



**NSTA Climate Change Symposium**  
**Climate Change Here and Now: Forest Ecosystem Impacts**

**8:30-8:45 a.m.**

**Welcome, Introductions, Goals for the Symposium**

Al Byers, Assistant Executive Director, Government Partnerships and e-Learning, NSTA  
Paul Tingler, Symposia and Web Seminars Director, NSTA

- About NSTA Symposia
- Agenda/Goals/Forms/Logistics/Introductions

Victoria Arthur – Conservation Education Specialist, U.S. Forest Service

Dr. Karen Flammer - Senior Science Advisor, Sally Ride Science

Leesa Hubbard - Teacher, Wilson County, Tennessee - Sally Ride Science

Dr. Steve McNulty - Research Ecologist and Team Leader of the US Forest Service Southern  
Global Change Program - U.S. Forest Service

Dr. Deborah M. Finch – Research Wildlife Biologist, U.S. Forest Service, Rocky Mountain  
Research Station

**8:46-8:56 a.m.**

**Symposium Overview**

Vicki Arthur, USFS

**8:57-9:17 a.m.**

**Activity 1: Carbon Sources and Sinks**

Dr. Karen Flammer, Sally Ride Science

Leesa Hubbard, Sally Ride Science

**Learning Outcomes:**

After participating in the activity,

- Participants will identify carbon sources and sinks.
- Participants will describe the difference between anthropogenic and natural carbon processes.
- Participants will explain the carbon cycle and how it changes.

**9:18 – 10:05 a.m.**

**Climate Change Impacts on Forest Ecosystems and What This Means to You**

Dr. Steve McNulty, U. S. Forest Service

**Learning Outcomes:**

After participating in the presentation,

- Participants will explain the results of climate change on ecosystems.
- Participants will identify two impacts of climate change on forests.
- Participants will identify three ecosystem services that forests provide.

**10:06 – 10:46 a.m.**

**Activity Two: Carbon, Oxygen, Water, and Shade: Putting a Price on the Benefits of Your School-Yard Trees**

Victoria Arthur

**Learning Outcomes:**

After participating in the activity,

- Participants will learn how to measure tree diameter and identify trees.
- Participants will learn how to enter tree data into the tree benefits calculator.
- Participants will be able to explain four examples of ecosystem services provided by trees.

**10:47-10:57 a.m.**

**Break**

**10:58-11:38a.m.**

**Climate Change Impacts on Wildlife and What This Means to You**

Dr. Deborah Finch

**Learning Outcomes:**

After participating in the activity,

- Participants will explain three examples of climate change impacts on wildlife.
- Participants will identify three reasons humans are reliant on biodiversity and healthy wildlife habitats.

**11:39-12:09 a.m.**

**Activity Three: Season Creep**

Dr. Karen Flammer, Sally Ride Science

Leesa Hubbard, Sally Ride Science

**Learning Outcomes:**

After participating in the activity,

- Participants will identify environmental cues such as temperature and sunlight that control many plant and animal activities.
- Participants will recognize that winters are getting shorter, spring is coming earlier, and fall is starting later in many places as the Earth's climate warms.

**12:10 – 12:25**

**Overview of Climate Change Educational Resources**

Dr. Karen Flammer, Leesa Hubbard and Vicki Arthur

**Learning Outcomes:**

After participating in the activity,

- Participants will identify several climate change education resources that they will use in their classrooms.



**12:25 – 12:40**

**Bringing it Back to the Classroom Educator's**

Dr. Karen Flammer, Vicki Arthur Discussion

**Learning Outcomes:**

After participating in the activity,

- Participants will have shared ideas about how they will use identified climate change education resources in their classrooms.

**12:40-1:00 p.m.**

**Final Words**

- Post-assessment form
- Evaluation form/Survey/Credit Info
- Drawing of door prizes

## **National Science Education Standards Addressed: Content Standards, 5-8**

### **Content Standard A: Abilities Necessary to do Scientific Inquiry**

- Develop descriptions, explanations, predictions and models using evidence.

### **Understanding about Scientific Inquiry**

- Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.
- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.

### **Content Standard C: Life Science**

#### **As a result of their activities in grades 5-8, all students should develop an understanding of**

- Populations and Ecosystems
  - The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

**Content Standard D:**

**Earth and Space Science**

**As a result of their activities in grades 5-8, all students should develop understanding of**

- Structure of the Earth System
  - Living organisms have played many roles in the earth system, including affecting the composition of the atmosphere, producing some types of rocks, and contributing to the weathering of rocks.
  - Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.
- Earth's History
  - The earth processes we see today, including erosion, movement of lithospheric plates, and changes in atmospheric composition, are similar to those that occurred in the past. Earth history is also influenced by occasional catastrophes, such as the impact of an asteroid or comet.

**Content Standard F:**

**Science in Personal and Social Perspectives**

**As a result of their activities in grades 5-8, all students should develop understanding of**

- Natural Hazards
  - Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes.
- Risks and Benefits
  - Individuals can use a systematic approach to thinking critically about risks and benefits. Examples include applying probability estimates to risks and comparing them to estimated personal and social benefits.
  - Important personal and social decisions are made based on perceptions of benefits and risks.

**Content Standard G:**

**History and Nature of Science**

**As a result of their activities in grades 5-8, all students should develop understanding of**

- Science as a Human Endeavor
  - Women and men of various social and ethnic backgrounds--and with diverse interests, talents, qualities, and motivations--engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.

## **Content Standards, 9-12**

### **Content Standard A:**

#### **Abilities Necessary to do Scientific Inquiry**

**As a result of their activities in grades 9-12, all students should develop understanding of**

- Understanding About Scientific Inquiry
  - Human Scientists usually inquire about how physical, living, or designed systems function. Conceptual principles and knowledge guide scientific inquiries. Historical and current scientific knowledge influence the design and interpretation of investigations and the evaluation of proposed explanations made by other scientists.

### **Content Standard C:**

#### **Life Science**

**As a result of their activities in grades 9-12, all students should develop understanding of**

- The Interdependence of Organisms
  - Human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems will be irreversibly affected.
- Matter, Energy, and Organization in Living Systems
  - The distribution and abundance of organisms and populations in ecosystems are limited by the availability of matter and energy and the ability of the ecosystem to recycle materials.

### **Content Standard D:**

#### **Earth and Space**

**As a result of their activities in grades 9-12, all students should develop understanding of**

- Geochemical Cycles
  - The earth is a system containing essentially a fixed amount of each stable chemical atom or element. Each element can exist in several different chemical reservoirs. Each element on earth moves among reservoirs in the solid earth, oceans, atmosphere, and organisms as part of geochemical cycles.
  - Movement of matter between reservoirs is driven by the earth's internal and external sources of energy. These movements are often accompanied by a change in the physical and chemical properties of the matter. Carbon, for example, occurs in carbonate rocks such as limestone, in the atmosphere as carbon dioxide gas, in water as dissolved carbon dioxide, and in all organisms as complex molecules that control the chemistry of life

**Content Standard F:**

**Science in Personal and Social Perspectives**

**As a result of their activities in grades 9-12, all students should develop understanding of**

- Natural Resources
  - Humans use many natural systems as resources. Natural systems have the capacity to reuse waste, but that capacity is limited. Natural systems can change to an extent that exceeds the limits of organisms to adapt naturally or humans to adapt technologically.
- Environmental Quality
  - Natural ecosystems provide an array of basic processes that affect humans. Those processes include maintenance of the quality of the atmosphere, generation of soils, control of the hydrologic cycle, disposal of wastes, and recycling of nutrients. Humans are changing many of these basic processes, and the changes may be detrimental to humans.
  - Materials from human societies affect both physical and chemical cycles of the earth.
- Natural and Human-Induced Hazards
  - Natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society, as well as cause risks. Students should understand the costs and trade-offs of various hazards—ranging from those with minor risk to a few people to major catastrophes with major risk to many people. The scale of events and the accuracy with which scientists and engineers can (and cannot) predict events are important considerations.
- Science And Technology In Local, National, And Global Challenges
  - Humans have a major effect on other species. For example, the influence of humans on other organisms occurs through land use—which decreases space available to other species—and pollution—which changes the chemical composition of air, soil, and water.