Environmental Science

Merit Badge Workbook

This workbook can help you, but you still need to read the merit badge pamphlet.
This Workbook can help you organize your thoughts as you prepare to meet with your merit badge counselor

Merit Badge Counselors may not require the use of this or any similar workbooks.
You still must satisfy your counselor that you can demonstrate each skill and have learned the information.
You should use the work space provided for each requirement to keep track of which requirements have been completed, and to make notes for discussing the item with your counselor, not for providing full and complete answers.
If a requirement says that you must take an action using words such as "discuss", "show", "tell", "explain", "demonstrate", "identify", etc, that is what you must do.
No one may add or subtract from the official requirements found in Scouts BSA Requirements (Pub.# 33216) and/or on Scouting.org.

The requirements were last issued or revised in 2023 • This workbook was updated in December 2022.

Scout's Name:_____ Unit: _____

Counselor's Name: _____ Phone No.:_____ Email: _____

Please submit errors, omissions, comments or suggestions about this **workbook** to: Workbooks@USScouts.Org
Comments or suggestions for changes to the **requirements** for the **merit badge** should be sent to: Merit.Badge@Scouting.Org

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1. Make a timeline of the history of environmental science in America.

1500s	
1600s	
1700s	
1800s	
1900s	

2000s	

Identify the contribution made by the Boy Scouts of America to environmental science. Include dates, names of people or organizations, and important events.

Date	People/Organizations	Event

2. Define the following terms: population, community, ecosystem, biosphere, symbiosis, niche, habitat, conservation, threatened species, endangered species, extinction, pollution prevention, brownfield, ozone, watershed, airshed, nonpoint source, hybrid vehicle, fuel cell.

Population:	
Community:	
Ecosystem:	
Biosphere:	

Symbiosis:	
Niche:	
Habitat:	
Conservation:	
Threatened species:	
Endangered species:	
Extinction	
Pollution prevention:	
Brownfield:	
Ozone:	
Watershed:	

Airshed:	
Nonpoint source:	
Hybrid vehicle:	
Fuel cell:	

3. Do ONE activity in SEVEN of the following EIGHT categories (using the activities in this pamphlet as the bases for planning and carrying out your projects):

☐ a. Ecology

☐ 1. Conduct and experiment to find out how living things respond to changes in their environments. Discuss your observations with your counselor.

☐ 2. Conduct an experiment illustrating the greenhouse effect. Keep a journal of your data and observations. Discuss your conclusions with your counselor.

☐ 3. Discuss what is an ecosystem. Tell how it is maintained in nature and how it survives.

☐ b. Air Pollution

☐ 1. Perform an experiment to test for particulates that contribute to air pollution. Discuss your findings with your counselor.

☐ 2. Record the trips taken, mileage, and fuel consumption of a family car for seven days, and calculate how many miles per gallon the car gets. Determine whether any trips could have been combined ("chained") rather than taken out and back. Using the idea of trip chaining, determine how many miles and gallons of gas could have been saved in those seven days.

☐ 3. Explain what is acid rain. In your explanation, tell how it affects plants and the environment and the steps society can take to help reduce its effects.

☐ c. Water Pollution

☐ 1. Conduct an experiment to show how living things react to thermal pollution. Discuss your observations with your counselor.

☐ 2. Conduct an experiment to identify the methods that could be used to mediate (reduce) the effects of an oil spill on waterfowl. Discuss your results with your counselor.

☐ 3. Describe the impact of a waterborne pollutant on an aquatic community. Write a 100-word report on how that pollutant affected aquatic life, what the effect was, and whether the effect is linked to biomagnification.

☐ d. Land Pollution

☐ 1. Conduct an experiment to illustrate soil erosion by water. Take photographs or make a drawing of the soil before and after your experiment, and make a poster showing your results. Present your poster to your patrol or troop. (Per National, “troop” means “unit”.)

☐ 2. Perform an experiment to determine the effect of an oil spill on land. Discuss your conclusions with your counselor.

☐ 3. Photograph an area affected by erosion. Share your photographs with your counselor and discuss why the area has eroded and what might be done to help alleviate the erosion.

☐ e. Endangered Species

☐ 1. Do research on one endangered species found in your state. Find out what its natural habitat is, why it is endangered, what is being done to preserve it, and how many individual organisms are left in the wild. Prepare a 100-word report about the organism, including a drawing. Present your report to your patrol or troop.

☐ 2. Do research on one species that was endangered, or threatened, but which has now recovered. Find out how the organism recovered, and what its new status is. Write a 100-word report on the species and discuss it with your counselor.

☐ 3. With your parent's and counselor's approval, work with a natural resource professional to identify two projects that have been approved to improve the habitat for a threatened or endangered species in your area. Visit the site of one of these projects and report on what you saw.

☐ f.Pollution Prevention, Resource Recovery, and Conservation

☐ 1. Look around your home and determine 10 ways your family can help reduce pollution. Practice at least two of these methods for seven days and discuss with your counselor what you have learned.

☐ 2. Determine 10 ways to conserve resources or use resources more efficiently in your home, at school, or at camp. Practice at least two of these methods for five days and discuss with your counselor what you have learned.

☐ 3. Perform an experiment on packaging materials to find out which ones are biodegradable. Discuss your conclusions with your counselor.

☐ g. Pollination

☐ 1. Using photographs or illustrations, point out the differences between a drone and a worker bee. Discuss the stages of bee development (eggs, larvae, pupae). Explain the pollination process, and what propolis is and how it is used by honey bees. Tell how bees make honey and beeswax, and how both are harvested. Explain the part played in the life of the hive by the queen, the drones, and the workers.

☐ 2. Present to your counselor a one-page report on how and why honey bees are used in pollinating food crops. In your report, discuss the problems faced by the bee population today, and the impact to humanity if there were no pollinators. Share your report with your troop or patrol, your class at school, or another group approved by your counselor.

Before you choose requirement 3g(3), you will need to first find out whether you are allergic to bee stings. Visit an allergist or your family physician to find out. If you are allergic to bee stings, you should choose another option within requirement 3. In completing requirement 3g(3), your counselor can help you find an established beekeeper to meet with you and your buddy. Ask whether you can help hive a swarm or divide a colony of honey bees. Before your visit, be sure your buddy is not allergic to bee stings. For help with locating a beekeeper in your state, visit www.beeculture.com and click on " Resources," then select "Find Help" and "Find a Local Beekeeper."

☐ 3. Hive a swarm OR divide at least one colony of honey bees. Explain how a hive is constructed

☐ h. Invasive Species

☐ 1. Learn to identify the major invasive plant species in your community or camp and explain to your counselor what can be done to either eradicate or control their spread.

☐ 2. Do research on two invasive plant or animal species in your community or camp. Find out where the species originated, how they were transported to the United States, their life history, how they are spread, and the recommended means to eradicate or control their spread. Report your research orally or in writing to your counselor.

☐ 3. Take part in a project of at least one hour to eradicate or control the spread of an invasive plant species in your community or camp.

4. Choose two outdoor study areas that are very different from one another (e.g., hilltop vs. bottom of a hill; field vs. forest; swamp vs. dry land). For BOTH study areas, do ONE of the following:

   a. Mark off a plot of 4 square yards in each study area, and count the number of species found there. Estimate how much space is occupied by each plant species and the type and number of non-plant species you find.

   Study Plot Location 1:_____ Number of Species: _____

Plant Species	Space each occupies

Non-Plant Species	Number found

   Study Plot Location 2:_____ Number of Species: _____

Plant Species	Space each occupies

Non-Plant Species	Number found

Report to your counselor orally or in writing the biodiversity and population density of these study areas.

b. Make at least three visits to each of the two study areas (for a total of six visits), staying for at least 20 minutes each time, to observe the living and nonliving parts of the ecosystem. Space each visit far enough apart that there are readily apparent differences in the observations. Keep a journal that includes the differences you observe

Study Area 1:

Visit 1 Date: _____ **Time Started:** _____ **Time Ended**_____

Observations of living parts:

Observations of nonliving parts:

Differences noted:

Visit 2 Date: _____ Time Started: _____ Time Ended_____

Observations of living parts:

Observations of nonliving parts:

Differences noted:

Visit 3 Date: _____ Time Started: _____ Time Ended_____

Observations of living parts:

Observations of nonliving parts:

Differences noted:

Study Area 2:

Visit 1 Date: _____ Time Started: _____ Time Ended_____

Observations of living parts:

Observations of nonliving parts:

Differences noted:

Visit 2 Date: _____ Time Started: _____ Time Ended_____

Observations of living parts:

Observations of nonliving parts:

Differences noted:

Visit 3 Date: _____ Time Started: _____ Time Ended_____

Observations of living parts:

Observations of nonliving parts:

Differences noted:

Discuss your observations with your counselor.

5. Identify the items that would need to be included in an environmental impact statement for a construction project such as building a house, adding a new building to your Scout camp, or one you create on your own that is approved by your counselor.

6. Find out about three career opportunities in environmental science.

1.
2.
3.

Pick one and explain how to prepare for such a career.

Discuss with your counselor what education and training are required, and explain why this profession might interest you.

Education

Training

Why this profession might interest you.

When working on merit badges, Scouts and Scouters should be aware of some vital information in the current edition of the *Guide to Advancement* (BSA publication 33088). Important excerpts from that publication can be downloaded from http://usscouts.org/advance/docs/GTA-Excerpts-meritbadges.pdf.
You can download a complete copy of the *Guide to Advancement* from http://www.scouting.org/filestore/pdf/33088.pdf.