

## Virtual Field Trip to China's Great Forests: What the Giant Panda and Earth's Climate Share

### TEACHER'S GUIDE

**Grades:** 3-8

**Subjects:** Science and Geography



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**Purpose:** This guide contains information on teacher preparation for the event, as well as a set of discussion questions and answers for any grade level, which can be used after the virtual field trip. It also contains links to resources and other resources ranging from lessons, activities, demonstrations, experiments, real-time data, and multimedia presentations. **At the end of the guide, you will find a one-page handout that elementary students can fill out before, during, and after the virtual field trip.**

**Description:** Join our expert scientist Yue Wang, a conservation planning officer for The Nature Conservancy, on a virtual field trip across the world to two stunning provinces in China—Sichuan and Yunnan—where we will explore majestic forests, towering mountains, and other iconic landscapes. While examining the role these vital natural areas play in the carbon cycle and climate change, as well as the benefits of reforestation, we will learn about the magnificent creatures who call these habitats home: giant pandas, golden snub-nosed monkeys, and the elusive and odd-looking takin.

Exploring these critical areas will help students understand how important all habitats are for both people and animals—no matter where you are in the world. Our journey will demonstrate how scientists work with local communities to protect nature and create new wilderness.

#### **Standards:**

##### *Next Generation Science Standards Disciplinary Core Ideas*

- ESS3.A Natural Resources
- ESS3.C Human Impacts on Earth Systems
- ESS3.D Global Climate Change
- ETS1.B Designing Solutions to Engineering Problems
- 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

**Discussion Questions:** You can use or adapt these questions for a follow-up discussion with your students after viewing the virtual field trip.

1. Why are forests and trees important to humans?

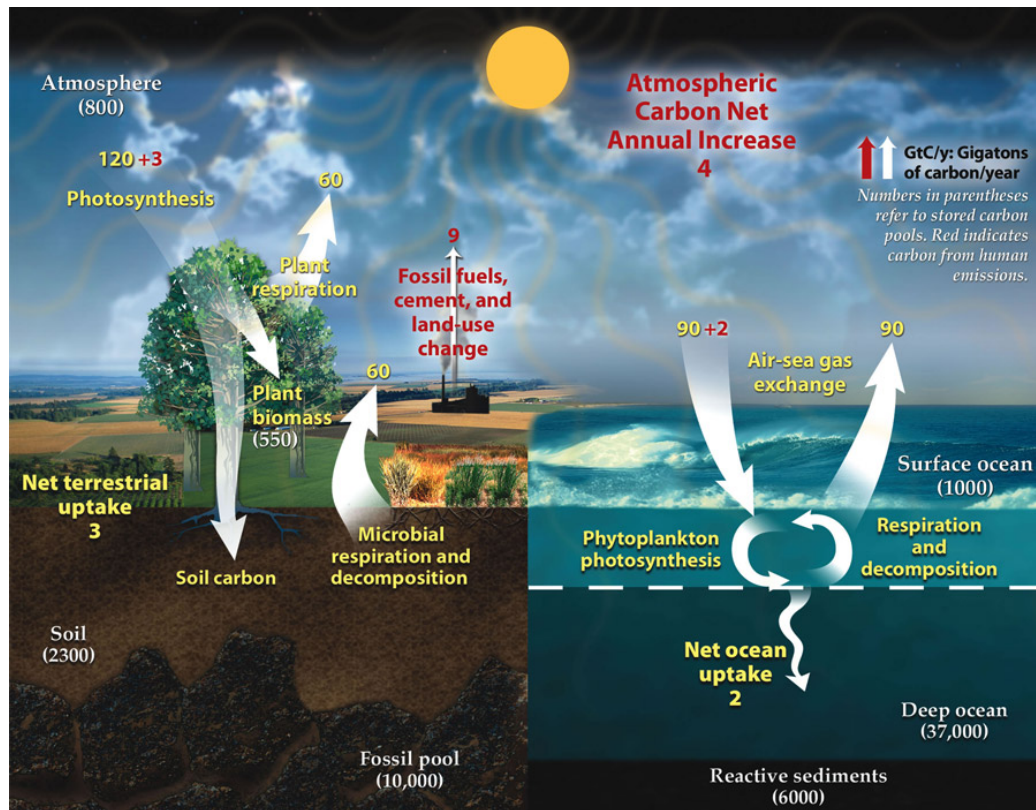
*Answer: Humans use forests for recreation and resources. We use wood from forests for building and for making paper products. Some people also use the wood as a heat source and for cooking. In the US, there are many protected forests that people visit to go hiking, fishing, and camping among other things. Forests also help filter water. Additionally, forests produce oxygen as a byproduct of photosynthesis and humans breathe oxygen.*

2. Why are forests and trees important to other animals?

*Answer: Trees and forests provide habitat and food for animals. Forests must be large enough for animals to get all of the food and shelter they need – without too much competition with other animals.*

3. Describe the role of trees and photosynthesis in the carbon cycle.

*Answer: Trees take in carbon dioxide during the process of photosynthesis. They use carbon dioxide and water to make sugar (glucose) and oxygen (a byproduct). The sugar is used for “food” and is ultimately a building block that helps trees make wood and gain biomass. Trees also release carbon into the atmosphere through respiration and when they die and decompose. However, they store more carbon than they release, as shown in the [diagram below from the US Department of Energy](#).*



Credit: Office of Biological and Environmental Research of the US Department of Energy

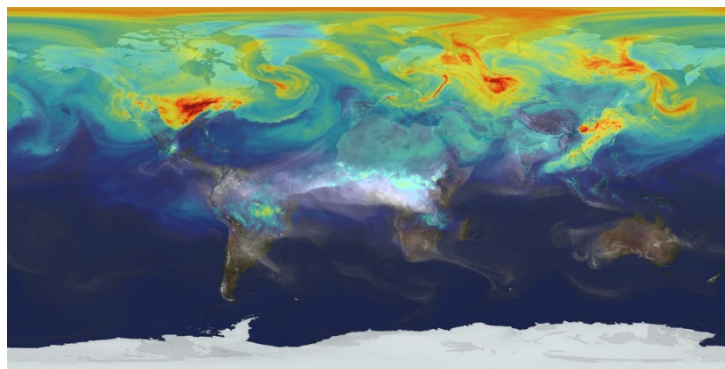
4. Trees are heavy and composed of wood. From where does the wood or biomass originate?  
*Answer: The wood comes from the **carbon** a tree takes in – in the form of carbon dioxide gas. Students might have the misconception that the mass comes from the sunlight, soil, or water.*
  
5. Describe carbon sequestration.  
*Answer: Carbon sequestration is the long-term storage of carbon. A lot of carbon is stored underground in the soil and in the fossil pool. However, when fossil fuels are burned, carbon that was once stored is released back into the atmosphere. Carbon is sequestered in trees and plants too, which is why reforestation can help mitigate climate change by reducing the accumulation of greenhouse gases like carbon dioxide.*
  
6. What human activities cause carbon dioxide to be released in the atmosphere?  
*Answer: The burning of fossil fuels like coal and gas release carbon dioxide into the atmosphere.*
  
7. What are some “natural” activities cause carbon dioxide to be released in the atmosphere? (Can refer to the image in question 3)  
*Answer: Decomposition and respiration by land and sea plants are two processes that produce carbon dioxide. Humans also exhale carbon dioxide.*
  
8. What can we do to decrease the release and overall amount of carbon dioxide into the atmosphere?  
*Answer: We can drive less, use public transportation, reduce energy use, and use renewable resources like solar and wind energy. We can prevent deforestation and plant more trees.*
  
9. Give an example of a greenhouse gas and explain the greenhouse effect.  
*Answer: Carbon dioxide is a greenhouse gas. The greenhouse effect is when gases like carbon dioxide build up in the atmosphere and cause heat from the sun to be trapped in Earth’s atmosphere. The thicker the layer of greenhouse gases, the more warming Earth experiences, which will ultimately lead to global climate change.*

You can find an interactive map of carbon dioxide emissions by country from 1981-present here:

<http://data.worldbank.org/indicator/EN.ATM.CO2E.KT/countries?display=map>

Additionally, this video by NASA shows an amazing visualization of CO<sub>2</sub> on the Earth over the seasons, which takes into account plant absorption of CO<sub>2</sub> during the summer months in the northern hemisphere. Find the video here: <https://www.youtube.com/watch?v=x1SgmFa0r04>; you can download the video here:

<https://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=11719>



Credit: NASA – Goddard Media Studios

10. List some of the endangered, threatened, and/or vulnerable animals in China.

*Answer: Giant Panda, Takin, Sichuan Golden Monkey, Yunnan Snub-nosed Monkey, Red Panda. Students can search for these animals on the IUCN Red List to find out more information: <http://www.iucnredlist.org/>*

11. Describe one of the main reasons why the animals listed above are threatened/endangered.

*Answer: Habitat loss is one of the main contributors to the decrease in populations of these animals.*

12. What is deforestation and why does it happen?

*Answer: Deforestation is the permanent destruction of forests to make land available for other uses. Agriculture is one of the largest global drivers for deforestation.*

*Indonesia has been in the news in 2015 for a massive deforestation crisis because slash and burn techniques are being used to destroy forests to make room for palm oil plantations. Read about it here: <http://www.theguardian.com/sustainable-business/2015/nov/11/indonesia-forest-fires-explained-haze-palm-oil-timber-burning>*

*Students can use free, online tools like the interactive map at Global Forest Watch Beta to examine worldwide forest change over time. Access the tool here: <http://www.globalforestwatch.org/>*

13. What is habitat fragmentation? Describe why protected areas need to be connected.

*Answer: Habitat fragmentation is when large continuous habitats are divided into smaller patches. One consequence of this is that animals don't have access to the other parts of their habitat if agricultural lands or human settlements lie between one habitat and another. This is why there is an effort to connect reserves or protected areas through corridors so that animals can migrate safely between protected locations. Another consequence of fragmentation is loss of species richness. As animals become physically isolated from each other, they also become genetically isolated from each other as they may no longer be able to interbreed, which helps maintain genetic diversity in a population. Learn more about habitat fragmentation here: [https://prod.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs144p2\\_015259.pdf](https://prod.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_015259.pdf)*

14. Describe ways that people can help decrease deforestation and increase reforestation.

*Answer: At a very basic level, we can help with deforestation by reducing our use of paper products and recycling – since trees must be cut down to produce these products. We can also become conscious consumers and look for brands that support sustainable forestry and agriculture. Additionally, we can plant trees around our communities and become stewards of our environment as well as environmental ambassadors! Some cities offer free trees and tree planting resources. Check out what your city has to offer. If there isn't a tree planting event already organized – start one yourself! The Arbor Day Foundation has great resources on how to plan a tree planting event: <https://www.arborday.org/takeaction/volunteer/>*

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



### Reforestation: Impact on Climate

Grade Levels: 6-8

Deforestation is clearing Earth's forests on massive scale. In this lesson, students learn the value of large-scale forests landscapes and their role in the carbon cycle. Tools such as infographics and carbon calculators help students investigate deforestation and its impact on climate. Students explore how reforestation can help decrease carbon dioxide and greenhouse gases in the atmosphere, thereby minimizing climate change and improving air quality.



### Urban Trees

Grade Levels: 6-8

Tree planting can reduce summertime temperatures, thereby reducing air-conditioning bills. Trees also capture some of the greenhouse gases responsible for global warming. In this lesson, students learn how trees renew our air supply by absorbing carbon dioxide and producing oxygen, and how they clean our air by filtering greenhouse gases. Students also learn to identify trees and the organisms that threaten them, as well as develop a plan for protecting and promoting trees in their own communities.

## Other Related Resources

### TED-Ed Interactive Lesson

Grade Levels: Any

<http://ed.ted.com/featured/I1QcUVAy#watch>

Humans are clearing Earth's forests to make way for development, agriculture, and other uses - this can have severe consequences for our environment. Learn the value of large-scale forest landscapes and their role in the carbon cycle. Discover how reforestation can impact climate change by decreasing carbon dioxide in the atmosphere. What is your role in helping to keep nature strong? This TED-Ed interactive lesson pairs our great video on reforestation with an interactive learning format and student questions.

# The Great Forests of China Virtual Field Trip Log

BEFORE

I know that... \_\_\_\_\_

\_\_\_\_\_

I wonder if... \_\_\_\_\_

\_\_\_\_\_

I hope that... \_\_\_\_\_

\_\_\_\_\_

AFTER

I want to know more about... \_\_\_\_\_

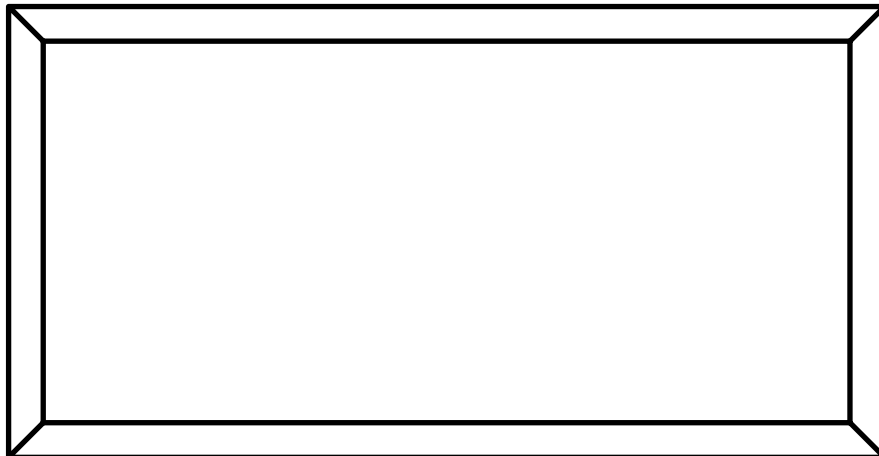
\_\_\_\_\_

My favorite part was ... \_\_\_\_\_

\_\_\_\_\_

I learned that... \_\_\_\_\_

\_\_\_\_\_



Imagine you are in China – what would you be doing? On the left, draw a “selfie” of yourself on your trip.

Rate this virtual field trip:



## Relevant Standards for *China's Great Forests: What the Giant Panda and Earth's Climate Share*

### Virtual Field Trip

#### Next Generation Science Standards

Grade	Standard	Performance Expectation	Disciplinary Core Idea 1	Disciplinary Core Idea 2	Disciplinary Core Idea 3
3	3-LS4-3	Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	LS4.C Adaptations		
3	3-LS4-4	Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.	LS2.C Ecosystem Dynamics, Functioning, and Resilience	LS4.D Biodiversity and Humans	
4	4-ESS3-2	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	ESS3.A Natural Resources	ETS1.B Designing Solutions to Engineering Problems	
5	5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	LS2.A Interdependent relationships in Ecosystems	LS2.B Cycles of Matter and Energy Transfer in Ecosystems	
5	5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.	LS1.C Organization for Matter and Energy Flow in Organisms		

MS	MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	ESS3.C Human Impacts on Earth Systems		
MS	MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	ESS3.D Global Climate Change		
<b>Grade</b>	<b>Standard</b>	<b>Performance Expectation</b>	<b>Disciplinary Core Idea 1</b>	<b>Disciplinary Core Idea 2</b>	<b>Disciplinary Core Idea 3</b>
MS	MS-LS2-5	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	LS2.C Ecosystem Dynamics, Functioning, and Resilience	LS4.D Biodiversity and Humans	ETS1.B Developing Possible Solutions
MS	MS-LS1-6	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	LS1.C Organization for Matter and Energy Flow in Organisms		

**[National Geography Standards](#)**

[The physical and human characteristics of places](#)

[The characteristics and spatial distribution of ecosystems and biomes on Earth's surface](#)

[The patterns and networks of economic interdependence on Earth's surface.](#)

[How human actions modify the physical environment](#)

[How physical systems affect human systems](#)