

THE LAY OF OUR LAND



CLASS



1 HOUR

KEY CONCEPTS:

Landforms, myths, local history, Ute Indians, navigation, creative thinking

COLORADO ACADEMIC STANDARDS:

- *Reading, Writing and Communication 1.1:* Oral communication is used both formally and informally.
- *Social Studies 1.2:* People in the past influence the development and interaction of different communities or regions.
- *Social Studies 2.2:* The concept of regions is developed through an understanding of similarities and differences in places.

LOCATION:

Indoors

SUGGESTED TIME OF YEAR:

Any

GOAL:

Students learn about local landforms and how these landforms influenced Native American culture.

LEARNING OBJECTIVES:

- Students will identify at least three local landforms.
- Students will describe how Native Americans possibly used landforms.
- Students will listen to and discuss Native American creation stories.

COMMON CORE:

- *Reading Standards for Literature #4:* Determine the meaning of words and phrases as they are used in a text, distinguishing literal from nonliteral language.
- *Reading Standards for Informational Text #1:* Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- *Language Standards #1:* Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- *Language Standards #3:* Use knowledge of language and its conventions when writing, speaking, reading, or listening.

MATERIALS NEEDED:

- “Earthmakers Tales; North American Indian Stories” by Gretchen Will Mayo
- “Origin of the Canyons of the Colorado” story, attached
- Large picture of each of these landforms (local landforms if possible):
 - o Mountain
 - o Valley
 - o Plains
 - o Canyon
 - o Plateau

BACKGROUND INFORMATION:

Land is often something we take for granted. The mountains are always “there,” the streams and rivers come from “somewhere” and flow “somewhere.” But what is their history, and how do these landforms we are surrounded by impact our human activities and societies?

The Yampa Valley, and Northwest Colorado in a broader sense, is an amazing contradiction of landforms. We live in a peaceful, stunningly serene valley, surrounded by hills, and majestic mountains. Even a little more distant are the red rock canyons, the high deserts and total contradiction of the Great Basin area. These landforms have stories written in their sculpted and carved rocks, colorful and aromatic mineral springs and sinuous rivers. The landforms also have a huge impact in civilizations, from our modern day world to the world of Native Americans living on the land long before the white people entered the picture. There are many stories passed down through generations of Native Americans

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BACKGROUND INFORMATION: (CONT.)

describing how they believed certain forces of nature came to be. Creation stories often have a dual purpose: relating how something came to be and providing a lesson for the younger generation listening to the stories. Because the Native American tribes lived daily on the land, the landforms around them became more than just pretty things to look at. The landforms were markers for trails, safety, food, shelter, etc. Even today’s civilizations have adjusted their cities, agricultural lands, recreation areas, etc. to fit with the local landforms. We have tended, historically, to build in valleys (where the water and protection is), place agricultural land in glacial till, recreate in mountains and canyons of beauty and diversity, etc.

Plateau – Flat Tops

Canyons – Fish Creek Canyon, Oak Creek Canyon, Mad Creek Canyon,

Mountains – Park Range, Bear’s Ears Range, Hahn’s Peak, Cedar Mountain, Storm Mountain

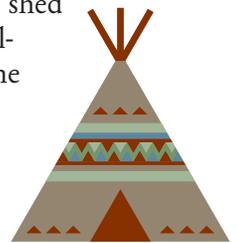
Butte – Finger Rock

Valley – Yampa Valley, Elk River Valley

GEOLOGY 101 FOR NORTHWEST COLORADO:

Existing mountains from the Precambrian period were eroded away by ocean advances. Vast basins received marine and continental sediment, many kilometers thick, which were buried, metamorphosed and injected with igneous rocks of all sorts. By the end of the Precambrian much of Colorado was eroded away to a nearly featureless plain. During the Paleozoic (318-545 million years ago (MYA)), most of Colorado was underwater as the sea transgressed and regressed.

Big changes began around 300 MYA when two great islands “Uncompahgria” and “Frontrangia” surged upward and the debris shed from them filled adjacent basins with red, sandy sediments. Fossil-poor, coarse-textured “redbeds” record the continued erosion of the Ancestral Rockies. Shallow seas invaded the area and stretched from Mexico to Alaska. At the close of the Permian (9253 MYA) the continents coalesced into one huge continent, Pangea, giving rise to arid and semiarid conditions worldwide which lasted for nearly 150 million years. The end of the Permian was met with mass extinctions, probably from the forming of the large supercontinent Pangea, and the ensuing drier conditions.



The Triassic is the first period of the dinosaurs. The supercontinent Pangea begins to break up and the Ancestral Rockies continue to erode. The earliest Jurassic period, about 200 MYA, sees huge coastal dunes along the north-south trending Sundance Sea along the Western Interior Basin.

The end of the Cretaceous, 65 MYA, is the K-T Boundary; an immense asteroid impact worldwide, bringing the Age of the Dinosaurs to an end and ushering in the Age of Mammals. The subtropical climate sets the stage for the explosion of flowering plants.

In Colorado there were three basic stages during the beginning of the Cenozoic: 1) early Tertiary Laramide events which include mountain uplifts (the Laramide

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GEOLOGY 101 FOR NORTHWEST COLORADO: (CONT.)

Orogeny, around 70 MYA, a huge mountain building process forming the Rocky Mountains of today that would continue for another 25 million years, 1) minerals placed along the Colorado Mineral Belt, basin development and erosion, 2) middle Tertiary post-Laramide events which is highlighted by tectonic quiescence and volcanism, and 3) later Tertiary events of large-scale regional uplift, erosion and canyon cutting and late Cenozoic volcanism. Around 25 MYA intense volcanism with the related basalt flows created the Flat Tops with more than 1,300 feet of basaltic flows (later to be carved and eroded to our modern plateaus). Starting around 5.5 MYA the Colorado Plateau and surrounding areas were rapidly uplifted, some areas by more than 5,000 feet! By the end of the Pliocene, around 1.8 MYA, most ranges in Colorado were almost buried in erosion debris. As the mountains rose from uplift, the moist air masses increased the precipitation in the mountains, increasing stream flows and creating rushing mountain streams and rivers.

The finishing touches for our mountains were in the Quaternary, lasting 1.8 million years. Here we had the Pleistocene Ice Age, leading into the Holocene epoch around 10,000 years ago and continuing into today. The Pleistocene climatic fluctuations resulted in the growth and retreat of enormous ice sheets and valley glaciers. All of Northwest Colorado was affected by this glacial action. Most were valley glaciers in our area, but the Flat Tops had large ice caps develop. To actually create the landforms the students are studying, here is a brief synopsis of what processes might produce them in our area.

Mountains: The earth's crust is broken into several rigid plates that move at varying speeds over the underlying mantle. These plates are of two types: denser, and heavier, oceanic crust, and lighter continental crust. Most mountains are formed along a subduction zone where the denser oceanic plate plunges underneath the leading edge of a continental plate; a process called subduction. The oceanic plate undergoes extreme melting, creating pressure on the land above, with volcanoes erupting to relieve the pressure. Strangely enough, our mountains are in the middle of the continent and are a mystery as to why they are here. One thought is that they were formed from an older set of plates that have long since changed. Others think the mountains were the result of a "wave" of activity from the violent subduction off the Pacific coast. This "wave" coming from the Pacific coast toward the continental interior could have been stopped by the harder bedrocks underlying the interior areas. The "waves" backed up, like ripples on a pond, and mountains were folded from this. This is only one hypothesis on our mysterious intercontinental mountains.

Individual mountains: **Sleeping Giant** is a lacolith (dome-shaped igneous intrusion with a floor) whose softer materials over the top of the lacolith have eroded. It is part of the Elkhead Volcanic field (Bear's Ears, Wolf Mountain, Sand Mountain and several others in the Hahns Peak area) are all part of a collection of stocks, laccoliths, and associated dikes and sills related to the same magma chamber. It is believed now that friction and heating from the shifting and subduction of crustal plates may cause part of the depressed plate to melt which begins to rise (being less dense than surrounding cooler rock). **Sand Mountain** is an extrusive example of this process. **Hahns Peak** was formed during an earlier time than the Elkhead

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GEOLOGY 101 FOR NORTHWEST COLORADO: (CONT.)

Volcanic field. Igneous activity began in the area 12-20 MYA, and as magma pushed upward in the Hahns Peak area faulting on both sides of the peak produced a horst (an uplifted block between two faults). Magma of the stock continued to rise toward the surface. Perhaps 9-11 million years before present, hot steam from the rising intrusion may have broken through the surface blasting out debris (technically, for a short time Hahns Peak was a volcano). At this time ore minerals (copper, lead, silver and probably gold) were deposited. The magma hardened, and the softer sedimentary covering was removed by erosion.

Plateaus: The Flat Top Range are plateaus. These were believed to be formed around 25 MYA during an active volcanic time, but these were not the eruptive type of volcano that we are most familiar with, but rather a flow type of volcano. This viscous lava flowed across the land, filling in the lower areas and eventually creating a large flat plain over the underlying sedimentary rocks. Then the whole area was uplifted and the Ice Age carved the steep sided plateaus we see today.

Valley: The largest valley in the area is the Yampa Valley. Since water tends to follow the path of least resistance, it makes sense that it would follow a fault line. The Yampa River follows a fault where the eastern edge of Emerald Mountain was thrust up 1,300 feet. The valley itself was carved by a large river covering the whole valley floor (you can see the “benches” of the river up against the existing valley sides) from intense glacial runoff as the Ice Age was ending.

Butte: These are, in the simplest terms, a smaller plateau or mesa. They can be formed of igneous rock or sedimentary rock, and the main element of formation is erosion.

Canyon: Canyons can be formed in a variety of ways, but they are all erosional processes. At one point many of the canyons could have been carved by glacial action in the Ice Age. Then water became the predominant form of erosion. Of course, none of this would have happened if the land had not had a massive uplift that created the slopes where water gained momentum to cut its path.

Sources:

Geology Profiles of the Steamboat Springs Area by Newell P. Campbell
Hiking Colorado's Geology by Ralph Lee and Lindy Birkel Hopkins
 Colorado Geological Survey, <http://geosurvey.state.co.us>

ACTIVITY:

1. Introduce the concept of landforms. Define what a landform is first based on student ideas. Then have the students look out the window of the classroom and name any of the landforms they see. They will probably name the obvious: mountains, hills, meadows. Ask them what they think a landform is. Describe a landform as a feature on the Earth's surface that is part of the flow of the land. Some of the major landforms are mountains, hills plateaus and plains, and some of the minor landforms are buttes, valleys, canyons and basins. Discuss the common landforms in our area.
2. To introduce the students to different landforms write the name of a landform on the white board and have a student come up and draw a simple version of the landform. Describe the specifics of each landform that would differentiate

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LOCATION:

Indoors

SUGGESTED TIME OF YEAR:

Any

ACTIVITY: (CONT.)

it from the other landforms. Now ask the students to go back 3,000 years or so to before the time of non-indigenous people in the area. Discuss who would have been here. The Utes and other nomadic Native Americans passing through. Discuss the things they needed to survive during that time. Reinforce the idea of having to find their food, shelter and water in the landscape. Discuss if they would use landforms to make decisions.

- Using the basic landforms structures they have drawn on the board, ask the students where Utes might have found food. They might have a hard time, but ask them if anyone hunts and they will begin to get ideas. Take a different colored marker and mark on the landforms where they think they might find food. Now ask about where the water is. Use another color to mark where they suggest water would be found. Lastly ask about the shelter and mark those areas with another color. Most of the time, these three things will all be located closely together; an important thing to point out how those landforms are shaping their decisions.
- Talk briefly about the idea of “creation stories” from the Native American standpoint. Explain that all the Native American tribes had ideas about where the things in nature came from. The stories served as a way to learn about the natural world and pass that information on through spoken language, and most of the stories also had a lesson for the young listeners.
- Read “Big Elk Digs up the Mountains”. It is lively and appropriate for the Northwest Colorado area of mountains. Use the white board with the landforms drawn on it at the end of each story to emphasize the landform that was in the story.
- End with the Ute story of “The Origin of the Canyons of the Colorado.”
- Finish by saying that on the field day they will be looking at all these things in more detail with some fun hands-on activities.

LANDFORMS, LANDFORMS EVERYWHERE?



FIELD



1 1/2 HOUR

KEY CONCEPTS:

Topography, map reading, creative thinking, problem solving, natural processes

COLORADO ACADEMIC STANDARDS:

- *Science 3.1:* Earth's materials can be broken down and/or combined into different materials such as rocks, minerals, rock cycle, formation of soil, and sand – some of which are usable resources for human activity.
- *Social Studies 2.1:* Use various types of geographic tools to develop spatial thinking.
- *Social Studies 2.2:* The concept of regions is developed through an understanding of similarities and differences in places.
- *Social Studies 1.2:* People in the past influenced the development and interaction of different communities and regions.
- *Reading, Writing and Communication 1.1:* Oral communication is used both informally and formally.
- *Reading, Writing and Communication 1.2:* Successful group activities need the cooperation of everyone.
- *Visual Arts 1.2:* Art has intent and purpose.

LOCATION:

Field Site

SUGGESTED TIME OF YEAR:

Any

GOAL:

This field session provides hands-on activities exploring the concept of topography by looking at maps and the land.

LEARNING OBJECTIVES:

- Students will create specific local landforms.
- Students will present the landform to the class.
- Students will describe how a topographical map is used to orient to the landscape.
- Students will compare older and recent topographical maps of the field site.
- Students will work together and create landform creation stories or plays.

COMMON CORE:

- *Speaking and Listening Standards #1:* Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
- *Speaking and Listening Standards #3:* Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
- *Speaking and Listening Standards #4:* Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
- *Speaking and Listening Standards #6:* Speak in complete sentences when appropriate to task or situation in order to provide requested detail or clarification.
- *Language Standards #1:* Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- *Language Standards #2:* Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- *Language Standards #3:* Use knowledge of language and its conventions when writing, speaking, reading, or listening.

MATERIALS NEEDED:

- 4-5 local topographical maps (all the same), at least 1:24 scale
- Tennis ball with "topo" lines drawn on it
- Whiteboard and markers
- Pictures of a variety of landforms (local if possible)
- Large lasagna pans or paint pans, one per group
- Sand, pre-moistened so it holds together well placed in the pans
- Spray Bottle
- Water
- Hand towel
- Pens

4-5 parent volunteers (one per group) are recommended for the field session.

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LOCATION:

Field Site

SUGGESTED TIME OF YEAR:

Any

Pre-Work: Have the teacher create five groups from the class that will work together for the next two sessions, preferably all groups being at equal reading levels.

ACTIVITY:

1. Welcome to the field site! Orientation to the site for the students, then right into the activity.
2. Review the lesson from the classroom: define a landform and ask what the common landforms to the area are.
3. Explain that today the students will be creating their own landforms and beginning to form their own stories of landforms in their communities.
4. Write the two words “landform” and “topography” on the white board. Review their definitions, breaking down the words to get good understanding. Explain that we can map landforms using topographical maps so that we can look at a piece of paper and see mountains and valleys and rivers, not just a flat piece of paper. Using a ball, draw lines around the ball 1/2 inch apart (or closer if it is a small ball). Explain that if this were a hill, these lines could be 100 feet elevation lines; the hill is rising in elevation 100 feet with each line. Have them count the number of lines on the ball and tell you how “tall” the ball is.
5. Turn the ball toward the students so they see the top of the concentric circles and have them describe what they see. Discuss if the lines the same distance apart now. Have them tell you where the “steep” part of the ball is and the flatter part is. Repeat this several times; this is a difficult concept. Move on to something a little more complicated: the topography of your knuckles. Create a “mountain range” with your knuckles. Draw topo lines across your knuckles when your fist is balled. Have them look at the sides and at the top. Flatten out your hand and show the students where the lines are close together and far apart. Emphasize, again, that where the lines are closer together the topography is steeper, and as the lines get farther apart it gets flatter.
6. Bring out a topo map and hold up to the class. Find one of the base lines and follow it all over the map with your finger saying that this line is always at the same elevation. The lines next to it show the elevation changes up and down. On this map the change in elevation between each line we see is 40 feet. If we went outside and walked 40 feet up the mountain then drew a line, walked another 40 feet and drew another line, etc. we would create a topo map.
7. Point out the green forested areas, the white non-forested areas, the roads, buildings and water.
8. Take the four or five maps and lay them out on the tables, splitting the class into the five groups the teacher has set up. Have an adult with each group and challenge each group to the topo locate game. Call out a very obvious item to find on the map. Example; find the largest road on the map. Find the highest point on the map, find the largest body of water, find your school, etc...
9. Assign a landform (mountain, butte, valley, canyon, plateau) to each group (teacher may have already done this). Explain that each group will be making a model of their landform to present to the class that day, drawing



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FIELD



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- *Social Studies 2.1:* Use various types of geographic tools to develop spatial thinking.
- *Social Studies 2.2:* The concept of regions is developed through an understanding of similarities and differences in places.
- *Social Studies 1.2:* People in the past influenced the development and interaction of different communities and regions.
- *Reading, Writing and Communication 1.1:* Oral communication is used both informally and formally.
- *Reading, Writing and Communication 1.2:* Successful group activities need the cooperation of everyone.
- *Visual Arts 1.2:* Art has intent and purpose.

LOCATION:

Field Site

SUGGESTED TIME OF YEAR:

Any

ACTIVITY: (CONT.)

a topographical map of their landform, then begin jotting down ideas for a “creation story” to present to the class on the next day. They will have 15 minutes or so to work on the model. Give each group a large roasting pan or paint pan filled with moistened sand. Encourage them to collect other items they need from the grounds of the site (make sure they are respectful of the area). Remind them that the plants are a valuable part of the landform they are creating, so try and reproduce them in their model. The reason for this will become clear in the “erosion” process. Water can be added to create the water found in their pictures, but they will need to be creative on how to “hold” the water with a base of sand.

10. After each group has finished their models have each group do a quick presentation of their landform. Emphasize the ever-changing landscape with erosion, mountain building, etc. Make the landform process more realistic by “eroding” the features with water (spray bottles) or wind (wind seems very realistic for the butte, since it is so dry. Students can produce a LOT of wind when they need to!). Ask the students to describe where their landform might end up if the water continued to carry their sand along.
11. If time remains, try to leave at least 10 minutes at the end for each group to begin writing their “creation story” for their landform play. Have them jot ideas down that they can then work into a story for the next lesson.
12. Make sure the teacher understands that the students should work on their stories and corresponding plays between the field and service session. The students will have five to ten minutes at the beginning of the service session to finish up, but not enough time to write their entire stories.

WHAT'S OUR CREATION STORY?



SERVICE-LEARNING 1 HOUR

KEY CONCEPTS:

Public speaking, collaboration, creativity, earth systems

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- *Reading, Writing and Communication 1.1:* Oral communication is used both informally and formally.
- *Reading, Writing and Communication 1.2:* Successful group activities need the cooperation of everyone.
- *Drama and Theater Arts 2.1:* Perform a scripted scene.
- *Drama and Theater Arts 2.2:* Work effectively alone and cooperatively with a partner or in an ensemble.

LOCATION:

Indoors

SUGGESTED TIME OF YEAR:

Any

GOAL:

The service-learning session gives students the opportunity to work together on their stories and practice presentation skills while they learn basic geology of Northwest Colorado.

LEARNING OBJECTIVES:

- Students will work together and create landform creation stories or plays.
- Students will practice their presentation skills

COMMON CORE:

- *Reading Standards for Literature #4:* Determine the meaning of words and phrases as they are used in a text, distinguishing literal from nonliteral language.
- *Reading Standards for Informational Text #1:* Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- *Reading Standards for Informational #7:* Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
- *Speaking and Listening Standards #1:* Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
- *Speaking and Listening Standards #3:* Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
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MATERIALS NEEDED:

- Different colored layers of thin foam
- White board and markers
- Pictures of landforms used for the creation stories

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Pre-Work:

Teacher should coordinate with a younger class (if possible) for the younger students to watch the third graders' presentations.

ACTIVITY:

1. Give the students about five to ten minutes to finish up their creation stories and corresponding skits. The students should have a creation story and corresponding simple skit. Each skit should be only a few minutes long. Leave about 20 minutes for your wrap-up.
2. Bring in, or go to, a younger grade for the presentations prearranged by the teacher.
3. Show the picture of the landform before each class presents their stories. Sit back and enjoy!!
4. Finish up the story section by saying that if the students want to create a little booklet with their stories, and maybe some hand-drawn pictures of their landforms, it would be a great addition to their landform unit.
5. If time permits after the skits are finished, use these activities to pull the lessons together with some basic geology the students have been working with.
6. Draw on the board the earth showing the continents as rafts riding on top of a liquid core. Ask which part of the earth is the hottest (the core). As the rafts move over millions of years they can come into contact with another raft. Bring a student up to show what could happen when a "heavier" raft comes in contact with a "lighter" raft by holding your arms out, coming together and your arms go under their arms as you "sink". As you go under their arms ask if your hands are changing temperature because of where they are heading. They are getting hotter and eventually will melt because of the hot core. Sometimes the two rafts get stuck at some point and you can get earthquakes. Sometimes a crack forms in the earth's crust (a fault) where the molten rock is forced up and out (volcano). All this takes place typically where the two rafts meet and have friction. Draw the North American continent on the board (or bring it up on the Internet) and have the kids point out Colorado. Ask how our mountains were formed in the middle of the continent. Take the towel and place it flat on a smooth surface. Ask what would happen if there were two rafts pushing on either side. Place your hands on each end of the towel and slowly slide your hands along the table, pushing the towel up in the center into wrinkles. This represents the Rocky Mountains.
7. Talk about how mountains disappear. Show a picture of an alluvial fan coming down from a mountain range. Ask the students where all the stuff in the water is coming from. What would this area look like in a couple of million years?
8. Take out the different colored foam pieces and start laying them one on top of the other. Explain that this is deposition from the erosion of the mountains. Talk about our early Ancestral Rocky Mountains being huge mountains millions of years ago. Water eroded them, and then layer upon layer of the resulting sediment was laid down and hardened. That hardened sediment is the beautiful sandstones we see today.



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- *Science 3.1:* Earth's materials can be broken down and/or combined into different materials such as rock, minerals, rock cycle, formation of soil, and sand – some of which are usable resources for human activity.
- *Visual Arts 1.2:* Art has intent and purpose.
- *Reading, Writing and Communication 1.1:* Oral communication is used both informally and formally.
- *Reading, Writing and Communication 1.2:* Successful group activities need the cooperation of everyone.
- *Drama and Theater Arts 2.1:* Perform a scripted scene.
- *Drama and Theater Arts 2.2:* Work effectively alone and cooperatively with a partner or in an ensemble.

LOCATION:

Indoors

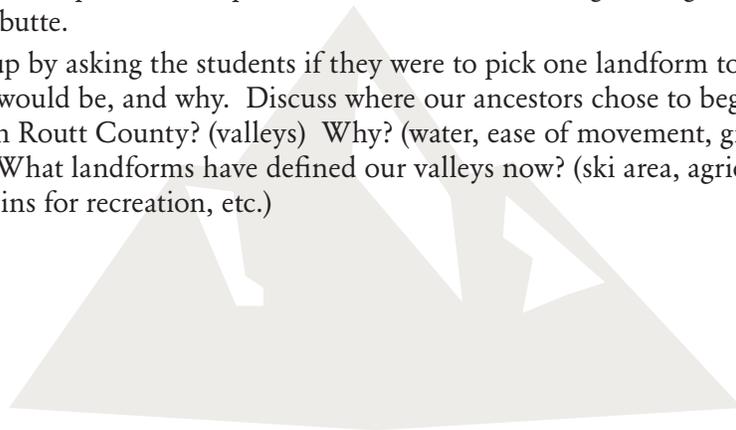
SUGGESTED TIME OF YEAR:

Any

ACTIVITY: (CONT.)

Discuss wind being an erosional process as well.

- Take the layers of foam core and talk about another building process called uplift. Deep underneath there was a big bubble of pressure that pushed a huge amount of land up. Show this by bending the layers up into an arc. This happened under the Colorado Plateau covering Arizona, Utah, Colorado, and New Mexico. As the land was rising the water was eroding at the same rate, so huge canyons were carved through this soft sandstone rock: Grand Canyon. Take the layers of foam and cut them in half, showing the arc still rising but now there is a large gap, the canyon, which has eroded down the center.
- One of the groups had a butte. Show the layers of foam again saying that all the foam except one small piece would be eroded, leaving a straight sided, flat-topped butte.
- Finish up by asking the students if they were to pick one landform to live near, what it would be, and why. Discuss where our ancestors chose to begin their towns in Routt County? (valleys) Why? (water, ease of movement, growing crops) What landforms have defined our valleys now? (ski area, agriculture, mountains for recreation, etc.)



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