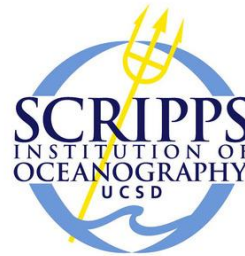


NSF PIRE: “Low Energy Options for Making Water from Wastewater”





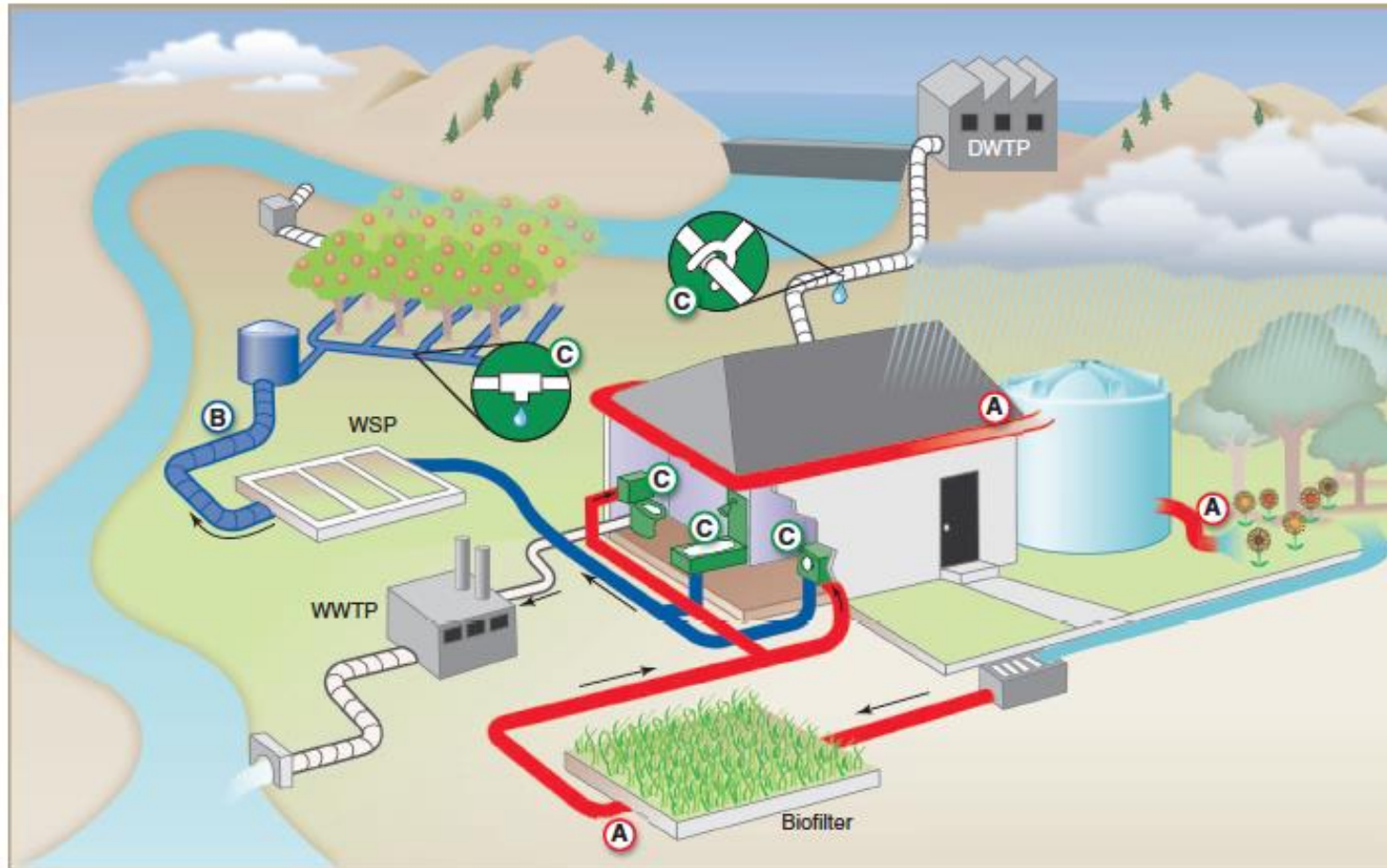


Background on Project

Motivation

Southeast Australia has experienced extreme weather in the past decade (record droughts and floods). Can their experience in climate change adaptation help inform similar efforts in the Southwest U.S. and beyond?

Focus: Stormwater Capture/Retention/Reuse



Grant et al (2012) "Taking the waste out of wastewater" *Science* **337**, 681-686



Research Community Outreach



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Science & Technology

Feature

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Adapting Urban Water Systems to a Changing Climate: Lessons from the Millennium Drought in Southeast Australia

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Professor Stanley Grant



Professor Amir AghaKouchak

COMMENTARY

Reflective scientific treatises
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Strengthening citizen science
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LETTERS

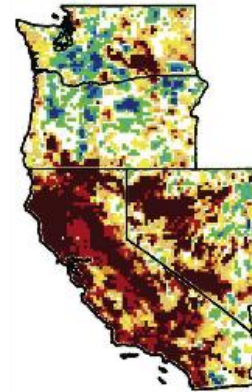
edited by Jennifer Sills

Australia's Drought: Lessons for California

MOST OF CALIFORNIA IS SUFFERING FROM AN extreme drought, and storage levels in the major reservoirs are well below historic levels. For the past several months, an unusually stubborn ridge of high pressure off the West Coast of the United States has been blocking normal winter storms and the rain they carry. California's history of drought has led to statewide strategies to save water, but Californian residents and policy-makers can do even more: They can look to the story of Australia's experience with a drought so intense and long-lasting that it was dramatically dubbed the Millennium Drought (1).

The Millennium Drought lasted from 1997 until late 2009 (2). Australia's economy and environment were hit hard. The drought accelerated the same trends facing farmers in developing countries worldwide: Small farms were squeezed out. Midsized farms were most vulnerable because they could neither achieve the economies of scale available to larger producers nor buffer losses with off-farm employment like the smallest farms could.

Amazingly, despite blows to crop yields and livestock numbers, Australia's rate of growth in agricultural production has quickly returned to predrought trends. The impacts of this major drought on irrigation communities were buffered by some critical water reforms. These included: (i) well-developed water markets that allowed water trade to farmers in the greatest need; (ii) modernization of irrigation infrastructure that increased the efficiency of water



Dried out. As of February 2014, most of California is in Extreme to Exceptional Drought (see red and dark red areas on map).

sumptive activities—such as daytime lawn watering and car washing—to rules promoting efficient water use—such as requirements for shutoff valves on hoses. Out of those temporary restrictions, permanent restrictions grew. Some areas in Australia still restrict daytime sprinkler use. Perhaps most relevant for worried Californians is how the Australian public received these changes. Studies cite an overall spirit of goodwill and cooperation fostered by the stress of drought (6).

The Millennium Drought brought about profound changes in Australians' conception of the environment, climate change, and water. The sticking power of those lessons and the success of the resulting policies and strategies will be tested by the next big drought. One lesson California can glean from the Australian experience is empowerment. Individuals making frugal water decisions can make a big difference in urban areas. Water markets and other measures that increase the flexibility of irrigation farmers in their response to drought can have big payoffs. Sustaining critical environmental water requirements will provide the basis for postdrought environmental recovery. A spirit of cooperation rather than contention can prevail even when tough decisions are made to address the needs of farmers and

Aquarium of the Pacific to produce a short movie on the California drought, and lessons from Australia



The screenshot shows a video player interface. On the left is a navigation menu with categories like 'Video', '10th Anniversary Scholars', 'Animal Information', 'Animal News', 'Conservation Issues', 'Educational', 'Environment', 'Exhibits', 'For Kids', 'Guest Speakers', 'Ocean Exploration 2020', 'Art', 'Business', 'Climate Change', 'Coastal Conversations Show', and 'Conservation Lecture'. The main content area is titled 'Ocean Acidification' and features a video player. The video player has a dark blue background with the 'Coastal Conversations' logo in green and white. The text 'Show 6 - Air Date 12/18/13' is displayed below the logo. A play button is centered over the video. The Aquarium of the Pacific logo is in the top right corner of the video frame. Below the video frame is a standard video player control bar with a progress bar at 00:00, a volume icon, and a full-screen icon.

Ocean Acidification

Video

- 10th Anniversary Scholars
- Animal Information
- Animal News
- Conservation Issues
- Educational
- Environment
- Exhibits
- For Kids
- Guest Speakers
- Ocean Exploration 2020
- Art
- Business
- Climate Change
- Coastal Conversations Show
- Conservation Lecture

COASTAL CONVERSATIONS

Coastal Conversations

SHOW 6 - AIR DATE 12/18/13

A monthly broadcast in which some of the nation's leading coastal scientists, managers and policy makers explore major coastal issues.

AQUARIUM OF THE PACIFIC

00:00 00:00

Urban Water Sustainability Textbook

- **Title:** *The Water-Sustainable City: Science, Policy, and Practice*
- **Publisher:** Edward Elgar Publishing, Ltd (UK) to appear in 2015
- **Goal:** Drawing on insights acquired through NSF-PIRE, we examine challenges in developing & deploying low-energy options to improve water productivity in cities, *as seen through a multi-disciplinary lens.*



Dr. David Feldman



Dr. Stanley Grant



Dr. Jean-Daniel Saphores



Dr. Sunny Jiang



Dr. Ashmita Sengupta



Lindsey Stuvick



Dr. Lisa Levin



Dr. Rich Ambrose

Special Issue of WIREs Water focused on UCI Water PIRE research (2015)



Dr. Jean-Daniel Saphores

WILEY



Select a WIREs Title

WIREs Water



WIREs Water

- An important new forum to promote cross-disciplinary understanding of the water environment, and the severe challenges that it faces during the 21st Century.
- An authoritative, encyclopedic resource addressing key topics from the perspectives of earth sciences, biology, engineering, social sciences, and humanities.
- Content is fully citable, qualifying for abstracting, indexing, and ISI ranking.



Industrial Practitioner Outreach



**SOUTHERN CALIFORNIA COASTAL
WATER RESEARCH PROJECT**
A Public Agency for Environmental Research

CAPIM

Centre for Aquatic Pollution Identification and Management



**California Stormwater
Quality Association**



California Stormwater Quality Association

UCI Water PIRE Special Session of the CASQA 2013 Annual
Conference in Tahoe, California (September 10, 2013)



2013 CASQA Meeting



California Stormwater
Quality Association

The California Stormwater Quality Association (CASQA) meeting was held at the Hilton Hotel in Costa Mesa, CA on November 14, 2013. Participants rated UCI PIRE presentations and panel discussion.



Dr. Ashmita Sengupta



Dr. Martha Sutula



2013-14 QUARTER 1

UCI WATER-PIRE

SMARTSTART EVALUATION NEWSLETTER



NOVEMBER 2013

Findings are presented from the Quarter 1, 2014 evaluation of the usefulness and impact of the 2013 CASQA Meeting.

Participant Comments

"I am extremely pleased that this collaboration is happening among entities in So Cal and Australia. I was grateful to be able to connect with leaders of the PIRE project and to learn of their interest in expanding the partners involved."

"Loved having an international conference, and really appreciated the high quality work and communication efforts of all the professionals who presented and organized it. I hope to see additional collaboration in the future."

"We would enjoy the opportunity to discuss potential activities we might collaborate on, including those focused on research, policy and public education engagement."



2014 PIRE Planning Retreat (January 25, 2014)

- Overview of all research conducted under the PIRE program, with outside representatives and presentations from:
 - Tree People (President, Andy Lipkis and Edith de Guzman)
 - OC Public Works (Dr. Chris Crompton, Dr. Jian Peng, Dr. Matt Yeager)
 - Building Industry Association of Southern California (Environmental Dir., Dr. Mark Grey)
 - City of Irvine Stormwater Initiatives (Amanda Carr)



UCI WATER-PIRE

SMARTSTART EVALUATION NEWSLETTER



2013-14 QUARTER 2

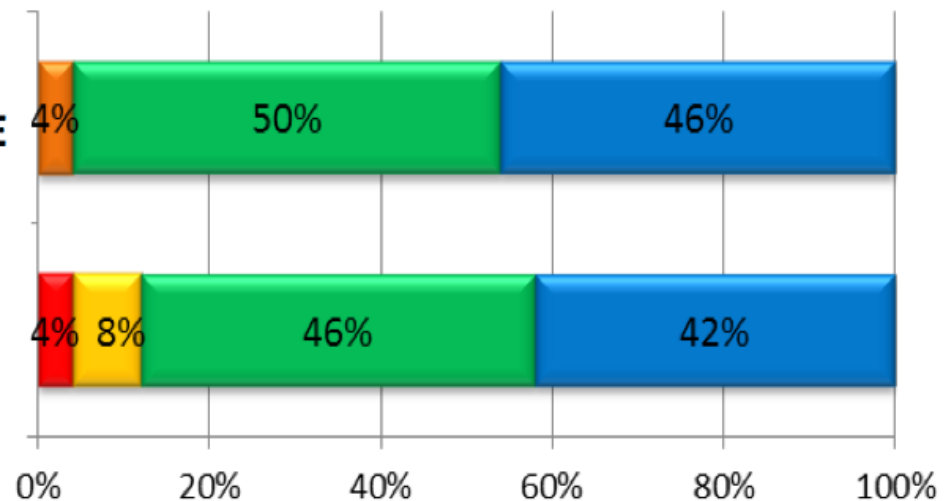
MARCH 2014

This newsletter presents findings from Quarter 2, 2014 evaluation of the Planning Retreat and Mid-year Participant Evaluation.

■ Not useful at all ■ Slightly useful ■ Somewhat useful ■ Very useful ■ Extremely useful

How useful was the retreat to increase your knowledge about PIRE project activities?

How useful was the retreat to plan and organize PIRE project activities?



The logo is circular with a light blue background. The outer ring contains the text "UNIVERSITY OF CINCINNATI WATER - PIRCE" in a yellow, serif font. Inside this ring, there is a white silhouette of a three-masted sailing ship on the water. Below the ship, there are stylized white waves and a white silhouette of a Native American figure standing on a rock. The entire logo is semi-transparent.

Undergraduate Outreach/Research



UPP Down Under

Undergraduate PIRE Program Down Under

Undergraduate PIRE Program (UPP) Down Under

- Competitive: >60 applicants for 12 slots
- Intensive: Lectures, Field Work, Laboratory Experiences
- Multidisciplinary: Environmental Engineering, Social Sciences, Biological Sciences, and Earth Systems Sciences
- International: University of Melbourne and Monash University

2013 UPP Cohort





2012-13 QUARTER 4

UCI WATER-PIRE

SMARTSTART EVALUATION NEWSLETTER



AUGUST 2013

Findings are presented from the evaluation of the usefulness and impact of the 2013 UPP Down Under Program.

Achievement of Project Goals

Participants reported statistically significant increases in impact ratings across all four goals. Greatest growth was experienced in participants' understanding of sustainable urban water systems (Goal 1) including:

- ◆ Low-energy approaches for removing pollutants.
- ◆ Low-energy treatment technology.
- ◆ Distributed approaches for capturing and reusing

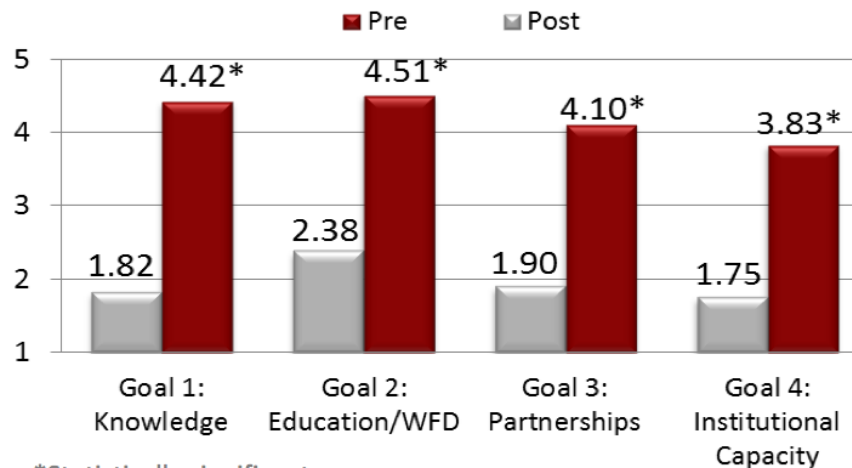
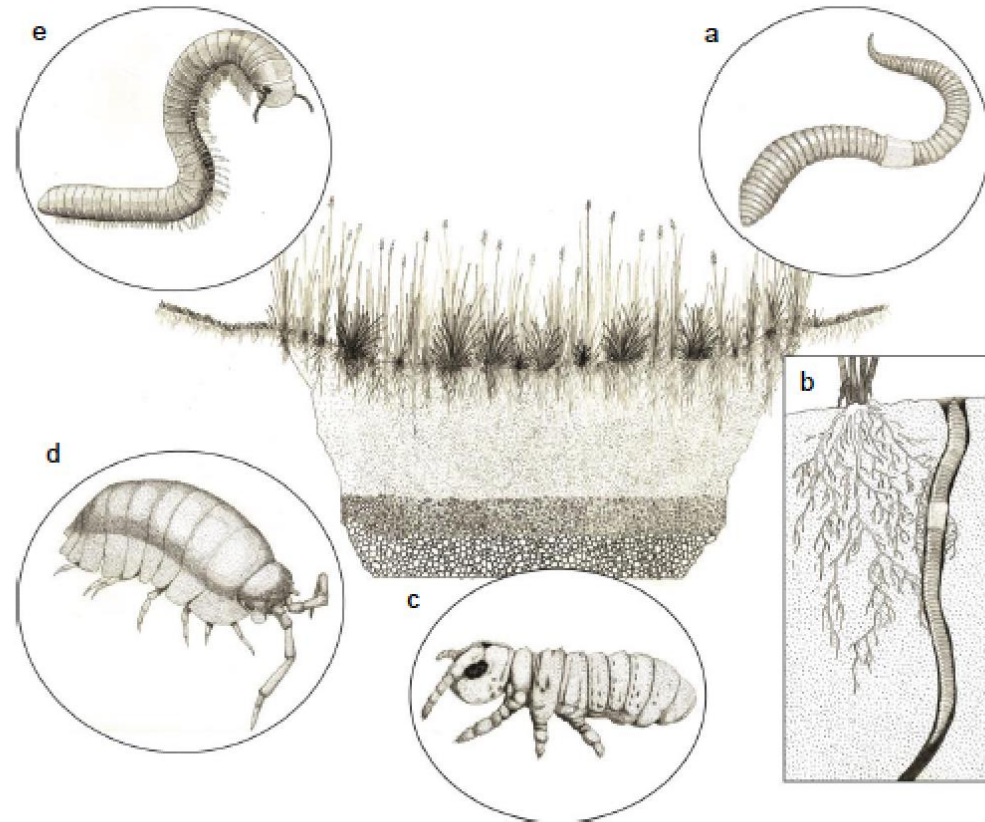


Figure 1.



Dr. Andrew Mehring



Professor Lisa Levin

NOW ACCEPTING APPLICATIONS!



2014 UNDERGRADUATE PIRE
PROGRAM DOWN UNDER

2014 UPP Cohort





K-12 Outreach

PIREwolf Productions

- K-12 Program to Actively Engage Students in Their Lessons Through Short Videos



Dr. Janet Rowe (UCI)



Professor Peter
Bowler (UCI)



Mr. Baline Jones
(The Academy,
Santa Ana, CA)

THE ACADEMY

Learning Today, Leading Tomorrow

Our Mission

The mission of The Academy is to provide a transformational learning environment to community, underserved and foster teens that offers consistency, stability, support, and a community in which to belong, thrive, and grow into successful, independent adults.

Project #1: The Hetch Hetchy Debate

- A 9th Grade Earth Science Project
 - Goal: To learn about the water cycle, water management, effects on different groups of people
- UCI Water PIRE Role:
 - Provide Balanced, Relevant Information
 - Encourage Curiosity and Answer Questions
 - Improve the Perception of Scientists and Engineers
 - Encourage Environmentally Friendly Practices

Water PIRE Outreach



UCI Water PIRE YouTube Channel



UC Irvine's PIRE Program uploaded a video



PIRE Bowler Revenge of the Firewolves

1 month ago • 143 views

On April 2 and 3, 2014 the Firewolves at The Academy held ferocious debates on whether or not the dam creating Hetch Hetchy should be torn down or allowed to ...



UC Irvine's PIRE Program uploaded a video



PIRE Bowler Encore1

1 month ago • 96 views

Dr. Peter Bowler speaks again to The Academy Firewolves in a video inspired by their thought-provoking questions on dam removal, mitigation, preservation, and ecologic...



UC Irvine's PIRE Program uploaded a video



PIRE Bowler Ecology

1 month ago • 40 views

Dr. Peter Bowler explains the ecological factors involved in dam removal to the students at Santa Ana's The Academy.



For more information...
<http://water-pire.uci.edu/>