

VIRTUAL FIELD TRIP TEACHER'S GUIDE

How Nature Works in Coastal Peru: The Amazing Biodiversity of Coastal Ecosystem

Grades: 3-8

Subjects: Science and Geography



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Purpose: This guide contains information on teacher preparation for the event, technical information, as well as a variety of student materials, which can be used before, after, or during the virtual field trip. It also contains links to Nature Works Everywhere resources and other resources ranging from lessons, activities, demonstrations, experiments, real-time data, and multimedia presentations.

Description of Virtual Field Trip: Join our expert scientist Matias Caillaux, a fisheries specialist for The Nature Conservancy, on a virtual field trip to explore the Humboldt Current Ecosystem off the coast of Peru while learning about the area's amazing diversity and productivity. While Peru is most frequently recognized for its rainforests, mountains, and ancient Inca civilizations, it is also home to one of the most productive ocean ecosystems. During this virtual field trip to the western coast of South America, students will learn about the Humboldt Current—a cold water current that pushes nutrients from the deepest ocean toward the surface, forming the basis of a unique and abundant ecosystem in which we will find a variety of sea birds, flamingos, and even penguins! Matias will travel by boat through an arid landscape with ancient carvings to an island that is home to more than 30,000 sea lions at a time! Students will learn that the productivity of this ecosystem is not only important to its animal inhabitants, but to the success of the region's fishing industry as well. They will also discover what's being done to protect this vulnerable ecosystem—so that both people and animals can continue to thrive.

Materials:

Elementary School

- **Nature Spy Handout**
https://natureworkseverywhere.org/asset/resources/Peru_Nature_Spy.pdf
This handout includes images of animals and other items that students will see during the field trip. Print it off and have students check off the images as they see them.
- **Peru Virtual Field Trip Log**
https://natureworkseverywhere.org/asset/resources/Peru_Virtual_Field_Trip_Log.docx
This one page handout can be printed and used before, during, and after the field trip for students to think about what they hope to see, what they learned, what they want to know more about.
- **Peru Vocabulary Graphic Organizer**
https://natureworkseverywhere.org/asset/resources/Peru_Vocabulary_Graphic_Organizer.docx
This handout includes six vocabulary words used during the virtual field trip and provides a structure for students to define and use them in a sentence.

Middle School

• Peru Virtual Field Trip Discussion Questions

https://natureworkseverywhere.org/asset/resources/Peru_Virtual_Field_Trip_Discussion_Questions.docx

This fifteen question handout can be used during and after the virtual field trip. You can modify the questions as needed or use them as discussion prompts after the trip. The answer key is located at the end of this teacher's guide.

Standards: A more detailed, grade-based map to the standards can be found here:

https://natureworkseverywhere.org/asset/events/Standards_for_Peru_VFT.pdf

Next Generation Science Standards Disciplinary Core Ideas

- ESS2.A Earth Materials and Natural Systems
- ESS2.E Biogeology
- ESS3.A Natural Resources
- ESS3.B Natural Hazards
- ESS3.C Human Impacts on Earth Systems
- LS1.C Organization for Matter and Energy Flow in Organisms
- LS2.A Interdependent Relationships in Ecosystems
- LS2.B Cycle of Matter and Energy Transfer in Ecosystems
- LS2.C Ecosystem Dynamics, Functioning, and Resilience
- LS4.C Adaptation
- LS4.D Biodiversity and Humans

National Geography Standards

- 4 - The physical and human characteristics of places
- 8 - The characteristics and spatial distribution of ecosystems and biomes on Earth's surface
- 11 - The patterns and networks of economic interdependence on Earth's surface
- 14 - How human actions modify the physical environment
- 15 - How physical systems affect human systems

Related Nature Works Everywhere Resources: The following lesson plan and video can be used to supplement the virtual field trip.



Fishing for a Future

Grade Levels: 9-12

<https://www.natureworkseverywhere.org/resources/fishing-for-a-future/>

In this set of activities, students explore sustainable fishing through a specific case study in Peru, which is home to one of the world's largest fisheries. The challenges to the health of fisheries in the waters off the coast of Peru represent a microcosm of the larger world as similar challenges are faced by fisheries everywhere. The need to protect the ecosystem and effectively manage its resources are important both for the health of the ecosystem and for the communities that depend on it. This lesson includes: interactive story maps that explore the Humboldt Current and El Niño and artisanal fishing; a fisheries management activity using data; and a Socratic Seminar that explores the challenges of open access fishing areas.

If you would like to give us feedback about your experiences with the **Peru Virtual Field Trip**, please participate in this short survey: <https://www.surveymonkey.com/r/peruvft>

Teacher Preparation and Tech Considerations Before the Event:

- Check to see if YouTube is blocked at your location. If so, you may be able to request that your district or school's IT person unblock the link to the virtual field trip. Refer to the link you received in your registration email. Be sure to do this several days in advance of the event.
- If your school site is not able to unblock YouTube, register for the field trip anyway and you will be added to a mailing list about the event. You will receive a newsletter when we edit the live recording and place the video on Vimeo (approximately 2-3 weeks after the live event) and you can try viewing it there. If you don't have school access to Vimeo, you can download the video at your home or other location and bring it to school on a USB drive.
- Note that anytime during the live recording, you can press "pause" and come back to the event. It will no longer be live, but your students can pick up where they left off in the event of recess, a fire drill, or any other interruption.
- **Also note that you can use the same link that was emailed in your registration to view the virtual field trip anytime.** Once the live event has concluded, you can watch it from the beginning. This is helpful if you are showing it to multiple periods or if the time of the live event doesn't work for you.
- Because there will be opportunities for Q and A as well as a "quiz" during the event, you may wish to select a student who can type in answers, questions, or comments before the event. **If you would like to participate in the Q and A, you will need to have a Google + account.** This feature of Google Hangouts, which can be accessed through YouTube, is only available to Google + users.

If you would like to participate in the Q and A feature, click on the "Be a Part of the Conversation" in the lower left hand corner of the screen, which will open the presentation in the "Google Hangouts" window.

If would like to enlarge the screen while watching, click on the "full screen" icon in the lower right hand corner of the screen.

The Coral Reefs of Palau: Nature's Amazing Underwater Factories

Nature Works Everywhere

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Discussion Questions: You can use or adapt these questions for a follow-up discussion with your students after viewing the virtual field trip. Older students may be able to follow along and answer the questions while viewing.

1. Describe the diverse landscapes of Peru.

Answer: Peru has habitats ranging from desert to tropical rainforest. The Amazon River is in Peru. There are also huge mountains including the peaks in the Cordillera Blanca range. The coastal region of Peru is very dry and desert-like.

2. Describe the importance of Paracas National Reserve in Peru.

Answer: It is the oldest marine protected area in Peru. There are animals native to Peru that are not found anywhere else in the world. These are called “endemic” species.

3. What is a geoglyph?

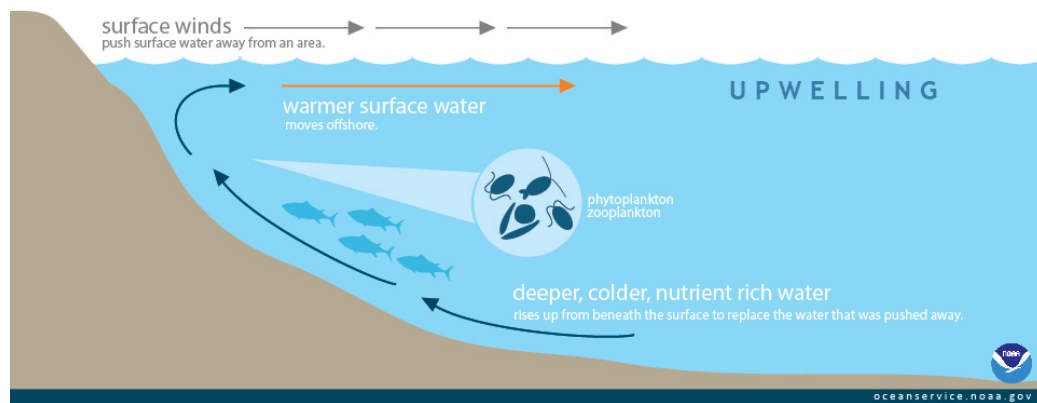
Answer: A geoglyph is an ancient artwork drawn into the landscape. There is one in Paracas called the Candelabra or Chandelier.

4. What is the Humboldt Current and how does it affect the coastal ecosystem of Peru?

Answer: The Humboldt Current is a cold water current from Antarctica that travels north up the coast of Peru. The cold water causes an upwelling of nutrients that feeds phytoplankton and leads to a highly productive ecosystem.

5. Describe how an upwelling works and draw a diagram of one in the space below.

Answer: An upwelling is when wind blows across the ocean, pushing surface water away and allowing cold, nutrient-rich water to rise to the top. Student drawings may look similar to the one below.



Credit: [NOAA](https://www.noaa.gov)

6. What are phytoplankton?

Answer: Phytoplankton are microscopic plants that are at the bottom of the food chain (producers). Fish and other organisms eat phytoplankton.

7. List one interesting fact about sea lions.

Answers may include: Sea lions eat 15-35 pounds of food a day. Males have a patch of short hair around their heads like a lion's mane. Sea lion pups enter the water when they are 3-4 weeks old.

8. How many tons of fish are caught every year in Peru?

Answer: 6 million tons

9. Why is it important to manage a fishery?

Answer: Fisheries management is important for both humans and the ecosystem. In order for there to be enough fish for sea lions and other animals to eat, we need to make sure that we aren't overfishing the system. Also, in order for humans to keep harvesting fish from the ocean, we need to make sure there are enough fish that can survive and reproduce to keep the population going strong.

10. Is overfishing only a problem in Peru?

Answer: No. Overfishing is a problem that can happen anywhere in the world.

11. What are some of the amazing organisms that you can find on the coast of Peru?

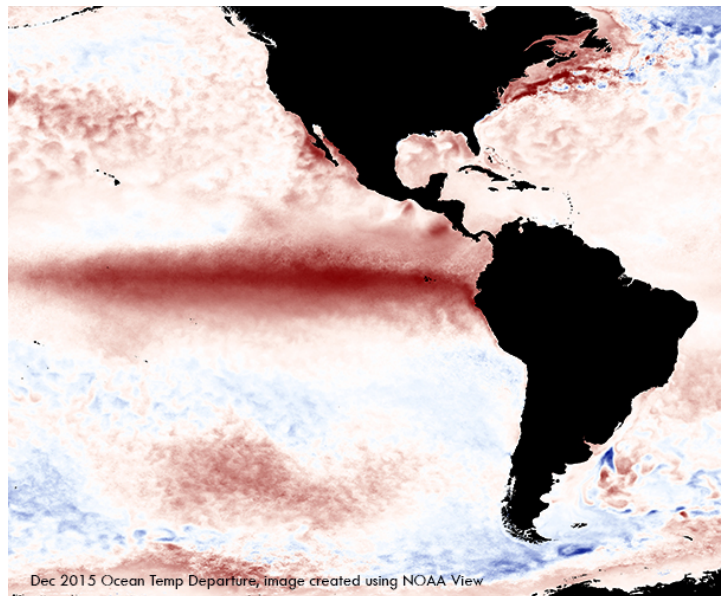
Answer: The Humboldt Penguin can only be found along the coast of Peru. There are also sea lions, flamingoes, Inca Terns, Pelicans, Peruvian Boobies, etc.

12. What is a quota and how does setting quotas help to conserve fish?

Answer: A quota is the setting of a limit. In this case, a quota is a limited number of species that can be harvested from the ocean. By limiting the number of fish that can be taken, this ensures that there will still be fish left to reproduce and replenish their populations.

13. What is an El Niño?

Answer: An El Niño is when warmer waters move toward the west coasts of N. and S. America. This happens every few years. Sea surface temperature measurements can indicate when there is an El Niño. The picture to the right shows above average sea surface temperatures in December 2015.



14. How does an El Niño affect the ecosystem?

Answer: During an El Niño, the warmer waters decrease the upwelling effect that normally brings nutrients to feed phytoplankton. The decrease in phytoplankton results in a decrease of fish, which in turn affects everything that feeds on the fish. Many organisms die during an El Niño. However, some organisms flourish during the warmer conditions.

15. What can we do to protect the health of the oceans?

Answer: We can ask where seafood comes from and find out if it was sustainably harvested. We can choose to eat only seafood that is sustainable. We can be aware of what we flush down the drain (microbeads, chemicals, etc.) because all drains lead to the ocean. We can reduce, reuse, and recycle. We can educate others.