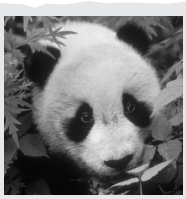
Finding Common Ground

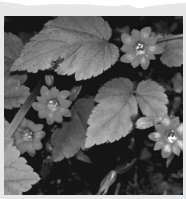
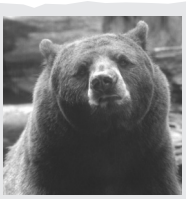
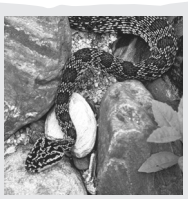
Temperate-Forest Habitat Conservation in the United States and China

A Middle School Curriculum

Friends of the National Zoo is dedicated to supporting the Smithsonian's National Zoo in a joint mission to celebrate, study, and protect the diversity of animals and their habitats.

Fujifilm, lead corporate sponsor of the giant panda program at the National Zoo, supports comprehensive conservation education programs, including the *Finding Common Ground* curriculum and the associated Conservation Central website, designed to help children and adults learn more about giant pandas and the conservation of all wildlife and their habitats.

Friends of the National Zoo, Smithsonian's National Zoological Park, Washington, D.C.

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Acknowledgments

Friends of the National Zoo gratefully acknowledges Fujifilm for its generous support of the Smithsonian's National Zoo's giant panda program, and for support of our conservation education initiatives, of which this curriculum is an integral part.

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Credits

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Habitat loss and poaching are major threats to the 1,000 or so endangered giant pandas that remain in the temperate coniferous and bamboo mountain forests of central China. The Smithsonian's National Zoo is supporting the China Wildlife Conservation Association to help conserve core habitat areas, protect the remaining populations in the wild, and increase the giant panda population in zoos. Zoo scientists are also sharing their conservation expertise with Chinese scientists and conservationists. Friends of the National Zoo and Fujifilm are proud to be partners in support of the National Zoo's panda conservation and education efforts. As corporate sponsor of the panda program, Fujifilm has made a ten-year commitment to support the acquisition of giant pandas, create the new Fujifilm Giant Panda Conservation Habitat, and support the development of comprehensive conservation education programs.

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遍地开花

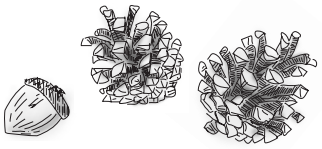
Blossom everywhere

— Chinese proverb

Introduction

"The loss of forest during the past half-century is one of the most profound and rapid environmental changes in the history of the planet."

— E. O. Wilson, conservation biologist (from *The Future of Life*)



Today, only half of Earth's original forest cover remains. During the past 30 years, activities such as logging, conversion to agriculture, infrastructure development, mining and oil extraction, and fire have had widespread effects on the world's forests. The majority of remaining forest has been fragmented and degraded, and only a fraction is protected. *But, why should we care about the global degradation and loss of forests, and how can we address this concern in our science and social studies classrooms?*

We have learned that our forest habitats are of great value to us when they remain intact. They provide essential functions and services such as erosion control and watershed protection, while also mitigating the effects of global climate change by storing tremendous amounts of carbon dioxide and by releasing oxygen, a by-product of photosynthesis, into the atmosphere. Intact forests also house a vast proportion of the Earth's biodiversity on which people depend. As forests are cut down and fragmented, the complex biological communities that depend on them become vulnerable, endangered, or may even disappear entirely—all at a high cost to ecosystem function and genetic, species, and ecosystem biodiversity. At the heart of this curriculum are new strategies for addressing the overlapping environmental, economic, and social challenges we face as we begin the 21st century. We depend on the biodiversity of the living world for the food we eat, the air we breathe, the water we drink, for shelter, and for medicines, yet we are having an adverse impact on the very environmental and biological systems on which our survival depends.[1]

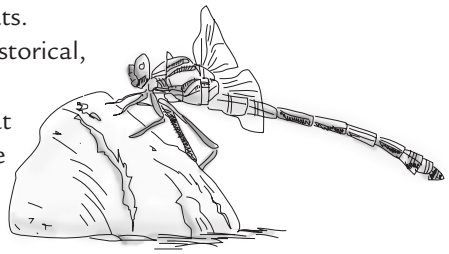
Finding Common Ground provides tools to help young people, the future stakeholders of our biosphere, make informed decisions to conserve these dynamic habitats. It focuses on the challenges of temperate-forest conservation in the United States and central China, habitat of the endangered giant panda and other animals, plants, and people who share its forest home. Through hands-on explorations and online habitat simulations, students learn strategies for monitoring, conserving, and restoring temperate-forest habitats for the health and survival of the species living within them, and for the valuable ecosystem services they provide. This inquiry-based curriculum is aligned with both national science and social studies standards for grades 5 to 8, and it meaningfully integrates concepts that are relevant to the study of both, providing rich opportunities for team teaching and school-wide learning.

We designed this curriculum to accommodate your busy schedule. You may choose to teach select modules, or to complete all six. In addition to the core lesson plan for each module, we encourage ongoing assessment through the use of a Habitat Journal and an Action Plan Portfolio where students archive and review artifacts of their learning and, in-turn, use these artifacts to create their own Conservation Action Plan. Each module also includes a multiple-age Family Learning Activity that connects to curriculum concepts. In each module, students take action steps toward monitoring, conserving, and restoring habitats, locally, nationally, and globally, ultimately integrating these steps into their Class Conservation Action Plan. With each action step, students come to see that their choices and actions have a profound impact on the natural world around them, be it in their own schoolyards or in the misty-mountain forests of central China.

Overarching Project Goals

Students will:

- comprehend that temperate forests are found in different parts of the world, including the United States and China.
- learn about the National Zoological Park's research and conservation efforts in these regions.
- explore the temperate-forest biome through hands-on and interactive, online field studies and simulations.
- gain knowledge and strategies for monitoring, protecting, and restoring habitats.
- comprehend the role of people in the temperate-forest ecosystem, and their historical, economic, ecological, social, and cultural interests in the forest.
- become stewards of the environment and be inspired to make wise choices that will lead to the conservation of this habitat, the species living within it, and the wildlife in their own backyards.



Curriculum Modules Overview

Each module may be used independently. However, as you progress through the curriculum, students take action steps toward creating a Class Conservation Action Plan.

Module 1: In My Own Backyard – Students locate the biome in which they live, explore a local habitat, and conduct a schoolyard biological inventory to assess habitat health and natural and human impacts. In the process, they understand that they can have a direct impact on enhancing or degrading habitat.

Module 2: Understanding Habitat: The Temperate-Forest Biome – Students apply what they have already learned about biomes to explore the temperate-forest biome through *A Walk in the Forest*, an online, virtual forest field study, and through hands-on field studies in a local forest or woodland.

Module 3: Exploring the Temperate Forest: Biodiversity and Interdependence – Students explore interdependence in the complex forest community by examining flora and fauna of the two most biodiverse temperate forest regions, central China and Appalachia, and the impacts of habitat loss and degradation on forest organisms and biodiversity. They consult the 2002 IUCN Red List and the U.S. Fish and Wildlife Endangered Species List to note current conservation status of species, noting specific threats and comprehending the importance of species monitoring.

Module 4: Smithsonian's National Zoological Park Research and Conservation – Students apply National Zoo scientific research, scientific knowledge, and their own observations to design the optimal zoo habitat for giant pandas Mei Xiang and Tian Tian in this interactive *Design a Panda Habitat* activity.

Module 5: People and the Forest – Through a full-inquiry investigation involving a role play, debate, and *Habitat Adventure: Panda Challenge* game on the temperate forests of central China, students help create a viable conservation model that balances the needs of people and animals.

Module 6: What *You* Can Do! – Students put their knowledge into action by creating their own Class Conservation Action Plan, building on artifacts in their Habitat Journals and Action Plan Portfolios.

Connected Conservation:
Integrating Technology into the Curriculum

We designed *Finding Common Ground* to be used interactively with several online simulations and games located on our Conservation Central website. Please visit Conservation Central at http://nationalzoo.si.edu/education/conservationcentral/ to access these interactives.

Conservation Central Website: http://nationalzoo.si.edu/education/conservationcentral/

Online Teacher Resources: http://nationalzoo.si.edu/education/conservationcentral/teacher/

Finding Common Ground is available to download from our Conservation Central website. Visit Conservation Central for additional print and Internet teacher resources for each module, including lesson plans for mini-lessons, extension, and supplemental activities.

Online Simulations and Games

Each module integrates interactive, online games and simulated field studies.

A Walk in the Forest – Students use scientific techniques and tools to monitor the biodiversity of a virtual Virginia forest plot *(Modules 1, 2, 3, and 6)*. http://nationalzoo.si.edu/education/conservationcentral/walk/

Design a Panda Habitat – Students create the optimal giant panda habitat at the National Zoo *(Module 4)*. http://nationalzoo.si.edu/education/conservationcentral/design/

Habitat Adventure: Panda Challenge – Students make real-world conservation decisions to balance the needs of people, pandas, and other temperate forest organisms that live in a fictional nature reserve in the temperate forests of central China. *(Module 5)*. http://nationalzoo.si.edu/education/conservationcentral/challenge/

Family Learning Activities

Distribute the Family Learning activities in this curriculum to students to encourage learning at home. These fun, hands-on activities will help families explore the natural world, and provide them with easy ways to help conserve local habitats and the environment.

How to Use This Curriculum

We designed this curriculum to be easily integrated into your existing science and social studies curricula, and to accommodate your busy schedule. We encourage you to customize it to meet your particular needs. You may choose to teach select modules, or to complete all six modules. The Investigation Questions for each module provide a basic inquiry framework for engaging in the investigation. However, we encourage you to develop your own, focused Investigation Questions based on students' interests and curiosities. All core lesson plans provide a timeline for completing the activity, ranging from 45 minutes to several days. The Procedure section provides step-by-step instructions for implementing each core activity. Additional extension and supplemental activities, located in the Teacher Resources section of our Conservation Central website, will challenge learners who are interested in opportunities for further investigation.

Module Walk Through

Overview and Objectives: Describes investigation for core activity; lists focused learning objectives for core activity.

National Standards Alignment: Shows core lesson alignment with national science and social studies standards, grades 5 to 8.

Investigation Questions and Our Questions for Investigation: Provides a basic inquiry framework for the investigation; encourages creation of your own focused Investigation Questions based on students' interests and curiosities.

Teacher Preparation: Helpful suggestions for facilitating the investigation; includes key **Vocabulary** and **Materials** needed for the investigation, and points to key teacher background readings to prepare you for the investigation.

Note: The majority of the vocabulary words for each module are included in the Forest Biodiversity Monitoring Project's Glossary. Download at: http://nationalzoo.si.edu/Education/ClassroomPartnerships/BioDivMonPro/trainingmanual/glossary.pdf .

Procedure: Step-by-step suggestions for conducting the investigation.

Reflection, Discussion, and Analysis: Provides suggested follow-up questions and an opportunity for students to rethink hypotheses based on what they learned during the investigation.

Teacher Resources: Selected print and Internet background readings for the core activity.

Student Overview Sheet (Handout 1): Provides students with an overview of the module, Investigation Questions, and core readings.

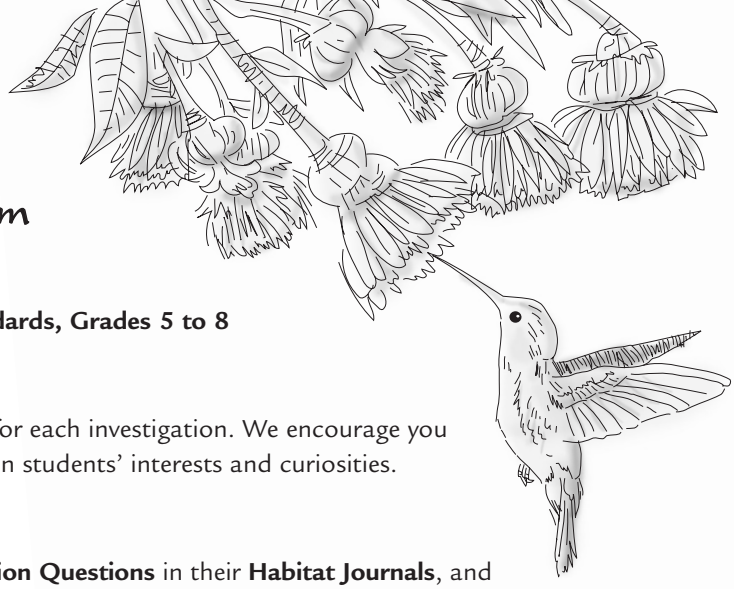
Student Activity Sheet (Handout 2): Helps students organize core activity information.

Additional Activities & Ongoing Assessment:

Extension Activity and Supplemental Activity
Expands on concepts explored in the core activity; web-based supplemental activities enhance core activity understandings.

Habitat Journal and Action Plan Portfolio/Portfolio Assessment
Students record their reflections, hypotheses, and Investigation Questions in their Habitat Journals, and compile their own artifacts, scientific research, and other resources in their Action Plan Portfolios to take action steps toward creating a Class Conservation Action Plan.

Family Learning Activity (Handout 3)
Encourages families to explore concepts introduced in the curriculum. These are also available to download on our website: http://nationalzoo.si.edu/education/conservationcentral/family/ .



Special Features of the Curriculum

- **Aligns with Both National Science and Social Studies Standards, Grades 5 to 8**

- **Provides an Inquiry-based Learning Framework**
  Investigation Questions provide a basic inquiry framework for each investigation. We encourage you to create your own, focused Investigation Questions based on students' interests and curiosities.

- **Encourages Ongoing Assessment**
  Students record their reflections, hypotheses, and **Investigation Questions** in their **Habitat Journals**, and compile their own artifacts, scientific research, and other resources in their **Action Plan Portfolios** to take action steps toward creating a Class Conservation Action Plan.

- **Integrates Technology with Science and Social Studies Concepts**
  Online simulated field studies and games provide opportunities to develop observation skills and gather data using authentic scientific methods and tools.

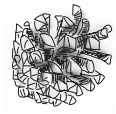
- **Provides Meaningful and Authentic Outcomes and Products of Learning**
  Students take concrete action steps in each module, expanding their understanding of the challenges and opportunities in conservation, as they work toward the development of their Conservation Action Plan.

- **Encourages Family Learning**
  Multi-age activities connect to curriculum concepts and encourage hands-on exploration of the natural world, providing easy ways for families to help conserve habitats.

- **Customizable**
  Each module can be used alone or, when used in its entirety, leads to the development of a Conservation Action Plan.

National Science Standards Alignment

Science Curriculum Standards: Grades 5–8

Standard	Strands	Curriculum Modules & Activities
Unifying Concepts and Processes	Systems, order, and organization Evidence, models, and explanation Change, constancy, and measurement Evolution and equilibrium Form and function	All Modules
Science as Inquiry	Abilities necessary to do scientific inquiry Understandings about scientific inquiry	All Modules
Physical Science	Properties and changes of properties in matter Motions and forces Transfer of energy	Tree Basics Mini-Lesson **MODULE 2:** Understanding Habitat: The Temperate-Forest Biome (C) What Is the Temperate Forest?
Life Science	Structure and function in living systems Reproduction and heredity Regulation and behavior Populations and ecosystems Diversity and adaptations of organisms 	Tree Basics Mini-Lesson **MODULE 1:** In My Own Backyard (C) Backyard Biology (E) Local Species and Habitat Registry **MODULE 2:** Understanding Habitat: The Temperate-Forest Biome (C) What Is the Temperate Forest? (C) A Walk in the Forest (E) Forest Field Study **MODULE 3:** Exploring the Temperate Forest: Biodiversity & Interdependence (C) Temperate-Forest Ecology: Flora and Fauna (S) Rotting-Log Researchers & Decaying-Leaf Detectives (E) Broken Webs **MODULE 4:** Smithsonian's National Zoo Science (C) Design a Panda Habitat (E) The Zoo and You **MODULE 5:** People and the Forest (C) Finding Common Ground (E) U.S. Habitat Conservation Connection: North American Black Bear **MODULE 6:** What *You* Can Do! (C) Create a Conservation Action Plan
Earth and Space Science	Structure of the earth system Earth's history Earth in the solar system	**MODULE 2:** Understanding Habitat: The Temperate-Forest Biome (C) What Is the Temperate Forest? **MODULE 3:** Biodiversity & Interdependence (C) Temperate-Forest Ecology: Flora and Fauna
Science and Technology	Abilities of technological design Understandings about science and technology	**MODULE 1:** In My Own Backyard (E) Local Species and Habitat Registry **MODULE 2:** Understanding Habitat: The Temperate-Forest Biome (C) What Is the Temperate Forest? (C) A Walk in the Forest (E) Making a Climograph (E) Forest Field Study

KEY: P = Pre-activity **C** = Core activity **E** = Extension activity **S** = Supplemental activity

Science Curriculum Standards: Grades 5–8

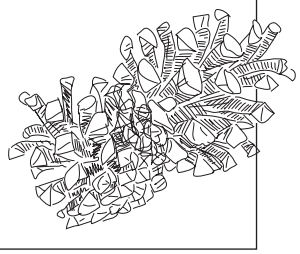
Standard	Strands	Curriculum Modules & Activities
		MODULE 3: Exploring the Temperate Forest: Biodiversity & Interdependence (C) Temperate-Forest Ecology: Flora and Fauna (S) A Walk in the Forest **MODULE 4:** Smithsonian's National Zoo Science (C) Design a Panda Habitat (E) The Zoo and You **MODULE 5:** People and the Forest (P) People and Forests (C) Finding Common Ground (E) U.S. Habitat Conservation Connection: North American Black Bear **MODULE 6:** What *You* Can Do! (C) Create a Conservation Action Plan (E) Get the Word Out! (Eco E-cards)
Science in Personal and Social Perspectives	Personal health Populations, resources, and environments Natural hazards Risks and benefits Science and technology in society	**MODULE 1:** In My Own Backyard (C) Backyard Biology (E) Local Species and Habitat Registry **MODULE 2:** Understanding Habitat: The Temperate-Forest Biome (C) A Walk in the Forest **MODULE 3:** Exploring the Temperate Forest: Biodiversity & Interdependence (C) Temperate-Forest Ecology: Flora and Fauna **MODULE 4:** Smithsonian's National Zoo Science (C) Design a Panda Habitat (E) The Zoo and You **MODULE 5:** People and the Forest (P) People and Forests (C) Finding Common Ground **MODULE 6:** What *You* Can Do! (C) Create a Conservation Action Plan (E) Land-Use Change and Habitats
History and Nature of Science	Science as a human endeavor Nature of science History of science	**MODULE 1:** In My Own Backyard (C) Backyard Biology **MODULE 4:** Smithsonian's National Zoo Science (C) Design a Panda Habitat (E) The Zoo and You **MODULE 5:** People and the Forest (P) People and Forests (C) Finding Common Ground **MODULE 6:** What *You* Can Do! (C) Create a Conservation Action Plan

KEY: P = Pre-activity **C** = Core activity **E** = Extension activity **S** = Supplemental activity

National Social Studies Standards Alignment

Social Studies Curriculum Standards: Grades 5–8

Strands	Performance Expectation	Curriculum Modules & Activities
I Culture	b. explain how information and experiences may be interpreted by people from diverse cultural perspectives and frames of reference;	**MODULE 4:** Smithsonian's National Zoo Science (C) Design a Panda Habitat **MODULE 5:** People and the Forest (P) People and Forests (C) Finding Common Ground
III People, Places & Environments	c. use appropriate resources, data sources and geographic tools such as aerial photographs, satellite images, geographic information systems (GIS) to generate, manipulate and interpret information such as data bases, graphs, grid systems, charts, and maps; f. describe physical system changes such as seasons, climate, and weather and the water cycle and identify geographic patterns associated with them; h. examine, interpret and analyze physical and cultural patterns and their interactions, such as land use, settlement patterns, cultural transmission of customs and ideas, and ecosystem changes; j. observe and speculate about social and economic effects of environmental changes and crises resulting from phenomena such as floods, storms and drought; k. propose, compare, and evaluate alternative uses of land and resources in communities, regions, nations, and the world.	**MODULE 1:** In My Own Backyard (C) Backyard Biology **MODULE 2:** Understanding Habitat: The Temperate-Forest Biome (C) What Is the Temperate Forest? (C) A Walk in the Forest (E) Forest Field Study **MODULE 3:** Exploring the Temperate Forest: Biodiversity & Interdependence (C) Temperate-Forest Ecology: Flora and Fauna (E) Broken Webs **MODULE 4:** Smithsonian's National Zoo Science (C) Design a Panda Habitat **MODULE 5:** People and the Forest (C) Finding Common Ground **MODULE 6:** What *You* Can Do! (C) Create a Conservation Action Plan (E) Land-Use Change and Habitats
VI Power, Authority & Governance	f. explain conditions, actions, and motivations that contribute to conflict and cooperation within and among nations; h. explain and apply concepts such as power, role, status, justice and influence to the examination of persistent issues and social problems;	**MODULE 3:** Exploring the Temperate Forest: Biodiversity & Interdependence (C) Temperate-Forest Ecology: Flora and Fauna **MODULE 4:** Smithsonian's National Zoo Science (C) Design a Panda Habitat **MODULE 5:** People and the Forest (C) Finding Common Ground **MODULE 6:** What *You* Can Do! (C) Create a Conservation Action Plan



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Social Studies Curriculum Standards: Grades 5–8

Strands	Performance Expectation	Curriculum Modules & Activities
VII Production, Distribution & Consumption	b. describe the role that supply and demand, prices, incentives, and profits play in determining what is produced and distributed in a competitive market system;	**MODULE 5:** People and the Forest (C) Finding Common Ground **MODULE 6:** What *You* Can Do! (C) Create a Conservation Action Plan
VIII Science, Technology, & Society	b. show through specific examples how science has changed people's perceptions of the social and natural world, such as their relationship to the land; d. explain the need for laws and policies to govern scientific and technological applications; e. seek reasonable and ethical solutions to problems that arise when scientific advancements and social norms or values come into conflict.	**MODULE 4:** Smithsonian's National Zoo Science (C) Design a Panda Habitat **MODULE 5:** People and the Forest (C) Finding Common Ground **MODULE 6:** What *You* Can Do! (C) Create a Conservation Action Plan (E) Get the Word Out! (Eco E-card)
X Civic Ideals & Practices	c. locate, access, analyze, organize and apply information about selected public issues—recognizing and explaining multiple points of view; d. practice forms of civic discussion and participation consistent with the ideals of citizens in a democratic republic; e. explain and analyze various forms of citizen action that influence public policy decisions; i. explain the relationship between policy statements and action plans used to address issues of pubic concern;	**MODULE 5:** People and the Forest (C) Finding Common Ground **MODULE 6:** What *You* Can Do! (C) Create a Conservation Action Plan (E) Get the Word Out! (Eco E-card)

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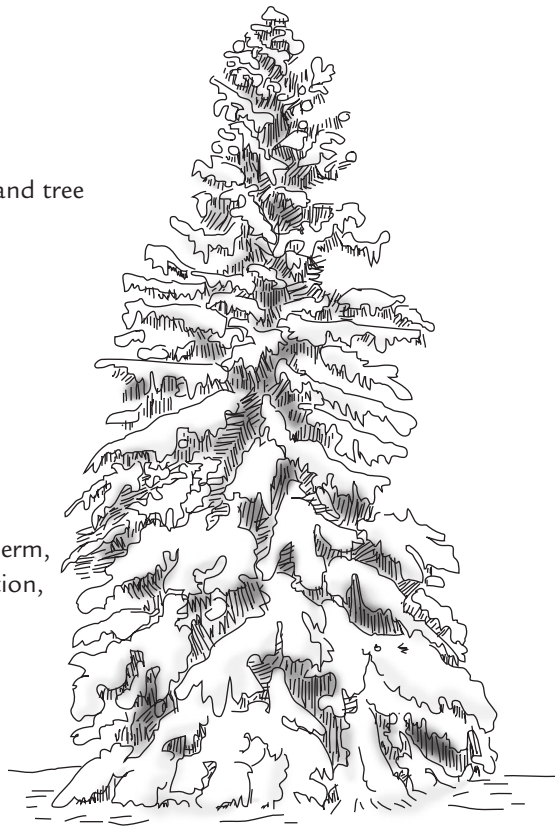
Mini-Lesson: Tree Basics



Overview

This mini-lesson outlines what students should already know about trees and tree processes and provides suggestions for reviewing these concepts.

Objectives

- assess student knowledge of trees and tree processes before exploring the temperate-forest biome
- review and reinforce concepts
- assign activities as needed

Vocabulary

angiosperm, carbon dioxide, chlorophyll, coniferous, deciduous, gymnosperm, nitrogen, nutrient, oxygen, phloem, photosynthesis, respiration, transpiration, vascular system, xylem

Assessing Student Knowledge

Students should be able to:

- define and label the parts of a tree and describe their functions.
  Activity – Diagram and label the parts of a tree and their functions.
- describe the life cycle of a tree.
  Activity – Make a flow chart to demonstrate the life cycle of a tree. Create hypotheses about how changes in available materials and energy might effect particular life processes in trees.
- differentiate between coniferous and deciduous trees and note distinguishing characteristics.
  Activity – Use a Venn Diagram to compare and contrast coniferous and deciduous trees.
- explain the sequence of events in the process of photosynthesis.
  Activity – Design a model to explain the sequence of events in the process of photosynthesis. Explain the process of energy transformation, describe the changes in chemical composition, and name two products of photosynthesis.
- demonstrate water and nutrient transport in trees.
  Activity – Create a flow chart to show water and nutrient transport in trees. Describe the vascular system and how xylem and phloem function.
- explain two different ways in which trees spread their fruits and seeds to new areas.
  Activity – Articulate differences in the reproductive cycles of gymnosperms and angiosperms.
- articulate why trees and green plants are important to all life.
  Activity – Write a one-page paper or deliver a presentation on the importance of trees.

For Further Review

The Nature of Trees – http://www.talkabouttrees.org/lessons/plan2.html
Tree Basics – http://www.cnr.vt.edu/dendro/forsite/treebasics.htm
The Wonderful World of Trees – http://www.domtar.com/arbre/english/start.htm
Tree Identification Lab – http://www.middleschoolscience.com/treeid.htm
Activities on Photosynthesis – http://www.education-world.com/a_lesson/lesson024.shtml