



SCOUTS PARTICIPATING IN A SCOUTMASTER BUCKY MERIT BADGE OPPORTUNITY (ONLINE OR IN PERSON), PLEASE CONSIDER ALSO USING THE ENVIRONMENTAL SCIENCE MERIT BADGE CLASS PREPARATION PAGE FOR CLARIFICATIONS, INSIGHTS, AND EXPECTATIONS.

https://scoutmasterbucky.com/merit-badges/environmental-science/environmental-science-cpp.pdf

#### **ENVIRONMENTAL SCIENCE MERIT BADGE WORKBOOK**

**REQUIREMENT 1:** 

Make a time line of the history of environmental science in America. Identify the contribution made by the Boy Scouts of America to environmental science. Include dates, names of people or organizations, and important events.

	Date	Name	Event
1800			
1810			
1820			
1830			
1840			
1850			
1860			
1870			
1880			
1890			
1900			
1910			
1920			
1930			
1940			
1950			
1960			
1970			
1980			
1990			
2000			
2010			
2020			





REQUIREMENT 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:	

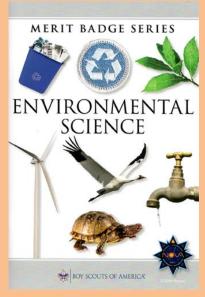




fuel cell:		
		The second secon

FYI: It is *CLEARLY* stated that the Environmental Science Merit Badge Pamphlet should be referenced for the basis of planning and projects for each of the components of Requirement 3.

Requirement 3 "Do ONE activity from EACH of the following categories (using the activities in this pamphlet [ENVIRONMENTAL SCIENCE] as the basis for planning and projects):"



**REQUIREMENT 3:** 

Do ONE activity from EACH of the following categories (using the activities in this pamphlet as the basis for planning and projects):the activities in the Environmental Science Merit Badge Pamphlet as the basis for planning and projects.





F001 00

DO ONE OF THE FOLLOWING ACTIVITIES (3A1, 3A2, or 3A3) FOR REQUIREMENT 3A			
ECOLOGY			
<del></del>			
REQUIREMENT 3a1:	Conduct an experiment to find out how living things respond to changes in their environments. Discuss your observations with your counselor.		
Experiment Title:			
State the Problem:			
Gather Information (list s	ources):		
Form a Hypothesis:			





Do an Experiment (explain):	
Analyze the Data:	-
	_
Conclusions:	
	1





ECOLOGY	
REQUIREMENT 3a2:	Conduct an experiment illustrating the greenhouse effect. Keep a journal of your data and observations. Discuss your conclusions with your counselor.
Experiment Title:	
State the Problem:	
Gather Information (list s	sources):
`	
Form a Hypothesis:	





Do an Experiment (explain):
Anadama (I. a Data
Analyze the Data:
Conclusions:
Conclusions.





ECOLOGY	
REQUIREMENT 3a3:	Discuss what is an ecosystem. Tell how it is maintained in nature and how it survives.
What is an ecosystem:	
How is an Ecosystem ma	aintained and how does it survive:
Tiow is all Ecosystem in	anitalized and new does it survive.





DO ONE OF THE FOLLOWING ACTIVITIES (3B1, 3B2, or 3B3) FOR REQUIREMENT 3B

AIR POLLUTION	
REQUIREMENT 3b1:	Perform an experiment to test for particulates that contribute to air pollution. Discuss your findings with your counselor.
Experiment Title:	
State the Problem:	
Cathor Information /list o	
Gather Information (list s	ources):
Form a Hypothesis:	





Do an Experiment (explain):		
Analyze the Data:	-	
	_	
Conclusions:		
	1	





QUIREMENT 3b2:	Record the t calculate how				otion of a fam	ily car for se	ven days,
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Trip 1 total miles							
Total gallons used							
Trip 2 total miles							
Total gallons used							
Trip 3 total miles							
Total gallons used							
Trip 4 total miles							
Total gallons used							
Trip 5 total miles							
Total gallons used							
Trip 6 total miles							
Total gallons used							
FORMULA FOR C	OMPUTING MILE						LLON
Daily Trip total miles							
Daily total gallons used							
Daily miles per gallon							





REQUIREMENT 3b2:	Determine whether any trips could have been combined ("chained") rather than taken out and back.
Notes:	
REQUIREMENT 3b2:	Using the idea of trip chaining, determine how many miles and gallons of gas could have been saved in those seven days.
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	Using the idea of trip chaining, determine how many miles and gallons of gas could have been saved in those seven days.





AIR POLLUTION	
REQUIREMENT 3b3:	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.
Notes:	





DO ONE OF THE FOLLOWING ACTIVITIES (3C1, 3C2, or 3C3) FOR REQUIREMENT 3C

WATER POLLUTION	
REQUIREMENT 3c1:	Conduct an experiment to show how living things react to thermal pollution. Discuss your observations with your counselor.
Experiment Title:	
State the Problem:	
Gather Information (list s	sources):
- 11 11 1	
Form a Hypothesis:	





Do an Experiment (explain):		
Anadama (I. a Data		
Analyze the Data:		
Conclusions:		
Conclusions.		





WATER POLLUTION	
REQUIREMENT 3c2:	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.
Experiment Title:	
State the Problem:	
Gather Information (list s	sources):
Form a Hypothesis:	





analyze the Data:
Conclusions:





WATER POLLUTION	
REQUIREMENT 3c3:	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.
Notes:	





DO ONE OF THE FOLLOWING ACTIVITIES (3D1, 3D2, or 3D3) FOR REQUIREMENT 3D

LAND POLLUTION	
REQUIREMENT 3d1:	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 counselor.
Experiment Title:	
State the Problem:	
Gather Information (list s	sources):
Form a Hypothesis:	





Do an Experiment (explain):
Analyze the Data:
Conclusions:
DON'T FORGET TO MAKE YOUR POSTER

2024 Edition





LAND POLLUTION							
REQUIREMENT 3d2:	Perform an experiment to determine conclusions with your counselor.	the effe	ect of ar	n oil spil	on land.	Discuss	your
Experiment Title:							
State the Problem:							
Gather Information (list s	sources):						
Form a Hypothesis:							
7,							





Do an Experiment (explain):	
Analyze the Data:	
Conclusions:	





LAND POLLUTION	
REQUIREMENT 3d3:	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.
Notes:	





# DO ONE OF THE FOLLOWING ACTIVITIES (3E1, 3E2, or 3E3) FOR REQUIREMENT 3E **ENDANGERED SPECIES REQUIREMENT 3e1:** 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. **Endangered Species: Species' Natural Habitat:** Why is it Endangered? What is being done to preserve the species? How many still exist in the wild?





REQUIREMENT 3e1:	Prepare a 100-word report about the organism, including	a drawing.
100-word report on the E	Endangered Species (include a drawing):	
Use an additional piece of paper	er if you need more room for your report or drawing	
REQUIREMENT 3e1:	Present your report to your patrol or troop.	
Adult Leader's Name	P	resentation Date
Adult Leader's Signature	D	ate presentation completed
		completed





ENDANGERED SPECIES	
REQUIREMENT 3e2:	Do research on one species that was endangered or threatened but that has now recovered. Find out how the organism recovered, and what its new status is.
Endangered or Threaten	ed Species:
How the Species Recove	red:
Tion the openies recove	iou.
What is the Openies Nove	Otatura O
What is the Species New	Status?





REQUIREMENT 3e2:	Write a 100-word report on the species and discuss it with your counselor.			
100-word report on the Ei	ndangered or Threatened Species:			
Use an additional piece of paper if you need more room for your report				





ENDANGERED SPECIES				
REQUIREMENT 3e3:	With your parent's and counselor's appridentify two projects that have been apendangered species in your area. Visit to you saw.	proved to improve the habita	at for a t	hreatened or
	RHAPS IMPLIED, THIS REQUIREMENT DOES NOT S PERFORM THE TASK. PLEASE NOTE, AS WITH AN' BADGE COUNSELOR.			
Natural Resource Profess	sional:			
Associated Organization	(s):			
Parent's Name		Phone		
Parent's Signature		Date		approved
Counselor's Name		Phone		
Counselor's Signature		Date		approved
Notes:				





PROJECT #1
Name:
Location:
Notes:
PROJECT #2
Name:
Location:
Notes:
SELECTED PROJECT TO VISIT
PROJECT 1 or PROJECT 2?
Date Visited:
What did you see?





DO ONE OF THE FOLLOWING ACTIVITIES (3F1, 3F2, or 3F3) FOR REQUIREMENT 3F

POLLUTION PREVENTION, RESOURCE RECOVERY, AND CONSERVATION
REQUIREMENT 3f1: Look around your home and determine 10 ways your family can help reduce pollution.
Pollution Reduction Method 1:
Pollution Reduction Method 2:
Pollution Reduction Method 3:
Pollution Reduction Method 4:
Pollution Reduction Method 5:





Pollution Reduction Method 6:
Pollution Reduction Method 7:
Tollution reduction method 7.
Pollution Reduction Method 8:
Pollution Reduction Method 9:
Foliution Reduction Method 9.
Pollution Reduction Method 10:





REQUIREMENT 3f1:	Practice at least two of these methods for seven days and discuss with your counselor what you have learned.				
Selected Method #1:					
Selected Method #2:					
Notes:					





POLLUTION PREVENTION, RESOURCE RECOVERY, AND CONSERVATION			
REQUIREMENT 3f2:	Determine 10 ways to conserve resources or use resources more efficiently in your home, at school, or at camp.		
Resource Conservation	Method 1:		
Resource Conservation	Masha d O		
Resource Conservation	ivietnod 2:		
Resource Conservation	Method 3:		
Resource Conservation	Method 4:		
Resource Conservation	Method 5:		





Resource Conservation Method 6:
Resource Conservation Method 7:
Resource conservation method 7.
Resource Conservation Method 8:
Resource Conservation Method 9:
Resource Conservation Method 10:





REQUIREMENT 3f2:	Practice at least two of these methods for seven days and discuss with your counselor what you have learned.				
Practiced Method #1:					
Practiced Method #2:					
Practiced Method #2:					
Notes:					





POLLUTION PREVENTION, RESOURCE RECOVERY, AND CONSERVATION			
REQUIREMENT 3f3:	Perform an experiment on packaging materials to find out which ones are biodegradable. Discuss your conclusion with your counselor.		
Experiment Title:			
State the Problem:			
Gather Information (list s	sources):		
Form a Hypothesis:			





Do an Experiment (explain):			
Anadama (I. a Data			
Analyze the Data:			
Conclusions:			
Conclusions.			



**POLLINATION** 



### **Environmental Science Merit Badge**

DO ONE OF THE FOLLOWING ACTIVITIES (3G1, 3G2, or 3G3) FOR REQUIREMENT 3G

REQUIREMENT 3g1:	Using photographs or illustrations, point out the differences between a drone and a worker bee.			
Don't forget to bring your photographs / illustrations with you to share with the merit badge counselor.				
This part of the requirement must be reviewed with your merit badge counselor.  BE PREPARED!				
DE FREPARED!				
REQUIREMENT 3g1:	Discuss the stages of bee development (eggs, larvae, pupae).			
Eggs:				
Larvae:				
Pupae:				









REQUIREMENT 3g1: Tell how bees make honey and beeswax, and how both are harvested.			
How Honey is Made: How Beeswax is Made:			
How Honov is Harvostad	How Boosway is Harvostod:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		
How Honey is Harvested:	How Beeswax is Harvested:		





REQUIREMENT 3g1:	Explain the part played in the life of the hive by the queen, the drones, and the workers.				
Queen:					
Drones:					
Diolics.					
Workers:					





POLLINATION	
REQUIREMENT 3g2:	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.
Notes:	





**REQUIREMENT 3g2:** Share your report with your troop or patrol, your class at school, or another group approved by your counselor.

COUNSELOR APPROVAL: PERHAPS IMPLIED, THIS REQUIREMENT DOES NOT STATE THAT YOU NEED THE COUNSELOR'S APPROVAL AHEAD OF TIME TO PREPARE AND PERFORM THE TASK. PLEASE NOTE, AS WITH ANY REQUIREMENT, ACCEPTANCE IS AT THE DISCRETION AND SATISFACTION OF THE MERIT BADGE COUNSELOR

SA	TISFACTION OF THE MERIT BADGE COUNSELOR.		
Gr	oup to Present to:		
Da	te and Location:		
	Counselor's Name	Phone	-
	Counselor's Signature	Date	
			approved
	Adult Leader's or Teacher's Name	Phone	<del>.</del>
	Addit Edda of Good Foldonia Good and Good Good Good Good Good Good Good Go	1 110110	
	Adult Leader's or Teacher's Signature	Date	presented
			honey-bee report
No	otes:		





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."

#### **POLLINATION**

**REQUIREMENT 3g3:** Hive a swarm OR divide at least one colony of honey bees.

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 "Bee Resources," then "Find a Local Beekeeper.

**REQUIREMENT 3g3:** Explain how a hive is constructed. Notes:





DO ONE OF THE FOLLOWING ACTIVITIES (3H1, 3H2, or 3H3) FOR REQUIREMENT 3H

INVASIVE SPECIES	
REQUIREMENT 3h1:	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.
Notes:	





INVASIVE SPECIES	
REQUIREMENT 3h2:	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.
INVASIVE SPECIES #1:	
Name:	plant animal
Where the species origin	nated:
Hayr it was transparted t	a the United States.
How it was transported to	o the Office States:
The species Life History:	





How the species spread:	
Recommended eradication / control methods:	





INVASIVE SPECIES #2:	
Name:	plant
	animal
Where the species originated:	
How it was transported to the United States:	
now it was transported to the officed states.	
The species Life History:	





How the species spread:	
December de describes de control montre de c	
Recommended eradication / control methods:	





INVASIVE SPECIES	
REQUIREMENT 3h3:	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.
Project:	
Project Date and Locatio	n:
Notes:	





**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:

#### DO ONE OF THE FOLLOWING (4A OR 4B) FOR REQUIREMENT 4 FOR BOTH STUDY AREAS

REQUIREMENT 4a:	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 nonplant species you find. Write a report that adequately discusses the biodiversity and population density of these study areas. Discuss your report with your counselor.			
Study Plot Location #1:				
Description of Location #	<i>‡</i> 1:			
Non-Plant Species	# found	space each species occupies		
Plant Species	# found	space each species occupies		
Notes for Study Plot #1:				
Notes for Study Flot #1.				





Study Plot Location #2:		
Description of Location #2:		
Non-Plant Species	# found	space each species occupies
Plant Species	# found	space each species occupies
Notes for Study Plot #2:		





R	E	O	U	IR	E	ИE	NT	4b:

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. Then, write a short report that adequately addresses your observations, including how the differences of the study areas might relate to the differences noted, and discuss this with your counselor.

study areas might relate to t	the differences noted, and	discuss this with your counselor.	
Study Area Location #1:			
Description of Location #1:			
STUDY LOCATION #1			
Study Location #1 visit date #1	time started	time ended	
Observations of living parts of the ecosystem:			
Observations of nonliving parts of the ecosystem:			





Study Location #1 visit date #2	time started	time ended
Observations of living parts of the ecosystem:		
Observations of nonliving parts of the ecosystem:		
observations of nonliving parts of the ecosystem.		
Differences noted since last visit:		





Study Location #1 visit date #3	time started	time ended	
Observations of living parts of the ecosystem:			
Observations of nonliving parts of the appropriate			
Observations of nonliving parts of the ecosystem:			
Differences noted since last visit:			





STUDY LOCATION #2		
Study Location #2 visit date #1	time started	time ended
Observations of living parts of the ecosystem:		
Observations of nonliving parts of the ecosystem:		





Study Location #2 visit date #2	time started	time ended
Observations of living parts of the ecosystem:		
Observations of nonliving parts of the ecosystem:		
Observations of normining parts of the ecosystem.		
Differences noted since last visit:		





Study Location #2 visit date #3	time started	time ended	_
Observations of living parts of the ecosystem:			
Observations of nonliving parts of the ecosystem:			
Differences noted since last visit:			





**REQUIREMENT 5:** 

Using the construction project provided or a plan you create on your own, identify the items that would need to be included in an environmental impact statement for the project planned.

An environmental impact study is usually required before any major project can be started. The study tries to be objective (not for or against the project) and tries to list all the benefits along with all the disadvantages. It considers the effect upon living and non-living parts of the environment. Your statement should look something like the following:

An Environmental Impact Statement for the

(Proposed Project Name) Prepared by (Individual's, Patrols, or Troop's Name) (Date statement is finished)

Project: Site:

**Historical Impact**: List information about what has happened previously in this area. What types of people (if any) have lived there? What other construction has gone on before?

**Geological Impact**: What type of land will be affected (desert, grassland, mountain slope, intercity, etc.)? What is the ground like (sand, clay, rocky, etc.)? Is it located near an earthquake fault line?

**Water Impact**: Will the community's water supply support the extra water needed during and after the project is finished? Is there underwater streams or water tables that will be affected?

**Wildlife Impact**: Will the building of the project affect the natural habitat of natural wildlife? Does it restrict or substantially reduce wildlife habitat? Will wildlife still be able to have proper food, water, and shelter? Will the introduction of man into this area force some wildlife to leave the area?

**Economic Impact**: How will this project affect the community's economy? Will it increase, decrease, or be of little affect? Will it affect property values? Will in provide more jobs for the community?

**Visual Impact**: How does the project affect the scenic beauty of the area? Will the structures impact the view for the surrounding homes?

**Transportation Impact**: Will the existing infrastructure (roads, traffic lights, highway access, etc.) be sufficient for the added traffic or will new roads be needed? Who will pay for the cost of any improvement?

**Community Impact**: Does the project fit into the theme of the community? Does it prescribe to the ideals and morals of the community?





Your Environmental Impact Statement:





REQUIREMENT 6:	Find out about three career opportunities in environmental science.
Career Opportunity #1:	
Career Opportunity #2:	
Career Opportunity #3:	
REQUIREMENT 6:	Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor.
Selected Career Opportu	nity:
Educational Requirement	ts:
Training Requirements:	
Experience Requirements	S:
REQUIREMENT 6:	Explain why this profession might interest you.
Notes:	