

Conserving Marine Life Along Catalina's Coast

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Annual Field Report 2019



Photo: Carol Wang, April 2019



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Dear Earthwatch Volunteers,

Thanks to your contributions in 2019, we had another outstanding year studying Catalina Island's coastal environment. As in previous years, you helped monitor our marine protected areas for harmful algae, observed our resident marine mammals, surveyed the rocky intertidal for patterns in local biodiversity, and tracked human activity in our coastal areas. You also explored the island by land and by sea. Participants shared meals and lively discussions with university professors and students, and became part of our marine laboratory's special research community. 2019 participants came from all parts of the country, and from a wide range of ages and walks of life. But despite those differences, your enthusiasm to study marine habitats and wildlife was universal. Thanks for the hard work and the inspiration you brought to our program.

Hard to believe, but here at the Wrigley Institute we are already digging into the 2020 Earthwatch field season! Our field leaders and principal investigators are excited to meet the next incoming teams and continue this important environmental monitoring. We're also looking at adding new data collections on ocean plastics, a problem which is becoming so prevalent in the marine environment. 2020 should be another great year building upon the foundation of knowledge our past three years of amazing Earthwatch teams established.

Thank you again for supporting our work and our oceans. May the next year bring fun adventures and new discoveries for us all!

Sincerely,

A handwritten signature in blue ink, appearing to read 'John Heidelberg', written in a cursive style.

Dr. John Heidelberg
Associate Director
USC Wrigley Institute

SUMMARY

2019 was the third year of the USC Wrigley Institute's Earthwatch program, where we continued to build an essential catalog of baseline data about Catalina Island's marine coastline. By replicating data collections across the years, we're beginning to better understand trends about algal community seasonality, human activities in protected areas, intertidal diversity, and mammal activities in this unique area. The data went directly to informing researchers and decision-makers in California's natural resource management programs.

GOALS, OBJECTIVES, AND RESULTS

The Catalina Earthwatch Expedition focuses on four coastal marine protected area (MPA) monitoring and research programs. They focus on harmful algal bloom patterns, human activities within local MPAs, marine mammal dynamics, and intertidal biodiversity in the face of changing conditions and stressors. Results for each program are described below:

HARMFUL ALGAL BLOOMS / HABWATCH PROGRAM



Photo Credit: Carol Wang



Photo Credit: Linda Chilton

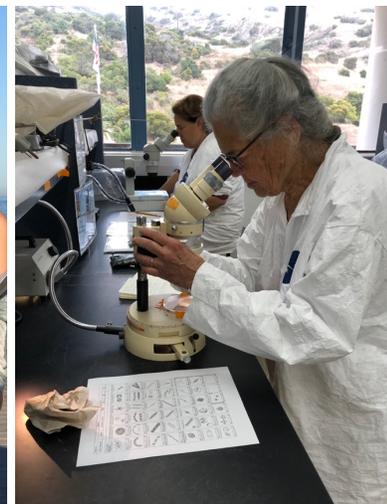


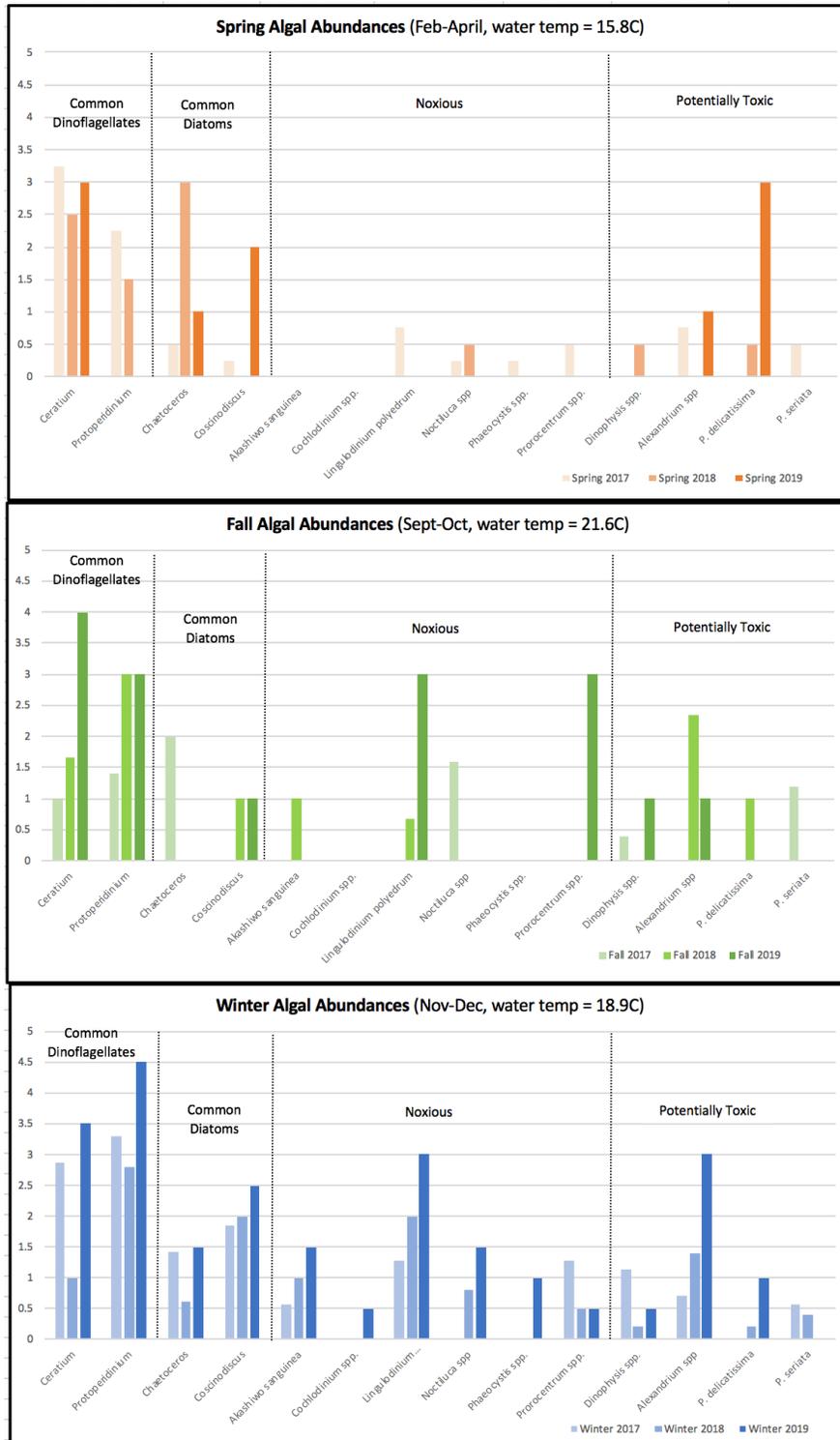
Photo Credit: Linda Chilton

Volunteers in 2019 continued to collect data on microscopic algal communities in Catalina's coastal waters to inform the HAB Watch program. HAB Watch is a citizen science program, designed by USC faculty member Dr. Dave Caron to observe how harmful algal blooms (HABs) occur along the S. California coast, and how they relate to concurrent environmental factors and human coastal activities.

Our Earthwatch observations represent the first Catalina Island contributions to this HAB Watch program. The data add important insights into how algal communities and potential blooms move spatially and temporally across the region. 2019 was the third year of data collection, and by combining our observer data seasonal patterns have begun to emerge.

Common dinoflagellates and diatoms are detected in Catalina waters consistently throughout the year. Through algal community analyses, we are also learning the identities of other major algal representatives in our local marine environment including some that can be noxious or potentially toxic to wildlife and humans. While some of these species are episodic and

only rarely observed, others are regular members of the ecosystem. In general, algal abundance and diversity appears highest in the winter months.



MPA WATCH PROGRAM

In 2019, Earthwatch teams observed human uses in a local Catalina marine protected area, Blue Cavern MPA. This is part of a state-wide effort to monitor and conduct adaptive planning for California's complex marine protected area network. Groups with Earthwatch recorded the different kinds of activities within the MPA during surveys for 30-40 minute intervals from April 14, 2019 to November 10, 2019. Each group recorded onshore, offshore non-boating, and boating activities observed during this survey time period.

No observations of onshore activities such as wildlife watching, shoreline walks with/without domestic animals, surfing, or shore-based fishing were reported for Blue Cavern during the observations. This is an expected result since activities such as fishing are prohibited in the MPA, and Blue Cavern has limited onshore access primarily via the USC Wrigley marine lab's roads.

Offshore, the 2019 Earthwatch groups reported various boat activities in Blue Cavern. Overall, the April 2019 team recorded the highest number of vessels during their survey (12 vessels) and the lowest observations in October 2019 (0 vessels); day of the week may have played a role in these observations. The vast majority of human visitors were non-consumptive boaters (private motor boats, sailboats, jet skis, and passenger ferries), with non-consumptive divers representing the second most common activity group. Knowing these user groups helps design outreach programs that educate those communities on MPA awareness and compliance. Most violations in Blue Cavern MPA involve illegal anchoring and fishing by recreational visitors; educating those groups can make a significant difference in protecting natural resources in the MPA.



Photo Credit: Carol Wang

MARINE MAMMAL SURVEYS

Throughout the year, Earthwatch teams observed many marine mammals across the San Pedro Channel. Teams consistently saw California sea lions and harbor seals exhibiting a variety of behaviors throughout the channel. Tracking these behaviors helps research Dr. LeiLani Stelle understand how human disturbances and environmental factors influence local populations. Our April team also witnessed about 25 members of southern California's large common dolphin population. Hundreds (and sometimes thousands) of these common dolphins can regularly be seen traveling together in the channel, hunting food and socializing.



Photo Credit: Carol Wang



The teams did not record any whale sightings in 2019. Typically we see a variety of whale species in the San Pedro Channel, especially during the spring season. This was likely just a result of luck, however, and not an indication of any ecological patterns underway.

INTERTIDAL BIODIVERSITY SURVEYS

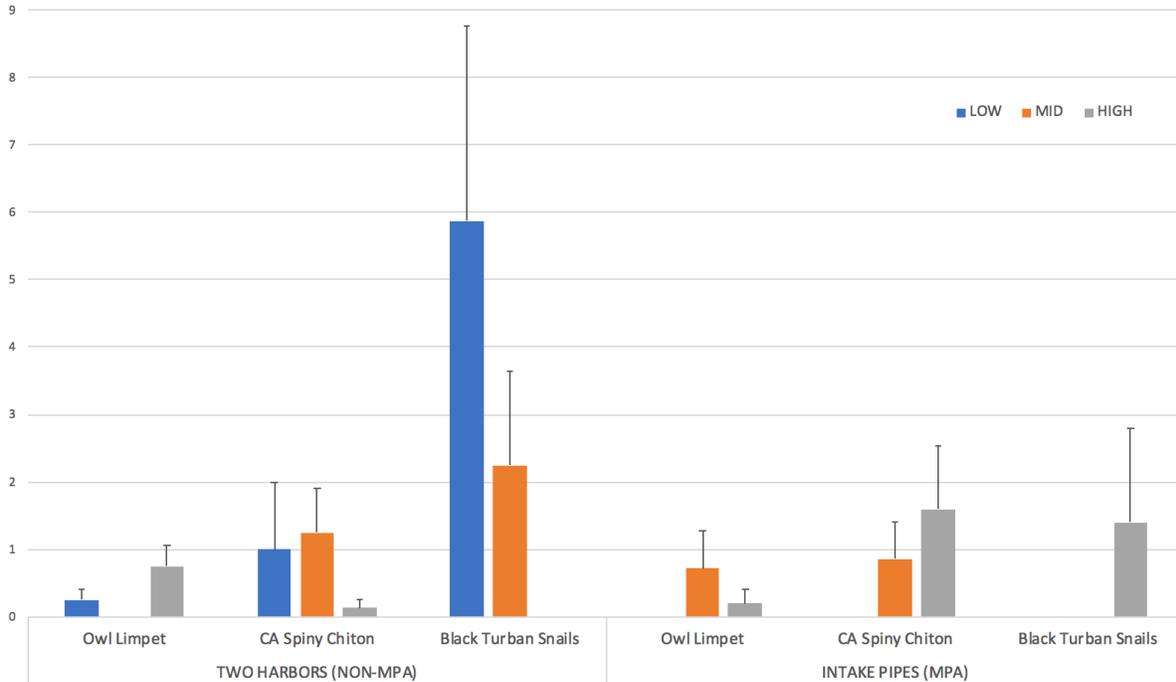
Our expedition teams conducted intensive surveys of the rocky intertidal both inside a local MPA (Blue Cavern MPA, at a site called the Intake Pipes) and outside the MPA (in the neighboring town of Two Harbors). At each location they conducted three types of surveys. Together those help us understand the current biodiversity of our local species, as well as the potential recovery of species that have recently become largely absent from our coastline.

The teams conducted abundance surveys of three key species using standardized quadrats. These species – the owl limpet, the California spiny chiton, and the black turban snail - are all mobile grazers within the intertidal habitat.



Photo Credit: Linda Chilton

2019 Intertidal Species - # Individuals by Site and Tidal Height



Inside and outside the MPA in 2019, all three species occupied mid-to-high intertidal areas (orange and gray, respectively). Outside the MPA boundary in Two Harbors, all target species were also in the low intertidal (shown in blue). This is consistent with Earthwatch data from previous years, where intertidal grazers were routinely found occupying lower intertidal habitats at the non-MPA site. This is likely, at least in part, due to the high abundance of macroalgae dominating the low intertidal at Intake Pipes but may also be the result of anthropogenic factors at the non-protected site.

Earthwatch teams also measured percent cover among sessile organisms (stationary animals and rockweeds) and in bare rock for the two sites. Percent cover is measured by observing 25 squares within a quadrat grid – the more squares that include a given substrate, the higher percent cover is calculated for that material. Similar to 2017 and 2018, our 2019 teams found acorn barnacles to be the most abundant animal in the mid-to-high habitats, presence of both olive and golden rockweed types across sites and tidal heights, and higher bare rock outside the MPA than within.

Finally, the teams conducted timed surveys for two groups of taxa that have been largely absent from Catalina’s coastline in recent years: abalone and seastars. Both groups have been hard-hit by diseases and other environmental changes. One juvenile variable star was observed during the 2019 expeditions, located within the MPA intertidal. We continue to do these observations with the hope that numbers will increase, toward an eventual recovery and return of these taxa to the Catalina intertidal.

2019 Intertidal Quadrat Cover (per 25 squares) by Tidal Height and Site

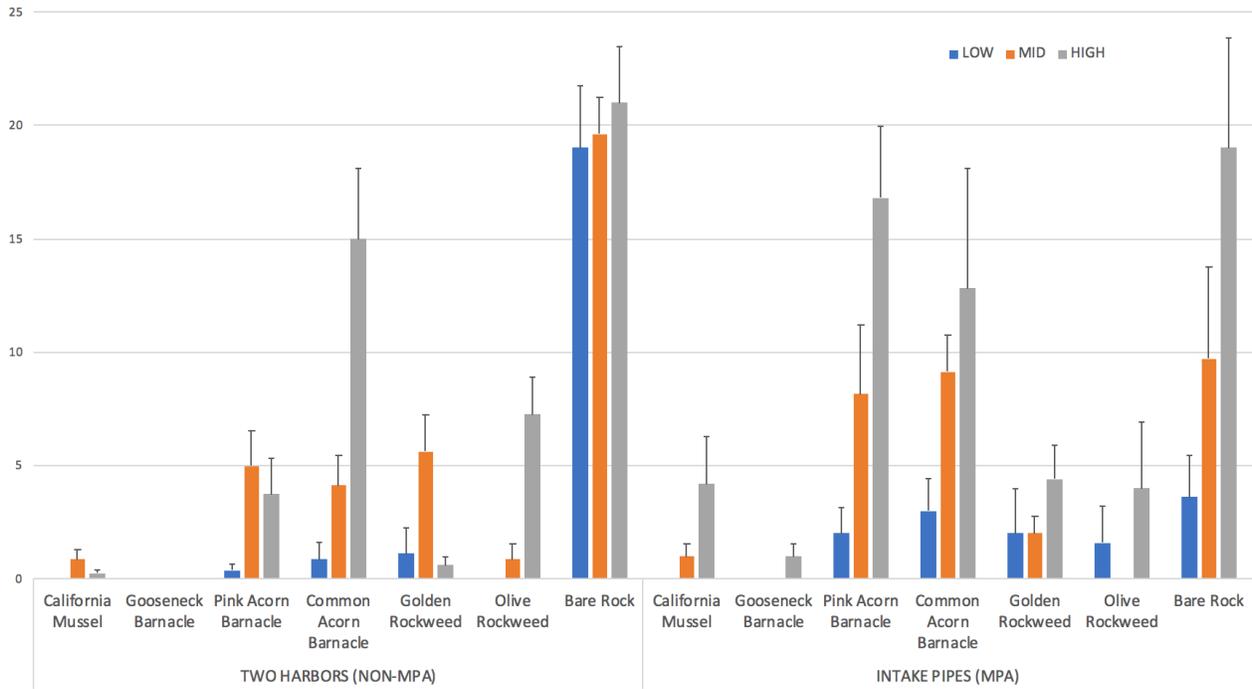


Photo Credit: Linda Chilton

ADDITIONAL RESEARCH

This year, participants also collected ocean plastics as part of the International Pellet Watch program led in the field by Ms. Linda Chilton, USC Sea Grant Education Program Manager. Plastic ‘nurdles’ are resin pellets used in the production of many plastic products including single use bottle caps, drink and food containers. Sadly, many millions of them pollute ocean waters around the world. At first, the task of finding such small materials on Catalina’s beaches seemed unlikely; but unfortunately, the plastics were all too prevalent once volunteers knew what to look for. Earthwatch participants with one team also found a dead desiccated bird (possibly a grebe) with plastic in its gut, which happens when birds confuse plastic pieces for food such as fish eggs.

The pellets and other debris we collected were a small step toward cleaning our local beach, and the pellets were sent to the International Pellet Watch program (<http://www.pelletwatch.org/en/what.html>). Researchers there will analyze these ocean plastics for persistent organic pollutants (chemicals including DDT and PCBs) and assess contaminant loads in pellets from Catalina Island and around the world. Additional pellets continue to be collected for USC Wrigley-affiliated professor Dr. Cameron Thrash, who is conducting local research into the unique microbes that grow on and slowly digest different ocean plastics.



Photo Credit: Linda Chilton



Photo Credit: Linda Chilton

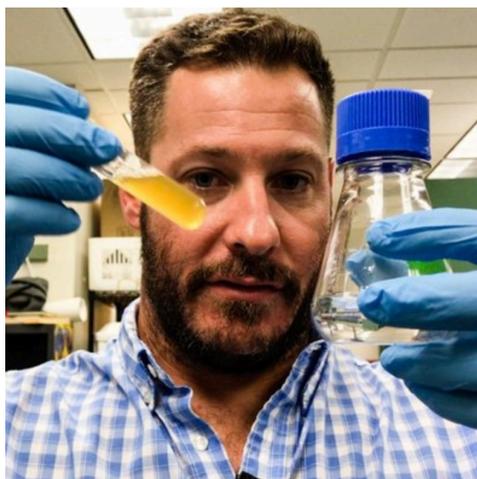


Photo Credit: Dr. Cameron Thrash

PROJECT IMPACTS

Increasing Scientific Knowledge

a) Total citizen science research hours

A total of 35 Earthwatch volunteers participated in four expeditions with our researchers in 2019. During their week at Catalina Island, each person dedicated approximately 7 hours / day toward training, collecting, and processing environmental data. All together, they contributed a total of 1,715 hours of community science research to our monitoring program.

b) Peer-reviewed publications

NA

c) Non-peer reviewed publications:

Personal teacher blog:

<https://mvb-catalina.blogspot.com/?m=1>

Newspaper article (Queens Chronicle):

https://www.qchron.com/editions/eastern/mvb-has-mvps-in-marine-biology-study/article_b3d41e98-95aa-53eb-b8fa-ef543d28ace0.html

Earthwatch activities were frequently shared via the USC Wrigley Institute’s social media and publications throughout the year.

d) Books and book chapters

NA

e) Presentations:

In prep: presentation at the National Marine Educators Association meeting (July 13-17, 2020) in Honolulu, Hawaii.



USC Wrigley Institute Instagram, 2019

Outreach and Mentoring

a) Graduate students

Student Name	Graduate Degree	Project Title	Anticipated Year of Completion
NA			

b) Community outreach

Name of school, organization, or group	Education level	Participants local or non-local	Estimated number of participants	Details on contributions/ activities
We bring many K-12 school groups to the island each year. At least half of these students come from schools serving underserved and underrepresented communities in the Los Angeles region	Middle and high school, mostly high school students	Both, mostly local schools and non profit organizations	Approximately 850 students and their teachers per year	Student groups come for environmental programming at Catalina Island in the form of day trips, overnight programs and/or extended research immersion experiences. They learn hands-on basic STEM concepts, and meet role models who embody and demystify college and various science careers

Partnerships

Partner	Support Type(s) ¹	Years of Association (e.g. 2006-present)
HAB Watch	Data collection, PI support and online exchange of information	Since inception of Earthwatch program (2017)
Whale mAPP	Data collection, PI support and online exchange of information	Since prior to Earthwatch inception
Heal the Bay (MPA Watch)	Data collection, PI support and online submission	Since prior to Earthwatch inception (2015)
LiMPETS program	Adaptive protocol sharing and data submission	Since inception of Earthwatch program (2017)
Catalina MPA Collaborative	MPA Watch data used to inform enforcement issues and education priorities	Since prior to Earthwatch inception (2015)
California Academy of Sciences	Biodiversity information for their statewide iNaturalist and Snapshot Coastal Cal programs	Since inception of Earthwatch program (2017)
International Pellet Watch	Collection and shipment of materials for analysis by PIs	2019

1. Support type options: funding, data, logistics, permits, technical support, collaboration, academic support, cultural support, other (define)

Contributions to management plans or policies

Plan/Policy Name	Type ²	Level of Impact ³	New or Existing?	Primary goal of plan/policy ⁴	Stage of plan/policy ⁵	Description of Contribution
California MPA Network	Management plan	Regional	Existing	Natural resource conservation	Ongoing	Data for adaptive management of California's MPAs

² Type options: agenda, convention, development plan, management plan, policy, or other (define)

³ Level of impact options: local, regional, national, international

⁴ Primary goal options: cultural conservation, land conservation, species conservation, natural resource conservation, other (define)

⁵ Stage of plan/policy options: proposed, in progress, adopted, other (define)

Conserving natural and sociocultural capital

a) Conservation of taxa

i. List focal species that you did not list in your most recent proposal

Species	Common name	IUCN Red List category	Local/regional conservation status	Local/regional conservation status source
NA				

ii. In the past year, has your project helped conserve or restore populations of species of conservation significance? If so, please describe below.

Species	IUCN Red List category	Local/regional conservation status	Local/regional conservation status source	Description of contribution	Resulting effect ⁶
Seastars, intertidal (various)	Not evaluated	Largely absent from Catalina intertidal since 2014 due to wasting disease	Personal Observations, MARINE program	Regular surveys to check for evidence of a potential recovery in local habitats	Detect occasional healthy individuals in local environment, no significant recovery yet
Abalone, intertidal (various)	Critically Endangered (black abalone)	'Endangered' and 'Species of Concern'- Largely absent from Catalina intertidal due to withering syndrome beginning in 1985 and poaching	NOAA Fisheries, Personal observations	Regular surveys to check for evidence of a potential recovery in local habitats	None seen to date

⁶ Resulting effect options: decreased competition, improved habitat for species, range increased, population increase, improved population structure, increased breeding success, maintained/enhanced genetic diversity, other

b) Conservation of ecosystems

Habitat type	Habitat significance ⁷	Description of contribution	Resulting effect ⁸
Coastal marine	CA Marine Protected Area	Biodiversity, water quality and compliance monitoring	Communication of activity violations to enforcement agencies; baseline information for monitoring ongoing health of MPA.

⁷ Habitat significance options: nursery, breeding ground, feeding site, corridor, migration path, refuge, winter range, summer range, spring range, fall range or other (define)

⁸ Resulting effect options: extent maintained, condition achieved, restored, expanded, improved connectivity or resilience



c) Ecosystem services

Indicate which ecosystem service categories you are *directly studying* in your Earthwatch research and provide further details in the box below as needed.

Provisioning Services

- Fisheries (Fresh & Marine)
- Energy (Fuelwood/hydropower)
- Livestock grazing
- Material extraction (e.g. resin, grass)
- Timber
- Water supply
- Other food (crops, wild foods, spices)
- Pharmaceuticals

Regulating & Support Services

- Carbon sequestration/storage/"blue"
- Coastal protection
- Erosion control
- Flood regulation/protection
- Pest and disease control
- Pollination
- Seed dispersal
- Water purification/quality
- Nutrient cycling

Cultural Services

- Cultural/historical values
- Health (mental & physical)
- Research & knowledge
- Recreational
- Spiritual/aesthetic values

Other Services

- Biodiversity
- Employment/Livelihoods

Details:

USC's Catalina MPA Earthwatch program studies aspects of the local coastline that provide numerous ecosystem services: these areas include rocky intertidal, subtidal and open water marine species, coastal water quality, and human uses of the environment. The habitats we study support individual and commercial sources of seafood, diverse ecosystem services and societal provisioning and protection, as well as many different forms of recreational and cultural benefits to society.

d) Conservation of cultural heritage

Cultural heritage component ⁹	Description of contribution	Resulting effect
NA		

⁹ Cultural heritage component options: traditional agriculture, artifacts, building(s), hunting ground or kill site, traditional ecological knowledge and practices, monument(s), oral traditions and history, spiritual site, traditional subsistence living

e) Impacting local livelihoods

Local livelihood impact(s)	Description of contribution	Number of people impacted
Multiple staff employees. See below		

f) Please provide any other measurable actions that you conducted within the local community(s) where your research takes place.

We maintain an incredible team of science field educators and team leaders to manage Earthwatch programming and other field programs throughout the year. The Wrigley Marine Science Center employs in total nearly 40 people who live within the local Catalina community including our cooks, facilities team, administration, laboratory technicians, waterfront staff and emergency medical crew. Many of these individuals are descended from families who have lived on the island for generations. They learn on the job skills training, and several gain professional advancement via certifications and credentials, as well as discounted tuition for themselves and free tuition for their children at USC.



RESEARCH PLAN UPDATES

Report any changes in your research since your last proposal/annual report. For any 'yes' answers, provide details on the change in the 'Details' box. This section will not be published online.

- | | | |
|---|---|--|
| 1) Have you added a new research site or has your research site location changed? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 2) Has the protected area status of your research site changed? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 3) Has the conservation status of a species you study changed? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 4) Have there been any changes in project scientists or field crew? | <input checked="" type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |

Details – provide more information for any 'yes' answers

We were beyond excited to add Natalie Foote to our field team in 2019. Natalie is an islander through and through. She was born and raised in the rural interior of Santa Catalina Island where she gained a true appreciation for the land and ocean around her. She is an adventure athlete, environmental advocate, freelance writer, and a health and fitness coach. As an education and outreach specialist with the Wrigley Institute, she knows the island better than almost anyone and inspires the public to engage with nature in new and exciting ways. Her passion for conserving Catalina Island and giving back to the planet makes her an amazing addition to our field team.

- 5) Provide details on any changes to your objectives, volunteer tasks, or methods, include reason for the change.

ACKNOWLEDGEMENTS

For the third year in a row, we extend heartfelt gratitude to the volunteers who joined us with enthusiasm and skill to help conserve Catalina's coastline and protect our ocean environments. We thank the amazing staff at the USC Wrigley Marine Science Center who keep our research running smoothly, our laboratories and boats functioning, our fieldwork safe, our tummies fed and our dorms feeling like home. Thank you to the visiting researchers and graduate students who gave lectures and shared meals with Earthwatch volunteers, making them part of our special community of scientists. And as always, the true heroes are our field naturalists and staff: Team Leader Meghan MacGregor, Natalie Foote, Linda Chilton, Lorraine Sadler and Lynn Whitley. Thank you everyone!