Natural Resources Grade 5-8 PowerPoint Walkthrough

Standards:

National Science Content Standards 5-8:

Content Standard A – Developing abilities to do scientific inquiry and understand scientific inquiry.
Content Standard D – Develop an understanding of the structure of the earth system.
Content Standard G – Understand science as a human endeavor.

Michigan Science Standards and Benchmarks:
CI.1.M1 – Generate scientific questions about the world based on observation.
EGV.1.M2 – Explain how rocks and minerals are formed.

AAAS Standards 6-8:
1A – Some scientific knowledge is very old and yet is still applicable today.

1B – Scientists differ greatly in what phenomena they study and how they go about their work.

1C – Scientists are employed by colleges and universities, business and industry, hospitals, and many government agencies. Their places of work include offices, classrooms, laboratories, farms, factories, and natural field settings ranging from space to the ocean floor.

4B – Some minerals are very rare and some exist in great quantities, but for practical purposes – the ability to recover them is just as important as their abundance.

4C – Sediments of sand and smaller particles (sometimes containing the remains of organisms) are gradually buried and are cemented together by dissolved minerals to form solid rock again. Thousands of layers of sedimentary rock confirm the long history of the changing surface of the earth and the changing life forms whose remains are found in successive layers.

11B – Models are often used to think about processes that happen too slowly, too quickly, or on too small a scale to observe directly, or that are too vast to be changed deliberately, or that are potentially dangerous.

Procedure (Presentation Slide Numbers):

1. Ask what students think geology is. Ask them if they can infer what geology is and what geologists do based on the picture.
2. Geology is a good career for those who don't want to spend all of their time working behind a desk. A lot of geologists go out into the field and study rocks.
3. Sometimes they work on ships and drill holes in the earth through the bottom of a river or lake.
4. They also go to cool places – these pictures are of geologists working in Utah - and they get to have some fun along the way!
5. They even work in tropical environments like the Bahamas!

6. Geologists have many different jobs. There are geologists here in Michigan who work for WMU MGRRE which is shown in this picture. MGRRE is part of the Geology department at Western Michigan University.
7. At MGRRE, which is sometimes called the "core lab", geologists take core samples of rocks from the subsurface all over the state of Michigan and store (or archive) them in a giant warehouse called a repository. Inside the repository it is like a library. However, instead of going to the shelf and pulling off your book, we use forklifts to remove pallets of rock core. Geologists come to the core lab to study the rocks, college students and professors study the rocks, and sometimes we even take core samples into classrooms to be studied by younger students.
8. Did you know that Michigan used to be an ocean basin? This is one thing that geologists have learned by studying the rocks from deep beneath Michigan. What do you think they found that told them that the part of the continent that is now Michigan was once an ocean? (Help the kids to come up with the answer , possibly by asking them if they have ever seen a Petosky stone and if they know what it is. Fossilized coral. So how would we get that fossilized coral deep beneath our feet?) We have fossilized coral and other marine plants and animals in the rocks beneath our feet. If anyone has ever seen a Petoskey Stone they have seen an example of fossilized coral.
9. The coral fossils that are under Michigan look a lot like the corals you can see in the ocean in the Bahamas today!
10. Some geologists study today's environments to find out what the earth was like in the past. What they learn about the past and present helps us to plan for the future. Michigan used to look like what the Bahamas look like today. Some of the scientists and students working at MGRRE study both ancient rocks and sediments being deposited now in places like the Bahamas.
11. These scientists are studying sediment from the Bahamas.
12. Why do geologists want to know about the rocks deep underneath Michigan that were deposited as sediments millions of years ago? What do we get from the rocks? Help the students to come up with: Natural Resources!
13. What are some examples of natural resources found in Michigan's rocks? There is water which we use for drinking, washing and cooking, oil used for gasoline and making plastics, natural gas for heating our homes, and minerals.
14. Let's start talking about natural resources by talking about one Michigan mineral that we spread on the roads in the winter to make it safer to drive. Do you know what this mineral is? Might get salt (common name) or sodium chloride (chemical name). Both are correct, but does anyone know the mineral name?
15. Halite, also known as salt. Michigan's salt is used on roads in many states.
16. There is a thick layer of salt underneath Michigan and in Detroit there is a large salt mine where they bring up the salt that is underground. This illustration is by Charles Barker, a Michigan geologist who wrote the book Under Michigan.
17. This is a picture of the Detroit Salt Mine. The walls, ceilings, and floors are made up of salt. Would you like to go down into the mine?
18. But how did this thick layer of salt get there? Try to get the kids to come up with "evaporation" by using the hints: What is in ocean water? Salt? What would happen if the ocean dried up?

Evaporation. The layers of salt got there by evaporation. The ocean that covered Michigan dried up and when it did, the salt stayed. This formed a layer of salt. The ocean filled again and dried up again creating another layer. This happened many times until we got the large layer that is there today.

19. Halite is called an evaporite mineral. We get this word from the word evaporate.
20. Here is a pictures of the salt cores that are housed at MGRRE. If you look closely you can see the layers of salt in some of them.
21. We use the salt in the winter to spread on icy roads in Michigan and other states.
22. We just found out that Halite is found in layers, and we know that coal is found in layers, but what about water, oil, and natural gas? Are these found in layers?
23. Or maybe they in underground rivers, lakes and pools? What do you think? (get some discussion going here), then use the next slide and activity on website to demonstrate that water doesn't stay on top of sand or go to the bottom, it goes where? Between the sand grains.
24. What happens to water or oil that is poured on top of sediments? Please see attached activity, mixing oil and sand. What do you think will happen? Where did the water go? Not to the bottom and it didn't disappear. Someone should answer: it is between the grains of sand and then introduce the word 'pores'. The pore spaces between grains of sand.
25. So what happens to these sediments over millions of years?
26. They turn into sedimentary rocks. Sandstone is an example of sedimentary rock. You can see in the microscopic view that there are tiny spaces between the grains of sediments in the rock. Pore spaces again.
27. Let's think. Where do sedimentary rocks come from?
28. They come from sediments!
29. Sedimentary rocks are made when sediments are buried and grains become cemented together over many millions of years. Just like there is space between grains of sand and sediment in our beaker and on a beach, there can also be space between sediment grains after they have turned to rock. These spaces are called "pores." Some of the spaces can be filled with the remains of algae and tiny animals that have turned into oil over many millions of years. The oil then fills the pore spaces.
30. So what is the answer to our question? Are oil, water, and natural gas found in underground rivers, lakes, and pools? Hopefully the kids will answer "no".
31. Or could they be inside the rocks?
32. Water, oil and natural gas are in the pore spaces between grains within rocks. The job of many geologists is to find and recover these natural resources.
33. Porous rocks have pore spaces that can be filled with water, salt water, oil, or natural gas.
34. If those pore spaces are connected together so that liquid or gas can flow through the rock, the rocks are called "permeable", and we can extract the resource. Let's see how porosity and permeability work. See attached activity, Porosity and Permeability.
35. Here are some pictures of rocks with holes in them! You can see the pore spaces in the magnified sandstone. There is blue dye inside the holes of the rock magnified in the upper right hand corner.

36. How do geologists measure permeability? They measure permeability in the field and in the laboratory with a permeameter. The model shown is a portable minipermeameter. Gas is forced into a rock sample and then measurements of how fast the gas travels through the rock are sent to the computer.
37. Virtual experiment?
38. So how do we extract these resources from porous rocks underground?
39. We use a pump and a well.
40. When most of the oil has been pumped out of a well, geologists can use the gas, carbon dioxide, to push remaining oil out of the hole. This technology gave some geologists an idea that could help to reduce the amount of "greenhouse gases" in the atmosphere…
41. Since "greenhouse gases" are building and contributing to "global warming", we want to find ways to decrease the amount of carbon dioxide we put into the air. Would the porous rock underground be a good place to store the carbon dioxide that we produce when we make electricity, cement and other products?
42. We can push gas back into the rocks below us and push out oil or salt water that is in the pore spaces. But how do you do it? Let's find out!
43. See attached activity, Enhanced Oil Recovery
44. Everything we have and everything we use comes from our natural resources. Most of the natural resources we use are Earth Materials – minerals, water, oil and natural gas.
45. What other geologic natural resources do we use every day?
46. Ready for a game? See attached activity, Where In The World Do We Use That?