



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

Scouts participating in a Scoutmaster Bucky merit badge opportunity, whether online or in person, should consider using the Geology merit badge pamphlet for discovery and knowledge, along with the class preparation pages for clarifications, insights, and expectations.

<https://scoutmasterbucky.com/merit-badges/geology/geology-pamphlet.pdf>

<https://scoutmasterbucky.com/merit-badges/geology/geology-cpp.pdf>

**REQUIREMENTS 4a, 5a1, 5a4, and 6a REQUIRE COUNSELOR APPROVAL.**

**REQUIREMENTS 4a and 6a REQUIRE PARENT / GUARDIAN APPROVAL.**

**REQUIREMENT 1:** Define geology.

Notes:

**REQUIREMENT 1:** Discuss how geologists learn about rock formations.

Notes:

**REQUIREMENT 1:** In geology, explain why the study of the present is important to understanding the past.

Notes:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**REQUIREMENT 2:** Pick three resources that can be extracted or mined from Earth for commercial use. Discuss with your counselor how each product is discovered and processed.

**RESOURCE #1:**

Resource:

How is this resource discovered:

How is this resource processed:

**RESOURCE #2:**

Resource:

How is this resource discovered:

How is this resource processed:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

RESOURCE #3:

Resource:

How is this resource discovered:

How is this resource processed:

**REQUIREMENT 3:** Review a geologic map of your area or an area selected by your counselor, and discuss the different rock types and estimated ages of rocks represented. Determine whether the rocks are horizontal, folded, or faulted, and explain how you arrived at your conclusion.

Consider using the [Geology Merit Badge Pamphlet](#) for preparation information  
**This requirement must be reviewed with your merit badge counselor.**  
**BE PREPARED!**

Notes:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**DO ONE OF THE FOLLOWING (4A or 4B) FOR REQUIREMENT 4**

**REQUIREMENT 4a:** With your parent or guardian's and counselor's approval, visit with a geologist, land use planner, or civil engineer. Discuss this professional's work and the tools required in this line of work. Learn about a project that this person is now working on, and ask to see reports and maps created for this project. Discuss with your counselor what you have learned.

**PARENT/GUARDIAN APPROVAL:** IS REQUIRED.

\_\_\_\_\_  
Parent's / Guardian's Name

\_\_\_\_\_  
Phone or Email

\_\_\_\_\_  
Parent's / Guardian's Signature

\_\_\_\_\_  
Date ☐ *approved*

**COUNSELOR APPROVAL:** IS REQUIRED.

\_\_\_\_\_  
Counselor's Name

\_\_\_\_\_  
Phone or Email

\_\_\_\_\_  
Counselor's Signature

\_\_\_\_\_  
Date ☐ *approved*

\_\_\_\_\_  
Person's Name, Title, and Profession to Visit:

\_\_\_\_\_  
Date and Location of Visit:

\_\_\_\_\_  
Current Project Reviewed:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

Tools required for this person's work:

Notes:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**REQUIREMENT 4b:** Find out about three career opportunities available in geology.

Career Opportunity #1:

Career Opportunity #2:

Career Opportunity #3:

**REQUIREMENT 4b:** Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor.

Selected Career Opportunity:

Education Requirements:

Training Requirements:

Experience Requirements:

**REQUIREMENT 4b:** Explain why this profession might interest you.

Notes:



# Geology Merit Badge Workbook - Surface and Sedimentary Process

## SCOUTMASTER BUCKY

### Requirement 5a - Surface and Sedimentary Processes Option

**REQUIREMENT 5a1:** Conduct an experiment approved by your counselor that demonstrates how sediments settle from suspension in water.

Experiment:

**COUNSELOR APPROVAL:** IS REQUIRED.

\_\_\_\_\_  
Counselor's Name

\_\_\_\_\_  
Phone or Email

\_\_\_\_\_  
Counselor's Signature

\_\_\_\_\_  
Date ☐ *approved*

**REQUIREMENT 5a1:** Explain to your counselor what the exercise shows and why it is important.

Notes:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**REQUIREMENT 5a2:** Using topographical maps provided by your counselor, plot the stream gradients (different elevations divided by distance) for four different stream types (straight, meandering, dendritic, trellis).

Consider using the [Geology Merit Badge Pamphlet](#) for preparation information

**This requirement must be reviewed with your merit badge counselor.**

**BE PREPARED!**

**REQUIREMENT 5a2:** Explain which stream types (straight, meandering, dendritic, trellis) flow fastest and why, and which ones will carry larger grains of sediment and why.

**STRAIGHT:**

Flow:

Sediment:

**MEANDERING:**

Flow:

Sediment:





## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

DENDRITIC:

Flow:

Sediment:

TERLLIS:

Flow:

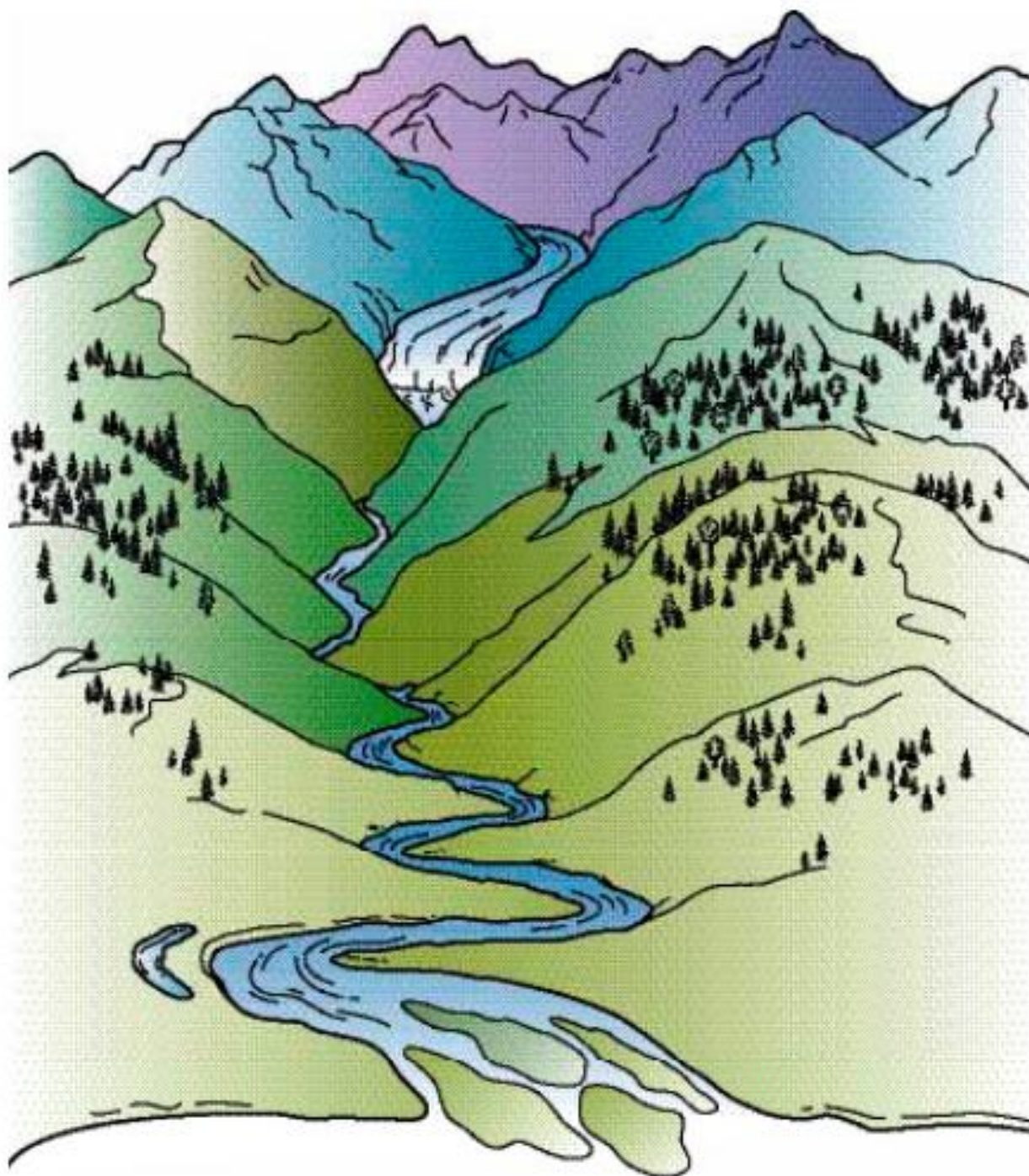
Sediment:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**REQUIREMENT 5a3:** On a stream diagram, show areas where you will find the following features: cut bank, fill bank, point bar, medial channel bars, lake delta.





## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**REQUIREMENT 5a3:** Describe the relative sediment grain size found in each feature.

Cut Bank:

Fill Bank:

Point Bar:

Medial Channel Bars:

Lake Delta:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**REQUIREMENT 5a4:** Conduct an experiment approved by your counselor that shows how some sedimentary material carried by water may be too small for you to see without a magnifier.

Consider using the [Geology Merit Badge Pamphlet](#) for preparation information

**This requirement must be reviewed with your merit badge counselor.**

**BE PREPARED!**

Experiment to be conducted:

**COUNSELOR APPROVAL:** IS REQUIRED.

Counselor's Name

Phone or Email

Counselor's Signature

Date

☐

*approved*

Notes:

**REQUIREMENT 5a5:** Visit a nearby stream. Find clues that show the direction of water flow, even if the water is missing. Record your observations in a notebook, and sketch those clues you observe. Discuss your observations with your counselor.

Be sure to bring your notebook with sketches to share with your merit badge counselor

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**This requirement must be reviewed with your merit badge counselor.**

**BE PREPARED!**



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**DO ONE OF THE FOLLOWING (6A, 6B, 6C, or 6D) FOR REQUIREMENT 6**

**REQUIREMENT 6a:** Visit a science museum or the geology department of a local university that has fossils on display. With your parent or guardian's and counselor's approval, before you go, make an appointment with a curator or guide who can show you how the fossils are preserved and prepared for display.

Place to Visit:

**PARENT/GUARDIAN APPROVAL:** IS REQUIRED.

\_\_\_\_\_  
Parent's / Guardian's Name

\_\_\_\_\_  
Phone or Email

\_\_\_\_\_  
Parent's / Guardian's Signature

\_\_\_\_\_  
Date ☐ *approved*

**COUNSELOR APPROVAL:** IS REQUIRED.

\_\_\_\_\_  
Counselor's Name

\_\_\_\_\_  
Phone or Email

\_\_\_\_\_  
Counselor's Signature

\_\_\_\_\_  
Date ☐ *approved*

Place to Visit:

Notes:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**REQUIREMENT 6b:** Visit a structure in your area that was built using fossiliferous rocks. Determine what kind of rock was used and tell your counselor the kinds of fossil evidence you found there.

Place and Location to Visit:

Rock Used:

Fossil Evidence:



## Geology Merit Badge Workbook - Surface and Sedimentary Process

# SCOUTMASTER BUCKY

**REQUIREMENT 6c:** Visit a rock outcrop that contains fossils. Determine what kind of rock contains the fossils, and tell your counselor the kinds of fossil evidence you found at the outcrop.

Place and Location to Visit:

Rock that fossils are contained in:

Fossil Evidence:

**REQUIREMENT 6d:** Prepare a display or presentation on your state fossil. Include an image of the fossil, the age of the fossil, and its classification. You may use maps, books, articles from periodicals, and research found on the internet (with your parent or guardian's permission). Share the display with your counselor or a small group (such as your class at school). If your state does not have a state fossil, you may select a state fossil from a neighboring state.

Consider using the [Geology Merit Badge Pamphlet](#) for preparation information  
Be sure to bring your display, or evidence of, to share with your merit badge counselor  
**This requirement must be reviewed with your merit badge counselor.**  
**BE PREPARED!**

**PARENT/GUARDIAN PERMISSION:** IS REQUIRED.

\_\_\_\_\_  
Parent's / Guardian's Name

\_\_\_\_\_  
Phone or Email

\_\_\_\_\_  
Parent's / Guardian's Signature

\_\_\_\_\_  
Date ☐ permission





# Geology Merit Badge Workbook - Surface and Sedimentary Process

## SCOUTMASTER BUCKY

State	Age	Common name	Binomial nomenclature
Alabama	<a href="#">Eocene</a>	Basilosaurus whale	<i>Basilosaurus cetoides</i>
Alaska	<a href="#">Pleistocene</a>	Woolly Mammoth	<i>Mammuthus primigenius</i>
Arizona	<a href="#">Triassic</a>	petrified wood	<i>Araucarioxylon arizonicum</i>
Arkansas	N/A	N/A	N/A
California	<a href="#">Pleistocene</a>	Saber-toothed cat	<i>Smilodon fatalis</i>
Colorado	<a href="#">Jurassic</a>	Stegosaurus	<i>Stegosaurus stenops</i>
Connecticut	<a href="#">Jurassic</a>	dinosaur tracks	<i>Eubrontes giganteus</i>
Delaware	<a href="#">Cretaceous</a>	Belemnite	<i>Belemnitella americana</i>
Washington, D.C.	<a href="#">Cretaceous</a>	Capitalsaurus	<i>nomen nudum only</i>
Florida	<a href="#">Oligocene - Miocene</a>	agatized coral	<i>Cnidaria, Anthozoa</i>
Georgia	<a href="#">Cretaceous - Miocene</a>	shark tooth	undetermined
Hawaii	N/A	N/A	N/A
Idaho	<a href="#">Pliocene</a>	Hagerman horse	<i>Equus simplicidens</i>
Illinois	<a href="#">Pennsylvanian</a>	Tully Monster	<i>Tullimonstrum gregarium</i>
Indiana	<a href="#">Pleistocene</a>	Jefferson's ground sloth	<i>Megalonyx jeffersonii</i>
Iowa	N/A	N/A	N/A
Kansas	<a href="#">Cretaceous</a>	Flying reptile	<i>Pteranodon</i>
Kentucky	<a href="#">Mississippian</a>	brachiopod	undetermined
Louisiana	<a href="#">Oligocene</a>	petrified palmwood	<i>Palmoxylon</i>
Maine	<a href="#">Devonian</a>	Pertica plant	<i>Pertica quadrifaria</i>
Maryland	<a href="#">Miocene</a>	murex snail / gastropod	<i>Ecphora gardnerae gardnerae</i>
Massachusetts	<a href="#">Jurassic</a>	dinosaur tracks	undetermined
Michigan	<a href="#">Pliocene - Pleistocene</a>	American mastodon	<i>Mammut americanum</i>
Minnesota	<a href="#">Pleistocene</a>	Giant Beaver	<i>Castoroides ohioensis</i>
Mississippi	<a href="#">Eocene</a>	Basilosaurus and Zygorhiza whales	<i>Basilosaurus cetoides</i> <i>Zygorhiza kochii</i>
Missouri	<a href="#">Pennsylvanian</a>	Sea lily	<i>Delocrinus missouriensis</i>





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## SCOUTMASTER BUCKY

State	Age	Common name	Binomial nomenclature
Montana	<a href="#">Cretaceous</a>	Duck-billed dinosaur	<i>Maiaasaura peeblesorum</i>
Nebraska	<a href="#">Pleistocene</a>	Woolly Mammoth Columbian Mammoth Imperial Mammoth	<i>Mammuthus primigenius</i> <i>Mammuthus columbi</i> <i>Mammuthus imperator</i>
Nevada	<a href="#">Triassic</a>	Shonisaurus	<i>Shonisaurus popularis</i>
New Hampshire	N/A	N/A	N/A
New Jersey	<a href="#">Cretaceous</a>	duck-billed dinosaur	<i>Hadrosaurus foulkii</i>
New Mexico	<a href="#">Triassic</a>	Coelophysis	<i>Coelophysis bauri</i>
New York	<a href="#">Silurian</a>	sea scorpion	<i>Eurypterus remipes</i>
North Carolina	<a href="#">Oligocene - Pleistocene</a>	Megalodon Shark tooth	undetermined
North Dakota	<a href="#">Paleocene</a>	shipworm-bored petrified wood	<i>Teredo</i> petrified wood
Ohio	<a href="#">Ordovician</a>	trilobite	<i>Isotelus maximus</i>
Oklahoma	<a href="#">Jurassic</a>	Saurophaganax	<i>Saurophaganax maximus</i>
Oregon	<a href="#">Eocene</a>	Dawn redwood	<i>Metasequoia occidentalis</i>
Pennsylvania	<a href="#">Devonian</a>	trilobite	<i>Phacops rana</i>
Rhode Island	N/A	N/A	N/A
South Carolina	N/A	N/A	N/A
South Dakota	<a href="#">Cretaceous</a>	Triceratops	<i>Triceratops horridus</i>
Tennessee	<a href="#">Cretaceous</a>	bivalve	<i>Pterotrigonia thoracica</i>
Texas	<a href="#">Cretaceous</a>	Pleurocoelus	<i>Pleurocoelus nanus</i>
Utah	<a href="#">Jurassic</a>	Allosaurus	<i>Allosaurus fragilis</i>
Vermont	<a href="#">Pleistocene</a>	Beluga whale	<i>Delphinapterus leucas</i>
Virginia	<a href="#">Miocene - Pliocene</a>	scallop	<i>Chesapecten jeffersonius</i>
Washington	<a href="#">Pleistocene</a>	Columbian Mammoth	<i>Mammuthus columbi</i>
West Virginia	<a href="#">Pleistocene</a>	Jefferson's ground sloth	<i>Megalonyx jeffersonii</i>
Wisconsin	<a href="#">Ordovician - Silurian</a>	trilobite	<i>Calymene celebra</i>
Wyoming	<a href="#">Eocene</a>	Knightia	<i>Knightia</i>

This list is not meant to be complete and may not reflect all current or variable fossils for each state  
N/A simply implies either unknown or unofficial / proposed may exist