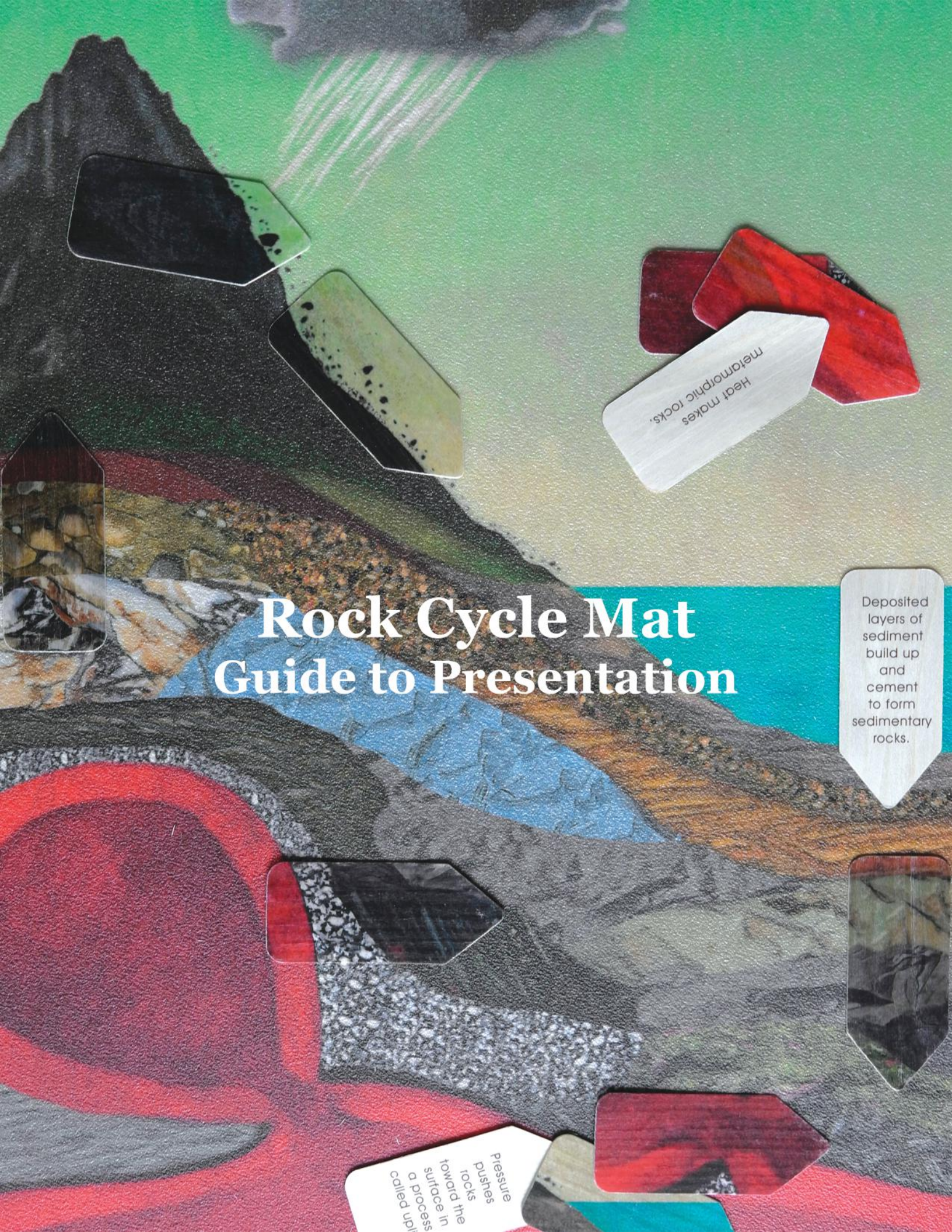


Rock Cycle Mat
Guide to Presentation

Rock Cycle Mat

(suitable for children 6 - 12 years of age)

Waseca Biome's Rock Cycle Mat includes:

- Guide to Presentation
- Rock Cycle Mat
- 22 Rock Cycle Mat Fact File cards with wooden box
- 19 veneer Rock Cycle Mat arrows
- 21 veneer rocks
- Rock Cycle Mat Control Chart
- Grammar Labels with wooden box
- Storage Tray

Guide to Presentation
Table of Contents:

About the Rock Cycle Mat

Waseca Biome's Rock Cycle Mat provides a comprehensive overview of the Rock Cycle. For those that teach from our Curriculum's "Elements that Support Life" sections, this package reviews concepts from the Soil lessons to contextualize the importance of the Rock Cycle. The materials foster a Systems Thinking approach of understanding where the Rock Cycle takes place, how it functions, and how it is constantly reshaping Earth's surface.

There are 22 Rock Cycle Mat Fact File cards included broken into 4 sections:

- Layers of the Earth
- Plate Tectonics
- Rock Cycle
- Parts of a Volcano

These Fact File Cards serve as primers for learning about each of the topics. The lessons that follow will outline options for presentation and offer extension ideas for research and further lessons as applicable.

Please note: These materials are very adaptive. The presentations below are suggestions and may be adapted to focus on particular parts for extended research or further lessons. They may be broken up into multiple sections for group and individual work as you see fit.

First Presentation: "Layers of the Earth" Fact File Cards

You will need: "Layers of the Earth" Fact File Cards
Purpose: To learn about the layers of the Earth to build a foundation for understanding that the Rock Cycle is a dynamic process that is constantly reshaping Earth's surface.

There are 5 Rock Cycle Mat Fact File Cards that provide an overview of the Layers of the Earth. They include: Layers of the Earth, Inner Core, Outer Core, Mantle, and Crust.

Work through these cards with the students as a group if it is their first introduction to the Layers of the Earth. If students are already familiar with the Layers of the Earth, they can review the cards individually. The Crust is the layer we live on. Emphasize that it is the result of the Rock Cycle in action. Each layer of the Earth plays a role in making the rocks that form the land beneath our feet!

Second Presentation: "Plate Tectonics" Fact File Cards

You will need: "Plate Tectonics" Fact File Cards
Purpose: To introduce Plate Tectonics as the means by which the surface of the Earth is constantly being reshaped.

Please note: This presentation covers some sophisticated concepts. The material introduced is great for further research and may be best for older students.

Work through the "Plate Tectonics" Fact File Cards:

1. The first cards, Plate Tectonics and Plates, present a general text overview of plate tectonics and how plates are formed. Emphasize that these plates are always moving **very** slowly. This is great opportunity to have students research the plates that cover the world and look into some questions like the following:
    - What plate do they live on?
    - What plates does it touch?
    - If plates can grow, how do they all still fit on Earth? (The Earth's surface isn't getting bigger. For plates - essentially, the crust - to grow, they need to be destroyed/recycled. This destruction and creation of plates is Plate Tectonics and the Rock Cycle in action.)
2. The next three cards describe three types of plate boundaries: Convergent Boundaries, Divergent Boundaries, and Conservative Boundaries. The cards touch upon the basics of the changes each boundary type can make to the Earth's surface. The boundaries can serve as a great starting point for research on geographical features. Some examples of questions to explore about geographical features that are the formed from plate tectonics at boundaries include:
    - What kind of boundaries does the plate they live on have with its neighbors?
    - What mountains are nearby? Research a mountain range nearby or one that interests them. What about hills?
    - Which mountain ranges are volcanic arcs?
    - What islands are volcanic island arcs?
    - What are the deepest trenches? What are they like? Is it hard to explore them?
    - What are the differences in mountain building they have learned about so far? Why are ridges different than volcanic arcs?
    - What is the relationship between a basin and a rift? Research some examples.
    - What is a fault? Are there places with lots of them? Are they active? Does that place have a lot of earthquakes?

Third Presentation: "Rock Cycle" Fact File Cards

You will need: "Rock Cycle" Fact File Cards
Purpose: To understand what rocks are and how they are formed and re-formed through the Rock Cycle. To understand a natural cycle as continuous and renewing.

Work through the "Rock" Fact File Cards:

1. The first card, Rock Cycle, presents a simple illustration and text description of the Rock Cycle focusing attention on how all rocks started as magma before undergoing transformations during the cycle.
2. The second card, What is a rock?, addresses what seems like a simple question. But is it? Rocks are everywhere - on the playground, at the beach, in the mountains. It's impossible to go anywhere and not see rock because the Earth we stand on is rock! So, what makes a rock a rock? Introduce the children to thinking about rocks from a new, scientific perspective.
3. The next three cards introduce the three types of rocks: Igneous, Sedimentary, and Metamorphic. These outline the forces that act upon rocks during the rock cycle to transform them from one type of rock into another… and another… and another… Emphasize that most actions that turn a rock into another type of rock usually happen far more slowly than we could see in our lifetimes. These processes can take thousands to millions of years! They have been happening since our planet formed billions of years ago. These changes are **slowly** taking place **right now** and these transformations make up all the different kinds of rocks they have ever seen.

Please note: There are many rocks within the three main categories that have unique and fascinating attributes that can serve as interesting departure points for further research. A few ideas are listed below in Extensions.

Extensions:

- "Three Different Kinds of Rocks" lesson from the Waseca Biomes Curriculum
- How is volcanic glass formed? Is it like most rocks? What makes it different from most rocks?
- There are many kinds of sedimentary rocks: Chemical Sedimentary, Evaporates, Carbonates, Siliceous, and Organic Sedimentary. What types of sediments are each of these made of? If they are not made of minerals, are they really a rock?

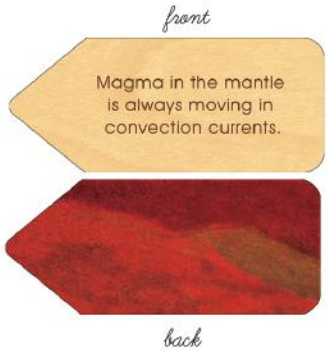
Fourth Presentation: Rock Cycle

You will need: Rock Cycle Mat, Rock Cycle Mat Veneer Arrows
Purpose: To explore the Rock Cycle, how it works, and how it forms the rocks that are the Earth's Crust. To understand a natural cycle as continuous and renewing.

1. Lay out the Rock Cycle Mat. Look at the large drawing and ask the children to identify parts. Make sure to highlight the mountain, the ocean, the land, the volcano, the Crust, magma, and the Mantle.

2. Review what you have learned about the layers of the Earth, and the three types of rocks and the processes that form them during the Rock Cycle. Discuss how:
    - The heat of the Inner Core moves the Outer Core and the Mantle.
    - Magma is always slowly moving in the Mantle from those convection currents deep below the Earth's surface.
    - The Upper Part of the Mantle and the Crust are constantly moving and forming and destroying the rocks in the Lithosphere.
    - The rocks at the top make up the Crust, the only part that we can see, the part that we live on!
3. Work through one of the illustrated sections of the Rock Cycle Mat with the arrows.* For example, you can use the following arrows to work through the cycle illustrated on the left side of the mat. Place the following arrows on the mat discussing each as you place it:

    - Magma in the mantle is always moving in convection currents.



    - Magma seeps into the crust.

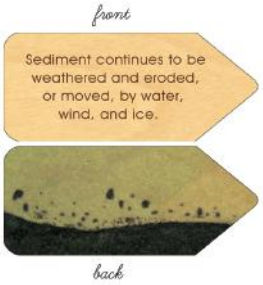
* There is a chart of all the included arrows and a key for their placement on the mat after this presentation for your reference while you gain familiarity with it.

- Trapped magma slowly cools to form intrusive igneous rocks.

- Pressure pushes rocks toward the surface in a process called uplift.

- Exposed rocks are weathered and broken into smaller pieces called sediment.

- Sediment continues to be weathered and eroded, or moved, by water, wind, and ice.



- Sediment is carried to the bottoms of rivers, lakes, and oceans where it settles.

- Deposited layers of sediment build up and cement to form sedimentary rocks.

- Burial, pressure from the weight of rocks above, makes metamorphic rocks.

The final arrow that gets placed on this side of the mat is:

- Heat makes metamorphic rocks.

The rocks that were already formed where the magma intruded can get heated and undergo metamorphosis. This arrow serves as a good opportunity to highlight that these cycles are dynamic and they do not always work in a linear fashion. Sometimes, multiple processes can be occurring simultaneously.

4. The remaining arrows can be worked though to follow what happens in the Rock Cycle with a volcano in a separate session.
5. The children will be able to work with the mat and arrows individually using the control on the back side to check their placement on the mat.

ROCK CYCLE MAT ARROWS

front

Magma in the mantle is always moving in convection currents.

back

front

Magma seeps into the crust.

back

Trapped magma slowly cools to form intrusive igneous rocks.

front back

Pressure pushes rocks toward the surface in a process called uplift.

front back

front

Exposed rocks are weathered and broken into smaller pieces called sediment.

back

front

Sediment continues to be weathered and eroded, or moved, by water, wind, and ice.

back

front

Sediment is carried to the bottoms of rivers, lakes, and oceans where it settles.

back

Deposited layers of sediment build up and cement to form sedimentary rocks.

front back

Burial, pressure from the weight of rocks above, makes metamorphic rocks.

front back

front

Heat makes metamorphic rocks.

back

front

Magma in the mantle is always moving in convection currents.

back

Magma seeps into the crust creating a magma chamber.

front back

Magma pushes toward the surface from pressure and expanding gases.

front back

Magma erupts from a volcano as lava.

front back

front

Lava cools to form extrusive igneous rocks.

back

front

Exposed rocks are weathered and broken into smaller pieces called sediment.

back

front

Sediment is carried to the bottoms of rivers, lakes, and oceans where it settles.

back

front

Heat makes metamorphic rocks.

back

Pressure pushes rocks toward the surface in a process called uplift

front back

Fifth Presentation: "Parts of a Volcano" Fact File Cards

You will need: "Parts of a Volcano" Fact File Cards
Purpose: To learn about the parts of a volcano.

1. Work through the "Parts of a Volcano" Fact File Cards using the Rock Cycle Mat as a point of reference and following the magma through the Rock Cycle.
2. Point out that the volcano pictured on the mat is a composite volcano. Are there other types of volcanoes? Have the children do some research to find out.
3. Volcanoes can form from hotspots (small ruptures in the crust) or along plate boundaries. What type of volcano is the one on the mat? What are some examples of hotspot volcanoes on Earth? What are some examples of plate boundary volcanoes?

Sixth Presentation: Grammar Cards

You will need: Rock Cycle Mat, Grammar Labels
Purpose: To practice grammar skills and sentence building while learning about the Rock Cycle.

Please note: The following steps are to be introduced in separate lessons and may be practiced independently between lessons. You may wish to limit the number of words introduced at one time and fill the box with the parts of speech as they are introduced.

1. Have the children identify parts illustrated on the mat. Can they find the volcano, the ocean, the magma, sediment, etc.? Label the parts with the appropriate black grammar label. Note that these words are nouns.
2. After matching the noun cards, take out the article cards (light blue) and "introduce" each noun with an appropriate article. Notice that any plural nouns require the article "the." Make a distinction between the use of "a" and "an."
3. Take out the adjective cards (dark blue) and read them. Ask the children if that word describes any of the nouns. Have them place the adjectives with the matching article and noun to make a phrase. Experiment with placement to see if it makes sense.
4. Choose 10 to 15 noun cards and find appropriate adjectives for them. Invite children to match the nouns with an adjective.
5. Take out the verb cards (red). Have the children perform the actions. Find a noun to match the verb. Add an article and, possibly, an adjective to make a sentence.
6. Choose 10 to 15 noun cards and find appropriate verbs for them. Invite children to match the noun with a verb.
7. Introduce the preposition cards (they are green). Write a phrase with the cards: "Rain and wind wash sediment to the ocean." Where is the sediment going? Emphasize that it is going "**to** the ocean." Leave the preposition cards out to add to the sentences the children may make.
8. Make a sentence like "The volcano erupts." Ask the children how does the volcano erupt? Give them the orange adverb labels and have them pick an adverb that applies. Match other adverbs to verbs and make sentences from there. "What flows

downhill? What moves slowly?" Add the adverbs to the box for making sentences. Put out blank orange labels and see what the children come up with.

9. Take out the verb "cools." Ask, "What cools?" Have the children find different nouns that answer the question: The magma cools. The lava cools. Then, bring out the conjunction "and." Ask how you can use the conjunction and to make one sentence. Note that you have to exchange the verb "cools" for "cool" to make the verb and subjects match. Show the children how you can replace the "and" labels with commas leaving the last "and" in place. Leave the pink conjunction labels out with the work to see how the children's sentences are enhanced.
10. At any of the above levels, the children may work independently to compose a sentence about the Rock Cycle Mat using the Grammar Labels. Have extra colored strips to use to make words that are not included. Use the Fact File Cards as reference for more information.

Seventh Presentation: Rocks

You will need: Rock Cycle Mat, Rock Cycle Mat Control Chart, Veneer Rocks
Purpose: To engage with examples of each of the three types of rocks. To gain an understanding of the transformations rocks undergo as they are formed and re-formed in the Earth's Crust.

1. Sort the veneer rocks to their type on the Rock Cycle Mat Control Chart. Are there things that they seem to have in common visually? Why would that be?
2. Match the veneer rocks to their layers on the Rock Cycle Mat. (Note that some have multiple places where they can match.)

Extensions:

- The child can select one of each type of rock to research to learn about how it is formed, what minerals it contains, and how it differs from the other rocks they selected.
- Collect rocks and see if you can find any that are the same as rocks on the mat? What can you learn about the rocks that you collected from the rocks on the mat?
- For any budding geologists that are working with the rock samples from the mat, they can research whether or not any of the layers near each other on the mat have relationships? Are slate and schist similar? How?

ROCK CYCLE MAT CONTROL CHART

IGNEOUS

basalt

diorite

granite

obsidian

peridotite

pumice

rhyolite

SEDIMENTARY

breccia

chert

conglomerate

limestone

sandstone

shale

METAMORPHIC

gneiss

hornfels

marble

phyllite

quartzite

schist

serpentinite

slate