

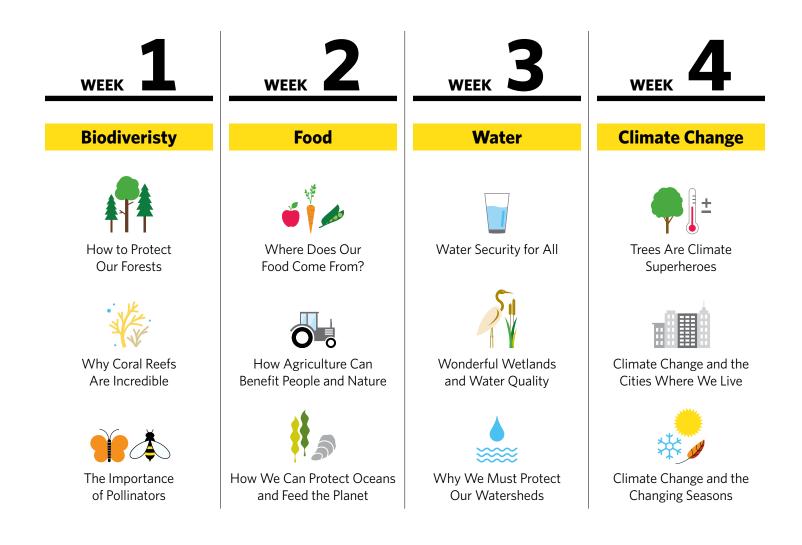
Celebrate Earth Month with The Nature Conservancy's Nature Lab and bring nature into your classroom all month long. Designed specifically for educators, these guides offer a comprehensive yet manageable way to integrate important environmental science concepts into your classroom routine. With just 20 minutes per day, you can introduce your students to a wide range of topics, including climate change, reforestation, biodiversity, water security, and regenerative agriculture, all in honor of Earth Month.

Geared towards ages 10-15 or older, these guides provide engaging activities and discussions that inspire curiosity and critical thinking about our planet's future. Created with research and conservation expertise from The Nature Conservancy, its 1000+ scientists, and its partners, these guides offer valuable resources to help students become informed and empowered stewards of the Earth. Join us as we embark on a journey of exploration, learning, and action to protect our planet for generations to come.

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1 Educator Teaching Guide: Earth Month

Learning Topics





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? ESSENTIAL QUESTION What if all the variety on the planet disappeared?

Introduction

Whether you live in a large coastal city or a small town in the foothills; work in agriculture, engineering or finance; live off the land or consider yourself an urban warrior; whether you consciously realize it or not, we all need nature.

The food we eat, the air we breathe, our climate—essentially, everything that makes Earth inhabitable—all depends on the interplay of millions of organisms in diverse ecosystems, which have learned to thrive and interact over billions of years.

This variety of life, the communities they form, and habitats in which they live make up the fabric of life—biodiversity. It underpins planetary health and informs everything down to the taste of a grain, the strand of a cloth and a sip of water, supporting our most basic needs. Yet, nature and wildlife are declining around the world at an unprecedented rate.

What if all the variety on the planet disappeared? It could happen. Extinctions are happening faster than ever. We must prioritize biodiversity for health of our environment, food supply, and economies.

• WATCH	
	Why Is Biodiversity So Important?
R	Play a Kahoot Game: All About Biodiversity

Focus: How to Protect Our Forests



We are going to learn about how all these different species of trees live in forests and how forests develop over time through creating separate layers.

- Ask students to close their eyes and picture a forest and to think about what different kinds of plants and animals they can imagine. Ask them after, do all these animals live on the bottom of the forest? Picture animals that may fly, hop, or even nest on tall trees. Without tree diversity, animals would all be crowded on the bottom of a forest and may not have the shelter they need to survive.
- Give students the Nature Lab Forest Layer Worksheet (Google Drive) and explain that we will be watching a video about the different layers of the forest and that they will be making observations of the characteristics of each layer and of the animals and plants that they see.
- Show students The 4 Layers of the Rainforest (YouTube) and pause between each layer of the forest. The video will start from the forest floor and make it way up high to the emergent layer.
- After the video, as a second visual for students, share with the Forest layer diagram (California Academy of Sciences), which is another representation of forest layers in a jungle.
- Seview the worksheet with the class and if there is time, ask students to share: What is your favorite forest layer and why? What part of the forest would you live in if you were an animal?

Focus: Why Coral Reefs Are Incredible

Discover the amazing world of coral reefs with coral scientist Joe Pollock, as he takes us on a virtual field trip to the beautiful coastline of the Dominican Republic. We'll dive into the waters of the Caribbean to see how corals form, the way they grow into reefs, and how they support an incredible array of plants and animals. Covering less than 1% of the ocean floor, coral reefs are home to an estimated 25% of all marine species. That's why they're often called the rainforests of the sea! Explore this amazing ecosystem and learn how the reefs are more than just a pretty place—they provide habitat for the fish we eat, compounds for the medicines we take, and even coastal protection during severe weather. Learn how these fragile reefs are being damaged by human activity and climate change, and how scientists from The Nature Conservancy and local organizations are developing ways to restore corals in the areas where they need the most help.

WATCH The Secret Life of Corals DISCUSSION Q: List and describe some of the things that coral reefs do for people. A: Coastal Protection: Reefs act as a barrier and help to calm or buffer waves that could be destructive to property on the coasts. They help prevent the coastline from eroding and keep waves from surging onto land and flooding property. Habitat for Fish: Reefs provide a home for a wide variety of organisms, including fish that people eat and sell to make a living.

• **Tourism:** Reefs provide natural beauty to support a tourist-based economy that benefits when people come to dive and snorkel

→ ACTIVITY



Play a Kahoot Game: Secret Life of Corals

Focus: The Importance of Pollinators



DISCUSSION

Lead students in a discussion. Students should conclude that apples and many fruit crops grow on trees from flowers pollinated by bees. This will emphasize the importance of bees to agriculture in their role as pollinators.

Use the whiteboard to help students complete a list of how bees are vital to the ecosystem. Possible reasons include:

- Bees depend on flowers and the plant's existence in turn depends on bees.
- When bees get pollen and nectar from flowers, they pollinate or fertilize the plant.
- Plants then can produce their own fruits and seeds.
- Bees are the primary or only source of pollination for many plants.
- Fruits resulting from pollination by bees are consumed by many birds, insects and other animals.
- · Honey is food for wild animals



Play a Kahoot Game: All About Pollinators



PESSENTIAL QUESTIONCan we feed the planet and protect nature?

Introduction

This week we are going to learn about some ways that we humans can have access to food and water while 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.

• WATCH





Play a Kahoot Game: How Creepy Animals Help Grow Our Food

Focus: Where Does Our Food Come From?

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 food-to-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.

Life Cycle Assessment

- 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
- Explain the definition of Life Cycle Assessment and tell students they are going to explore and diagram the production, transportation and consumption cycle of a tomato.
 - Life Cycle Assessment: A Life Cycle Assessment is a tool that takes into consideration all of the steps that go into the creation of a product including inputs and outputs and assesses the potential environmental impacts associated with those inputs and outputs from cradle (acquisition of raw materials) to its grave (waste management).
- Break students into small groups and have them 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.
 - Direct students to think about what happens to a tomato from seed to table. Describe the steps in the table (following page) where the production column includes anything related to growing the tomato. The transportation column has to do with any point

along the life of the tomato. The use column should include anything related to storing, preparation, eating or waste. Make sure to include the by-products and/or outputs that result from each of the phases at the bottom. For example, in the production phase, chemical run-off from fertilizer use is a by-product of the growing process.

Production	Transportation	Use
By-produ	cts or Outputs from the Abo	ve Phases

- Show students The Industrial Tomato. After they view this video, ask them if there are additional things that can be added to their life cycle tables.
- Once the groups have brainstormed their lists, have students use the lists to diagram the cycle of the tomato from seed to table. When you start to explore the story of your food, a web of people, processes, and relationships become apparent.
- 6 Now, watch The Local Tomato.

" DISCUSSION

Q: What issues on these diagrams are the most important to you? Why?

Q: What groups of people are affected by this system? How? What are negative ways they are affected? What are positive ways?

Q: Who or what has the most power to influence the food we eat? Why?

Focus: How Agriculture Can Benefit People and Nature



DISCUSSION

Q: How do regenerative farming practices, like cover cropping and conservation tillage, contribute to soil health and sustainability? Can you explain their benefits?

Sample Response: Regenerative farming practices, such as cover cropping and conservation tillage, promote soil health and sustainability. Cover crops protect the soil from erosion, add organic matter, and increase biodiversity. Conservation tillage reduces soil disturbance and helps retain moisture, preventing soil erosion. These practices improve soil structure, nutrient retention, and overall soil health, leading to sustainable agriculture.

Q: Why is it important to preserve wetlands and their role in maintaining water quality? How do wetlands mitigate nutrient runoff?

Sample Response: Wetlands are crucial for maintaining water quality as they act as natural filters. They capture and store excess nutrients, like nitrogen and phosphorus, preventing them from running off into water bodies. This helps reduce nutrient pollution and the formation of harmful algae blooms, which can harm aquatic life and humans. Preserving wetlands is essential for preventing water pollution and protecting ecosystems.

Q: The video discusses the environmental challenges associated with modern agriculture. Can you name some of these challenges and how regenerative agriculture practices address them?

Sample Response: Some environmental challenges include soil depletion, greenhouse gas emissions, and water pollution caused by modern agriculture. Regenerative agriculture practices combat these issues by improving soil health, sequestering carbon to mitigate greenhouse gas emissions, and reducing runoff of fertilizers and pesticides through practices like cover cropping. They also protect water quality and enhance biodiversity, contributing to a more sustainable and environmentally friendly approach to farming.

Q: What role do pollinator gardens play in regenerative agriculture, and why are they essential for ecosystems and food production?

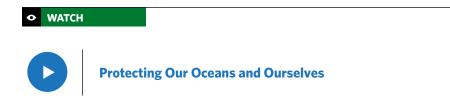
Sample Response: Pollinator gardens in regenerative agriculture provide essential habitats for insects, particularly bees and butterflies, that play a crucial role in pollinating crops. They are essential for food production because many of our fruits and vegetables depend on pollinators for reproduction. By fostering biodiversity and supporting pollinators, regenerative agriculture ensures healthy ecosystems and abundant crop yields.

→ ACTIVITY



Play a Kahoot Game: Regenerative Food Systems

Focus: How We Can Protect Our Oceans and Feed the Planet



DISCUSSION

Q: What are some benefits of mangrove trees in tackling climate change?

A: Mangrove trees help stabilize the shoreline and sequester carbon.

Q: Explain the role of mapping tools in using natural solutions effectively.

A: Mapping tools help find the most at-risk areas, those that are most able to be restored, and what solutions might work best in each place.

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A: Mapping tools help find the most at-risk areas, those that are most able to be restored, and what solutions might work best in each place.

Q: Explain the importance of shellfish reefs.

A: Shellfish reefs filter water and if the ecosystem is healthier, there will be more wild fish available for people to catch.

Q: In what ways can aquaculture be restorative to the environment?

A: Shellfish and seaweed production requires almost zero feed, freshwater or land and releases almost no greenhouse gases. They also filter out nitrogen, an element that can cause harmful algal blooms. They also eat algae itself—a two-for-one!





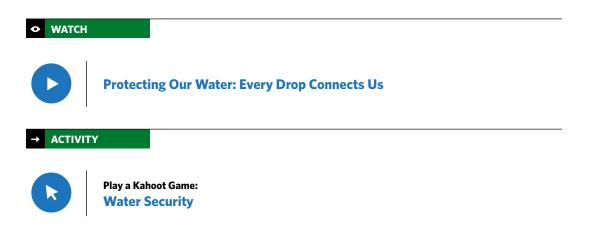


2 ESSENTIAL QUESTION

Can nature help us ensure clean water for all?

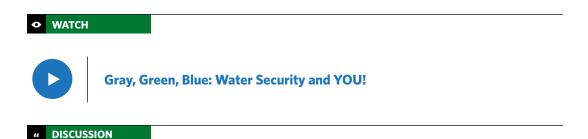
Introduction

If water is the lifeblood of the planet, rivers, lakes, and wetlands are the hard-working systems that keep it pumping. These vital ecosystems, which also include springs, deltas, and intricate underground networks, play a crucial role in feeding communities, shaping cultures, and sustaining the diversity of life on Earth. Unfortunately, for too long, we've undervalued our freshwater ecosystems, leading to over-extraction, overfishing, and over-engineering. As a result, these ecosystems are now in trouble. Deforestation, fragmentation from dams, unsustainable farming and fishing practices, and unchecked pollution have compounded the increasingly frequent and damaging impacts of climate change. However, there is hope! Degraded freshwater systems have the potential to recover, and they can do so relatively quickly. By protecting and restoring healthy and connected freshwater ecosystems, we can pave the way for a sustainable future. This week, we will explore the importance of freshwater conservation, learn how to conserve water, and discover how nature can be a vital part of the solution to ensure the health and resilience of our precious freshwater resources.



Focus: Water Security For All

People, businesses and industries, recreation, waste removal, transport, nature, and even lawn care all require water. Making sure there's enough reliable, clean water for the health and livelihoods of people and natural environments is what we mean by water security, and it is one of the biggest challenges we face. Learn how nature can play a role in ensuring water security and what YOU can do to help.



Q: What is water security? Why is it a concern?

A: Water security is the reliable availability of an acceptable quantity and quality of water for health, livelihoods and production, coupled with an acceptable level of waterrelated risks. Water insecurity is one of the greatest risks to global prosperity as it plays an integral role in our daily lives. From the food we eat, the energy that powers out planet, the ecosystems we depend on, to even the industries that provide crucial services like health, transportation, we all need water.

Q: What is the difference between surface water and groundwater?

A: Groundwater is located underground in large aquifers and must be pumped out of the ground after drilling a deep well. Surface water starts as rain and is found in lakes, rivers and streams, which collect surface water from their watershed, or the area surrounding them that drains rainwater into them.

Q: Where do rivers and lakes collect surface water from?

A: Their watersheds

Q: What is the role of an aquifer? How do aquifers help supply water?

A: Aquifers contain water which can be pumped out for our use using wells. This is a limited source which has been building up for thousands of years but will eventually run out.

Q: How do cities tap into water sources if they don't have enough locally?

A: Through interbasin transfer or moving water from one watershed to another

Q: How can cities run out of water? What can we do to help them?

A: Cities are growing and increasing demand and climate change is creating new patterns of rainfall with more severe droughts and storms. While it is hard to change these patterns, there practices that we can change to make sure we don't drain water supplies.

Focus: Wonderful Wetlands and Water Quality

Objective: Understand the role of wetlands in maintaining water quality and supporting agriculture.

Materials:

- Two identical shallow containers (e.g., plastic trays)
- Potting soil
- Grass seed
- Measuring cup

- Water source (e.g., a watering can)
- Plastic wrap
- Ruler
- Notebook and pen

Procedure:

Setup:

- Fill both shallow containers with potting soil to create a level surface.
- In one of the containers, plant grass seeds to represent a field without any wetland or natural buffer.
- In the other container, leave the soil surface undisturbed, representing a field with a natural wetland buffer. Do not plant grass seeds in this container.
- **2** Simulating Rainfall:
 - Measure and note the volume of water (e.g., 500 ml) that represents rainfall in your experiment.
 - Pour the measured amount of water evenly over both containers, simulating rainfall.

3 Observations:

- Observe and record what happens in each container during and after the "rainfall."
- Pay attention to any runoff, sedimentation, or changes in soil structure.
- 4 Simulating Nutrient Runoff:
 - Sprinkle a small amount of coffee grounds (representing nutrients) onto the surface of the grass seed container, as if they were applied as fertilizers.
 - Pour a small amount of water onto the grass seed container to simulate nutrient runoff.

5 Comparison:

- Compare the conditions of both containers. Note any differences in runoff, soil structure, or nutrient retention.
- Measure and record the distance sedimentation or nutrient runoff has traveled from the grass seed container.

DISCUSSION

- Discuss the observations and findings of the experiment. Highlight the differences between the container with grass seeds (representing a field without wetland) and the container without grass seeds (representing a field with a natural wetland buffer).
- Emphasize that wetlands act as natural filters, capturing and retaining excess nutrients and preventing them from running off into water bodies. This filtration process helps protect water quality and reduces the risk of nutrient pollution.



Play a Kahoot Game: Wonderful World of Wetlands

Focus: Why We Must Protect Our Watersheds



DISCUSSION

Q: What are the primary sources of pollution or contaminants in the water that travels from Chingaza to Bogotá?

A: Agriculture, ranching activities

Q: Why do you think you were shown this video?

Answers will vary: The video makes it clear that water is connected in a watershed between its source and along its path (where it is used), that upstream and downstream areas are connected. We were shown the video to help us understand that what happens upstream can affect downstream users. Because the city of Bogotá receives the majority of its water from Chingaza National Park, it is important to protect the watershed that provides the city with water so the city can receive a good supply of high quality of water.

Q: Think about what you know about your own watershed. What ideas might you use from the video as inspiration and understanding for exploring or working in your own watershed?

Answers will vary

Develop a plan for watershed protection that involves identifying the primary impacts on water at its source and along its path, to the key stakeholders (water users), and a set of possible mechanisms for protecting and restoring the water.



Climate Change

2 ESSENTIAL QUESTION

How can we tackle climate change?

Introduction

For students to fully grasp climate change, they must first understand the difference between climate and weather. This basic understanding helps to demystify statements such as "We had record snowfall this year! How can there be global warming?" Essentially, weather is short-term, representing the atmospheric conditions over a brief period. It includes phenomena like sun, rain, clouds, wind, snow, flooding, blizzards, and thunderstorms. Climate, on the other hand, refers to the long-term behavior of the atmosphere. When discussing climate, scientists typically refer to the averages of precipitation, temperature, and other factors over an extended period in a specific location. Climate change refers to alterations in these long-term daily weather averages. It's not a distant threat; it's happening now. The impacts of climate change encompass more extreme weather events, natural disasters, chronic droughts, and economic instability.

The Nature Conservancy and its partners focus on innovative, science-based solutions to match the urgency of this crisis. This includes restoring forests from Brazil to Indonesia and working towards a clean energy future. Solutions like tree planting, which has enormous potential to store carbon dioxide, and improved forest management, which can be as effective as reducing oil consumption, are key strategies. Additionally, demonstrating how renewable energy can boost economies while reducing carbon emissions, and helping vulnerable communities adapt to climate change by restoring habitats such as mangroves, which reduce the impact of severe storms, are crucial efforts. What we do between now and 2030 will determine whether we can slow warming enough to avoid climate change's worst impacts. We must drastically cut emissions and remove some carbon from the atmosphere. Fortunately, plants naturally absorb and store carbon. By protecting natural habitats and carefully managing farmland and forests, we can store billions of tons of this "living carbon."

As individuals, we can all learn more about these various types of solutions and contribute to improving our world.

◇ WATCH A Natural Solution to Climate Change → ACTIVITY Play a Kahoot Game: How Climate Change Affects Winter Wildlife

WEEK

Focus: Trees Are Climate Superheroes



Ask students to brainstorm answers to the following question:

Q: We talk a lot about humans protecting and planting trees. But, in what ways can trees protect humans?

→ ACTIVITY

The **Tree Benefit Calculator** allows students to make a simple estimation of the benefits individual street-side trees provide. Patterns and trends with the type of tree planted, size, location and their energy savings can be investigated using this web tool.

Ask students to think about the benefits of trees in their neighborhood or city and consider: do larger diameter trees provide greater energy savings? Why or why not? Is there a relationship between the size of the tree and the gallons of storm water runoff a tree can intercept? Students may write a response to these questions or you may lead small-group discussions and ask the group to share their reflections with the class.



Play a Kahoot Game: Why Trees are Climate Superheroes

Focus: Climate Change and the Cities Where We Live



DISCUSSION

Q: What is the difference between climate and weather?

A: Weather refers to what happens to the conditions around you in the short term (the next day or week). Climate is what you expect the conditions to be like in the longer term (decades, even millennia).

Q: What are some of the impacts of climate change?

A: Extreme weather, natural disasters, chronic droughts, and poor air quality.

Q: How do plants benefit cities?

A: They can clean the air (making it easier for us to breath) and they can capture and store carbon.

Q: Why are some areas in Phoenix hotter than others?

A: Looking at a side-by-side examples of two neighborhoods, you can see that the first neighborhood has lots of plants and trees, but the 2nd neighborhood has almost no trees, which probably makes it hotter.

Q: Why is it important to plant the right trees?

A: Trees that are "adapted" to warm climate or used to desert conditions should be the ones planted in those environments, so they are more likely to survive.

Q: In what ways can stormwater pollute our drinking water?

A: In cities around the world, paved surfaces can make even a simple storm much worse because the rainwater can't soak into the ground. Stormwater carries with it almost anything that's on the ground. That means trash, definitely pollutants (like oil from cars, gasoline, pesticides and fertilizers...), and this dirty water can be funneled into rivers and oceans, harming wildlife and ruining our drinking water.

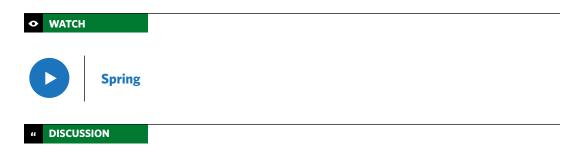
→ ACTIVITY



Play a Kahoot Game: Climate Change & Cities WEEK

Focus: Climate Change and the Changing Seasons

Begin by watching all four parts of **For Everything There was a Season**, either in class or prior in a blended learning model. For each video (also linked below), students should answer the questions outlined. A Socratic seminar method can be used. Alternatively, teacher can lead a general class-wide discussion while watching, pausing when necessary.



Q: How does snow starting later than it historically has impact the entire ecosystem?

Q: Why does the delay have an impact on Spring?

Q: What are some cascading effects of the temperature changes?

Q: How do the impacts of climate change in Wyoming impact the rest of the country?



Q: What makes summer critical for species' survival?

Q: Why is the melting of glaciers important for the region and how have those been impacted by climate change?

- Q: What is causing increases in fires and the length of fire season?
- Q: What are some consequences of those changes?

•	WATCH	
		Fall
"	DISCUSS	SION

Q: How is early snow melt impacting the Fall in the West of the United States?

Q: What kind of restoration work is being used to support wildlife?

Q: What are some restoration solutions that help tackle the pressures of climate change?

• WATCH		
v	inter	
" DISCUSSION		

Q: How do warming temperatures impact the winter season?

- Q: How is rain on snow impacting the wildlife?
- Q: How is diminishing snow pack impacting communities?

→ ACTIVITY



Play a Kahoot Game: Wildfires and Their Impact on Nature



Additional Resources



Explore more resources from The Nature Conservancy's Nature Lab



Play Kahoot games about environmental science topics

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Sign up to make sure you never miss a new classroom resource. **The Nature Lab newsletter** arrives in your inbox only once a month and is packed with useful teaching materials and exciting opportunities for students.

