

# Earthwatch Teach Earth Final Report

November, 2023





## 2023 Teach Earth Program

Time and time again, teachers like Aisha highlight how valuable it is to be united as a team of environmentally passionate teachers from all over the country, full of personal insight and driven by a love of learning.

"I was...able to learn from teachers across the United States. We all came together with different expertise and background knowledge [and were] able to share it. We were taking on old and new experiences depending on the person, and we used our knowledge to support each other and push forward as we learned together."

#### - Aisha Dumbuya, Teach Earth 2023 teacher

In 2023, you have changed the teaching practices of 21 incredible K-12 teachers from across the US. They gained confidence and a first-hand understanding of science by conducting hands-on research alongside leading scientists. Humbled and inspired by nature and each other, Teach Earth teachers returned to their schools with a renewed sense of possibility and the experience to bring science and nature to life for the students in their classrooms.

Teach Earth 2023 kicked off with a team of 12 teachers at the University of Reno campus in July to support our Earthwatch scientists' study on *Climate Change and Caterpillars in Nevada*. The team spent nine action-packed days together in the Great Basin, gathering data on the patterns of interaction diversity between plants, caterpillars, and parasitoids. Most of their time together was spent outside among the stunning landscapes, searching for caterpillars and collecting plant samples. Once samples were gathered, the teachers learned to rear the collected caterpillars and process their invaluable data.

In August, a second Teach Earth group of nine teachers packed their bags and journeyed to Golfo Dulce to participate in Earthwatch's expedition *Conserving Marine Mammals in Costa Rica*. Once there, they spent a week working alongside our team of researchers studying life underwater, from humpback whales to spotted dolphins. Much of the research on this project takes place on board a 27-foot motorboat as the group sets out to observe the whale and dolphin species, monitoring their behavior and habitat over time. In addition to the usual research tasks, this team had the unique opportunity to assist the scientists with a necropsy of a predatory roosterfish as part of their efforts to understand the trophic web of Golfo Dulce better.

When teams were not busy working with and learning from the Earthwatch scientists, they spent their time learning from one another. Each Teach Earth team included one Senior Fellow who had experienced an Earthwatch expedition before and done impressive work bringing their prior experience back to the classroom. As a unique part of Teach Earth, the Senior Fellows ran five professional development workshops on bringing the expedition experience back to their community and students. As team leaders, they also organized a team blog (links accessible in the Blog section of this report). These activities are pivotal to the experience as the teachers work together and learn so much from one another.

Thanks to you, Teach Earth has been serving teachers and, by extension, their students since 1975. There is still much work to do, with new teachers entering the profession each year and few programs that embed teachers in scientific research. This year, 333 teachers applied for only 21 spots.

## We look forward to continuing our work with you, serving more teachers on their path to engaging students in science and nature through this once-in-a-lifetime opportunity.



## Program Impact

Beyond the immediate teacher experience in the field, the impact of Teach Earth is profound. The 21 teachers who returned to their classrooms this fall are now brimming with increased confidence and motivation, armed with fresh

updates to their curriculum and teaching methodologies that will ultimately influence 2,000 students annually.

The impact of Teach Earth continues to shine through the evaluations submitted by all 21 teachers. Highlights of the impact on the 2023 cohort of Teach Earth teachers include:

- 90% of teachers increased their understanding of the importance and role of citizen/participatory science in supporting research.
- 90% of teachers were motivated to engage in civic or community action to support environmental sustainability.
- 95% of teachers increased their understanding of the importance of the data and research being conducted.
- 100% of teachers were inspired to act in their professional lives to create a more sustainable world.



But statistics like this alone cannot capture the change that is ignited by this program. One of this year's passionate educators, Laura Lanik, a 9th-grade geography teacher hailing from Brighton, MA, shares her perspective:

"I will bring back the joy of seeing animals in the wild and the urgency to protect them and to keep nature wild and free from plastic and other harmful pollutants, especially human influence. I learned so much, so I will share my learning and experience with them, and in my geography classroom, we can connect environmental science and sustainability to human interaction and change...I want to teach students that they make a difference even if they are one person."

- Laura Lanik, Teach Earth 2023 teacher

Dedicated teachers like Laura are essential in shaping future generations' thoughts, beliefs, and actions. With every teacher served by Teach Earth, hundreds of students stand to benefit, becoming catalysts for change in global efforts to promote sustainability and responsible living. Teachers share more about the program's impact in their own words in Appendix 1.



Karaka T: 1.978.461.0081 | 1.800.776.0188
F: 1.978.461.2332
☑ info@earthwatch.org



## Teach Earth in High Demand!

Several key aspects of the Teach Earth professional development experience draw in hundreds of applicants nationwide each year. In addition to the incredible opportunity to travel to breathtaking environments, this is a chance for K-12 teachers spanning various schools, subjects, and grades to come together and share their passion to address environmental issues and inspire the next generation of young learners. The 2023 cohort of teachers represented 21 different schools across 10 States. There is no denying the incredible demand for this program. Our pool of candidates totaled several hundred schools and teachers from 50 states and territories hoping to participate in Teach Earth.

The impacts of Teach Earth extend far beyond the expedition. For some, as you will read in the Alumni Spotlight, the experience will continue to impact their teaching and students for countless years. Thanks to your donations, Teach Earth has doubled the number of teachers served annually between 2022 and 2023. However, this work is far from finished; a significant gap

remains for many incredibly dedicated and deserving teachers and their school communities.





## Research Connections to Global Issues

The Teach Earth expeditions of 2023 addressed critical themes that have emerged as hot-button climate change and environmental conservation issues. These central themes include the complex impacts of climate change, the importance of native plants and pollinator conservation, and marine mammals and ecosystems. As a result, teachers can equip their students with a better understanding of environmental and climate change issues, enabling them to engage in conversations and act in their communities.

#### COMPLEX IMPACTS OF CLIMATE CHANGE:



Climate change is undoubtedly one of the most pressing challenges of our time. Both Teach Earth expeditions in 2023 focused on understanding climate change's entangled and complex impacts, including shifts in weather patterns, rising global temperatures, and the consequences for ecosystems and communities. This issue is critical due to its far-reaching consequences, affecting everything from local ecosystems to human health. An in-depth understanding of climate change equips educators and students with the knowledge to appreciate its urgency and take informed actions to mitigate its effects. Teachers gaining insights into the complex impacts of climate change can translate this knowledge into engaging, fact-based lessons for

students. Teachers empower students to become informed and responsible global citizens by fostering a deeper understanding of climate change.

#### IMPORTANCE OF NATIVE PLANTS AND POLLINATOR CONSERVATION:



Pollinators, including bees and butterflies, are crucial in global food production and ecosystem health. Their decline due to a myriad of factors, including climate change and pesticide use, is a significant environmental concern. The decline of pollinators threatens food security, biodiversity, and the sustainability of agriculture. It underscores the interconnectivity of ecosystems and the delicate balance of nature. By comprehending the importance of pollinator conservation, teachers can impart knowledge about the critical role these creatures play in our ecosystems and global communities. This knowledge informs students about the urgency of protecting pollinators and fosters an appreciation for Earth's intricate web of life.

#### MARINE MAMMALS AND ECOSYSTEMS:



The health of marine ecosystems and the conservation of marine mammals are closely linked to climate change and human activity, making this theme highly relevant. Oceans absorb vast amounts of carbon dioxide and provide sustenance to millions. Their degradation through increasing temperatures, overfishing, pollution, and habitat loss has serious repercussions for the planet. During their expeditions, teachers who explore marine mammals and ecosystems equip students to understand the critical need for ocean conservation. They raise awareness about the interconnectedness of our planet and inspire young minds to take action to protect marine environments.

Educators participating in these expeditions are uniquely positioned to impart this newfound knowledge to their students, helping them comprehend and engage with current environmental and climate change topics and issues. Each of this year's teachers has integrated these complex themes into engaging and intentional lessons and community action plans. As the world grapples with these challenges, the role of teachers in shaping the next generation's understanding and commitment to environmental stewardship cannot be understated.



## Blogs

Each of this summer's Teach Earth teams crafted detailed blogs chronicling their daily field experience. The blogs are replete with teacher bios, field science, personal entries, photographs, and fun facts. Each day, a different teacher "hosts" the blog. At Earthwatch, we enjoyed following along from the virtual office, and we hope you will, too! You can use the following links to access each team blog:

- Climate Change and Caterpillars in Nevada: https://earthwatchcaterpillars.weebly.com/july-6-2023.html
- Conserving Marine Mammals in Costa Rica: https://horowitzlesli.wixsite.com/earthwatch23

### Alumni Spotlight



Sufyan Tootla first heard about Teach Earth through his district Science Coordinator in 2021 as a 9<sup>th</sup>-grade Biology teacher at the Rancho Dominguez Preparatory School in Long Beach, California. Sufyan was new to teaching then, writing in his application, "I have yet to experience any professional development opportunities aside from Zoom sessions detailing how to use online resources for our student body better. I am hoping to broaden that experience through this program."

As one of the 11 awarded teachers that year, Sufyan participated in the Earthwatch expedition *Following Forest Owls in the Western U.S.* in July 2022. Through his post-fielding final report and Lesson Plan, it became evident that the impressive impacts of his experience would be ongoing in his professional and personal life for years to come. To better understand this impact over time, Earthwatch reached out to Sufyan with some interview questions in December 2022 and again in October 2023. Sufyan

generously agreed to give us some time amid his busy school days to share more about his Teach Earth journey. The following are some of those questions and Sufyan's responses verbatim:

#### • Why did you decide to apply to Teach Earth?

I went through my undergraduate years as a biology major, but I did not have the opportunity to do any field research. Initially, I was unsure where the expedition would be headed, but I was still excited to apply and hopefully be accepted. As a teacher, it feels like I would never have an opportunity to go out in the field and do scientific research. This felt like a disservice to my students—having personal experience in the field would help with student investment, engagement, and understanding of science. I loved the idea of going out and working on conservation research with experts in the field to share my experiences with my students.

#### • What was the most interesting or transformative part of your expedition?

I live in the inner city and easily feel detached from the natural world—I have to drive out at least 2 hours to see natural landscapes. Seeing the animals up front was, 1000%, the most fascinating and transformative part of the expedition...When we were having lunch together, a random ecologist approached us and said, "Hey, do you all wanna see a snake?" Seeing these animals up close made me feel connected to nature and enthusiastic about sharing this experience with others. The animals don't understand what climate change is. They can't comprehend it. It's so eye-opening to realize that many of them will be unable to adapt to something they don't know about. And I am so grateful that we have scientists working to protect these species better and that organizations like Earthwatch are spreading that experience.



#### • What have been the ways that Teach Earth ultimately impacted your approach to teaching?

Going on an expedition with the Earthwatch team has given me a second opportunity to gain skills I could not experience while younger. In a way, this made me feel more legitimized as a science teacher. I had actual field experience that I could show to my students and say, "Hey, I was a part of this!" This confidence had a positive feedback loop, and many of my students became curious about the entire process (especially the owl-capturing method). Overall, Teach Earth has made me feel more confident as a science teacher and allowed me to understand better the scientific method for different biological phenomena I share in my classroom.

#### • Do you see that your students have benefited from your experience? If so, how?

I do believe that my students have benefited from my experience. I brought many images and videos, which the students used to analyze the data from the research, the photos, and so forth. They, in turn, knew that I had experience with scientific research and felt more comfortable asking questions about various things that helped them better understand the scientific method. And they were in awe of me holding an owl and wanted to partake themselves!

• Based on your experience participating on an Earthwatch expedition, what is the value of connecting schoolteachers nationwide with scientists?

Connecting schoolteachers nationwide to scientists is an amazing way to spread up-to-date news and ideas about conservation work. Our students are facing information overload these days and can easily scroll past headlines without giving them a second thought. Having teachers with experience in research engage students in lessons relating to conservation is a powerful way for them to retain important information.

• Is there anything else you would like to share with us now that you've wrapped up another year of teaching since your Teach Earth team?

I want to say thank you! I remember my high school biology teacher would go on an expedition every summer, which I was curious about when I started working. I applied to Teach Earth on a whim, as I had no summer plans, but I can honestly say that it still feels unreal when I think back to it- all the memories, learning, and friends I made that summer still stick with me to this day, and I know I will be bringing it up every year that I teach this class. In fact, I would love to go back again!





# Thank you for...

Enabling positive change and inspiring environmental responsibility.

You have directly impacted K-12 teachers in the US through Teach Earth by equipping them with the skills and confidence to facilitate hands-on science learning opportunities, impacting hundreds of students each year. This would not be possible without your support.





### Appendix: 2023 Teachers

#### CATERPILLARS AND CLIMATE CHANGE IN NEVADA



Holly Dong Riverside Virtual School, Riverside, CA Forensics, Chemistry, and Physics Teacher, Grades 10, 11, & 12

"This experience...has motivated and inspired me to bring what I have learned into improving [my students'] community. Teaching the connection between climate change and declining insect populations is good. But adding in the actions of what small part we can play to

improve the situation is empowering."

Holly's Lesson Plan: Holly's 10<sup>th</sup>-grade students will explore the interconnections between global climate change and local pollinator populations, conducting fieldwork to answer the question: how are increasing fall temperatures affecting the population of butterflies? During their unit on climate change, students will go into the field and collect caterpillars and butterflies using the same methods that the Teach Earth teachers in Nevada utilized. Data collected by each student will then be combined for a collective analysis. As a final product, students will use what they have learned to make an action plan for how best to support the butterfly and caterpillar population in their location, which Holly will help them implement.



Allison Cram Brattleboro Union High School, Brattleboro, VT Tech Integration and Visual and Performing Arts Teacher, Grades 10, 11, & 12

"I have always been a huge advocator of conservation, and this experience has solidified my understanding of specific roles even the smallest of species can have in conserving our environment."

Allison's Community Action Plan: Noticing that there is no outdoor space at her school for students to gather and classes to meet, Allison decided to direct her community action plan toward solving this issue, asserting that for students to care about nature, they need to be exposed to the outdoors. Over the school year, Allison will develop a native pollinator garden with classroom seating on her school grounds. She has identified partners and funders to support this work, with whom she will collaborate to make this transformative project a reality for her students and community. Allison's vision for the native pollinator garden and outdoor classroom space will allow students to connect with nature for years.



K₀ T: 1.978.461.0081 | 1.800.776.0188
F: 1.978.461.2332
☑ info@earthwatch.org



#### Margaret Self

East Boston Early Education Center, Boston, MA Classroom Teacher, Grades K and Elementary

"This experience has made me a better teacher in that it has shown me that science is not just about the colossal, the comprehensive, and the exhaustive, but also about the gradual and meticulous, the small-scale and the local...I feel empowered to help my students

participate in citizen science and see their role in the scientific community as important."

**Margaret's Lesson Plan:** Margaret has added an additional section to her students' long-term Quadrants study, showing them how to identify native plants and flowers in each quadrant. Students will learn which native pollinators prefer which plants and flowers. Students will perform "counts" and assess the native plants in each quadrant and will then be asked to predict which pollinators they might find in each quadrant based on the native plants they find. This lesson plan integrates pattern recognition, ecological literacy, and experiential education at a level applicable to elementary school students. Margaret's approach fosters ecological awareness in her elementary school students. It empowers them to become environmental stewards by understanding the intricate relationships between native plants and their pollinator partners in the quadrants study.



#### Aisha Dumbuya

Dudley Street Neighborhood Charter School, Roxbury, MA Classroom Teacher, Grades K, and K1

"I left with questions about what more I can contribute to help Mother Nature and what things I can personally stop doing so that it can continue to thrive in its natural beauty. I will keep asking myself these questions in my everyday life."

Aisha's Lesson Plan: Aisha's lesson plan is for her rising kindergarteners during their summer school before starting the school year. Throughout the four weeks of summer school, students will spend half of the morning entirely focused on environmental topics and why it is important to care for their planet. Aisha will focus on caterpillars and climate change to help students better grasp our actions' consequences (and benefits). Aisha has developed several crafts and activities, including sorting images of plants between "native" and "non-native categories" and a craft showcasing the life cycle of a butterfly. The flow of her activities from one day to the next throughout the four-week session allows students to build on their previous knowledge and experiences, learning how climate change impacts species in their communities and how they can help.





#### Nika Blank

The Peddle School, Hightstown, NJ Biology and Environmental Science Teacher, Grades 9–12

"I learned what research questions, data, and experiments scientists are working on right now, in addition to the interdisciplinary connections between the different fields of science in answering research questions. These skills are invaluable in teaching my students

about the scientific process and encouraging them to think critically and engage in handson investigations."

**Nika's Lesson Plan:** Nika's high school biology and ecology students will conduct their transect study on campus to analyze the ecological systems at work in their local area. Students will be asked to identify plant species and insect groups, and data will be gathered and reported for each transect. Nika envisions a long-term project, intending that in future years, students will be able to compare the species richness and populations to the data collected by students before them, enabling a comprehensive assessment of ecological changes. Nika's ambitious project promotes a deeper understanding of local ecology. It encourages a sense of stewardship among her students, fostering a sense of responsibility for the environment in their school community.



#### level."

Kristen Van Der Linden Bioscience High School, Phoenix, AZ Government and Economics Teacher, Grade 12

"Students here have always been passionate about climate change, but there has been a focus on sustainability regarding clothes. I think I now have the knowledge base (and passion) to develop the students' abilities to find more concrete ways to make an impact at the local

Kristen's Lesson Plan: Throughout her expedition, Kristen was struck by how inequitable pesticide contamination and climate change impact human communities. Her students' senior year theme is "How do I meaningfully engage with and contribute to a world in constant change?" She decided to assign her students a research project into redlining, environmental health, and the lack of green spaces in communities. Her students will contextualize historical inequities in modern-day environmental health disparities in their hometown of Phoenix, producing an article, interview series, art piece, or well-developed plan for increasing green space access in the city.



K₀ T: 1.978.461.0081 | 1.800.776.0188
F: 1.978.461.2332
☑ info@earthwatch.org



#### Delia Cortez

Longfellow Elementary School, Riverside, CA Classroom Teacher, Grade K

"This project has opened my eyes to the importance of conservation too. I now realize that conservation is a moral philosophy we should actively participate in because it focuses on protecting species from extinction and maintaining and restoring habitats. It enhances

#### ecosystems and protects biological diversity."

**Delia's Lesson Plan:** During a week-long unit, Delia's kindergarten students will learn about caterpillars' physical characteristics and needs. Students will first compare what they need to survive to what caterpillars need, emphasizing that all living things have needs. Using books and animated online stories, students will then compare the life cycle of a butterfly to that of a person. Following a discussion of habitats at the end of the unit, students will go on a nature walk or to a nearby botanical garden to look for and observe caterpillars and butterflies and bring their lessons to life. Delia's holistic approach to teaching instills early science concepts and cultivates a sense of wonder and appreciation for the natural world in her kindergarten students.



Lauren Hubert Senior Fellow Camelbak High School, Phoenix, AZ Biology, Anatomy, and Sustainability Teacher, Grades 9–12

"My experiences with Earthwatch have helped me understand how attainable student research projects and citizen science can be. My confidence in designing outdoor activities and possibly supporting

## more advanced student research projects has grown due to what I have learned by following forest owls and collecting caterpillars."

Lauren's Lesson Plan: Lauren's lesson plan asks her students to explore human impacts on the environment and how monoculture farming, pesticides and herbicides, and manufactured fertilizers affect the very insect populations needed for pollinating crops, in addition to water and soil resources. Students will not only learn about various agricultural techniques and their ecological impacts. Still, they will actively engage with the subject matter through at-home experiments to develop a viable alternative to harmful chemicals, testing the effectiveness of neem oil, clove oil, citrus, marigolds, and sound waves as potential pesticide alternatives. Lauren's approach equips her students to understand the environmental challenges posed by pesticide use and contamination. It empowers them to take meaningful action by applying their knowledge to experiment with eco-friendly solutions.



Karaka T: 1.978.461.0081 | 1.800.776.0188
F: 1.978.461.2332
☑ info@earthwatch.org



#### Andrew Virdin Estes Park High School, Estes Park, CO

Literature, History of Hip Hop, and Publications Teacher, Grades 9–12

"This project gave me a lot of insight into the exciting complexity of biodiversity...I understand better how caterpillars, moths, and butterflies can tell an important climate change narrative."

Andrew's Lesson Plan: As a literature teacher, Andrew's interdisciplinary lesson plan focuses on the importance of science communication to raise awareness about environmental concerns and the critical nature of conservation. His students will begin by looking at specific flora, fauna, and anthropology on their school campus and nearby Rocky Mountain National Park. They will use their immersive experiences to inspire their work, just as Andrew's experiences in Nevada have further inspired his teaching. They will use the quadrant plot model to look at microecosystems, using this zoning to extract data for a scientific narrative. As a culmination of their interdisciplinary journey, students will create short reflection videos to share their insights on the week's collaborative process and the valuable knowledge they've acquired.



#### around us."

#### Wendi Pillars

Biology, Earth Science, and ESL teacher, Siler City, NC Biology, Earth Science, and ESL Teacher, Grades 9–11

"I now have a deeper appreciation for the numerous invisible processes at play, along with a welcome reminder of how many tiny organisms help keep our world in balance...I will encourage students to observe more closely to appreciate those invisible processes

Wendi's Lesson Plan: Wendi has developed a unit focused on one of the *Climate Change and Caterpillars* researcher's own published works, engaging her students in a holistic exploration of the ecological challenges faced by pollinators. Wendi's students will first do a reading comprehension of the scientific research paper regarding how milkweed plants bought at nurseries may expose monarch caterpillars to harmful pesticide residues. After several activities evaluating their reading comprehension and discussing the implication of the research, students will be asked to conduct their research on the effects of pesticides, allowing them to design their experiments regarding pesticide impact on pollinators, fostering critical thinking and hands-on learning.



K T: 1.978.461.0081 | 1.800.776.0188
F: 1.978.461.2332
☑ info@earthwatch.org



#### Katherine Hepburn

Roger Clap Elementary School, Dorchester, MA Math, Social Studies, and ELA teacher, Grade 6

"Climate change no longer feels like something in the distance; it is here now and has always been here in my lifetime. Learning how those events impact caterpillars and other insects was very powerful... it has made me think of ways to incorporate science into my math, ELA, and

social studies classes and get students outside having meaningful experiences with nature."

Katherine's Lesson Plan: As a math teacher, Katherine has devised an interdisciplinary "BioBlitz" lesson to incorporate experiential learning and environmental education into her classroom. During their unit on ratios, students will conduct a "bio blitz" using the iNaturalist application to evaluate how many plant species they have around their school campus and determine the ratio of native to non-native plants. Students will then be asked to think critically about why the ratio is what it is and what factors might change it, allowing students to understand how mathematical concepts can be effectively applied to real-world scenarios, including ecology. Katherine's lesson plan enriches her math curriculum and instills a deeper appreciation for the environment by enabling her students to immerse themselves in nature and think critically about local ecosystems.



#### **Rachel Vallee**

Chester W Nimitz Middle School, Huntington Park, CA Science and Audiovisual Elective teacher, Grade 8

"Getting outside and doing research during Earthwatch reminded me why I started to love science...It has made me realize how much the curriculum I use lacks in hands-on activities and has pushed me to think about how I can work on improving this and helping the other

#### teachers at my school do the same."

**Rachel's Community Action Plan:** After her transformational experience connecting with nature in Nevada, Rachel wanted to provide her students with experiential opportunities to develop their relationship with the natural world. She will sponsor a science club at her school, with the initial goal of creating a shared green space on campus. The green space will have native plants, allowing her students to explore which species are the best option for their local pollinators. The club will be able to tend to the garden, providing students with an outlet in nature and enriching the campus for the entire school in the process. Rachels' plan and commitment to sponsoring a school club and developing a greenspace provide long-term opportunities for her students to engage in nature.



#### CONSERVING MARINE MAMMALS IN COSTA RICA



Maria Fernanda Lizarraga Benjamin Franklin Elementary School, Riverside, CA Classroom teacher, Grade 6

"Real life stories...opened my eyes to the reality that people witness in parts of the world where they have major changes that will cause a lifetime of challenging effects to different ecosystems. This is the type of information that I want to be able to discuss during class while

equipping my students with the necessary tools and information to hopefully encourage them to do their research and think about ways to prevent such issues from continuing."

**Maria's Lesson Plan:** During a six-day unit, Maria's sixth-grade students will focus on deforestation, learning about trees' important role in their survival and global ecosystems. Maria's lesson plan is inspired by the mangrove forests they visited and learned about during their expedition and their essential role in the ecosystem and the survival of marine mammals. Students will first read articles about various ecosystems and be asked to predict what would happen if trees were removed from that environment. Students will then conduct research on deforestation and be asked to write an essay synthesizing what they have learned and proposing at least one solution to combat deforestation. As a final assignment, students will present their solutions to the class and share their ideas for how they can participate in global solutions to deforestation.



Reina Ali

Martin Luther King Jr High School, Riverside, CA Chemistry teacher, Grade 10

"I was given the opportunity to work closely with an experienced researcher to collect data on dolphins and whales, which provided me with a deep understanding of ecological systems and scientific methodologies. Everything that I learned from this trip will make my

teaching more interesting and will create a more direct connection between chemistry and the world that we live in."

**Reina's Lesson Plan**: Throughout her Earthwatch experience, Reina thought critically about how her students could apply their chemistry lessons to the natural world, facilitating a deeper understanding of and appreciation for the material through an interdisciplinary lens. Reina will ask her students to conduct research on climate change, and in particular, the chemical components of climate change and greenhouse gases like carbon. Students will then calculate their carbon footprint using an online platform to understand their role in climate change. In groups, students will conduct a research project on the topic of their choice and present it to the class, focusing on how chemical changes in ecosystems can cause a range of impacts.



Karaka T: 1.978.461.0081 | 1.800.776.0188
F: 1.978.461.2332
☑ info@earthwatch.org



#### John Woodwell

Thomas Jefferson High School for Science and Technology, Alexandria, VA Earth, atmospheric, biological, and oceanic sciences, Grade 12

"During the expedition, we had the opportunity to talk with locals and see and hear about the environmental issues they experience and how they directly affect their livelihoods...I now have a new portfolio of experiences that I can, will, and already have, woven into

conversations in the classroom."

John's Lesson Plan: John's 12<sup>th</sup>-grade geography students will use Geographic Information Systems (GIS) to analyze remotely sensed images of the Golfo Dulce watershed in Costa Rica. Using satellite imagery from various timeframes, students can analyze vegetation health and where deforestation has occurred with the Normalized Difference Vegetation Index, creating maps of deforestation growth and patterns. John will be able to use the knowledge and experiences he gained during his expedition to bring this lesson to life, describing how deforestation has impacted the local ecosystems and marine species and bringing home the importance of GIS analysis in understanding ecological processes.



Marc Abelson Lee Academy, Boston, MA Science Teacher, Grades K-3

"I have thought about how I can make relevant connections with my expedition to many of the subjects we discuss in school, particularly regarding how a holistic approach towards conservation is vitally important."

**Marc's Lesson Plan**: Marc worked with Isabel Ambrosoli to create a multidisciplinary four-day mini-unit to encourage collaboration among Isabel's high schoolers and his elementary school students. The unit provides students with a toolbox to engage in conservation and helps students understand how poetry can be used to capture the beauty of the natural world. Marc and Isabel both appreciated the collaborative nature of their Earthwatch expedition and wanted to mirror this in their lesson plan. The two classes will meet in a local community garden. For 3<sup>rd</sup> graders, this interdisciplinary unit promises an exciting and interactive learning experience. The 3<sup>rd</sup> graders will engage in discussions and creative activities with their older peers, producing art pieces and poems that capture their shared experiences and appreciation for nature. The 3<sup>rd</sup> graders' experience is designed to foster an understanding of the importance of conservation and the role of poetry and collaboration as tools for positive change.





#### Isabel Ambrosoli

TechBoston Academy, Dorchester, MA English Language Arts Teacher, Grades 11 & 12

"The skills I developed throughout my Earthwatch expedition are already evident in my curriculum planning for the upcoming school year. I am including a conservation thematic unit for all my tenthgrade sections...My experience on the Earthwatch fellowship has

impacted how I will structure my unit to prioritize sustainability and native practices in our understanding of conservation."

**Isabel's Lesson Plan:** Isabel worked with Marc Abelson to create a multidisciplinary four-day mini-unit to encourage collaboration among Isabel's high schoolers and Marc's elementary school students. The two classes will meet in a local community garden where Isabel's 10<sup>th</sup> graders will partner with one of Marc's 3<sup>rd</sup> graders and discuss how and where they like to spend time outside. Isabel's students will then produce an art piece and a poem together and present their poems to the class. This unit will fall in the middle of the high schooler's poetry unit when they learn various poetry techniques and the cultural significance of poetry as an agent of change.



Lesli Horowitz Senior Fellow Kearny School of College Connections, San Diego, CA Biology Teacher, Grades 9–12

"Getting out in the field renewed my excitement and commitment to teaching conservation...Working with the scientists and learning what they do allows me to communicate the work of a field biologist better

#### and hopefully inspire my students to consider it a career."

Lesli's Lesson Plan: Lesli's biology students will learn about conservation triage and how to identify a species in critical need of conservation efforts. Her students will first learn about concepts like habitat niches, keystone species, and ecosystem engineers, as well as the importance of genetic diversity within a population. Then, students will get the opportunity to act as the director of the local San Diego Frozen Zoo, which collects DNA and embryos of endangered species. Lesli will present them with six species as potential candidates for the zoo. Students will then conduct research on each of the species and decide which of the six they will prioritize for conservation, presenting their arguments and ideas to the class.



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F: 1.978.461.2332
☑ info@earthwatch.org



#### Katie Brown

Canalino Elementary School, Carpinteria, CA Math, Science, English Teacher, Grade 5

"This experience has made me a better teacher in so many ways. It has reinvigorated a sense of passion and excitement for teaching due to the experience itself and the wonderful fellows I worked alongside."

Katie's Lesson Plan: Katie has developed a week-long unit where her students will explore the question, "Why does it matter if an animal goes extinct?" Students will learn about concepts like food webs, ecosystems, biodiversity, producers, and consumers and begin to identify the roles that various species play in their unique ecosystems. Students will be given a food web model and asked to predict how populations will be affected when one species is removed from the food web. They will then discuss why species go extinct and divide into groups to explore a specific reason. On the final day of the unit, students will present to the whole class, and Katie will facilitate a discussion about what laws, practices, and policies are in place to protect species, providing the example of mangrove population reductions she witnessed in Costa Rica and the impacts on the local ecosystems.



#### Sarah Compton

Tilden Community Career Academy High School, Chicago, IL Biology and Nutrition Teacher and Department Chair, Grades 9–12

"I am always looking for new ways to incorporate authentic science in my classroom and encourage my students to try new and sometimes uncomfortable things. This experience has helped me to do all of that. I have learned an incredible amount about cetaceans and

conducting field science from [the Earthwatch PI and his team of scientists] that I can use in my classroom."

Sarah's Lesson Plan: During the expedition, Sarah considered her role in climate change, environmental degradation, and the species and ecosystems suffering from human behavior. As a result, she developed a unit to encourage students to evaluate their contributions to the global waste problem. After a contextual lesson on the impacts of pollution, students will walk through the school and take photos of things that generate waste. Students will collect their photos, identify the top sources of waste, and then break into groups to research one of the leading contributors and its impact on ecosystems globally. Finally, students will choose a type of school waste they want to help decrease or eliminate, analyze how much of the waste is generated at the school, and propose an alternative or solution to this waste production. This unit allows students to analyze their role in pollution and empowers them to make critical changes in their community.



Karaka T: 1.978.461.0081 | 1.800.776.0188
F: 1.978.461.2332
☑ info@earthwatch.org



Laura Lanik South High School, Minneapolis, MN Geography and Social Studies Teacher, Grades 11 & 12

"Being able to participate in citizen science and be a part of a research team doing conservation work has been life-changing for me as a social studies teacher... I can transfer this knowledge into the classroom and create opportunities for students to solve real-world

problems in the classroom."

Laura's Lesson Plan: Laura's human geography students will apply geospatial technologies and geographic tools to analyze human systems and evaluate the relationship between humans and the environment throughout 3–4 class periods. Laura was impacted by the locals' stories of why species and ecosystems were important to them and chose to emphasize this to her students through the lens of a local species. Her lessons will specifically focus on the Emerald Ash Borer, the importance of the Ash tree in Native American cultures and communities, and how students can boost the Ash tree's resilience through seed collecting. Students will learn about the concepts of invasive and native species and how certain species hold not only ecological importance but cultural value as well.

