow our county and city boundaries.

- The north Orange County MS4 permit governs the storm drains that flow into north Orange County waters. This permit controls the vast majority of Orange County’s MS4

system and controls pollutants discharging to Newport Bay, Anaheim Bay/Huntington Harbor, Bolsa Chica, and the Santa Ana River and its tributaries. We anticipate that this permit will go through its draft and comment period in the end of 2015 to the beginning of 2016.

- The south Orange County MS4 permit is issued by the San Diego Regional Board and includes parts of coastal south Orange County. This MS4 system discharges into Prima Descheca Channel, Aliso Creek, the Irvine Coast Area of Special Biological Significance



A school group monitors water quality in San Diego Creek in Irvine. Staff photo.

(ASBS), and the Pacific Ocean, as well as other waterbodies.

- Two permits in the Inland Empire issued to Riverside and San Bernardino counties, and associated cities, influence Orange County’s water quality because they control discharges into the headwaters of many of our waterways.
- The Los Angeles MS4 permit affects water in the San Gabriel River, a waterbody shared between Orange and Los Angeles counties. The Los Angeles MS4 permit is a high-profile permit that was appealed by environmental organizations shortly after adoption and will continue to work its way through the legal system. Regardless of the outcome, this permit will set the landscape for MS4 permits statewide over generations of permits.

The MS4 process

The Regional Board staff and key stakeholders begin the process by writing a draft MS4 permit. This draft is then released for official public comment. The Regional Board then addresses these comments and releases a revised permit that is open for further public comment. The public usually has 30 days

to submit official comments on draft permits before the Regional Board takes a final vote at a board meeting. Public comment is usually also allowed at the board meeting, and sometimes the Regional Board will request last-minute revisions on the final draft, and then they vote.

During the summer of 2013, Coastkeeper successfully negotiated the south Orange County MS4 permit. In mid-2015, the State Water Resources Control Board (State Board) issued their decision on the appeal of the Los Angeles MS4 permit’s incorporation of Safe Harbor Provisions. That decision can be read as guidance to Regional Boards to consider the Los Angeles style MS4 permit elsewhere.” Currently, Coastkeeper is negotiating the north Orange County MS4 permit before the Santa Ana Regional Water Quality Control Board and will



A colorimeter for measuring water quality and tape measure for measuring stream width. Staff photo.

be arguing against the type of language seen in Los Angeles.

Going backward shouldn’t be an option

Coastkeeper is concerned about the inclusion and adoption of Safe Harbor Provisions in MS4 permits. In this context, a Safe Harbor Provision is a section of the permit that specifies that certain conduct—continuing to discharge stormwater that causes or contributes to an impairment of water quality—will not be considered a violation of the permit. In other words, it’s a loophole in, or a way around, the permit’s requirements, making it possible for dischargers to delay, or prevent, improvement in water quality. The big issue for us is that the inclusion of a Safe Harbor Provision in any MS4 permit fails the basic premise that permits should build on their own successes and evolve to strengthen water quality protections with the goal of achieving fishable, swimmable, drinkable and sustainable water. Safe Harbor Provisions remove permittee accountability, freezing progress, and in certain instances can allow for the increased degradation of water quality.

We believe the inclusion of Safe Harbor Provisions in MS4 permits

MS4 Permits, continued....

are a violation of the Clean Water Act's anti-backsliding provisions. The Clean Water Act and associated federal regulations, specifically, 40 CFR § 122.44(l)(1), provide that except in a narrow set of enumerated circumstances, "when a permit is renewed or reissued, interim effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards or conditions in the previous permit." In short, water quality protections Coastkeeper is concerned about in this and other MS4 permits cannot weaken when permits are being renewed.



Student filtering water for further analysis. Staff photo.

Coastkeeper's goal is to prevent the Regional Board supporting the inclusion of Safe Harbor Provisions in our region's MS4 permits. Further, Coastkeeper seeks to ensure permits protect water quality standards and provide other Regional Boards with successful examples of effective MS4 permits. Currently, the north Orange County MS4 draft permit includes a variation of a Safe Harbor Provision. Coastkeeper is working diligently to get it removed in order to restore the integrity of our surface waters by ensuring the adoption of comprehensive, enforceable, and legal MS4 permits.

Keeping a close eye on the Los Angeles MS4

The Los Angeles MS4 permit is currently on appeal with the State Board because it includes a Safe Harbor Provision. Additionally, it governs water quality in the San Gabriel River, which flows into Orange County.

Simultaneously, the State Board is developing guidance for MS4 permits, using the Los Angeles MS4

permit as the example. We want the Regional Board to recognize the uniqueness of Los Angeles' multiple protections absent in Orange County and adapt the State Board's guidance to the water quality issues present in our precious waterways. Without the layer of additional protections provided in Los Angeles, the permittees in Orange County should not receive the benefits of a Safe Harbor Provision.

Los Angeles is unique in the sense that it has been well over a decade since its last MS4 permit was renewed and a lot has changed in the world of MS4 permits in that time. On the other hand, Orange County has had numerous MS4 permits during that time, some of which have been used by the EPA as an example for other states and locales. We innovate in Orange County and hold our permittees to a high standard through multi-beneficial requirements that improve water quality, recharge our groundwater, and in many instances, beautify neighborhoods.

In commenting on the Los Angeles MS4 permit, we stated, "Coastkeeper would like to respectfully caution the State Board on using information and processes gained from permit development (however long overdue) in one region and extrapolating that reasoning and interpretation to other regions, as this Draft Order does." The letter then goes on to examine situationally unique justifications presented by the State Board and why they don't apply outside of the Los Angeles Regional Board's jurisdiction.

Coastkeeper continues to fight for clear, appropriate and enforceable language that complies with the Clean Water Act, and against attempts to create unenforceable, vague permit limits and/or Safe Harbor Provisions that weaken water quality standards. We also want to open the door for new engineered solutions and best management practices to improve water quality, and MS4 permits should be crafted to encourage these technological breakthroughs as part of the process. Coastkeeper has also been successful in ensuring that our Marine Protected Areas (MPAs) will be referenced in the North Orange County MS4 Permit

You can help

To make sure our waters are healthy and sustainable, we need the permits to strengthen with time. You can help by donating to our advocacy work, spreading the word about strong MS4 permits on social media, and attending hearings to make your voice heard.



DID YOU KNOW?

Nearly five miles out one of the longer trails through Caspers Wilderness Park you will find one of Orange County's lesser-known natural and historical treasures. You wouldn't know it today, but for more than 100 years people have been coming to this spot, believing that healing powers may be found here. In the early 1900s, this place was bustling, and once included cabins, a hotel, a dance hall, a general store, a swimming pool, and early versions of the Jacuzzi—cement sitting pools filled with hot, bubbling spring water.

San Juan Hot Springs, Orange County's 38th historical landmark, probably gets a few dozen visitors per day, but it should be a must on any hiker's Orange County "Did You Know?" bucket list. In 1936 the resort was shut down, but was renovated and run again as a business for a short time in the late 1970s and early 1980s. In 1993 most of the remaining structures were destroyed by fire. Today, the pools still remain, filled with bubbling water that is so hot you would not want to take a soak in it. To learn more, see our Orange County Parks feature story on page 62.



ORANGE COUNTY PARKS

Living in your urban Southern California neighborhood, have you ever found yourself sitting there bored, with nothing to do, wishing you could just get out into nature somewhere? If you live in Orange County, you have no excuse, because you are only minutes away from a bounty of natural treasures and recreation, no matter where you live.

- 60,000 acres of nature
 - 243 miles of trails
 - 170 campsites
 - 15 regional parks
 - 5 wilderness parks
 - 7 historic parks
 - 12 lakes
 - 11 beaches
- and there's way more...**

Orange County has one of the most diverse park systems of any county in the nation, and county parks include a whopping 60,000 acres of parkland, open space and shoreline. That's one-tenth of the land area in the county. Thirteen million visitors experienced the park system last year, with its 170 campsites, 15 regional parks, five wilderness parks, seven historic parks, 12 lakes, 11 beaches, four nature preserves, eight nature centers, 116 horse stalls/corrals, 39 playgrounds, 30 group areas, 137 picnic shelters, and a zoo.



Environmental Stewardship

But before we get into more of the specifics, let's get to the main reason we at Coastkeeper are highlighting the Orange County Parks system in this issue: preservation and protection of our water and other natural resources. OC Parks has a massive environmental stewardship duty—one of the biggest of any entity in Southern California.

The vision of the organization is to “Preserve Orange County’s Parks in



Winter color at Laguna Coast Wilderness Park.

perpetuity for the recreation, education and inspiration of all visitors.” Its mission addresses its responsibility to the environment: “As a steward of significant natural and cultural resources, Orange County Parks manages and operates a system of regional parks, beaches, harbors, trails and historic sites that are places of recreation and enduring value.”

Preserving nature while accommodating and delighting millions of visitors takes work, according to Chief Restoration Ecologist Jennifer Naegele. “As Orange County is nearing build-out and Internet applications and social media continuously reach new groups, OC Parks facilities are now more on the map than they have ever been, and balancing public access with habitat protection is becoming an increasing concern,” she said.

“OC Parks are regional facilities, meant to provide a range of recreational experiences for a diversity of visitors from a wide geographical range,” Naegele said. “There have been major increases in visitation across all OC Parks facilities over the past 10 years, with the trend expected to continue. The coastal parks have all experienced this increase, including Aliso and Wood Can-

yons Wilderness Park, Laguna Coast Wilderness Park, Upper Newport Bay Nature Preserve and Talbert Regional Park.”

In addition to stewardship over the land, OC Parks also maintains 230 miles of trails and is continually involved in developing and linking more segments. These trails bring visitors closer to nature, but they also provide easy access to sensitive areas that are vital to sustainability of what is left of our watersheds and wildlife habitat.

“As part of balancing public access with recreation, individual trails are being evaluated for long-term sustainability, their role in the overall trail network of a given park and their position in relation to sensitive

species and habitats,” Naegele said. “Wildlife camera and trail counter data are collected and analyzed to aid understanding of public use of authorized and illegal park trails. OC Parks staff continually assesses additional tools to capture public recreational needs and to monitor wildlife movement and sensitive species locations.”

Some of the major trails include two that stretch from the Orange County foothills to the ocean and have been designated as National Recreational Trails. These are the Aliso Creek Riding and Hiking Trail and the Santa Ana River Trail.

Santa Ana River Trail

The Santa Ana River Trail is popular with hikers, runners, dog walkers and bicyclists. The surface of the trail also accommodates rollerblades and parents with strollers. The Orange County portion of the Santa Ana River Trail starts at the county line in Santa Ana Canyon at the Green River Golf Club and winds along the river for 29 miles to the wide mouth of the river in Huntington Beach. OC Parks currently has maintenance responsibility for the trail from Gypsum Canyon Road to the

ocean. Once the Army Corps of Engineers is finished with work related to improvements to Highway 91 in the Santa Ana Canyon, OC Parks will take over responsibility from Orange County Public Works for maintenance of the approximately 3 miles from Gypsum Canyon up to Green River Road near the county line.

Most of the trail is flat, with the only moderate hills in the first portion in the Santa Ana Mountain foothills from the Green River Golf Club to Yorba Regional Park. This first stretch of the trail features riparian habitat that is teeming with birds and other wildlife.

Yorba Regional Park provides a rest stop along the trail. It is a good example of one of the 15 regional parks in the system, with lakes for fishing that are interconnected by streams, six play-



Two views of the Santa Ana River Trail at Yorba Park: the soft side and the hard side.



grounds, 400 picnic tables, 200 barbecue stations, and bicycle and boat rentals. Yorba Park is enjoyable site to stop for a picnic.

As you head toward the beach Orange-Olive is another picnic rest stop where you can get a fresh drink of water and relax. As you continue riding past Anaheim Pond & Angel Stadium you can enjoy a restroom stop and another picnic area located just off Katella Ave. Centennial Regional Park at Edinger Ave. is another rest area in the City of Santa Ana and several city parks are along the route. Closer to the beach you will encounter Fairview and Talbert Regional Parks. Your journey will end at the mouth of the river in Huntington Beach.

A Brief Tour

Visiting and fully exploring all of Orange County Parks trails, parks and facilities could easily take a year of weekends, even for those in good hiking shape. And even in that year of weekends you might only scratch the surface. For this article we were able to sample and hike some of the wilderness and regional parks and walk a few miles of the Santa Ana River Trail. Even in these few encounters with Orange County Parks we found quite a few scenic and natural treasures, and would like to share them.

Irvine Regional Park

The 15 regional parks in the OC Parks system provide a diverse range of activities for individuals and families. A great example is the 475-acre Irvine Park. The 118-year-old park was the first regional park in California and is home to the Irvine Park Railroad and the Orange County Zoo. Dogs and horses are welcome here, and a 3-mile trail around the park provides exercise and enjoyment for hikers, runners and bike riders. Several shorter trails are also available around the perimeter of the park. Visitors can ride a train and ponies, and rent boats and bikes for the day.



A mountain lion enjoys the water and thrills visitors close up at the Orange County Zoo.

There is much natural beauty and history here. Santiago Creek runs through Irvine Park, which features a fishing lake with a stonework waterfall and a footbridge. The park also features a nature center, historical exhibit hall and a Spanish-American War memorial. The boat house in the park was built in 1914 and the dance pavilion and exhibition hall date from 1928. Wildlife is abundant and peacocks can be seen roaming the park.

Of course, the park also has the usual amenities found at many regional parks, including ball fields, picnic tables and shelters, barbecues, playgrounds, horseshoe pits and plenty of cool shade everywhere. And you can't beat the price. The OC Parks web site (www.ocparks.org) points out that a family of four can enjoy a full day at Irvine Regional Park, including parking and admission to the Orange County Zoo, all for just \$13.

Not many regional parks include a zoo, especially one like the Orange County Zoo, which features many local animals, including mountain lions, black bear, raccoon, red-tailed hawk, a bald eagle, great horned owl, coyote, opossum and more. There is also



A scrub jay stands guard over his territory at Caspers Wilderness Park.

a petting zoo for the children featuring domesticated animals. The zoo also includes hands-on learning, and arts and crafts activities, throughout the year. Guided tours are offered for school field trips, scout troops and other youth organizations.

Caspers Wilderness Park

For a wilder park experience for campers, mountain bikers and people who like to hike, consider Caspers Wilderness Park. At 8,000 acres, this protected preserve is the largest park in the OC Parks system. A quick note: Although dogs are welcome in a majority of the parks, you are asked to leave them at home if you are going to visit one of the wilderness parks, where wildlife management is a major priority.

We hiked more than 10 miles round trip from the entrance along the Juaneño and San Juan Creek trails to the San Juan Creek Hot Springs (see photos on page 61) for a hike that, although much of it skirts the Ortega Highway, makes for an enjoyable and scenic walk. It is fairly level until you run into some elevation gain during the last mile or so before the hot springs.

Caspers Wilderness Park includes a nature center, playground, and individual, group and equestrian camp-

grounds. Many miles of hiking and riding trails, from easy to difficult, meander through the park. Bring lots of water and food with you, and remember that this a wild place that connects to National Forest lands, and mountain lions visit the area frequently.

As you travel the park on foot, keep an eye out for fossils, especially in the stream beds, as this area was once covered by the ocean.

Laguna Coast Wilderness Park

Even in late winter when we walked it, Laguna Coast Wilderness Park (off of Laguna Canyon Road) was alive with birds, mammals and even wildflowers. This 7,000-acre park is the place to go to for exercise, whether you are hiking, running, mountain biking or horseback riding. The 40 miles of trails in the park are open every day from 7 a.m. to sunset.

In Laguna Coast Wilderness Park we hiked the Little Sycamore Canyon Trail and parts of the Willow Canyon Trail and the Laurel Canyon Trail. All of these trails provide great exercise and views of interesting rock formations and chances to see a variety of birds, wildlife and native wildflowers.



One of many interesting rock formations in the Laguna Coast Wilderness Park.

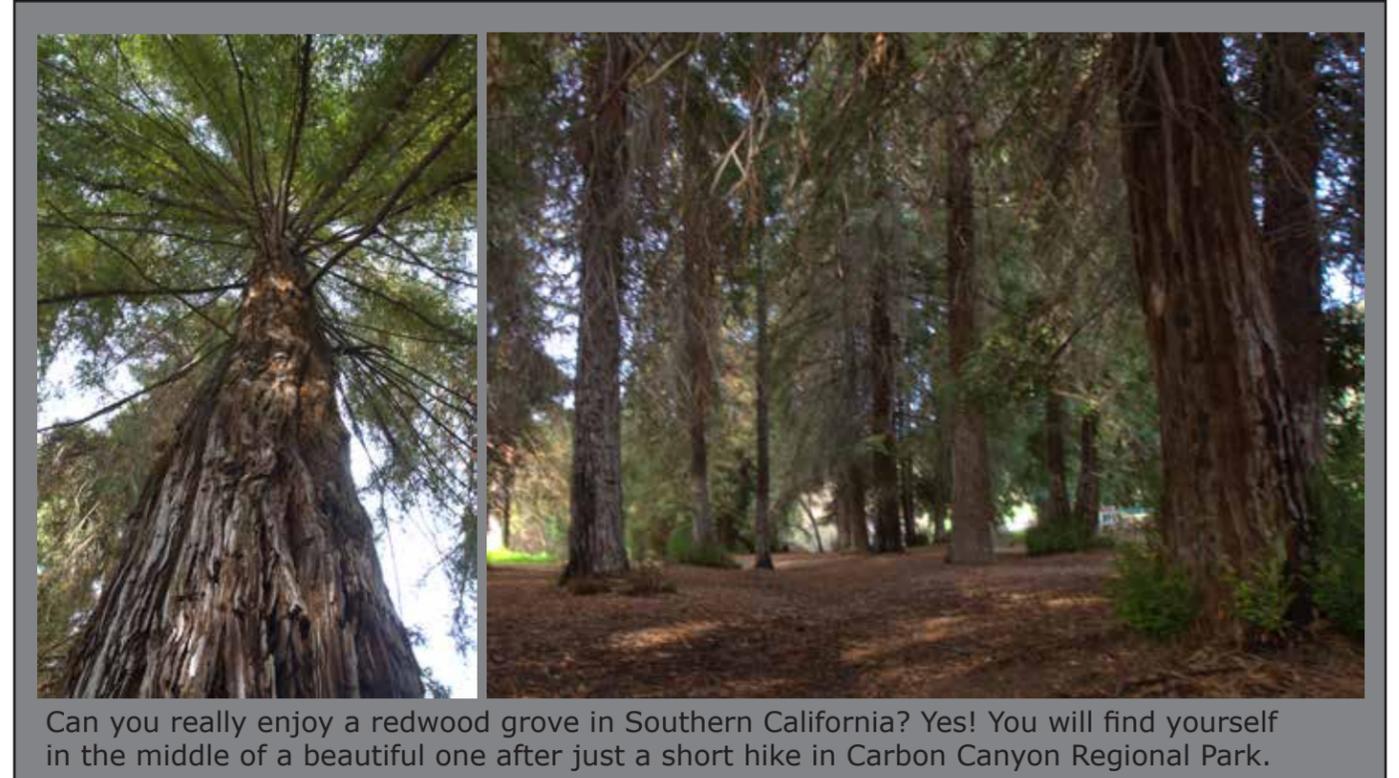


An inviting bend in the scenic Laurel Canyon Trail in the Laguna Coast Wilderness Park.

Walking and bicycle tours are offered at Laguna Coast Wilderness Park, guided by volunteer naturalists and park staff. Many kinds of tours are offered each month and can be found listed under “Events and Programs” on the park’s web page at <http://ocparks.com/parks/lagunac/>

The Nix Nature Center offers a location to explore the meaning of parkland through exhibits and wildlife viewing area portals. Here you can enjoy scavenger hunts with the family, and learn from free, fun quarterly wildlife programs featuring live animals, American Indian customs, craft projects, and more.

Wildflowers that may be found in the Laguna Coast Wilderness Park and in other wilderness parks in the system include Indian paintbrush, scarlet larkspur, splendid mariposa lily, farewell-to-spring, poppies, fiddleneck, sun cups, oldenstars, California buttercup, tidy tips, whispering bells, morning glory, pincushion, aby blue-eyes, miniature lupine, woolly blue curls, lue-eyed grass, arroyo lupine, fiesta flower, Chinese houses and chia.



Can you really enjoy a redwood grove in Southern California? Yes! You will find yourself in the middle of a beautiful one after just a short hike in Carbon Canyon Regional Park.

Laguna Coast Wilderness Park’s 7,000 acres are part of the South Coast Wilderness area, comprised of Aliso and Wood Canyons Wilderness Park, Crystal Cove State Park, The City of Irvine Open Space, and Laguna Coast Wilderness Park (totaling almost 20,000 acres).

Carbon Canyon Regional Park

In Carbon Canyon Regional Park you will find many of the amenities that make all of the regional parks in the OC Parks system great places for families and friends to get together and spend a whole day.

You can also do something very special that you can’t do anywhere else in Orange County—stand in the deep shade of a large stand of redwoods.

Habitat for the Future

Restoration of riparian corridors is occurring in several locations throughout OC Parks facilities. according to Chief Restoration Ecologist Jennifer Naegele. “Parks staff generally considers control of non-native, invasive species

to be a passive form of restoration,” she said. “This type of restoration is generally undertaken when there is a high diversity and cover of native species in the area and removing non-natives will allow a native habitat to recover on its own. More intensive restoration, which may include non-native removal followed by planting, seeding and maintenance, takes place when habitat is degraded to the point that native species either won’t recover on their own or may eventually recover over a much longer time period.

“Aliso Creek in Aliso and Wood Canyons Wilderness Park is presently in its second year of maintenance after approximately 25 acres of invasive species were removed. The primary non-native removed was giant reed, or *Arundo donax*, which is generally the most common target invasive in riparian systems. All *Arundo* was identified for removal in the creek along with secondary invasive species, and key pockets were hydroseeded with natives. Most of the creek has healthy stands of willows and associated riparian species to repopulate the areas previously occupied by *Arundo*.

The end result of this project and all other riparian restoration in OC Parks should be functioning riparian habitat that supports diverse, healthy populations of native plant and wildlife species.”

Balancing Access and Habitat

OC Parks continues to maintain the balance between access and protecting habitat in our watersheds, according to Naegele.

“Without planned public access, habitat fragmentation, trampling and increased introduction of non-native, invasive plant species significantly degrades habitat and also results in lower quality recreation,” she said. “The parks have regulated protections, and long-term solutions will focus on providing high-quality recreational opportunities to the public with maintaining high standards of stewardship and ensuring no net loss of habitat.”

We at Orange County Coastkeeper invite you to get out and enjoy and support our parks.

Cleanup OC:

Combining Education, Environment and Quality of Life

Cleanup OC is Orange County Coastkeeper's community cleanup program that strives to improve the quality of life and the environment throughout the Orange County region. As waste continually pollutes our streets, waterways, and beaches, Cleanup OC provides an opportunity for the community to give back and protect their home.

Coastkeeper holds monthly beach cleanups, and co-coordinates the annual Orange County Coastal Cleanup Day. At these public events, community members take initiative and spend time outdoors with friends, family, and neighbors to make their home a better place. Cleanup OC's ultimate goal is to unite Orange County through service, responsibility, and sharing of the natural environment.

The Importance of Cleanups

Litter on beaches is more than just an eyesore—it damages our environment, threatens our public health and undermines our quality of life. The most common items found on local beaches are cigarette butts and single-use plastics. If these types of debris are not removed from the beach, they end up in our water. Marine debris is one of the biggest problems facing our ocean, posing a serious threat to wildlife through ingestion or entanglement.

Coastkeeper informs businesses and communities about how they can help stop pollution before it starts by taking greater care in their everyday activities and choices to minimize marine debris.



Monthly Beach Cleanups

On the second Saturday of every month, Coastkeeper holds beach cleanups at Huntington State Beach. Invite your friends and family out to this monthly event to keep our beaches clean and to learn more about coastal conservation, our watershed and marine debris.

Coastkeeper asks all volunteers to wear closed-toe shoes, dress appropriately for the weather (warm or cold), wear a hat and sunscreen, and to please bring water (preferably using a reusable water bottle). We always try to reduce the amount of trash at our beaches, so if you have garden/reusable gloves, feel free to bring them. You can also reuse a grocery bag, or use a reusable bag/bucket to collect the trash. If you do not have any of these items, we will have disposable gloves and bags available to all volunteers.

Coastkeeper also conducts creek cleanups in the San Gabriel River Watershed. In 2015, Coastkeeper

planned creek cleanups at Craig Park on Fullerton Creek in Brea, Brea Dam Recreation Area in Fullerton, Arroyo Vista Park in La Habra on Coyote Creek, Sage Park in Anaheim and College Park on the San Gabriel Estuary in Seal Beach.

Orange County Coastkeeper's inland chapter, called Inland Empire Waterkeeper, also holds creek cleanups in the Santa Ana River Watershed.

For more information, email beachcleanups@coastkeeper.org

Group and Corporate Cleanup Opportunities

Orange County Coastkeeper offers your group the opportunity to partner with us to run an engaging hands-on beach cleanup. Involvement in our beach cleanup program is a great way to enhance the image of your company as a positive contributor to the community and local environment. Sponsoring a beach cleanup involves your employees

in an important hands-on environmental program, teaching people about pollution while they remove debris from the beaches.

Why organize a beach cleanup?

- it encourages teamwork and cooperation
- volunteers learn about their local environment while making a difference in their community
- it is a perfect way to kick-start a team BBQ
- many of our cleanups receive media attention
- beach cleanups are fun and a great way to start volunteering

With a \$1,000 donation, Coastkeeper will:

- help you choose a cleanup site appropriate for your team
- arrange for necessary permits
- provide instructions for the

cleanup along with all necessary supplies (bags, gloves, grabbers and water) for 50 people

- Orange County Coastkeeper attends on-site to speak with your group about the need for picking up litter from our beaches and the impacts of marine debris on marine life and the environment
- Provide the opportunity to set up a promotional table and signage at the cleanup, advertising your company in the local community
- Analyze the data and report back to your group about the impact made by your team

For more information on corporate beach cleanups and arranging an event for your organization, please contact our Coastal Cleanup Program Manager Courtney James at (714) 850-1965 ext. 308 or Courtney@coastkeeper.org.

Coastal Cleanup Day

Since the Coastal Cleanup Day Program's inception in 1985, close to 1.2 million volunteers have helped remove over 20 million pounds of debris from California's coast, ocean, and inland shorelines. Orange County Coastkeeper organizes efforts along the coast, and in 2015 took over responsibility for cleanup activities at sites formerly organized and coordinated by Orange County Parks. Coastkeeper also helps promote inland Coastal Cleanup Day events.

The 2014 Coastal Cleanup Day took place on Saturday, Sept. 20. Californians turned out by the tens of thousands to lend their hands in support of clean beaches and inland waterways at the 30th Annual California Coastal Cleanup Day. They scoured beaches and inland water



ADT Volunteers remove marine debris from Huntington State Beach as part of our Corporate Cleanup Program.

ways, picking up trash and debris at over 850 sites in 55 of California's 58 counties, gathering hundreds of tons of trash during this three-hour event. Beach, inland waterway, and community cleanups took place up and down the California coast, from Mexico to the Oregon border, around San Francisco Bay, and at sites as far inland as Lake Tahoe.

The Orange County count for the 2014 Coastal Cleanup Day stands at 7,053 volunteers. Those volunteers picked up 67,139 pounds of trash and recyclable materials over an area of 91 miles throughout all of Orange County.

You can help! Sponsoring Coastal Cleanup Day is an investment. Not only are you getting a great exposure

to your local community members, media, and businesses, you are contributing to the beautification and preservation of the environment you call home—and your employees call home. Your company can demonstrate its desire for clean water, thriving marine life and healthy livelihood for families.



Since 2008, Orange County Coastkeeper has coordinated Kids Ocean Day, a statewide event funded and organized by the California Coastal Commission. At assemblies before Ocean Day, Coastkeeper teaches children about how items such as food wrappers and plastic water bottles travel from their streets to the ocean. Students also learn how trash, once it reaches our coast, can cause problems for animals that become entangled in it or mistake it for food. Then, on Kids Ocean Day, hundreds of children, parents and teachers are transported from all over the area to the beach, where they conduct a cleanup, and then join together to create an important message in the sand. This photo shows the design from 2015's theme "Unite for the Ocean," created by children, parents and teachers from Anaheim, Garden Grove, Orange, Santa Ana, Stanton and Westminster. Since the program started, about 7,000 students have taken part in Coastkeeper's Kids Ocean Day event.

Share our love for the coast



At Coastkeeper we have been working for more than 15 years to preserve our coastal environments and improve water quality so that all Southern Californians can enjoy our beautiful beaches, bays and estuaries. This means we work from the mountains to the ocean to ensure that our water resources are drinkable, fishable, swimmable and sustainable.

You can make a difference!

Join Coastkeeper today and share your love for our coast. There is NO COST to join, but donations are always appreciated.

You may email your name, address, phone number, and email address to join@coastkeeper.org, or donate using our secure donation page at www.coastkeeper.org. To join by phone or for more information, call (714) 850-1965.

We thank all of our members for their generous support!



Orange County Coastkeeper is a 501(c)(3) nonprofit supported largely by private-sector contributions. 100% of your tax-deductible donation is used for the purpose you choose.

Keeping *OUR* Coasts Clean

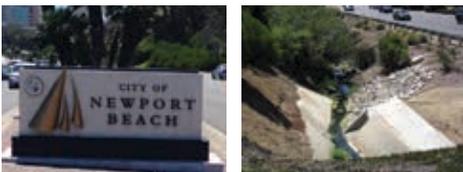


Stormwater Solutions to Keep Orange County Coasts Clean

Runoff Reduction ♦ Trash Removal ♦ Treatment ♦ Reuse
Low Impact Development ♦ Green Infrastructure

Trash Removal

A Contech CDS[®] hydrodynamic separator keeps a bioswale clean in Newport Beach.



Reuse

A Contech UrbanGreen[®] Rainwater Harvesting system reuses rainwater at Yakult Manufacturing in Fountain Valley.



CONTECH[®]
ENGINEERED SOLUTIONS

Contech is proud to support
Orange County Coastkeeper.