



WWF Wildlife and Climate Change Educator Resources

WWF is calling on students and educators to become involved in our work helping species persist in a changing climate. This page includes background information, wildlife assessment tools, and resources to help engage your students in our global wildlife conservation work.

1. Background Information

Wildlife and Climate Change: Making the Connection

<http://www.worldwildlife.org/pages/wildlife-and-climate>

Climate change impacts are already being felt all over the globe. Major impacts on wildlife include:

- Altitudinal/poleward range shifts
- Changing food/water availability
- Increase in pests and disease
- Changes in the timing of life cycle events
- Coral bleaching
- Extinction

For example, in Canada's Hudson Bay—a far northern bay filled with wildlife that has adapted to the region's long and icy winters—spring comes earlier now, leaving polar bears to swim longer distances across areas that would normally be covered in ice.

http://wwf.panda.org/about_our_earth/aboutcc/problems/impacts/species/polar_bears/

In the warm tropical waters of the Caribbean, hawksbill turtles have been returning to the same beaches to lay their eggs in the sand for thousands of years. But warmer temperatures in the sand threaten to upset the balance in the nests, where temperature determines the mix of males and females developing in the eggs. <http://d2ouvy59p0dg6k.cloudfront.net/downloads/hawksbturtlebrochure9605b.pdf>

Protecting wildlife and wild places across the planet requires scientists and others to think about the long and short term changes that climate change is bringing, and tailor plans to help wildlife adapt to the rapidly changing conditions.

The Rapid Pace of Climate Change

Excessive amounts of greenhouse gasses, in particular carbon dioxide, are causing the planet to warm. http://wwf.panda.org/about_our_earth/aboutcc/how_cc_works/ Humans are the cause of most of this build-up of gasses in the atmosphere, and the quantity of these gasses is now so great that some amount

of climate change is now inevitable: Even if every country fulfills its pledge to cut greenhouse gasses, the Earth is still committed to warming for decades, if not centuries.

Higher average temperatures are not felt in the same way in every part of the planet. Changes in average temperatures over large areas such as an ocean or a continent can cause weather patterns, ocean currents, and other large-scale processes to change. That doesn't mean that there aren't still cold winters, changing seasons, and vital ocean currents. Things are just different: spring may come earlier, plants can start to grow in areas that they previously couldn't, storms may be more severe, and so on.

The changes are happening so quickly that people and wildlife are struggling to keep pace. Most wildlife have adapted to specific conditions over many thousands of years. Birds depend on temperature changes to signal the start of migrations, whales depend on ocean currents to bring them to feeding or breeding grounds, rhinos depend on the appearance of watering holes in the desert during certain times of year, and so on. Likewise, human communities have become established over centuries or decades and also depend on historic climatic conditions. Coastal cities are contending with the prospect of rising seas. Farmers are scrambling to find new sources of water as reliable water sources dry up. And medical professionals are treating patients afflicted with tropical diseases that were rarely seen outside of the tropics before.

The pace of change is challenging life on Earth to adapt, and quickly. WWF scientists are working around the globe to help wildlife in a changing climate, and you and your students can be part of that work.

2. Wildlife and climate change tools

For WWF, conserving wildlife requires thinking about what species need to thrive not only in the current climate, but also increasing their resilience in a changing climate. It's what WWF calls "climate-smart conservation."

<http://www.worldwildlife.org/initiatives/adapting-to-climate-change>

When WWF scientists analyze a species' vulnerability to changing climatic conditions, they consider four key factors:

1. **Sensitivity:** How capable is a species of persisting, as it currently is, under changing climatic conditions. For example, some species have very low freshwater requirements, and will therefore be less affected by changes in rainfall.
2. **Adaptive Capacity:** Is the species able to respond to changes in climate? Some species can move over very large distances, and may be capable of seeking out more suitable climatic conditions.
3. **Exposure:** How much climatic variation does the species encounter, or is likely to encounter? For some species, dramatic changes in their habitat are very likely.
4. **Other Threats:** What other pressures are there on the species? For example, is it a fish species that has been overfished? Has the species lost much of its habitat already? And are humans' responses to the changing climate likely to intensify threats? For example, if a species' water source is likely to become threatened by climate change, will the species also have to compete with humans for access to water?

When WWF scientists and conservationists work to protect wildlife species, these factors are analyzed using an assessment tool, and the results are factored into conservation plans. And it's a process you and your students can become involved in.

How You and Your Students Can Help

We've created a series of tools that you and your students can use to learn about how WWF is working to help wildlife as the climate changes, let them try their hands at using the same assessments that scientists use, and submit their own research to us.

Step One: Learn about How Climate Change is Affecting Wildlife

WWF scientists have already completed species assessments for monarch butterflies, polar bears, African elephants, snow leopards, mountain gorillas, and Asian elephants. Take a look at them to understand how these well-known wildlife species are being affected by climate change, and what it means for how we plan to protect them.

<http://www.worldwildlife.org/pages/african-elephants-and-climate-change--2>

<http://www.worldwildlife.org/pages/snow-leopards-and-climate>

<http://www.worldwildlife.org/pages/mountain-gorillas-and-climate-change>

<http://www.worldwildlife.org/pages/asian-elephants-and-climate-change>

Step Two: Complete Your Own Species Assessment

Download the Species Assessment Tool and fill it out for species of interest to you and your students. You can complete the assessment for one species as a large group, the students can work together in small groups, or students can complete the assessments independently.

Download the Species Assessment Tool

http://assets.worldwildlife.org/publications/792/files/original/WWF_CCVA_for_species.pdf?1429823048&_ga=1.31104767.1759680828.1419000570

The assessments can be completed for any kind of wild animal or plant—for example, a wildlife species that's native to where you live, your state bird or mammal, a species that's on the endangered species list, or simply a wildlife species that interests you. But the more information that's available about the species you choose, the easier it will be to complete the assessment. If little research has been done on a species, it will be challenging to complete the assessment. Following is a list of suggested resources for finding information on wildlife species.

<http://www.iucnredlist.org/>

<http://www.worldwildlife.org/species>

<http://animals.sandiegozoo.org/>

<http://www.torontozoo.com/ExploreTheZoo/Animals.asp>

Step Three: Submit Your Assessment

Assessments completed in a thorough manner with supporting references can be submitted to Nikhil.advani@wwfus.org for consideration of publication as a fact sheet.

Optional: Extend the Experience

Many educators find that the assessments offer a jumping-off point for many other activities and can link to a variety of themes in the curriculum, either before or after completing the assessments. We've provided a few suggested activities below.

3. Discussion Questions

Help your students think critically about climate change and what it means for their communities, wildlife conservation, and broader themes. Below are some suggested discussion starters, which could lead to new projects as students investigate them.

- What climate changes are predicted for your community? Are there already signs of climate change?
- Is your community doing anything to prepare for the effects of climate change? For example, some communities are developing climate adaptation plans to help guide them as they develop new infrastructure. Does your community have any climate adaptation plans?
- What are some of the major industries where you live? Will climate change affect any of them? For example, some mountain communities depend on tourism related to snow sports, but climate change is predicted to dramatically reduce snowfall in some regions. These communities are beginning to think about developing new industries to adapt to the changing climate. Could climate change affect industries in your community?
- What kinds of foods are grown near you? Will climate change mean changes in the kinds of foods that can be grown?
- Have you noticed more or less wildlife in the area? Or changing activity patterns at different times of the year?
- An ethical dilemma: What if climate change is predicted to wipe out a wildlife species' habitat? For example, what if there is a coastal bird whose only known habitat is on a small stretch of beach that scientists project will be underwater within 100 years because of sea level rise. Should we continue efforts to protect the bird?
- Certain species, such as crocodiles, have persisted on the Earth without changing very much since the time of the dinosaurs. Why have these species been so adaptable to major changes in climate?
- Although some amount of climate change is inevitable, we do have the power to limit climate change by slowing our emissions of greenhouse gasses. Do you do anything in your daily life to be more climate friendly? Do you think businesses and governments have a role to play?

4. Climate Science Resources

Want to know more about the science of climate change? There are many resources available to help students learn about why and how the climate is changing, and what we can do to help. Below are some of the resources that are available for high-school students and educators.

The Alliance for Climate Education

acespace.org

The Alliance for Climate Education is an award-winning national non-profit dedicated to educating America's high school students about the science behind climate change and inspiring them to do something about it—through the ACE Assembly and Student Action Program.

ARM Climate Change Lesson Plans

<http://www.arm.gov/education/teacher-tools/lessons>

The U.S. Department of Energy's Atmospheric Radiation Measurement (ARM) program maintains a collection of lesson plans and information for students and teachers in elementary, middle, or high school.

Climate Literacy & Energy Awareness Network (CLEAN)

<http://cleanet.org/index.html>

CLEAN provides a peer-reviewed collection of educational resources dealing with climate and energy geared towards middle school, high school, and undergraduate students.

EPA Environmental Curriculum

<http://www2.epa.gov/students/lesson-plans-teacher-guides-and-online-resources-educators>

The US Environmental Protection Agency provides a variety of lesson plans and activities for many different environmental topics, including climate change, which are appropriate for middle school and high school students.

Global Climate Change Modules from PBS and NASA

http://climate.nasa.gov/resources/education/pbs_modules/

Explore best practices for teaching global climate change to middle- and high-school students with these free, self-paced modules for teachers. Each module includes STEM resources that will increase your knowledge of climate change concepts and can be used directly with students.

NASA Climate Change Lessons

<http://mynasadata.larc.nasa.gov/lesson-plans/climate-change-lessons/>

The National Aeronautics and Space Administration (NASA) has developed a peer-reviewed collection of climate change education resources geared towards upper elementary school, middle school, and high school students. See also https://trace.larc.nasa.gov/trace_catalog.php

NOAA Climate Change Education Resources

<http://www.education.noaa.gov/Climate/>

The National Oceanic and Atmospheric Administration (NOAA) site includes lesson plans about the carbon cycle, changing seasons, climate change impacts, and climate monitoring.

SERC Teaching Climate Change: Lessons from the Past

<http://serc.carleton.edu/NAGTWorkshops/climatechange/index.html>

The Science Education Resource Center's (SERC) site links educators with a variety of resources for teaching about Earth's climate system, including climate data, visualizations, teaching activities, workshops and more.

Wild Center Youth Climate Summit

<http://www.wildcenter.org/youthclimate>

The Wild Center organizes an annual Youth Climate Summit, with participants from area high schools, colleges and universities, involving more than 25,000 students each year. They also provide educational resources, through their climate disruption page.

Wildlife & Wildlands Toolkit

<http://www.globalchange.gov/browse/educators/wildlife-wildlands-toolkit>

This kit is designed for classroom teachers and informal educators in parks, refuges, forest lands, nature centers, zoos, aquariums, science centers, etc., and is aimed at the middle school grade level.

Years of Living Dangerously

<http://climateclassroom.org/>

The Years of Living Dangerously (YEARS) education website, where you will find climate smart educational resources and learning opportunities that correspond to the science and issues presented in the series.

UN CC:Learn

<http://www.uncclearn.org/>

The one UN Climate Change Learning Partnership.

5. Citizen Science Opportunities

In addition to helping WWF build its database of species assessments, there are many ways that students (and any interested people) can get involved in science to save wildlife. Below is a list of links to citizen science projects that may be of interest to you and your students.

WWF Climate Crowd

www.wwfclimatecrowd.org

WWF's initiative to crowd source human responses to climate change from around the world.

Zooniverse

<https://www.zooniverse.org/>

Zooniverse maintains citizen science sites for projects exploring space, climate change, nature, and more.

Scientific American's Citizen Science Resource List

<http://www.scientificamerican.com/citizen-science/>

Scientific American maintains a large database of citizen science projects.

FrogWatch USA

<https://www.aza.org/frogwatch/>

FrogWatch USA is a citizen science program of the Association of Zoos and Aquariums (AZA) that provides an opportunity to report data on the calls of local frogs and toads. Volunteers collect data during evenings from February through August and have been submitting data for over 15 years.

Project FeederWatch

http://feederwatch.org/?__hstc=161696355.3e7ff9d2becafb9b218a8cbf6941d388.1435153588529.1435

[153588529.1435153588529.1&_hssc=161696355.1.1435153588529&_hsfp=2773375755](https://www.projectfeederwatch.org/)

Project FeederWatch is a winter-long survey of birds that visit feeders at backyards, nature centers, community areas, and other locales in North America. FeederWatchers periodically count the birds they see at their feeders from November through early April and send their counts to Project FeederWatch.

Monarch Butterfly Journey North

<http://www.learner.org/jnorth/monarch/>

Join students and scientists across North America every spring to track the monarch butterfly's migration from Mexico.

Great Backyard Bird Count

<http://gbbc.birdcount.org/>

Launched in 1998 by the Cornell Lab of Ornithology and National Audubon Society, the Great Backyard Bird Count was the first online citizen-science project to collect data on wild birds and to display results in near real-time. Volunteers tally the numbers and kinds of birds they see for at least 15 minutes on one or more days of the count. You can count from any location, anywhere in the world.

National Geographic FieldScope

http://education.nationalgeographic.com/education/programs/fieldscope/?ar_a=1

National Geographic FieldScope is a web-based mapping, analysis, and collaboration tool that allows participants to contribute as citizen scientists investigating real-world issues. NatGeo FieldScope enables citizen scientists to upload their own field data—including measurements, field notes, and digital media, such as photos and videos—and to see them in relation to data from peers and professional scientists.

Project Noah

<http://www.projectnoah.org/>

Project Noah is a global study that encourages nature lovers to document the wildlife they encounter, using a purpose built phone app and web community. In addition to the virtual "collection" of species, Project Noah encourages citizen science by linking up with existing surveys including the International Spider Survey and the Global Coral Reef Monitoring Network.

eBird

<http://ebird.org/content/ebird/>

A real-time, online checklist program, eBird has revolutionized the way that the birding community reports and accesses information about birds. Launched in 2002 by the Cornell Lab of Ornithology and National Audubon Society, eBird provides rich data sources for basic information on bird abundance and distribution at a variety of spatial and temporal scales.