

# ON TOP OF OLD SMOKY



*Ranger Led  
Program*

**THEME:** Weather and Ecology  
**GRADE LEVEL:** Fifth  
**BEST TIME TO PLAN TRIP:** Fall or Spring

## UNIT RATIONALE

Great Smoky Mountains National Park is world renowned for biological diversity. The influence of the last ice age on the Smoky's climate, coupled with variations in elevation, rainfall, temperature, and geology in these ancient mountains gave rise to five forest biomes and provide ideal habitat for over 1,600 species of flowering plants, at least 4,000 non-flowering varieties, 66 species of mammals, 246 kinds of birds, 43 amphibians, 38 reptiles species, 1,500 varieties of beetles and 500 types of spiders just to name a few.

## NORTH CAROLINA ESSENTIAL STANDARDS - FIFTH GRADE

### SCIENCE

- 5.P.1 Understand force, motion and the relationship between them.
  - 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects.
- 5.P.2 Understand the interaction of matter and energy and the changes that occur.
  - 5.P.2.1 Explain how the sun's energy impacts the process of the water cycle (including, evaporation, transpiration, condensation, precipitation).
  - 5.P.2.3 Summarize properties of original materials, and the new materials(s) formed to demonstrate that a change has occurred.
  - EX.5.P.2.3 Classify changes in matter as physical (reversible) or chemical (irreversible).
- 5.E.1 Understand weather patterns and phenomena, making connections to the weather in a particular place and time.
  - 5.E.1.1 Compare daily and seasonal changes in weather conditions (including wind speed and direction, precipitation, and temperature) and patterns.
  - 5.E. 1.2 Predict upcoming weather events from weather data and collected through observation and measurements.
  - 5.E. 1.3 Explain how global patterns such as the jet stream and water currents influent local weather in measurable terms such as temperature, wind direction and speed, and precipitation.
- 5.L.1 Understand how structures and systems of organisms (to include the human body) perform functions necessary for life.
  - EX.5.L.1.2 Understand how the functions of the internal and external structures (e.g. eyes, nose, ears, mouth) of the human body are essential for life.
- 5.L.2 Understand the interdependence of plants and animals with their ecosystem.
  - 5.L.2.1 Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grassland).
  - 5.L.2.2 Classify the organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers (biotic factors).
  - EX.5.L.2.2 Identify animals and plants found in common ecosystems (e.g. ocean, forest, lake, desert, arctic).
- 5.L.2.3 Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystems.
  - EX.5.L.2.3 Classify parts of different ecosystems as living and non-living.





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# PLANNING A SUCCESSFUL TRIP ON TOP OF OLD SMOKY



## SCHEDULE FOR A DAY OF ACTIVITIES IN GREAT SMOKY MOUNTAINS NATIONAL PARK

### Morning:

- Meet park ranger at Clingmans Dome parking area
- Break into two groups
- Hike to Clingmans Dome
- Lunch
- Small group activities
- Hike to parking area and large group conclusion

\*Extended program options available  
(see On-Site Activity on page 19 for  
details)

## Planning a Successful Trip

- Check the weather before you go.
- School buses can park at the program site.
- The maximum number of students for this trip is 50. One adult chaperone is required for every eight students
- Students should be prepared to carry their lunches in backpacks. All trash must be carried back to school. NEVER leave food unattended.
- Be sure that chaperones are aware of the hiking portion of this trip.
- Vault toilets are available at Clingmans Dome. Groups should bring their own drinks/water, as there is no running water at Clingmans Dome.



# SAFETY CONSIDERATIONS AND OTHER IMPORTANT INFORMATION

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- Great Smoky Mountains National Park is a federally protected public use area. Please help the rangers keep all of the plants and animals protected in the park by not picking the plants or taking anything from the park.
- Please remind your students to wear appropriate footwear and clothing for this extended outdoor experience. Flip flops, slip-on shoes, or sandals are not appropriate for the program.
- Temperatures in some parts of the park can be 10-15 degrees colder than at your school. Long pants and layers are suggested for the program. Pants are the best precaution against cool temperatures, bee stings, ticks, and poison ivy.
- Within the park, cell phones are not always reliable. Rangers will follow the on-site agenda. If an unexpected problem occurs, rangers do carry park radios to make contact with the park dispatch office. For non-emergencies, call the Park Ranger dispatch at 865-436-1230 or contact a park employee.

## **Animals and Plants of Concern in the park**

- All animals in the park are wild and their behaviors are unpredictable. Treat all animals with caution.
- Venomous snakes - Two species of venomous snakes live in the Smokies, the copperhead and timber rattlesnake. Students should be cautious where they place their hands and feet.
- Insects - Yellow jacket wasps are the insects of greatest concern. They build nests in the ground along trails and streams and are aggressive when disturbed. Stings cause local swelling and can lead to severe allergic reactions in sensitive individuals. Such persons should carry epinephrine kits.
- Poison Ivy - Poison ivy is a three-leaved plant which can grow on the ground as well as on “hairy” vines up trees. To avoid chances of an allergic reaction wear long pants, stay on trails, and avoid direct contact with vegetation. If contact occurs or is a concern, wash affected parts in cold soapy water immediately.
- It is extremely helpful to rangers leading the program for students to wear clearly labeled name tags with first names only.
- Pets are not allowed on most park trails. Please do not bring them on the field trip.
- For more information about the park (Things to Know Before You Come) please visit the park’s website: <http://www.nps.gov/grsm/planyourvisit/things2know.htm>





# BACKGROUND INFORMATION

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## **Park Description:**

The National Park Service is charged with the management and preservation of the nation's most precious natural and cultural resources. These resources are woven into our natural heritage, and they provide opportunities for recreation, appreciation of beauty, historical reflection, cultural enrichment, and education.

Great Smoky Mountains National Park is one of the largest protected land areas east of the Rocky Mountains. With over 500,000 acres (800 square miles) of forest, the Smokies contain an enormous variety of plants and animals. In terms of biological diversity, a walk from a mountain's foot to its peak is comparable to the 2,000 mile hike on the Appalachian Trail from Georgia to Maine.

Because the National Park Service is responsible for protecting resources and natural systems, the park engages in comprehensive research programs. These programs, such as air quality monitoring, foster an understanding of park resources and show how the resources are affected by local, regional, and global influences. Since the Smokies are so biologically diverse, the park is designated as an International Biosphere Reserve by the United Nations. The international system contains over 320 reserves in over 80 countries with the primary objectives of conserving genetic diversity and coordinating environmental education, research, and monitoring.

The Smokies also have a rich cultural history. Native Americans have lived in this area for thousands of years, and permanent white settlement began around 1800. The coming of commercial logging around 1900 stripped trees from two-thirds of what is now park land. Established in 1934, the park was created from more than 6,000 tracts of private and commercial land that was bought mostly with money raised and privately donated. Centrally located within a two-day's drive for half of the nation's population, Great Smoky Mountains National Park has the highest visitation of all the national parks in the country.

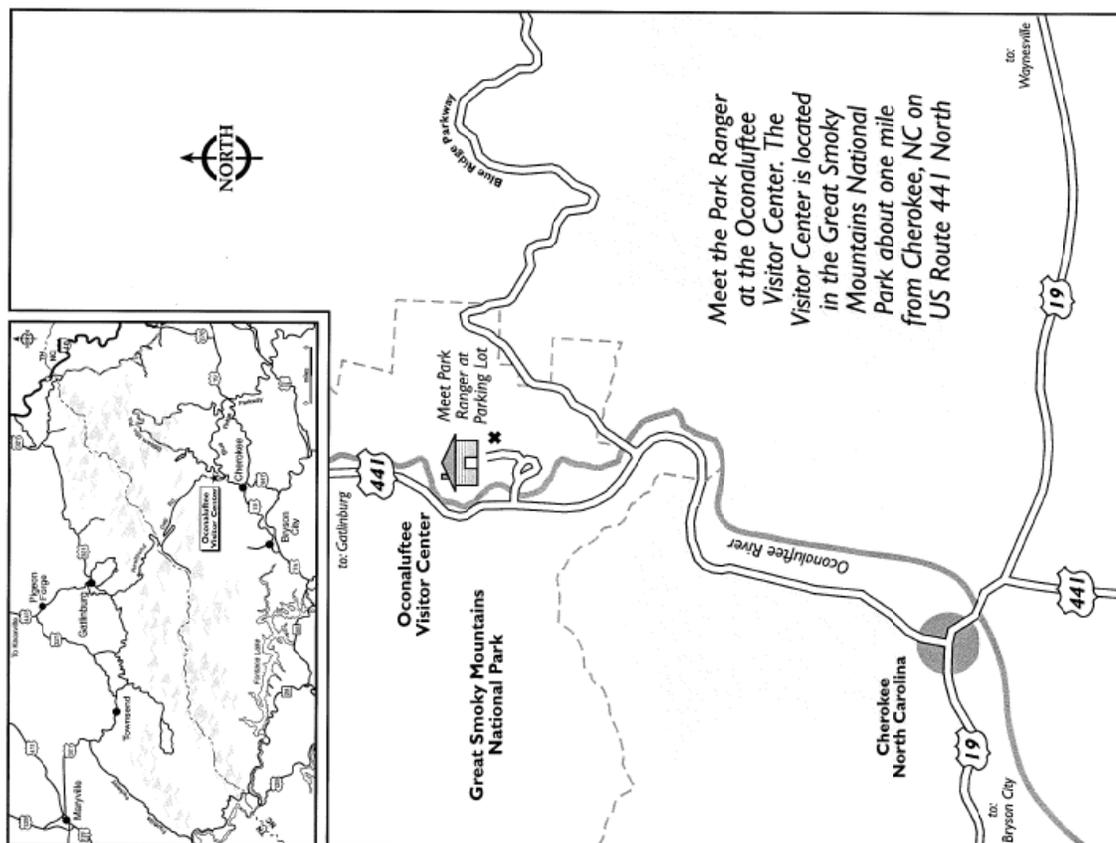
## **Clingmans Dome Description:**

Clingmans Dome, towering 6,643 feet above sea level is the highest peak in the Smokies. The peak was once called Smoky Dome, but was renamed Clingmans Dome in honor of U.S. Senator and Confederate brigadier general, Thomas Clingman. The seven-mile spur road to Clingmans Dome follows the border between TN and NC. The road leads to a parking area some 332 feet below the summit. From there it is a steep half-mile walk on a paved trail to the peak. Along the way the path climbs through a spruce-fir forest. This type of forest, rarely found in the southern Appalachians, is a remnant of the ice age. The walk and organized activities will give students the opportunity to learn about this forest community, its inhabitants, and the dangers this fragile forest community faces. At the peak a 375 foot ramp spirals upward to a 45 foot observation tower, allowing a view above the trees. This is the third highest mountain east of the Mississippi river. Mt. Mitchell and Mt. Craig, 70 miles west in Yancey County, North Carolina, are both slightly higher.

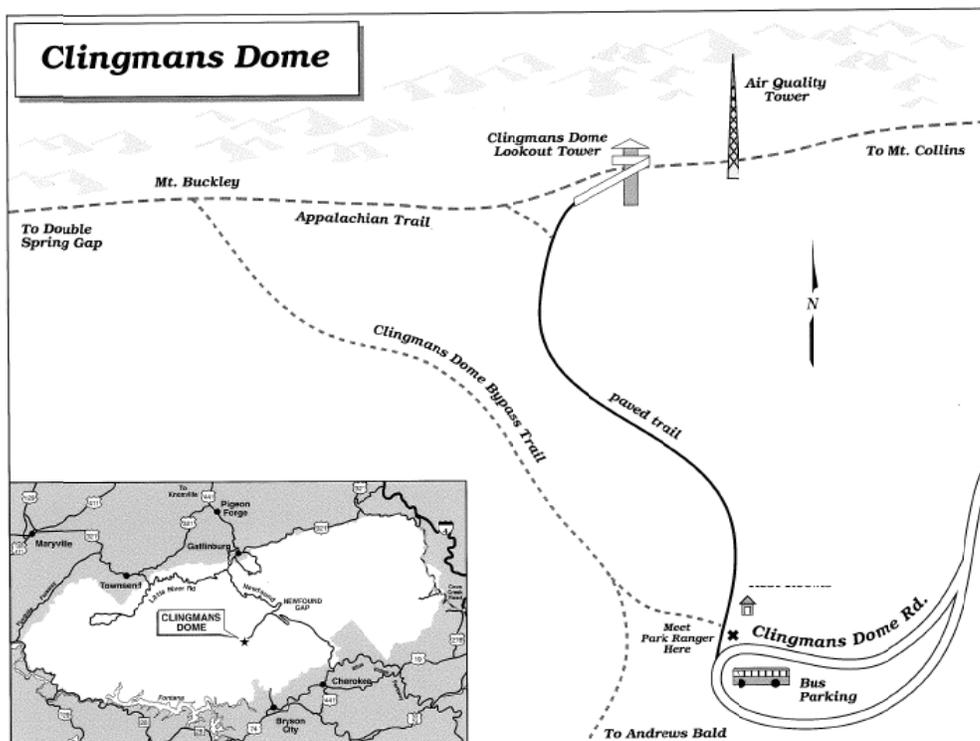




# MAP TO OCONALUFTEE VISITOR CENTER



# MAP TO CLINGMANS DOME



# PRE-SITE/POST-SITE TEST



Pre- Site Score \_\_\_\_\_

Post-Site Score \_\_\_\_\_

Name \_\_\_\_\_

## Write T for True or F for False

- \_\_\_\_\_ 1. Air quality, fire management, and education are not important issues in the Park.
- \_\_\_\_\_ 2. The Balsam Woolly Adelgid is native to the Great Smoky Mountains ecosystems.
- \_\_\_\_\_ 3. The Spruce-Fir forest community is found only in the higher elevations (above 4,500 feet) of the Great Smoky Mountains National Park.

## Circle the letter of the correct answer.

4. Acid in the air from the burning of fossil fuels by power plants and industries produces:
- sulfur dioxide and nitrogen oxides
  - oxygen and nitrogen oxides
  - lead and mercury
5. Industries, government agencies, schools and individuals can work together to
- reduce air pollution
  - help research and solve park problems
  - stop the destruction of park resources (like carving and writing on the cabins and trees of the park or removal of wildflowers and other plants)
  - all of the above
6. Information shown on a graph is \_\_\_\_\_ and is useful in \_\_\_\_\_.
- exploring maps/problem solving
  - making assignments/defining words
  - data collected/organizing information
7. It is illegal and potentially harmful to do which of the following in the national park?
- feed bears and other wildlife
  - camp and hike in the backcountry
  - take a nap in the Spruce-Fir forest on top of the mountains
8. Air pollutants are carried to the local forests by
- rivers and streams
  - animals and people
  - rains, clouds, and snow
9. The Balsam Woolly Adelgid feeds on the tree's \_\_\_\_\_ and injects a \_\_\_\_\_.
- needles/small amount of water
  - bark/nutrient
  - sap/toxin
10. While hiking you should always
- walk along off the trails so not to damage the wilderness
  - follow the stream especially while walking at night
  - hike with a buddy and let someone know where you are going and when you will return





## PRE-SITE/POST-SITE TEST (CONTINUED)

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11. An existing threat to Great Smoky Mountains National Park is
  - a. not enough rainfall
  - b. no visitors
  - c. air quality
  
12. Air pollution causes
  - a. poor visibility
  - b. threats to health of plants and animals
  - c. both of the above are correct
  
13. An adelgid population consists of wingless females that spread from tree to tree by
  - a. jumping off the backs of tourists
  - b. moving water and rain
  - c. wind
  
14. How are Park Resource Managers slowing the destruction of the Fraser fir by the adelgid?
  - a. spraying a soap mixture on the tree trunk is with first hoses
  - b. using a mild poison at the base of the trees
  - c. spraying the trees with chemicals from airplanes and helicopters
  
15. Air pollution that effects the Smoky Mountains comes from
  - a. cities surrounding the area and automobile traffic
  - b. cities far away such as Chicago, IL
  - c. all of the above
  
16. An example of a good chain would be
  - a. sun-soil-plant-insect-salamander-owl-human
  - b. sun-tree-insect-spider-salamander-shrew-owl-soil
  - c. soil-plant-insect-bird-tree-flower-insect-plant-soil



# PRE-SITE/POST-SITE TEST

## TEACHER ANSWER SHEET



### Write T for True or F for False

- F 1. Air quality, fire management, and education are not important issues in the Park.
- F 2. The Balsam Woolly Adelgid is native to the Great Smoky Mountains ecosystems.
- T 3. The Spruce-Fir forest community is found only in the higher elevations (above 4,500 feet) of the Great Smoky Mountains National Park.

### Circle the letter of the correct answer.

4. Acid in the air from the burning of fossil fuels by power plants and industries produces:

a. sulfur dioxide and nitrogen oxides

b. oxygen and nitrogen oxides

c. lead and mercury

5. Industries, government agencies, schools and individuals can work together to

a. reduce air pollution

b. help research and solve park problems

c. stop the destruction of park resources (like carving and writing on the cabins and trees of the park or removal of wildflowers and other plants)

d. all of the above

6. Information shown on a graph is \_\_\_\_\_ and is useful in \_\_\_\_\_.

a. exploring maps/problem solving

b. making assignments/defining words

c. data collected/organizing information

7. It is illegal and potentially harmful to do which of the following in the national park?

a. feed bears and other wildlife

b. camp and hike in the backcountry

c. take a nap in the Spruce-Fir forest on top of the mountains

8. Air pollutants are carried to the local forests by

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b. animals and people

c. rains, clouds, and snow

9. The Balsam Woolly Adelgid feeds on the tree's \_\_\_\_\_ and injects a \_\_\_\_\_.

a. needles/small amount of water

b. bark/nutrient

c. sap/toxin

10. While hiking you should always

a. walk along off the trails so not to damage the wilderness

b. follow the stream especially while walking at night

c. hike with a buddy and let someone know where you are going and when you will return



# PRE-SITE/POST-SITE TEST

## TEACHER ANSWER SHEET (CONTINUED)

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11. An existing threat to Great Smoky Mountains National Park is

- a. not enough rainfall
- b. no visitors

*c. air quality*

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- a. cities surrounding the area and automobile traffic
- b. cities far away such as Chicago, IL

*c. all of the above*

16. An example of a good chain would be

- a. sun-soil-plant-insect-salamander-owl-human

*b. sun-tree-insect-spider-salamander-shrew-owl-soil*

- c. soil-plant-insect-bird-tree-flower-insect-plant-soil



# PRE-SITE ACTIVITY

## TEMPERATURE AND ELEVATION



**Grade Level:** Fifth

**Subject Area:** Science

**Curriculum:**

Science 5.E.1 - Understand weather patterns

**Activity time:** 30 minutes

**Setting:** Classroom

**Skills:** Collecting information, Comparing, Connecting, Discussing, Hypothesizing, Inferring, Predicting

**Vocabulary:**

- altitude
- elevation
- temperature
- topography

### Objectives:

- 1) Calculate changes in temperature as elevation changes.
- 2) Understand why temperature changes with elevation.
- 3) Understand the health risks associated with extreme temperature changes.

### Materials:

- Background information sheet
- Activity sheet

### Background:

Great Smoky Mountains National Park offers a wide range of activities for its ten million annual visitors. Pre-trip planning and weather-wise clothing will help ensure an enjoyable visit anytime of the year and reduce the risk of hypothermia (over exposure to the cold). It is helpful to keep in mind that elevations in the park range from 800 feet to 6,643 feet in elevation and that the topography of the mountains can drastically affect local weather. Temperatures from mountain top to mountain base can vary by 20 degrees Fahrenheit or more. Clear skies in the low elevations do not guarantee pleasant weather higher up.

### Procedure:

Describe the range of elevation in Great Smoky Mountains National Park to students (elevations range from 800 feet to 6,643 feet) and explain that topography of the mountains can drastically affect local weather. Then have students review the temperature graphs listed on the following page. Have students answer the questions listed below the chart. Describe the elevation of Clingmans Dome and introduce the concept of altitude.

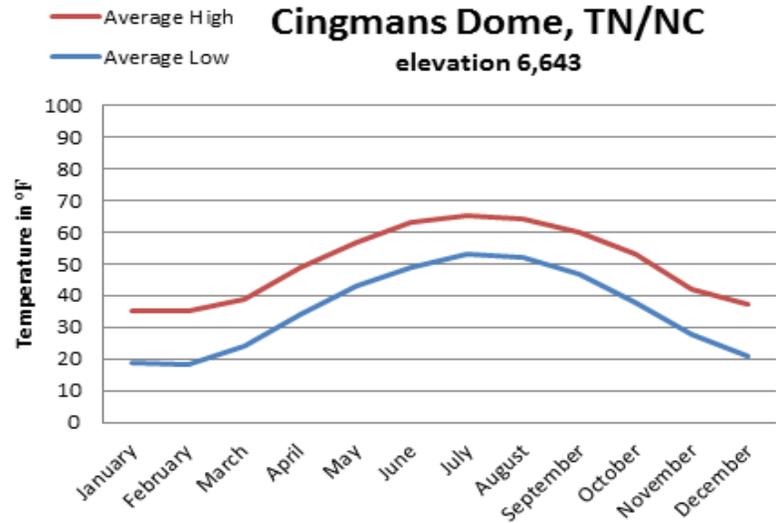
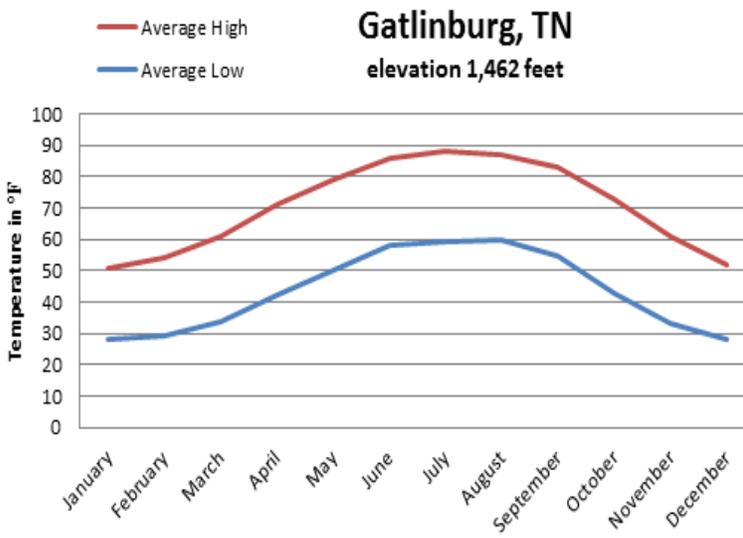
**Extension:** Research and compare their results with elevations of mountain ranges that are taller than Clingmans Dome (i.e. the Rocky Mountains In Colorado, the Himalayas, Mt. Everest, etc.)



# TEMPERATURE AND ELEVATION WORKSHEET



Name \_\_\_\_\_



Questions:

1. On average, which is the coldest month of the year at Clingmans Dome? Which is the warmest?
2. Based on the above information, write a statement or hypothesis about what you believe the weather will be like on the day of your field trip on top of Clingmans Dome?
3. Temperatures can vary 10-20 degrees from the bottom of the mountain to the top. Temperature usually drops three degrees for each 1000 feet of elevation. With this information, figure out the following: A teacher has planned a class trip to Clingmans Dome in October. The temperature at the school is expected to be 60 degrees on that day. Research the elevation at your school and determine what the temperature at the Dome will be by using the above calculation. What would be the best clothing to what for the field trip based on the predicted temperature?



# PRE-SITE ACTIVITY

## SAFETY



**Grade Level:** Fifth

**Subject Area:** Science

**Activity time:** 15-20  
minutes

**Setting:** Classroom

**Skills:** Collecting  
information, Connecting,  
Discussing, Hypothesizing,  
Inferring, Identifying cause

### Objectives:

- 1) List at least three items to carry with them when they hike with their families in the woods.
- 2) List three methods to keep from getting lost.
- 3) Identify the most important thing to do when lost.
- 4) Discuss and identify three dangers in the woods and know how to avoid them.

### Materials:

- Teacher discussion sheet on safety

### Procedure:

Discuss the safety sheet and potential dangers students might encounter in the Park. Identify items the students might carry with them when they visit the park with their families. Discuss methods to keep from getting lost and identify the most important thing to do if lost. Student task is to participate in discussion. Summarize safety issues discussed during the lesson.

### Extension:

Create a list of terms that would be necessary to safely day hike in the mountains.



# SAFETY LESSON-TEACHER DISCUSSION SHEET



**Park Hazards:** Include rocky, uneven trails; stinging insects; poison ivy and other irritating plants; snakes; changing weather conditions.

**Avoid potential dangers by:**

- staying together as a group
- not running or playing rough
- watching where you put your hands and feet
- knowing how to identify poison ivy
- knowing of any allergies or conditions that may cause concern on the trail

**Avoid getting lost by:**

- hiking with a group at all times
- staying on established marked trails at all times
- reading and understanding all trail signs
- taking along a good map and knowing how to read it
- letting others know where you are and when you will return

**If you get lost:**

- Stop, wait, and blow your whistle

**Words to the wise:**

- If you can carry it in full, you can carry it out empty. Pack out all trash
- The park is a living museum where all living and nonliving things are protected by law.
- Boil or treat all of your drinking water. Never drink from a stream even if it looks pristine.
- Use caution when walking near streams. Wet and moss-covered rocks can be slippery.
- Pair off into a “buddy system” and keep track of your buddy.

<b>Items for hiking:</b>	<b>Necessary</b>	<b>Optional</b>
	•map	•compass
	•water	•extra clothes
	•lunch or snack	•pencil and paper
	•whistle	•guide books
	•rain gear	•hat
	•first-aid kit, any personal medication	



# PRE-SITE ACTIVITY

## AIR QUALITY



**Grade Level:** Fifth

**Subject Area:** Science,  
Social Studies

**Curriculum:**

Science  
5.E.1 - Understand weather  
patterns

**Activity time:** 30-45  
minutes

**Setting:** Classroom

**Skills:** Collecting  
information, Connecting,  
Discussing, Hypothesizing,  
Inferring, Identifying cause  
and effect

**Vocabulary:**

- Coriolis effect
- jet stream
- pollution

**Objectives:**

- 1) Identify sources and effects of air pollution
- 2) Plot a course and measure distance on a map

**Materials:**

- Background Information Sheet
- Student Activity Sheet
- Map

**Procedure:**

Ask the students to think about differences in technology and the environment by imagining what it was like for a Cherokee youth living in the Smokies in the 1760's. Discuss the causes and effects of air pollution in the Great Smoky Mountains National Park using the air pollution background information. Have the students complete the mapping pollution activity and supervise the *Pollutionary* game

**Extension:**

Create a chart at school that displays the daily air quality index. Local newspapers often list an air quality section on the weather page. Adjust chart daily so that all students will know the air quality in your area.



# PRE-SITE ACTIVITY

## AIR QUALITY (CONTINUED)

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### Background Information

#### Acid Rain

The catch phrase “acid rain” was first coined in 1852 by Robert Angus Smith, a scientist living and working in England. Acid rain, however, only describes one of the routes whereby acids are added to our ecosystems. The term “acid precipitation” is more encompassing and includes rain, sleet, hail, snow, fog, dew, etc.

Burning of fossil fuels for electric power generation and heating, industrial processes, and transportation release sulfur dioxide and nitrogen oxides into the atmosphere in a dry form. They react with moisture to oxidize creating sulfuric and nitric acids. The acids dissolve in cloud droplets and raindrops and are deposited on the ground via precipitation.

Rainfall in the Southern Appalachians is more than five times as acidic as normal. Cloud water acidity is even more severe. Acid deposition affects plants, streams, lakes and other aquatic resources.

#### The Smokies Haze

The bluish haze which gave the Smokies its name was produced largely by forest vegetation. Leaves of countless trees and other plants emit great amounts of moisture and natural chemicals into the air which react to form a visible suspension.

Today, during periods of summer air stagnation, this natural haze is almost insignificant compared to man-made pollutants that make up over 70% of the haze that obscures your view of the distant mountains. Sulfates which come from burning coals and oil account for most of the haze in the southern Appalachians. Scientist constantly monitor air pollution and study its effects on the Park’s resources. Thick haze from pollution frequently obscures the view from Clingmans Dome, and the dead tops and thinning crowns of spruce trees are signs of extreme stress.

#### Ozone

Another air quality problem, ozone pollution, is also responsible for damaging plants in the Park. Not to be confused with the beneficial ozone layer which shields us from the sun’s harmful rays, ground level ozone pollution is produced when nitrogen oxides mix with sunlight and natural hydrocarbons.

Ozone pollution can affect breathing in people and damage plant life. Research shows that 30 species of plants suffer leaf damage at ozone levels that occur in the park. Ozone concentrations over the ridge tops of the park are the second highest in the U.S. (after California) and have reached the federal public health standards, potentially threatening the health of visitors to the park.



# PRE-SITE ACTIVITY

## AIR QUALITY (CONTINUED)

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### POLLUTIONARY GAME

Break the class into teams. One person from each team comes to the blackboard and is given one of the following words or phrases. Each student at the blackboard will draw something that will help his/her teammates guess what the word or phrase is. Other phrases and words can be created by the students. If there is any additional class time left you can award extra points to the team that can list the most solutions to the problems of pollution (such as recycling, putting cleaning devices on smokestacks, designing electric cars, etc.)

Pollutionary Phrases: Wind currents

- Acid rain
- Acid rain hurts the Smokies
- Cars cause pollution
- Ozone can make you cough
- Smokestacks
- Acid rain gets in the water
- Winds can carry pollution

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### MAPPING POLLUTION

Look at the map on the following page. Copy the map for each student before class. Using the facts below, draw a line tracing the path of a storm system. You should also label the cities the storm moves through. This storm will move from Chicago, IL where it will pick up pollution from several manufacturing plants to Indianapolis, IN where it will pick up car exhaust. From there the storm hits Louisville, KY and Nashville, TN, accumulating more pollutants. Then it moves across Nashville, TN. The storm begins slowing down as it moves into Knoxville, TN where pollution from nearby coal-fired power plants is added. Finally the storm, and its accumulated pollutants, moves into the Great Smoky Mountains National Park, where it settles. See if you can answer the following questions.

A. Use a ruler measure the distance the storm traveled. Roughly how far did it travel? Map scale is approximate: one inch = 375 miles.

B. If the storm moved at a rate of one hundred miles per day, how long did it take it to reach the Smokies?

Summary:

You can see that the pollution from far away does affect the Park. It also affects you as a visitor to the Park, though you may not notice it. Just fifty years ago visitors could see an average of one hundred miles, now a visitor can see an average of just twelve to nineteen miles. The white haze that hangs over the Smokies and blocks the beautiful mountain views is not natural; it is pollution. Most of this pollution is made up of chemicals called sulfates which are produced by burning coal and oil.





# ON-SITE ACTIVITY PARK RANGER DIRECTED LESSONS



**Grade Level:** Fifth

**Subject Area:** Science

**Activity time:** 3 hours (including a lunch break) for short program and 5 hours (including lunch break) for long program)

**Setting:** Outdoors in the park

**Skills:** Collecting information, Communicating, Connecting, Discussing, Experimenting, Gathering information, Hypothesizing, Identifying cause and effect, Inferring, Listening, Measuring, Predicting, Public speaking, Recording data, Role playing,

## **Vocabulary:**

Abiotic, Acid precipitation, Adaptation, Air pollution, Balsam woolly adelgid, Barometric pressure, Biotic, Coniferous, Deciduous, Ecosystem, Haze, Prevailing winds, Topography, Watershed

## **Objectives:**

- 1) Describe the differences between ecosystems found in the region.
- 2) Identify the function of producers, consumers and decomposers.
- 3) Explain 3 ways humans affect ecosystems.
- 4) Define a watershed.
- 5) Explain how the mountains influence the local weather patterns and pollution concentrations.

**Materials:** Study equipment provided by park rangers

## **Background:**

The following is a brief description of your on-site activities. These activities will be led by park staff, but please be familiar with them, as the classroom teacher may be asked to assist on-site.

*Groups can choose one of two options to reach the tower depending on time available. Both options return to the parking area via the Clingmans Dome Trail (0.5 mile, approximately 15 minutes).*

### **Clingmans Dome Trail - 45 minutes (0.5 mile)**

Students discuss interdependence, weather, and threats to the Smokies as they walk along a paved path to the tallest point in the national park.

### **Bypass Trail / Appalachian Trail - 1 hour 15 minutes (0.9 mile)**

Surrounded by the sounds of the forest, students discuss weather, interdependence, and threats to the Smokies along the trail to the top.

## **Activity options:**

### **Ranger-Ride-Along (45 minutes - 1 hour)**

A park ranger will accompany the students on the bus to discuss the ecology, biodiversity, and history of Great Smoky Mountains National Park.

### **Elevation Change (30 minutes)**

Students will conduct an experiment for air pressure using a balloon. Data will be collected and compared. *This activity is split between Oconaluftee Visitor Center and Clingmans Dome parking lot.*

### **Weather Watchers (30 - 45 minutes)**

Students will use meteorological instruments to measure real-time weather data and make a prediction for the following day's weather.

### **Clingmans Dome Tower (15 minutes)**

From the highest point in the national park students can observe the surrounding landscape and synthesize natural and human-created changes over time.

### **Food Web Game (20 minutes)**

Everything in a high-elevation ecosystem relies on something else. Students are challenged to determine a logical progression of needs.



# POST-SITE ACTIVITY

## OBSERVING AIR POLLUTION



**Grade Level:** Fifth

**Subject Area:** Science, Language Arts, Health, Mathematics

**Activity time:** 30-45 minutes

**Setting:** Indoors

**Skills:** Collecting information, Connecting, Brainstorming, Analyzing, Experimenting, Presenting, Communicating

### Objectives:

- 1) Define what air pollution is.
- 2) List sources of air pollution around their community.
- 3) Describe what air pollution can look like.

### Materials:

- \* 2 large lids from jars of coffee cans
- \* Petroleum jelly
- \* Scissors
- \* Hand lens/microscope
- \* Microscope slides
- \* Glue
- \* 1 sheet of black/1 sheet of white construction paper

### Procedure:

Discuss terms utilized and concepts discussed during completion of the unit. Demonstrate how to cut construction paper and create collection "lids" for experiment. Supervise experiment and development of charts. Summarize what the students learned about air quality, high elevation forest communities, and threats to the high elevation forest.

### Creation of collection "lids"

1. Using the jar lids as patterns, draw and cut out a black paper circle and a white paper circle.
2. Fold each circle. Then cut each circle in half along the fold line.
3. Glue one white half-circle and one black half circle in each lid.
4. Cover the paper in each lid with a thin coating of petroleum jelly.
5. Leave the lids in place for 2 days.

### Analysis:

Use a hand lens to observe the particle pollution each lid collects. You could also smear a microscope slide with petroleum jelly from each slide and observe the pollution with a microscope. Chart the number, and possibly type, of particles collected in each location.

### Application:

1. Which lid collected the most particles?
2. Compare the lid you left inside the classroom with other lids left inside the classroom. Did all of the lids collect the same number of particles? Why or why not?

Local newspapers often list an air quality section in the weather section of the paper. Create a chart of particle pollutant counts throughout the year to determine when the air quality is best and worst.

### Extension:

Find out what kinds of fuels students burn at home. Include fuels used in cars, trucks, stoves, furnaces, hot water heaters, and clothes dryers. Make a class chart showing the kinds of fuels your class uses.

Students can also test their pollution knowledge. Visit the State of North Carolina's Division of Air Quality page to play air Jeopardy!

<http://daq.state.nc.us/airaware/kids/jeopardy/instruct.shtml>



# POST-SITE ACTIVITY

## EXOTIC INVASION GAME



**Grade Level:** Fifth

**Subject Area:** Science,  
Social Studies

**Activity time:** 30-45  
minutes

**Setting:** Classroom

**Skills:** Analyzing,  
Brainstorming, Collecting  
information, Communicating,  
Connecting, Presenting

### Objectives:

- 1) Describe what an exotic species is and why exotics are a threat to native species
- 2) Be able to list two exotic species that are causing problems in the United States
- 3) Be able to list two exotic species in the Great Smoky Mountains National Park

### Materials:

- \* Activity sheets
- \* World Map

### Procedure:

Refresh students on what an exotic is. Compare it with a native species. Summarize what the students learned at Clingmans Dome regarding exotics. Play the Exotic Invasion Game with students and lead class discussion of exotics.

Divide the class into groups. Tell them they will be playing a guessing game. You will read them a series of five clues. After you read each clue, give them a moment to think of the correct answer to write down on a piece of a paper. A group representative will bring the answer to you. Even if a group feels they have the answer after only two clues, read all five clues. When all the clues are read, every group must submit an answer. Note the order in which the groups bring you their answers. The first group with the correct answer gets five points, the second, four, etc. Students can confer with their group but at no time should they shout out their answers or discuss them with a competing group. Add up the group's points before the end of the game. You may also wish to have a world map handy so students can see where these exotics came from and how far they traveled.

Summarize what the students learned about exotics and their impact. Exotics can be fungi, germs, insects, mammals, reptiles, birds, or plants. Not all are harmful, but many can have an incredible impact on man and the environment. As people travel greater distances at faster speeds, exotics will become more of a problem. Students can help us in the Smokies by educating others, by volunteering their time (to pull up Japanese grass, or plant a native tree, for example), and by never taking anything into or out of the Park.

### Extension:

Pick one exotic that has affected your area of the country and do an oral report on it.



# EXOTIC INVASION GAME (CONTINUED)



**Exotic #1** Exotics are not a new problem. In fact we'll go back several hundred years, back to the Dark Ages, for our first exotic. Nowadays we worry about exotics harming native plants and animals, but we should remember that anything that affects the environment also affects us, and could do us a lot of harm. As I read these clues, keep in mind that an exotic is not always an animal, plant, or insect.

- Clue 1. I came from the Middle East to Europe in the 1300's.
- Clue 2. I hitched a ride with some fleas in the fur of rats that came by ship to Europe.
- Clue 3. A few hundred years ago I made over 1/3 of the people in Europe get sick and die.
- Clue 4. The disease I cause made their tongues turn black. That's where I got my name.
- Clue 5. Just recently I popped up again, this time in India.

**Exotic #2** We see that exotics are a problem all over the world. The exotics we've talked about came from very far away to their new home. Some exotics in the U.S. didn't travel so far. They just moved from one state to another. That's what happened with our next exotic.

- Clue 1. I live in the Rocky Mountains, but was transported to Oregon and Washington.
- Clue 2. I love mountains, and I'm a great climber.
- Clue 3. I get very hungry and eat native plants and grasses other animals need.
- Clue 4. People enjoy looking at me. Maybe it's my big horns.
- Clue 5. You can find some of my relatives on any farm in North Carolina. You can even find relatives of mine in Hawaii. I'm a big problem there, too.

**Exotic #3** Some exotics are bad not only for the environment, but they hurt us economically. Our next exotic is one of the biggest environmental problems we have today. This exotic seems to be spreading all over the country.

- Clue 1. I came over by getting in tanks filled with water in the bottom of ships from the Middle East. These tanks help balance the ship and were a perfect home for me.
- Clue 2. I attach myself to drain pipes, sewage lines, etc. I clog and damage pipes.
- Clue 3. My North Carolina cousins are unhappy to see me. I eat too much of their food. That is bad because these native species are big business in North Carolina. The Japanese make pearls from them.
- Clue 4. The first part of my name refers to my black and white shell (African animal).
- Clue 5. I got the last part of my name because my whole body is one of these. Hint: What does Arnold Schwarzenegger have a lot of?

**Exotic #4** We've talked about exotics in other countries and other parts of the U.S. Now, let's talk about problems here in the Smokies. As you know from our visit to Clingmans Dome exotics are a big problem here in the Great Smoky Mountains.

- Clue 1. I was brought to this country from Asia to stop erosion. I am good for the soil.
- Clue 2. I can grow as much as two feet per day.
- Clue 3. You've probably seen me growing all over hillsides in North Carolina
- Clue 4. You can make baskets, cookies, medicine, and even gravy from me.
- Clue 5. Unfortunately, I grow too fast. I choke out native plants.





## EXOTIC INVASION GAME (CONTINUED)

**Exotic #5** Our next exotic has been in the Smokies a little less than a hundred years, but this exotic has multiplied fast. I bet lots of you have seen one of them, maybe even touched one.

- Clue 1. I was brought from Europe because people thought it would be a lot of fun to catch me.
- Clue 2. I'm brightly colored, that's how I got my name.
- Clue 3. I'm kind of a bully, so I chase my native cousins here in the Smokies upstream where they don't breed as well.
- Clue 4. I was first released here in the Smokies in the area that's now called Elkmont campground.
- Clue 5. One of my other cousins is found in the Smokies. He does not belong here either and was also brought in for people to catch. He's not as attractive as I am. He's brown.

**Exotic #6** Now let's talk about the most famous exotic here in the Smokies

- Clue 1. I was brought from Russia so people could hunt me. I was penned up in a game preserve in North Carolina, but about 70 years ago I got loose and now there are lots of me.
- Clue 2. Females of my species can have thirteen babies at a time, twice a year.
- Clue 3. I was a little worried when there were red wolves in the Smokies because they like to eat me.
- Clue 4. I like to stick my snout in the ground and root up plants. I have a healthy appetite too, so I take away a lot of food from native animals.
- Clue 5. As you walk through the Great Smoky Mountains National Park, you may see traps set out to catch me.

Answers.

1. *Black plague (Bubonic plague)*
2. *Mountain goats*
3. *Zebra mussels*
4. *Kudzu*
5. *Rainbow trout*
6. *Wild hog*



# POST-SITE ACTIVITY

## EXPLORE YOUR NATIONAL PARKS



**Grade Level:** Fifth

**Subject Area:** Science

**Activity time:** 30 minutes

**Setting:** Indoors

**Skills:** analyzing;  
brainstorming; collecting  
information; communicating;  
computer skills, connecting;  
presenting; research

### Objectives:

- 1) List three features of Great Smoky Mountains National Park that make it special.
- 2) Name several other national parks in their home state.
- 3) Name ten national parks across the country.
- 4) Be able to explain who owns all national parks.
- 5) Earn their online web ranger certification.

**Materials:** internet access

### Background:

The Great Smoky Mountains are world renowned for their diversity of plant and animal species. This great variety makes the park an exemplary outdoor laboratory for the study of relatively undisturbed native flora, fauna, physical environs, and processes of the Southern Appalachians. The park is the largest federally preserved and protected upland area east of the Mississippi River offering park visitors a refuge from the stresses of everyday life.

You and your students can learn more about this special place as well as participate in on-line activities to further your knowledge of the National Park Service and other federally protected lands.

Please check out the following web addresses:

### Especially for Kids

To learn how to become a web ranger for the National Park Service, go to: [www.nps.gov/webrangers](http://www.nps.gov/webrangers)

To learn how to become a Junior Park Ranger at Great Smoky Mountains National Park or other parks, go to:

[www.nps.gov/learn/juniorranger.htm](http://www.nps.gov/learn/juniorranger.htm)

### Especially for Teachers

For a comprehensive understanding of the background and development of the National Park Service, that is perfect for teachers and others those who need the maximum amount of accurate information in the minimum amount of time, go to:

<http://www.ParkTraining.org>

The U.S. Department of Education is pleased to announce the newly remodeled and updated Federal Resources for Education Excellence (FREE) website. It now provides richer, more expansive resources to teachers and students alike. There are over 1,500 resources to take advantage of at FREE ranging from primary historical documents, lesson plans, science visualizations, math simulations and online challenges, paintings, photos, mapping tools, and more. This easily accessible information is provided by federal organizations and agencies such as the Library of Congress, National Archives, National Endowment for the Humanities (NEH), National Gallery of Art, National Park Service, Smithsonian, National Science Foundation (NSF), and National Aeronautics and Space Administration (NASA). Go to: <http://www.free.ed.gov/>



# PARENT/CHAPERONE LETTER

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Greetings Parents/Chaperones:

Park rangers are pleased to be presenting an educational program to the students in Great Smoky Mountains National Park. In order to achieve the goals for a successful program, the park rangers will need your assistance in the following ways:

(These points will help to ensure that park rangers and teachers will be able effectively conduct the lessons and activities throughout the trip.)

- The program will be conducted outside and there will be some hiking throughout the trip. Prepare your student with appropriate footwear, long pants, layers, and rain gear.
- If your child is bringing a lunch from home, we recommend that students bring water to drink and a lunch with minimal packaging. Soft drinks are usually left unfinished by students, and remaining sugary drinks cannot be poured out on the ground. (Minimally packaged lunches lead to less trash being left behind or scattered by the wind. Additionally, this reduces the accumulated trash to be disposed).

If you are a chaperone attending the field trip:

- Please be an active part of the lessons. Keep up with the group and listen to the information being given in the case that you may be called upon to assist (handing out materials, sub-dividing groups etc.).
- Please do not hold conversations with other chaperones or use a cellular phone while the rangers are teaching the students.
- Refrain from smoking during the trip. If you must smoke, please alert a ranger or teacher and remove yourself from the group.
- Please be aware that the program will be conducted outside and that there will be some hiking throughout the trip. Prepare yourself with appropriate footwear, long pants, layers, and rain gear.
- We recommend that parents and students bring a small towel in their backpacks to sit on at lunch (there are no picnic tables at the program site).

Thank you for your needed assistance. We look forward to meeting you on the program!

Sincerely,

The Education Staff at Great Smoky Mountains National Park

