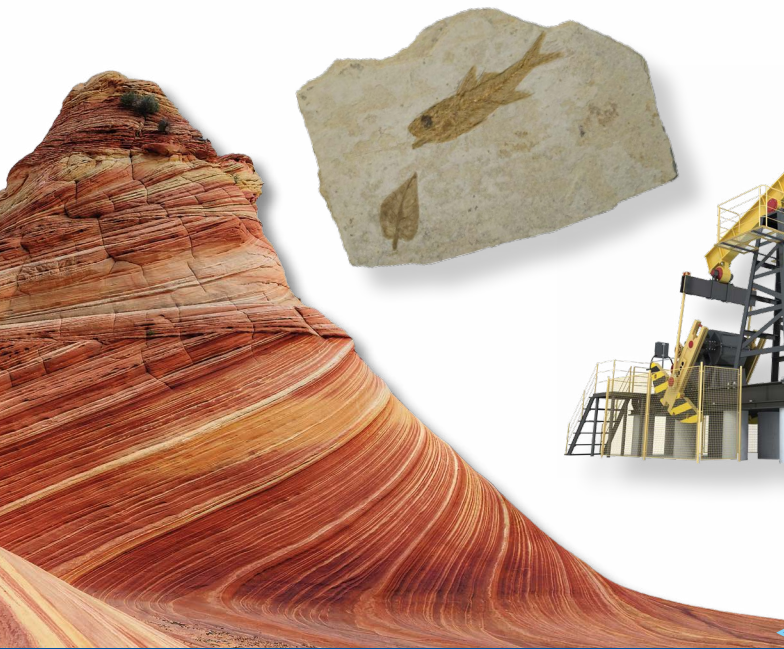


# MERIT BADGE SERIES



# GEOLOGY



BOY SCOUTS OF AMERICA®



STEM-Based

BOY SCOUTS OF AMERICA  
MERIT BADGE SERIES

# GEOLOGY



*"Enhancing our youths' competitive edge through merit badges"*



BOY SCOUTS OF AMERICA®



## Geology

1. Define geology. Discuss how geologists learn about rock formations. In geology, explain why the study of the present is important to understanding the past.
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.
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.
4. Do ONE of the following:
  - (a) With your parent'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.
  - (b) Find out about three career opportunities available in geology. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.
5. Do ONE of the following (a OR b OR c OR d):
  - (a) **Surface and Sedimentary Processes Option**
    - (1) Conduct an experiment approved by your counselor that demonstrates how sediments settle from suspension in water. Explain to your counselor what the exercise shows and why it is important.
    - (2) 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). Explain which ones flow fastest and why, and which ones will carry larger grains of sediment and why.
    - (3) On a stream diagram, show areas where you will find the following features: cut bank, fill bank, point bar, medial channel bars, lake delta. Describe the relative sediment grain size found in each feature.
    - (4) 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.
    - (5) 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.

**(b) Energy Resources Option**

- (1) List the top five Earth resources used to generate electricity in the United States.
- (2) Discuss source rock, trap, and reservoir rock—the three components necessary for the occurrence of oil and gas underground.
- (3) Explain how each of the following items is used in subsurface exploration to locate oil or gas: reflection seismic, electric well logs, stratigraphic correlation, offshore platform, geologic map, subsurface structure map, subsurface isopach map, and core samples and cutting samples.
- (4) Using at least 20 data points provided by your counselor, create a subsurface structure map and use it to explain how subsurface geology maps are used to find oil, gas, or coal resources.
- (5) Do ONE of the following activities:
  - (a) Make a display or presentation showing how oil and gas or coal is found, extracted, and processed. You may use maps, books, articles from periodicals, and research found on the internet (with your parent's permission). Share the display with your counselor or a small group (such as your class at school) in a five-minute presentation.
  - (b) With your parent's and counselor's permission and assistance, arrange for a visit to an operating drilling rig. While there, talk with a geologist and ask to see what the geologist does onsite. Ask to see cutting samples taken at the site.

**(c) Mineral Resources Option**

- (1) Define rock. Discuss the three classes of rocks including their origin and characteristics.
- (2) Define mineral. Discuss the origin of minerals and their chemical composition and identification properties, including hardness, specific gravity, color, streak, cleavage, luster, and crystal form.
- (3) Do ONE of the following:
  - (a) Collect 10 different rocks or minerals. Record in a notebook where you obtained (found, bought, traded) each one. Label each specimen, identify its class and origin, determine its chemical composition, and list its physical properties. Share your collection with your counselor.
  - (b) With your counselor's assistance, identify 15 different rocks and minerals. List the name of each specimen, tell whether it is a rock or mineral, and give the name of its class (if it is a rock) or list its identifying physical properties (if it is a mineral).
- (4) List three of the most common road-building materials used in your area. Explain how each material is produced and how each is used in road building.
- (5) Do ONE of the following activities:
  - (a) With your parent's and counselor's approval, visit an active mining site, quarry, or sand and gravel pit. Tell your counselor what you learned about the resources extracted from this location and how these resources are used by society.

(b) With your counselor, choose two examples of rocks and two examples of minerals. Discuss the mining of these materials and describe how each is used by society.

(c) With your parent's and counselor's approval, visit the office of a civil engineer and learn how geology is used in construction. Discuss what you learned with your counselor.

**(d) Earth History Option**

(1) Create a chart showing suggested geological eras and periods. Determine which period the rocks in your region might have been formed.

(2) Explain the theory of plate tectonics.

(3) Explain to your counselor the processes of burial and fossilization, and discuss the concept of extinction.

(4) Explain to your counselor how fossils provide information about ancient life, environment, climate, and geography. Discuss the following terms and explain how animals from each habitat obtain food: benthonic, pelagic, littoral, lacustrine, open marine, brackish, fluvial, eolian, protected reef.

(5) Collect 10 different fossil plants or animals OR (with your counselor's assistance) identify 15 different fossil plants or animals. Record in a notebook where you obtained (found, bought, traded) each one. Classify each specimen to the best of your ability, and explain how each one might have survived and obtained food. Tell what else you can learn from these fossils.

(6) Do ONE of the following:

(a) Visit a science museum or the geology department of a local university that has fossils on display. With your parent'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.

(b) 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.

(c) 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.

(d) 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'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.

# Geology Resources

## Scouting Literature

*Archaeology, Chemistry, Collections, Drafting, Energy, Engineering, Environmental Science, Landscape Architecture, Mining in Society, Nuclear Science, Oceanography, Orienteering, Soil and Water Conservation, Surveying, Sustainability, and Weather merit badge pamphlets*

Visit the Boy Scouts of America's official retail website at <http://www.scoutstuff.org> for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

## Books

- Altman, Linda Jacobs. *The California Gold Rush*. Enslow Publishers Inc., 2012.
- Dixon, Dougal. *The Practical Geologist*. Simon & Schuster Inc., 1992.
- Erickson, Jon. *Historical Geology*. Facts On File Inc. 2002.
- Gaines, R., H. Skinner, E. Foord, B. Mason, and A. Rosenzweig. *Dana's New Mineralogy*. Wiley-Interscience, 1997.
- Hyne, Norman J., Ph.D. *Nontechnical Guide to Petroleum Geology, Exploration, Drilling, and Production*. PennWell Corp., 2012.
- Johnson, Carl. *Fire on the Mountain*. Chronicle Books, 1994.
- Lamb, Simon, and David Sington. *Earth Story: The Forces That Have Shaped Our Planet*. Princeton University Press, 2003.
- Lambert, David, and the Diagram Group. *The Field Guide to Geology*. Checkmark Books, 2006.
- Pough, Frederick H. *Rocks and Minerals*. Houghton Mifflin Harcourt, 1998.
- Redfern, Martin. *Planet Earth*. Kingfisher Publications, 1999.
- Thompson, Graham R., Ph.D., and Jonathan Turk, Ph.D. *Introduction to Physical Geology*. Harcourt Brace College Publishers, 1998.
- VanCleave, Janice. *Rocks and Minerals*. John Wiley & Sons Inc., 1996.

## Organizations and Websites

### American Association of Petroleum Geologists

1444 S. Boulder Ave.  
Tulsa, OK 74119  
Toll-free telephone: 800-364-2274  
Website: <http://www.aapg.org>

### American Geosciences Institute

4220 King St.  
Alexandria, VA 22302-1502  
Telephone: 703-379-2480  
Website: <http://www.agiweb.org>

### American Petroleum Institute

1220 L St. NW  
Washington, DC 20005-4070  
Telephone: 202-682-8000  
Website: <http://www.api.org>

### The Geological Society of America

P.O. Box 9140  
Boulder, CO 80301-9140  
Telephone: 303-357-1000  
Website: <http://www.geosociety.org>

### Paleontological Research Institute

1259 Trumansburg Road  
Ithaca, NY 14850  
Telephone: 607-273-6623  
Website: <http://www.priweb.org>

### Society of Exploration Geophysicists

8801 S. Yale Ave., Suite 500  
Tulsa, OK 74137-3575  
Telephone: 918-497-5500  
Website: <http://www.seg.org>

### U.S. Geological Survey

Website: <http://www.usgs.gov>

## Acknowledgments

The Boy Scouts of America thanks the E.F. Reid Scouting Fund of the American Association of Petroleum Geologists Foundation for its work in promoting the science of geology in Scouting. In particular, the BSA thanks Ronald Hart (team leader), Robert Baxter, Richard Erickson, Sherman Lundy, John “Jack” Thomas, and William Underwood for their time and expertise in writing this edition of the *Geology* merit badge pamphlet, as well as the 2009 revision.

Special thanks to Michael Jackson, Tony Kolodziej, and Robert Silva for their assistance in reviewing materials and to the American Association of Petroleum Geologists and the Society of Exploration Geophysicists for their assistance.

The Boy Scouts of America is grateful to the men and women serving on the Merit Badge Maintenance Task Force for the improvements made in updating this pamphlet.