

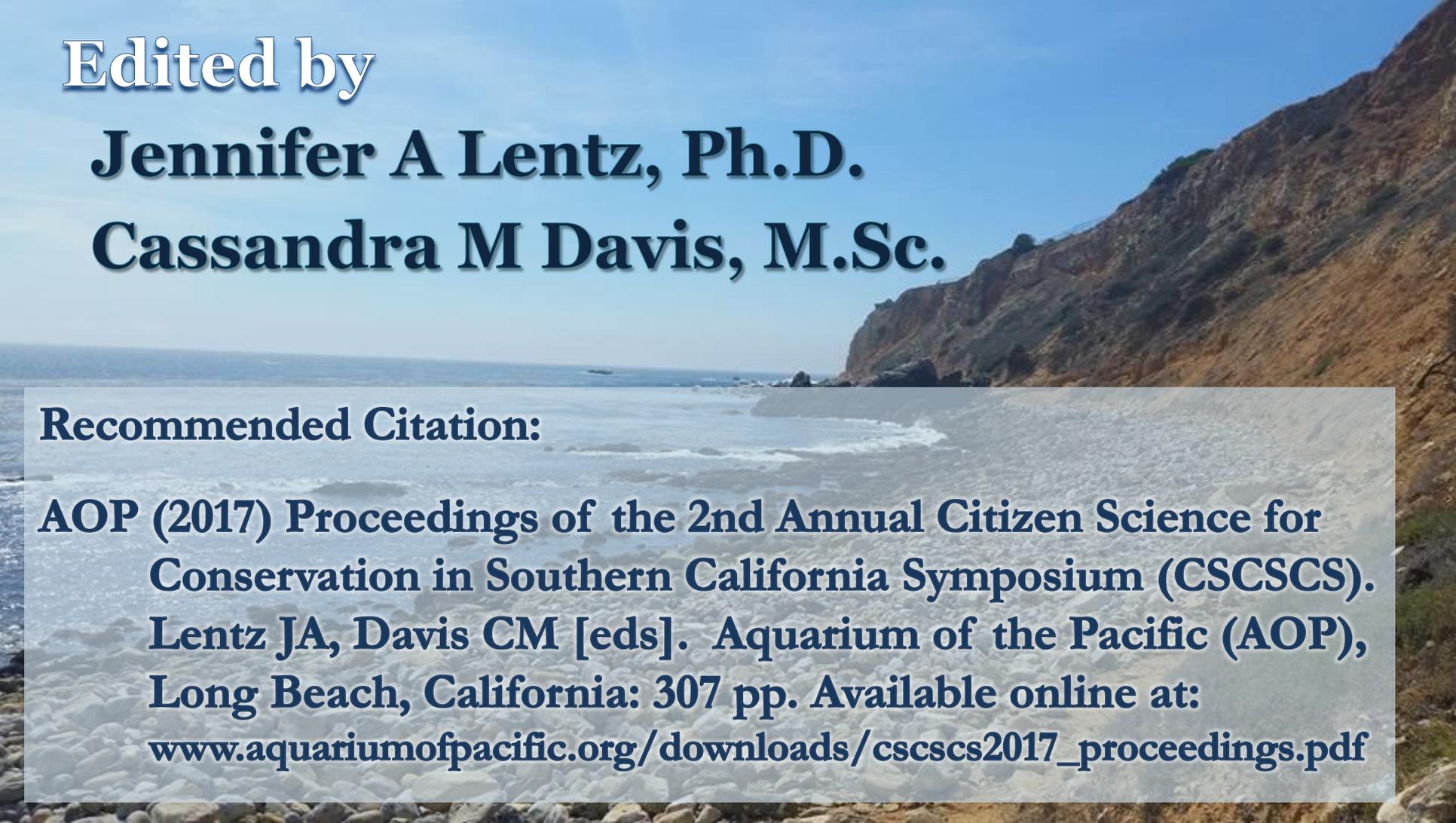
2nd Annual

CITIZEN SCIENCE

for Conservation in Southern California

SYMPOSIUM

SYMPOSIUM PROCEEDINGS



Edited by

Jennifer A Lentz, Ph.D.

Cassandra M Davis, M.Sc.

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Table of Contents

- Acknowledgements
- Keynote Speaker
- Lightning Round Presentations
- Shoreline Aquatic Park BioBlitz during Lunch
- Moderated Panel Discussions
- Special Session Presentations
- Reception with Poster Presentations

2nd Annual
CITIZEN SCIENCE
for Conservation in Southern California
SYMPOSIUM

ACKNOWLEDGEMENTS

*This symposium was made possible by the
individuals who served on the **Planning Committee**,
our **Symposium Volunteers**,
and the generous financial support of our **Event Sponsors***

Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

Planning Committee

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Richard Smart – *Natural History Museum of Los Angeles County (NHMLA)*

Citizen Science for conservation in Southern California Symposium
Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

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Diana Rudensky – *West Hollywood College Preparatory School*

Jacqueline Olvera – *Aquarium of the Pacific (AOP)*

James Stewart – *Aquarium of the Pacific (AOP)*

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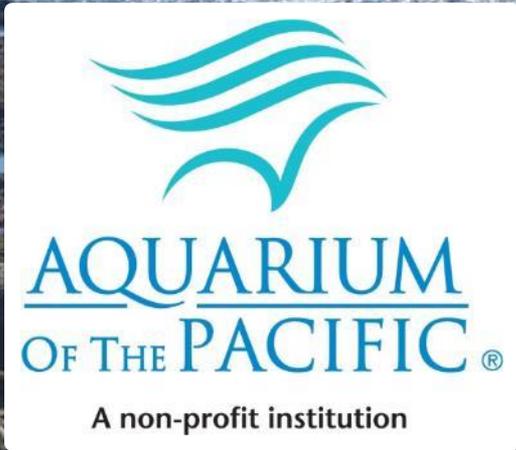
Linda Chilton – *USC Sea Grant*

Richard Smart – *Natural History Museum of Los Angeles County (NHMLA)*



Citizen Science for conservation in Southern California Symposium
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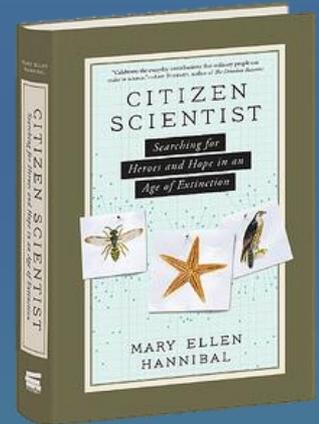
2nd Annual
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FEATURING
KEYNOTE SPEAKER



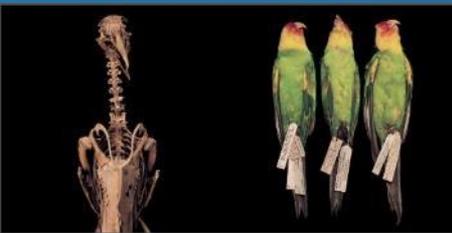
Mary Ellen Hannibal

Bay Area writer and author of
*CITIZEN SCIENTIST: Searching for
Heroes and Hope in an Age of Extinction*



Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

Paraphrased Keynote Highlights



The World Wildlife Federation (WWF) reports that since the early 1970s 60% of all wildlife has been lost. For example, today there are 1 billion fewer birds on Earth than there were in 1970.

“Extinction is happening too fast, and we are losing plants and animals about 1000 times faster than we should. It’s not just polar bears and elephants—we are losing populations of more common species right in our own states, regions, back yards. The Ivory-billed woodpecker probably went extinct because it lost its habitat when the great forests of the east coast were logged to make way for development.”

“Habitat loss is the biggest cause of extinction today.”



“By keeping tabs on biodiversity, including birds, we can better assess what’s going on in local landscapes, to help make better decisions about how we treat these places.

Paraphrased Keynote Highlights (continued...)

All life-forms have a holistic sense of belonging in the world.

For example, Darwin's hawkmoth has an 18 inches long proboscis so that it can successfully pollinate the Madagascar star orchid, which has a spur that is about the same length. "Plants and pollinators co-evolved—that is, traits in one came about in response to traits in the other. This close relationship between species is being disrupted by climate change and habitat loss, which leads to further extinctions. Keeping track of pollinators is critical citizen science, and most of us can do it in our backyards or on our windowsills!"

[The Great Sunflower Project](#) & [The Xerxes Society: Pollinator Citizen Science](#)

Citizen Science is both Place-based and Global...Place-based in that the emphasis is on where you are, what's around you, and how it is all connected, while Global in the sense that you can detect broader/largescale patterns through citizen science crowd-sourced observations.

"Citizen science is a great tool for helping make connections between people, species, & ecosystems."

Today, we must reconsider our own place in the world...citizen science can help us to better understand these connections so that we can avoid destroying key habitats and work to restore what we can.



Paraphrased Keynote Highlights (continued...)



Why the Beaver should thank the Wolf

Today we are used to Elk and other browsing animals eating vegetation right down to the soil. However, they behaved much differently when wolves were around. Elk were constantly on the move, only stopping for a bite or two here and there, and always vigilant of their surroundings to avoid becoming prey to the wolf.

The presence of the wolf therefore changed the behavior of the elk, which in turn allowed the vegetation to grow nice and tall, providing shelter for beavers.

Beavers have an incredible effect on the hydrologic landscape. They build dams which helps keep rivers clean by slowing down the water, which in turn causes it to cool and gives it time to percolate down into the water table, lessening the effects of drought.



Wolves change the behaviors of Elk, which benefits the beaver, the actions of beavers benefit the entire ecosystem.

Paraphrased Keynote Highlights (continued...)

US ecologic decline began when Europeans settled in the Northeast in the 1600s



Spanish colonization of California introduced agriculture which displaced bears

“Sea Otters look cute but they are gangster in how they go about their business”



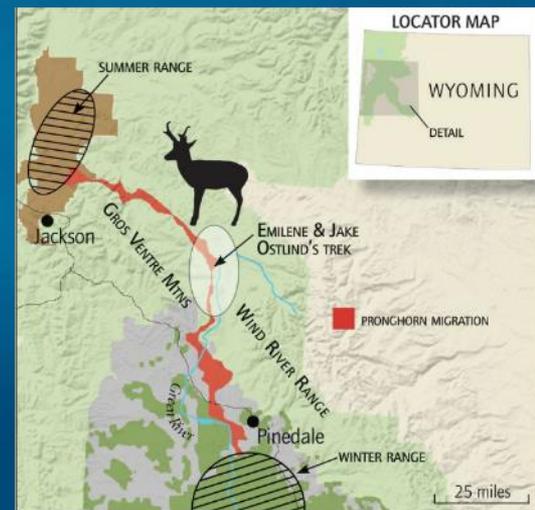
If you weigh all humans and their livestock we would out weight all other forms of life on Earth.



...

*The **Path of the Pronghorn** is a Citizen Science Story, & the subject of Hannibal's book "The Spine of the Continent"*

The Pronghorn Antelope is the only animal in the US whose movement is protected over their entire migratory route (120 miles long).



Paraphrased Keynote Highlights (continued...)

The key to protecting the pronghorn was identifying and protecting the wildlife corridors, because in order for nature to persist it must be able to move.

The Sky Island Alliance is working to protect wildlife corridors in Arizona, New Mexico, and Mexico.

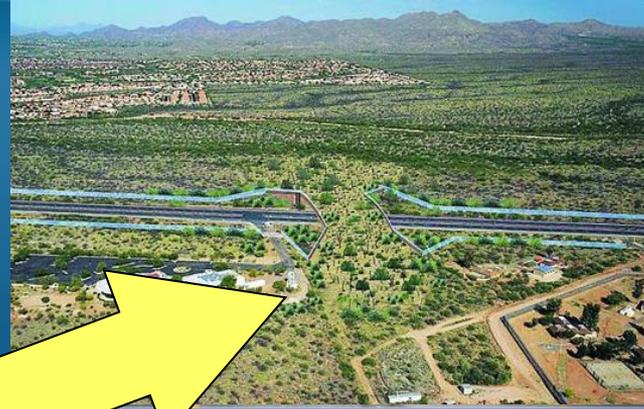


Citizen scientists, trained to identify the tracks & scat of wildlife, are helping to gather information on where animals are going, and which habitats they are using.





© Sky Island Alliance



Renderings © Coalition for Sonoran Desert Protection

This information can then be used to create habitat bridges over roadways enabling wildlife to migrate without being hit by cars.



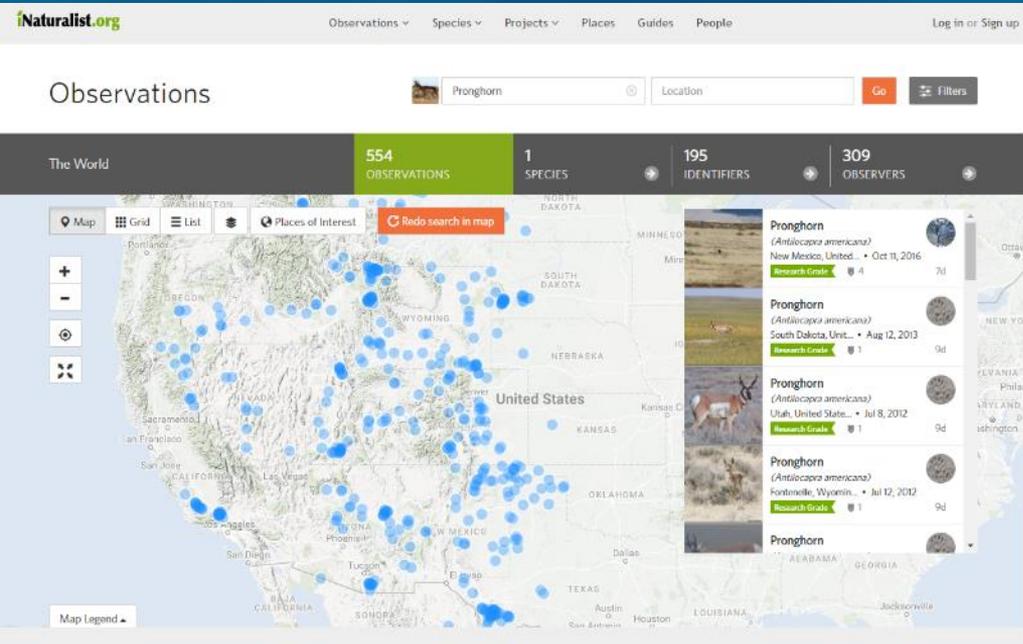
Paraphrased Keynote Highlights (continued...)



Citizen Science apps like iNaturalist are being used to connect People to Nature through Technology

Citizen Science enables spatial and temporal sampling at a scale that isn't possible any other way

It can be used to study (and establish) the distribution and range of a species, like the Pronghorn...



or track the spread of a disease, like Sea Star Wasting Disease



Paraphrased Keynote Highlights (continued...)

Layers of dust from Arizona cause Colorado snow to melt faster, which in turn allows flowers to bloom earlier, unfortunately these system changes are happening too quickly as the pollinators aren't ready yet



Rachel Carson was a citizen scientist, and used citizen science data to make the case for Silent Spring

2nd Annual
CITIZEN SCIENCE
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LIGHTNING ROUND
PRESENTATIONS

5 minute presentations
given back to back, without Questions from the Audience

Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

Lightning Round Presentations

Citizen Science is Community Service

by Rosalind Helfand – *West Hollywood College Preparatory School*

Linking Education, Conservation, & Resource Management through Citizen Science

by Kaitlin Magliano & Chris Halsch – *Crystal Cove Alliance*

Sand Crab Monitoring as a Way to Engage the Community

by Taylor Spesak & Keara Tusso – *Heal the Bay's Santa Monica Pier Aquarium*

Water Quality Monitoring of 303(d) Listed Streams in the San Bernardino National Forest

by Sherri Craig¹, Jennifer Byler¹, & Bill Wells² – *Fisheries Resource Volunteer Corps¹ & U.S. Forest Service²*

Ocean Water Quality Monitoring in San Clemente

by Lisa Kerr & AP Environmental Science Students – *San Clemente High School*

Citizen Scientists Track Reef Health in California

by Katie Kozma & Jan Freiwald – *Reef Check Foundation*

Organizing a Watershed-Wide Citizen Science Network

by Erika Presley & Erin Snyder – *Riverside-Corona Resource Conservation District*

Lightning Round Presentations (continued)

Estimating Urban Carnivore Populations Using Noninvasive Techniques via Camera Traps

by Korinna Domingo – Santa Monica College

Southern California Bottlenose Dolphin Catalog Project for Citizen Scientists

by Margaret Snelgrove & Kera Mathes – Aquarium of the Pacific (AOP)

Ghost Gear, the Damage Abandoned Fishing Gear Causes

by Kurt Lieber – Ocean Defenders Alliance

Personal Impact & Awareness:

A Case Study Examining the Effects of Citizen Science Involvement

by Lynn Massey, Heidi Ziegler, Cassandra Davis, Jennifer Lentz, & Peggy Morrison – Aquarium of the Pacific (AOP)

Ocean Sanctuaries: Marine Citizen Science in San Diego

by Bridget Altman – Ocean Sanctuaries

Catalina Marine Society Projects

by Karen Norris – Catalina Marine Society

Snapshot Cal Coast:

Mobilizing Community Members to Document Species Ranges Along the California Coast

by Alison Young & Rebecca Johnson – California Academy of Sciences

Rosalind Helfand

Citizen Science
is Community Service



Citizen Science is Community Service

by Rosalind Helfand; *West Hollywood College Preparatory School*

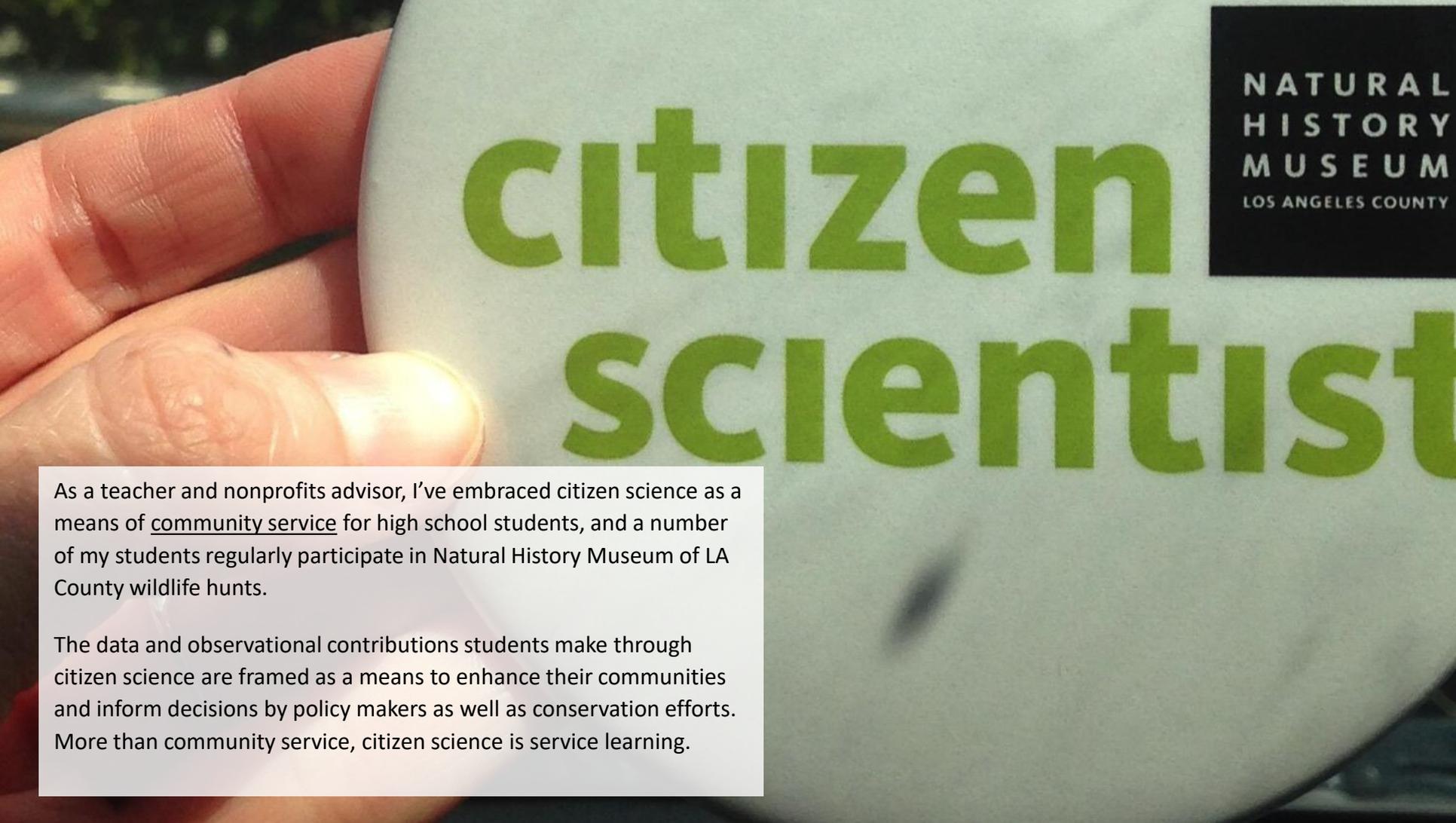
As a teacher and nonprofits advisor, I've embraced citizen science as a means of community service for high school students, and a number of my students regularly participate in Natural History Museum of Los Angeles County wildlife hunts. Citizen science presents a unique opportunity for high schools and their students to engage in service. The data and observational contributions students make through citizen science are framed as a means to enhance their communities and inform decisions by policy makers as well as conservation efforts. More than community service, citizen science is service learning. Students learn about science while completing their service and gain skills that they can share with others when engaged in citizen science programs. Connecting with high schools through their community service programs is also a great way for citizen science programs to expand their outreach, impact, and longevity.

A young woman with glasses, wearing a red t-shirt with an American flag patch and a patterned baseball cap, is crouching in a field of succulents. She is holding a plant specimen with small brown flowers. The background is filled with various types of succulent plants under bright sunlight.

Citizen Science is Community Service

Aquarium of the Pacific's 2nd Annual Citizen Science for
Conservation in Southern California Symposium

March 4, 2017

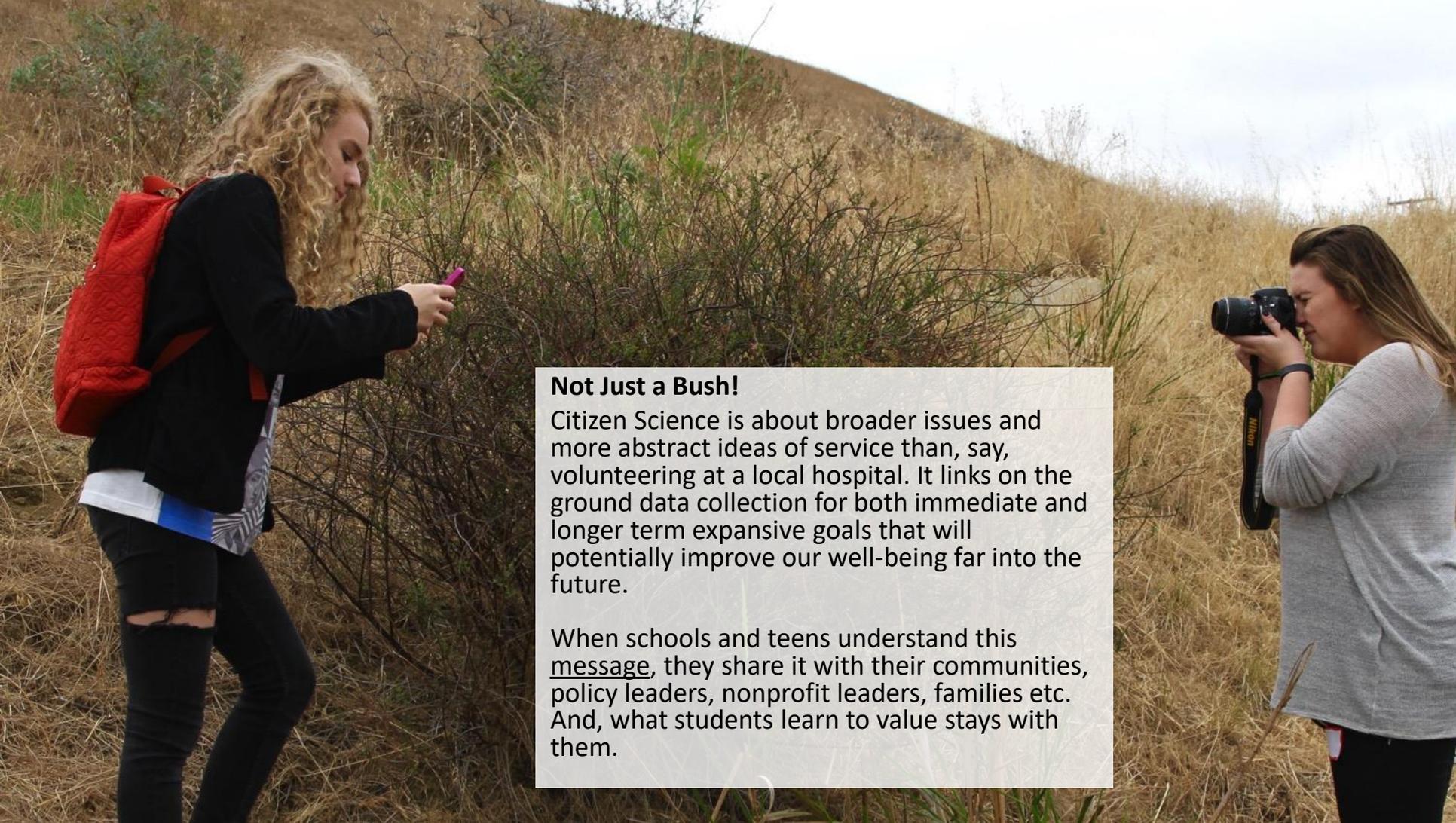


citizen scientist

NATURAL
HISTORY
MUSEUM
LOS ANGELES COUNTY

As a teacher and nonprofits advisor, I've embraced citizen science as a means of community service for high school students, and a number of my students regularly participate in Natural History Museum of LA County wildlife hunts.

The data and observational contributions students make through citizen science are framed as a means to enhance their communities and inform decisions by policy makers as well as conservation efforts. More than community service, citizen science is service learning.



Not Just a Bush!

Citizen Science is about broader issues and more abstract ideas of service than, say, volunteering at a local hospital. It links on the ground data collection for both immediate and longer term expansive goals that will potentially improve our well-being far into the future.

When schools and teens understand this message, they share it with their communities, policy leaders, nonprofit leaders, families etc. And, what students learn to value stays with them.



It's important to talk about Citizen Science as Community Service with school administrators, teachers, and parents. Make the connection.



Reaching Out to Schools: Identify the Community

- Relationship with volunteerism
- Motivations for community service
- Level of parental support
- Mobility and weekend activities ability

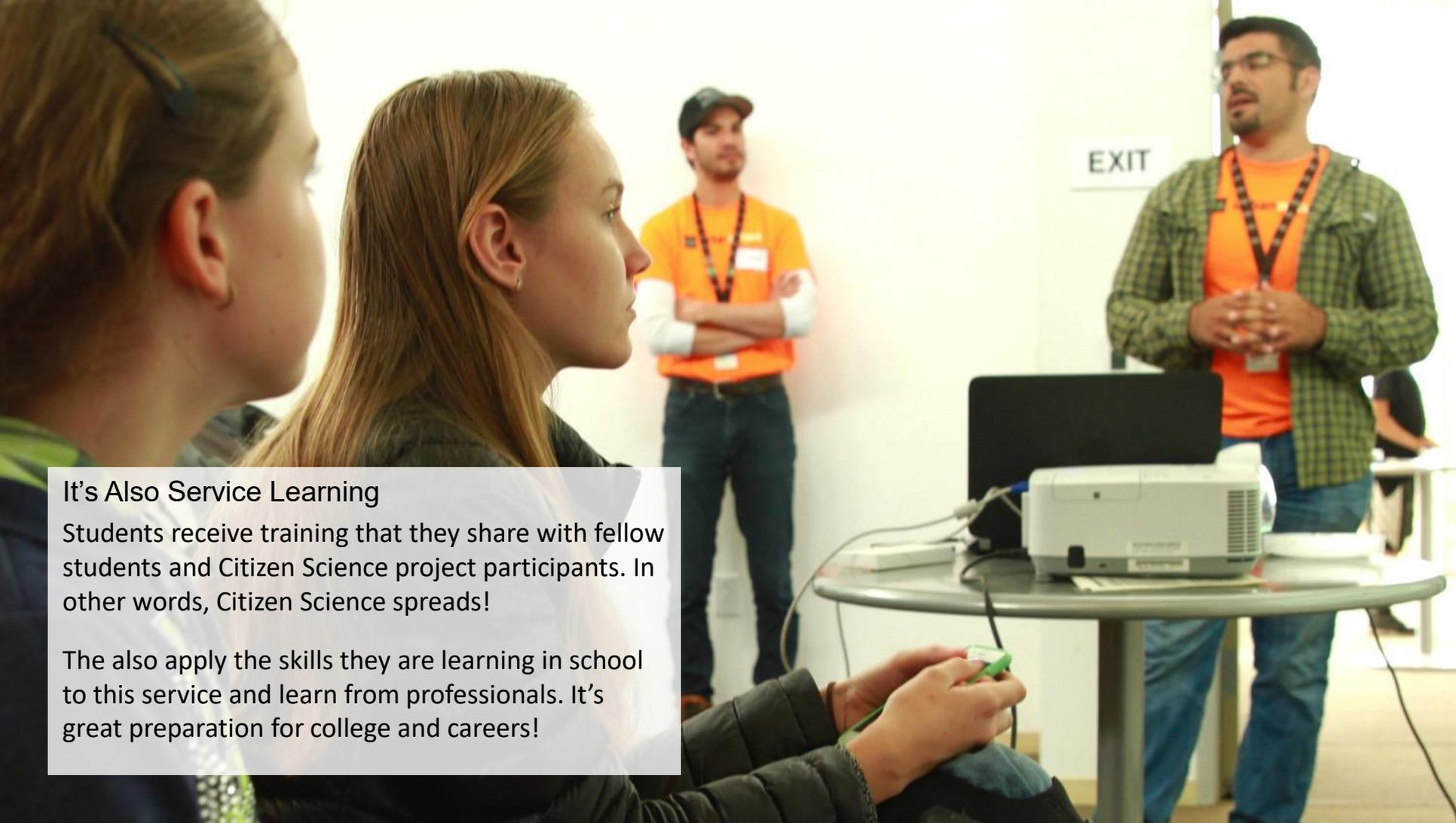


Benefits for Students:

- Mentoring from staff & involved teachers
- Education / science experience
- Connecting local actions with wider community needs and goals
- Learning the spirit of volunteerism
- Connecting with communities
- Can lead to other more involved service projects

Motivations for Students:

- Community service hours and college application material
- Outdoor / adventure time
- iNaturalist entries fun galore
- Friends and food!
- Independence
- Sought after one-on-one time with educators
- Applied science and experience wildlife are fun!



It's Also Service Learning

Students receive training that they share with fellow students and Citizen Science project participants. In other words, Citizen Science spreads!

The also apply the skills they are learning in school to this service and learn from professionals. It's great preparation for college and careers!



And Students Get to Work in the Field
Students get an idea of what it's like to work
in the field, engage in team work, and are
mentored in a community service context.

Mentoring = Longevity & Impact

Students are mentored by staff and other volunteers at citizen science events. These mentors aren't just teachers-- they are role models and a window to the possibilities for careers in science and conservation, as well as what it means to be an adult who is thinking about the connections between citizen science, social justice, urban planning and conservation.



Working with Schools

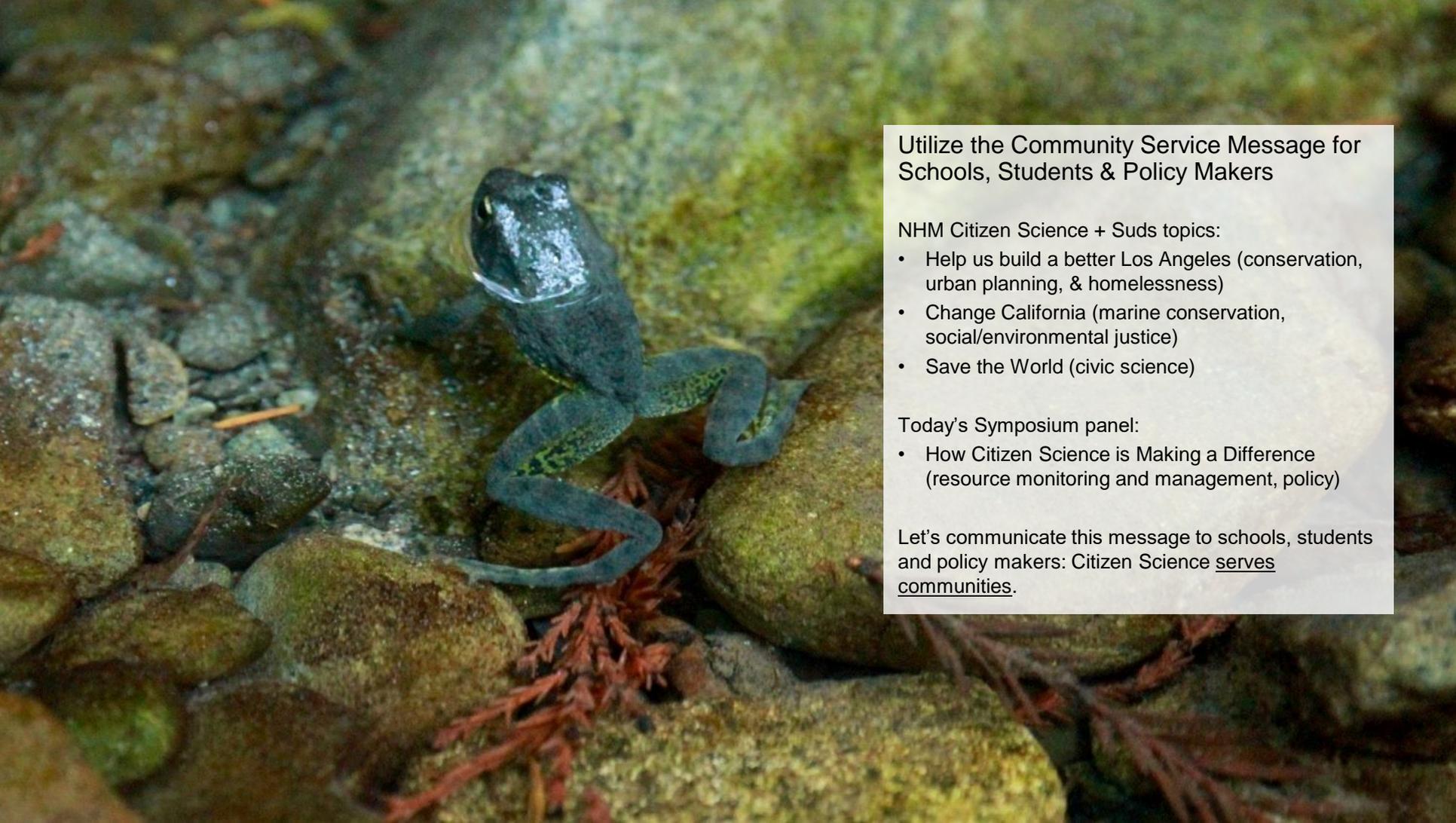
Benefits for Schools:

- Expands their community service programs
- Expands community partnerships
- Ties together classroom learning and field experiences
- Potentially connects and increases learning in several disciplines: science, government, social studies, history, and civics

(Overcomable) Challenges in Working with Schools:

- Undefined support for community service programs
- Overextended teachers
- Establishing a relationship with the institution





Utilize the Community Service Message for Schools, Students & Policy Makers

NHM Citizen Science + Suds topics:

- Help us build a better Los Angeles (conservation, urban planning, & homelessness)
- Change California (marine conservation, social/environmental justice)
- Save the World (civic science)

Today's Symposium panel:

- How Citizen Science is Making a Difference (resource monitoring and management, policy)

Let's communicate this message to schools, students and policy makers: Citizen Science serves communities.

Connecting with City Hall: Park La Brea News / Beverly Hills Press

Ten citizen scientists got their hands dirty and their minds blown as they documented wild life and plants in an urban environmental outing on Aug. 8. The event, dubbed #BioBlitzLA, co-hosted by Los Angeles City Councilman Paul Koretz and the Los Angeles County Natural History Museum is part of a year-long effort to bio-diversify the city.



Nicole Rudenky, 11, of West Hollywood College Preparatory School, studied insects at the #BioBlitzLA event on Aug. 8 at Los Angeles City Hall. (photo by Rosalind Helfand)

Scientists from the Natural History

Museum
on what
surround
loose wit
to photog
social me
logged in
Museum

"Most people have no idea that there are more than 1,500 plants here that exist nowhere else in the world, along with animals that rely on those plants and live only in Los Angeles," Higgins said. "Additionally, our biodiversity hotspot is under threat because of the city around us, and it is important to us to save it."

maps all of the data throughout
greater Los Angeles for the public, and
also helps scientists to gain a better

understanding of nature in the city.

"Before this weekend, there were only two observations from the city hall area, but now we have close to 150," said Lila Higgins, manager of the citizen scientist program at the Natural History Museum. "There is so much living there and we walk by it on a regular day and don't even realize it. I would like to go back a month, or even a year from now, to see what all has changed and how it compares."

The information that is collected by the citizen scientists through these programs is very valuable to the Natural History Museum, its scientists and urban developers as they seek to build a city that is better for both humans and wildlife in the future. To date, more than 1,000 citizen scientists have submitted their observations.

"As a changing climate becomes more and more apparent, through the drought, wildfires and increasing extreme storm events, it is vital to catalog the plants and animals with whom we share Los Angeles, so we know what else we have to lose if we do not take action more quickly," Koretz said.

The opportunity to be a citizen scientist in Los Angeles is very special, according to

in and around city hall in preparation for #BioBlitzLA, resulting in a collection of more than 100 species of insects. Of their findings, Higgins was most excited about micro-wasps, which are about the size of a pen-head and have metallic, alien-like features.

"Because we had no traps in the middle of downtown Los Angeles, we wanted to show all of the species that exist in that area. There is even a possibility of a new species existing there," Higgins said. "Even as a nature advocate who is always walking around the city, there were way more species than I thought would be there."

While the citizen scientist events typically receive a higher attendance, Higgins was happy with the turnout – especially in the case of Michael Gronwold, a seasoned citizen scientist with a specialty in butterflies, and Rosalind Helfand, a West Hollywood College Preparatory School teacher that brought four teenage students with her.

What iNat experts want to see

- One species per observation, either grouped (mussel clump) or single animal
- Single animals on simple background
- Good, sharp focus
- Natural color
- Marine animals & plants submerged in water so appearance is natural, not flat or clumped
- Bright even light, no shadows (ok to crop image)
- Subject occupies most of the frame & details
- Multiple images of different views & details
- Use macro for close-up details

Community Service Benefits the Institutions that Support Citizen Science Projects

- Visibility for and connections to where it takes place and who hosts Citizen Science programs – nature and visitors centers, museums, libraries, city hall – the community.
- Long term engagement in Citizen Science programs.
- Recruitment of future staff, volunteers, and visitors.

Kaitlin Magliano & Chris Halsch

Linking Education,
Conservation, &
Resource Management
through Citizen Science



Linking Education, Conservation, & Resource Management through Citizen Science

by Kaitlin Magliano and Chris Halsch; *Crystal Cove Alliance*

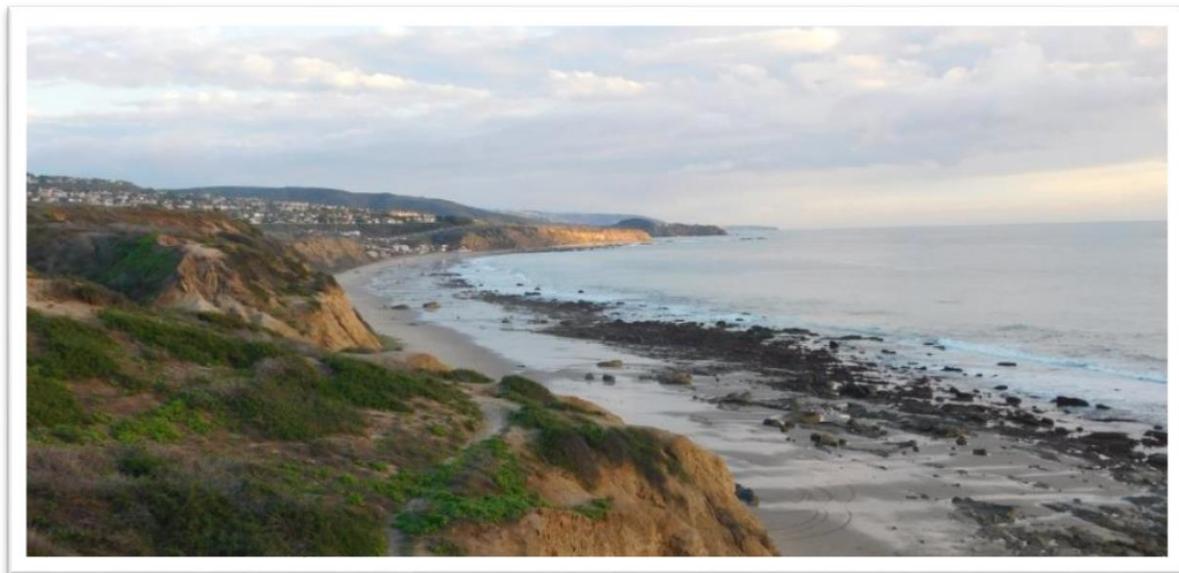
Crystal Cove Alliance is the public benefit nonprofit of Crystal Cove State Park. Crystal Cove is unique in coastal Orange County because of its diverse natural resources, which include 3.4 miles of coastline, 2,600 acres of backcountry, and an 1,100-acre State Marine Conservation Area.

CCA's STEM programs leverage Crystal Cove as an outdoor classroom to immerse students and public park visitors in the science of conservation both on the water and in the backcountry. Learners become citizen scientists and take part in real research projects, designed and run in partnership with university researchers, and help Park managers answer questions about how to improve restoration and conservation efforts in Crystal Cove. CCA's school programs include a suite of pre- and post-trip curriculum that takes them through the scientific process, from conducting background research and forming hypotheses, to analyzing their data and presenting their findings.



CRYSTAL COVE
ALLIANCE

LINKING EDUCATION, CONSERVATION, & RESOURCE MANAGEMENT THROUGH CITIZEN SCIENCE



KAITLIN MAGLIANO & CHRIS HALSCH



CRYSTAL COVE
ALLIANCE

Teacher
Learning
Community

STEM
Education



Research
&
Monitorin
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Resource
Managem
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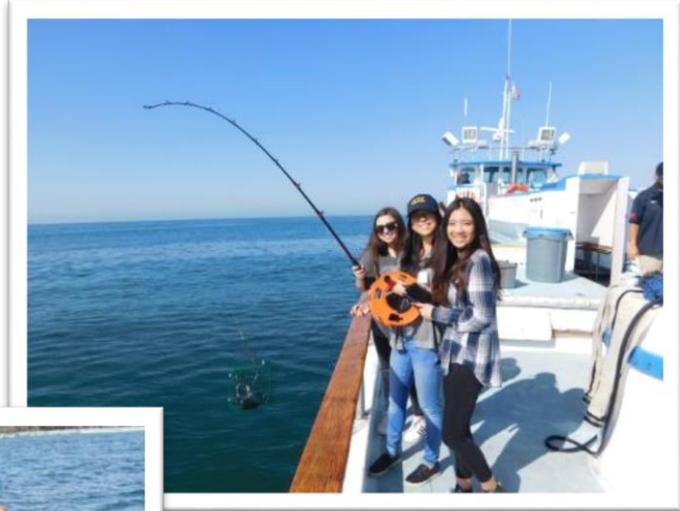


CENTER FOR ENVIRONMENTAL BIOLOGY
FRANCISCO J. AYALA SCHOOL OF BIOLOGICAL SCIENCES
UNIVERSITY of CALIFORNIA • IRVINE

Marine Protected Area Citizen Science Cruise



**Plankton
Monitoring**



Digital Fishing



Water Quality



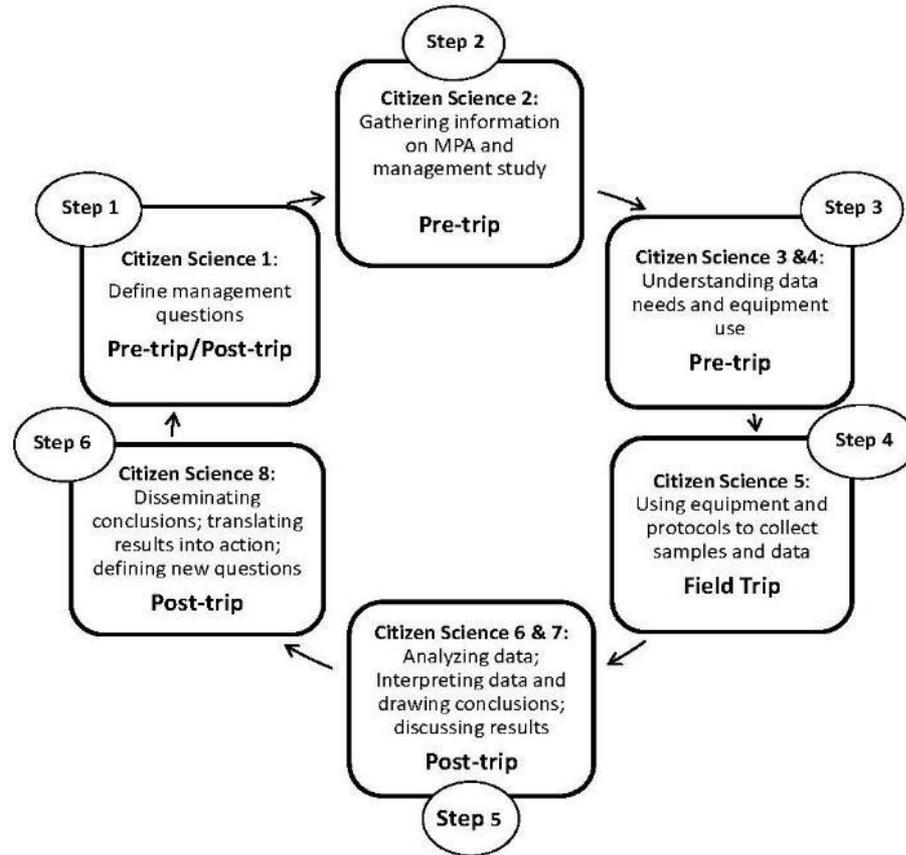
Coastal Field Science Program



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FRANCISCO J. AYALA SCHOOL OF BIOLOGICAL SCIENCES
UNIVERSITY OF CALIFORNIA • IRVINE



What does Citizen Science look like in CCA school programs?



Keara Tusso, Mallory Pinkis, & Adam Wiryadimejo



**Sand Crab Monitoring
as a Way to
Engage the Community**

Sand Crab Monitoring as a Way to Engage the Community

by Taylor Spesak, Keara Tusso, Adam Wiryadimejo, and Mallory Pinkis;
Heal the Bay's Santa Monica Pier Aquarium

At Heal the Bay's Santa Monica Pier Aquarium scientists, interns, and volunteers have been working to engage the community in hands-on science programs by collecting sand crabs (*Emerita analoga*) from the beach. The Santa Monica Pier Aquarium citizen science sand crab monitoring utilizes a modified methodology from the state-wide LiMPETS program, which engages youth along the California coast in real scientific research. Last year, we partnered with the Los Angeles Academy of Arts and Enterprise to help collect data. We use citizen science as an excellent way to engage youth in science and empower them to take action on scientific issues in their community. Our program has been running for roughly 18 months and we have had the opportunity to engage over 500 people with hands on scientific research in this time. Moving forward, we hope to continue inspiring the youth about the importance of scientific discovery!

Sand Crab Monitoring as a Way to Engage the Community About Ocean Health



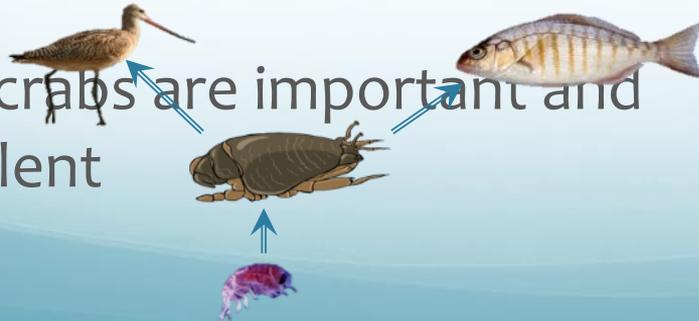
Keara Tusso, Adam Wiryadimejo, Mallory Pinkis
Courtesy of: Taylor Spesak, Catherine Hoffman
Heal the Bay & Santa Monica Pier Aquarium



Acknowledgments: Jessie Altstatt (LiMPETS), Jose Bacallao, David DeFrenza & the Los Angeles Academy of Arts and Enterprise, Candice Sunderland, Jenn Swart, Alys Arenas, Travis Legget, Jackie Cannata, & the numerous other citizen scientists who have helped us collect data!

Why Heal the Bay & Sand Crabs?

1. How do the populations of ocean organisms reflect changes in ocean water quality and ocean health?
2. How can we connect the community to the importance of a thriving ocean?
 - Modified protocol from LiMPETS
 - Sand crabs are important and prevalent



What Are We Finding?

Demographics

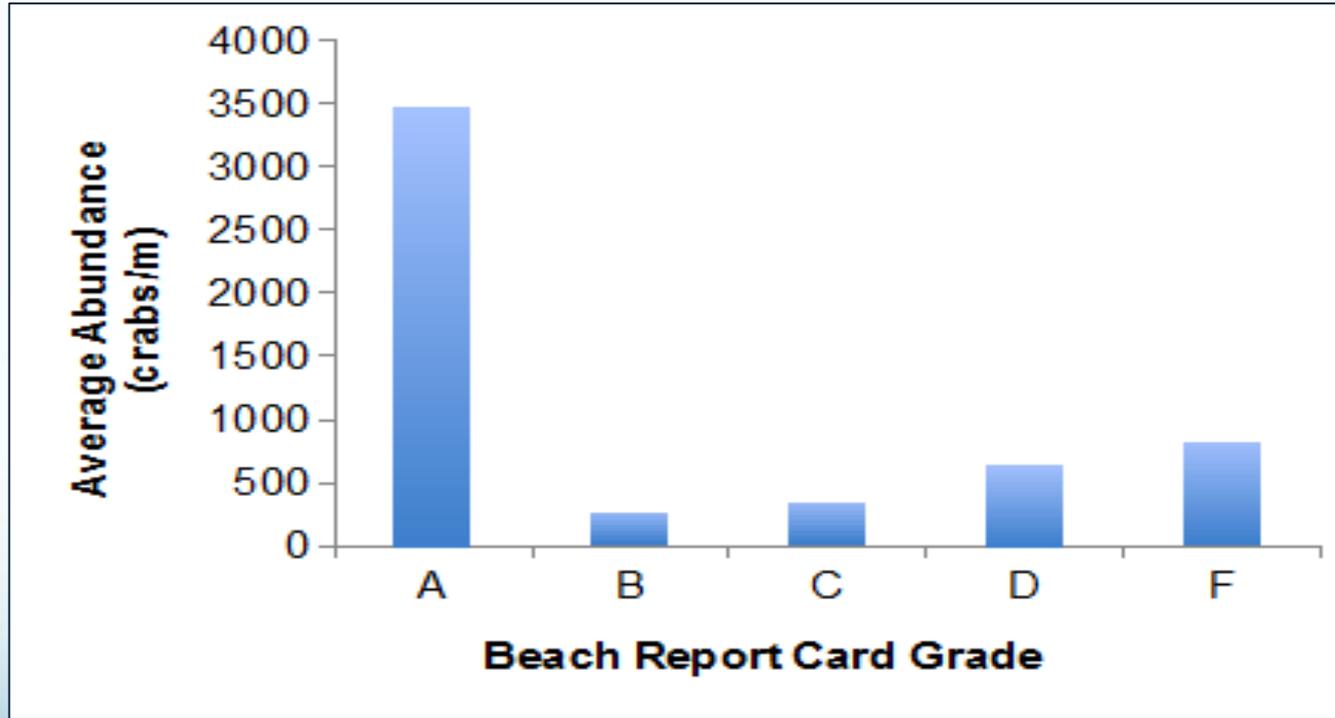
- Abundance, sex, and size.

Environmental Impacts

- Rainfall linked to water quality.



Beach Grade vs. Crab Abundance



Where Can We Go from Here?

- Connect ocean & watershed health indicators to sand crab populations.
- Increase community involvement
 - Appreciate the value of onlooker effects.



Sherrri Craig

**Water Quality Monitoring
of 303(d) Listed Streams
in the San Bernardino
National Forest**



Water Quality Monitoring of 303(d) Listed Streams in the San Bernardino National Forest

by Sherri Craig¹, Jennifer Byler¹, & Bill Wells²; *Fisheries Resource Volunteer Corps*¹ & *US Forest Service*²

The San Bernardino National Forest currently has twelve streams on the 303(d)-impaired waters list that are not meeting quality standards. Many of the listed streams have not been monitored or assessed in over 10 years. In addition, some of the streams were not sampled on public land managed by the San Bernardino National Forest.

This monitoring effort is providing an updated set of water quality data collected within the boundary of the San Bernardino National Forest utilizing trained volunteers.

We are in the early stages of this project, which is a two-year on going monitoring effort; our presentation will share the initial coordination of obtaining necessary equipment, training of volunteers and initial data results. It is our hope that many if not all of these streams and rivers can be delisted within the boundary of the National Forest.

The background is a light blue gradient with several realistic water droplets and bubbles of various sizes scattered across it. The main title is centered in a large, bold, blue font.

WATER QUALITY MONITORING

303(D) LISTED STREAMS IN THE SAN BERNARDINO NATIONAL FOREST

PRESENTED AT:

2ND ANNUAL CITIZEN SCIENCE FOR CONSERVATION IN SOUTHERN CALIFORNIA SYMPOSIUM

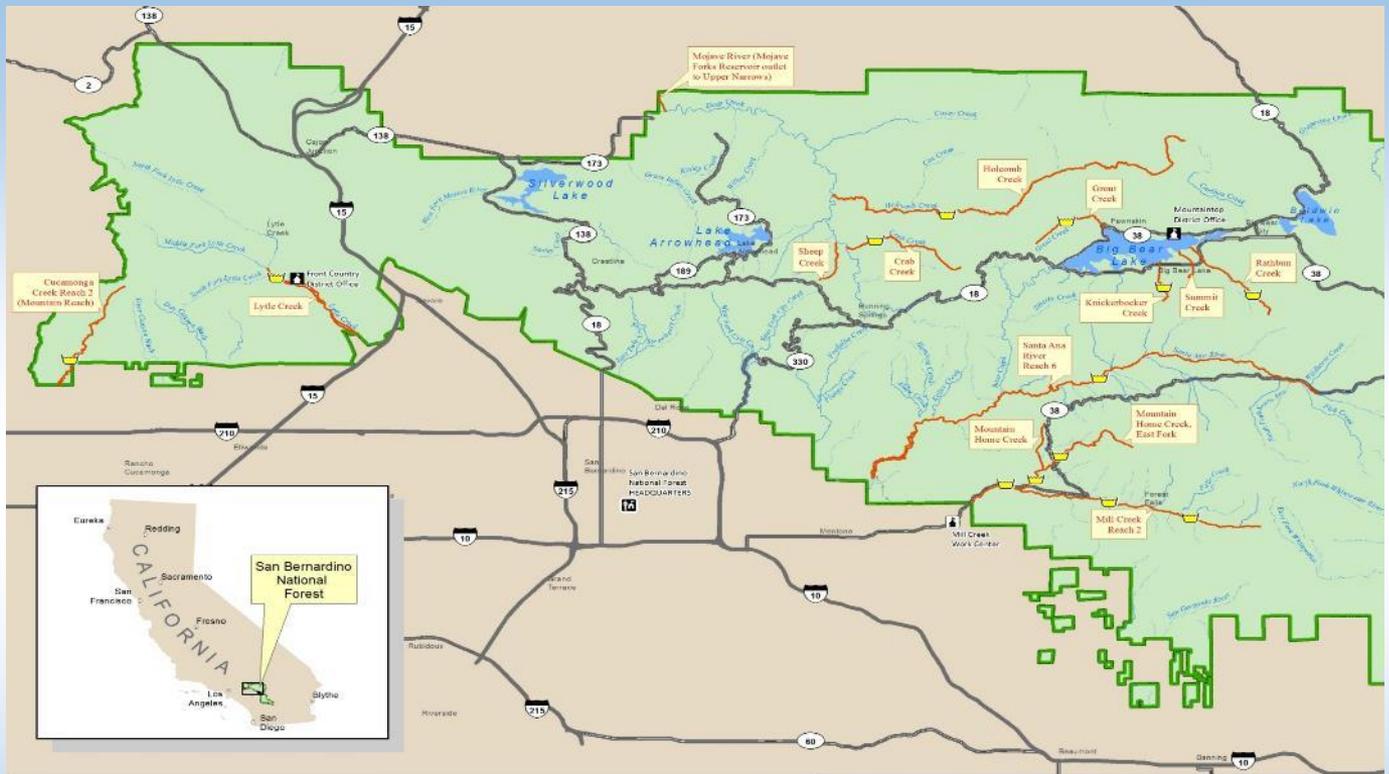
MARCH 4, 2017

San Bernardino National Forest

Contains 12 streams on the 303(d) List

Most Streams not Monitored or Assessed in 10 Years

Subwatershed	Stream	Pollutant
Big Bear Lake	Grout Creek	Nutrients
	Knickerbocker Creek	Pathogens
	Rathbone (Rathbun) Creek	Nutrients, Cadmium, Copper, Sedimentation/Siltation
Santa Ana River	Santa Ana River (Reach 6)	Cadmium, Copper, Lead
Holcomb Creek	Holcomb Creek	Total Dissolved Solids
Upper Deep Creek	Crab Creek	Total Dissolved Solids
	Sheep Creek	Nitrate, Total Dissolved Solids
Mill Creek	Mill Creek	Pathogens
	Mountain Home Creek	Pathogens
	East Fork Mountain Home Creek	Pathogens
Cajon Wash – Lytle Creek	Lytle Creek	Pathogens
Upper Cucamonga Creek	Cucamonga Creek (Reach 2)	pH

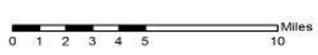


Legend

- Impaired 303d Stream
- Proposed Sampling Point
- Forest Boundary
- Forest Headquarters
- Ranger Station
- Work Center
- Lake/Reservoir
- Perennial Stream
- - - Intermittent Stream
- - - - - Ditch/Stormwater
- Aqueduct
- Artificial Flap/Connector
- Pipeline/Underground Conduit
- Interstate
- State Highway

**303d Streams
San Bernardino National Forest**

Date: 2/16/2017



The Project is...

- Providing an updated sample set of water quality data within the San Bernardino National Forest
- Utilizing trained volunteers
- Samples field tested for, pH, dissolved oxygen, conductivity, salinity, alkalinity, turbidity & temperature





Volunteers trained to collect & process samples under the direction of US Forest Service Hydrologist, Bill Wells

Processing Stream Samples for E. coli and Total Coliform Counts

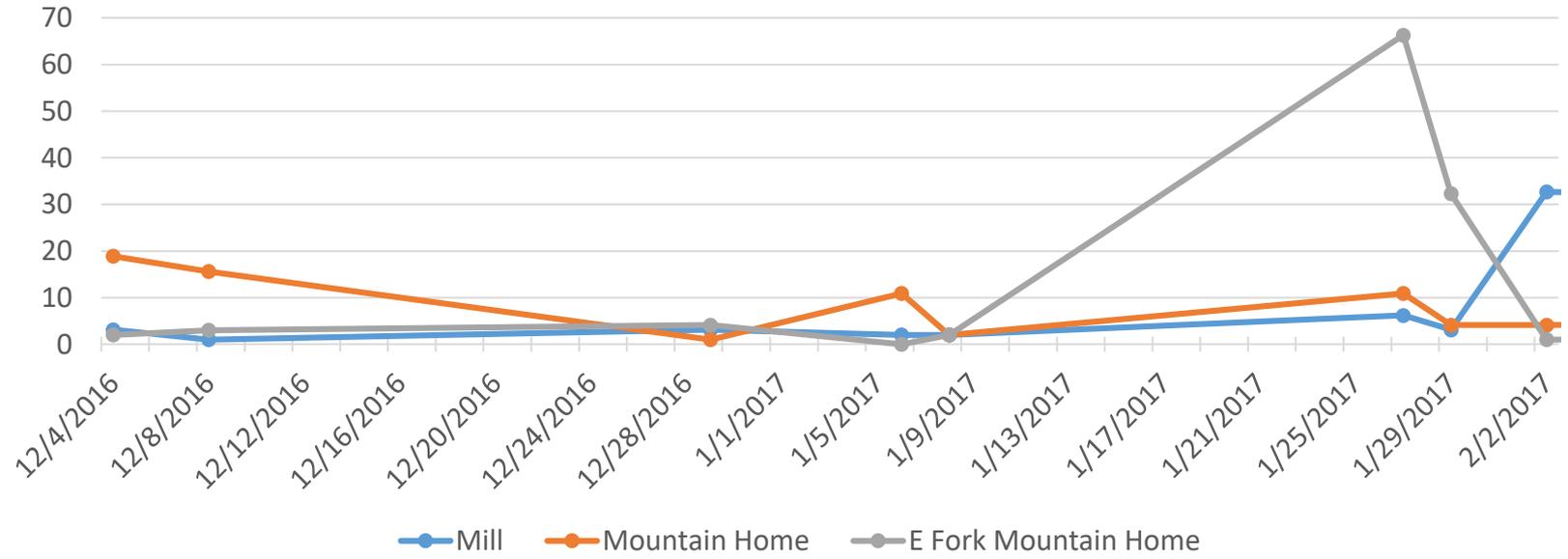


Volunteers preparing bacteria sampling and analysis using Idexx Colilert-18 test

Initial Results on Mill Creek Sub-Watershed

Mill Creek - Mountain Home Creek - East Mountain Creek

E. coli; MPN/100 mL



The Project will...

Answer the following questions:

- Are the practices or activities of the San Bernardino National Forest supporting designated beneficial uses of the water
- Is water being maintained of sufficient quantity and quality to sustain aquatic life and support terrestrial habitats, domestic uses, recreation opportunities, and scenic character





Fisheries Resource Volunteer Corps

- Established in 1994 as a volunteer program
- Operate under the United States Forest Service “Volunteers in the National Forests Program”
- Nonprofit 501(c)(3) Public Benefit Corporation for Charitable and public purposes
- Primary mission to protect and monitor 12 wild trout streams and 4 tributaries within the Angeles and San Bernardino National Forests

Protect Monitor and Educate

Mission of the FRVC

- **Protect** - Regular stream patrols, provides high visibility to the forest visitor while ecosystems are being monitored and protected.
- **Monitor** - Monitoring the streams by documenting resource and enforcement problems encountered while on stream patrols.
- **Educate** - Educating the public concerning habitat and watershed conservation, camping, fire and safety regulations, as well as, special fishing regulations for streams with “wild trout” designation.

Other Projects of Interest - Conservation, cleanup, construction and maintenance projects for the Forest Service and survey projects for the California Department of Fish and Wildlife.

Find out more about us at www.FRVC.net

Thank You to Our Partners

- Erick Burren
 - Senior Environmental Scientist (Specialist)
 - State Water Resources Control Board
 - Clean Water Team-Citizen Monitoring Coordinator
- Renee Spears
 - QA Officer – State DMR – QA Coordinator
 - State Water Resources Control Board
- Santa Ana and Lahontan Regional Water Quality Control Boards
- Bill Wells
 - Hydrologist/Project Manager
 - U.S. Forest Service, San Bernardino National Forest
- Fisheries Resource Volunteer Corps
 - Sherri Craig (Field Team Leader)
 - David Allred
 - Dave Baumgartner
 - Jennifer Byler
 - Alberto Castro
 - Yolanda Miranda
 - Farheen Rizvi
 - Jerry Searcy
 - George Shearer
 - Vince Silverman
 - Aubrey Stack
 - Scott van Beek
 - Tom Walsh

**Lisa Kerr's
AP Environmental Science Students
Sara Barnes, Colby Bertrand,
Gabriel Chadsey, & Kyle Merrill**



**Ocean
Water Quality
Monitoring in
San Clemente**

Ocean Water Quality Monitoring in San Clemente

by Lisa Kerr and AP Environmental Science Students; *San Clemente High School*

Presented by: Sara Barnes, Colby Bertrand, Gabriel Chadsey, & Kyle Merrill

We have been performing ocean water quality testing for the past 16 years. We test four beaches two times a week and upload the data to a website for community use. The testing is done by high school students and it utilizes the Quantitray method with Enterolert as the nutrient reagent to test for the presence of *Enterococcus* bacteria. We have 16 years of longitudinal data in regards to the water quality of our cities beaches.



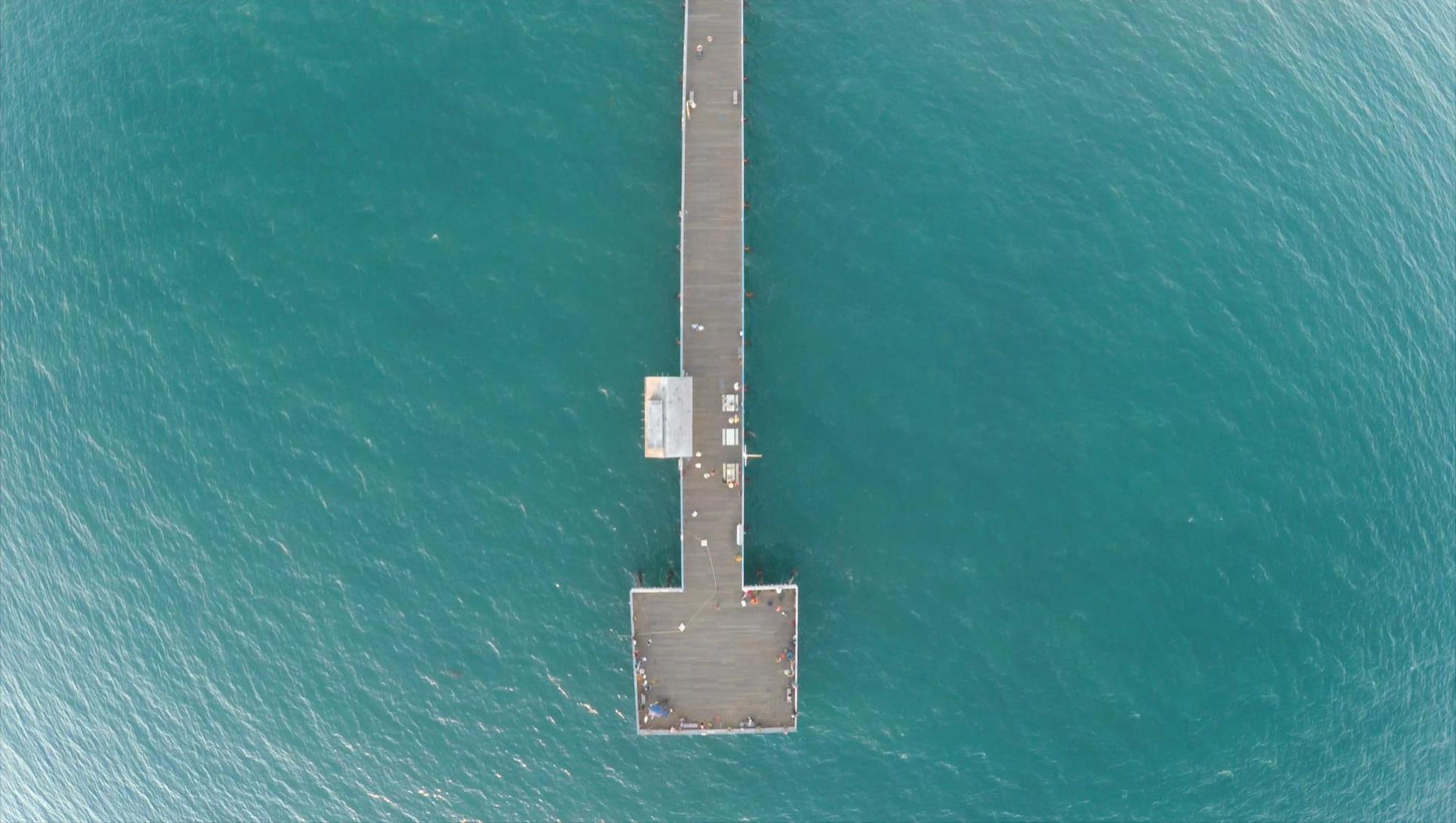
Ocean Water Quality Monitoring in San Clemente

Presented by:

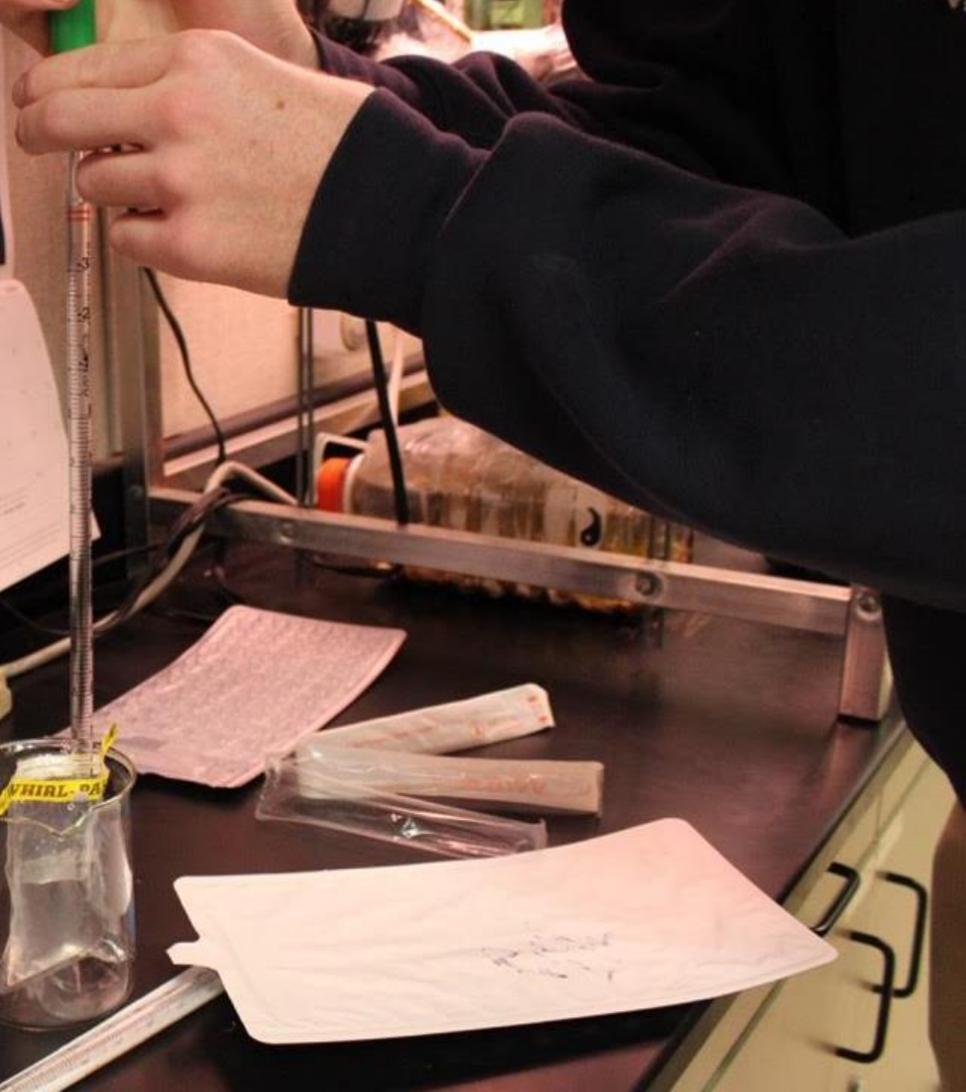
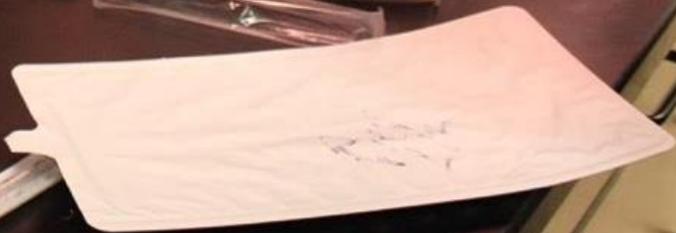
Sara Barnes, Colby Bertrand, Gabriella Chadsey, and Kyle Merrill
under the direction of Mrs. Lisa Kerr

A partnership between San Clemente High School, The Surfrider Foundation, The Ocean Festival, PTSA, & the City of San Clemente

- ❑ At the beginning of this endeavor, The Surfrider Foundation sponsored the water testing. This allowed Mrs. Kerr and her AP/IB Environmental Science students to conduct testing at North Beach, the Pier, Poche, and Riviera. The Surfrider Foundation continues to provide the website where we enter the data, though their funding has been retracted.
- ❑ Presently, project funding is provided by the City of San Clemente, San Clemente High School's PTSA, and The Ocean Festival.











CERTIFICATE
FOR THE
PROTECTION OF
WHALES
AND OTHER
MARINE MAMMALS
ISSUED BY THE
WORLD WIDE FUND FOR NATURE
AND THE INTERNATIONAL WHALING ASSOCIATION

Certificate of Whale Protection
This certificate is issued to the
Whaling Station
for the purpose of
protecting the
Whale

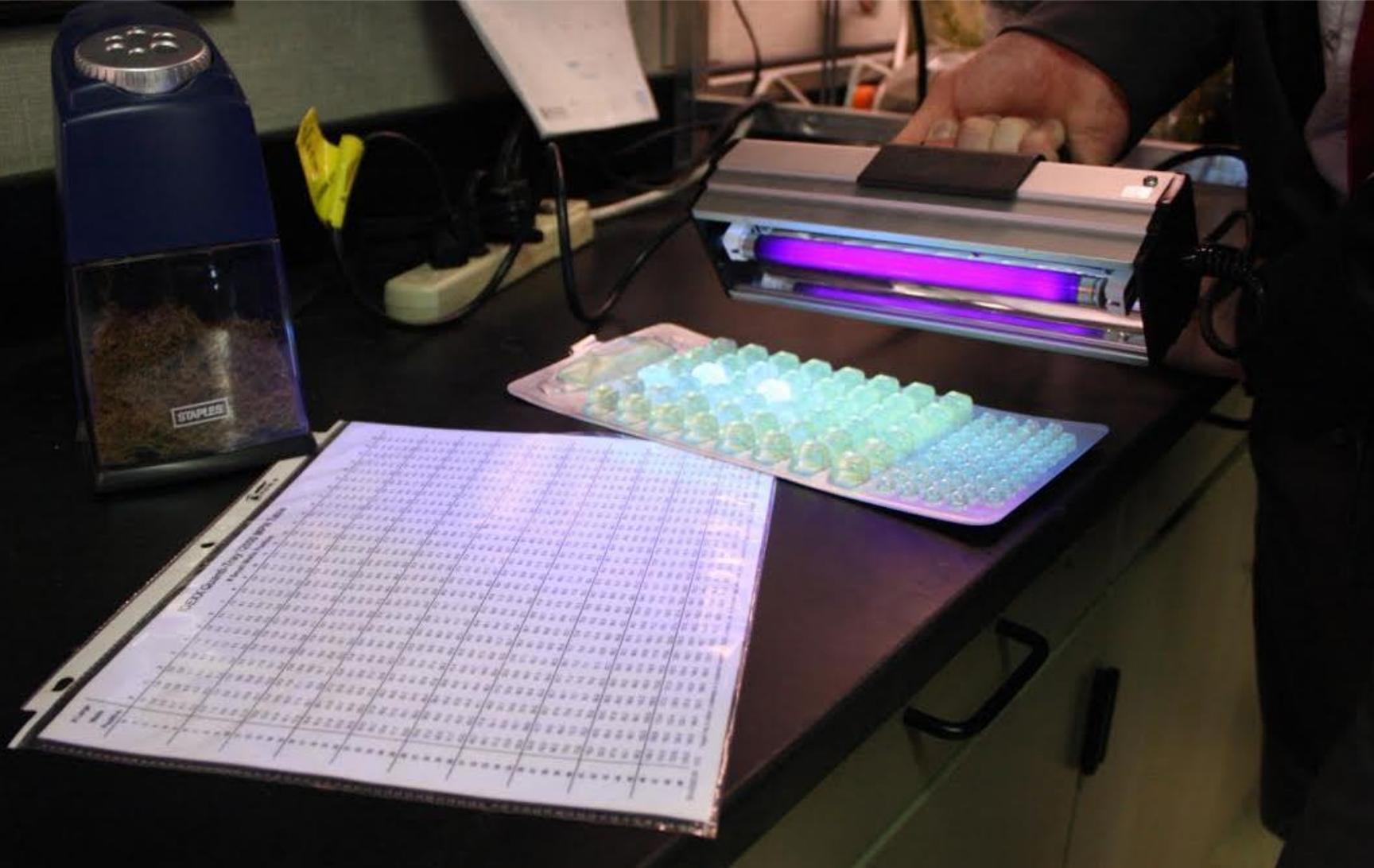
Presented to
of the Award
Name: **Keve**
for the year of

Whales and Other
Marine Mammals

BOEKEL
Boekel Scientific

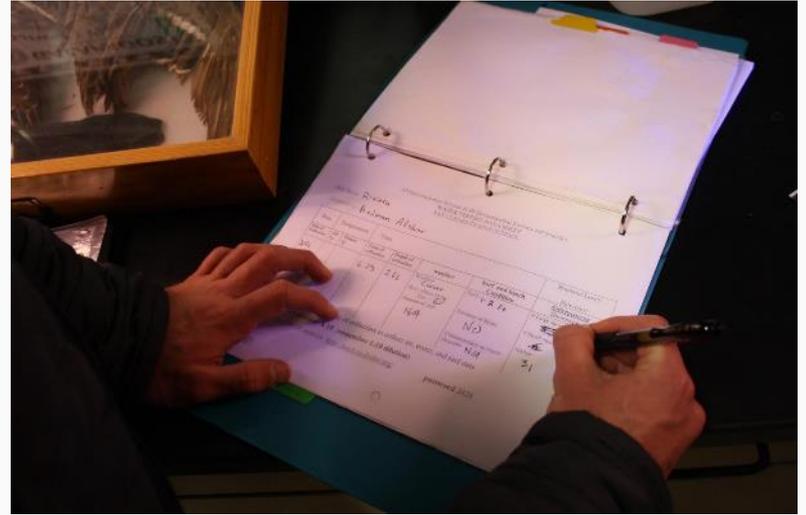
18.5
18.5

Warning
of the
of the



Data

- The sample's location, date, weather conditions, beach condition and bacterial MPN are recorded.
- The weather data includes air temperature, water temperature, precipitation, and general description from the day the sample was taken.
- The bacteria MPN is an estimate of the presence of *Enterococcus* in the water, based off the Quanti-Tray.



BLUE WATER TASK FORCE

[Intro](#)[Resources](#)[Recent Blog Posts](#)[Contact](#)

This is the homepage of the Blue Water Task Force, a global organization which monitors water quality. They have links to access data on many beaches, such as the ones tested by San Clemente High School.

WATER TESTING LABS

CALIFORNIA:

- [Huntington Beach](#)
- [Isla Vista](#)
- [Marin County](#)
- [Newport Beach Chapter-Corona Del Mar HS](#)
- [Newport Beach Chapter-Esperanza HS](#)
- [Newport Beach Chapter-Mater Dei HS](#)
- [Newport Beach Chapter-Newport Harbor HS](#)
- [Newport Beach Chapter-Northwood HS](#)
- [Newport Beach Chapter-Orange HS](#)
- [Newport Beach Chapter-Valencia HS](#)
- [San Clemente HS](#)
- [San Diego](#)
- [San Luis Obispo](#)
- [San Mateo County](#)
- [Santa Cruz](#)
- [Sonoma Coast](#)
- [South Bay](#)

The Blue Water Task Force (BWTF) is the Surfrider Foundation's volunteer-run, water testing, education and advocacy program. Our [chapters](#) use this program to alert citizens and officials in their communities about water quality problems and to work toward solutions. The BWTF has demonstrated success by identifying problems with beach and coastal water pollution, raising public awareness of these incidents and working collaboratively with local stakeholders to find and implement pollution solutions.

Prima Deshecha Landfill- drains into Poche Creek





This is the Leachate pond that did not exist prior to water testing by SCHS students!

where it enters the Pacific Ocean



Poche Clean Beach Project

Co-Sponsored by

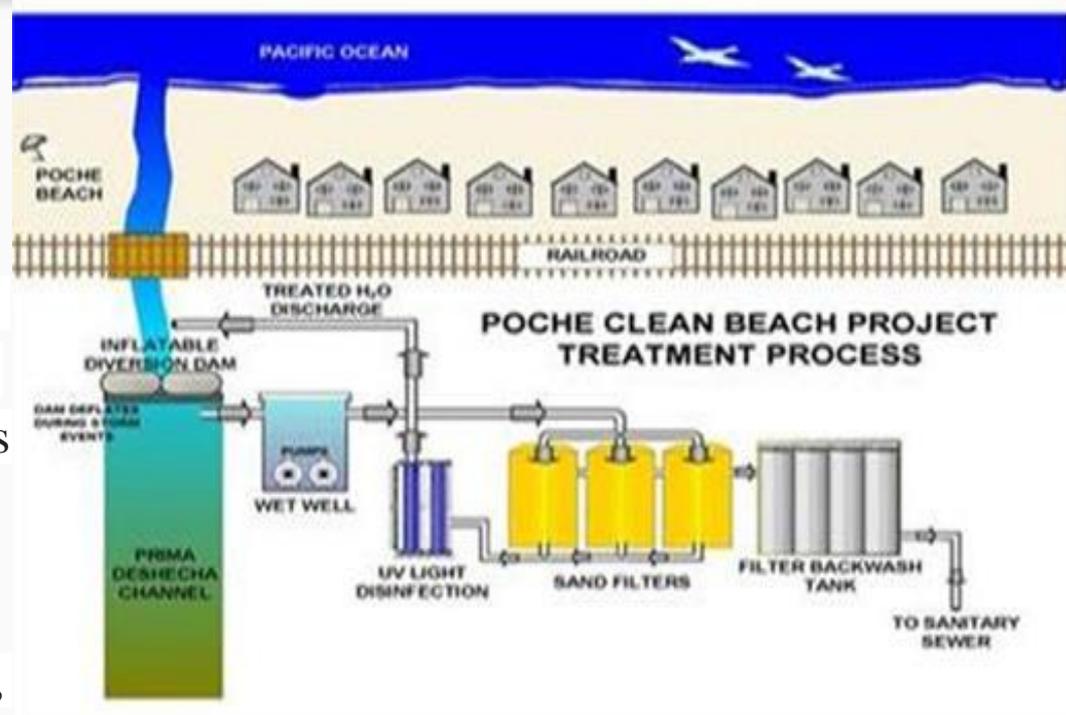


m|ocean

**POCHE CLEAN BEACH
PROJECT OPERATION
IS
SUSPENDED DURING
HIGH TIDE EVENTS**

Poche Water Project

- ❖ The plant treats non-point source runoff
- ❖ It processes runoff from 4,450 acres including a golf course, the landfill, and residential area within the cities of San Clemente, San Juan Capistrano, and Dana Point.
- ❖ The project was completed in 2009, and operational in 2010.



*Poche Clean Beach Project
uses sand filtration and
UV light to treat the bacteria.*

Results from the Poche Water Project

- ❖ From a test conducted on **November 4, 2008**; two years before the plant started operation- after only **½ inch of rain, the MPN was at 24,192.**
- ❖ Safe levels to swim in are <200.
- ❖ The 2008 test indicates extremely high levels of non-point source pollution that is dangerous for beachgoers.
- ❖ On a test conducted on **March 3, 2015**- five years after the plant opened- **after ½ inch of rain, the MPN was only 86.**
- ❖ The paralleling tests prove that the project is exponentially successful at decreasing bacteria levels.

Rain and Runoff: The Most Prominent Factors affecting Bacteria

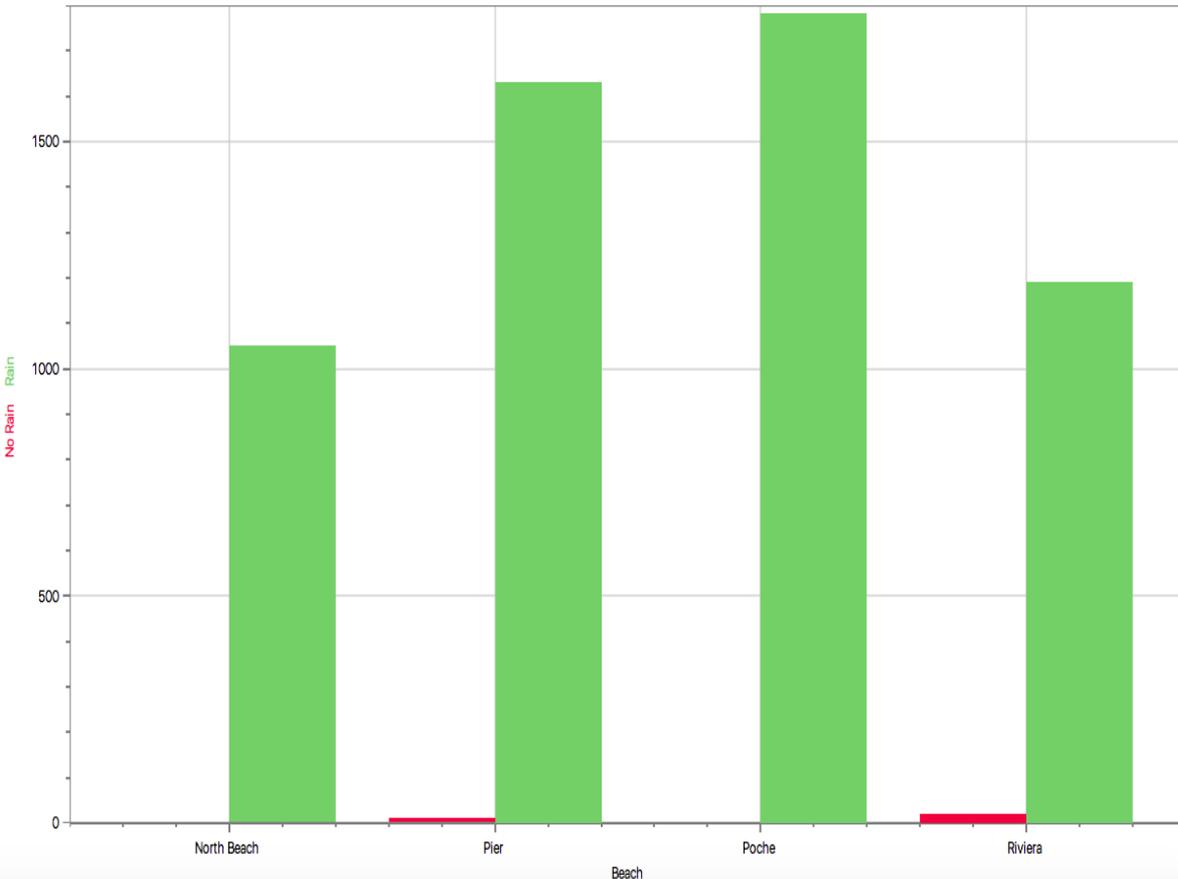
- Non-point source runoff- the chemicals, fertilizers, and waste that collect in the watershed. Rain events flushes this material into the ocean, the areas around the main release points become polluted with the contaminants.
- With urbanization, there is greater surface area for pollutants to collect and less area for it to be naturally processed (ecological service), most of the water flows unchecked and unfiltered, because of the creation of roads and the destruction of watersheds.



Non-point source runoff under San Clemente Pier

From 16 years of collection,
what does the data indicate?

Comparing bacteria levels on days with and without rain



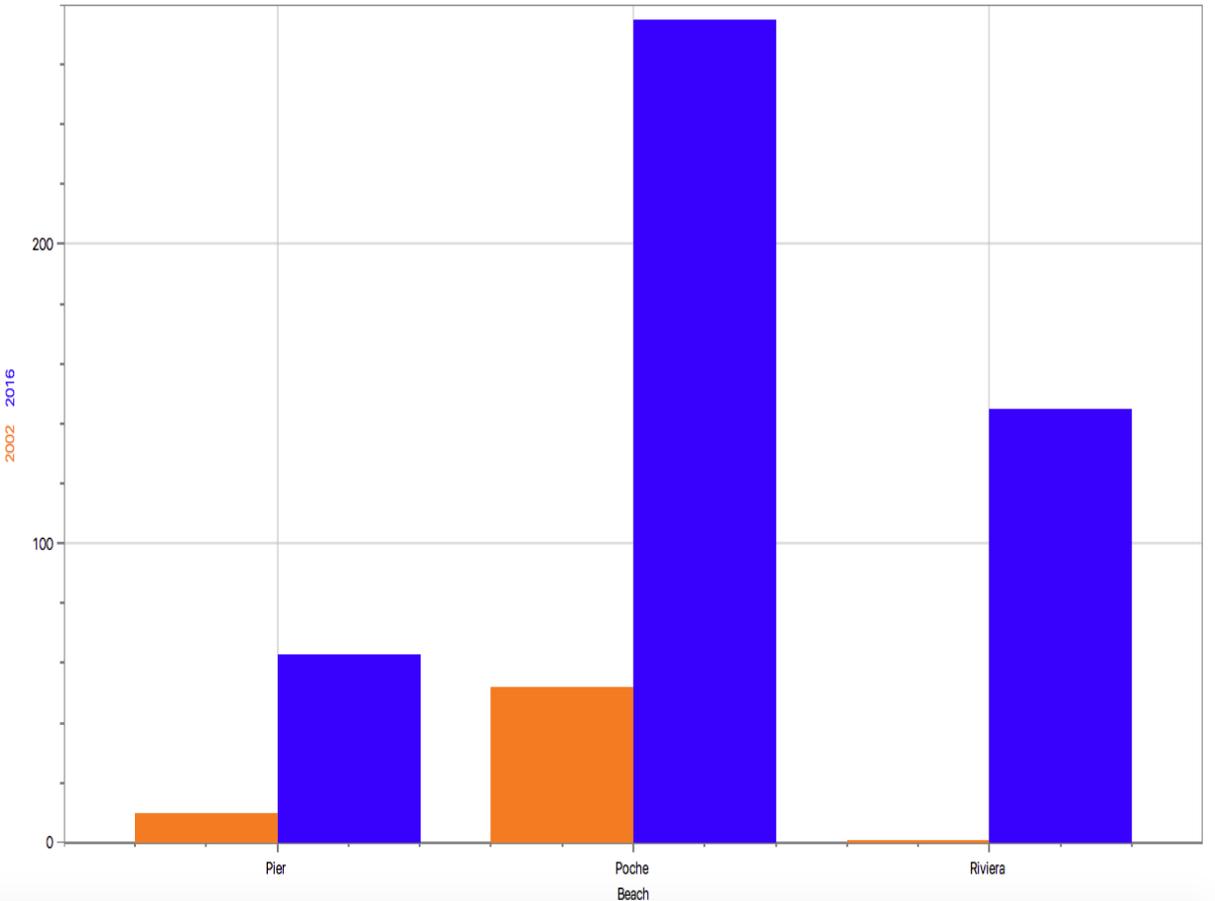
Notes:

- Rainfall if it has rained within the past 24 hours
- Date of sample with no rain (red bar): 9/29/15
- Date of sample with rain (green bar): 1/7/16

Relationship between variables:

More rain means a substantially higher bacteria level.

Comparing Bacteria levels between 2002 and 2016



Notes:

- Both samples were recorded on January 14th of their respective years
- **2002: orange bar**
- **2016: blue bar**

Relationship between variables:

Since 2002, there has been an exponential decrease in the health of our coast water in San Clemente because of further development

Thank you for your time!



Katie Kozma

Citizen Scientists Track Reef
Health in California

Citizen Scientists Track Reef Health in California

by Katie Kozma and Jan Freiwald; *Reef Check Foundation*

Reef Check is an international organization with the mission of empowering people around the globe to save our reefs. The focus of the California program is to improve the health of California's rocky reef and kelp forest ecosystems. This is accomplished by training approximately 300 divers each year to carry out standardized scientific surveys of about 90 sites along the coast and then passing along the data and analyses to state resource managers. Reef Check's volunteer citizen scientists monitor inside and outside of California's network of marine protected areas (MPAs) using scientific protocols. This large scale-monitoring network can be used to identify regional population trends including the effects of local invasive species like *Sargassum horneri*. Based on the presence of this invasive, we've recently changed our monitoring protocols to be able to further quantify how this algal species is changing the dynamics of the ecosystems along the California coast.

Citizen Scientists Track Reef Health in California



Katie Kozma and Jan Freiwald

Citizen Science Symposium

SCUBA Citizen Science Monitoring

- Near shore rocky reef & kelp forest monitoring program started in 2005
- Long term MPA monitoring since 2007
- 90+ sites and surveys done annually statewide
- 275+ participants/year
- 11 years of data collection



Reef Check Training & Surveys for Citizen Scientists

Classroom and Underwater Training

- 4-day rigorous training
- 73 indicator species ID test
- Task-loaded SCUBA tests to learn RCCA standardized scientific protocol

Surveys/Data Collection

- Collect data using standardized scientific protocol learned during training
- RCCA certified divers must be recertified in the protocol every survey season.



Data Processing

- Entered with Quality Control
- Analyses prepared for state resource managers
- Able to identify regional population trends overtime
- All data that is collected is available to the public

<http://data.reefcheck.us/>





Global Reef Tracker

About Reef Check

Tutorial



SELECT A REGION: (select a region)

10447 Reef Check surveys worldwide

Zoom to: search address, hit enter

Getting Started

1. Select a region
2. Select sites and species
3. Click the update button to show your selection on the map

Reference Layers

- Distribution heat map (matching your filters)
- Reef Check survey sites
- California Marine Protected Areas
- California Depth Contours (50 ft)
- US National Marine Sanctuaries

Analysis Tools

Find Coordinates
Measure Distance

Data Entry Portals

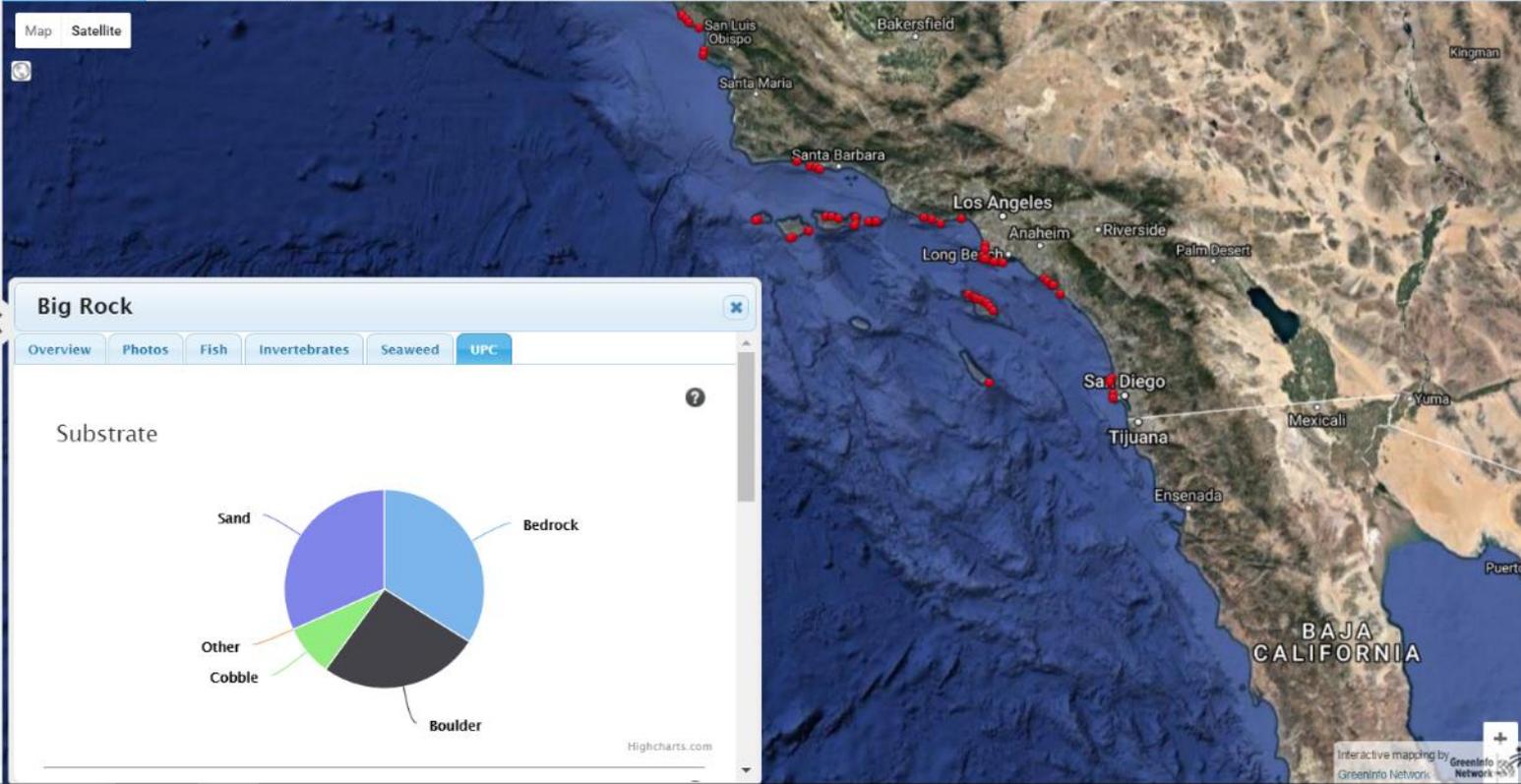
California data entry and photo upload

Monitoring Protocols

California Program
Tropical Program

Distribution Map | Site Comparison | Abundance Graph | Time Graph | Export

Map | Satellite

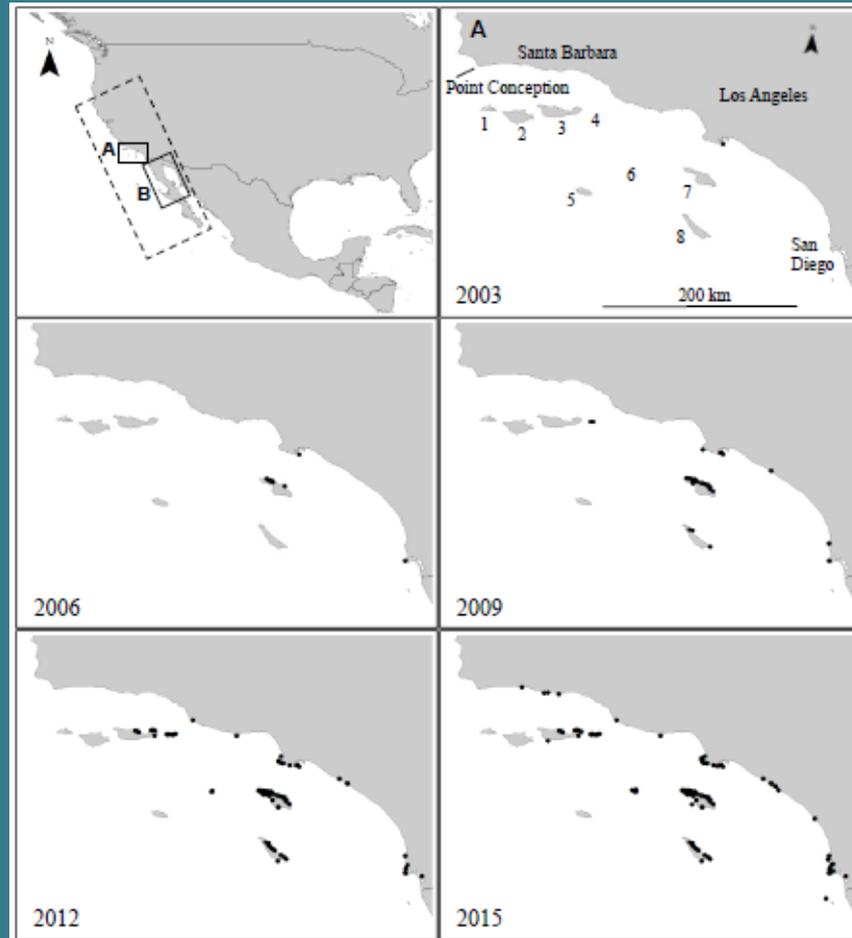


Local Invasive: *Sargassum horneri*

- Changed our protocol to monitor increased presence of this invasive species
- As of 2015, we count individual plants (stipes) at all sites
- Opportunity to capture the spread and effect of an invasive species



Distribution of *Sargassum horneri*



Erika Presley & Erin Snyder

Organizing a Watershed-Wide
Citizen Science Network



Organizing a Watershed-Wide Citizen Science Network

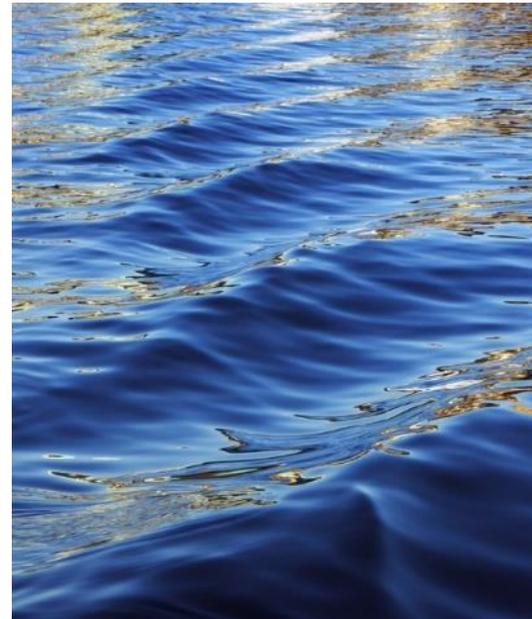
by Erika Presley and Erin Snyder; *Riverside-Corona Resource Conservation District*

The Riverside-Corona Resource Conservation District (RCRCD) through The Southwest Resource Management Association (SRMA) has initiated and is in the process of developing a network of citizen science partners within the Santa Ana River Watershed. The Santa Ana Watershed Citizen Science Network is a collaborative of conservation practitioners, scientists, educators and citizens working to coordinate existing citizen science efforts, create new opportunities, and encourage wider citizen science participation and stewardship among the communities that live, work, and play in the Santa Ana Watershed. The Santa Ana Watershed Citizen Science Network intends to facilitate a collaborative and cohesive network for watershed-wide citizen science participation, aimed at engaging communities, classrooms and individuals in the monitoring and protection of the Santa Ana River and its ecosystems. This talk will focus on why a watershed-wide approach to Citizen Science is beneficial and how it can be done.

Organizing a Watershed-Wide Citizen Science Network

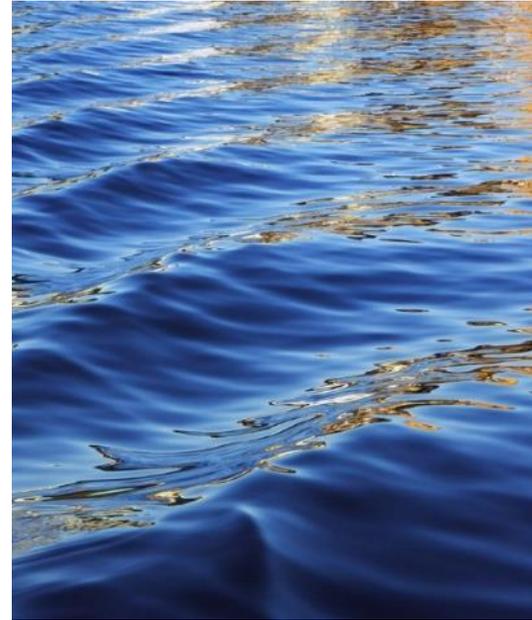
The Santa Ana Watershed
Citizen Science Network

Erika Presley and Erin Snyder
Riverside-Corona Resource Conservation District

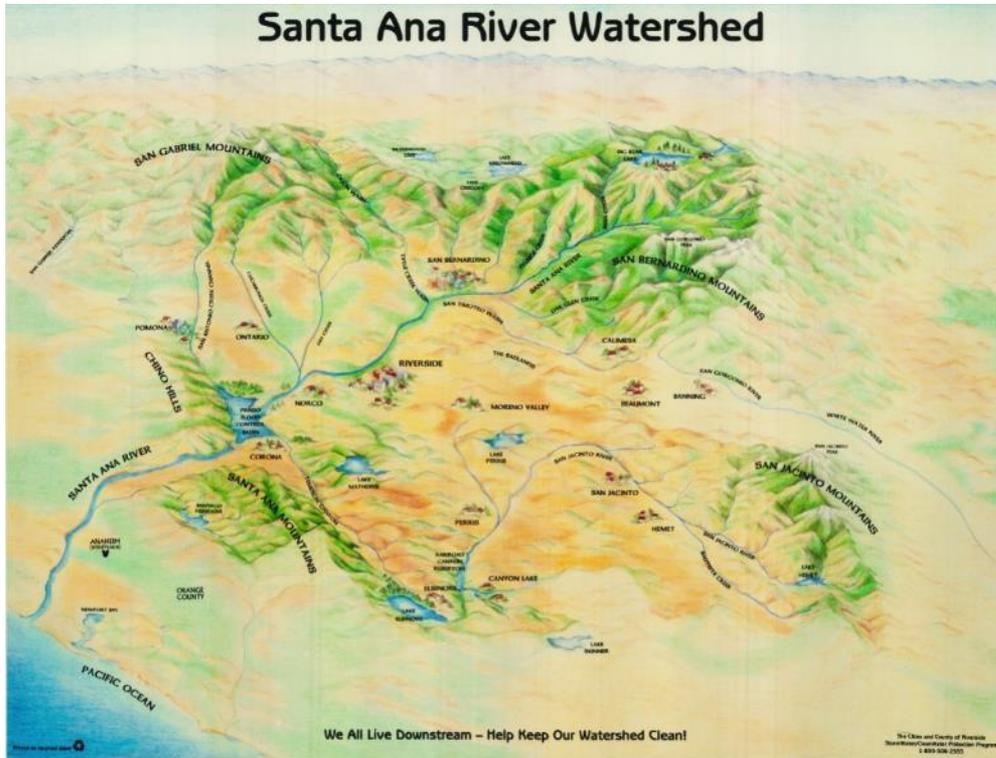




Why a Watershed Approach?



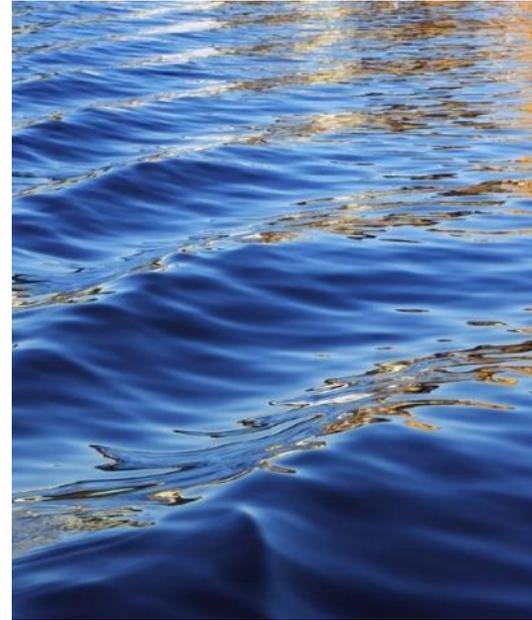
Benefits of Watershed Wide Network



- Encourage watershed based conservation and stewardship
- Building regional sense of place
- Educating communities though connectedness with the river
- Sharing of data and resources
- Coordinating public participation opportunities



What will it look like?



Citizen Science Outposts



- Backpacks
 - Equipment (binoculars, GPS, measuring tools...)
 - Field guides
- Data sheets
- Computers for data entry
- Kiosks/Bulletin boards
- Information and resources

Training and Education



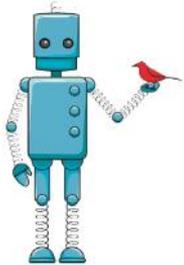
How:

- Workshops/Field trips/events
- How-to videos
- Certification program

What:

- Field Methods
- Equipment use
- Documentation
- Quality Assurance
- Citizen Science resources
 - SciStarter
 - iNaturalist

Citizen Science Projects



scistarter



- National, statewide and regional projects
 - Zooniverse
 - CALeDNA
 - LA Natural History Museum
 - RASCals
- Local Projects
 - Community driven
 - Riverside Nature Spotter
 - Academic research
 - Operation Resilient Trees 3.0

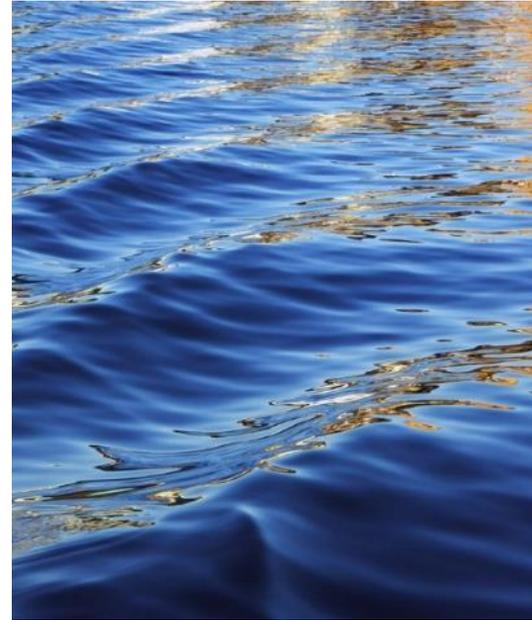
Citizen Science Events

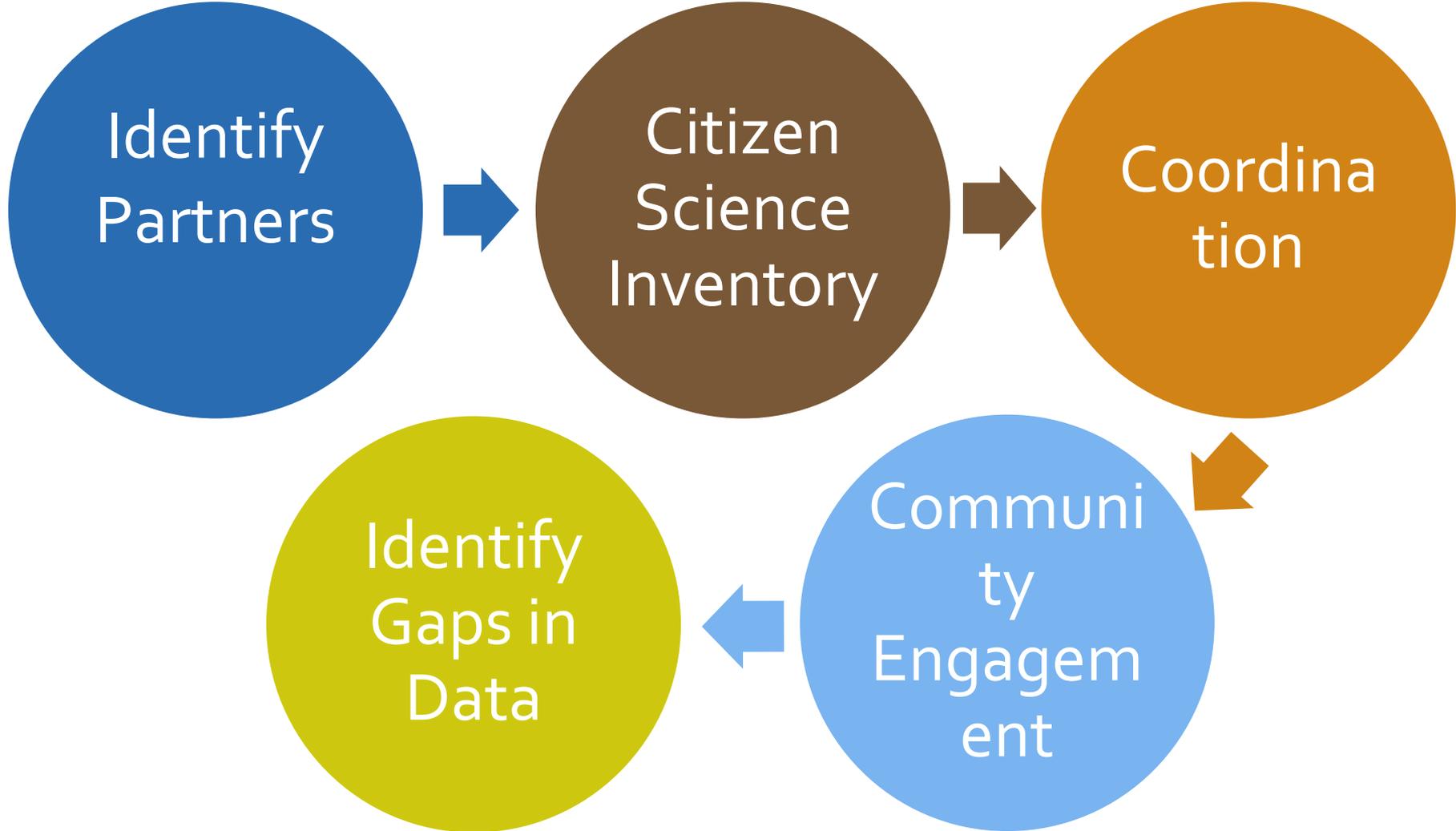


- Bioblitz
- Water Monitoring
- Citizen Science Day
- Workshops
- Field trips



The Process





Partners to Date

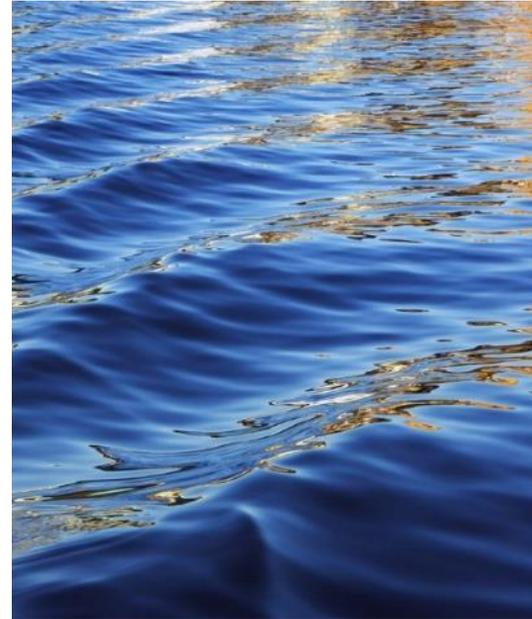
- The Riverside Corona Resource Conservation District (RCRCD)
- The Southwest Resource Management Association (SRMA)
- The San Jacinto Basin Resource Conservation District
- The Chino Basin Water Conservation District
- Orange County Parks
- Riverside County Parks and Open Space
- Bolsa Chica Interpretive Center
- San Bernardino County Museum
- City of Newport Beach
- Big Bear Discovery Center
- Southern California Mountains Foundation
- Irvine Ranch Conservancy
- Newport Bay Conservancy

Next Meeting

Please join us in spreading citizen science
throughout the Santa Ana River Watershed.

April 13
10 am-12 pm

Chino Basin Water Conservation District
4594 San Bernardino Street
Montclair, CA 91763



For More Information:

Riverside-Corona Resource Conservation District 951-683-7691

Erika Presley ext.232 (Presley@RCRCD.org)

Erin Snyder ext. 207 (Snyder@RCRCD.org)

Chino Basin Water Conservation District 909-267-3226

Becky Rittenburg (rrittenburg@cbwcd.org)

Find us on Facebook:

Santa Ana Watershed Citizen Science Network

Korinna Domingo

**Estimating Urban Carnivore
Populations Using Noninvasive
Techniques via Camera Traps**

Estimating Urban Carnivore Populations Using Noninvasive Techniques via Camera Traps

by Korinna Domingo; *Santa Monica College*

I currently attend Santa Monica College and I am an accepted undergrad at Humboldt State University, where I will be getting my bachelors in Wildlife Management and Conservation. I hope to go on and be a field biologist working with large carnivores.

I am currently conducting my own research estimating carnivore densities around the Stough Canyon Nature center using noninvasive techniques such as camera traps. This piece of land is nestled in the Verdugo Mountains of Burbank, California and offers critical habitat for urban wildlife such as coyotes, raccoons, bobcats, mountain lions, fox, mule deer, and much more. In addition to the camera trap research, I am gauging people's attitudes towards carnivores around the area via surveys.

The way I wish to present my data is to look at the relationships between the activities of carnivores vs. time of day, temperature, moon phase, and ambient light.

Estimating Carnivore Densities

Using Noninvasive Monitoring Techniques via Camera Traps

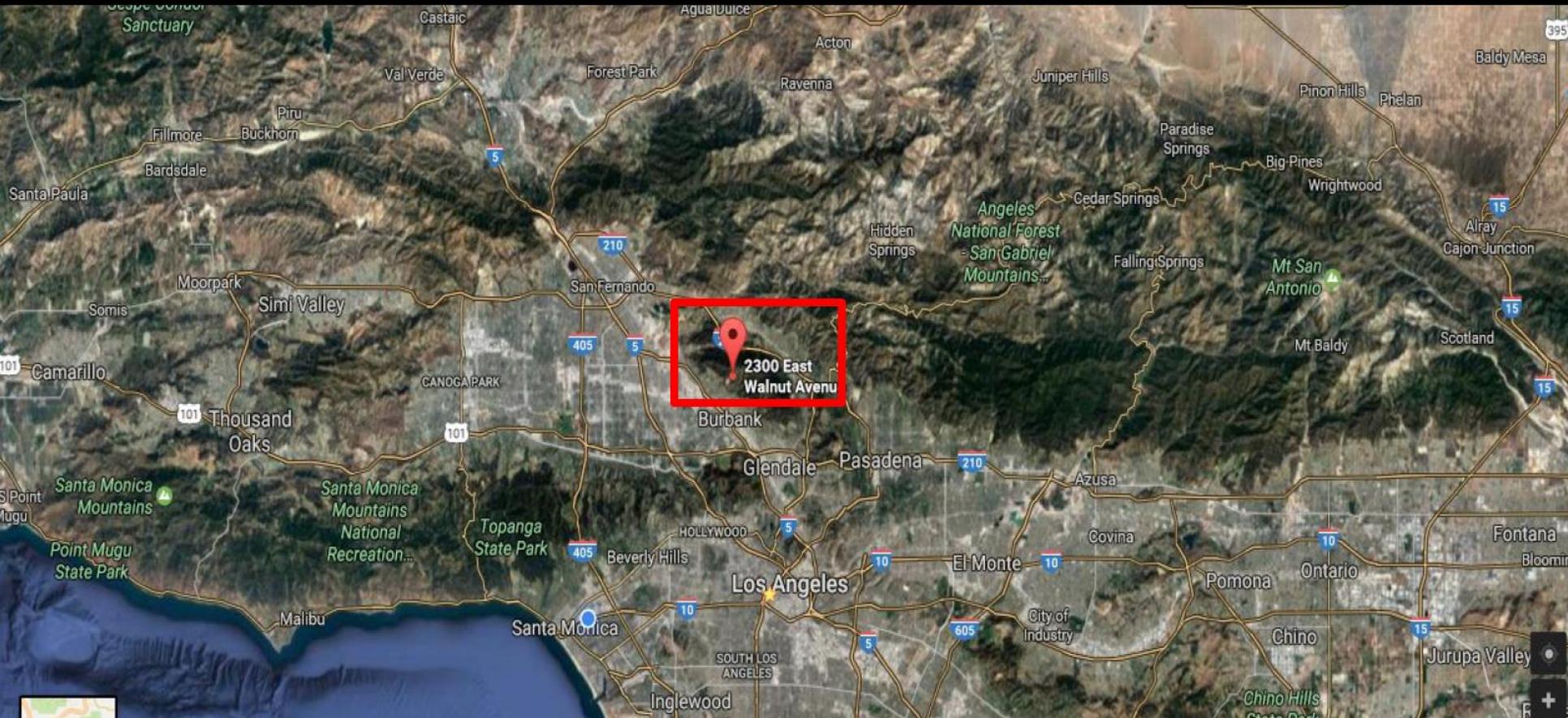
Korinna Domingo, Santa Monica College



Photo:
ROBERT MARTINEZ/ PARLIAMENT OF OWLS

Urban Wildlife Living in Fragmented Habitats

A case study of the Verdugo Mountains around the Stough Canyon Nature Center



Noninvasive Monitoring Techniques

- Remote trap cameras
- Footprint Identification Techniques (FIT)
- Scat analysis
- Hair snagging devices
- DNA Extraction & Analysis using VNTRs, STRs, SNPs, microsatellite DNA panels

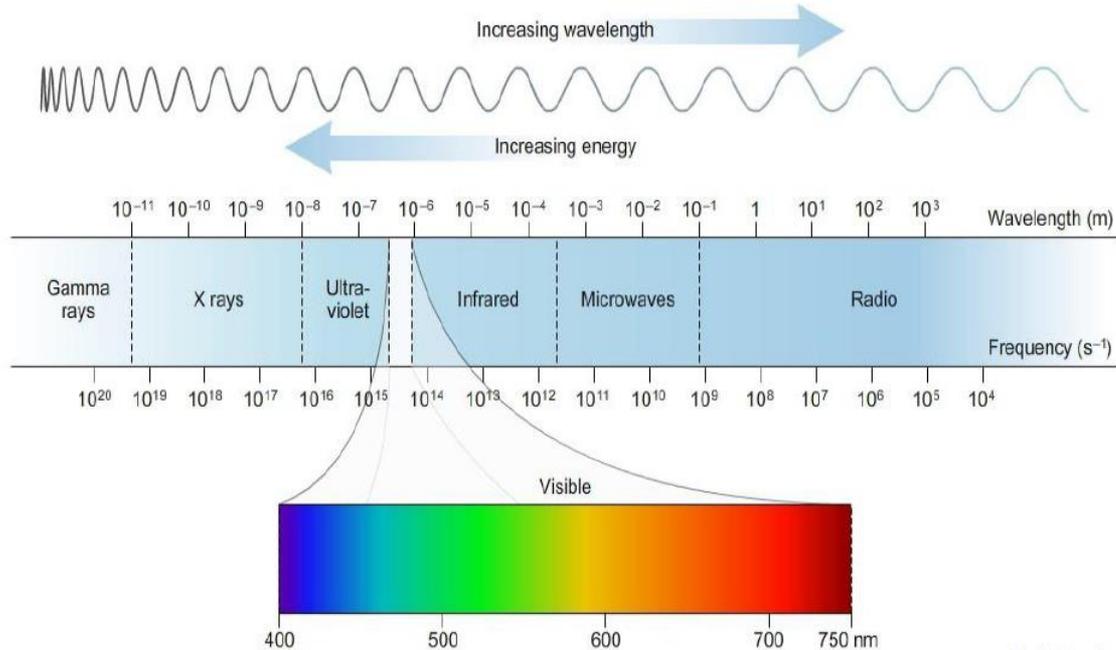


Benefits of Noninvasive Monitoring Techniques

- Inexpensive
- Does not alter animal's behavior
- Efficient
- Allows researchers to study remote environments



Remote Sensing Camera Specs



- 14 MP images
- 1080HD Videos
- Infrared LED flash
- GPS Geotag Software
- Auto PIR Sensitivity
- Information Stamps

Sample Camera Capture



Species Identified

Mountain lion



Bobcat (*Lynx rufus*)



Coyote (*Canis latrans*)

Ringtail



Gray Fox (*Urcyon cinereoargenteus*)



Striped Skunk (*Mephitis mephitis*)

Relationships Being Observed

- Species observed vs temperature
- Species observed vs time of day
- Species observed vs moon phase
- Species observed vs elevation



Aims of the Study

Does ambient temperature effect carnivore activity?

How does the moon phase affect the movement the species being observed?

Does wildlife stay away from trails heavily used by people?

Does elevation affect the density of carnivores observed?

General census of urban wildlife

Community outreach and education

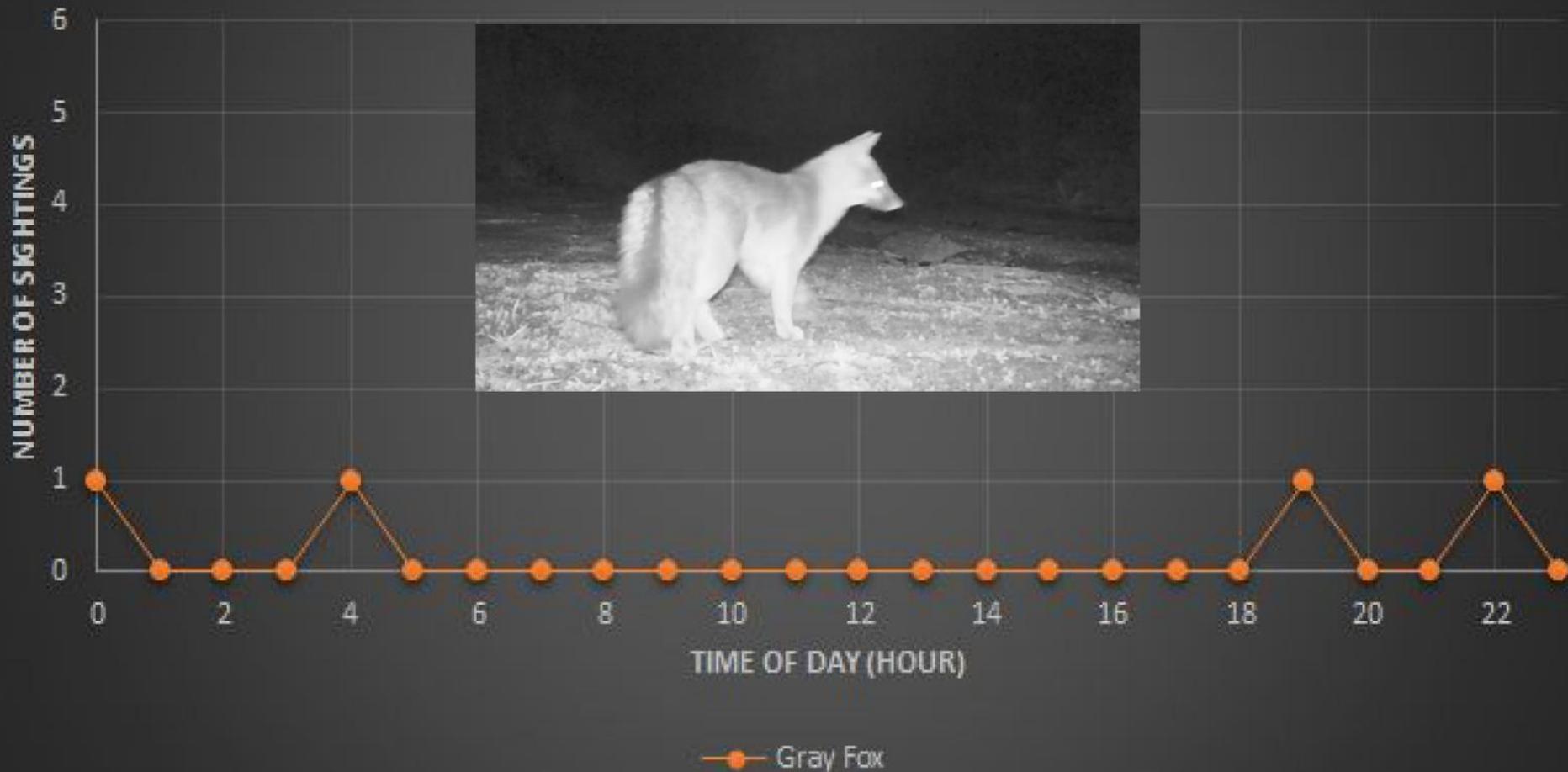


Carnivore Sightings vs. Time of Day

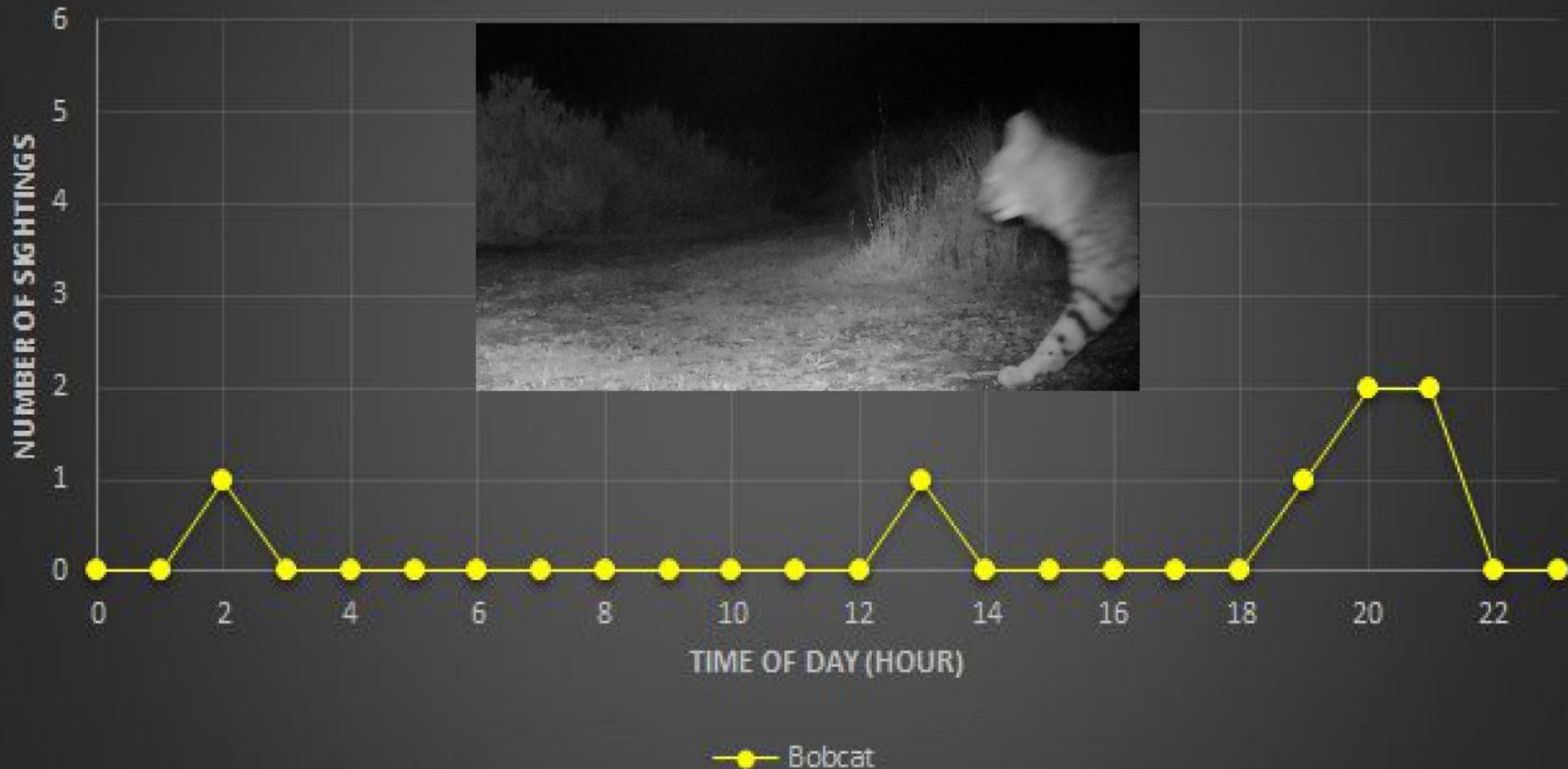


—●— Total Sightings —●— Gray Fox —●— Bobcat —●— Coyote —●— Skunk —●— Mountain Lion

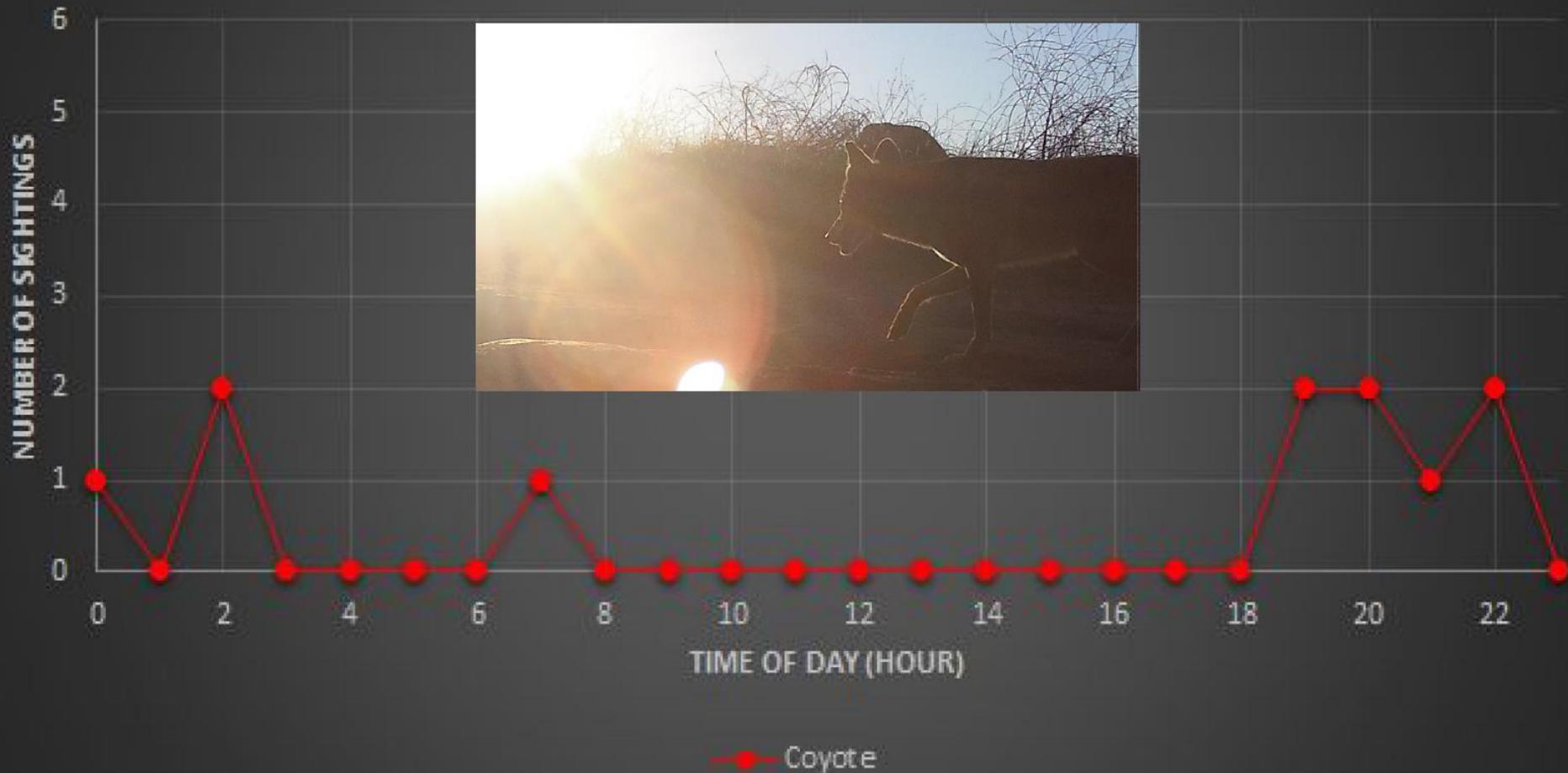
Gray Fox vs. Time of Day



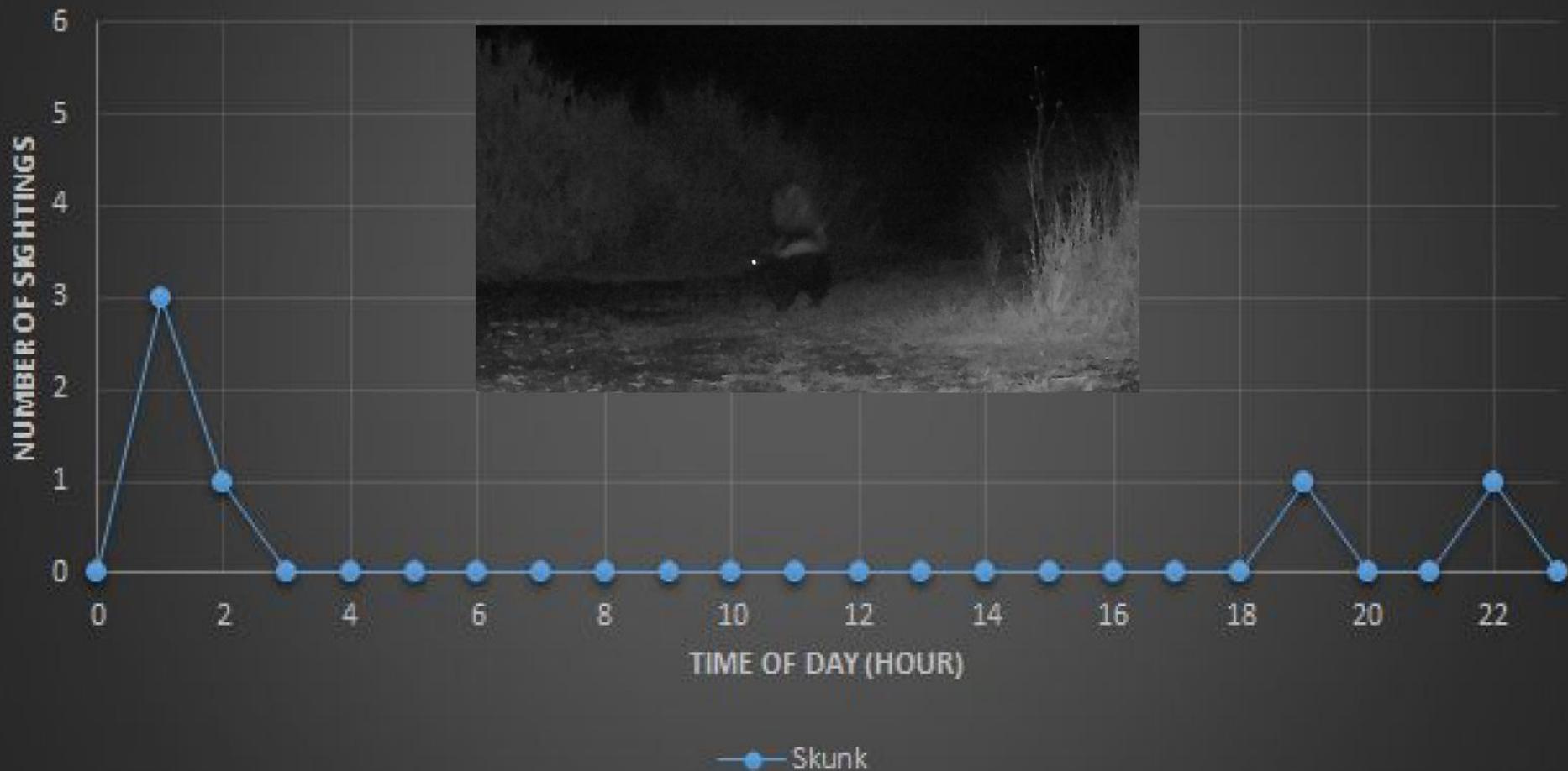
Bobcat vs. Time of Day



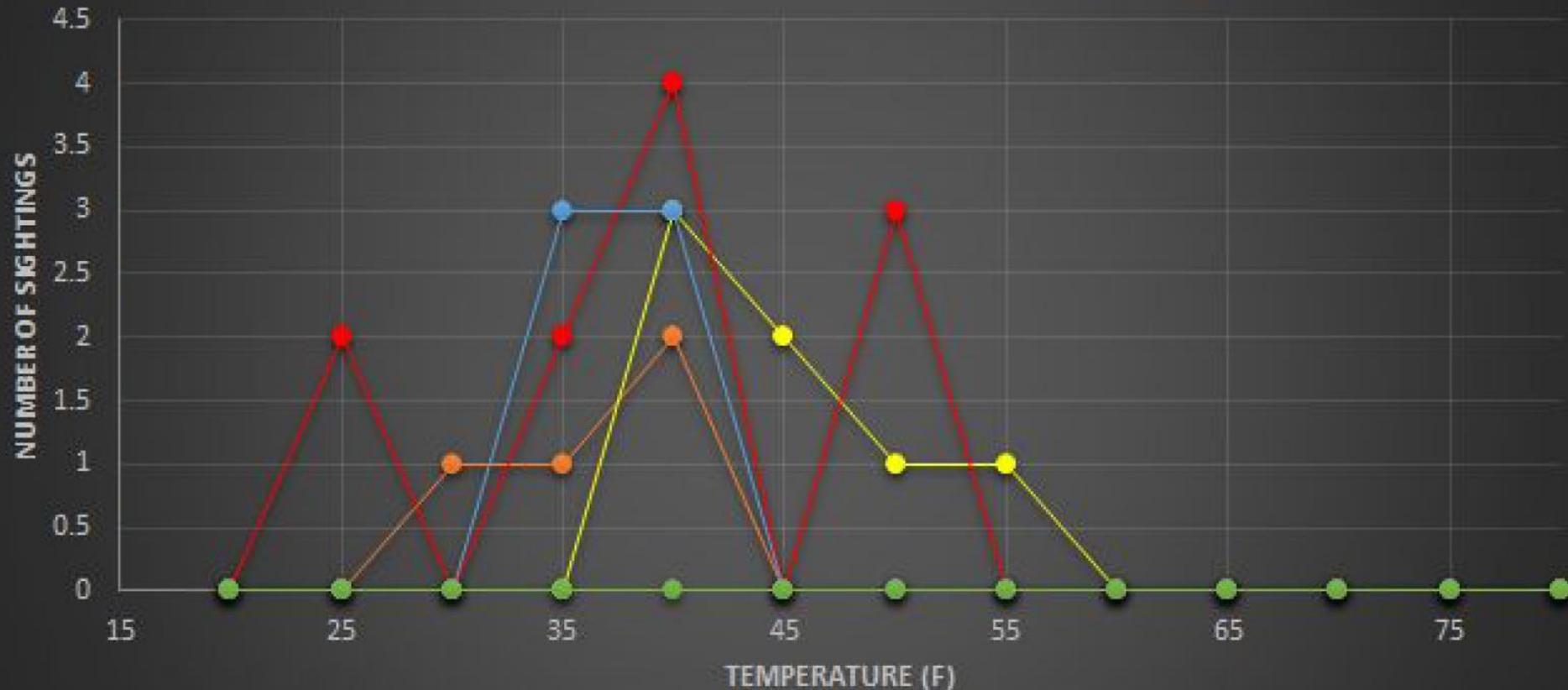
Coyote vs. Time of Day



Skunk vs. Time of Day



Temperature vs. Number of Sightings



—●— Gray Fox —●— Bobcat —●— Coyote —●— Skunk —●— Mountain Lion

Limitations to the Research

- Small sample size
- Unable to establish individual identity of animals in population causing artificial inflation of numbers observed
- Length of study

Practical Issues:

- False positives
- False negatives



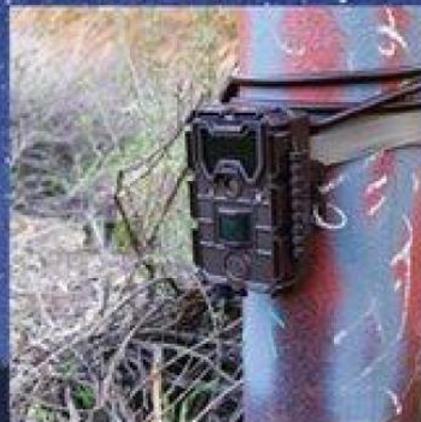
Bobcat 1



Bobcat 2

Stough Canyon Urban Wildlife Research

Estimating Carnivore Densities Using Non Invasive Monitoring Techniques



Korinna Domingo | 818.415.0920

facebook.com/korinna.domingo | [korinnadomingo@gmail](mailto:korinnadomingo@gmail.com)

Margaret Snelgrove

Southern California
Bottlenose Dolphin Catalog
Project for Citizen Science



Southern California Bottlenose Dolphin Catalog Project for Citizen Scientists

by Margaret Snelgrove and Kera Mathes; *Aquarium of the Pacific (AOP)*

My presentation will be on the Aquarium of the Pacific's Citizen Scientist Bottlenose Dolphin Catalog Project. I will introduce myself, my connection to AOP, and then discuss how the project started as an offshoot of the Marine Mammal Photo Identification Program. The goal of this project is to create the first digital catalog of coastal bottlenose dolphins in Southern California. Using photos taken on the Aquarium's daily whale watches, connected through Aquarium of the Pacific, we can train citizen scientists to identify dolphins that have been seen in previous years. With the help of NOAA's National Marine Fisheries Service, we have the ability to compare dolphins from our sightings to their physical catalog of bottlenose dolphins. The future for this project is very bright and we welcome anyone, of any background, to volunteer and become a citizen scientist for us.

A photograph of two dolphins leaping from the water, creating a large splash. The dolphins are dark grey and are captured in mid-air, with their bodies curved and fins visible. The water is a deep blue color, and the background shows the ocean surface with some white foam from the splash.

**Southern California Bottlenose Dolphin Catalog Project for
Citizen Scientists
By Maggie Snelgrove
Aquarium of the Pacific
March 4, 2017**

AOP's Marine Mammal Photo ID Program

- Capture photos of marine mammals on whale watches
- Also record GPS location, behavior, species
- Matching photos to existing catalog
- Expanded to our Bottlenose Dolphin Catalog Project!



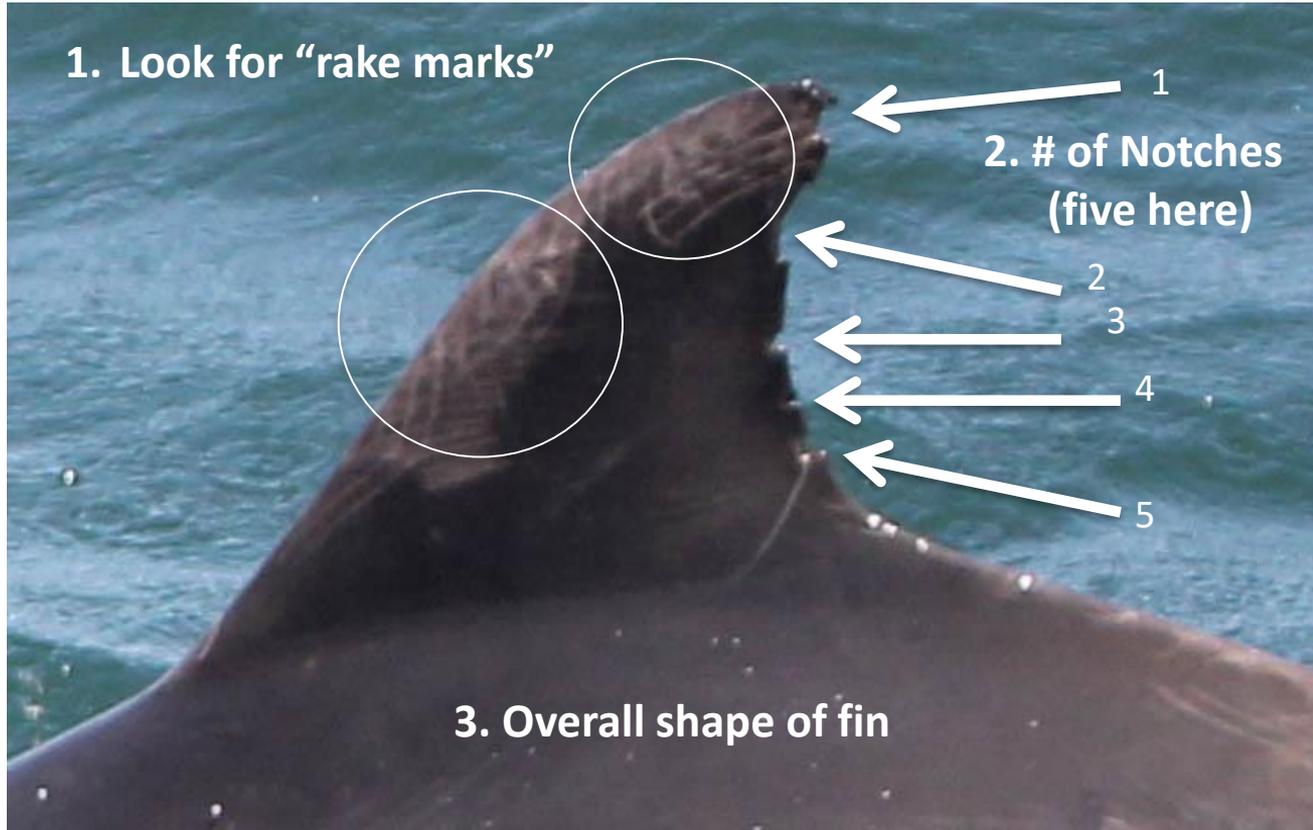
Southern California Bottlenose Dolphin Catalog Project

- Coastal Bottlenose
- Partnership with NOAA's National Marine Fisheries Service
- Opportunistic data on whale watches
- Anyone can volunteer!!



Q: How do I ID a dolphin?

A: Look at the dorsal fin!



Making a Match

Select Candidate

Seen 4/23/2012

Seen 4/29/2014

Compare: Zoom 1:1 Sync Done

Histogram

Custom Quick Develop

Keywording

Keyword Tags Enter Keywords

CDTT, CDTT3, ID, NMF533090, possible match to #11269, TT, TT1

[Click here to add keywords](#)

Keyword Suggestions

Slow travel	OSTT	1
Laptop	2	milling
CDSP	33090	6

Keyword Set Recent Keywords

10	TT	Slow travel
CDTT	TT4	Laptop
TT3	ID	7

+ Keyword List

IPTC Metadata

Preset None

File Name IMG_1863.JPG

Metadata Status Has been changed

Sync Sync Settings

Making a Match – Rake Marks?

Select Candidate

Seen 4/23/2012

Seen 4/29/2014

Histogram

Custom Quick Develop

Keywording

Keyword Tags: Enter Keywords

CDTT, CDTT3, ID, NMFS33090, possible match to #11269, TT, TT1

Click here to add keywords

Keyword Suggestions

Slow travel	OSTT	1
Laptop	2	milling
CDSP	33090	6

Keyword Set: Recent Keywords

10	TT	Slow travel
CDTT	TT4	Laptop
TT3	ID	7

Keyword List

IPTC Metadata

Preset: None

File Name: IMG_1863.JPG

Metadata Status: Has been changed

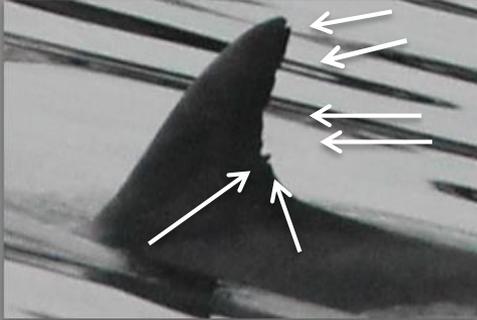
Compare: Zoom 1:1 Sync Done

Sync Sync Settings

Making a Match - # of Notches?

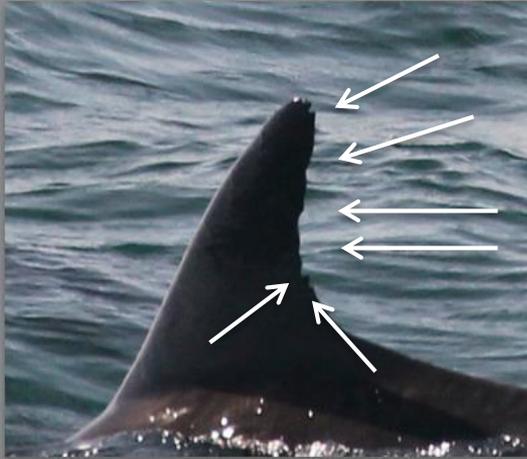
Select Candidate

6!



Seen 4/23/2012

6!



Seen 4/29/2014

Histogram

Custom Quick Develop

Keywording

Keyword Tags Enter Keywords

CDTT, CDTT3, ID, NMFS33090, possible match to #11269, TT, TT1

Click here to add keywords

Keyword Suggestions

Slow travel	OSTT	1
Laptop	2	milling
CD5P	33090	6

Keyword Set Recent Keywords

10	TT	Slow travel
CDTT	TT4	Laptop
TT3	ID	7

+ Keyword List

IPTC Metadata

Preset None

File Name IMG_1863.JPG

Metadata Status Has been changed

Compare: Zoom 1:1 Sync

Sync Sync Settings

It's a Match!!! 😊

Select Candidate

6!

6!

Seen 4/23/2012

Seen 4/29/2014

Histogram

Custom Quick Develop

Keywording

Keyword Tags Enter Keywords

CDTT, CDTT3, ID, NMFS33090, possible match to #11269, TT, TT1

Click here to add keywords

Keyword Suggestions

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CD5P	33090	6

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10	TT	Slow travel
CDTT	TT4	Laptop
TT3	ID	7

Keyword List

IPTC Metadata

Preset None

File Name IMG_1863.JPG

Metadata Status Has been changed

Compare: Zoom 1:1 Sync

Done

Sync Sync Settings

Future for the Project?



😊 THANK YOU FOR LISTENING! 😊



Kurt Lieber

Ghost Gear,
the Damage Abandoned
Fishing Gear Causes



Ghost Gear, the Damage Abandoned Fishing Gear Causes

by Kurt Lieber; *Ocean Defenders Alliance*

Ocean Defenders Alliance removes ghost gear. Learn about the ways that abandoned commercial fishing gear is harming our marine wildlife and ecosystems. The whales that visit our coastal waters face dangerous man-made obstacles that can maim, and sometimes kill them. ODA utilizes volunteer SCUBA divers to remove this marine debris, and has been doing it since 2000.

This presentation
consisted of a live
narration of a video

Lynn Massey

**Personal Impact & Awareness:
A Case Study Examining
the Effects of Citizen Science
Involvement**



Personal Impact and Awareness: A Case Study Examining the Effects of Citizen Science Involvement

by Lynn Massey, Heidi Ziegler, Cassandra Davis, Jennifer Lentz, & Peggy Morrison;
Aquarium of the Pacific (AOP)

In 2010, the year-round presence of ESA-threatened green sea turtles (*Chelonia mydas*) in the San Gabriel River, located in Long Beach, California, was established through documentation of observations made by professional biologists and local citizens. Since 2012, local Citizen Science volunteers have participated in monthly sessions to document sightings of endangered green sea turtles residing in the San Gabriel Watershed. These volunteers provide valuable baseline data on the endangered green sea turtles residing in the San Gabriel Watershed for fisheries managers and academia to use in ongoing research efforts. From individuals who "think globally and act locally" to families seeking a unique learning experience to professionals interested in the community data, the San Gabriel River Sea Turtle Monitoring program has attracted a diverse population of individuals who are intrinsically motivated to participate in monthly observation sessions and contribute to longitudinal data collection. Examining four different cross-sections of involvement – self-reported data, individual interviews, citizen science demographics, and expanded volunteer commitment – this case study provides additional insight into the volunteer motivation and the impact of citizen science participation on individuals, their personal networks, and the local communities.



Personal Impact and Awareness: A Case Study Examining the Effects of Citizen Science Involvement

Aquarium of the Pacific Citizen Science Symposium

March 4, 2017

Lynn Massey, San Gabriel River Sea Turtle Monitoring Project Citizen Scientist

Heidi Ziegler, San Gabriel River Sea Turtle Monitoring Project Citizen Scientist

Cassandra Davis, San Gabriel River Sea Turtle Monitoring Project Lead

Jennifer Lentz, Ph.D., Aquarium of the Pacific

Peggy Morrison, San Gabriel River Sea Turtle Monitoring Project Citizen Scientist

Spa Day or Permanent Get-Away?



Citizens Scientists of the San Gabriel Sea Turtle Monitoring Program



Long Beach

Alamitos Bay

Seal Beach

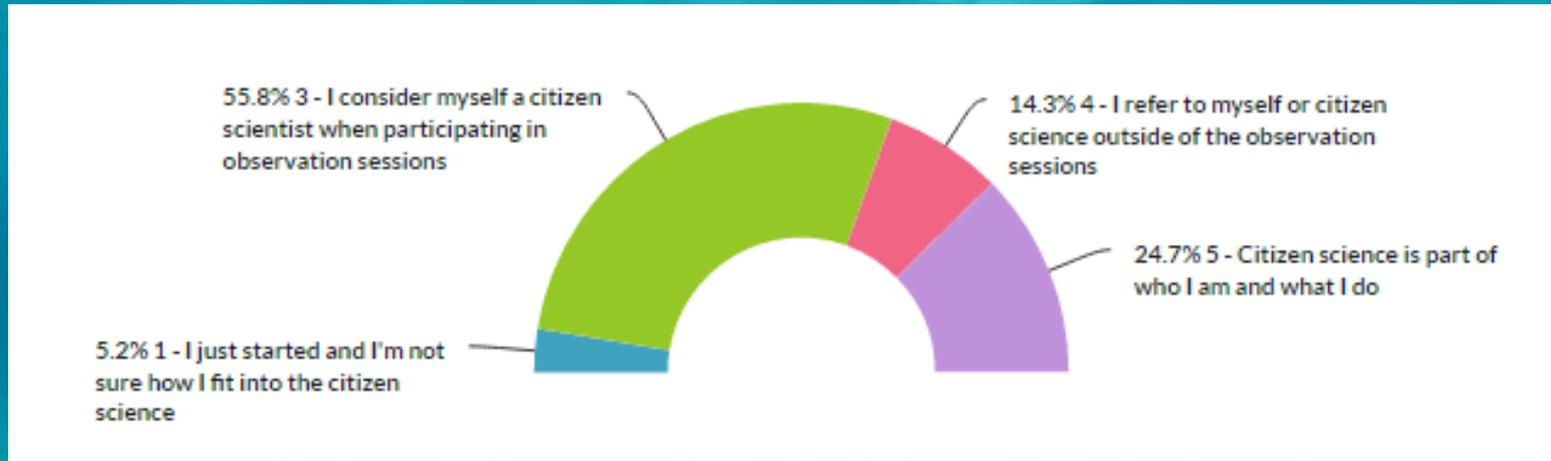
Anaheim Bay



What ***motivates*** our Citizen Scientists?

What do they ***learn***?

How does this experience ***affect their perception of conservation and science***?



***Personal Impact and Awareness: A Case Study
Examining the Effects of Citizen Science
Involvement***

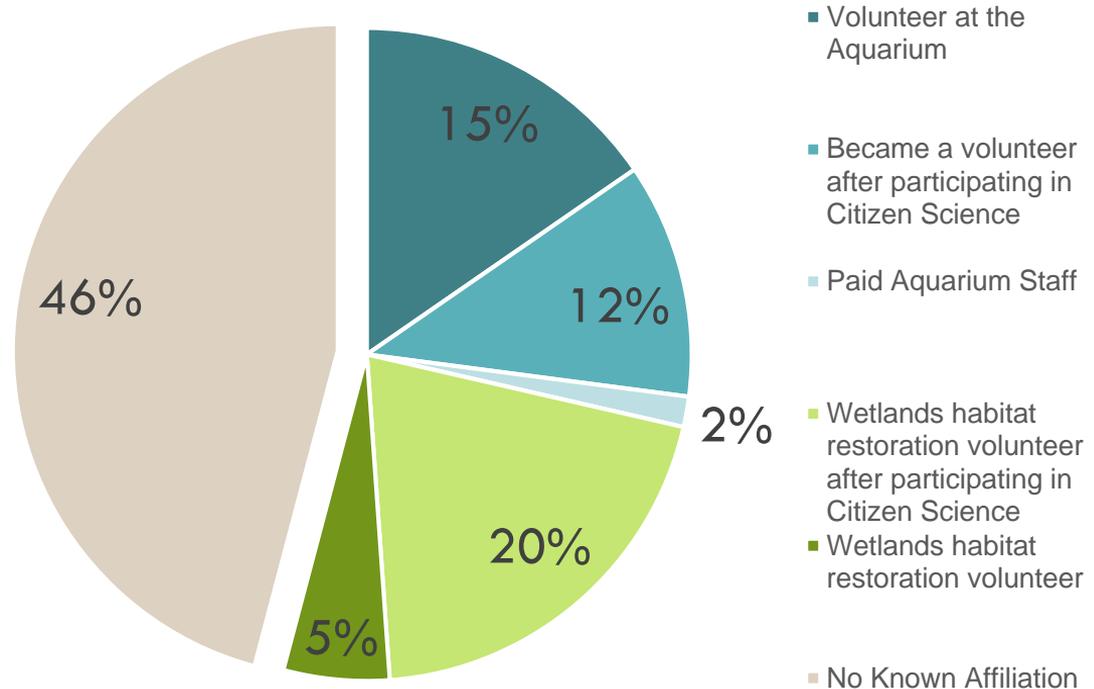
Evidence of impact: *Involvement*

Citizen Scientist involvement over one year in two related conservation activities:

- Volunteering at the Aquarium of the Pacific (6 month commitment)
- Volunteering in Los Cerritos Wetlands Restoration two or more times

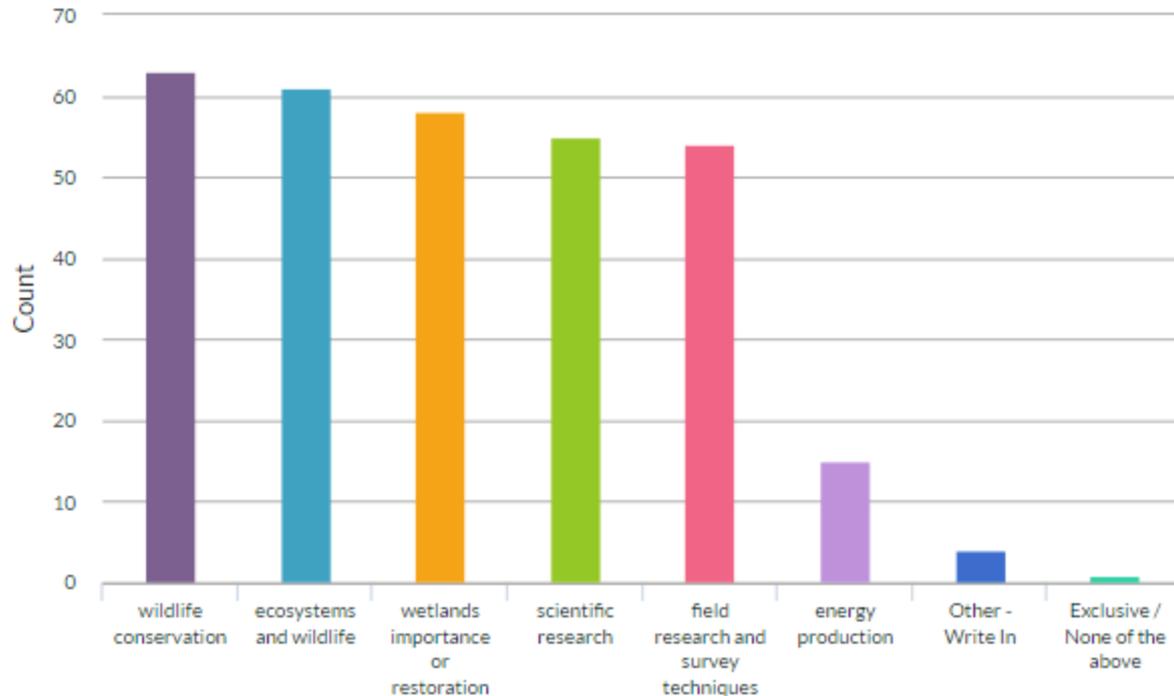
Key Findings:

- Volunteers expressed increased commitment to conservation through action
- Actions showed an increased volunteer commitment after involvement with local citizen science
- Overwhelming majority (58.8%) volunteered with one of the two additional volunteering options
- The majority had not previously volunteered for the Aquarium of the Pacific or Wetlands Restoration



What do they *learn* from this experience?

6. My experience with San Gabriel River Sea Turtle Monitoring Project increased my interest in or awareness of (check all that apply):



Learning and commitment

Exploring citizen scientist curiosity:

What actions did citizen scientists undertake due to an experience at a sea turtle monitoring session?

Value		Responses
Looked up more information online or at a library		42
Read a book or attended a lecture about a wildlife or conservation subject		33
Visited a museum, zoo, or aquarium to learn more		44
Signed up for additional commitments related to wildlife or conservation		20
Signed up for additional commitments related to education and learning		17
Volunteered to take part in another citizen science program		16
Created my own citizen science program		2
<u>Other - Write In (click to view)</u>		2
Exclusive / None of the above		8

How does their involvement help make them *stewards of conservation*?

How have you changed your personal behavior (outside of the monitoring sessions) based upon your experience as a citizen scientist with the San Gabriel River Sea Turtle Monitoring Program?

“I have taken friends to see the turtles at other times/days in order to spread the word about their existence and trying to interest others in conservation.”

“I am more concerned about trash.

I also share my experiences volunteering to spread awareness.”

“My interest in learning and helping the community, marine life, ecology, urban wildlife areas and environmental aspects have all increased. I am careful with things that contribute to global warming, am closer to living a trash free lifestyle and am constantly looking into new ways to help.”

Thank you



Bridget Altman

**Ocean Sanctuaries:
Marine Citizen Science
in San Diego**



Ocean Sanctuaries: Marine Citizen Science in San Diego

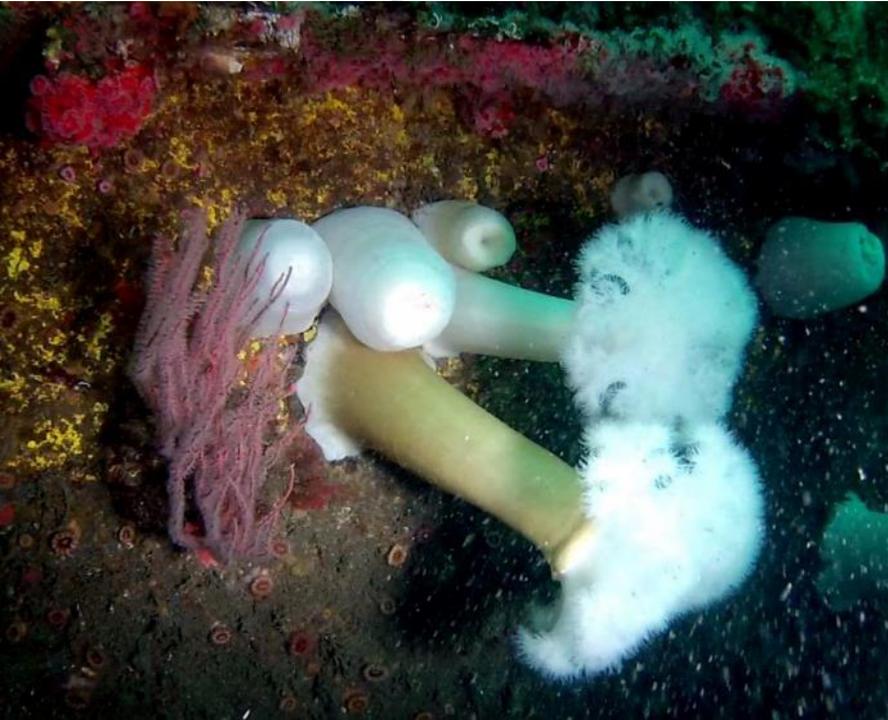
by Bridget Altman; *Ocean Sanctuaries*

I will introduce and briefly discuss three marine citizen science projects in San Diego from Ocean Sanctuaries: The Sevengill Shark Identification Project, The Yukon Marine Life Survey, and The Sharks of California Project.

Marine Citizen Science in San Diego



Yukon Marine Life Survey

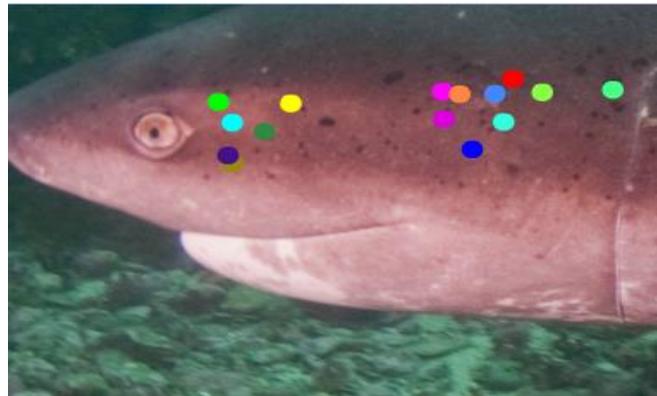
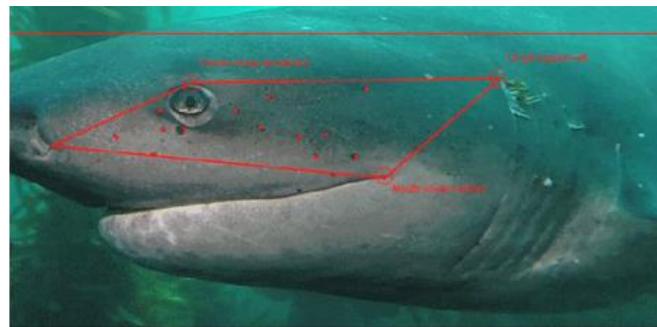
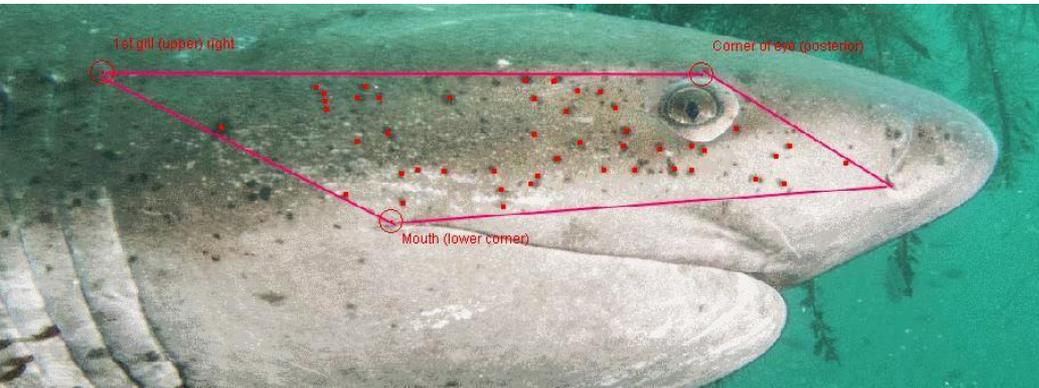


- Creating a biodiversity baseline to monitor the HMCS Yukon Shipwreck in San Diego
- Photo ID based on diver photos!

Sevengill Shark Identification Project

Photo ID based on diver submissions

- Creates 4-point boundary
- Submits points to scientific algorithm
- Associates prior image/encounters



Sharks of California Project

- Divers and Snorkelers can log encounters with all shark species!



Marine Citizen Science Certification Course

- Learn the skills to participate in Marine Citizen Science Projects along the California Coast!



Karen Norris

Catalina Marine Society
Projects



Catalina Marine Society Projects

by Karen Norris; *Catalina Marine Society*

The Catalina Marine Society is chartered to advance scientific knowledge of the local ocean. We design projects for which SCUBA divers and boaters can use their expertise to deploy sensors that automatically record important ocean data. Other volunteers organize and analyze the measurements. The Society has made considerable contributions to the understanding of the Southern California Bight using ocean temperature measurements gathered by citizen scientists coupled with data obtained from universities and government laboratories.

Catalina Marine Society Projects

Karen Norris

Aquarium of the Pacific Citizen-Science Symposium

March 4, 2017



CMS Mission



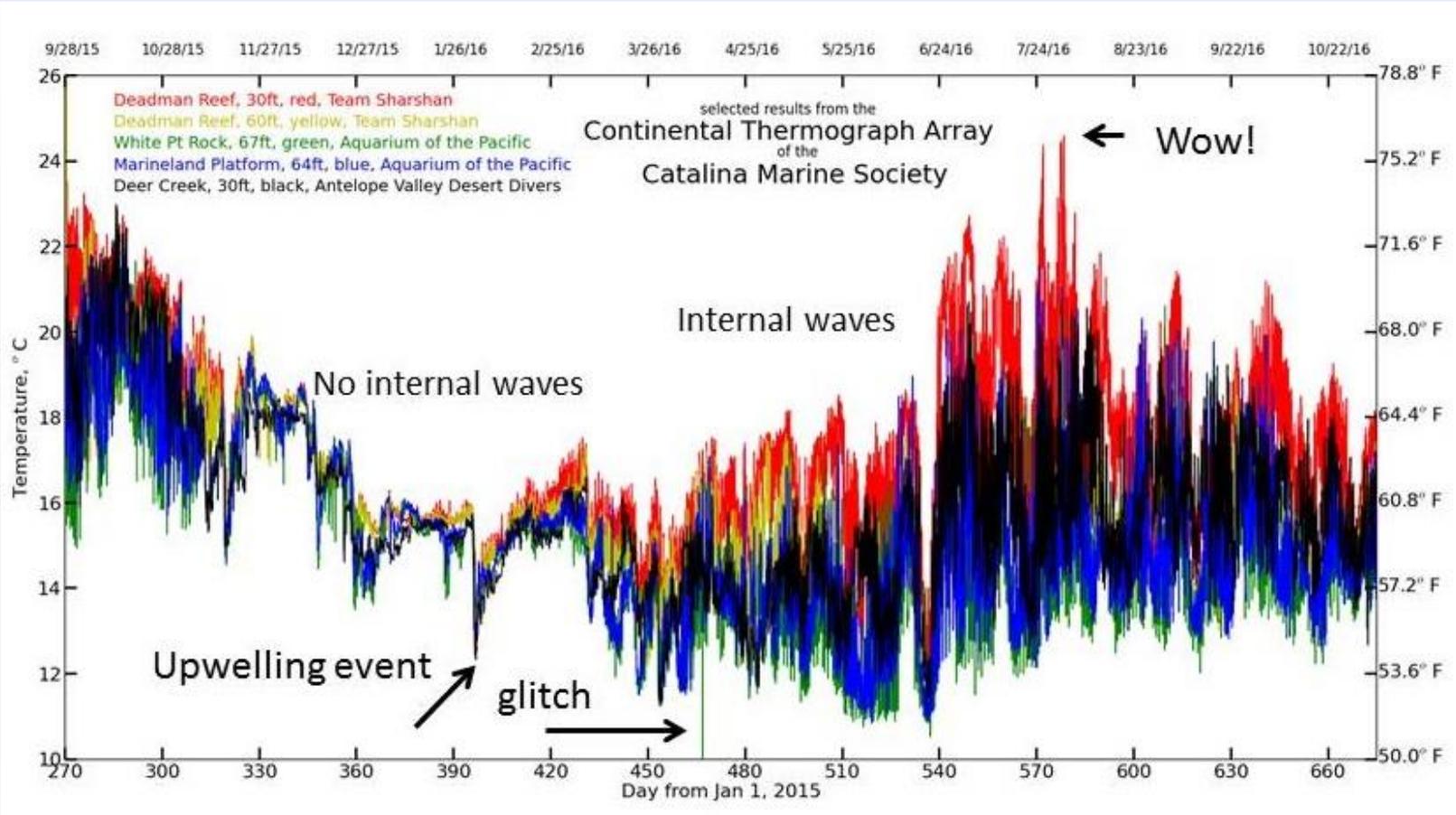
- The goals of the Society are to promote, facilitate and distribute studies and insights into the physical and biological dynamics that both comprise the marine environment or that otherwise affect the underwater regions in the Southern California Bight.
- We sponsor experiments and data collections; provide analytical support to researchers; sponsor presentations to professional societies; and, organize and publish marine studies.

CMS Projects

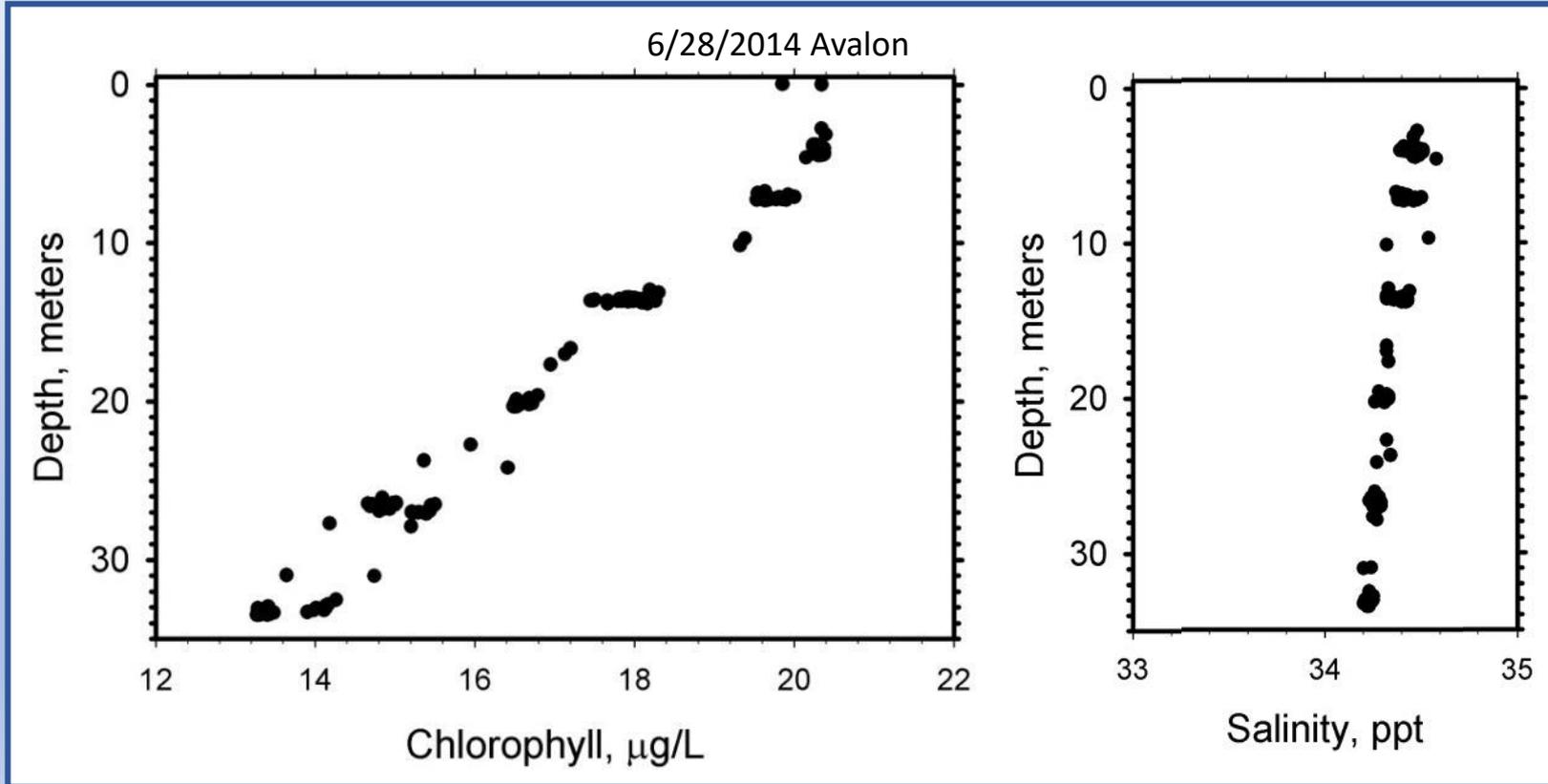


- Continental Thermograph Array
 - Augments dense array of thermographs around Catalina Island initiated by Catalina Conservancy Divers: 20+ years of temperatures
 - Thermographs placed at sites along the Southern California coast at ~30' and ~60' depths
 - Deer Creek, Malibu, Palos Verdes, and Laguna Beach
 - Maintained by beach divers: individuals, dive clubs, and the AOP dive team
- Depth-Profiling Project
 - Measures temperature, salinity, chlorophyll, pH, and dissolved oxygen of the water column, to 100', at a single site
 - Sonde is deployed by volunteers from kayaks, motor and sail boats
- *OceanBights*
 - Bi-annual magazine with solicited and unsolicited articles

Continental Thermograph Array



Depth-Profiling Project



CMS Publications



- *OceanBights*

- Bi-annual magazine
- Available through our website www.catalinamarinesociety.org and via email
- Solicited and unsolicited articles
 - Broad range of topics: shark research, ocean acidification, urchins and El Niño
- Peer-reviewed journal articles
- Ocean Sciences Meetings
- California Academy of Science
- Cal-COFI Conferences
- California Island Symposia: posters and papers

Alison Young

**Snapshot Cal Coast:
Mobilizing Community Members
to Document Species Ranges
Along the California Coast**



**AQUARIUM
OF THE PACIFIC**

Snapshot Cal Coast: Mobilizing Community Members to Document Species Ranges Along the California Coast

by Alison Young and Rebecca Johnson; *California Academy of Sciences*

In early 2016, the citizen science team at the California Academy of Sciences (CAS) worked with the California Marine Protected Area (MPA) Collaborative Network to coordinate Snapshot Cal Coast, a series of community-led bioblitzes along California's coast. This initiative was the first Network-wide project and an unprecedented effort to link a series of bioblitz events across one region to scale collective impact and the ability to collect species range data. Together CAS and the MPA Collaborative Network trained, supported, and mobilized volunteers and staff in documenting intertidal biodiversity along our coast from June 1-12, 2016. Hundreds of people from Del Norte to San Diego made over 7,000 observations of more than 900 species. Snapshot Cal Coast participants also documented dozens of species that had not previously been recorded on iNaturalist from the California coast. This talk will go over results, interesting findings, and how to participate in Snapshot Cal Coast 2017.

SNAPSHOT CAL COAST: Mobilizing community members to document species ranges along the California coast

Alison Young
@alisonkestrel

Rebecca Johnson
@rebafay

@snapshotcacoast





iNaturalist





ADD
OBSERVATIONS



Frenchman's Reef Bioblitz

June 08, 2016, 7:00 AM - 12:00 PM PDT



An aerial satellite-style map of a coastline. The ocean is on the left, and the land is on the right. The land features a mix of green fields, brownish areas, and some buildings. Numerous colorful location pins (red, green, blue, orange) are scattered along the shoreline, indicating specific observation points. A semi-transparent white box with a light green background is overlaid on the bottom left of the map, containing summary statistics.

Totals

370

Observations »

148

Species »

14

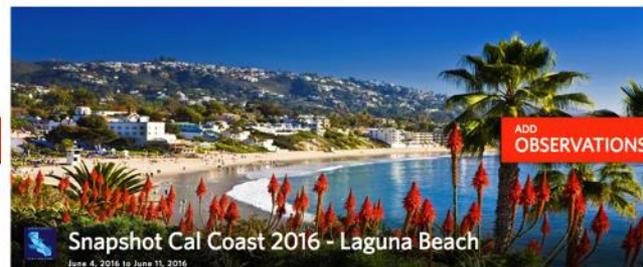
People »



SNAPSHOT CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Duxbury Reef Bioblitz
June 11, 2016, 9:00 AM - 2:00 PM PDT

[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Snapshot Cal Coast 2016 - Laguna Beach
June 4, 2016 to June 11, 2016

[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Snapshot Cal Coast: Pyramid Point MPA Bioblitz
June 8, 2016 to June 10, 2016

[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST FORT ROSS COORPORATION CALIFORNIA ACADEMY OF SCIENCES

Fort Ross Bioblitz
June 4, 2016 to June 12, 2016

[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Pigeon Point Intertidal Bioblitz
June 07, 2016, 6:00 AM - 12:00 PM PDT

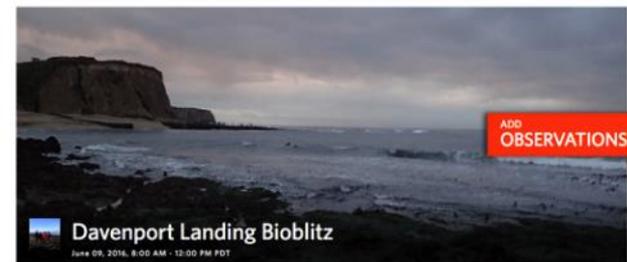
[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Morro Bay Bioblitz-Snapshot Cal Coast
June 11, 2016, 10:00 AM - 1:00 PM PDT

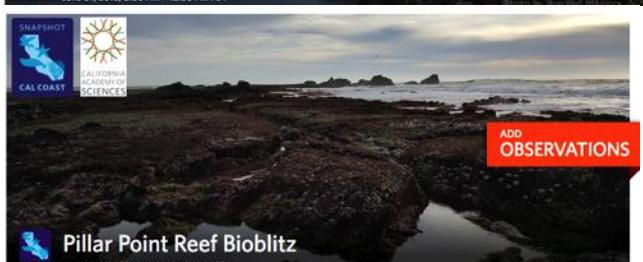
[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Davenport Landing Bioblitz
June 09, 2016, 8:00 AM - 12:00 PM PDT

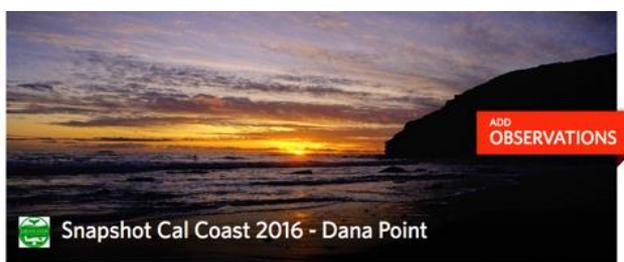
[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Pillar Point Reef Bioblitz
June 06, 2016, 5:30 AM - 10:00 AM PDT

[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Snapshot Cal Coast 2016 - Dana Point

[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST SAN MATEO COUNTY PARKS CALIFORNIA ACADEMY OF SCIENCES SEQUOIA AUDUBON SOCIETY FRIENDS OF FITZGERALD MARINE RESERVE

Fitzgerald Marine Reserve Bioblitz
June 09, 2016, 7:00 AM - 1:00 PM PDT

[ADD OBSERVATIONS](#)



SNAPSHOT CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Snapshot Cal Coast 2016: Manila Dunes BioBlitz
June 11, 2016, 10:30 AM - 1:00 PM UTC

[ADD OBSERVATIONS](#)



CRYSTAL COVE ALLIANCE CALIFORNIA ACADEMY OF SCIENCES CAL COAST CALIFORNIA ACADEMY OF SCIENCES

Crystal Cove Intertidal Bioblitz
June 11, 2016, 8:00 AM - 5:00 PM PDT

[ADD OBSERVATIONS](#)

Totals

7102

Observations »

943

Species »

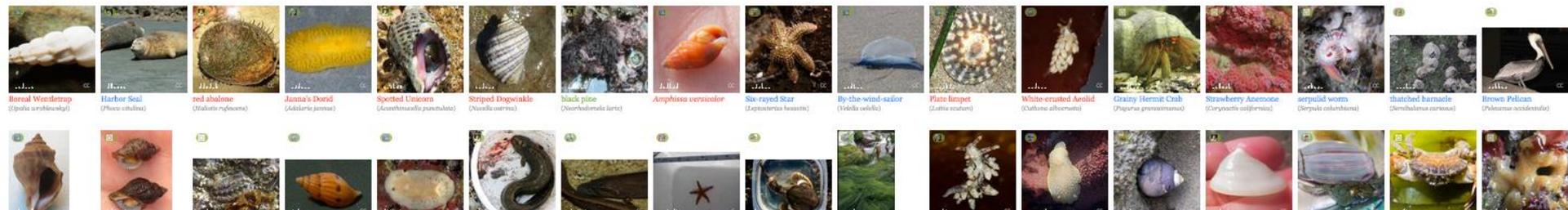
387

People »



Snapshot Cal Coast 2016

June 1, 2016 to June 12, 2016



102
OBSERVATIONS

1
SPECIES

23
IDENTIFIERS

48
OBSERVERS

interest

Redo search in map

OREGON

IDAHO

NEVADA

CALIFORNIA

AR

BAJA
CALIFORNIA

Snapshot Cal Coast
Observations



Hopkin's Rose

(*Okenia rosacea*)

Davenport, CA 9501... • Jun 9, 2016

Research Grade

2



4mo



Hopkin's Rose

(*Okenia rosacea*)

Santa Cruz, Califo... • Jun 9, 2016

Research Grade

3



5mo



Hopkin's Rose

(*Okenia rosacea*)

Fitzgerald Marine... • Jun 11, 2016

Research Grade

1



5mo



Hopkin's Rose

(*Okenia rosacea*)

Duxbury Reef, Mari... • Jun 11, 2016

Research Grade

2



5mo

Hopkin's Rose





iNaturalist



GBIF

Global Biodiversity
Information Facility



SNAPSHOT CAL COAST 2017

June 23 – July 2, 2017

Checklists

More teams, more places

Please share your thoughts!



Thank you to
everyone who organized events,
shared their finds, and identified
observations.

MPA Collaboratives
Calla Allison & Paul Hobi
Resources Legacy Fund Foundation

Alison Young
@alisonkestrel
ayoung@calacademy.org

2nd Annual
CITIZEN SCIENCE
for Conservation in Southern California
SYMPOSIUM

LUNCH
&
OPTIONAL BIOBLITZ

11:30 a.m. – 1:00 p.m.

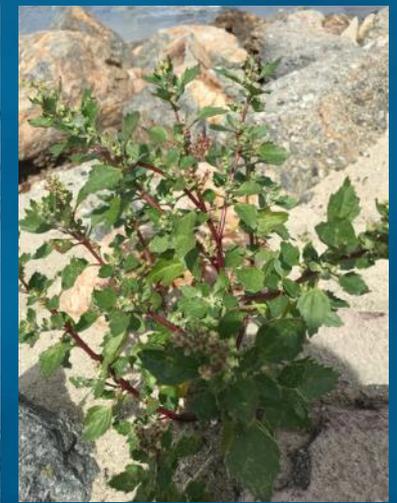
Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

Lunchtime BioBlitz

Aquarium of the Pacific

Shoreline
Aquatic Park

Google Earth



Results from the “Shoreline Aquatic Park” BioBlitz

naturalist.org Observations ▾ Species ▾ Projects ▾ Places Guides People Log in or Sign up

Projects [Terms & Rules](#) | [Join this project](#)

Shoreline Aquatic Park Cit Sci Symposium

[Add observations to this project](#)

Event Stats

Totals	Most Observations	Most Species	Most Observed Species
87 Observations »	andmag25 14 observations	kestrel 9 species	Rock Pigeon 5 observations
37 Species »	colleenbowman064 12 observations	colleenbowman064 5 species	Ring-billed Gull 5 observations
16 People »	colleenbowman064 11 observations	smartrf 3 species	American Coot 3 observations
	hbrandon369 8 observations	ktbug 3 species	True Limpets 3 observations
	smartrf 6 observations	barbaralloyd 3 species	Asian Lady Beetle 3 observations

Members 20 members
[View all members »](#)

Export observations
[Atom](#) / [KML](#) / [CSV](#)

About

The citizen science community attending the symposium will develop a census of the abundance of life in Shoreline Aquatic Park adjacent to Aquarium of the Pacific.

[Like](#) [Share](#)

ichtlon created this project on March 01, 2017
Is this inappropriate, spam, or offensive? Add a flag

[Embed a widget for this project on your website](#)

Recent observations [View all »](#)

[Grid](#) [List](#)

- Pink knotweed
- American Coot
- California Sagebrush
- Burr clover
- Berberis Buttercup
- Double-crested Cormorant
- Stone plants
- Burr clover
- Lamb's Ears
- Ring-billed Gull
- Western Gull
- Cockroaches and Termites
- Insects
- Cockroaches and Termites
- Pears
- Purple flowers

<http://www.inaturalist.org/projects/shoreline-aquatic-park-cit-sci-symposium>

2nd Annual
CITIZEN SCIENCE
for Conservation in Southern California
SYMPOSIUM

**MODERATED PANEL
DISCUSSIONS**

1:00 p.m. – 3:00 p.m.

Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

Moderated Panel Discussions

Panel 1

HOW CITIZEN SCIENCE *IS* MAKING A DIFFERENCE

Moderated by Ron Kilgore



Photo Courtesy of USC Sea Grant

Citizen Science for Conservation in Southern California Symposium
Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

Moderated Panel Discussions

Panel 1

HOW CITIZEN SCIENCE *IS* MAKING A DIFFERENCE

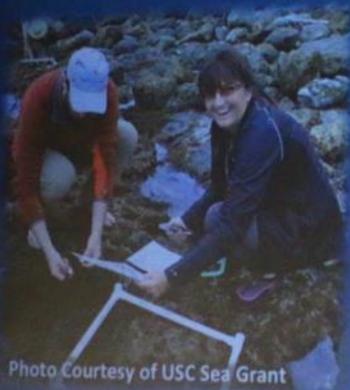


Photo Courtesy of USC Sea Grant

Moderated by **Ron Kilgore**

Citizen Science for Conservation in Southern California Symposium
Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA



AQUARIUM
Of The PACIFIC



AQUARIUM
Of The PACIFIC

Panel 1:

How Citizen Science *IS* Making a Difference

The goal of this panel was to provide an overview of local Citizen Science programs, discuss the different types and functions of these programs, their importance, and how citizen science data is being used to make an impact in Southern California academic research, resource monitoring and management, policy, and as a tool for community engagement.

Moderated by Ron Kilgore – *KNX Radio*

Panelists:

Lila Higgins – *Citizen Science Program Manager, Natural History Museum of LA County*

Michael Quill, M.A.– *Marine Programs Director, LA Waterkeeper and MPA Watch*

Darrel Jenerette, Ph.D.– *Associate Professor, UC Riverside*

Lead Researcher, Earthwatch Urban Resiliency Program

Daniela Soleri, Ph.D.– *Associate Research Scientist, UC Santa Barbara*



Paraphrased Panel 1 Highlights

Engaging in citizen science makes it personal, it becomes a “lived” experience – Lila Higgins

We prefer “Community Science” because in this political atmosphere the term “Citizen” makes people nervous, we engage ALL members (documented & undocumented) of our community in science, particularly those from underserved communities. – Michael Quill

NHM is going to try to collect data on how people react to the word “Citizen”– Lila Higgins

MPA Watch: works to not only help people become familiar with what MPAs are, that they’re a community resource, & then trains community members to monitor this resource. These community members become ambassadors for the MPAs, spreading the word about violations. – Michael Quill

As we heard during our keynote this morning, citizen, or rather “Community-based” Science enables data collection at a spatial & temporal depth unachievable through traditional methods alone, with the added benefit of engagement & personalization – Daniela Soleri

Community Science helps us reflect on what is “expertise” & who has it....people on the ground are more likely to notice fine scale changes – Daniela Soleri

Paraphrased Panel 1 Highlights (continued)

Participating in these programs opens students up to the idea that science is a possible career path for them. Through their involvement students learn new skills and the importance of asking questions which leads them to contemplate new opportunities which they'd previously thought were out of their reach – Michael Quill

it's about listening and seeing where people are at and then meeting them there – Lila Higgins

bridging the gap in communication while also expanding scientific literacy – Michael Quill

We also need to acknowledge that there are large groups of people who have been hurt by science, and have a very real reason to distrust science...community science is a way to bring science to these communities and help to get them more comfortable with it – Daniela Soleri

We find that participating in these programs often give the participants “Eudaimonic Pleasure” which is the happiness that comes from having a sense of purpose – Lila Higgins

What we're all discovering is that TOGETHER is our way forward – Mary Ellen Hannibal

Moderated Panel Discussions

Panel 2

IMPORTANCE OF STUDY METHODOLOGY & QUALITY DATA

Moderated by Amber Dance, Ph.D.



Photo Courtesy of USC Sea Grant

Citizen Science for Conservation in Southern California Symposium
Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

Panel 2 Discussions

IMPORTANCE OF STUDY METHODOLOGY & QUALITY DATA

Moderated by Amber Dance, Ph.D.

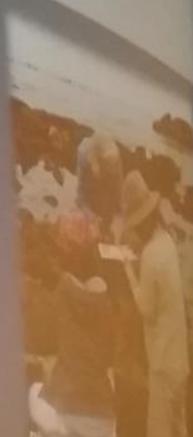


Photo Courtesy of USC Sea Grant

Science for Conservation in Southern California Symposium
at the Aquarium of the Pacific

AQUARIUM
OF THE PACIFIC

AQUARIUM
OF THE PACIFIC

Panel 2: Importance of Study Methodology & Quality Data

The goal of this panel was to discuss what data QA/QC is, why it is important, what happens when there isn't robust data QA/QC, and provide examples of breakthroughs that have been made because of citizen science data.

Moderated by **Amber Dance**, Ph.D. – *Freelance Science Writer*

Panelists:

Erick Burre – *Citizen Monitoring Coordinator, Sr. Environmental Scientist Specialist, Clean Water Team – State Water Resources Control Board (SWRCB)*

Karen Martin, Ph.D. – *Biology Professor, Pepperdine University
Co-Founder & Executive Director, Grunion Greeters*

Gregory Pauly, Ph.D. – *Associate Curator of Herpetology, Natural History Museum of LA County*

Linda Chilton, M.A. – *Education Programs Coordinator, USC Sea Grant*



Paraphrased Panel 2 Highlights

The most important part of designing a citizen science project is having a clear question, and then considering how that question can best be answered, and whether the tools, resources, and budget you have available will get you there – Erick Burre

*The difference between citizen scientists and someone who is just curious is the data
– Karen Martin*

Technology is removing a lot of the potential user error (i.e. automatically recording the timestamp, GPS coordinates, photo of the observation) – Karen Martin

We used to have to design a new app for every project, but iNaturalist solved a lot of problems by filling the needs of numerous types of projects– Greg Pauly

The Urban Tides project and app started with finding out what types of photos the scientists needed, but continued to evolve and be fine-tuned after the app was released. It was an on-going refining process that relied on ongoing communication. The resulting project allows citizen scientists to collect data that can be used by the scientists to validate and fine tune their sea level rise models. – Linda Chilton

Paraphrased Panel 2 Highlights (continued)

It's important to differentiate between "Training" and "Education" which requires clear documentation – Erick Burre

*Grunion Greeters has once a year training workshops. The success of this program comes from the emphasis we put on engagement, our participants keel coming back because they like the feeling of being part of this community, and that their work has a larger purpose.
– Karen Martin*

The key to having successful programs is to have continuous training and QA/QC. For example, I'm constantly on iNaturalist monitoring observations as they're posted, so that if I see something odd I can immediately contact the person who posted it to get more information (including confirming location, asking for additional photos from new angles, etc.) . If I waited till the end of a project to look at the observations it would be a lot harder to follow-up on the outlier data to confirm whether or not they are accurate. Likewise, if one of the methods needs to be fine tuned, it's better to find that out at the onset of the project, rather than the end after all the data has been collected. – Greg Pauly

Paraphrased Panel 2 Highlights (continued)

It's important to carefully consider what types of data are needed to answer the question. A common pitfall of not just citizen science projects, but scientific projects in general, is that the project's methods don't work towards the question – Erick Burres

it's often about asking the right question at the right time – Karen Martin

*When you see problems in citizen science projects, its not the participant's fault but rather the fault of the project's developer. It's also important to point out that a lot of things are lumped under the "Citizen Science" umbrella (like outreach projects) that aren't actually science .
– Greg Pauly*

Question: What percentage of community data is usable?

- *I help communities design programs to collect the data they need and how to use this data to answer the question they're interested in, I never actually see the results, so I can't answer this – Erick Burres*
- *More than 90% of Grunion Greeters data is usable, and citizen science is the only way to get the data we need for grunions – Karin Martin*

2nd Annual
CITIZEN SCIENCE
for Conservation in Southern California
SYMPOSIUM

SPECIAL SESSION
PRESENTATIONS

3:15 – 4:00 p.m.

10-12 min talks with time for Questions from the Audience

Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

Special Session Presentations

Citizen Science in the Classroom

by **Molly Porter** – *Natural History Museum of Los Angeles County (NHMLA)*

Building an Engaged Community: Tips for Communicating Citizen Science Projects

by **Holly Rindge & Linda Chilton** – *USC Sea Grant*

ACS/LA Gray Whale Census and Behavior Project Citizen Science: Recruiting and Retaining Volunteers

by **Alisa Schulman-Janiger** – *American Cetacean Society, Los Angeles Chapter*

Molly Porter

Citizen Science
in the Classroom



Citizen Science in the Classroom

by Moly Porter; *Natural History Museum of Los Angeles County (NHMLA)*

Teachers often ask for access to the real thing - at the Natural History Museum and the La Brea Tar Pits, it's most often access to the scientists themselves or opportunities to work with us on active scientific research projects. It might be the most difficult request to make a consistent reality, but it also promises one of the greatest rewards. For the past 4 years, we have been training teachers to use their school campuses as field research sites to activate the NGSS science and engineering practices as well as contribute data to our Urban Nature Research Center. Join me to hear about the different ways we are inviting teachers to participate in our Citizen Science initiatives, from fossils to squirrels, and beyond.

Citizen Science in the Classroom

Molly Porter, Senior Manager of School and Teacher Programs
Natural History Museum of Los Angeles County

March 4, 2017

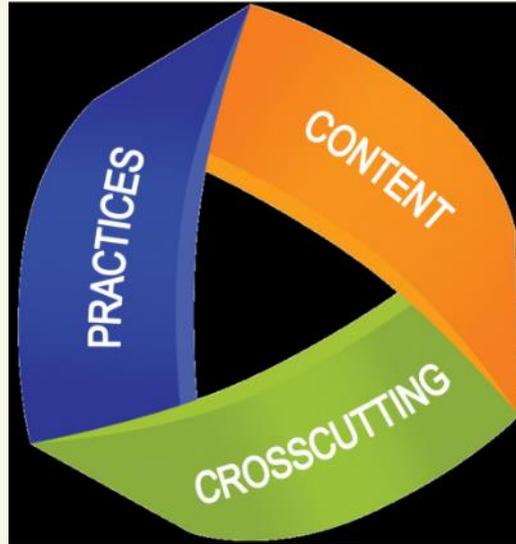
Citizen Science Symposium

Today's Presentation

- Overview of approach to Citizen Science on the school site
- A couple of specifics
- Q & A



Next Generation Science Standards



- NGSS moves away from knowing facts and emphasizes thought processes and demonstrating understanding
- NGSS requires a huge shift in teaching practice

- c. *Students know* heat from Earth's interior reaches the surface primarily through convection.
- d. *Students know* convection currents distribute heat in the atmosphere and oceans.
- e. *Students know* differences in pressure, heat, air movement, and humidity result in changes of weather.

Ecology (Life Sciences)

- 5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:
 - a. *Students know* energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
 - b. *Students know* matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
 - c. *Students know* populations of organisms can be categorized by the functions they serve in an ecosystem.
 - d. *Students know* different kinds of organisms may play similar ecological roles in similar biomes.
 - e. *Students know* the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

Resources

- 6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept:
 - a. *Students know* the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.
 - b. *Students know* different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.
 - c. *Students know* the natural origin of the materials used to make common objects.

[Related Content »](#)

Views: [Disable Poptups](#) / [Black and white](#) / [Practices and Core Ideas](#) / [Practices and Crosscutting Concepts](#) / [PDF](#)

Students who demonstrate understanding can:

- MS-LS2.2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.**
[Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]
- MS-LS2.5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*** *[Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]*

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Constructing Explanations and Designing Solutions</p> <p><i>Constructing explanations and designing solutions in 6–9 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.</i></p> <ul style="list-style-type: none"> Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2) <p><i>Engaging in Argument from Evidence</i></p> <p><i>Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).</i></p> <ul style="list-style-type: none"> Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5) 	<p>LS2.A: Interdependent Relationships in Ecosystems</p> <ul style="list-style-type: none"> Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2) <p>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</p> <ul style="list-style-type: none"> Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5) <p>LS4.D: Biodiversity and Humans</p> <ul style="list-style-type: none"> Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5) <p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"> There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to MS-LS2-5) 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns can be used to identify cause and effect relationships. (MS-LS2-2) <p>Stability and Change</p> <ul style="list-style-type: none"> Small changes in one part of a system might cause large changes in another part. (MS-LS2-5) <hr/> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World</p> <ul style="list-style-type: none"> The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5) <hr/> <p>Connections to Nature of Science</p> <p>Science Addresses Questions About the Natural and Material World</p> <ul style="list-style-type: none"> Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5)

Connections to other DCIs in this grade-band:
MS.LS1.B (MS-LS2-2); **MS.ESS3.C** (MS-LS2-5)

Articulation of DCIs across grade-bands:
1.LS1.B (MS-LS2-2); **HS.LS2.A** (MS-LS2-2); (MS-LS2-5); **HS.LS2.B** (MS-LS2-2); **HS.LS2.C** (MS-LS2-5); **HS.LS2.D** (MS-LS2-2); **HS.LS4.D** (MS-LS2-5); **HS.ESS3.A** (MS-LS2-5); **HS.ESS3.C** (MS-LS2-5); **HS.ESS3.D** (MS-LS2-5)

Common Core State Standards Connections:
ELA/Literacy -
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-2)
RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5)
RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-5)
WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2)

NHM as Teacher Resource

- NHM is already supporting NGSS and Common Core
- Teachers are not getting the support they need from the district to make the transition
- NHM offers workshops and PD to meet these needs
 - 1 to 2 workshops per month at the museum, many focused on using the outdoor classroom and CS
 - Pilot program this year training teachers/students on school sites on iNat/CS

Why Citizen Science?

- connects students to current, active scientific research and research methods
- turning a school site into a field site supports the idea of urban nature research
- shifts student perspectives on what and where science is

Start at the beginning: Using the Outdoor Classroom



Tips for Nature Observation

Carefully Consider the Obvious

We often make instant assumptions about something we see without realizing it. This means slowing down and looking closer is extremely important. Have students note the relative position, size, shape and height of characteristics (and color too, but be cautious with this) How many legs does an invertebrate have? What are its wings like? Is the body symmetrical? How so? In what way do a leaf's veins form a pattern or splits from the branch? How big is a bird's beak relative to the size of its head? What is the overall shape of the body?

Use The Senses

When it is safe to do so, go notice more than what something looks like. Have students consider how a specimen sounds or what it smells and feels like (these last two tips are more applicable to plants than animals—but in some instances can be used in both)!

Think about the Context

An animal or plant is closely connected to its environment. Note where an organism is found —broadly (e.g. Coastal Sage Scrub, Santa Monica Mountains) and specifically (e.g. under a rock in an area with full sun). What time of day or year is it? What is the weather like? There can be two nearly identical seeming animals are easiest to identify by their habitat or behavior, not how they look.

Note the Action

Take the time to consider behavior—it might not be possible to know exactly what an animal or plant is doing, but note how or where it is moving and how it sounds. A lack of activity is important to note as well, so there is always something to describe. In a plants case, notice where it growing or blooming in relation to other plants around it.

Record, Record, Record!

Put down what is noticed — draw a picture, write key words, sketch the habitat, whatever helps log the ol'

How can Citizen Science connect to Classroom Science?

- Some ideas:
 - Use pre-existing resources to create your own research question and project
 - iNaturalist.org
 - “Nightwatch” light trap kits
 - Use a scientist’s research question to begin your own project
 - Participate in a larger project

What is Citizen Science?



Projects in which volunteers partner with scientists to answer real-world questions.

— Cornell Laboratory of Ornithology

(some) Projects

- RASCals
- S.L.I.M.E
- Southern California Squirrel Survey
- Project Paleo:
 - La Brea Tar Pits
 - Invertebrate Paleontology

RASCals – Goals

General goal:

To document current distributions of reptiles and amphibians throughout southern California.

“Real-world” questions:

1. To document and track introduced species.
2. To assess how species have responded to urbanization.



RASCals – How to Participate

- 1) Find lizards, snakes, turtles, frogs, salamanders
- 2) Take photos (document location and date)
- 3) Share photos with NHM
 - Email: rascals@nhm.org
 - Upload to the project: inaturalist.org/projects/rascals

S.L.I.M.E Educator Workshop





Squirrel Observations

Grades K-12

Duration

Pre-Visit: 20-30 minutes

Location

Gem & Mineral Hall

Supplies

- Data sheets
- Pencil
- Watches or timers
-
- Clipboard (optional)

Standards

NGSS:

K-ESS2-1, K-LS1-1, 2-LS4-1, 3-LS3-1, 3-LS3-2, 3-LS4-2, 4-LS1-1, 5-PS3-1, 5-LS2-1, MS-LS2-2, HS-LS2-2, HS-LS2-6

CCSS ELA:

9-12.W.1, 9-12.W.9

CCSS Math:

K.OA.1, 1.MD.4, 2.MD.10, 3.MD.3, 4.MD.4, 5.MD.2, 6.SP.4, 6.SP.5, 8.SP.1, Algebra I 5-ID.6, Algebra II 5-IC.4,

Vocabulary

Concepts

- Consistent observations can be compiled into workable data sets
- Data can be evidence from which students can support a claim

Objectives

- Students will practice making and recording observations outdoors.
- Students will improve their data-collection skills through practice and reflection.
- Students will analyze their own collected data and produce graphs or other visual representations of their observations.

Outline

1. Students will practice recording observations in an outdoor setting for the first few sessions.
2. For the next few sessions, students will make more structure observations using a timed drawing exercise
3. For the last few outdoor sessions, students will collect data directly onto a data sheet.
4. The class will analyze and pictorially represent its data at grade-appropriate levels.

Southern California Squirrel Survey



Project Paleo: La Brea Tar Pits

In classroom model :

students sort
fossil matrix



Teacher Feedback

- Since visiting the renovated NHM in 2013 after several years of absence, I have developed a newfound awareness and appreciation for the biodiversity existing in Los Angeles. Nature has become a priority in my daily life both at home and at school, and I often implement the ideas learned at NHM teacher workshops in one or both settings.
- I keep my camera handy to photograph and upload pictures to iNaturalist. I actively participate in the SLIME program and regularly collect and drop off snails at NHM. I love participating and contributing to citizen science programs!

Student Impact

- At school, we are participating in the Super Citizen Scientist program with our upper graders. Students are much more observant, aware and appreciative of nature. I believe that our students have become more caring and respectful of living things. I recently recognized that all the field trips I schedule are outdoors and nature-related!
- I hope that all the nature-related activities that I have provided for my students will help them to be good stewards of the earth.

In the works

- Project Paleo: Invertebrate Marine Fossils
- On school site iNat trainings for teachers and students
- Camera traps on school sites
- Pending proposals for more dedicated staff and staff time...



22



29.61 inHg ↑ 🌡️ 64°F ● 07/04/2012 09:43PM NATURELAB

NATURAL
HISTORY
MUSEUM
LOS ANGELES COUNTY

Thanks for joining me!

- Questions? Comments?

Contact: mollyporter@nhm.org



Holly Rindge

Building an Engaged Community: Tips for Communicating Citizen Science Projects

Building an Engaged Community: Tips for Communicating Citizen Science Projects

by Holly Rindge and Linda Chilton; *USC Sea Grant*

Many citizen science projects are focused on big issues such as water quality, sea level rise, and the conservation of species. Successfully meeting project goals requires project visibility and long-term community participation. How do you balance a variety of communication goals to support a project? This talk will explore what motivates volunteers to participate and what makes their participation worthwhile. Building on these motivations, the talk will share communication and marketing tips for increasing a project's visibility and sustaining positive engagement. If you know what motivates your audience, you can tailor communication and marketing efforts that speak to the common values and goals that you share. Lessons will be shared from the Urban Tides Community Science Initiative and other projects.

Building an Engaged Community



Tips for Communicating Citizen Science Projects



Holly Rindge | USC Sea Grant
Communications Manager

Define Communication Goals



Goals:

- Raise visibility
 - funding
 - issue awareness
 - gain partners
- Increase participation
 - initial
 - long term

Find Your Audience



Considerations:

- Type of project
 - online
 - on location
- Timing
 - specific
 - flexible
- Tasks
 - Level of knowledge or training needed



FACES OF CITIZEN SCIENCE



URBAN TIDES COMMUNITY SCIENCE INITIATIVE



**What Motivates
Your Audience?**

Initial Participation



Motivations:

- personal interest
- self- promotion
- self-efficacy
- social responsibility

Long term Participation



Motivations:

- trust
- common goal setting
- acknowledgement & attribution
- mentorship
- external relationships
- time
- technology

Evaluation



Participation is Worthwhile:

- knows their data is useful
- contribution has an impact on project and/or issue
- enjoying the project
- skills development
- received feedback and support
- **good project!**

Messages Matter



Tips:

- shared values
- compelling threat
(issue & why it matters)
- local connection
- simple solution
- call to action
- impactful visual

Messages Matter



Example:

Capture the future of our Urban Ocean! Urban Tides is a community based science effort to photo-document tidal lines, coastal flooding and beach erosion in Southern California.

Messages Matter



Example:

It's your coastline! Your observations about how and where it is changing will help further the collective dialogue about how we can adapt to rising seas.

Messages Matter



Example:

Help document the impacts of rising sea levels in your community! Visualizing today's risks enables communities to set priorities and plan strategies that will help them adapt to the future impacts of sea level rise.

Tell a Good Story



Sources:

- <http://www.resource-media.org/toolbox/>
- <http://www.bangthetable.com/lessons-from-citizen-science-for-community-engagement-practice/>
- <https://vimeo.com/200238318>

Thank you!



Contacts:

- Holly Rindge
rindge@usc.edu
- Linda Chilton
lchilton@usc.edu
- Urban Tides
<http://dornsife.usc.edu/uscsea/grant/urban-tides-initiative/>

Alisa Schulman-Janiger

ACS/LA

Gray Whale Census & Behavior
Project Citizen Science:
Recruiting & Retaining
Volunteers



ACS/LA Gray Whale Census and Behavior Project

Citizen Science: Recruiting and Retaining Volunteers

by Alisa Schulman-Jangier; *American Cetacean Society, Los Angeles Chapter*

The ACS/LA Gray Whale Census and Behavior Project, the only full season shore-based gray whale census, has been conducted by citizen scientists near Pt. Vicente, CA for the past 34 years. We collect baseline data for seasonal usage of the gray whale nearshore migratory corridor in the San Pedro Channel, document trends over time, record behaviors, and identify and record other marine mammals. We also interact with the visiting public at our site: the Point Vicente Interpretive Center. Our observation station is open 7 days/week, from 1 December through mid/late May, averaging ~12 hours/day. Teams of ~3-6 observers work in shifts of 3-6 hours/day, each with at least one veteran observer. Most observers volunteer for 1-3 shifts/week. The number of observers has varied between 55-110 annually; ~35-50% of effort hours are by a core group of 10-15 veteran observers who are volunteer more than 200 hours per season. Twenty-eight of this season's 95 observers have been with our project for over 10 seasons. In my presentation, I will discuss how we have recruited our volunteers: how they found out about our project, and why they joined us. I will also discuss how we retain them: why our observers say that they continue to stay involved in this project.

ACS/LA Gray Whale Census and Behavior Project

Citizen Science: Recruiting and Retaining Volunteers



ALISA SCHULMAN-JANIGER

janiger@cox.net

Citizen Science Symposium, Aquarium of the Pacific
4 March 2017: Long Beach, CA

ACS/LA GRAY WHALE CENSUS AND BEHAVIOR PROJECT

34th consecutive season: 1984-2017

Point Vicente Interpretive Center

Citizen Science

98 Trained volunteers

Cabrillo Whalewatch volunteers

Public

1 Dec 2015 - 31 May 2016

183 days (2,213 hours, 12+ hours/day)

9,296 effort hours

14 core volunteers (200+ hrs each)

~51% of effort hours





POINT VICENTE INTERPRETIVE CENTER
Palos Verdes Peninsula



Point Vicente Interpretive Center

ACS/LA Gray Whale Census and Behavior Project



ACS/LA Gray Whale Census and Behavior Project: PVIC

Identifying, counting, recording numbers of gray whales/other cetaceans
Noting trends in distribution, abundance, recruitment, and seasonality



Recording Data: teamwork



Breaching: most exciting behavior!

(Photographed from our Census Post: Feb 2016)



© Alisa Schulman Janiger

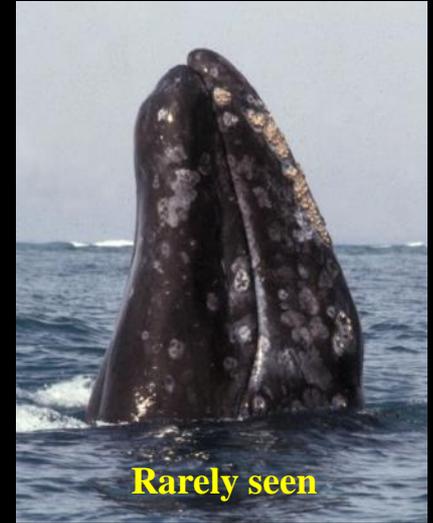
Behaviors Observed

SPYHOPPING



From GW Census

BREACHING



Rarely seen

MILLING: circling



From GW Census

KELPING: play in kelp, rest; sometimes feed



Skim-Feed, Lunge-Feed Opportunistically



LUNGE
FEED



SKIM-FEED



SKIM-FEED

Behaviors Observed



COURTSHIP
MATING



NEWBORN
CALVES
NURSING!



COW/CALF PAIRS

Difficult to track newborns (sb)

Low-profile cows , small calves

Frequently hug kelpbed; resting

Easier to track northbound pairs

Nursing behavior observed



Newborn



**2014 northbound calf
#285!**

“Super-Pod”: 23+ Gray Whales on 20 January 2013!

Collaboration, Sighting Network: Tracked Group

20 January 2013: Pt. Vicente



Natalie Massey



Alisa Schulman-Janiger

21 January 2013

Coronados Is, SD

~18 hours later

~3.5 miles/hour

9/10 Fluke Matches



Melissa Panfili Galieti

Gray Whale Super-Pod: Fluke ID Match!



© Alisa Schulman-Janiger

20 January 2013: Pt. Vicente



© Melissa Panfili-Galiati

21 January 2013: San Diego

Orca tooth
scars →



© Diane Alps

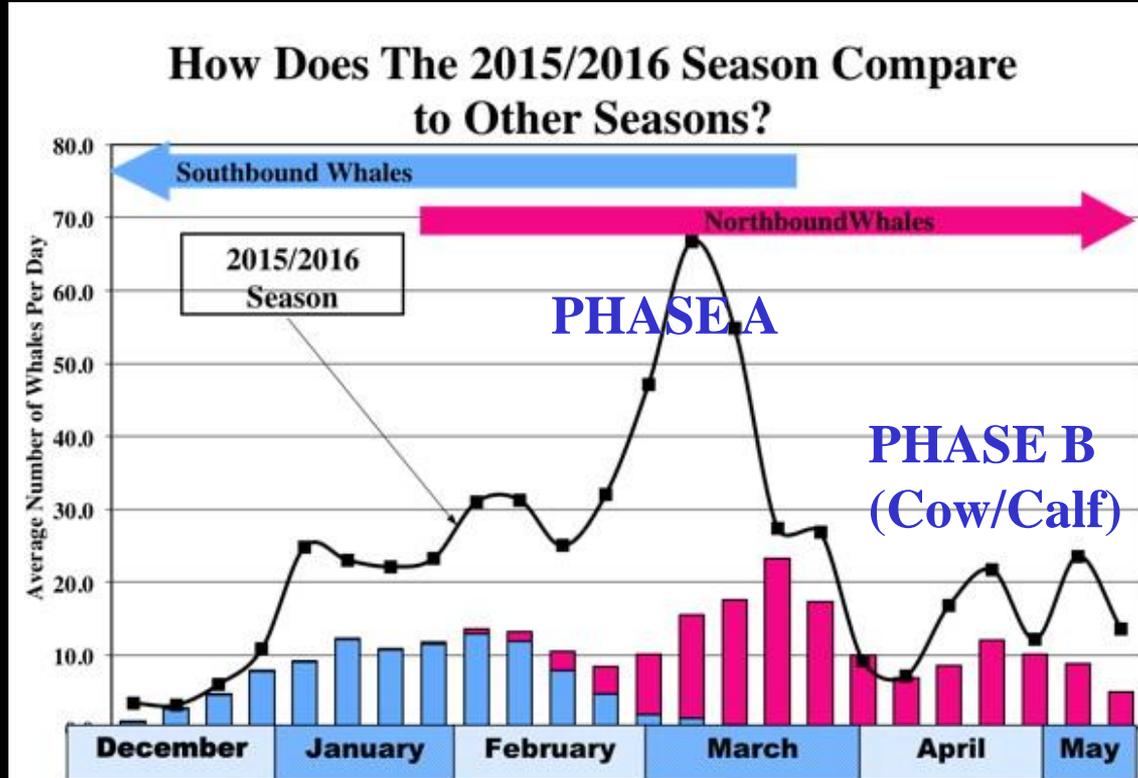
← Orca tooth
scars

9 March 2012: San Ignacio Lagoon

ACS/LA Gray Whale Census and Behavior Project

Comparing 2015-2016 Season with 10 Previous Seasons

1,430 southbound (including 33 cow/calf pairs: 2.3%) – 2nd highest (last season – 1,902 record)
2,541 northbound (including 341* cow/calf pairs: 13.4%) – 4th highest; *highest calf count



ACS/LA Gray Whale Census:

Whiteboard Display: Public Education

2016-2017

GRAY WHALE CENSUS & BEHAVIOR PROJECT AMERICAN CETACEAN SOCIETY, LOS ANGELES CH

GRAY WHALES	TODAY 3 • 3 •17	TOTALS SINCE 12•01•16	LAST SEASON TOTALS
SOUTHBOUND	7	1181	1430
NORTHBOUND	32	174	2541
TOTAL GRAY WHALES	39	1355	3971
COW/CALF PAIRS SOUTHBOUND		68	33
COW/CALF PAIRS NORTHBOUND		0	341 *

OTHER SIGHTINGS

RECORD*

WHALES	DATE	DOLPHINS	DATE	OTHER	DATE
FIN	3-1	COMMON	3-3	FALSE KILLER WHALE	1-1
BLUE		BOTTLENOSE	3-3		
MINKE	3-1	PACIFIC WHITESIDED	2-25		
HUMPBACK	2-24	RISSO'S			
ORCA	1-7				

WWW.ACS-LA.ORG

Interactions with Other Species: Pacific White-sided Dolphin



More Common Cetaceans Sighted Off Point Vicente



Less Common Cetaceans Sighted Off Point Vicente



Sperm Whales (5 Dec 2016)

© Alisa Schulman-Janiger



Pilot Whales



Northern right whale dolphin



False killer whales

© Alisa Schulman-Janiger



Dall's Porpoise

CALIFORNIA KILLER WHALE PROJECT



Bigg's (transient) killer whales: The Friendly CA51s: most years since 2011



© Alisa Schulman-Janiger

Offshore killer whales (shark specialists): Dec 2016



© Alisa Schulman-Janiger

Eastern Tropical Pacific killer whales: Jan 2017



CALIFORNIA SEA LION: ~ daily
(Steller's Sea Lion: very rare)



NORTHERN ELEPHANT SEAL
Most seasons



NORTHERN FUR SEAL
Very rare



HARBOR SEAL: most days



SOUTHERN SEA OTTER
Occasional: more in recent years

2015-2016 Sightings (photographed from PVIC)



© Allen Sobelman-Taniger

Gray Whale: 28 Jan 2015



7+ Gray Whales: 11 Feb 2015



Coastal Bottlenose Dolphin-ID.
11 Feb 2015



Killer Whale CA49B. 10 Feb 2015

Gray Whale Census: Team Players



Gray Whale Census: tracking whales



Tracking whales – rain or shine! 1 March 2014: 101+ grays!



Gray Whale Census: Team Players, having fun!



Volunteer Appreciation: Annual Potluck

40 Hours:
Census Patch



75 Hours:
Census Visor



200 Hours:
Engraved Glass Mug



Stunning views



Volunteer Recruitment

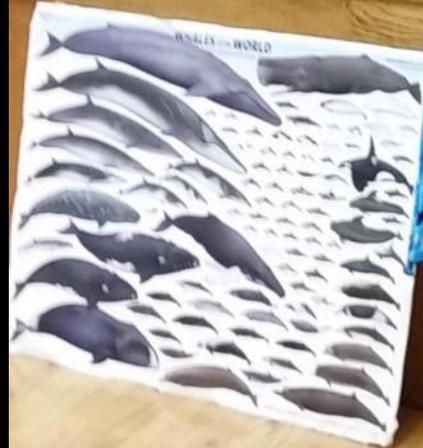
How did you hear about our project?

From Alisa, Census Director: (23/55)

Cabrillo Whalewatch Class

Weekly updates , Dec-Mar

ACS Talks



Volunteer Recruitment

How did you hear about our project?

Friends (20/55)

From the Census

From whale watch trips

Neighbors

Point Vicente docents



Volunteer Recruitment

How did you hear about our project?

Visited Point Vicente Interpretive Center (14/55)

Walking

Saw whales

Talked with volunteers



Volunteer Recruitment

How did you hear about our project?

Media (12/55)

Newspaper (6)

Online (5)

Radio (1)

THE CALIFORNIA REPORT

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Citizen Scientists Take On Gray Whale Census

Reporter: Valerie Hamilton

A highway cop, a musician and an animal trainer – it sounds like the setup for a corny punch line, not the basis of one of Southern California's longest-running gray whale research projects. Add in an IT technician, a night nurse and more than 70 others, and you've got the force driving the gray whale census at Palos Verdes' Point Vicente Interpretive Center, a marine biology research project staffed by



Marcus Teply/KQED

A whale census volunteer scans the water for gray whales near Palos Verdes.

volunteers for 31 years.

From a cliff-top terrace, volunteers working in shifts scan the sea from sunrise to sunset, for the duration of the whales' December-to-May migration, keeping tabs on whales' direction, condition, company and behavior. Run by the Los Angeles chapter of the American Cetacean Society, it's the only project of its kind that covers the entire migration season – and what keeps it afloat are citizen scientists, ordinary people trained to make and record scientific observations.

"Many of our people are members of the public who were jogging by one day, another day brought binoculars, another day brought a chair, and then they end up as part of that project," says Alisa Schulman-Janiger, the marine biologist who founded and oversees the project.

Volunteer Sheila Parker is a case in point, a retired Los Angeles highway patrol officer who stumbled upon the project on a walk with her daughters. "My daughters were bored, so the next day I came out by myself," she recalls. That was three years ago. Now she staffs the project every week, watching through binoculars for whales and other marine life, and keeping detailed records of position, weather conditions and behavior that the group logs and shares with other researchers studying the whales.



Marcus Teply/KQED

Sheila Parker (L) shows a volunteer the day's whale census log sheet. This year's gray whale count at Point Vicente is the highest in 16 years.

Gray whales have one of the longest migrations of any mammal, traveling more than 10,000 miles round-trip every year, between Arctic feeding waters and the warm-water Pacific lagoons in Baja California where whale calves are born every spring.

Volunteer Recruitment

How did you hear about our project?

Media:

I post daily summaries

ACS/LA Facebook

ACS/LA Website

 **Alisa Schulman-Janiger** at Point Vicente Interpretive Center.
1 hr · Rancho Palos Verdes · 🌐

ACS/LA Gray Whale Census, 3 March 2017, Pt. Vicente, message from our observers: seven southbound and thirty-two northbound GRAY WHALES today! Whales in two sightings rolled around, displaying pectoral flippers: a northbound pair, and a southbound single. One southbound whale and one northbound whale were stealthy, keeping low profiles. Gray whales in fourteen of twenty-two sightings fluked. We also spotted multiple groups of COMMON DOLPHIN (feeding with many birds), as well as small groups of coastal BOTTLENOSE DOLPHIN. Photo today: Census Sunset, by Gray Whale Census Director Alisa Schulman-Janiger.

Gray whale counts to date (since 1 Dec):

Southbound grays today	----- 7
Northbound grays today	----- 32
Southbound calves today	-----0
Southbound grays, totals	--- 1181
Southbound calves, totals	-----68
Northbound grays, totals	----- 174


© Alisa Schulman-Janiger

👍 Like 💬 Comment ➦ Share

   Cindy L. Dumas, Judy Peacock and 5 others

 **Scottie Schmidt** Wow! Great color in that sunset. Thanks Alisa.
Like · Reply · 1 hr · Edited

Volunteer Recruitment

Why did you join our Gray Whale Census Project?

Loves whale watching (31)

Interested in the more scientific side of whales (15)

Loves the ocean (11)

Great way to meet people with similar interests (11)

Stay connected with friends that also like whale watching (6)

Naturalist: wants to get better at spotting/learning about whales (6)

Retired: had more time, looking for something interesting to do (4)

Loves nature and outdoors: wanted to be in a beautiful area (4)

Wanted to learn new skills (4)

Sounded like it would be good therapy, relaxing (3)

Sounded like fun! (3)

Volunteer Retention

What has kept you involved with our project?

Social

Make new friends, get to know fellow whale watchers (52)

Gray Whale Census team: “like family”

Enjoy interactions with the public (10)

Lifelong educators: love to teach others

Citizen Science Project

Seeing the whales: enjoy watching, learning more about them (51)

Wants to contribute to citizen science, long-term study (36)

Beautiful Location

Love being outdoors, looking at ocean: animals, taking photos (36)

Therapy,: very relaxing, lowers blood pressure (6)

Pure enjoyment, very fun activity (6)

Volunteer Retention

What has kept you involved with our project?

NOTE: I schedule census coverage around volunteer availabilities

“I have stayed because: enthusiasm of other participants; the beautiful location, opportunity to participate in this citizen science project; I am continually learning and thus can help to educate others; I get to watch whales with other enthusiasts”

“In order of importance: counting whales and learning about them, making friends, being a part of something so important scientifically, spectacular scenery of RPV”

“I come for the whales, and the bonds formed with my fellow whale watchers”

“Being part of a citizen science project is the best part of the census. The great people are a plus, as is the amazing location – but the project is the main reason”

“I feel welcomed and valued”

Gray Whale Census: Sunrise to Sunset





© Alisa Schabmar-Janiger

Thirty-four seasons...and counting!



Carla Mitroff

Any Questions?



© *Alisa Schulman-Janiger*

2nd Annual
CITIZEN SCIENCE
for Conservation in Southern California
SYMPOSIUM

RECEPTION
with
**POSTER PRESENTATIONS
& BOOK SIGNING**

4:00 – 6:00 p.m.

Saturday, March 4, 2017 at the Aquarium of the Pacific in Long Beach, CA

Data Quality in Citizen Science: Applying Technology to Assess Volunteer Participation in Marine Wildlife Research

by Cassandra Davis¹, Barbara Ramon¹, Jennifer Lentz¹, and Dan Lawson²;
Aquarium of the Pacific¹ & National Marine Fisheries²

The San Gabriel River Sea Turtle Monitoring project applied technology to assess the accuracy of citizen scientist observations and population monitoring with the objective of providing ongoing assessment of real data reported by citizen science participants, identifying margins of error, and contributing to improved data and instructional protocol. Over a period of one year, accuracy and data quality were tracked by filming active monitoring stations. The evaluation of participants was randomized, and the use of video monitoring allowed for multiple passes analyzing the accuracy of live observation. The comparative data serves to validate the observational data and allows for further estimation of citizen scientist value in this ongoing study. This study revealed that video observation allows for independent, unbiased and in-depth analysis of volunteer findings in a manner that is both scalable and replicable, while adding a measure of data quality analysis that can benefit a variety of citizen science observation projects.

Data Quality in Citizen Science: Applying Technology to Assess and Analyze Volunteer Participation in Marine Wildlife Research



Cassandra Davis¹, Barbara Ramon¹, Jennifer Lentz, PhD¹, and Dan Lawson²,
 Aquarium of the Pacific¹ and National Marine Fisheries Service²

Abstract

Results from existing studies indicate that combining citizen science data with traditional biological research methods and new tracking technology may be an ideal approach for marine research.

Mixed methods can confirm data collection methods, identify outliers, strengthen small sample sizes or time periods, and provide a richer picture of animal behavior, but only if researchers are able to accurately measure observation data fidelity.

The San Gabriel River Sea Turtle Monitoring Project applied technology to assess the accuracy of citizen scientist observations and population monitoring with the objective of providing ongoing assessment of real data reported by citizen science participants, identifying margins of error, and contributing to improved data and instructional protocol.

This study revealed that video observation and review allows for independent, unbiased and in-depth analysis of volunteer findings in a manner which is both scalable and replicable while adding a measure of data quality analysis that can be easily replicated for a variety of citizen science observation projects.

Background

Tullooh, A.L.T., Possingham, Joseph, Szabo, and Martin (2013) indicate that data reported from citizen scientists trends toward accuracy. They highlight the possibility of greater accountability from citizen scientists and more accurate estimates of error rates for data analysis through the addition of technology tools, training for scientists in the field; comparative analysis between citizen scientists and surveys by scientists; and realistic expectations and measurements for citizen science participants.

Danielsen, Jensen, Burgess, Altamirano, Alviola, Andrianandrasana, and Young (2014) evaluated the accuracy of citizen recording for biodiversity and scientific sampling through a direct comparison between citizen-gathered data and data gathered by trained scientists across thirty-four different habitats.

Research from Danielsen, et al. (2014) found that locally trained individuals and trained scientists are equally good at gathering and recording data, validating the value of local citizen science projects measuring biodiversity. This validation is key to evaluating the value and accuracy of citizen science projects.

Objectives

This study sought to explore and compare scientist-reported and trained citizen-reported wildlife observation data in field research. Volunteer observation sessions were digitally recorded and meticulously reviewed in order to:

- Duplicate the data quality analysis of Danielsen, et al. (2014) in comparing 1:1 citizen science and researcher observations across multiple observation stations through the use of technology.
- Assess the effectiveness of citizen scientist observations.
- Identify any areas where additional training or support could improve citizen scientist data reliability.
- Establish a reasonable and reliable margin of error across citizen scientist reports from observation sessions.
- Institute scalable and repeatable solutions to providing increased rigor and accountability in citizen science applications.

Methods

Citizen scientists are recording surfacing behavior of Pacific green sea turtles (*Chelonia mydas*) at set observation stations on the San Gabriel River for ongoing population assessment in a joint project between the Aquarium of the Pacific, Los Cerritos Wetlands Authority, and the National Marine Fisheries Service.

Accuracy in data reporting was tracked over a one year period by filming active monitoring stations during set observation sessions and comparing the digital record with the citizen scientist report for that same time period. Two out of ten stations were monitored each session, stations 4 and 6, with additional video monitoring employed when available.

The use of video monitoring allowed for multiple passes analyzing the accuracy of live observation while minimally affecting observation behavior.

- Outdoor sports action cameras were utilized to record footage of monthly monitoring sessions from start to finish at 20% of stations
 - Selected due to their video quality, low profile, durability, and weather resistance
- Cameras recorded data at stations concurrently with the observation period for twelve consecutive months
- All active citizen scientist participants were rotated through one of the stations at least once during this twelve month period, ensuring a variety of individuals were assessed for quality and consistency in observations
- Videos were reviewed blindly, without knowledge of date, station number, or citizen scientist participants
- A multiple review system was created in order to ensure that no sighting was overlooked using the video:
 - Videos are reviewed twice with no sound and observations are recorded.
 - Videos are paused, rewound, or zoomed in order to better identify or confirm sightings on the second viewing.
 - Videos are reviewed once with sound and observations are recorded separately, then compared with previous observations
- Following the reviews, recorded observations are viewed a final time compared to citizen scientist data sheets to observe accuracy

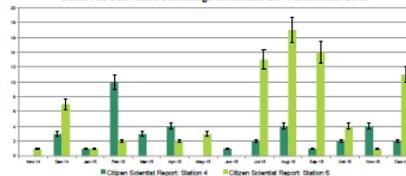
Results

- Errors in recorded observation data included four missed sightings, three false sightings, and seven additional estimated individual turtles over the course of the year between the two stations.
- Comparison between live observation and recorded review revealed an average error rate of +/- 0.5408 for surfacing counts and +/- 0.7142 for the estimated number of turtles.
- Live observation by citizen scientists was consistently more accurate than direct video observation without sound (watching without pausing or zooming) or other external reference.
 - Observation of video recordings with sound was biased due to citizen scientist exclamation or discussion about recent sightings. It is unknown whether video observations with sound but without citizen scientist participation would be more or less accurate than live observation.
- Missed sightings create the biggest impact on citizen scientist data accuracy.
 - Distractions played a key role in missed sightings, including talking, the presence of debris, high bird activity, or increased surfacing numbers.

Results

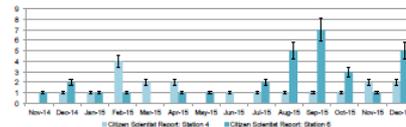
Observation	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15
Citizen Scientist	0	2	1	1	1	1	1	1	1	1	1	1	1
Video Observation	0	2	1	1	1	1	1	1	1	1	1	1	1
% Citizen Scientist	0	100	100	100	100	100	100	100	100	100	100	100	100
Video Observation	0	2	1	1	1	1	1	1	1	1	1	1	1
% Video Observation	0	100	100	100	100	100	100	100	100	100	100	100	100
% Citizen Scientist	0	100	100	100	100	100	100	100	100	100	100	100	100

Observed Sea Turtle Surfacing November 2014-December 2015



Observation	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
Citizen Scientist	0	2	1	1	1	1	1	1	1	1	1	1	1	1
Video Observation	0	2	1	1	1	1	1	1	1	1	1	1	1	1
% Citizen Scientist	0	100	100	100	100	100	100	100	100	100	100	100	100	100
Video Observation	0	2	1	1	1	1	1	1	1	1	1	1	1	1
% Video Observation	0	100	100	100	100	100	100	100	100	100	100	100	100	100
% Citizen Scientist	0	100	100	100	100	100	100	100	100	100	100	100	100	100

Estimated Number of Sea Turtles Observed 2014-2015



Conclusions

Comparative data obtained through high quality video recording serves to validate observational data, assess a margin of error, and build more robust tools for analyzing citizen scientist data in this longitudinal wildlife study. Recent technological advances have made it affordable for citizen science projects to employ technology solutions that are compact, resistant to the elements, and able to withstand the rigor of field work.

Combining citizen science data with traditional biological research methods and new tracking technology may be an ideal approach for marine research. Mixed methods can confirm data collection, identify outliers, strengthen small sample sizes or time periods, and provide a richer picture of animal behavior.

Technology can be applied to analyze the quality of data collected by citizen scientists, but it was not found to be a good substitute for citizen scientist participation in this study. Citizen science participation in person was more time efficient than digital video analysis, and was found to be more accurate than the initial viewing of a digital video. Video recording of data collection sessions and subsequent analysis is recommended for further spot evaluation and more extensive data quality and error rate analysis.

Development and Enhancement of the Michigan Invasive Aquatic Plant Citizen Monitoring Program

by Angela De Palma-Dow and Jo Latimore;

Michigan State University & MiCorps Cooperative Lakes Monitoring Program

The Exotic Aquatic Plant Watch (EAPW) is a specialized volunteer component of Michigan's Cooperative Lakes Monitoring Program. Although public interest in the EAPW is great, evidenced by high attendance at annual training sessions, volunteer enrollment and completion rates were initially quite low. To identify the barriers to enrollment and reporting we visited 41 lakes and volunteers during 2013-2016. Lake visits revealed that volunteers were uncertain how/where to sample, desired help in their efforts, and lacked confidence in correctly identifying plants. To address these findings, we improved protocol and teamwork training and also incorporated a new, lightweight and water-resistant Michigan-specific aquatic invasive plant field guide. After applying these strategies to the program, we saw a 23% increase in lake enrollment, 26% increase in data reporting and a 262% increase in aquatic invasive plant detections, when comparing 2016 results to 2013 data. These findings indicate that hands-on staff involvement and investment in training and resources are essential to increasing participation and reporting of aquatic invasive plants.

DEVELOPMENT AND ENHANCEMENT OF THE MICHIGAN INVASIVE AQUATIC PLANT

CITIZEN MONITORING PROGRAM

Angela De Palma-Dow and Jo Latimore, Michigan State University, East Lansing, MI



BACKGROUND

- The Exotic Aquatic Plant Watch (EAPW) is part of Michigan's Cooperative Lakes Monitoring Program (CLMP)
- CLMP provides valuable data on 200+ lakes to local communities and statewide managers
- EAPW volunteers can initiate early detection & rapid response for invasives, minimizing their impacts

PROBLEMS

- Low EAPW enrollment: While training sessions were popular, only 26 of the 221 CLMP lakes (12%) enrolled in 2011
- Low reporting: Only ten (43%) of enrolled lakes reported EAPW data in 2011
- No volunteer-friendly identification literature for Michigan invasive aquatic plants

RESEARCH QUESTIONS

- Why are volunteers not enrolling in the EAPW?
- Why are enrolled volunteers not completing surveys & submitting data?
- How can EAPW staff improve both?



1) Written surveys distributed in 2013 examined:

- Awareness & perception of EAPW
- Motivation of volunteers to enroll / not enroll in EAPW

2) Staff lake visits assessed volunteers' ability to:

- Conduct plant sampling & record & map data
- Distinguish exotic plants from native ones

3) National program review using phone interviews:

- Targeted similar state-wide invasive species monitoring programs
- Identified approaches to increase volunteer participation

RESULTS

- Volunteer surveys (n=36, 2013) revealed that while 87% of volunteers were aware of EAPW program, the most common reasons for not enrolling in EAPW were:
 - Lake community pays a professional to manage weeds (23%)
 - Volunteers are not confident in plant ID (18%)
 - Volunteers do not have time (14%)
- Staff lake visit (n=41, 2013-2016) observations revealed volunteers:
 - Lacked confidence in correctly identifying invasive plants
 - Didn't know how to ask staff for help with plant identification
 - Were uncertain where in their lake to sample for invasives
 - Felt alone in their efforts and wanted help from others to complete sampling
- National program review (n=9, 2013) revealed that successful programs include:
 - Hands-on training & personal communication, videos & interactive websites
 - Acknowledgement & reward systems
 - Regional training & support networks

IMPROVEMENT ACTIONS

- Creation of program brochure & training video to advertise the program
- Creation & distribution of a Michigan-specific invasive plant guide
- Clarified sampling protocol & training with advertised side-by-side staff visits
- Encouraged digital photo use & electronic submission to staff for ID confirmation
- Creation & distribution of training tools & resources focused on teamwork & recruitment
- Increased regional training opportunities



OUTCOMES

Figure 1. EAPW enrollment and reporting 2011-2016



Figure 2. Number of invasive species detections by volunteers

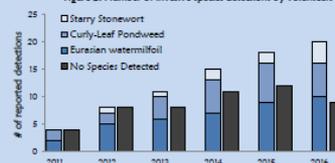


Figure 3. Volunteer Teamwork

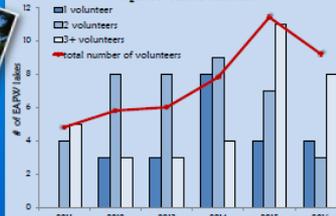


Figure 1. While enrollment has increased, reporting has almost doubled since program enhancements were implemented. To date, 78 different lakes have enrolled in the EAPW!

Figure 2. Participation increases lead to more frequent discoveries of invasive species, which facilitates control. Volunteers are also reporting negative results (absence of invasive species), which is very useful for tracking invasion status over time. This result suggests volunteers' confidence in ID has improved, in part to EAPW ID resources and staff lake visits.

Figure 3. Overall, the number of volunteers in the EAPW has increased and, most importantly, volunteer teams with 3 or more members have increased, indicating teamwork tools have been beneficial to volunteers in recruiting assistance.



Funding for this project is provided from citizen donations collected through fees associated with the sale of Michigan's Water Quality Protection License Plates under Public Act 74 of 2008. By law, these funds are to be used for water quality protection in Michigan Great Lakes, inland lakes, rivers, and streams through the Michigan Department of Environmental Quality.

Developing a Citizen Science Program for the Multi-Agency Rocky Intertidal Network (MARINe)

by Andrea Maguire and Lisa Gilbane; *Bureau of Ocean Energy Management (BOEM)*

The Multi-Agency Rocky Intertidal Network (MARINe) is a unique partnership of agencies, universities and private groups committed to long-term monitoring of the rocky intertidal habitat. MARINe is working to develop a citizen science program to supplement its existing monitoring program and to fulfill outreach and educational goals. A pilot was launched at a permanent site in Santa Barbara, CA, where a trained site leader guides volunteers in utilizing simplified survey protocols. The next steps are to build upon this work to design and implement a sustainable citizen science program for MARINe. The goal is to develop a strategy that will add value for both MARINe and the volunteers. Areas that will be explored include: identifying key research questions and data needs; evaluating approaches that will yield accurate, useful, and trustworthy data; and developing solutions for known issues such as data quality and integration, resource constraints, and volunteer training and retention.

The Multi-Agency Rocky Intertidal Network

MARINe is a unique partnership of agencies, universities, and private groups committed to long-term monitoring of the rocky intertidal habitat. The ecological importance, accessibility, and strong public appreciation of these communities provide an ideal venue for citizen participation in monitoring.

MARINe monitors over 200 sites from Alaska to Baja, Mexico.



- Monitoring includes:
- Long-Term Plots
 - Target Species
 - Biodiversity Surveys
 - Rapid Assessments

MARINe scientists use standardized protocols and submit data into a shared database. Each partner contributes money, time, equipment, and/or people. The existing network provides a framework to utilize and support citizen science.



For a full list of MARINe partners, funding sources, data, and protocols, visit: pacificrockyintertidal.org

Integrating Citizen Science into MARINe

The Bureau of Ocean Energy Management (BOEM) is taking steps to develop a citizen science program that will supplement existing monitoring and fulfill outreach and educational goals. Key aspects of a successful program have been identified, including a need to:

- Focus on key data needs and research questions
- Add value to monitoring efforts in time and/or space
- Produce useful, high-quality, and reliable data
- Leverage resources across the network
- Engage the public in a meaningful way

Here we present an overview of two citizen science programs that MARINe is involved in.

Citizen Science Pilot: Coal Oil Point

A pilot program was launched at an existing long-term monitoring site in Santa Barbara, California. A site leader was designated to guide volunteers in data collection. The standard MARINe methodology was adapted for a simplified protocol.



Felins et al., 2016. A Citizen Science Monitoring Protocol for the Rocky Intertidal Habitat. Bren School of Environmental Science & Management, University of California, Santa Barbara, 2016 Master's Group Project.

Key features of the pilot program:

- Designed to take place once per season (4 times per year)
- Flexible sampling dates, during low tide
- Survey takes 2 hours, + 1 hour setup and cleanup
- Requires at least 4 citizen scientists + 1 site leader
- Simple protocol only requires a short in-field training

Easily Identifiable Target Species



Felins et al., 2016. A Citizen Science Monitoring Protocol for the Rocky Intertidal Habitat. Bren School of Environmental Science & Management, University of California, Santa Barbara, 2016 Master's Group Project.

Next Steps to Expand the Pilot

To implement a sustainable program, MARINe will develop a strategy that will add value for all participants, with a focus on:

- Solutions for data quality, management, and integration
- Selecting new sites and adapting the protocol
- Recruitment and retention of site leaders and volunteers
- Connecting with existing groups across the network

Crowdsourcing Observations: Sea Star Wasting Syndrome

Since 2013, sea stars along the Pacific coast from Alaska to Mexico have been dying due to a wasting syndrome. In response, MARINe began working with volunteers to expand the frequency and location of observations. Crowdsourced data have been crucial in elucidating trends in sea star populations, making it possible to document the extent of wasting and recovery.

Why is the sea star effort successful?

- Easily identifiable, charismatic species
- Volunteers want to help solve a tangible problem
- Multiple tiers of involvement, both informal and formal
- Valuable supplement to long-term monitoring data

Public and media interest



Results shared with public



Easy protocol and ID guides



Web forms for data entry



Special thanks to C. Melissa Miner and the MARINe team at University of California, Santa Cruz, and the many volunteers who contributed to the sea star work.

For more information and a complete list of contributors, visit: seastarwasting.org

Beyond MARINe, BOEM and other federal agencies are working to determine how citizen science can best be integrated into existing programs and support decision-making.

About BOEM Pacific OCS Region

The Bureau of Ocean Energy Management (BOEM) manages the responsible exploration and development of the nation's offshore energy and marine mineral resources on the U.S. Outer Continental Shelf (OCS). The BOEM Pacific OCS Region is responsible for providing access to and managing energy and mineral resources on the OCS offshore California, Oregon, Washington, and Hawai'i. BOEM is a substantial supporter and participant in MARINe.

Harmful Algal Bloom Watch (HABwatch): Long Beach

by David Merrill, Cassandra Davis, and Jennifer Lentz;
Aquarium of the Pacific (AOP)

HABwatch is a network of scientists and volunteers from science centers, aquaria, marine sanctuaries, and schools in Southern California that monitors local coastal ecosystems for harmful algal blooms (HABs) and educates the public about toxic events. HABwatch was formed in 2011 with support from USC Sea Grant, the Center for Ocean Science Education Excellence West, and the Southern California Coastal Ocean Observing System. The Aquarium of the Pacific has been participating in the HABwatch program since July 2015. Samples look for specific plankton and measure the frequency of occurrence in the sample. These observations provide a snapshot of the plankton found in Rainbow Harbor over the past 18 months and may provide insight into plankton growth patterns in the Southern California Bight.

Harmful Algal Bloom Watch (HABWatch)

Aquarium of the Pacific - Long Beach

David Merrill, Cassandra Davis, & Jennifer Lentz, PhD.

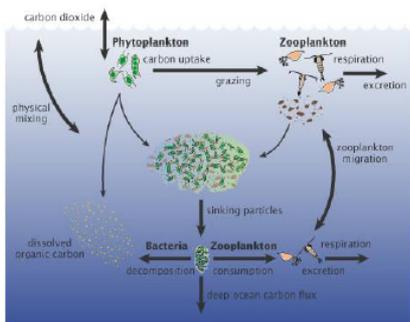
INTRODUCTION

Interest and awareness of harmful algal blooms (HABs) has brought together scientists and informal educators in the Southern California Bight to form a volunteer harmful algal bloom monitoring network called HABWatch. This effort increases the number of eyes on the ocean for early detection and sets into place a method for rapid response.

This project was funded by Southern California Coastal Ocean Observing System with support from USC Sea Grant and COSEE West. The next steps include development of educational resources to use in outreach to visitors at each of the centers. (From the Sea Grant USC website)

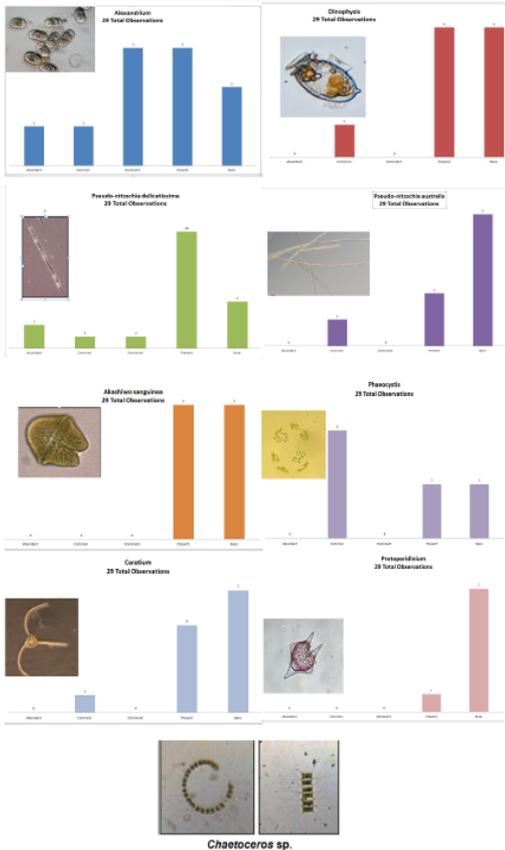
The Objectives of a Community HABWatch program

- Improve temporal and spatial monitoring for harmful algal blooms (HABs)
- Increase monitoring locations
- Increase frequency of sampling
- Improve dissemination of HAB information to the general public
- Accurate, current information
- Providing educational activities and exhibit materials



From: NASA Earth Observatory

Various Collected Phytoplankton



Phytoplankton

Microscopic plant-like organisms that are the foundation of the food chain in the ocean and fresh water. Most are single celled plants, some are bacteria
Diatoms are the most common types of phytoplankton- unicellular – major group of algae
Dinoflagellates- can bloom in huge quantities

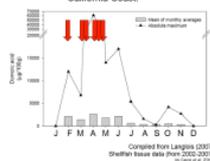
What makes algae harmful?

- Toxin production
- Reduced light penetration of water
- Anoxia/hypoxia
- Gill irritation and clogging
- Feather wetting
- Food web disruption

Symptoms in humans:

- Nausea, Vomiting, Abdominal cramps
- Headache dizziness, confusion, disorientation
- Short term memory loss
- Motor weakness,
- Seizures, cardiac arrhythmia,
- Coma
- Rarely death

Seasonality of Domoic acid along the California Coast.



Compiled from LENZIS (2007)
Shelfish Toxin Data from 2000-2007
© 2008 AOPAC

ACKNOWLEDGEMENT: Text by: Dr. David Caron, USC, June 2015

Monitoring Coastal Cactus Wren in the Palos Verdes Nature Preserve

by Josh Weinik; *Palos Verdes Peninsula Land Conservancy*

The Land Conservancy established the Citizen Science Cactus Wren Monitoring Program to investigate habitat use by cactus wren within the Palos Verdes Nature Preserve. Recent modifications to a laborious and technical monitoring methodology have streamlined the survey process increasingly facilitating the inclusion of both casual and expert citizen scientists. Newly adopted methods also produced powerful data used to supplement triennial surveys of NCCP monitoring requirements, providing habitat managers with better understanding of wren habitat use. Collected data was analyzed on the basis of observation frequency to categorize the level of wren inhabitation adjacent to each survey trail route. Surveyed trails were assigned value reflecting level of observation including areas of high habitat use, nesting, and extirpation. This information will inform restoration and conservation efforts. Future study will adaptively document the frequency of cactus wren inhabitation within individual patches of cactus allowing for fine scale management of habitat patches.



Monitoring Coastal Cactus Wren in the Palos Verdes Nature Preserve

Citizen Scientists: Sandra Albers, Bill Cullen, Bonnie Cohn, Alexis Diaz, Ann Dalkey, Connie Lao, Mai Lee, Donna McLaughlin, Dustin Hartuv, Evi Meyer, Jess Morton, Jim Ressler, Joan Krause, John Dickinson, Linda Wedemeyer, and Lowell Wedemeyer.



INTRODUCTION

The coastal cactus wren (*Campylorhynchus brunneicapillus*) is a California Species of Special Concern that lives exclusively in cactus dominated patches of coastal sage scrub. Monitoring the intensity and frequency of habitat occupancy has the potential to describe locations important to supporting the life cycle of this uncommon bird. The Palos Verdes Peninsula Land Conservancy (PVPLC) designed a volunteer friendly survey method to investigate habitat use by cactus wren in relation to hiking trail segments of the Palos Verdes Nature Preserve (PVNP) and investigate cactus wren use of habitat following wildfire. In this study, we documented cactus wren inhabitation levels adjacent to trail segments within seven reserves of the PVNP to inform habitat restoration and protection efforts.

Figure 1. Cactus wren.



Figure 2. Cactus wren habitat.



METHODS

Study Area: The study area was within the Alta Vicente, Three Sisters, Filiorum, Forrestal, Ocean Trails, San Ramon, and Portuguese Bend reserves of the Palos Verdes Nature Preserve (Figure 6) in Rancho Palos Verdes, CA.

Data Collection: Volunteers walked predetermined trail routes documenting visual or aural observations of cactus wren and noting the trail segment closest to each observation. The survey period was April - July 2016.

Data Analysis: Collected data were analyzed on the basis of three criteria that allowed for a rating of cactus wren inhabitation adjacent to each trail surveyed.

Criteria:

- 1) Observation Rate
- 2) Multiple Month Observation
- 3) Multiple Cactus Wren Observation

Figure 3. Observation rate and inhabitation rating per trail.

Trail Rating	Inhabitation Rating Criteria			Indication of Breeding
	Observation Rate (%)	Multi-month Observation	Multi-cactus wren Observation	
PERIODIC	<25	No	No	None
REGULAR	26-50	No	No	Possible ¹
REGULAR	50-75	Yes ²	Yes ²	Expected
CONSISTENT	75-100	Yes	Yes	Very Strong

¹ = PERIODIC is a weak indicator of nesting due to a lack of multiple sightings, however a high observation rate would strengthen the possibility of nesting.

² = A REGULAR inhabitation rating could include either multiple sightings or both.

RESULTS

- 1) Alta Vicente, Portuguese Bend, and San Ramon reserves are likely supporting cactus wren breeding due to high observation rates (>50%) per trail and multiple month and/or multiple cactus wren sightings.
- 2) Cactus wren were not detected at a historic breeding site in Portuguese Bend following a wildfire in 2009.
- 3) Filiorum reserve exhibited low observation rates and lacked multiple month and multiple cactus wren observations therefore was not expected to have supported cactus wren breeding activity.

Figure 4. Example of a trail rating analysis.



1 = PERIODIC rated trail indicates occasional use but likely excludes breeding activity.

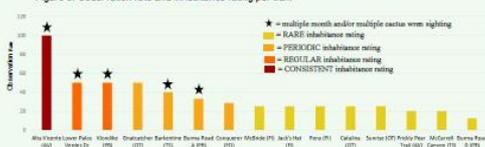
2 = No rating indicates a lack of cactus wren inhabitation. This formerly occupied area is expected to be a site of local extirpation post-fire.

3 = CONSISTENT and REGULAR trail ratings indicate breeding.

Figure 6. Highest inhabitation rating per reserve.



Figure 5. Observation rate and inhabitation rating per trail.



CONCLUSIONS

- 1) Identifying trail segments adjacent to cactus wren sightings have detected areas of high-use, breeding, and possible extirpation.
- 2) Identifying occupancy levels within habitat adjacent to trail segments provided a general spatial descriptor of cactus wren inhabitation.
- 3) The 2009 wildfire is having long-term negative effects on cactus wren occupancy at a historic breeding site in Portuguese Bend reserve.



FUTURE STUDY

Future study of cactus wren inhabitation will increase detail specific to cactus wren habitat management by:

- 1) Mapping cactus habitat patches.
- 2) Documenting cactus wren occupancy of individual cactus patches.
- 3) Documenting presence and possible threat of nest predators such as corvids, reptiles, domestic cats, Cooper's hawks and other raptors.
- 4) Noting changes in cactus patches and surrounding habitat, presence of weeds, plant health, and other possible impacts to nest site suitability.

Figure 7. Updated field survey form.



- 4 = Yellow polygons depict contiguous cactus patches.
- 5 = Predator monitoring data form.
- 6 = Area available to note changes in habitat.



Monitoring Wild Canids in the Palos Verdes Nature Preserve

by Josh Weinik; *Palos Verdes Peninsula Land Conservancy*

The Land Conservancy established the Wildlife Tracking Program in an effort to document wild canids (coyote, grey fox, and red fox) presence within the Palos Verdes Nature Preserve to better inform open space management and understand the population dynamics and movement of these species. Citizen science volunteers documented wild canid scat and tracks on over 16 kilometers of trail. This work has resulted in the creation of mapping documents that spatially describe track and scat observations. This work will inform land management about coyote and fox populations in the Palos Verdes Nature Preserve.



Monitoring Wild Canids in the Palos Verdes Nature Preserve



INTRODUCTION

Three species of wild canid inhabit the Palos Verdes Nature Preserve (PVNP): coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), and red fox (*Vulpes vulpes*). These canids serve as top predators within PVNP. The Palos Verdes Peninsula Land Conservancy (PVPLC) has monitored wild canid presence within the PVNP since 2006 in accordance with the Rancho Palos Verdes Natural Community Conservation Plan (NCCP). This agreement provisions PVPLC to describe biological data on wildlife movements of predators. The Citizen Science Wildlife Tracking Program is currently engaged in performing this monitoring task.



METHODS

Study Area: The study area was within five reserves of the Palos Verdes Nature Preserve (Figure 4 and 5) in Rancho Palos Verdes, CA.

Survey Period: November 2016 - March 2017

Data Collection: Volunteers walked predetermined trail routes documenting scat or tracks of wild canids. A photo was taken of each observation and the location was noted on field data sheets (Figure 1).

Data Analysis: Track and scat observations were collectively mapped to spatially describe the movement of wild canids within the PVNP.

Figure 1. Completed field sheet for the Forestal Reserve.

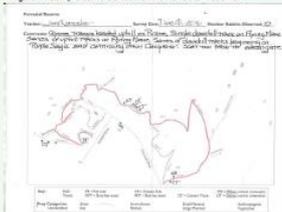


Figure 2. Track photo.



Figure 3. Scat photo.



RESULTS

- 1) Field surveys identified the presence of all 3 wild canid species known to exist within the Palos Verdes Nature Preserve.
- 2) The majority of scat and track observations were coyote.
- 3) Three areas of intensive use by wild canids were found within Three Sisters, Portuguese Bend, and Forestal reserves.
- 4) Areas of low-use or near exclusion may exist between observed high-use areas.

Figure 4. Locations of wild canid scats detected across the PVNP.



Figure 5. Location of wild canid tracks detected across the PVNP.



CONCLUSIONS

- 1) Coyotes were observed to be the most abundant wild canid within the Palos Verdes Nature Preserve.
- 2) Habitat areas of the PVNP support varying intensities of wild canid activity. This may potentially describe differing levels of in-habitance factors known to affect canid occupancy such as habitat quality, prey abundance, and disturbance pressure.
- 3) High-use areas may generally depict den locations.

FUTURE STUDY

Future study will evaluate the validity of observed high/low-use areas as well as work towards better understanding wild canid movement across the PVNP. Trail cameras will be used to identify individual coyote movement and describe the presence or absence of territorial use of observed high-use areas. This work may also improve our understanding of wild canid presence within low-use areas and supplement current research methods in the case that environmental factors such as substrate composition or trailside vegetation impede track and scat detection. The development of a relative abundance index (# of scat/kilometer surveyed/week) will be created to track yearly fluctuations of wild canid populations.

Figure 6. Installation of a trail camera.



Figure 7. Trail camera capture of a coyote.



CITIZEN SCIENTISTS



Bethany Bax (AmeriCorps), Mike Bell, Tana Bell, Peter Cameron, Joseph Garcia, Linda Howat, Rebecca Heisey, Alex Kovary, Joan Krause, Connie Lao, Donna McLaughlin, Jim Rassler, Ben Smith, Wes Wyberg (AmeriCorps), and the Casil family.

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Overlap Between Blue Whale Location Patterns and Busy Shipping Lanes May Increase Risk of Ship Strikes off the Coast of Southern California

by Brayden Massie, Kailey Macpherson, Diana Pabón, Lindsey McVay,
and Jacqueline Olvera; *Aquarium of the Pacific (AOP)*

The Southern California coastline is home to two of the busiest ports in the United States, Long Beach and Los Angeles ports, causing high ship traffic. Coincidentally, these ports are the same feeding grounds of hundreds of baleen whales making them more susceptible to ship strikes. One of the most endangered is the blue whale (*Balaenoptera musculus*). We conducted a study to gain a better understanding of blue whale locations off of Long Beach coast and to determine the likelihood of ship strike. This study combines five years of data consisting of the total number of blue whale sightings and their locations, and data obtained from the Cascadia Research Marine Mammal Sighting Database. Results showed high concentrations of blue whale sightings overlapping the shipping lanes. Therefore, we propose moving the shipping lanes from areas of high frequency and expanding the precautionary area to take steps toward protecting these whales.

Overlap Between Blue Whale Location Patterns and Busy Shipping Lanes May Increase Risk of Ship Strikes off the Coast of Southern California

Brayden Massie, Kailey Macpherson, Diana Pabón, Lindsey McVay, Jacqueline Olvera

Aquarium of the Pacific



Introduction

Ship strikes are one of the primary threats for baleen whales. Co-occurrence of ships and whales, hydrodynamic forces, and ship speed can all increase the risk of such collisions (McKenna, 2015). The Southern California coastline is both a hotspot for baleen whale species and home to two of the busiest ports in the United States, which can make co-occurrence of ships and whales common. Of all the whale species that inhabit the Southern California coastline, one of the most endangered is the Blue whale (*Balaenoptera musculus*). Blue whale sightings occur from June to October (Calambokidis, 2016), when food is plentiful (Tomlin, 1967). These whales consume large amounts of krill, which gives them a key role in trophic interactions (Croll, 2006). Due to slow decent rates and minimal horizontal movement, they lack an efficient response to possible ship collisions, and thus are at a high risk of injury from a collision (McKenna, 2015). Between the months of June and October of 2015, the port of Long Beach received over three million cargo containers transported by cargo ships, making encounters between blue whales and these ships very possible. (Port of Long Beach, 2016)



Figure 1. NOAA shipping lanes and regulations for the ports of Long Beach and Los Angeles as shown on the ARCGIS Online Viewer.

Rationale

The objective of this study was to gain a better understanding of blue whale locations off the coast of Long Beach in order to determine the likelihood of co-occurrence of ships and blue whales. These location patterns are of high priority for management strategies to ensure minimum conflict between human uses and wildlife conservation, making them of critical importance for the recovery of the species (Dransfield et al., 2014).

In this study we combined data from whale watch tours between January 2011 and July 2016. Our data consisted of: (1) total number of blue whale sightings and (2) location of blue whale sightings. We collected data opportunistically off the coast of southern California, more specifically, the Port of Los Angeles-Long Beach, during June and July of 2016. We obtained the rest of our data from the Cascadia Research Marine Mammal Sighting Database for the Aquarium of the Pacific. The region of Los-Angeles-Long Beach has high ship density (Redfern et al., 2013) and is the second busiest port of North America (CINMS, 2009). Because of this, the whales that seasonally migrate to the coastline are particularly vulnerable to ship strikes.

Objectives

- Provide data supporting the theory that local shipping lanes and migratory/feeding whales cross paths
- Identify areas with frequent blue whale sightings
- Make suggestions to minimize co-occurrence of ships and whales in these high risk areas

Methods

We collected data while aboard three Harbor Breeze Cruise public whale watching vessels in Rainbow Harbor, Long Beach, CA: The "Christopher", "Triumphant", and "La Espada". We participated in data collection from June 2016 until early September of 2016, and obtained the rest of our data from the Cascadia Research Marine Mammal Sighting Database for the Aquarium of the Pacific.

During each whale watch, we gathered cetacean data as directed by Cascadia Research Collective. We also used we used R to calculate the density of these sightings by location in order to identify the frequency of blue whale sightings by location. We then used ggmap to map these densities into Google maps imagery (Google Maps, 2016; Kahle and H. Wickham, 2013; R Development Core Team, 2008). We then overlay NOAA shipping lanes and regulations imagery into both our maps to determine if there's overlap between blue whale locations and shipping lanes (NOAA, 2015). We used a Garmin® eTrex10 GPS unit to log coordinates of each cetacean sighting. We then input all cetacean sighting data into the Cascadia Research Marine Mammal Sighting Database for the Aquarium of the Pacific. We also exported the tracks to Cascadia Research Collective to provide insight on where the whales and animals are located off of the coast.

To obtain blue whale sighting numbers and sighting locations, we singled out all blue whale sightings in the Marine Mammal Sighting Database for the Aquarium of the Pacific. We used the ggmap package for R to map the location of each sighting with Google Maps imagery. Finally, we used R to calculate the density of these sightings by location in order to identify the frequency of blue whale sightings by location. We then used ggmap to map these densities into Google maps imagery (Google Maps, 2016; Kahle and H. Wickham, 2013; R Development Core Team, 2008). We then overlay NOAA shipping lanes and regulations imagery into both our maps to determine if there's overlap between blue whale locations and shipping lanes (cite NOAA shapefiles)



Figure 3: Blue whale off the coast of Long Beach (AOP)

Results

Between 2011 and 2016, there were a total of 1,121 blue whale sightings. Each year had between 102 and 288 sightings, with 2011 having the most blue whale sightings (Table 1).

Table 1. Number of blue whale sightings between January 2011 and July 2016.

Number of Blue whale sightings	Year
288	2011
102	2012
224	2013
230	2014
163	2015

Most of the blue whale sightings occurred along the edges of the San Pedro Basin and Newport Canyon (Fig 2).



Figure 2: Individual sightings of blue whales (green) from 2011-2016. NOAA shipping lanes and regulations are shown in pink.

We identified the areas with the highest concentration of blue whale sightings as the left edge of the San Pedro Escarpment and the edge of the Newport Canyon. Shipping lanes overlap both of these areas. Only the area in the San Pedro Escarpment is covered by the precautionary area, and even then only partially covered (Fig 3).

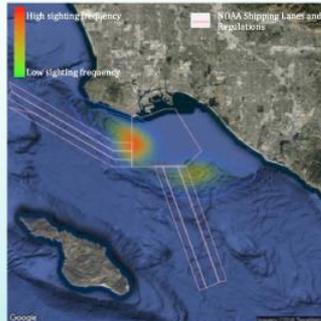


Figure 3: Frequency of blue whale sightings off the coast of Southern California. Red indicates high sighting frequency, while blue indicates low frequency. Green to red gradient indicates frequency levels in between low and high. NOAA shipping lanes and regulations are shown in pink.

Conclusion

Long Beach and Los Angeles are the two busiest ports in the country, causing high ship traffic. Coincidentally, these are the same areas that feed hundreds of baleen whales. Previous research has suggested that during their seasonal association with coastal California, it is not uncommon for ship strikes to occur resulting in injured or dead whales (Berman-Kowalewski et al., 2010). Ultimately, through combined efforts between the Aquarium of the Pacific, Cascadia Research Collective, and Los Angeles County, the shipping lanes were successfully moved in 2013. Even so, our collected data shows that blue whales in the coast of California tend to frequent the edges of the coastline's canyons. These areas overlap with several NOAA shipping lanes. Some of these shipping lanes overlap with areas where the highest number of blue whale sightings occur. More so, the precautionary area regulated by NOAA only covers these high risk areas partially. This suggests that a change in shipping lanes may once again be necessary in the future. Based on our data, we suggest moving the shipping lanes away from areas with the highest frequency of blue whale sighting and expanding the precautionary area to cover the coordinates of this area. Our mission through all of this is to take steps toward protecting the whales that congregate near the continental shelf.

Acknowledgements

Aquarium of the Pacific: Julien Jordan, James Stewart, Kera Mathes Also: Cascadia Research Collective along with Harbor Breeze Cruises.

Project CRYSTAL: Citizen Science Goes to School

by Rossella Santagata, Hosun Kang, Sarah Kimball, Jennifer J. Long, Sara Ludovise,
and Chris Stillwell; *UC Irvine*

Environmental researchers from University of California Irvine's Center for Environmental Biology, education researchers from UCI's School of Education, and staff from Crystal Cove Alliance and Crystal Cove State Park collaborated to implement and study a citizen science project that engaged 27 4th/5th grade students in an ecology experiment designed to inform Park management decisions. During this project, environmental researchers, science educators, resource managers, and youth worked as partners to conduct solutions-oriented research in restoration ecology and to prepare the next generation of stewards of biological resources. We addressed the question of how to design an educational intervention that involved students in collaborative citizen science and promoted science learning outcomes, in this case systems thinking. Analysis of students' drawings and interviews revealed that despite learners' initially fragmented view of the ecological system, most made progress in their ability to understand the core features and interactions of a complex system.

Project CRYSTAL: Citizen Science Goes to School

Rossella Santagata, Hosun Kang, David Liu, and Chris Stillwell
Sarah Kimball & Jennifer J. Long
Sara Ludovise



What is project CRYSTAL about?

Project CRYSTAL engages youth, environmental scientists, science educators, learning scientists, and State Park staff in citizen science programs involving both in and out-of-school experiences. Fourth-sixth grade children participate in ecological research at Crystal Cove State Park focusing on restoration ecology.



HOW DO WE RESTORE the CRYSTAL COVE STATE PARK? The Focus Questions

Invasive species of plants have disturbed the ecosystem of Crystal Cove State Park over the last 200 years. Is passive restoration effective in assisting the park's recovery?

- What is the effect of removing non-native species of plants on the growth of one native species, California sagebrush (*Artemisia californica*)?
- How do rabbit herbivores affect the growth of non-native species as well as of natives?

We randomly assigned 28 *Artemisia californica* (California Coastal Sage Scrub) shrubs to 4 different conditions:



We measured soil moisture and transpiration rate.

Study Goals & Questions

Can citizen science be integrated in school learning experiences for upper-elementary students? Do students enjoy participating in these experiences? Do teachers find them valuable?

Does participation in citizen science facilitate youth's development of systems thinking?

Participants

- 74 children in grades 4-6, predominantly Latino
- 3 teachers at two different school sites
- Data Sources
 - Student and teacher interviews
 - Pre- and post-assessments (drawings)

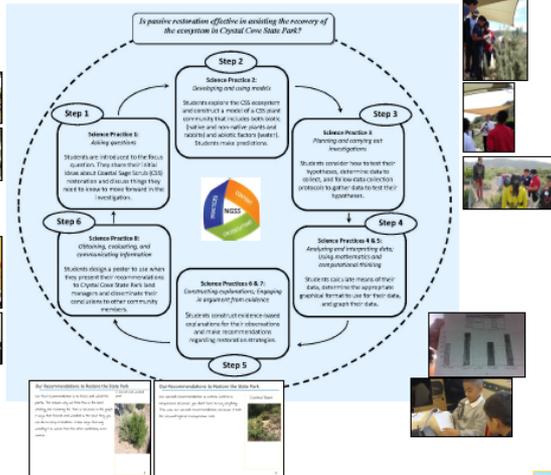
Systems Thinking

Systems thinking refers to our ability to recognize patterns of interconnections between a system's parts and then to synthesize these patterns into a unified view of the whole (Senge, 1990).

Traditional school curricula encourage incomplete and reductive thinking about complex systems by focusing on "cycles," "food chains," and "chain reactions" as isolated events rather than on how components interact.

Learners as young as 10 years of age can begin to understand important concepts related to complex systems (Ben-Zvi Assaraf & Orion, 2010).

"Developing such a systems perspective takes less time with a young, inquisitive, and open mind than with a mind that has already been conditioned to see the world in terms of unidirectional cause to effect" (Forrester, 2007, p. 356).



Two whole-day fieldtrips at Crystal Cove State Park and 10 related classroom lessons

Student Drawings



Over the course of the program and to varying degrees, the students replaced a simplistic view of the system with a more complex understanding of the ways that coherent systems operate over space and time.

Student Interviews

What was project CRYSTAL about?

- Several students were able to link the tasks they did with the environmental research question and the land management needs: *"taking measurements on plants and figuring out the soil moisture and how much water is already on it so you can figure out how to protect it"* and *"try to restore the park, trying to figure out what strategies are best"*

What did you like about being a scientist?

- Using the equipment: *"figured out the transpiration rate and the soil moisture and learn about the native plants and the non-native plants"*
- Visiting new places: *"see[ing] places that I have never seen before"* and *"going hiking and seeing animals"*
- Being part of something that mattered: *"I really liked how our science experiments really mattered because when you do it in class it's just for fun. It doesn't really matter. It helped restore the park in an efficient way"* and *"We were in class and I was writing down my things, and [educator] read my things and used it and gave it to the scientists in Crystal Cove. They liked it and it was good"*.

What would you change about the project? *"give more time"* for both classroom and field-based activities.

Teacher Interview Themes

- *"collaboration needs to be explicitly taught and constantly reinforced"*
- *"... running out of time"*
- *"background knowledge about the park, the different kinds of plants" [for teachers]*

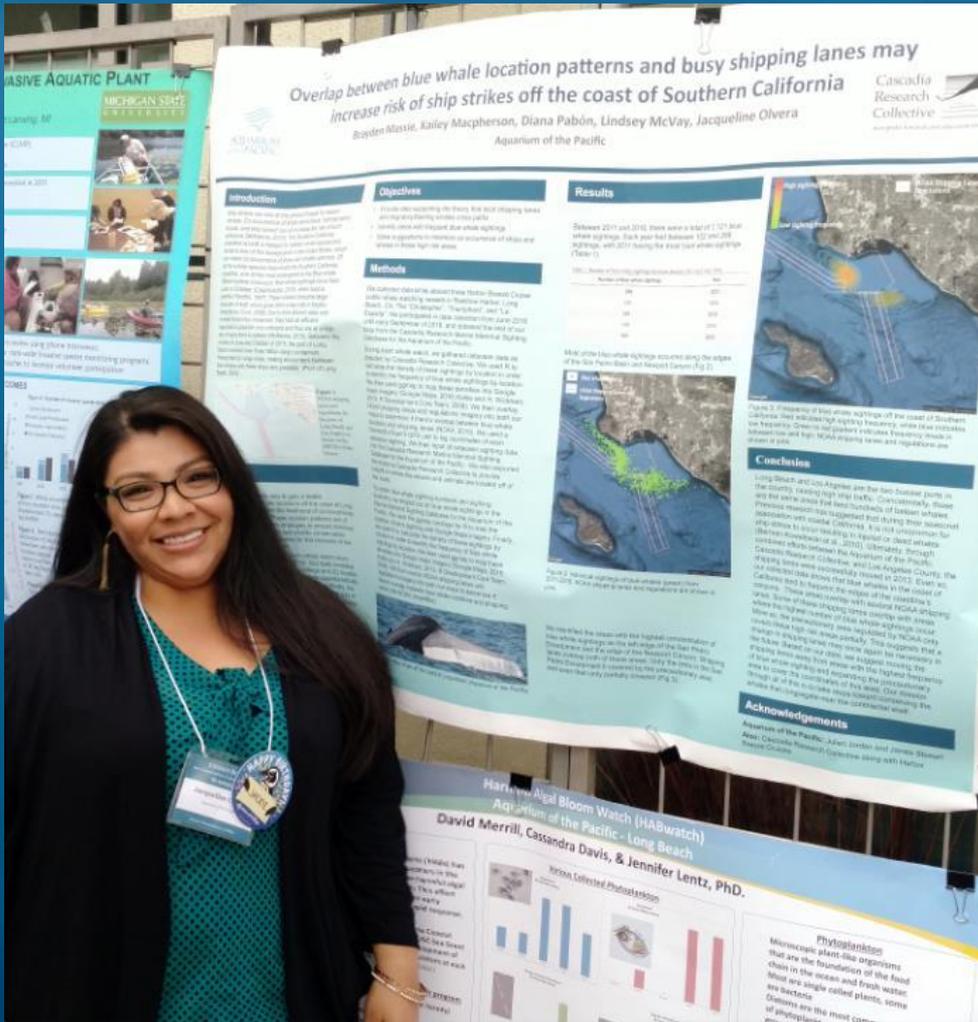
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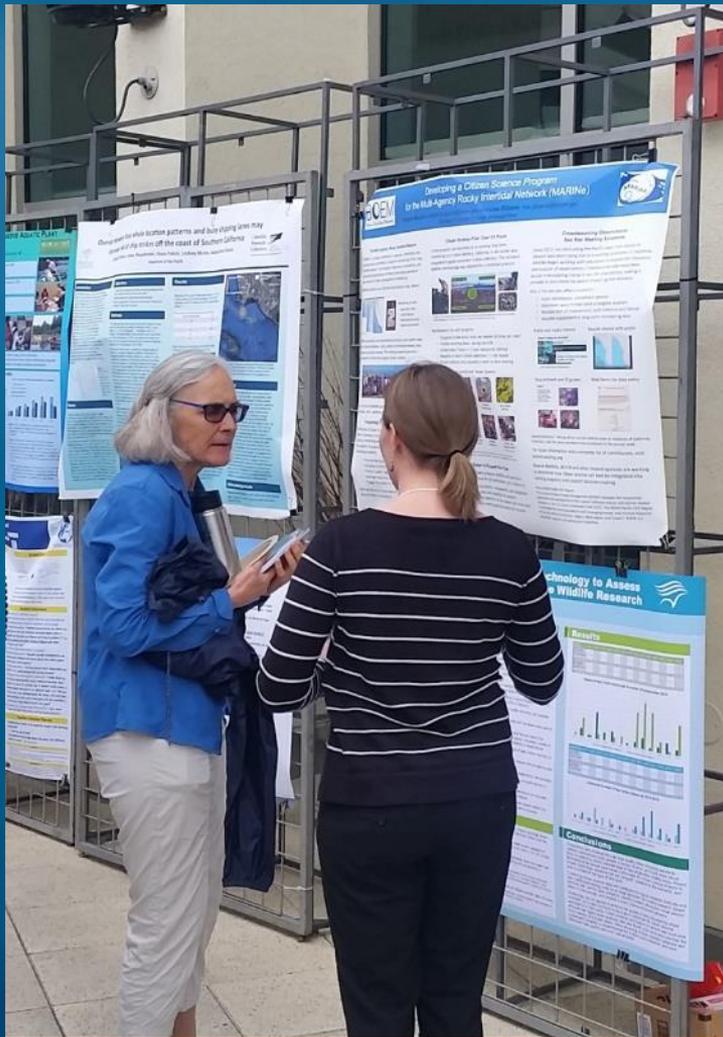
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✉ CitSci@lbaop.org

This document, along with information from our past & upcoming citizen science symposiums can be found online at:
http://www.aquariumofpacific.org/conservation/citsci_symposiums

Pelican Cove, CA
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