

TRUTH IN WATER – WEBCOMICS AS ENVIRONMENTAL EDUCATION TOOLS

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Abstract

Comics have a long history in education, used from medieval politics to medical instruction. They are often better at learning, retention and engagement than traditional methods of instruction (lectures, long readings). Comics help readers process emotions, as well as information – steps needed to enact sustainable behavior and laws. Webcomics have larger reach than traditional media. This project uses webcomics to unwrap some of the difficult problems with water use in California, teaching readers how to understand different narratives in water use discussions and become more active participants in those discussions. A webcomic was created – Truth In Water – and shared with residents of California. Readers took surveys before and after reading the webcomic and evaluated how much they learned how willing they were to act on California water. The results show that the webcomic had no effect in teaching how to decipher California water narratives and had a slightly positive effect in engaging readers to action. A higher quality webcomic and stronger sampling may be lead to stronger conclusion. The project results imply that webcomics may be a valuable tool for shaping environmental values discussions – they can help educate and engage people on other environmental issues.

Advisor: Faith Kearns

Preface

I have always been interested in things considered nerdy or goofy, like comics. When I discovered that they had a rich history in education and behavior change I was shocked – shocked that a medium considered low class and facile should have such power. The idea of using a comic for education on California water stayed with me for a few years and I am happy to complete it. Finally, thanks to Professor Daniel Zachary, Faith Kearns, On The Public Record and many more in the California water wonk circle. Without their guidance and writings to inform much of the project I would be lost.

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Truth In Water – Webcomics as Environmental Education Tools

Introduction

Comics and Education

What are comics? McCloud (1993) defines comics as “juxtaposed pictorial and other images in a deliberate sequence, intended to convey information and/or produce an aesthetic response in the viewer.” While generally thought of as a medium for children, bright colors and superhero platitudes, in the past few decades comics have shed that image. The medium can garner serious mainstream critical consideration in titles like “Maus” and “American Born Chinese.” Scully (2014) documents 500 years of art, cartoons, and comics informing political classes. Comics continue to figure in modern campaigns, with information and messages that influence media narrative and election results (Brantner & Lobinger, 2014).

Simply put, comics have power. Now that power is often directed towards education in the form of non-fiction comic journalism, textbooks and short pamphlets. The following studies found that readers who learned from comics learned better, retained information better, and paid more attention to educational content than control groups with traditional lectures or pure text. Comics have been used for education in art (Adams, 1999), business (Short et al., 2013), language (Kihckaya & Krajka, 2012), literacy (Comer, 2015), engineering, and science (Hosler & Boomer, 2011).

Educational comics are seeing their biggest surge in the field of medicine.

They are used to obtain informed consent for stroke care (Furuno & Sasajima, 2015), change behavior in obesity prevention programs (Branscum et al., 2013), explore mental health issues (Glazer, 2015), teach recognition signs of schizophrenia (Joshi, 2015), and explain numerous other maladies and issues (such as doctor fatigue and depression) in the medical field symptoms (McNicol, 2014).

Webcomics are an interesting evolution of comics. Their digital nature, easily sharable and readable, shows great potential for interaction with readers and deeper levels of understanding (Marianthi et al., 2007). Webcomics creation will continue to grow as access to comic creation and reading materials spreads.

Drought in California

Drought in California is one of the largest threats facing the state. Lack of water, the most essential molecule to life, leads to economic hardship and struggle for humans and loss of life for wildlife and ecosystems. Climate change is already exacerbating these costs and will continue to do so. Abnormal temperature from climate change is causing extremely powerful droughts – the current drought is the driest in nearly 2000 years (Griffin & Anchukaitis, 2014). These reductions in water supply in the US west and Southern California are expected to become even more prominent by 2050 (Pagan et al., 2016). Managing human water use and environmental flows for wildlife could reduce suffering and environmental degradation. Parker and Kearns (2016) explain that water is simultaneously available and scarce, with human needs

driven by changing precipitation, adaptive capacity, and water governance systems. Short of geo-engineering nothing can be done about changing precipitation, thus the focus of this project will be on changing water governance systems. The systemic change needed to sustainably manage water in California must grow from a change in thinking, against status quo ideas and thought. Boyle (2007) proposes that for environmental campaigns to succeed there must be a large scale attitude and culture change, to weave new, positive values into common beliefs. Ultimately the political system that continues to allow environmental degradation and human suffering needs to change – that change begins with shifting attitudes. Comics, especially webcomics, may be able to provide the avenue for such attitude and behavior change.

Webcomics and Environmental Education

Comics can become a popular agenda setting medium and reflect the prevailing sentiments of the time. Mainstream comics like Batman and X-Men reflected American environmental and social issues in the 1960s and continue to do so (Blum, 2010). Crosby (2013) evaluated comics as integral to the mid 2000s environmental movement in Java, finding them to be a component of grass roots organizing. Similarly, Packalen and Sharma (2007) studied a comics program for posters on public streets in India and found the simplicity of comics communication to be effective in spreading awareness and engagement on social issues. Environmental

issues are often scientific issues, esoteric and difficult to understand. Comics again present a marvelous tool to break down barriers – Hosler and Boomer (2011) found comics especially good at motivating and teaching people not particularly familiar with scientific principles. Most importantly comics can change behavior in the real world, action sorely needed to move towards sustainable systems (Leung et al., 2014).

Randall writes of parallel narratives for climate change discourse, solution narratives versus problem narratives, that can also be applied to water in California. Solution narratives do not recognize the losses coming with climate change and lock away “energy for realistic and lasting programmes of change” (2009). Open and honest discussion about the water future of California could similarly unlock energy for the large scale change needed to address water challenges. This change is possible, as McNicol (2015) shows that emotional, deep connection and change can happen from reading educational comics. This project asks if a webcomic about common water tropes and myths in California water discussions can unlock knowledge and energy for sustainable behavior change in California.

Methods

The first step of the project was to create a comic. The comic, Truth In Water (available at <http://bhihara.wixsite.com/truthinwater>), was created digitally. It deconstructed common tropes in messages used by stakeholder groups in California water. Once hosted, the webcomic was available to view to readers. The website

was shared on social media.

A pre-comic survey took gender, age, income, zip code, highest education, employment, ethnicity, and household information in addition to asking California water specific questions. These questions were ranked with answers on a scale of one to five, one being weak and five being strong. Questions included “Do you feel knowledgeable about California water? How likely are you to talk to a friend about water issues? How likely are you to go to a city council meeting or water board?”

The next step was for readers to read the comic. After reading, readers were directed to a post-comic survey, asking the same questions.

Results

15 readers took the pre-comic survey, with 8 taking the post-comic survey. Only 3 of readers took both surveys. These 3 readers are highly educated and urban – their answers were mostly high knowledge, exhibited a small positive change in engagement and no change in education.

Table 1 – Reader Demographics

Reader ID	Gender	Age	Income (yearly)	Zip Code	Education	Employment	Ethnicity	Household
JF	Female	65+	90,000-150,000	92646	Graduate Degree	Retired	Other	2
Di	Female	51-65	70,000-90,000	92646	Bachelor's Degree	Full time	European	2
S	Male	25-35	12,000-30,000	90034	Bachelor's Degree	Student	European	2

Table 2 – Reader Pre-comic Survey Answers

Reader ID	Knowledge	Discussion with Friends	Visit city council or water board
JF	4	4	3
Di	5	5	1
S	4	3	2

Table 3 – Reader Post-comic Survey Answers

Reader ID	Knowledge	Discussion with Friends	Visit city council or water board
JF	4	4	4
Di	5	5	1
S	4	3	2

Discussion

Of the 3 readers only one exhibited any change from reading the comic. Reader JF became more likely to visit a city council or water board, increasing from 3 (average) to 4 (likely). The useable sample is too small to indicate any effects with statistical significance. There can be an anecdotal, informal analysis of this change. The comic may have given reader JF a connection to the environmental issue of Californian water. Armed with their knowledge of water in California and presented with the techniques and arguments in Truth In Water, reader JF might feel more comfortable and confident attending a city council or water board meeting.

The survey instructions may have been confusing – that could explain the lack of change in post-comic surveys. Some readers only took the post-comic survey while others only took the pre-comic survey. The survey instructions could be masking the real educational and engagement effect of the Truth In Water comic. Another problem with the sample size of readers is the loss and attrition of readers between the pre-comic survey and post-comic. If readers assumed they were completing a duplicate survey with no purpose they might not complete it, accounting for the 7 readers who did not take the post-comic survey.

The readers were mostly friends and family of me, the author. There are inherent biases that would show up in results when the sample is comprised of readers with personal connection to the author. Biases could also appear because of the uneven representation of different economic, social, and political echelons.

For future studies and projects, the use of a professional survey service or better designed survey in combination with a larger, more diverse sample from street outreach or survey-answer services like Mechanical Turk would lead to better results and more confidence in the conclusion.

Conclusion

From this project, webcomics have either no effect on education and engagement in California water issues or a slight positive effect on engagement – the comics were only able to change one reader's willingness to attend a water board by one degree of strength. Despite the lack of statistically significant evidence, I believe webcomics

have greater potential to be an effective tool for Californian water education than shown in this project. More study is required on webcomics for environmental education, on both California water and on other single topic environmental issues.

Summary

Comics are strong educational tools. Environmental and sustainability issues are difficult to process and solve. It is not clear if webcomics help educate readers on environmental issues like California water scarcity.

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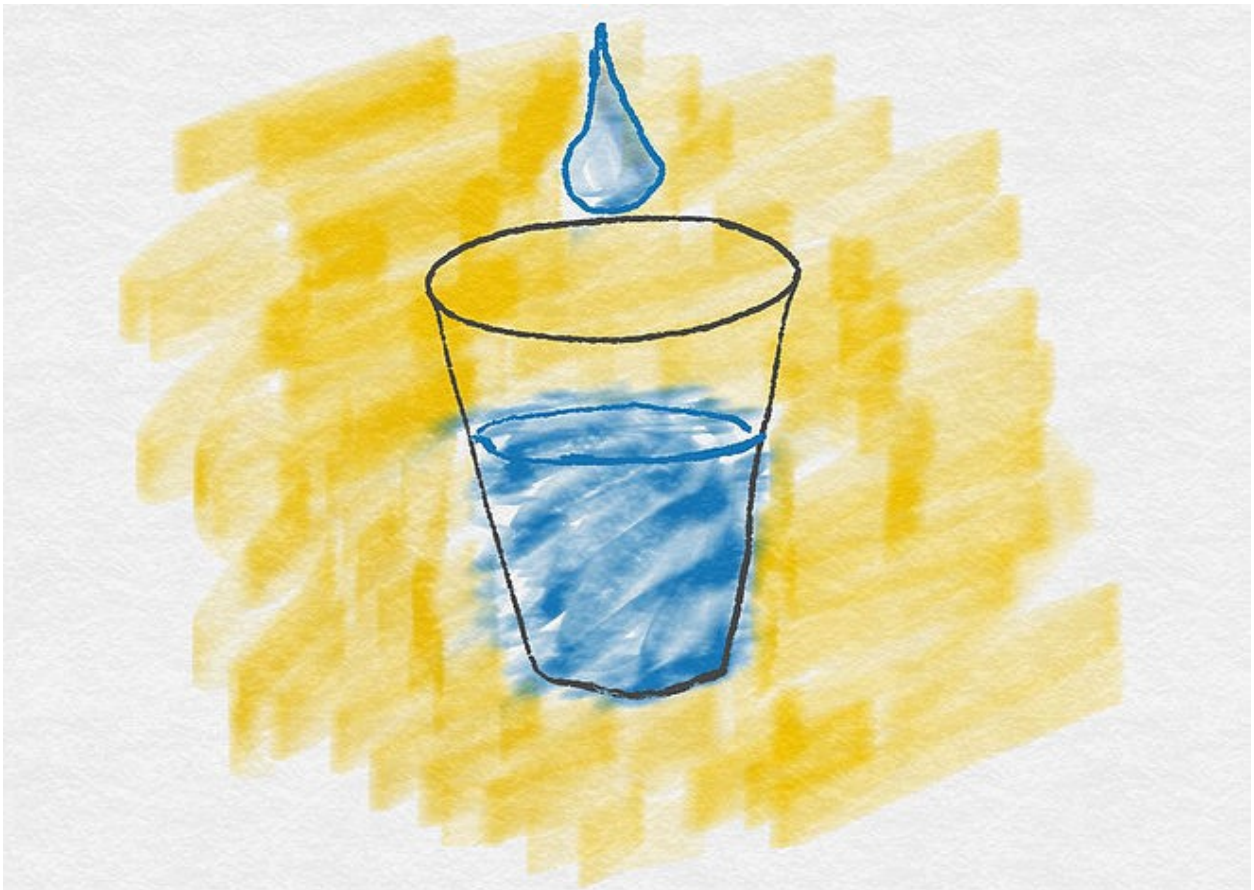
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Appendix A

Truth In Water Webcomic

Available at <http://bhihara.wixsite.com/truthinwater>



WATER. THE BASIS OF LIFE ON EARTH. A PRECIOUS RESOURCE TO ALL. EVEN MORE PRECIOUS IN THE STATE OF CALIFORNIA. CALIFORNIA IS CURRENTLY IN ITS 5TH YEAR OF DROUGHT (2011-NOW). EVEN IN WET YEARS DIFFERENT GROUPS MUST VIE FOR WATER. MAJOR PLAYERS IN THE STATE INCLUDE AGRIBUSINESS, ENVIRONMENTAL ORGANIZATIONS, CITIES, NATIVE TRIBES, FISHERS, HUNTERS, AND RECREATIONAISTS. EACH PARTY HOLDS DIFFERENT VALUES AND ADVOCATES FOR THEIR GOALS IN SHARED MEDIA CHANNELS, DISSEMINATING MESSAGES INTENDED TO TIP THE BALANCE OF POWER.

THIS COMIC WILL BE A PRIMER FOR BREAKING DOWN THE TROPES AND NARRATIVES IN CALIFORNIA WATER, FOR UNDERSTANDING HOW MESSAGES ARE PRESENTED AND RECEIVED, AND FOR CONSTRUCTING A MORE JUST, PARTICIPATORY WATER FUTURE.



CALIFORNIA WATER BASICS:

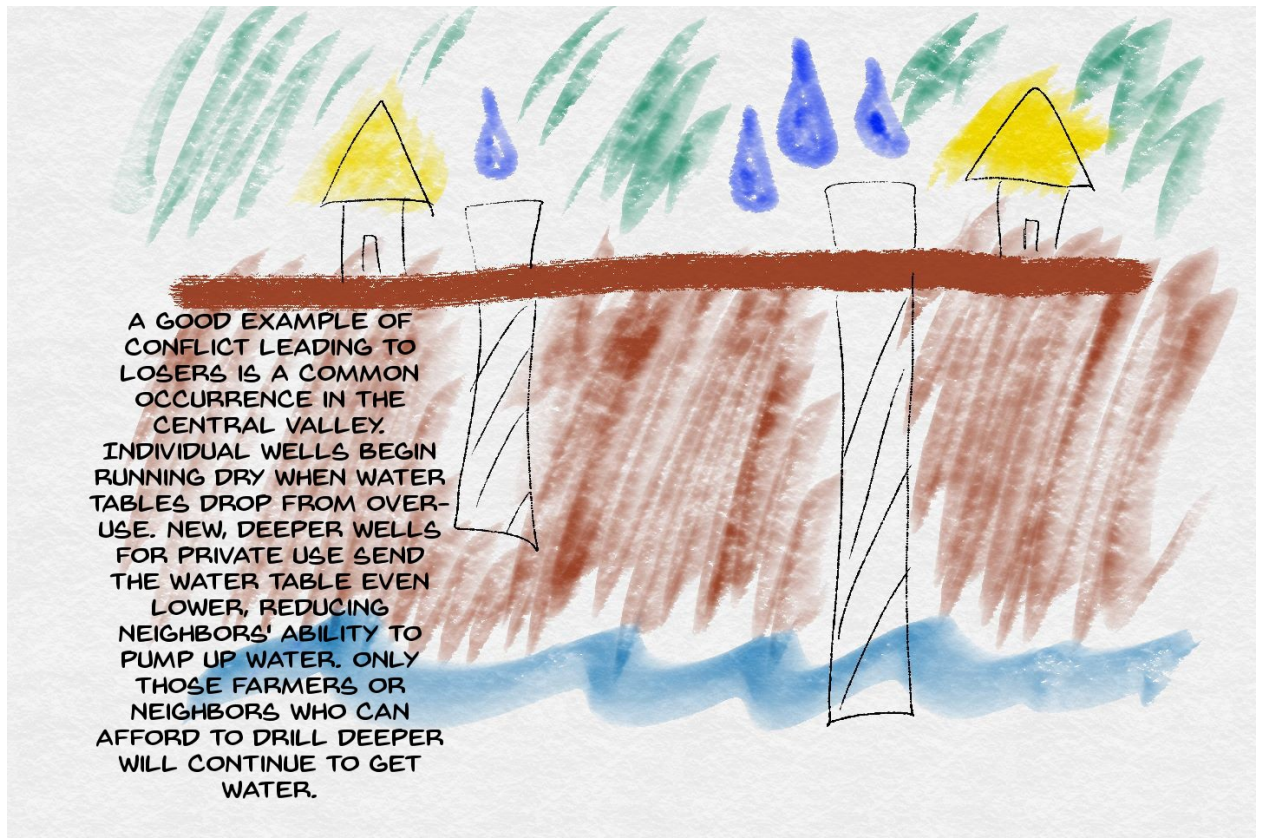
STATEWIDE, ABOUT 50% OF WATER STAYS IN RIVERS FOR ENVIRONMENTAL FLOWS. SOME RIVERS AVERAGE IN THE 10% RANGE. THE SAN JOAQUIN IS OCCASIONALLY DRY FOR 60 MILES. THE OTHER 50% OF WATER IS DIVERTED FOR HUMAN USES.

OF HUMAN WATER USE, A FULL 80% OF IT GOES TO IRRIGATED AGRICULTURE. THE REMAINING 20% GOES TO CITIES AND TOWNS.

39 MILLION PEOPLE LIVE IN CALIFORNIA. POPULATION EXPECTED TO BE 49 MILLION IN 2060.

ROUGHLY 2/3RD OF CALIFORNIA'S WATER FALLS IN THE NORTHERN 2/3RDS, WHERE ONLY 1/3RD OF THE POPULATION LIVES. MUCH OF THAT WATER IS DIVERTED SOUTH TO URBAN CENTERS AND SAN JOAQUIN VALLEY AGRICULTURE THROUGH ENORMOUS STATE AND FEDERAL PROJECTS.







THERE ARE TIMES WHEN MONEY DOES DETERMINE WATER ACCESS, AS SEEN IN THE WELL EXAMPLE. THE NEIGHBOR OR FARMER WHO CAN DRILL DEEPEST (A FUNCTION OF MONEY) WILL GET WATER. GENERALLY, THE MYTH IS FALSE. IF THIS MYTH WAS TRUE CITIES WOULD GET ALL WATER - THEY SIMPLY HAVE MORE MONEY TO THROW AT THE PROBLEM THAN FARMING ASSOCIATIONS OR INDIVIDUAL FARMERS. THE CURRENT REALITY IS THAT FARMERS CONTINUE TO PLANT NEW ACREAGE WHILE CITIES BECOME THE FOCUS OF STATEWIDE CONSERVATION GOALS.

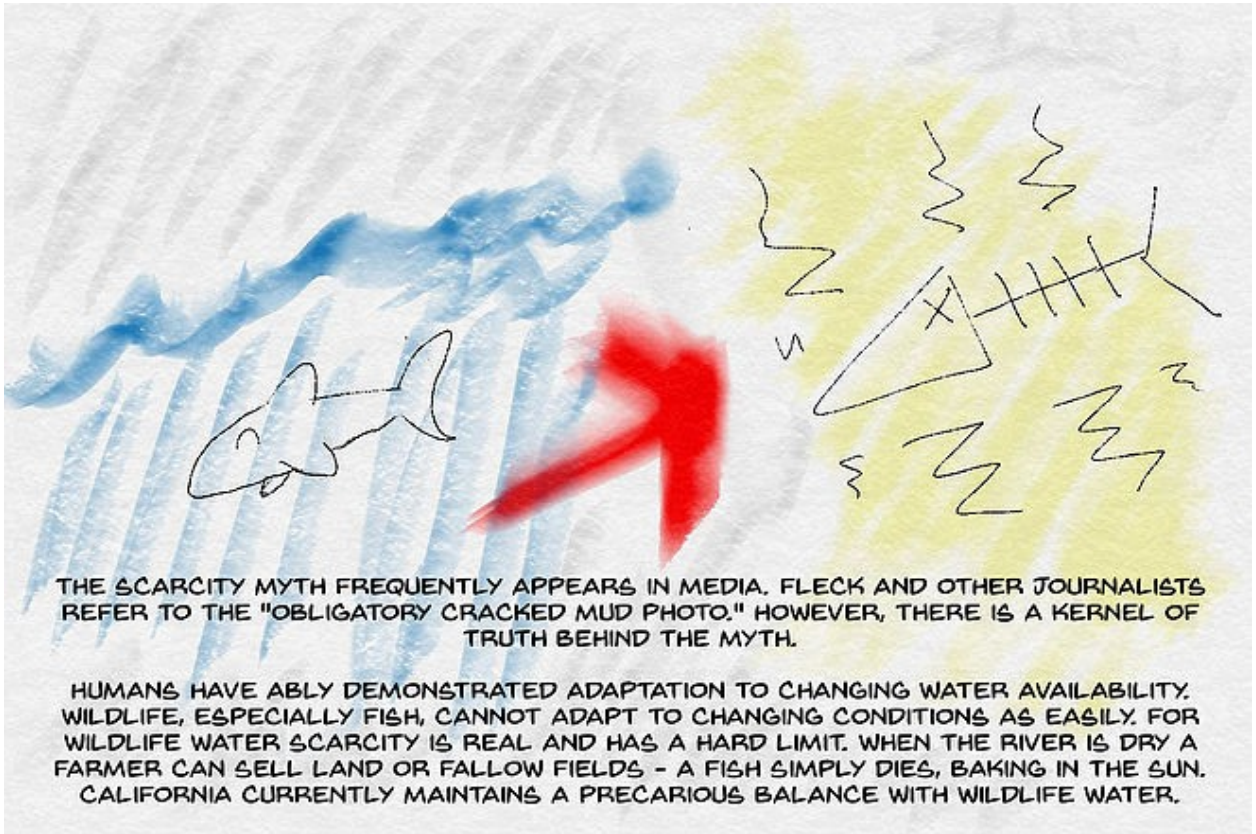
PSUEDONYMOUS WATER WONK AND BLOGGER 'ON THE PUBLIC RECORD' THINKS THIS MYTH MAY BECOME REALITY (RECOGNIZING THAT MONEY DOES HAVE VALUE AS POWER):

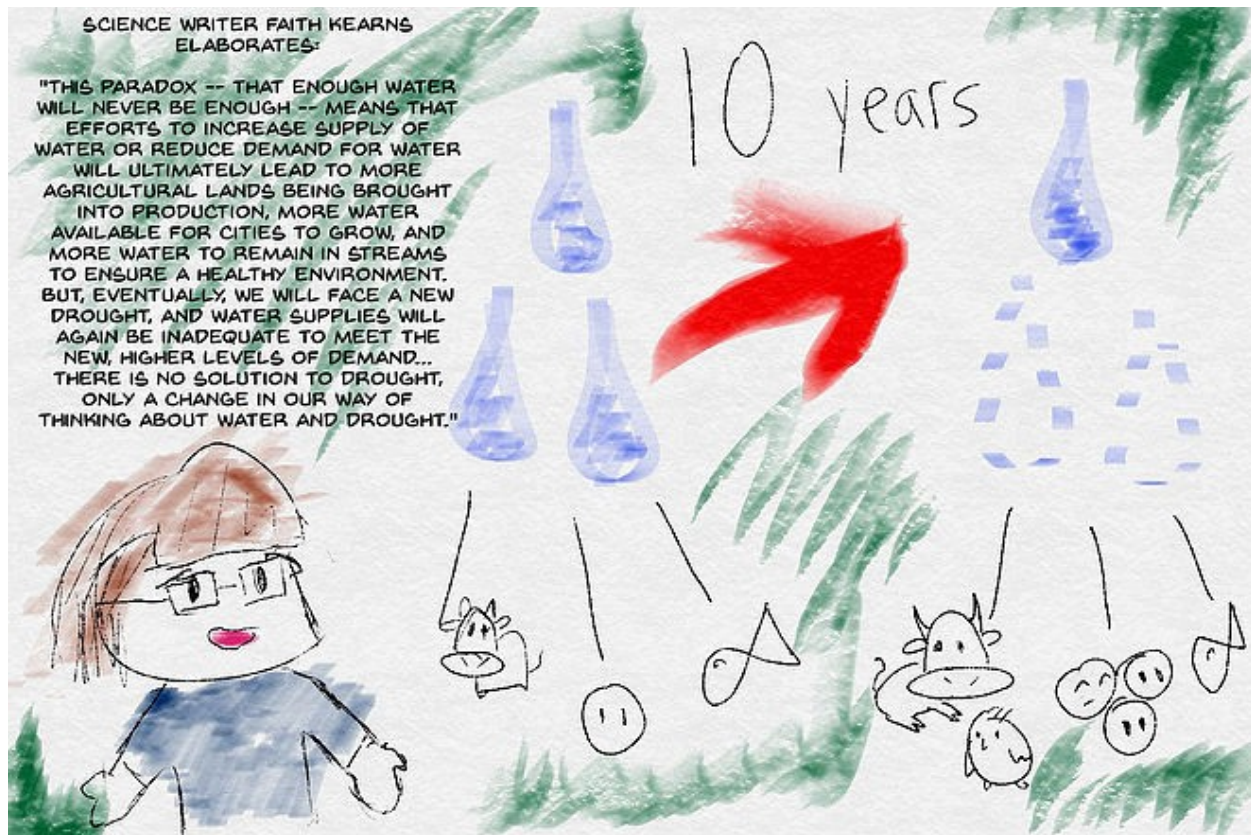
"I DO NOT BELIEVE ANY POLITICAL CONSTRAINTS CAN STAND UP TO THE SELF INTEREST OF THE URBAN WATER USERS IN CALIFORNIA. A TIPPING POINT WILL COME AND WHEN IT DOES, 38 MILLION OF THE 39 MILLION PEOPLE WHO LIVE HERE WILL REALIZE THAT WORDS ON PAPER ARE THE ONLY THING STANDING BETWEEN THEM AND THE WATER THEY WANT. THEY HAVE THE POWER TO REWRITE THOSE WORDS, BY INITIATIVE OR THROUGH LEGISLATURE."



"THE MOST PERVERSIVE OF THE MYTHS IS THAT WE ARE 'ABOUT TO RUN OUT OF WATER.' I'VE HEARD IT COUNTLESS TIMES, AND IT USUALLY FOLLOWS A PREDICTABLE PATTERN. TODAY, WE NEED THIS MUCH WATER TO SUPPORT THIS MANY PEOPLE AND THIS MUCH FARMING. AS EITHER GROWS, WE'LL NEED MORE WATER, THE NARRATIVE WOULD SUGGEST. WHEN THE 'NEED' LINE CROSSES THE SUPPLY LINE, WE WILL 'RUN OUT.' THIS IGNORES HISTORY, WHERE AGAIN AND AGAIN WE HAVE SEEN BOTH CITY AND FARM COMMUNITIES ADAPT AND CONTINUE TO GROW AND PROSPER WITHOUT USING MORE WATER, OFTEN, IN FACT, USING LESS. BUT THAT DEEPLY HELD FEAR OF 'RUNNING OUT' OF WATER FEEDS BACK INTO THE FIRST MYTHS, TRIGGERING A LIMBIC RESPONSE TO PROTECT 'OUR SHARE' AGAINST OTHERS.







CALIFORNIA'S 150 YEAR OLD WATER LAWS ENSHRINED CERTAIN VALUES, SUCH AS THE VALUE OF DOMINION OVER NATURE. THE PRIOR APPROPRIATION RIGHTS SYSTEM IS THE CLEAREST INDICATOR OF THAT VALUE - ONCE HUMANS HAVE LAID CLAIM TO WATER THEY HOLD THAT RIGHT FOREVER, BARRING UNREASONABLE USE. OUR CURRENT WATER THINKING IS STUCK, TOO FAMILIAR, COASTING ON THE INERTIA OF PROSPECTOR ERA BELIEFS. WE NEED TO CLEARLY EVALUATE WHAT IS IMPORTANT TO US AS CALIFORNIANS, AS USERS OF WATER.

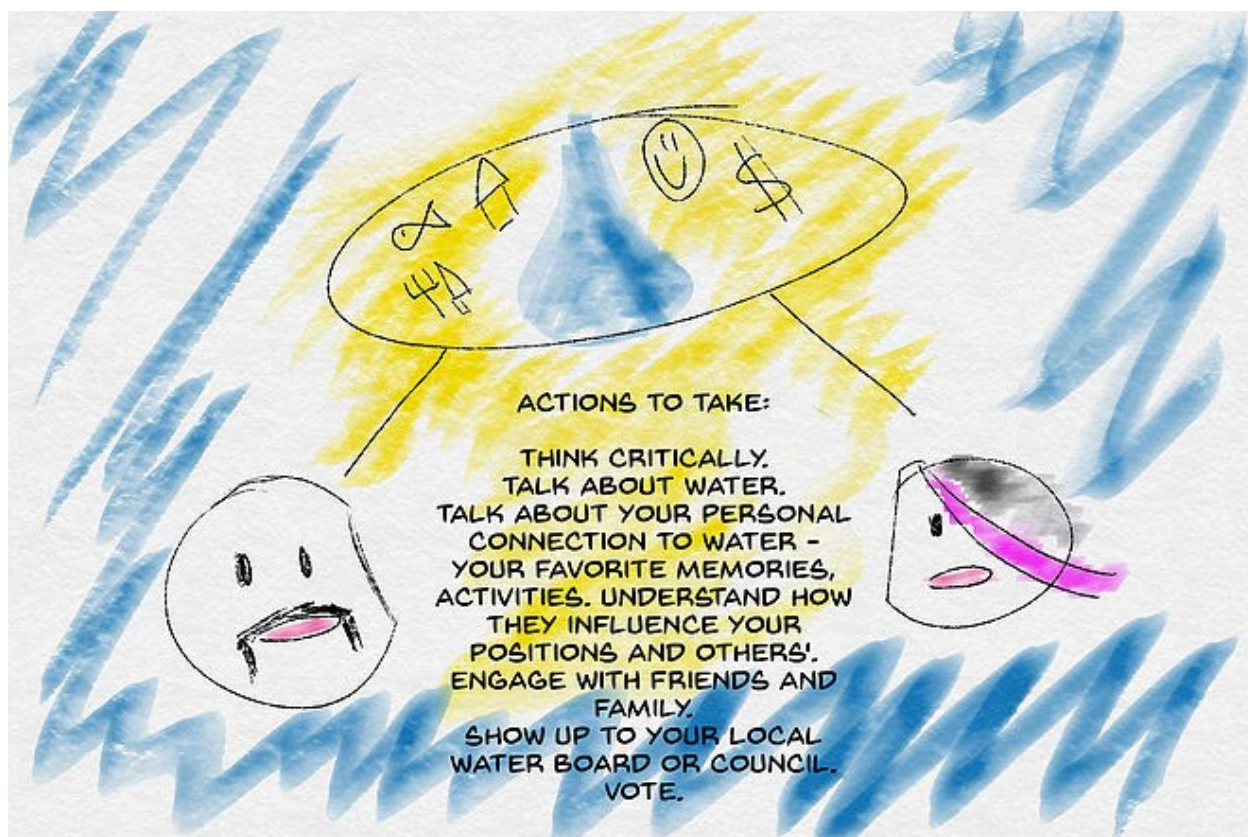
MEDIA OFTEN SPINS A TECHNOLOGICAL UTOPIA STORY, HOW NEW DESALINIZATION TECHNOLOGY OR UNDISCOVERED RESERVES OF GROUNDWATER OR WATER SHIPPED FROM THE POLES WILL SAVE CALIFORNIA FROM SCARCITY.

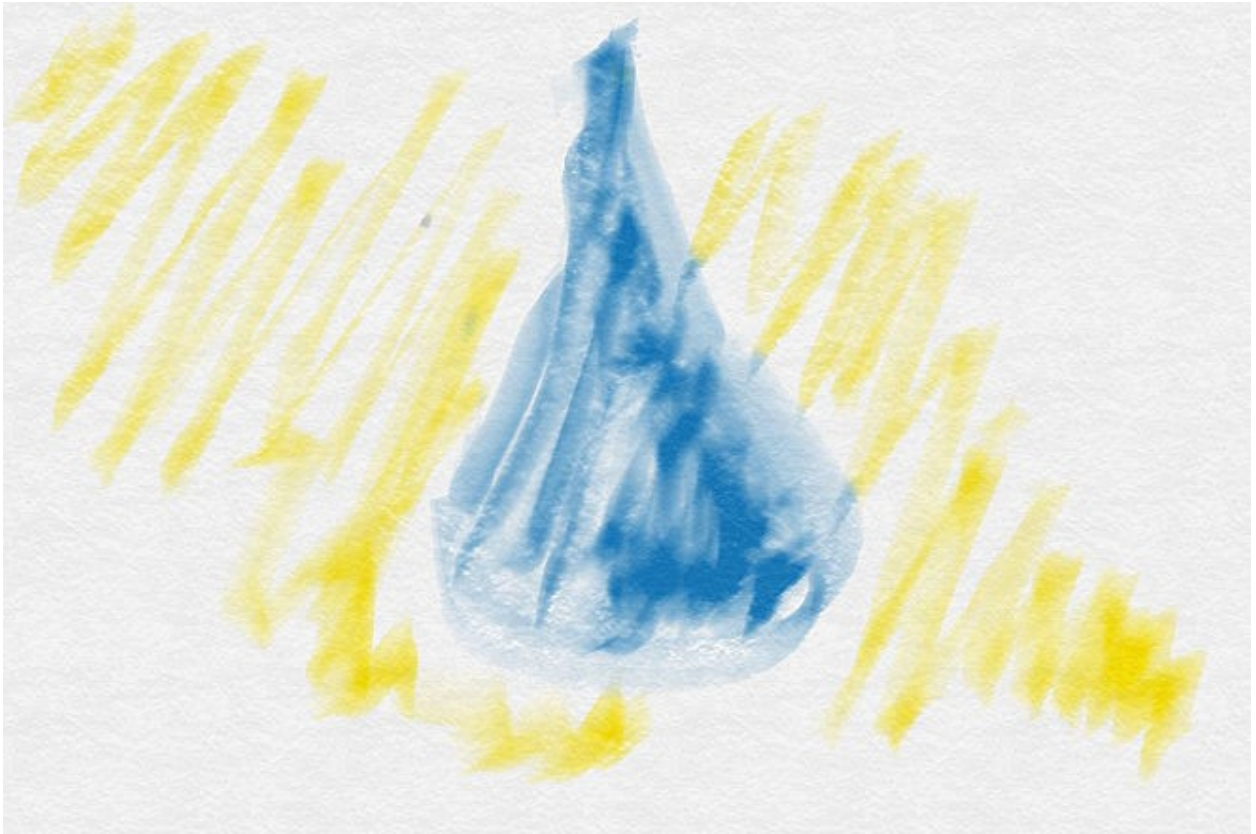
WATER SCIENTIST AND PROFESSOR JAMES FAMIGLIETTI ADDRESSES SUCH THINKING:

"ALL THE TECHNOLOGY IN THE WORLD WILL NOT SOLVE THE WATER CRISIS WITHOUT POLICY INNOVATION. CURRENT POLICY NO LONGER FITS OUR MODERN UNDERSTANDING OF HOW WATER MOVES OVER AND THROUGH THE LANDSCAPE. IT IS A LEGACY FROM ANOTHER ERA THAT NO LONGER MAKES SENSE."

THERE IS NO SILVER BULLET, NO HAPPY, WIN-WIN ENDING. PAINFUL SOLUTIONS LIKE ENFORCEMENT OF CURRENT LAW (PUBLIC TRUST DOCTRINE) OR AGRICULTURAL MORATORIUMS ARE ONLY POSSIBLE WITH A CHANGE IN THINKING. THAT REQUIRES DIFFICULT DISCUSSION ABOUT WHAT WE WANT TO HOLD ONTO IN THE FUTURE. DISRUPTION IS HAPPENING NOW AND WILL INCREASE WITH CLIMATE CHANGE. ACKNOWLEDGING THE REAL SUFFERING OF OTHER GROUPS, OF MIGRANT FARM WORKERS, DISPLACED FAMILIES, OUT OF WORK FISHERS IS THE FIRST STEP TO STOPPING THE SUFFERING. OSCAR WILDE SAYS "MAN IS MANY THINGS, BUT HE IS NOT RATIONAL." RECOGNIZE THIS IN OURSELVES, SO THAT WE CAN RECOGNIZE THE HYPOCRISY IN OTHERS AND THEIR MESSAGES.







Curriculum Vitae

Blake Hihara, born April 13 1990, Newport Beach, California, grew up in Southern California and received a BA in Environmental Studies from University of California, Santa Cruz. His research interests is cultural perceptions of water and sustainability.

Previous publications include Ruth Langridge's California Energy Commission paper "Climate Change and Water Supply Security: Reconfiguring Groundwater Management to Reduce Drought Vulnerability." Blake served as a research assistant and coauthor.