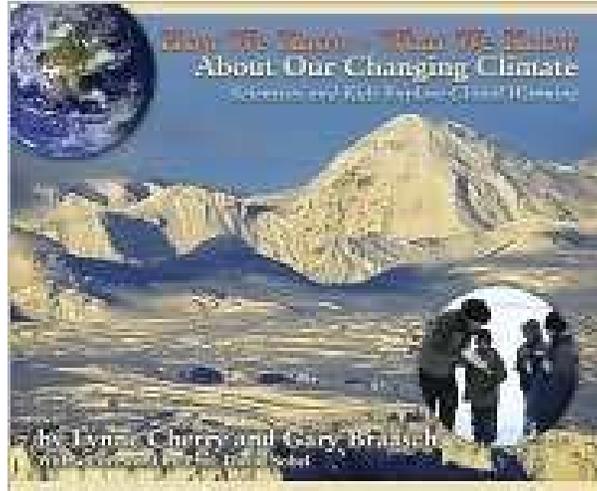


# How We Know What We Know About Our Changing Climate

by Lynne Cherry and Gary Braasch

Dawn Publications,  
Nevada City, USA 2008



Scientists and kids explore climate change together. The book is a non-scary, action-oriented, and inspiring look at how scientists do their work, what they are discovering about global warming, and how kids are already learning about this through Citizen Science. Kids can make a difference!

A film project: “Children’s Voices on Climate Change” is a series of short videos show middle school age kids with personal projects to reduce global warming and learn about climate change. These films are being shown in science museums and will eventually form a full-length film to inspire everyone through the actions of incredible kids. Lynne Cherry, producing these films, is one of the authors and has based her work on the book *How We Know What We Know About Our Changing Climate*.

## **National Science Teachers Association (NSTA) book recommendation**

(<http://www.nsta.org/recommends/ViewProduct.aspx?ProductID=18455>)

More and more information is being shared with us about global warming and climate change. With all of the television, internet, and newspaper articles popping up on these topics, what can we believe? Is there any evidence of this change over time taking place in your neighborhood?

This book introduces the methods through which the scientific community has documented climate change and the responsibilities of citizen scientists as we move to remediate the problem. As you read this timely book, *How We Know What We Know About Our Changing Climate: Scientists and Kids Explore Global Warming*, you’ll find out how some students, teachers, and scientists have become active in collecting data. Many of the examples can be applied in local communities.

Students young and old have become part of the studies in the USA, Mexico, and Siberia. For example, if you have butterflies or birds in your area, perhaps you could start keeping track of such activities as their arrival and departure dates. Or you may be interested in noting plant life changes as the weather warms in spring and summer or cools in fall and winter. Recording ways that plants or animals adapt or change their growth and location are important now and will be in the future as certain trends are examined by students and scientists.

There are even historical connections in this book. Readers will learn, for instance, that by keeping records at his Monticello home, Thomas Jefferson was one of the original phenologists who studied how nature changes with the seasons. You can be a phenologist, too, and ask why changes are occurring. Living things seem to be responding to change in climate where the air temperature affects the lives of animals and plants.

By reading and discussing this book, readers can easily relate to the most current information that is carefully researched and presented in two-page spreads. There are many outstanding full-color photographs of students and scientists actively participating in observation as well as data collection.

By using computers, their data can be analyzed, graphs can be created, and hypotheses can be explored. Amateur naturalists around the world are documenting climate change. Some records go back 250 years and are indicating broader patterns of change.

Using maps and data collected, citizen scientist students can explore the work of many leading scientists as they investigate why the numbers of frogs, polar bears, or penguins are decreasing as their special habitats are effected by rising temperatures. Scientists have even been able to reconstruct a 9,000 year timeline of climate records with bristlecone pine tree data.

As you read this amazing book, you will find new vocabulary words defined in context; reading and comprehension go hand in hand. Students and teachers can participate in brainstorming, experiments, water monitoring, or class discussions that might lead to student activism to improve our environment. With others around the world who are working on their hypotheses, we explore how life forms are changing due to increases in temperatures. From these efforts, there is a growing realization by students and adults that what we do here in North America impacts life in other places in our world.

By presenting real-life accounts of scientists and their work, author Lynne Cherry helps students and others connect with our environmental problems and actions by becoming active decision makers. Hopefully the interconnections of all living things with their surroundings will lead us to see the Earth as one living system in the past, present and future.

Cherry distinguishes between a climate footprint and a carbon footprint, and presents ways that students can get involved in saving planet Earth. The "Resources" section provides many more ideas about programs that students can join as active participants. This engaging book is a "must read" for students, teachers, parents, and their community at large. A separate teacher's guide is correlated with standards for grades 5 to 8.

## REVIEWS

**Science magazine**, the leading US scientific journal published by the AAAS, said: "In his earlier *Earth Under Fire*, photojournalist Braasch visited climate researchers in the field to document their discoveries. Here he and Cherry (a seasoned author of environmental books for children) also spotlight citizen science and (especially) data that can be, and are, collected by children."

Cherry and Braasch developed the children's book to emphasize the adventure of science, how scientists work and the tools they use, and the ways that kids can learn by hands-on and outdoor activities. It also provides a way for parents to talk to their children about climate change in an engaging, non-scary and energizing way. The book replaces fear and dread over global warming with knowledge and the assurance that actions can be taken that help everyone and the world. A special page shows how much carbon dioxide can be saved as kids work together to reduce climate change.

**Robert Coontz, deputy news editor SCIENCE magazine** "This beautiful and informative book fills a major gap in environmental writing for children. It covers a wide range of research, defining technical terms gracefully and naturally as they arise. The overall tone--urgent without being shrill, hopeful without being complacent--strikes me as just right. I happily recommend it."

**Bill McKibben, author of *The End of Nature*** "This is a necessary book. It treats kids with respect—they deserve to know what's going on. But they also deserve to know that there's much that can be done and much that is being done. In a word, it's empowering!"

**The New York Times December 21, 2003 by Anne Raver:** Lynne Cherry's children's books, which include "The Great Kapok Tree" and "A River Ran Wild", are all rich with questions about the natural world. Her latest, "How Groundhog's Garden Grew", with its charming illustrations of Groundhog and his friend Squirrel, as they save seeds, sprout potatoes, thin cabbage and watch bees pollinate squash blossoms, has even this longtime gardener itching to start the spinach. Groundhog also gets a lesson in letting the birds and insects eat the predators in his garden, rather than harming his friends with pesticides."

**Rapid City Journal** "How Groundhog's Garden Grew" is a beautiful and worthy book that parents of young children would enjoy reading to them often. This is a book that all who care about the Earth and re-connecting people to the Earth might memorize and quote. This is a book that every gardener will want to own because of the magnificent botanical illustrations and the passion of the tale. And as delightful as the story of the animals in the garden is, this is a book that teaches values such as

honesty, integrity, responsibility, caring, self-sufficiency, forgiveness, love and sharing. I love this book and recommend it. Forget the fact that it is a children's book. It addresses the human condition and deserves a place on every bookshelf."

**The Washington Post** "There is wry humor when children's book authors turn their attention to gardens and garden animals. Beatrix Potter, who loved animals, nevertheless recognized that Peter Rabbit was a pest that brought out the worst in the gardener. "How Groundhog's Garden Grew" by Lynne Cherry revolves around the premise that a squirrel teaches a groundhog to stop raiding other gardens and grow his own. "Little Groundhog!" Squirrel scolded. "This food does not belong to you. If you take food that belongs to others, you will not have a friend in the world! Why don't you plant your own garden?" "I'm sorry," Little Groundhog told her, embarrassed, "but I don't know how." "Well, then," replied Squirrel, "I will show you."

**Chicago Tribune** "How Groundhog's Garden Grew...describes the annual cycle of a garden in whimsical terms. For more information, see her web site at <http://lynnecherry.com>

**The American Gardener (American Horticulture Society)** "Using some lovable animal characters, this simple and beautifully illustrated story introduces kids to lots of practical gardening skills and terms." Your child will learn how good food can taste-- and she or he will EAT vegetables—because fresh home-grown vegetables TASTE GOOD!

So climate change is any change in the climate, lasting for several decades or longer, including changes in temperature, rainfall or wind patterns. The best scientific evidence we have shows that our world is rapidly heating. Long-term air and ocean temperature records clearly show the Earth is warming. The global average temperature has already risen by 1.1°C since the time before the Industrial Revolution. This might not sound like a lot, but 1.1°C represents a massive amount of extra heat and energy – the equivalent of four Hiroshima bomb detonations per second. While the earth's climate has changed throughout history, scientists agree that the significant changes we've seen over the past hundred years or so have been due to human activities. We know Earth's climate is changing because of the evidence scientists have collected over many years. Extra greenhouse gases in our atmosphere are the main reason that Earth is getting warmer. Greenhouse gases, such as carbon dioxide (CO<sub>2</sub>) and methane, trap the Sun's heat in Earth's atmosphere. It's normal for there to be some greenhouse gases in our atmosphere. They help keep Earth warm enough to live on. But too many greenhouse gases can cause too much warming. The burning of fossil fuels like coal and oil increase the amount of CO<sub>2</sub> in our air. This happens because the burning process combines carbon with oxygen in the air to make CO<sub>2</sub>. It's important that we monitor CO<sub>2</sub> levels, because too much CO<sub>2</sub> can cause too much warming on Earth. The instrumental record of climate change is derived from thousands of temperature and precipitation recording stations around the world. We have very high confidence in these records as a whole. The scientific community is certain that the Earth's climate is changing because of the trends that we see in the instrumented climate record and the changes that have been observed in physical and biological systems. The instrumental record of climate change is derived from thousands of temperature and precipitation recording stations around the world. We have very high confidence in these records as a whole. Our streamflow records show an earlier peak in spring runoff; borehole temperature records in Alaskan permafrost as well as water temperature records on land and sea show the warming trend. How do we know about climate change? We observe climate change. Climate change is not a future event it is happening now. It is easy to see climate change if you look further than your immediate environment. Climate is the longer term average of weather. Our senses can not directly detect what is a statistical construct. Climate and climate changes are very real, but we can't sense it in real time. We sense the "now". BBC News looks at what we know and don't know about the Earth's changing climate. This is linked to the greenhouse effect, which describes how the Earth's atmosphere traps some of the Sun's energy. Solar energy radiating back to space from the Earth's surface is absorbed by greenhouse gases and re-emitted in all directions. This heats both the lower atmosphere and the surface of the planet. Without this effect, the Earth would be about 30°C colder and hostile to life. This is known as climate change or global warming. What are greenhouse gases? The greenhouse gas with the greatest impact on warming is water vapour.