



Challenge Guide



Biodiversity:
“...humanity’s
most important
life-supporting
‘safety net’”



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The OurEcho Challenge Challenge Guide



PROGRAM OVERVIEW

The OurEcho Challenge is an online destination powered by EarthEcho International and designed by educators to engage middle school-aged students as they tackle the decline in biodiversity head-on. All program resources are available at no cost and were created for educators, museums, community programs, and any organization or group of students seeking credible information for learning and teaching about biodiversity, as well as taking action.

The two main components of the program website www.OurEchoChallenge.org include:

1. **Teaching and Learning Resources** to foster **understanding and awareness** of biodiversity and factors impacting biodiversity.
2. **The OurEcho Challenge** to inspire **action** toward preserving, protecting, and repairing biodiversity at the local level.

Why Biodiversity?

Like an echo, the impact of all living species resonates among all other life to create the balance on which we all rely. This interconnectivity of life is called biodiversity.

Life across our world is sustained by biodiversity, that includes not just the rare or endangered life forms like tube worms at hydrothermal vents or polar bears, but widespread organisms like grasses, bacteria, and human beings. The heterogeneity of life from the genetic to the ecosystem level is vital to maintaining a healthy planet. Recognizing that half of the world's biodiversity has been destroyed since 1970, the OurEcho Challenge empowers young people to understand, embrace, and protect biodiversity for our collective future.

The OurEcho Challenge is a STEM innovation competition that empowers U.S. middle school students to take a closer look at biodiversity in their communities. Students will first identify threats to local ecosystems and then propose solutions to help preserve, protect, or repair those natural resources.

Why Now?



Source:
One million animal and plant species are now threatened with extinction, more than ever before in human history.



Plastic pollution has increased tenfold since 1980, as **300-400 million tons** of heavy metals, solvents, toxic sludge, and other wastes from industrial facilities are dumped annually into the world's waters.



Fertilizers entering coastal ecosystems have produced more than **400 ocean "dead zones,"** totalling more than **94,595 square miles** – a combined area greater than that of the United Kingdom.



The number of invasive alien species per country has risen by about **70% since 1970**, across **21 countries** who keep detailed records.



100 million hectares of tropical forests were lost from 1980 to 2000



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TEACHING AND LEARNING RESOURCES

EarthEcho has developed and curated a suite of middle-school level educational resources to support students' understanding of the important role biodiversity plays in sustaining the delicate balance of systems on our planet. All resources refer to Next Generation Science Standards (NGSS) and are free to use regardless of whether students are participating in the competition portion of the OurEcho Challenge.

Biodiversity Basics Lesson Plan

For educators looking to use the OurEcho Challenge as the deep-dive solution for teaching biodiversity to their students, we have developed a suite of research-based and standards-aligned lesson plans leading students from the basics of biodiversity all the way through building solutions and action plans to foster and protect this element of our world.

Step 1: What is biodiversity? In this introductory mini lesson, students will begin to examine biodiversity and signs that it is in peril. Teams of students will collaborate to design an ideal biome that reflects the healthy interconnectedness of species, habitat, and environmental factors.

Step 2: What are different types of biodiversity? What species pose challenges to biodiversity? Students will expand their understanding of diversity to realize that richness of species and ecosystems, and diversity within species, offers resilient and adaptive protections. But what happens when human activity interferes with ecosystems and non-native species are introduced? Students will create an ideal food web and infer consequences if an organism is overwhelmed by introduced species. Finally, students will consider what species is the ultimate invader... could it be humans?

Step 3: What are mitigating factors to strengthen biodiversity? Students will access international warnings and data about how humans have compromised biodiversity. While recognizing human activity as the culprit for this current phase of species extinction, students will also learn about the human activity to mitigate threats to biodiversity as they research citizen scientist groups trying to restore natural habitats and reverse extinction.

Step 4: Next Steps? What can I do to meet the challenge? Students journey from a global introduction about biodiversity to their own regional landscape. Students will explore local biodiversity threats through research and local polling, and start their first steps of the OurEcho Challenge action project: identifying a local threat to biodiversity, developing persuasive arguments to appeal to the community, and formulating a plan of action.

Supplemental Links: Similarly to EarthEcho, there are many great organizations and educators who have dedicated their time and energy to building high-quality resources that celebrate biodiversity. Within each lesson we have incorporated vetted materials from across the web, including lessons, videos, and helpful annotations and cited these resources throughout the curriculum.

Standards Correlation: All lessons are aligned to the Common Core and Next Generation Science Standards for grades 6-8.



Activity Starters

For classroom or informal learning environments looking to integrate biodiversity into existing curriculum or programming in a more informal manner, consider these quick and interactive activity starters to introduce biodiversity in fun and dynamic ways.

Invasive Species: Trying to find a lesson starter that illustrates how invasive species work? Take two clear cups filled with water. Add yellow food coloring to one cup to serve as a habitat; add black food coloring, representing an invasive species, to the other cup. Talk to students about how some species can completely alter an ecosystem when they enter it. While this is not always the case, certain factors, such as diet, ambient conditions, and a lack of predators can create a lasting change when an unexpected visitor arrives. After walking students through several examples of invasive species, pour some water from the yellow cup into the black cup. Students should notice the water stays black. This is an example of a non-invasive species. However, when you then pour some of the black water in the yellow water, the water changes forever.

Healthy Ecosystems: In this classic activity starter, we mix learning with food! We use the hands-on example of baking chocolate chip cookies, but you can get creative using any food you'd like—or even just talking through it with students. Start out with a batch of pre-made chocolate chip cookies alongside the ingredients it takes to make a batch of chocolate chip cookies. Tell students that you are going to make cookies as a class. Ask students how many ingredients they can take away from the ones displayed before the cookie is no longer a cookie. If possible, have students try to create chocolate chip cookies using the ingredients of their choice but without a recipe. After completing the exercise, explain to students how this compares to an ecosystem such as a pond—there are bugs, fish, and plants in the water. If we take away the plants we still have a pond, but if we take away all the plants some of the animals will begin to die. If we double the amount of algae in the pond, can the ecosystem still thrive? At what point does the pond's balance shift?

Intergenerational Biodiversity Investigation: Encourage students to research the biodiversity of their regions by collecting oral histories from older relatives and neighbors. Assist students in developing interviews to investigate if the region has changed from the middle of the last century until now. Suggested interview prompts include has/have: weather patterns changed, wildlife disappeared or overtaken the area, habitats changed from development, agriculture products changed, fish and seafood been depleted or introduced, and/or water sources been contaminated or restored.

Looking for more? Here are a few of EarthEcho's activities as well as some from our favorite partners creating great resources for teachers:

[EarthEcho Expedition: Into the Dead Zone:](#)

[Oyster Reef Ecology Lesson Plan](#)

[Oyster Reef Ecology Student Activities](#)

[National Biodiversity Teach-in](#)

[National Geographic Bio-Blitz](#)

<https://scistarter.org/citizen-science>

[Teachers Pay Teachers](#) particularly the [Biodiversity Scavenger Hunt](#) by *E is for Explore* that gets students outside and exploring with a fun twist on this traditional activity using the game-like factor of a biodiversity scavenger hunt!



THE OURECHO CHALLENGE

How can we preserve, protect, and repair biodiversity starting in our own backyards? The OurEcho Challenge was created to inspire middle school-aged students to answer this question by identifying a local issue affecting biodiversity and proposing a solution. Solutions can be in the form of a process or prototype.

Basic Requirements:

FOR EDUCATORS AND PARENTS:

In order to participate in the OurEcho Challenge, all students must receive parent/guardian consent. To provide consent, parents/guardians will need to provide their student's educator with a signed [permission form](#), which can be found in the [OurEcho Challenge Resources](#) section of the website.

Given the age of students, an adult (educator or parent) will need to submit each team's entry on behalf of their child/ students using the [online form](#).

The OurEcho Challenge is open to groups of 1-3 students (ages 10-15). Teams will **identify an issue** impacting local biodiversity and **propose a solution** to protect, repair, and/or preserve biodiversity as it relates to that issue.

Supporting Resources:

In addition to a suite of classroom content (see *Educator Resources*), we have also provided a host of tools, worksheets, and a step-by-step checklist for entering the OurEcho Challenge. All of these resources can be found online on the [OurEcho Challenge page](#) and are listed below:

- OurEcho Challenge Checklist & Winning Tips
- Student Brainstorming Worksheet
- Scoring Rubric
- Official Rules
- FAQ



Judging:

The panel of judges may be comprised of EarthEcho Youth Leadership Council members, Aramco Services Company scientists, EarthEcho International employees or Board members, and middle school science educators. The panel of judges will carefully review all entries using the [judging rubric](#) guided by the following criteria.

- **Inspiration (33%)**
Conveys authenticity and a connection to local community issues and resources.
- **Scientific Rigor (33%)**
Identifies an evidence-based issue with a proposed solution that alludes to the scientific method or the engineering design process.
- **Feasibility (34%)**
Demonstrates a realistic solution that answers the question, “Is this DO-able?” with supporting information.

Prizing:

Finalists *(Notified by April 21, 2020)*

- **10 finalist teams will receive \$500** to expand upon their proposed solutions by creating prototypes, pilot projects, test sites, etc. All finalists will win a trip to Washington, DC, where they will present their ideas and potentially their proof of concept at EarthEcho’s annual Youth Leadership Summit (August 7-9, 2020), where the winning ideas will be selected and announced.

Winners: *(Selected among finalists in August 2020)*

The OurEcho Challenge has some exciting prizes that will allow student teams to bring their amazing ideas to life! All prizes will be awarded in the form of project grants to schools/organizations:

- **First Prize: \$10,000**
- **Second Prize : \$5,000**
- **Third Prize: \$2,000**

OurEcho Challenge Rules

The Contest is offered only within the 50 United States and the District of Columbia. Middle school-aged students (attend school in Grade 5 through Grade 9 during the Entry Period or be Grade 5 through Grade 9 equivalent age as determined by Administrator in their sole discretion for students who are not in a traditionally-graded educational environment)) are encouraged to enter in teams of 1-3. Given the age of students, we ask that an adult (21+) submit each entry online on behalf of the teams they are mentoring. Mentors can be traditional educators, parents, and/or adult facilitators of more informal learning environments. All students will require a permission form signed by their legal guardian to be uploaded with their entry. In order to ensure that teams are meeting the basic requirements for a qualifying entry, we encourage you to use the [Challenge Checklist](#) handout and the [Official Rules](#) prior to hitting “submit.” We have also included the Challenge Checklist in the appendix of this Educator Guide.





OurEcho Challenge Timeline

Mark your calendars!

January 27
2020

OurEcho Challenge open for entries.

March 22
2020

OurEcho Challenge closes – all entries must be received by or before 11:59 PM EDT in order to qualify.

April 21
2020

Top 10 finalist teams notified - each finalist team will receive a \$500 stipend to help cover the cost of supplies and resources needed to create the final presentation and/or prototype.

May–July
2020

The 10 finalist teams will have a development period to draft a final presentation and/or prototype of the proposed projects.

August 7–9
2020

Each team, and their mentor, will travel to Washington, DC to join EarthEcho's Youth Leadership Council annual summit, during which the final OurEcho Challenge event will take place. All expenses will be covered by EarthEcho.

The final event will take place on Saturday, August 8, 2020, with travel dates on August 7 and August 9, 2020.



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Challenge Checklist & Winning Tips



Use this checklist to track your progress toward being ready to submit your entry!

- ☐ Our team consists of 1-3 students, all of whom are between the ages of 10 and 15 years old (grades 5 - 9).
- ☐ Our entry identifies a biodiversity issue that is local to our community or region.
- ☐ Our entry proposes a solution to preserve, protect, and/or repair biodiversity.
- ☐ Team's entry contains our original ideas and work.
- ☐ We have reviewed the scoring rubric to make sure our idea aligns to criteria required for a successful submission.
- ☐ We have reviewed the contest rules with an adult to ensure we are submitting a qualifying entry.
- ☐ Every team member has a completed and signed parent/guardian permission form, ready to be uploaded.
- ☐ An adult, over the age of 21 years old, is submitting this entry on behalf of our team.

10 finalist teams will be chosen and notified by April 21, 2020.

If your team is selected as one of the top 10 finalist teams, you will be expected to continue work on your proposed project for a final presentation in Washington, DC, on Saturday, August 8, 2020. The 10 finalist teams will have from May - July to draft a final presentation and/or prototype of the proposed projects. During this development time period, each finalist team will receive a \$500 stipend to help cover the cost of supplies and resources needed to create the final presentation and/or prototype.

Each team, and their mentor, will travel to Washington, DC, to join EarthEcho's annual Youth Leadership Summit, during which the final OurEcho Challenge event will take place. Travel, meal and lodging expenses for team members and their mentor and will be covered by EarthEcho.

The final event will take place on Saturday, August 8, 2020, with travel dates on August 7 and August 9, 2020. Each finalist team member and their mentor will travel to the final event where they will present their proof-of-concept presentation to compete for the winning prizes: **First Prize: \$10,000.00** ◆ **Second Prize: \$5,000.00** ◆ **Third Prize: \$2,000.00**

QUESTIONS? EMAIL US AT OURECHALLENGE@EARTHECHO.ORG



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OurEcho Challenge Glossary & Vocabulary

Biodiversity – biological diversity in an environment as indicated by numbers of different species of plants and animals. Biodiversity includes three main types: diversity within species (genetic diversity), between species (species diversity), and between ecosystems (ecosystem diversity).

Biological resource – a resource is a substance or object in the environment required by an organism for normal growth, maintenance, and reproduction. Resources can be consumed by one organism and, as a result, become unavailable to another organism.

Biome – a major ecological community type (such as tropical rainforest, grassland, or desert).

Citizen scientist – volunteers who team up with professional scientists to collect and/or analyze data.

Community – an interacting population of various kinds of individuals (such as species) in a common location.

Ecological biodiversity – the variation in the ecosystems found in a region or the variation in ecosystems over the whole planet.

Ecosystem – the complex of a community of organisms and their environment functioning as an ecological unit. Endemic an organism that is restricted or peculiar to a locality or region: an endemic organism.

Engineering design – the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic science and mathematics and engineering sciences are applied to convert resources, optimally to meet a stated objective.

Environment – the complex of physical, chemical, and biotic factors (such as climate, soil, and living things) that act upon an organism or an ecological community and ultimately determine its form and survival.

Genetic biodiversity – the sum of genetic information contained in the genes of individual plants, animals, and microorganisms; serves as a way for populations to adapt to changing environments.

Habitat – the place or environment where a plant or animal naturally or normally lives and grows.

Indigenous – produced, growing, living, or occurring naturally in a particular region or environment.

Innovation – a new idea, method, or device.

Introduced species – organisms that are not native or natural to a habit which have been accidentally or purposefully brought to a new habitat (also known as an exotic species).

Invasive species – a species that is not native to a specific location, and that has a tendency to spread to a degree believed to cause damage to the environment, human economy, or human health.

Keystone species – a species of plant or animal that produces a major impact (as by predation) on its ecosystem and is considered essential to maintaining optimum ecosystem function or structure.

Mitigate – to make less severe.

Natural resources – industrial materials and capacities (such as mineral deposits and waterpower) supplied by nature.

Research scientist – a scientist who works primarily with gathering knowledge, understanding and conducting research or investigation, in order to discover new things, etc.

Resilience – an ability to recover from or adjust easily to misfortune or change.

Restoration – a bringing back to a former position or condition.

Solution – an action or process of solving a problem.

Species – a class of individuals having common attributes and designated by a common name.

Species biodiversity – the existence of many different kinds of plants and animals in an environment.

Sustainability – relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged.

Source: <https://www.merriam-webster.com>





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Thanks to the support of Aramco,
EarthEcho is launching
the OurEcho Challenge
to enhance the biodiversity of our
planet by creating resources to help
foster the problem solvers of the future.



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