Summer/Fall 2012

Issue 12

WATERMARKS

The California Newsletter for Citizen Water Quality Monitoring

- Celebrating the Clean Water Act
- 8th National Monitoring Conference
- On The Rocks: Profile of the California Newt
- Learn About Your Watershed! Find a Place to Volunteer!
- The Cutting Edge: Inside Look on PhyloChips
- Interview with a Water Warrior
- Clean Water Team Videos
- *New*- SWAMP Field Method Module 7

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Watermarks: The California Newsletter for Citizen Water Quality Monitoring

Issue No. 12| Summer/Fall 2012

A product of the State Water Resources Control Board's Clean Water Team

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Contents

Celebrating the Clean Water Act

Forty years ago, Congress signed one of the greatest environmental legislations to protect the nation's waters into law. The Federal Water Pollution Control Act, or Clean Water Act (CWA), was totally revised in 1972 to give the CWA its current shape. The CWA was established due to national concerns about untreated sewage, industrial and toxic discharges, destruction of wetlands, contaminated runoff, raw sewage was being flushed into waterways and rivers catching fire. The goal of this legislation was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" and to make all waters fishable and swimmable. The CWA also gave citizens a strong role to play in protecting and restoring waters.

The CWA has many components, one of which is the National Pollutant Discharge Elimination System (NPDES). It is one of the key regulatory tools available in the CWA to protect and restore the nation's waters. The law requires that any point source facility that discharges polluted wastewater into a body of water must first obtain a permit from the EPA or their designated representative (46 States and 1 Territory are delegated). The NPDES permit is also the CWA's principal enforcement tool. EPA may issue a compliance order or bring a civil suit in U.S. district court when there are violations of the terms of a permit. Further, the CWA provides for substantial penalties for permit violators. The CWA also allows individuals to bring a citizen suit in U.S. district court against persons who violate a permit limit or standard. Individuals may also bring citizen suits against EPA's Administrator (or equivalent state official) for failure to carry out their duties as specified under the CWA.

Over the last 40 years an observable shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to a more integrated, place-based watershed protection strategy has been seen. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones, and a full array of issues are addressed, not just those subject to CWA regulatory authority. Involving multiple stakeholders at the state, tribal and local level to develop and implement strategies for achieving and maintaining state water quality and other environmental goals is another hallmark of this approach.

The CWA has accomplished a great deal over the past four decades in protecting healthy waters and restoring impaired ones. But many challenges remain and we must work together to protect clean water for our families and future generations. Everyone has an impact on the water and we are all responsible for making a difference.

Learn more about the Clean Water Act by visiting "Water is Worth It" <http://water.epa.gov/action/cleanwater40c/>.

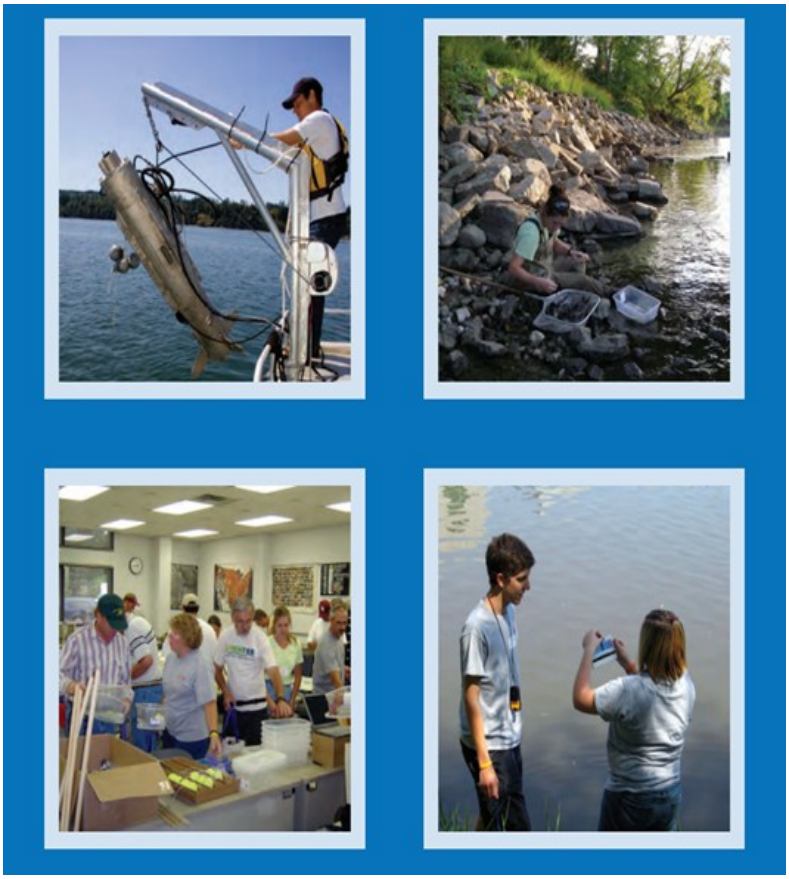
Additional information can be found by visiting:
http://cfpub.epa.gov/watertrain/moduleFrame.cfm?module_id=69&parent_object_id=2569&object_id=2569
www.rivernetwork.org/introduction-cwa-course
www.epa.gov/lawsregs/laws/cwa.html
http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45
www.fws.gov/laws/lawsdigest/FWATRPO.HTML

WATER: One Resource – Shared Effort – Common Future

8th National Monitoring Conference

April 30 - May 4, 2012 • Portland, Oregon

NWQMC



- Applying Innovative Monitoring Technologies and Methods
- Strengthening and Advancing Assessment Methods and Models
- Addressing Climate and Water Availability Issues
- Communicating Science and Data to Decision Makers and the Public
- Managing and Sharing Water Quality Monitoring Data
- Strengthening Monitoring Collaboration and Partnerships at all Scales
- Addressing Emerging Contaminants and Emerging Threats to Water Quality
- Evaluating and Managing Water Protection and Restoration Activities

Presentations now online!

Presentations from the **8th National Monitoring Conference**, held in Portland, OR, in April, 2012, are now available online. This national forum provides an opportunity for water stakeholders to exchange information and technology related to water monitoring, assessment, research, protection, restoration, and management. http://acwi.gov/monitoring/conference/2012/index.html

Contributions made by your Clean Water Team:

ES A9: Implementing Web-based Digital Technologies for Volunteer Monitoring and Watershed Stewardship Organizations and Agencies Organized by Erickson "Erick" Burres, California State Water Resources Control Board- Clean Water Team
http://acwi.gov/monitoring/conference/2012/ESA9_Burres_TitleLink.pdf

O1: Strengthening Monitoring Programs through Nonprofit/ Government Collaboration
Organized by Jen Bayer, USGS
Strengthening Regional Monitoring Programs through the Development of a Collaboration Network: The California Water Quality Monitoring Collaboration Network Erickson Burres

K1: Evaluating Monitoring Program Needs and Outcomes
Moderator: Elizabeth Herron, University of Rhode Island
A Summary of Findings on Citizen Monitoring Contributions Towards the Monitoring of California Waters and Beneficial Uses Erickson "Erick" Burres, CA-SWRCB
http://acwi.gov/monitoring/conference/2012/K1/K1Burres1.pdf

Posters Session Thursday May 3, 2012:
Strengthening Monitoring Programs
69B Strengthening Regional Monitoring Programs through the Development of a Collaboration Network: The California Water Quality Monitoring Collaboration Network,
Erickson Burres and Romy Tabet , California SWRCB

Selection of Sessions Relevant to Many California Citizen Monitoring Programs
B7: Effective Communication of Water Quality Science to Stakeholders
C7: Effective Communication of Water Quality Science to Stakeholders, Session 2
C1: Expanding the Use of Volunteer Monitoring Information
C4: Assessing Urban Waters
D1: Developing Local, Regional, and National Water Quality Data Exchanges
D3: UV Sensors: Nitrate
D6: Transformation and Fate of Mercury in River and Streams
D7: Influencing Behavior through Public Education
E4: Emerging Contaminants in Urban Waters
E7: Communication Using Innovative Technologies
F1: Data Access through Innovative Web Technologies
F4: Tools for Prioritizing Restoration Efforts
ES F8/G8: Evaluating Volunteer Monitoring Program Success
G1: Development and Use of Water Quality Indicators
G2:Improving State/Tribal Monitoring Programs using the National Aquatic Resource Surveys
G3: Continuous Real-time Monitoring: QA from Start to Finish
H1: Adaptive Monitoring with Volunteers
I4: Monitoring for the Effectiveness of TMDLs
ES I8: Volunteer Water Quality Monitoring around the World: Global Water Watch Affiliate Experiences in Mexico, South America, and the Philippines
J1: Strengthening Monitoring Programs through Nonprofit / Nonprofit Collaboration
J4: Nonpoint Source Monitoring for TMDL Implementation
K1: Evaluating Monitoring Program Needs and Outcomes
K4: Identifying and Protecting Healthy Watersheds
K6: Strengthening Monitoring Programs through Government-to-Government Collaboration
ES L1: Shale Gas Volunteer Monitoring
ES L3: Effective Public Communication of Water Quality Data
L4: Monitoring Effectiveness of BMPs for Urban Stormwater
ES L6: Creative Partnerships for Monitoring Restoration Projects
ES M1: Bridge Day Plenary Panel: Are Monitoring Collaborations Worth My Time?
M4: Identifying Causes of Impairment Due to Multiple Stressors
M7: Detection, Fate and Transport of Pesticides
M8: Statistical Approaches for Assessing Water
O1: Strengthening Monitoring Programs through Nonprofit/Government Collaboration
ES O7: Water Quality Monitoring for Enforcement

ON THE ROCKS

An Eye On Newts

Newts are fascinating inhabitants of some California waters. Their biology links them to both land, air and water quality. Newts can be sensitive bioindicators of stream health. Studies have demonstrated that they are responsive to changes in the environment and a degraded habitat can cause a decline in their presence or even local extinctions.

Newts breed in the water and because their eggs lack a protective covering, they become vulnerable to pollutants. Pollutants in the water can lead to poor embryo development, eventually leading to death. Adult newts can also be indicators of a healthy habitat. Because of an adult newt's permeable skin, gases and water flow freely into and out of the body. As a result, newts have little to no protection from toxins in the soil and water. Newts can also be adversely affected by poor air quality such as acid rain and fog. For that reason, the stability of a newt population in a specific waterbody can indicate healthy water quality and habitat conditions.

Newts are a part of the family Salamandridae. However, not all salamanders are considered newts. Generally, newts tend to have rough and bumpy skin but during their breeding season, they move in and out of water causing their skin to become smooth. They live their adult life on land, but breeding and early development stages happen in water. Female newts lay their eggs on submerged vegetation like tree roots. These eggs will hatch into larvae with gills and a fish-like tail, "waterdogs". Metamorphosis is the next stage in development where the tail is absorbed and the gills are reduced. Once metamorphosis is complete, juvenile newts leave the water and live on land until they are ready to migrate to their aquatic habitat to breed.

In California, four types of newts can be found. These western newts fall under the genus *Taricha,* meaning Pacific Newts, with only a few physical distinctions separating them. The types of newts found in California are *Taricha granulosa (Rough-skinned Newt)*, *Taricha rivularis (Red-Bellied Newt),* and *Taricha torosa* (California Newt). The California Newt has two subspecies including *Taricha torosa torosa* (Coast Range Newt) and *Taricha torosa sierra* (Sierra Newt).

Photo credit: Erick Burres

All four types of newts are similar in appearance making it difficult to distinguish between them. They have poisonous skin secretions containing tetrodotoxin that can repel most predators. The major distinctions between various newts are the coloring of their eyes, eyelids, and their geographical distribution. The Rough-Skinned Newt can be found in terrestrial or aquatic habitats like grasslands, woodlands, ponds and lakes. Similarly, the Red-Bellied Newt is established in streams, rivers, and woodlands. The Sierra Newt is better adapted to and more likely to breed in faster-flowing waters, whereas the Coast Range Newt is located in wet forests, chaparral, and grasslands. Having the greatest variance in eye color from the other newts is the Red-Bellied Newt. The other three types of newts possess an iris with a yellowish hue, whereas the Red-Bellied Newt has dark colored eyes.

A majority of the newt populations have declined in recent years due to the introduction of non-native species, habitat destruction, hydro-modification, sedimentation, wildfires, and human activity. In California, one species of concern is the California newt (*Taricha torosa)*. Lee Kats, a professor of Biology at Pepperdine University, has performed several studies regarding the decline of Southern California amphibian populations. He has discovered connections between newt population impacts and wildfires. Wildfires have led to excessive soil erosion and sedimentation which destroyed stream pools use for breeding. Losses of streamside vegetation, also increased ultraviolet radiation penetration to streams, which disrupts the development of newt eggs.

Invasive species including crayfish, bullfrogs, and even mosquito fish have become a serious threat to newts. Because newts are non-poisonous in their early stages, invasive species are able to feed on the defenseless larvae and eggs.

A combination of poor water quality and invasive species can be even more troublesome. Crayfish are aggressive and a successful invasive species throughout much of the Southern California region. They can overpower, harass, and kill newts. A study done by Kats showed a correlation between elevated nitrate levels and increased aggression in crayfish. At elevated nitrate levels, crayfish tend to become more aggressive. As various waterbodies become polluted with nutrients like nitrates, levels of aggressiveness in crayfish will increase and newts are at greater risk.

This is a female newt ready to lay eggs whose tail has been seriously damaged by crayfish attacks. Photo credit Lee Kats

Some steps can be taken to reverse declining newt population trends caused by non-natives and help promote the recovery of the newt population. Separation barriers can be installed to prevent crayfish from moving into newt breeding areas. A three-year Pepperdine University study proved that implementing these barriers helped to dramatically increase the newt larvae population. Upland and riparian restoration projects can also benefit newt populations by preventing breeding pool sedimentation and provide protection from harmful UV radiation.

Newt photos this page:
Lee Kats

FOR MORE INFORMATION ABOUT THE CALIFORNIA NEWT VISIT:

www.calherps.com
www.dfg.ca.gov/wildlife/nongame/ssc/amphibian-reptile.html
www.nationalgeographic.com/lewisandclark/record_species_185_15_3.html
www.werc.usgs.gov/OLDsitedata/fieldguide/index.htm
www.sdnhm.org/archive/fieldguide/herps/tari-tor.html

Learn About Your Watershed! Find a Place to Volunteer!

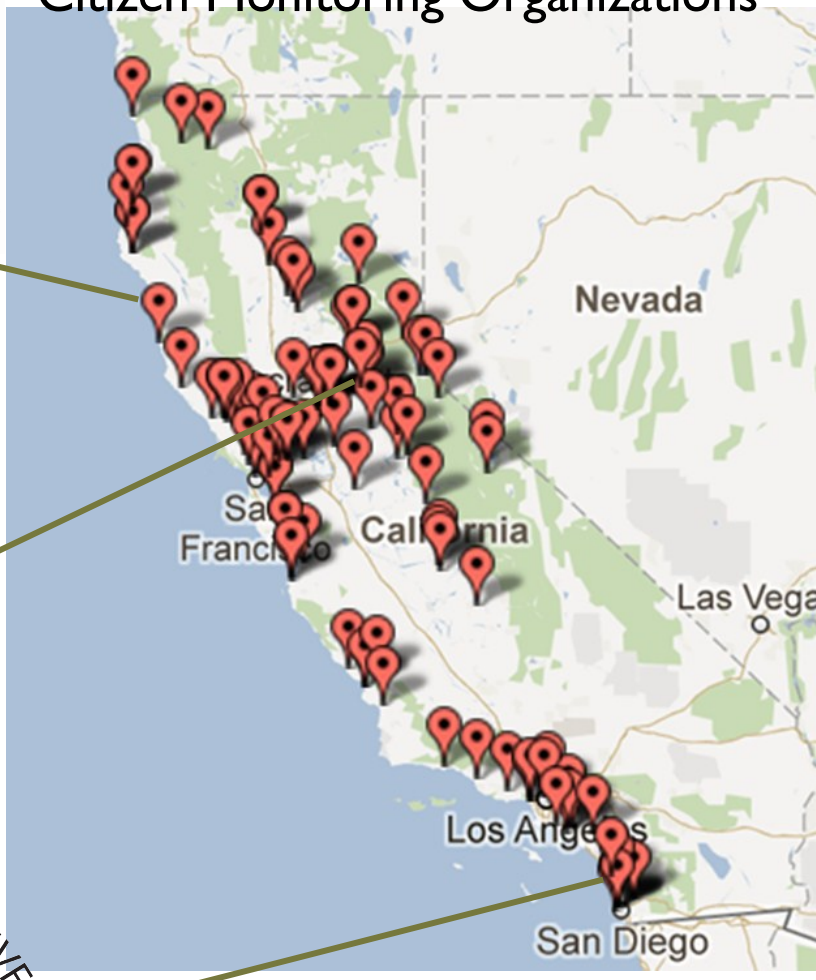
Gualala River Watershed Council has collected data throughout their watershed for 14 years. Their program includes flow monitoring, rainfall tracking, ambient water and air temperature, channel morphology, riparian function, and winter spawning surveys.

Wolf Creek Community Alliance is a citizen-led grassroots organization whose activities are focused primarily on restoring Wolf Creek. Volunteers regularly monitor the physical, chemical, and biological condition of Wolf Creek, and engage in community outreach, education, and riparian restoration projects.

San Diego River Parks Foundation is a nonprofit organization that was founded in 2001 dedicated to the enhancement of the San Diego River, the River Park and its wildlife. The RiverWatch Team collects data at 15 different locations along the river.

(Click the logos to visit our featured groups!)

California's
Citizen Monitoring Organizations



Use your mobile device to access this map & locate your nearest citizen water quality monitoring program!

The Cutting Edge:

An Inside Look on PhyloChips

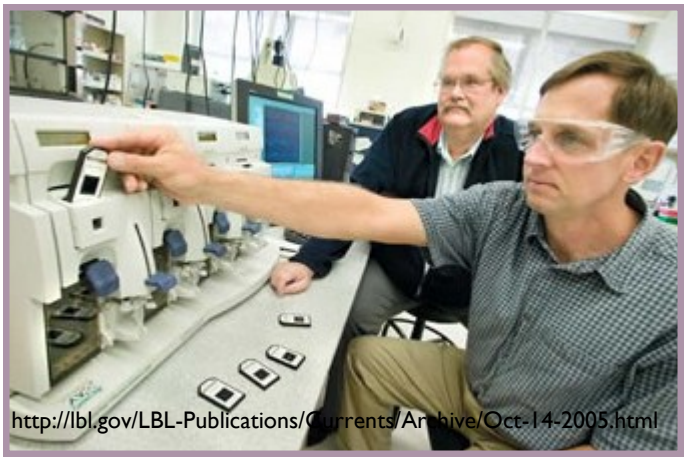
The PhyloChip can be used to help us further understand the microbial ecology of our ocean. Gary Anderson and Todd DeSantis from the Lawrence Berkeley National Laboratory (LBNL) designed the PhyloChip technology to determine specific taxa based on the unique structure of the 16S gene, which is contained in all bacteria and archaea.

Prior to the PhyloChip, routine water quality testing was conducted using traditional methods, such as the multiple tube fermentation. State Water Resources Control Board and the County of Marin Environmental Health Services compared the two procedures in a Beach Monitoring PhyloChip Project. In a water sample analyzed using the PhyloChip method, 1524 different types of bacteria were detected. However, when using the multiple tube fermentation method, only a few species were identified. The difference being that detection by the Phylochip does not require bacterial growth in order for reliable detection.

Various types of the PhyloChip have been developed and studied. The original PhyloChip, which was funded by the Department of Homeland Security, was able to detect the presence of pathogenic microorganisms in the air. The existing PhyloChip was engineered to perform aquatic testing which would address public health problems in recreational water environments. After redesigning the PhyloChip several times, the final generation is able to detect the presence and relative abundance of over 59,000 discrete taxa of bacteria.

The design of the PhyloChip was made to isolate DNA from the from the sample of interest, which is used for the 16S rRNA gene sequences amplification. Genetic probes and primers were added onto the chip in order to detect various types of bacteria.

Understanding the base of the web of ocean life will give us more understanding of not only the ocean ecology, but the effects of global warming, pollution, and how the organisms might effect public health.



Terry Hazen (left) and Gary Andersen, microbiologists with Berkeley Lab, are shown here with the 16s Phylochip that can analyze a sample for the unique DNA signatures of all known species of bacteria.

For additional reading on PhyloChips, visit:
-www.lbl.gov/tt/techs/lbnl2229.html
-www.mobio.com/blog/2011/01/10/phylochip-technology-for-simultaneous-microbial-taxa-detection/
-http://www.phylochip.com/phylochip.html

Interview with a WATER WARRIOR

Captain Charles Moore

Captain Charles Moore is passionate about citizen science and environmental stewardship. Captain Moore founded Algalita Marine Research Institute in 1994. On a return voyage from Hawaii to Los Angeles, in 1997, he saw an ocean filled with trash and plastic debris. Ever since then, he has been raising awareness about this tragedy in the North Pacific Gyre.

How did you get involved with citizen science?

I got started with the Surfrider Foundation's "Blue Water Task Force" and then with the Southern California Marine Institute's Rocky Intertidal Marine Invertebrate Survey. A few years later, when I built the Oceanographic Research Vessel Alguita in Australia, I teamed up with their "Streamwatch" and "Coastcare" programs to do volunteer water quality monitoring of Australia's East Coast.

In the beginning of Algalita, what types of struggles did you face?

As with all 501c3 startups, there were struggles with defining our mission, attracting productive board members and eventually staff. And of course grant writing and fundraising were challenging and still are. Initially, I converted a room in my house to our office, and that sufficed for the first decade of our existence. I think it takes about ten years for non-profits to become established.

How did you overcome those hurdles, as a non-profit citizen monitoring program, and become a leader in the field of trash debris and especially plastic debris monitoring in the ocean?

The non-profit served as a vehicle for building and running the Oceanographic Research Vessel (ORV) Alguita. The vessel was the key to citizen monitoring offshore, and was specifically designed to provide a small footprint monitoring platform for citizen and low budget post graduate science. Many Masters and PhD candidates cannot afford sea time on expensive university research vessels. In this capacity, I learned many monitoring protocols from the scientists onboard, and in 1997 when my curiosity was piqued by the plastic I observed in mid-ocean, the opportunity presented itself to quantify the ocean's plastic load. I consulted with colleagues I had worked with at the Southern California Coastal Water Research Project and MBC Applied Environmental Sciences. Through these contacts, I developed methods and procured equipment that allowed Algalita Marine Research Foundation to become a leader in this field.

Any advice for current and especially new citizen monitoring programs and watershed stewardship organizations?

Here, I would like to quote Homero Aridjis, a Mexican Poet who appeared in "The Baja Wave Document," directed by Chris Figler for Wildcoast: "The most important thing in the world right now is to defend Nature, because we are defending Life itself."

> "The 'Patch' is a bit of a misnomer inasmuch as it is larger than any patch of anything on earth, has no outline or boundaries, and is made up of dispersed marine debris, mostly floating plastic."

What is the Great Pacific Garbage Patch and how was it discovered?

The Great Pacific Garbage Patch was predicted to exist and named by Dr. Curtis Ebbesmeyer, the author of "Flotsametrics." I accidentally discovered it in 1997 while returning from the Transpac yacht race, which ORV Alguita had entered to test a new mast.

The "Patch" is a bit of a misnomer inasmuch as it is larger than any patch of anything on earth, has no outline or boundaries, and is made up of dispersed marine debris, mostly floating plastic. The "Garbage Patch" is a useful term, however, in that it connotes a general area where persistent plastic marine debris converges and accumulates.

What are some of the struggles you faced after discovering the Garbage Patch?

The first struggle was to get our findings published in a peer reviewed scientific journal so that they could be quoted in policy documents and lead to implementation of Total Maximum Daily Loads (TMDLs) for trash which were being promulgated by the Los Angeles Regional Water Quality Control Board. The next struggle was to get the message out concerning the seriousness of the problem to a wider, and ultimately world-wide audience.

Is there any one specific state/country struggling with trash more than others?

It is now apparent that the "Throwaway Society" has been globalized; *single use* and other plastics have become a serious environmental problems for every country on earth.

What is the impact of the trash on the creatures that live in our streams, rivers and oceans?

They are being killed through entanglement and ingestion, but they are also being imprisoned. We are regularly finding creatures that have lived through their juvenile existence safely ensconced inside a plastic container, only to be unable to exit through the neck of the container as adults. All plastic waste eventually fragments and becomes micro-debris, which absorbs oily pollutants like many well-known POPs (persistent organic pollutants) and thereby become "poison pills," transmitting pollutants up the food chain and eventually to human consumers.

Many of these creatures are consuming the plastics in the ocean, how does it affect humans and the food chain? Is there a certain type of fish humans should stay away from?

The study of this problem is in its infancy, but preliminary results indicate that both invertebrates and fish are consumers of our polluted plastic waste and that the plastics desorb the pollutants they carry into the food web.

Since all fish are polluted to some degree in natural environments, and pollutants tend to bio-accumulate in larger predators, we suggest that smaller and younger fish are less polluted. *"Minnowstrone" anyone?*

Do you believe that coastal cleanup days are having a significant impact? How much more needs to be done?

Based on figures given by the Ocean Conservancy for the total trash removed during the entire history of Coastal Cleanup Day, the impact has been insignificant, The total over the decades long effort is less than what enters the sea from the world's urban runoff in one month.

What would you say is the future for our oceans concerning trash?

They have become the victims of a plastic plague that threatens to overwhelm entire species, from zooplankton to the great whales. Scientists have yet to predict which will be the first to crash as a result.

Is there something citizens can do in their daily lives to help?

Refuse single use plastics. Buy local. Support bans on plastic bottles, bags and foam.

How can more people be reached and informed and involved with trash prevention and trash monitoring?

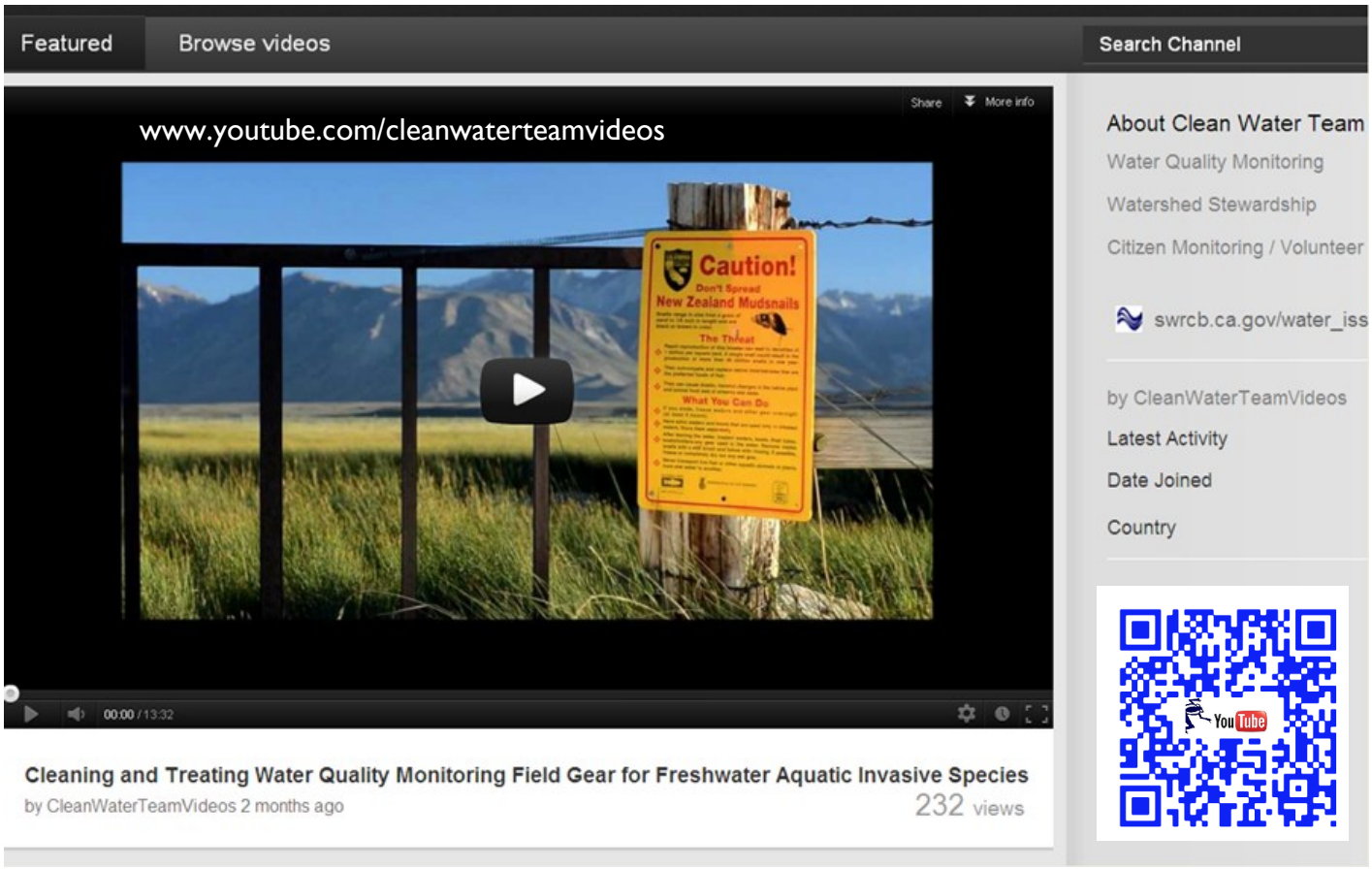
They can get a copy of my book, **Plastic Ocean**, to learn more and join Algalita Marine Research Institute, which continues to monitor marine plastics. My TED talk and other major media appearances are available on the web. They can support the Zero Waste movement and monitor vagrant plastics in their own neighborhoods.

Do you have any other message you would like to share?

The unlimited growth economic paradigm which brought us the fabulous wealth we enjoy today as a global society has run its course. We need a steady state model that shares resources and work equitably, and can focus on pacifying the struggle for existence rather than intensifying competition and conflict.

Photos courtesy of the Algalita Marine Research Institute.
Click to visit the
Algalita Marine Research Institute website.

Clean Water Team Videos



Visit the Clean Water Team's improved YouTube page featuring new videos including:

- **Cleaning and Treating Water Quality Monitoring Field Gear for Freshwater Aquatic Invasive Species**
- **Rejoining a Separated Thermometer Column**
- **How to Repair Breathable & Neoprene Waders**
- **Measuring Water Clarity and Color Using a Secchi Disk and a Forel Ule Scale**

New SWAMP Field Methods Module 7

SWAMP is proud to announce the long awaited release of the SWAMP Field Methods Course Module 7: Biological & Physical Assessments.

This excellent and inclusive video covers all the basics of biological and physical assessments, and then some. It includes an extensive outline for easy navigation.

For clarity, the common elements for ALL seven modules of this now complete SWAMP Field Methods Course are now clearly labeled in the left hand template on your computer screen. Under 'Common Elements', you will find:

- Health and Safety
- Quality Assurance
- Representativeness
- Information Management

Here, for your review and use, is the direct link to this updated SWAMP Field Methods Course resource:

http://water101.waterboards.ca.gov/swamp/qapp_advisor/FieldMethods/start.html

State Water Resources Control Board - Clean Water Team
1001 “I” Street I 8th Floor I Sacramento I CA 95814
www.swrcb.ca.gov/water_issues/programs/swamp/cwt_volunteer.shtml