The Nature Conservancy

NATURE LAB Educator Resources

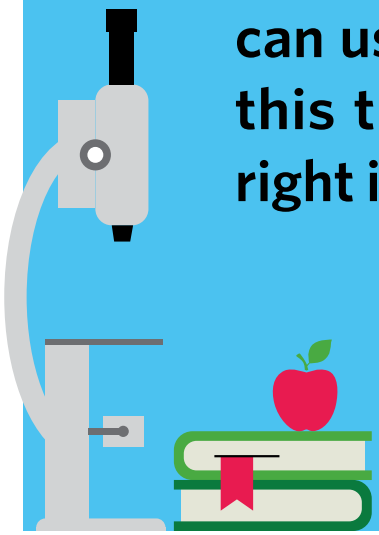
FAMILY TEACHING GUIDE

Provide Food and Water Sustainably

Standards-based instructional resources for use at home

NATURE LAB
Educator Resources

Nature Lab is intended to share the places, science and conservation stories of The Nature Conservancy with the next generation, with a focus on helping students connect what they see on the screen to actions they can take in their own backyard. Our teaching guides offer educators standards-based instructional resources for classroom use but now you can use our resources at home too! Use this thematic guide to explore nature right inside your home.



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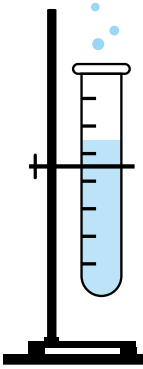


DAY 1 Introduction

Demand for food and water is expected to increase by more than 50% in just the next 30 years

This week we are going to learn about some ways that we humans can have access to food and water while still keeping our lands and oceans healthy. Demand for food and water is expected to increase by more than 50% in just the next 30 years as the world's population continues to grow—and while that sounds like a big challenge, it's a challenge that can be met.

Providing food and water sustainably includes creating innovative agricultural practices, using technology to manage fisheries and protecting water at its source in order to ensure that nature can endure. Food is sustainable when it benefits the environment and maintains soil fertility. The Nature Conservancy is fostering innovations in technology, collaborating with communities to use resources more efficiently and promoting policies that enable sustainability. Together, we can secure healthy food and clean water for all people without sacrificing the environment.

DAY 2 Sustainable Fishing

? ESSENTIAL QUESTION

How can fisheries become more sustainable?

→ ACTIVITY

WATCH:
An Intro to Fisheries Management
Fishing for the Future

“ DISCUSSION

What does “open access” mean?

- Open access means that the right to catch fish is free and open to all. There are no restrictions on the number of fishers that can enter the fishery.

Describe the potential problems with common pool resources.

- An individual working alone has an incentive to protect their fishing stock, but in a group, there is less incentive because whatever that individual leaves behind might be fished by another individual.

✱ For advanced readers, read the article on **pages 27-28** of the Teacher Guide together and discuss the following questions:

1. Use evidence from the text to support where you think there might be a source of conflict between the two fleets.
2. What might be the unintended consequences of some of the policies presented in this text?
   - What might be some of the ecological consequences?
   - What might be some of the economic consequences?
3. Do you see any issues with the area that the fleets are allowed to fish?
4. Is there a “tragedy of the commons” scenario at play here? Cite evidence from the text that might allude to this.
5. Suggest practical approaches that could be used to create different management solutions for the artisanal or industrial sector.

Share your reflections with us on social media and help us spread the word!

! TAKE ACTION

WATCH:
the TEDtalk “The Four Fish We’re Overeating”

Identify how you can make a difference:

- Next time you eat fish, ask where it came from and how it was caught
- Write a short reflection a short reflection about changes you might make with their own diets

DAY 3 A Coastal Ecosystem in Peru

? ESSENTIAL QUESTION

How can fisheries become more sustainable?

Yesterday we learned about sustainable fishing. Today, we'll join fisheries scientist Matias Caillaux again to explore the Humboldt Current Ecosystem off the coast of Peru while learning about the area's amazing diversity and productivity.

During this virtual field trip to the western coast of South America, we 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!

We 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

→ ACTIVITY

WATCH:
How Nature Works in Coastal Peru

Use the nature spy handout on **page 7 of the Teacher Guide** to help younger students stay focused! Challenge them to find each item while watching the film.

" DISCUSSION

Q: Describe the diverse landscapes of Peru.

A: 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.

Q: Describe the importance of Paracas National Reserve in Peru.

A: 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.

Q: What is the Humboldt Current and how does it affect the coastal ecosystem of Peru?

A: 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.

Q: Why is it important to manage a fishery?

A: 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.

Share your reflections with us on social media and help us spread the word!

! TAKE ACTION

Discuss the following. Make a visual representation of your responses (poster, drawing, etc.) and share your answers with us on Twitter or Facebook!

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

Possible Answers: 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.

DAY 4 The Industrial Tomato

? ESSENTIAL QUESTION

Does eating food grown locally help reduce your carbon footprint?

Students will use their own food at home as an entry into the complex world of food production and try to answer the even more complex question of "Where does our food come from?" And then extend that question further to evaluate the impacts of food systems on our environment. The point is that there are no cut and dry answers when it comes to understanding the dynamic relationship of food and our environment.

One place to begin looking for carbon emissions is transportation—how the food arrives at the supermarket or at our door. But transportation represents only one part of the story. Some scientists have found that production is the primary culprit in greenhouse gas emissions in the foodto-consumer chain. Production includes the energy used to manage the soil (e.g., farm machinery), irrigate, apply fertilizers or pest controls, harvest, run greenhouses (if they are used), and more. The study of all the steps of how food reaches our homes has been termed Life-Cycle Assessment

Another critical component of food's role in energy use and carbon emissions is diet: Eating vegetables and fruits during their local growing seasons and eating all the food we buy (or grow)—that is, not wasting food—can cut down on off-season (high-energy) production and long distance transportation. Eating a vegetable during its natural production period (for example, eating tomatoes during the part of the season when they are produced) can have a significant impact in the amount of energy used and carbon dioxide emitted.

→ ACTIVITY

WATCH:
The Industrial Tomato

Ask students to think of their favorite fruits and vegetables and where these foods might be purchased in their community. Then ask students: where do those food items come from? The grocery store? A farm? Your backyard? Ask students to think of all the possible ways food makes it to their plate. Students can complete their life cycle assessment using the **Life Cycle handout**

" DISCUSSION

Discuss what happens to a tomato from seed to table

- Facilitate organization of their ideas into production (anything related to growing the tomato), transportation (at any point along the life of the tomato), and use (related to storing, preparation, eating or waste). Students can also think about the by-products and/or outputs that result from each of the phases. For example, in the production phase, chemical run-off from fertilizer use is a by-product of the growing process.

You can use this graphic to help students understand how food is produced.

- This diagram explores food systems at the macrolevel. Students should do a simpler version of this cycle – they are exploring the cycle of one vegetable, the tomato, and not the entire food system

After completing the **life-cycle assessment**, have a conversation using the following guiding questions:

- What issues on these diagrams are the most important to you? Why?
- What groups of people are affected by this system? How? What are negative ways they are affected? What are positive ways?
- Who or what has the most power to influence the food we eat? Why?
- What are the environmental impacts of this food system?
- What works well in this system? What doesn't work well? Why?

! TAKE ACTION

- Next time you eat produce, ask where it came from and how it was grown
- Write a short reflection about changes you can make to your diet as a family. Share your reflections with us on social media and help us spread the word!

Share your reflections with us on social media and help us spread the word!

DAY 5 The Local Tomato

? ESSENTIAL QUESTION

Does eating food grown locally help reduce your carbon footprint?

From the previous exercise, students learned about the life cycle of a tomato, from seed to table. Now they will compare and contrast how production is different in their garden from commercial production.

→ ACTIVITY

WATCH:
The Local Tomato

Create Venn diagram(s) noting the features they think are unique to the settings and those that are different.

" DISCUSSION

Discuss the pros and cons of home or school gardening vs. commercial farming. You can also have students do the same comparison, creating a Venn diagram, for produce grown and sold at a local farm or farmer's market and that grown at a large-scale commercial farm.

Review the following examples together:

Case Study ❶ – Immokalee, FL

Florida's climate is less than ideal for growing tomatoes in fields – they have sandy soil, very hot and humid temperatures, and many insects. Farmers add fertilizers to the soil, keep seedlings cool, and apply pesticides frequently. Tomatoes grown in field require the use of field equipment for large-scale production. The tomatoes, once harvested, are usually transported long-distances –approximately 1,300 miles from Immokalee, Florida to Chicago, Illinois for example – and need to be heavily packaged to protect them from damage on their journey.

Case Study ❷ – Baja, Mexico

Mexico's warm climate is good for growing tomatoes year-round in fields, except for one crucial factor. When tomatoes are produced in Mexico, they are generally coming from a desert area. It doesn't rain much, so water for the tomatoes needs to be piped-in or pumped from elsewhere. It also means the soil needs a lot of fertilizer since desert soils are generally quite sandy and lack many nutrients. Tomatoes grown in fields require the use of farm equipment and as with all long-distance transportation, the tomatoes need to be heavily packaged to protect them from damage on their journey. When traveling by air from Baja, Mexico to Detroit, Michigan, a tomato moves approximately 3,000 miles.

Case Study ❸ – The Netherlands

Most tomatoes grown in the Netherlands are grown in greenhouses (also called glass houses). Greenhouses usually require the use of heating systems and lights to produce a tomato in a cold climate. Since this type of tomato is grown in a greenhouse, it does not require field or farming equipment, but does still require the use of fertilizer and heavy packaging if transported a long distance. Shipping from the Netherlands to New York City, this tomato travels approximately 3,500 miles.

Go back to the Venn Diagrams and make any changes together.

! TAKE ACTION

Calculate the food miles of 5 items in your kitchen or pantry:
http://www.foodmiles.com/

Share your findings with us on social media & let us know what changes to your food consumption you plan to make as a family!

DAY 6 The Journey of Water

? ESSENTIAL QUESTION

How does water get to our sink?

Today we will see what it's like to walk among towering, furry, sunflower-like plants that capture the mist and rain, ultimately providing water for city residents downstream. And we'll see moss that can hold 40x its weight in water—it's true! We will also learn about the incredible wildlife in the area including spectacled bears, tapirs, jaguars, and Andean condors. Along the way, we will explore where water comes from, how nature works to store and filter water, and how we can help protect water in our hometown. By the end of the journey, we will have a better understanding of how water, nature, and people are connected. It'll be an experience to remember!

→ ACTIVITY

WATCH:
The Journey of Water: From Colombia's Páramo to the Kitchen Sink

During the field trip, play Nature Spy **using page 9 of our Teacher Guide**

" DISCUSSION

After viewing the virtual field trip, discuss the following:

- Chingaza is a national park in Colombia. Can you name 2 or 3 national parks in the United States? This is a great extension opportunity to explore current national parks and the history of national parks. See **The National Park Service's Learn & Explore** for resources and plan for some parks you'd like to visit in the future!
- Alejandro described visiting Chingaza National Park when he was eight years old. Describe a natural place that you have enjoyed visiting (it doesn't have to be a national park). What is it like there? What do you like about it?
- How do the plants in the páramo help people in Bogotá to have safe drinking water? Answer: The plants capture and store water and release it year-round, even during the dry season. The plants also help to filter and clean the water.
- What are some of the things that can lower the quality of the water as it travels from Chingaza to Bogotá? Answer: Loose soil, fertilizers, and manure.
- Take it further: Is the water where you live affected by any of these things? Why or why not? Answer: Answers will vary.
- If the water in your region, or the region in which students live, passes through agricultural areas, the answer is likely yes because these issues are the result of agricultural practices.
- Think about your day. What are some things that you depend on water for and that would be more difficult if you did not have access to enough clean water? Answer: Answers will vary, but might include eating meals, drinking enough water, washing clothes and dishes, taking showers.

Share your reflections with us on social media and help us spread the word!

! TAKE ACTION

- Tyler describes the water used to make a simple cheeseburger. Describe one of your favorite meals and how water might be used in each part of it. You do not need to include the number of gallons of water, only how the water might be part of the process, as with the grass the cows need to eat. Answer: Answers will vary but should include the "hidden" components of the meal.
- Take It further: See if you can do some online research to find out how much water, in gallons, your meal really does use! Answer: Answers will vary.
- Share your reflections with us on social media and help us spread the word!

DAY 7 Salmon and Healthy Forests

? ESSENTIAL QUESTION

How can managing salmon support healthy forests?

Today, we will address the impact of unsustainable fishing practices, as applied to the case of salmon fisheries in the Pacific Northwest.

Salmon runs are an important factor in cycling several nutrients. As fish return to rivers during their annual spawning run, they are consumed by predators or die at the end of the spawning run. Their carcasses contribute nutrients for forest plants. Overfishing salmon reduces the forest's capacity for growth and regeneration.

→ ACTIVITY

WATCH:
Salmon-Healthy Dinner, Healthy Forests

" DISCUSSION

Q: What makes salmon so special?

A: We eat a lot of it and it creates a lot of jobs.

Q: What have you learned about how salmon reproduce?

A: Natural river systems provide breeding grounds for the salmon we eventually eat. Salmon is born in clear cool rivers, then the young migrate to the ocean and then return o the same rivers to reproduce as adults.

Q: Why are salmon considered a "keystone" piece?

A: Because they hold the whole system together. More than 137 species will eat salmon.

Q: How are salmon at the center of the "poop loop"?

A: When salmon die, bears, eagles, racoons, and other animals eat their carcasses and then poop in the woods. The nutrients from the salmon fertilize the forests.

Share your reflections with us on social media and help us spread the word!

! TAKE ACTION

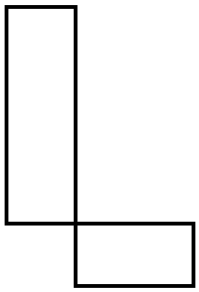
- To conclude our week-long exploration of sustainable food and water, we invite you to take action to protect nature. You can send a letter or email, or make a phone call, to the people who make laws and decisions. In the United States, this can be your local town council or mayor, or your state representatives, or your representatives in Congress. At www.nature.org/act, we have lots of options for important issues you can write about, and we make it easy to just put in your name and address to send an email right away. Speak up about some of the issues you've explored this week!

You've earned it!

From sustainable fishing practices and different farming methods to the important role of salmon, you've learned a lot about how we can get our food and water sustainably and you have much to be proud of!

Download your food and water digital badge and share your learnings on social media.

Tag **@nature_org** on **Instagram** and **@TNCnaturelab** on **Twitter** and **Facebook** so we can celebrate your accomplishment with you!



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Educator Resources

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NATURE LAB SUMMER CAMP:
Provide Food and Water Sustainably

Experiential Project Concept:
Pollinators are important.

Grade Levels: 3-8

Essential Question:

- Why must we protect pollinators to protect food growth?

Introduction:
A pollinator garden provides habitat for and attracts pollen-spreading species. Pollinators make native habitats and food growth possible; therefore, pollinator gardens have an essential function to our planet.

Build a Pollinator Garden

1) Learn about pollinators. Watch The Nature Conservancy's "Pollinators: Putting Food on the Table" - (https://vimeo.com/77811127)

2) This video illustrates the incredible importance of pollinators to agriculture and landscapes. In the video, students build a pollinator garden and learn how little of their picnic lunch would be possible without pollinators.

3) Familiarize yourself with garden-building resources from Nature Lab. For information and step-by-step videos on building gardens more generally, visit: https://www.nature.org/en-us/about-us/who-we-are/how-we-work/youth-engagement/nature-lab/school-garden-resources/

4) You will need a diversity of nectar and pollen sources. Consider the following when choosing plants for your garden:

- Choose plants that flower at different times of the year to provide nectar and pollen sources throughout the growing season
- Plant in clumps, rather than single plants, to better attract pollinators
- Provide a variety of flower colors and shapes to attract different pollinators.
- Use NAPPC's Pollinator Syndrome table tofind the types of flowers that different pollinator groups (bats, hummingbirds, bees, butterflies, etc.) find attractive.
- Whenever possible, choose native plants. Native plants will attract more native pollinators and can serve as larval host plants for some species of pollinators.
- Pollinator friendly plants for your area can be found in NAPPC's Ecoregional Planting Guides.

5) Provide Nesting Sites. Different pollinators have different needs for nesting sites.

- Hummingbirds typically nest in trees or shrubs, and use plant materials, mosses, lichens, and spider webs to construct their nests. Many butterflies lay eggs on specific plants (host plants) that their young (caterpillars) eat. Most bees nest in the ground and in wood or dry plant stems.
    - Ground nesting sites: Simply maintaining a small, undisturbed patch of well-drained bare or sparsely vegetated ground may provide nesting habitat for ground-nesting bees. It is best if the site faces south so that it gets the most sun possible during the day, and is not inundated by a sprinkler.
    - Wood nesting sites: Carpenter bees will chew their own burrows in wood, while many other bees use holes or cavities that are already in wood or dry plant stems.
    - If it's not a safety hazard, consider leaving a dead tree or limb undisturbed to provide natural nesting habitat.

6) Avoid or Limit Pesticide Use. Pesticides can kill more than the target pest. Some pesticide residues can kill pollinators for several days after the pesticide is applied. Pesticides can also kill natural predators, which can lead to even worse pest problems.

Source: *U.S Fish and Wildlife Service*