WATER AND OUR WORLD

K - 8 Science Unit Study
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Science Journal
All The Good and the Beautiful science units include activities for a science journal. For each child prepare a 1-inch to 2-inch 3-ring binder to function as his or her science journal. Tabbed divider pages can be used to separate the different units. Also, have wide-ruled paper and blank white paper on hand for journal activities. All completed journal activities are to be kept in the science binder. If desired, have the child create a cover and insert it under the clear cover of the binder.

Science Wall
All The Good and the Beautiful science units include vocabulary words to be placed on your science wall, which is a wall or tri-fold presentation board in your learning area on which you can attach the vocabulary words and other images. Cut out the vocabulary word cards at the beginning of the unit. The course will indicate when to place them on the wall.

Lesson Mini Books
Some lessons in this unit incorporate science mini books. If you bought the PDF download only, print the pages single sided. To assemble the mini books, cut them in half along the dotted lines, stack the pages together with the page numbers in the correct order, and staple twice along the left side.

Lesson Preparation
All The Good and the Beautiful science units include easy-to-follow lesson preparation directions at the beginning of each lesson.

Experiments
Many of The Good and the Beautiful science lessons involve hands-on experiments and parent or teacher demonstrations. Always supervise children as they participate in the experiments to ensure that they are following all necessary safety procedures. Go to goodandbeautiful.com/sciencevideos and scroll down to the Water and Our World section to see videos of experiments used in this unit. This is a convenient way to watch experiments that may be more complicated. Children often learn best through hands-on experience; therefore, this unit includes a supply list and instructions for all experiments, and you may choose to do as many as you wish.
READ-ALOUD BOOK PACK
(Optional)

The two books below are optional read-aloud books that complement this unit. These books can be purchased as a book pack by going to goodandbeautiful.com/science and clicking on the Water and Our World unit link.

**Famous Floods**
By Shannen Yauger

**Wonderful Waterfalls**
By Molly Sanchez

CORRELATED BOOKS

The Good and the Beautiful Library has several books that correlate well with this unit. It can be a wonderful experience for children to read books on their levels related to the subjects they are learning in science. These book selections contain both fiction and nonfiction books and are organized according to reading level. Find the Correlated Books at goodandbeautiful.com/science on the Water and Our World science unit product page.
How the Extensions Work

Each lesson has an optional lesson extension for children in grades 7–8. Complete the lesson with all the children, and then have the older children complete the self-directed lesson extension. These extensions are generally located at the end of the lesson, though some are combined on a page, and you will need to turn back to them.

Answer Key

The answer key for the lesson extensions can be found by going to goodandbeautiful.com/science and clicking on the Water and Our World unit.

Flexibility

The amount of time it will take to complete each lesson extension will vary for each child. The average time is about 10–15 minutes per extension. Parents/teachers and children may choose to omit parts of the lesson extension if desired. Encourage the children to stretch their capabilities, but also reduce work if needed.

Science Journal

The extension pages are non-consumable. The children will do their work on separate sheets of paper and insert them into their science journal binders along with any science journal pages done during the lessons.

Children are encouraged to take ownership of their science journals and put forth effort to make the journals visually appealing. The journals will be something the children can treasure. The children should use color and illustrations where possible.

Taking Notes

Some of the grades 7–8 lesson extensions have the children summarize the material they have read. Teach the children to look for key information, summarizing the most important points. Children can also add notes with their thoughts and the facts that are most interesting to them.

Optional Grades 7–8 Reading Book

We recommend The Water Questions & Answers Book by Anthony Klemm as extra reading for children in grades 7–8. This book can be purchased by going to goodandbeautiful.com/science and clicking on the Water and Our World science unit product page.
SUPPLIES NEEDED

This section is divided into supplies needed for activities and supplies needed for experiments.

If gathering supplies and doing the experiments is too stressful or expensive for you at this time, you can watch all the experiments at goodandbeautiful.com/sciencevideos. The activities, however, are not filmed.

Lesson 1: All About Water

Experiment Supplies:
• Paper towel (1 or 2 pieces)
• 2 drinking glasses
• Food coloring (any color)
• Eye dropper
• 1 penny for each child
• Water
• Small piece (4”–5” in length) of each of the following: paper, facial tissue, plastic wrap, aluminum foil, and wax or parchment paper
• Pitcher
• Powdered drink mix
• Sugar (if needed—see powdered drink mix directions)

Lesson 2: States of Water

Activity Supplies:
• LEGO® bricks (a few dozen)
• Bucket to hold all the LEGO® bricks
• Small toy
• Craft paint (any color)
• Cotton swab for each child
• Optional read-aloud books (see read-aloud page)

Lesson 3: Evaporation, Condensation, and Precipitation

Activity Supplies:
• Large, clear glass or plastic container with a lid
• Pebbles or small rocks (enough to make a 1” layer in the container)
• Soil (enough to plant a small plant in the container)
• Small indoor plant (not a desert plant)
• 1 c activated charcoal (optional)
• Shells, stones, or other small decorations (optional)

Experiment Supplies:
• 8 ice cubes
• Saucepan with lid
• Stove
• Bowl of water
• Chalkboard (only needed if there is inclement weather)
• Paintbrush for each child

Lesson 4: The Water Cycle

Activity Supplies:
• Cotton balls (a handful for each child)
• Sheet of construction paper or cardstock for each child (8.5”x11” or larger)
• Watercolor paints or craft paints (at least green, blue, and yellow)
• Paintbrush for each child
• Markers
• Tape or glue

Lesson 5: Bodies of Water

Activity Supplies:
• Green play dough (a container for each child)
• Blue construction paper or cardstock (3–4 sheets 8.5”x11” or larger for each child)
• 29 colored push pins or 29 straight pins for each child (See the Map Skills Activity in Lesson 5 for an explanation of how many different colors of pins are needed.)
• Old phone book, old coloring book, or corkboard for each child
• Clear plastic water bottle, filled with water (one that can be placed in the freezer)
• Permanent marker

Lesson 6: Water Shapes the Earth

Experiment Supplies:
• Frozen water bottle prepared in the previous lesson
• 2 cookie sheets or large baking dishes
• Parchment or wax paper to line the cookie sheets or baking dishes (optional)
• 5 paper cups completely filled with the following: one with dry sand, one with wet sand, one with dry dirt, one with mud, and one with mud mixed with weeds
• Spray bottle full of water
• Small rock
Lesson 7: Oceans, Currents, and Tides

Experiment Supplies:
- Cake pan (9”x13” or larger)
- Water
- Yellow and blue food coloring
- Straw for each child
- 4 clear plastic cups, all the same size
- 1/2 c salt (divided in half)
- Spoon
- Blue and yellow food coloring
- 2 pieces of cardstock or thin cardboard (just larger than the mouths of the cups)
- 2 paper or plastic cups (8 oz or larger)
- Small handful of dirt

Activity Supplies:
- Highlighter for each child
- A blue and a red marker, crayon, or colored pencil for each child (optional)

Lesson 8: Icebergs and Glaciers

Experiment Supplies:
- 1 cookie sheet
- Wax paper to line the cookie sheet
- A few pieces of tape
- A few handfuls of dirt and small pebbles
- 2 cups of ice prepared in the previous lesson
- Large, clear bowl of water (deep enough for the ice to float in it)
- Box or stack of books (to prop up the cookie sheet)

Lesson 9: Groundwater

Experiment Supplies:
- Tall, clear jar or vase
- Rocks, sand, and dirt (enough to layer and fill the tall jar or vase)
- Tape or glue

Activity Supplies:
- Dry kitchen sponge
- Small, closed plastic container
- 2 plates
- Pitcher of water

Lesson 10: Water Power

Activity Supplies:
- Skewer
- 8 plastic spoons
- 4” craft foam ball
- 2 cardboard boxes (each at least 1 ft tall)
- Glass of water
- Large towel
- Container to catch falling water

Lesson 11: Clean Water

None
Instructions: Cut out the vocabulary cards in this section. Place them on your science wall when prompted to do so in the lessons. Review the vocabulary words several times during this unit and, if desired, at various times throughout the school year.

VOCABULARY—WATER

Properties of Water

1. Cohesion
   Water molecules cling to one another.

2. Adhesion
   Water molecules cling well to many other substances.

3. Universal Solvent
   Water can dissolve a wide range of important substances.
Lesson 1: All About Water

Objectives

• Help the children identify water throughout their world and specific properties of water.
• Define vocabulary words Cohesion, Adhesion, Universal Solvent, Capillary Action, and Surface Tension.

Preparation

☐ For each child, print one copy of the “Water in Our World” page included in this lesson. The lined version is suggested for older children who can write. The grid version has empty spaces for younger children to draw pictures.

☐ Assemble the mini book All About Water.

Experiment Supplies:

☐ Paper towel (1 or 2 pieces)
☐ 2 drinking glasses
☐ Food coloring (any color)
☐ Eye dropper
☐ 1 penny for each child
☐ Water

☐ Small piece (4”–5” in length) of each of the following: paper, facial tissue, plastic wrap, aluminum foil, and wax or parchment paper
☐ Pitcher
☐ Powdered drink mix
☐ Sugar (if needed—see powdered drink mix directions)

Reminder: The experiments in this unit are available to watch at goodandbeautiful.com/sciencevideos.

☐ Optional Read-Aloud

At any point in the lesson, you may read one of the books from the optional Read-Aloud Book Pack or the Correlated Books. Longer books may be split into more than one reading session.

☐ Read to the children:

Water is a very important part of our lives. It is all around us in one form or another. Water is so prevalent in our world that it actually covers around 70% of the earth’s surface. That means that if you divided the surface of the earth into four equal sections, nearly three of the four sections would be completely covered with water.

Water is also a vital part of your body. Nearly three-fourths of your body is water, too! And without water, you would not be able to live.

In this unit we are going to learn all about water. We will learn about the different forms of water, how water moves around in our world, and how water affects many parts of our lives that we may not realize.

☐ Science Journal

Have the children think of examples of forms of water throughout the world and write them on the “Water in Our World” page. Younger children may draw pictures rather than write the words. Tell the children that as they learn about new sources of water throughout this unit, they should add those sources to their lists. Have the children place their pages in their science journals.
Read to the children:
Water has many characteristics. We call these characteristics “properties.” Let’s read about some of water’s properties.

Mini Book
Read the mini book All About Water included in this lesson.

Science Wall
Read and discuss the vocabulary card PROPERTIES OF WATER and place it on your science wall.

Tell the children that they will be participating in several experiments demonstrating these properties of water.

Experiment: Capillary Action
Have the children begin this experiment that demonstrates capillary action first as it will require extra time to sit during the other experiments.

1. Roll a sheet or two of paper towel so that it is in the shape of a rope roughly one foot in length.
2. Fill one glass half full of water. Add a drop of food coloring.
3. Place an empty glass next to the glass with food coloring. Place one end of the paper towel in the colored water and the other end into the empty glass.

4. Allow this experiment to sit undisturbed as the children complete the following experiments. Return to the experiment after the others are complete.

5. Upon returning to this experiment, ask the children what they notice about the paper towel. The children will likely notice that the colored water has crept up the paper towel.

Read to the children: What do you think caused the water to climb up the paper towel despite gravity? What you have observed is called capillary action. The water molecules are attracted to the molecules in the paper towel, so they cling to one another and, additionally, cling to the molecules in the paper towel and spread up the paper towel. Capillary action is the process plants use to draw water out of the ground through the roots and up into the plant.

6. The experiment may now be cleaned up, or, if you choose, it can be left out overnight to observe the full process.
Experiment: Surface Tension

Have the children participate in the following experiment demonstrating cohesion and surface tension.

1. Give each child a penny.

2. Using an eye dropper, have each child take a turn slowly dropping water onto his or her penny. Have the children see who can drop the most drops onto his or her penny before the water spills over the edge onto the table.

3. Read to the children: This demonstrates cohesion. The water molecules cling to one another so much that the water appears as if it has a skin-like surface holding it together. This cohesion, or sticking together of molecules on the outer surface of the water, is called surface tension.

Experiment: Adhesion

Have the children cooperatively participate in the following experiment demonstrating adhesion.

1. Lay a small piece (4"–5" each) of the following items on a small table: paper, facial tissue, plastic wrap, aluminum foil, and wax or parchment paper.

2. Using the eye dropper, have the children drop one small drop of water onto each piece.

3. Have the children carefully lift each item and turn it over. Have them watch to see how well the water adheres to the surface and compare which items are better sources of adhesion for the water. Also, point out that on some of the surfaces, most of the water may drip off, but, if they look closely, they may still see very small droplets of water adhering to the surface. This demonstrates the adhesive property of water.

Experiment: Solubility

Have the children participate in the following experiment demonstrating how items dissolve in water.

1. Have the children help you make a pitcher of powdered drink mix according to the package directions. Have them look at the sugar and/or powder as it is poured into the water, and then stir it in.

2. Give each child a spoonful of the prepared beverage. Ask the children if they can see or feel the sugar and/or powder now that it is dissolved into the water.

3. Remind the children that water is a solvent and ask them what that means. [It can dissolve something.]

Science Wall

Read and discuss the vocabulary cards CAPILLARY ACTION and SURFACE TENSION and place them on your science wall.

Capillary Action  Surface Tension
Water has many unique properties. *Property* is a word used by scientists to mean the specific characteristics of a substance. Let’s learn about some of the properties of water.

Water is all around us. Whether we think of the lakes nearby, the raindrops falling from the sky, or the water flowing from our faucets, water is a very big part of our lives.
Have you ever sprinkled sugar, salt, or another substance into water? As you stir it into the water, it seems to disappear. Where does it go?

Water is a solvent. That means that other substances are able to easily dissolve into it. When a substance dissolves in water, the water molecules overcome the force that holds the other substance’s molecules to one another so that the other molecules no longer join together. The water molecules then surround each individual molecule of the other substance. Because the molecules are all pulled individually apart, they are too small for you to see.

Water dissolves a wide range of useful substances, giving it the description of “universal solvent.”
The Search for the Lost Malaysian Flight MH370

The need for better ocean maps was made clear during the international search for Malaysian Flight MH370, which disappeared from the sky somewhere west of Australia in 2014, with 239 people on board. To detect an object the size of a large passenger jet in the deep and remote Indian Ocean, even the data collected from ships using the most advanced type of sonar are not detailed enough because ships are too far away from the seafloor. This type of search requires the use of underwater robots that can take detailed sonar images closer to the bottom. To safely perform the search without accidentally running into the side of an uncharted seamount, the underwater robot needs an accurate map of the search area before it can start.

The search teams had to get creative. They had to first use the sonar on the ship to map the area. This information helped them safely navigate their autonomous underwater vehicles, or AUVs for short, closer to the seafloor. Some of the AUVs could even communicate back to smaller boats at the surface using a new type of underwater wireless modem similar to Wi-Fi. After months of searching and over 120,000 square kilometers (46,332 square miles) mapped, the final resting place of the airplane remains a mystery.

The Future of Ocean Exploration

There remains so much of the ocean to discover. New marine species are routinely discovered during deep-sea excursions. Underwater volcanoes, ancient shipwrecks, hidden canyons, and valuable mineral deposits are just waiting to be studied.

Our imagination is our only limit to the future of ocean exploration. Just think, maybe one day you will find yourself working in an undersea laboratory, managing the operation of hundreds of undersea robots exploring the unknown depths of our ocean. The future is bright.
Lesson 3: Evaporation, Condensation, and Precipitation

Objectives

- Help the children understand and recognize the processes of evaporation, condensation, and precipitation.
- Define vocabulary words Evaporation, Condensation, Precipitation, and Water Vapor.

Preparation: None

Activity Supplies:

- Large, clear glass or plastic container with a lid
- Pebbles or small rocks (enough to make a 1" layer in the container)
- Soil (enough to plant a small plant in the container)
- Small indoor plant (not a desert plant)
- 1 c activated charcoal (optional)
- Shells, stones, or other small decorations (optional)

Experiment Supplies:

- 8 ice cubes
- Saucepan with lid
- Stove
- Bowls of water
- Chalkboard (only needed if there is inclement weather)
- Paintbrush for each child

☐ Read to the children:

In the last lesson, we learned about the three states or forms water can take. What are they? [solid, liquid, and gas] Today we are going to learn how water changes from one form to another.

☐ Science Wall

Read and discuss the vocabulary words EVAPORATION, CONDENSATION, PRECIPITATION, and WATER VAPOR and place the corresponding cards on your science wall.

The Water Cycle Water Vapor

☐ Read to the children:

We are going to participate in some experiments that will demonstrate evaporation, condensation, precipitation, and water vapor. Watch closely to see if you can identify when each of these takes place during the experiments.

☐ Water Cycle Experiment

Have the children observe as you do the following. Take care that the children do not get too close to the hot stove, pan, or water.

1. Place eight ice cubes in a saucepan and place it on the stove.

2. Turn the stove up to high heat. The ice cubes will begin to melt.

3. Allow the water to come to a boil.

4. As the water begins to boil, ask the children what they see. [steam] Point out to the children that the steam is water vapor. Ask the children if this demonstrates evaporation, condensation, or precipitation. [evaporation]

5. Show the children the dry underside of the pan’s lid. Then hold the lid about six inches above the pan for 30 seconds. Now show the children the underside of the lid. Ask the children how they think the water droplets got on the underside of the lid. Explain to the children that when the warm water vapor hits the cool lid, the water vapor condenses and forms water droplets. Explain that condensation occurs in the sky when water vapor cools and condenses onto dust particles in the air. The tiny water droplets
Lesson 4: The Water Cycle

Objective
• Help the children understand the process and steps that take place in the water cycle.

Preparation
☐ Cut out the labels on “The Water Cycle” page.

Activity Supplies:
☐ Cotton balls (a handful for each child)
☐ Sheet of construction paper or cardstock for each child (8.5"x11" or larger)
☐ Watercolor paints or craft paints (at least green, blue, and yellow)
☐ Paintbrush for each child  ☐ Markers  ☐ Tape or glue

☐ Shared Reading
With the children, read the “Noah’s Ark” story included with this lesson.

☐ Read to the children:
Today we are going to learn about the water cycle. What do you think the water cycle is? The water cycle is the process in which water moves around in our world. Water moves through our world by evaporation, condensation, and precipitation. Review the vocabulary words EVAPORATION, CONDENSATION, and PRECIPITATION that were placed on your science wall.

☐ Activity
Show the children “The Water Cycle” page. Have the children tape or glue the evaporation, condensation, and precipitation labels on top of the number that shows that part of the water cycle. Point out that the water cycle does not end; water keeps cycling over and over in our world.
Answers:
1. Evaporation, 2. Condensation, 3. Precipitation

☐ Art Project
Have the children construct their own diagrams showing how water moves through the water cycle by using cotton balls, construction paper or cardstock, paint, markers, and tape or glue.

Have the children draw arrows showing the continuous cycle of water and label the diagram with the following terms: evaporation, condensation, and precipitation.

☐ Science Wall
Place “The Water Cycle” picture or the children’s art diagrams on the science wall.
Can you imagine the winds howling, the flash of lightning, the rumbling of thunder, and the first raindrops of the storm falling as Noah gathered and brought in the last of his family and things onto the ark? A storm was coming unlike any before upon the earth.

“I will cause it to rain upon the earth forty days and forty nights,” the Lord had told Noah. And only seven days after this warning, the waters of the flood were upon the earth.

We read in wonder and amazement of this great storm that caused “all the fountains of the great deep [to be] broken up, and the windows of heaven [to be] opened.”

And the rain was upon the earth forty days and forty nights. . . . And the flood was forty days upon the earth; and the waters increased, and bare up the ark, and it was lift up above the earth. And the waters prevailed, and were increased greatly upon the earth; and the ark went upon the face of the waters.
The Water Cycle

- Evaporation
- Precipitation
- Condensation
- Evaporation
Lesson 5: Bodies of Water

Objectives

- Help the children identify areas on the earth where water accumulates as it passes through the water cycle.
- Define vocabulary words Ocean, Sea, Lake, River, Stream, Pond, Gulf, Bay, Wetland, Fresh Water, Salt Water, and Strait.

Preparation

- Cut out the “Bodies of Water Cards.”
- For each child, print one “Map of North America” page.

Activity Supplies:

- Green play dough (a container for each child)
- Blue construction paper or cardstock (3–4 sheets 8.5”x11” or larger for each child)
- 29 colored push pins or 29 straight pins for each child (See the Map Skills Activity for an explanation of how many different colors of pins are needed.)
- Old phone book, old coloring book, or corkboard for each child
- Clear plastic water bottle, filled with water (one that can be placed in the freezer)
- Permanent marker

Read to the children:

As water moves through the water cycle, sometimes the water is in the air and sky. Other times it is falling from the sky as rain, hail, or snow. And other times the water is on the surface of the earth. When water is gathered on the surface of the earth, we call it a body of water. There are many kinds of bodies of water on Earth. Some are big. Others are very small. Today we are going to learn about the different types of bodies of water.

Activity

Lay the “Bodies of Water Cards” facedown on the table. Have a child turn over a card and read what it says. Discuss the content with the children. Also, make sure to point out the following information not included on the cards:

- Bay: A bay is generally smaller than a gulf, though exceptions do occur (e.g., Hudson Bay).
- Wetland: A wetland is also known as a swamp or marsh.
- Sea: A few extremely large lakes have also been given the name sea.

Read and discuss the SALT WATER and FRESH WATER vocabulary cards. As you read aloud the next paragraph, help the children sort the “Bodies of Water Cards” under the corresponding vocabulary cards.

Read to the children:

Some bodies of water on the earth are salt water and some are fresh water. Saltwater bodies of water include oceans and seas. In fact, 97% of the water on the earth is salt water. That leaves only 3% of the water on the earth as fresh water. Freshwater bodies of water include ponds, rivers, streams, and wetlands. Almost all lakes are fresh water; however, there are a few lakes that are saltwater lakes (for example, the Great Salt Lake). Bays and gulfs are generally
considered saltwater bodies of water. However, some smaller bays quite often contain a mixture of fresh water and salt water.

☐ **Science Wall**

Place the “Bodies of Water Cards” and the SALT WATER and FRESH WATER vocabulary cards on the science wall.

Salt Water  Fresh Water

☐ **Bodies of Water Activity**

Give each child a container of green play dough and 3 or 4 sheets of blue construction paper or cardstock. Have the children create each body of water as shown on the “Bodies of Water Cards” by placing the green play dough (land) on top of the blue paper (water).

The children can create each individual body of water separately on different parts of the blue paper, or they can tape together the sheets of blue paper and create a physical map of an invented land containing each type of body of water.

After creating the bodies of water, have the children label them.

☐ **Map Skills Activity**

Show the children the “Map of North America” page included with this lesson. Help each child place a copy of the map on a bulletin board, a corkboard, an old phone book, or an old coloring book.

Help the children locate bodies of water on their maps. Have them place colored pins to mark each type of body of water.

Seven different colors of pins will be needed, or you can make your own by taping pieces of colored paper to the end of straight pins.
Bodies of Water Cards

River
a large body of moving water that flows downhill

Stream
a small shallow body of moving water that flows downhill

Pond
a small shallow body of water surrounded by land

Lake
a large standing body of water surrounded by land
Mapping the Yukon River

Between 1896 and 1900, thousands of hopeful prospectors flooded the rugged Klondike region of Canada in search of gold. It is estimated that around 10,000 people attempted the trek to the Klondike, but less than half ever made it to their destination.

The remoteness of the mining areas was a significant problem for the prospectors. There were three main routes to the Klondike: a trek across the Canadian wilderness, an overland route that required a hike through the Chilkoot or White Pass in Southeast Alaska, and an all-water route up the Yukon River.

All options were complicated. The gear and supplies required for mining were bulky, and each person was required to carry his or her own load. Hauling supplies over the rugged mountain landscape, as in this image to the right, proved dangerous, and many perished or turned back before ever seeing an ounce of gold.

The all-water route up the Yukon was also treacherous. First, it required a ship to cross the Gulf of Alaska, a region notorious for its violent storms. Second, it passed through the chain of Aleutian Islands by way of the Unimak Strait, braving its shifting currents. Lastly, the ship entered the uncharted mouth of the Yukon River, which is riddled with shallow banks and sandbars that are shrouded underneath the muddy waters.

The all-water route up the Yukon River was the preferred option to resupply the boomtowns that sprang up along its banks, but because of the lack of nautical charts at the river entrance, many ships ran aground and were lost. Responding to an urgent request for a safe route at the entrance to the Yukon River, the US Coast and Geodetic Survey (USC&GS), the predecessor to the National Oceanic and Atmospheric Administration (NOAA), sprang into action.

Carrying some of the most adventurous and daring scientists of the time, the ship USC&GS Thomas R. Gedney found its way to the Yukon River mouth and immediately started mapping. Measuring the depths of the seafloor and the position of the coastline was a complicated process. Each depth was measured by lowering a weighted rope, called a lead line, into the sea until it touched the bottom. Along with the depth, locations were recorded by triangulating their positions using sextants and landmarks onshore. Tide stations were set up in the area to measure the heights and frequencies of high and low tides. Finally, all the depths were corrected based on the height of the tide at the time of the observation. All this information was put together to create maps called nautical charts.

The Klondike Gold Rush seemed to end as fast as it started. Still, maritime transportation remains vital to the small communities that live on the banks of the Yukon River, the third-longest river in North America. To update the nautical charts at the entrance to the river, today’s surveyors use satellite imagery, computer modeling, and specialized sonar sensors to notate the safe routes for navigating the mouth of the river. Using this type of remote-sensing technology, they are monitoring the changes to the river year by year.
Our earth is always changing! Each and every day, bit by bit, changes happen. Sometimes the changes happen fast; sometimes the changes occur very, very slowly over time. Sometimes the changes create a beautiful landscape; other times the land we once loved isn’t quite the same.

Changes to our earth happen for many different reasons. Many changes are human made, but many others are a result of natural causes.
Weathering is one of the natural ways that the earth is changed. When weathering occurs, Earth’s natural features, like rocks and soil, are broken down. Water is one of the major causes of weathering on Earth.

The rock shown here broke in half as a result of water weathering.

Rocks are broken during the weathering process as water collects in cracks within the rocks. When temperatures drop, the water freezes. As the water freezes, it expands, expanding the rocks with it. Eventually, the water melts and drops farther into the cracks that were created. The water again freezes, and the cycle continues until the rocks crack and break.

Erosion is another way the earth is shaped and changed. Erosion happens when wind, water, or ice moves rocks and soil to a new location.

Rivers are great examples of water erosion. Rocks, soil, and sediment (broken-down bits of rock and soil) are picked up by rushing water and deposited in new areas along the way.
Bryce Canyon in Utah, USA, was formed as repeated freezing of water weathered the rock. Erosion from rainwater then took place, leaving beautiful rock formations.

Delicate Arch, just outside Moab, Utah, USA, was formed over time as water, frost, and wind wore away the sandstone rock.

The Cliffs of Moher in Ireland were formed long ago as a river deposited sediment in the area. Over time, the sediment was compressed, creating the beautiful rock cliffs.

The Nile River deposits sediment into the Mediterranean Sea, creating the Nile Delta, one of the largest deltas on Earth.
Water and Weathering

Below each picture, list the term that best describes the image: delta, deposition, erosion, or weathering.

[Images showing different natural landscapes]

Draw a picture of and describe one of the changes that happened to the sand or soil in the "Water and Soil Experiment."
The Ocean
By Mindi Eldredge

Swift winds brush the water’s surface,
The ocean starts to swell,
The crests of waves rise higher,
How tall I cannot tell.

The waves crash down like thunder,
Dashing hard against the shore.
The undertow beckons them lower
Back to the ocean floor.

The tide is high, the moon is full,
The salty smell is thick.
The waves keep marching, rolling in,
And retreat back just as quick.

And farther out away from shore
A current rushes by.
A river deep within the sea,
Bringing warmth to land nearby.

I may not know just how
The current finds its way
Or how the waves grow bigger
Or smaller every day.

But one thing I am certain,
As certain as the tide,
The Lord God has created
The ocean far and wide.
unsaturated zone is called the water table. The water table in an area can move higher or lower depending on the amount of water in the area at a given time.

Impermeable Rock: At some point the water reaches impermeable rock where it cannot get through or go any lower within the earth.

Groundwater Experiment

Show the children the following to demonstrate how water arrives underground.

Note: Using thicker, claylike soil will cause the demonstration to take a lot longer. If that is the only dirt available to you, use smaller amounts of dirt and more rocks and sand.

1. In a tall, clear jar or vase, have the children help you layer rocks, sand, and soil. Fill the jar until it is nearly full, repeating the layer pattern a couple of times.

2. Have the children watch closely as you pour water into the jar. The water will very slowly trickle down through the rocks and soil to the bottom of the jar. (Depending on the type of soil you use and the size of the jar, you may need to continue the lesson while the water continues to settle to the bottom. After completing the rest of the lesson, you can return and finish this experiment.)

3. Have the children identify the following areas within the jar: the unsaturated zone, the water table, the aquifer (saturated zone), and the impermeable rock. [The bottom of the jar represents the impermeable rock.]

4. Pour a little more water into the jar and ask the children what happens to the water table. [It rises.] Ask the children what they think might cause the water table to rise in a certain area. [rainfall, snow melting] What might cause the water table to drop? [drought or overuse]
Water has an amazing ability to shape and change the landscape of our beautiful planet. Large glaciers and strong rivers carve deep gouges on the earth's surface, and wind and rain can sculpt artful masterpieces in desert sandstone. Similarly, the dissolving power of groundwater can have a striking effect on an area's landscape by hollowing out the underlying rock.

The spectacular formations caused by groundwater dissolving the underlying rock include massive underground caverns, collapsing sinkholes, and lofty pinnacles. These occur in areas known as karst landscapes, which are underlain with readily dissolvable limestone rock, named after the Karst region of Slovenia that borders Italy.

On its own pure water cannot readily dissolve limestone. However, limestone is easily dissolved in the presence of an acid; in this case it is a weak acid called carbonic acid. Rainwater naturally contains small amounts of carbonic acid, which it picks up by mixing with carbon dioxide when falling through the sky and soaking through nutrient-rich topsoil. The process of dissolving limestone by slightly acidic groundwater is a type of chemical reaction that results in some bizarre and unexpected wonders.

**Sinking Rivers**

Imagine canoeing down a large slow-moving river through a lush forest, and suddenly the river seems to end, even though the water keeps flowing. You were likely traveling down a sinking river, and you found the location where the river starts flowing underground.

A striking example of this is the Danube River in Germany. For almost half the year when river levels are low, the upper part of the river completely disappears underground, emerging miles later as another river called the Aach.

**Tower Karst**

Another amazing karst landscape is made of tall, near-vertical hills and pinnacles. These hills are interconnected by extensive cave systems, such as the Batu Caves outside Kuala Lumpur, Malaysia, some of which are used for religious ceremonies.

The towering hills in the Guangxi province of Southern China are one of the most famous examples of this unique landscape. It is a frequent destination for moviemakers looking to capture its majestic and natural beauty.

**The Great Blue Hole**

Another characteristic of karst landscapes is sinkholes. Sinkholes can sometimes form unexpectedly and can range between just a few feet to more than 50 feet deep. They occur when the underlying limestone is washed away by groundwater and the surface above it suddenly collapses.

The Great Blue Hole off the coast of the Central American country of Belize is a unique type of marine sinkhole. This popular diving location is found on a barrier reef and is more than 121 meters (400 feet) deep.

Instructions:
1. Read the article. In your science journal, take notes and illustrate them.
2. The Great Blue Hole off the coast of Belize has stalactite and stalagmite formations that can form only in dry caves. In your journal, write how you think these were formed. Here are some questions to guide your thinking: Was the Great Blue Hole always underwater? How did it fill up with ocean water?
Lesson 11: Clean Water

Objectives
• Help the children understand where drinking water comes from and the importance of water conservation.
• Define the vocabulary word Conserve.

Preparation
☐ Assemble the Clean Water mini book.
☐ For each older child (grades 4+), print one copy of the “From Lake to Sink” page. (optional)
☐ Print one copy of the “Let’s Save the Water Together Clue Coins” and cut them out. Place one coin in each area of the home as explained in the “Hide and Save Game” section of this lesson.

☐ Optional Read-Aloud
At any point in the lesson, you may read one of the books from the optional Read-Aloud Book Pack or the Correlated Books. Longer books may be split into more than one reading session.

☐ Read to the children:
Have you ever wondered how the water you use and drink comes to your home? There are several ways water is collected and distributed to homes and businesses. Today we will learn where our water comes from and what we can do to keep our water clean and available.

☐ Mini Book
Read to the children the Clean Water mini book included in this lesson.

☐ Science Journal (Optional Activity)
Give each of the older children (grades 4+) a copy of the “From Lake to Sink” page included with this lesson. Have the children write in their own words the process that river, lake, or reservoir water goes through to be cleaned and prepared for drinking. (See page 5 of the Clean Water mini book.)

☐ Read to the children:
What do you think the word conserve means? To conserve something means to protect it from harm, contamination, or unnecessary waste. So, water conservation means to keep water uncontaminated (clean) and to save clean water from being wasted.

☐ Science Wall
Read and discuss the vocabulary card CONSERVE and place it on your science wall.

☐ Hide and Save Game
Before the lesson all of the “Let’s Save the Water Together Clue Coins” should be placed in the locations listed below. (The underlined words describe the location.)
Have the children each take a blank page from their science journals and title the page “How I Can Help Conserve Water.” Down the left side of the
Fortunately, God created our world and is aware of all of us and our needs. We should remember, though, that we must do our part to take care of the earth He has provided for us. It is important that we help protect Earth’s water from contamination and waste. What do you think you can do to help take care of and conserve water?

Here are a few ways to get started:

1. **Don’t waste water.**
   When you wash your hands, brush your teeth, take a shower, and wash the dishes, don’t leave the water running longer than necessary.

2. **Fix leaks.**
   If you notice that a faucet has a leak, tell your parents so they can fix it.

3. **Wash full loads.**
   When it’s your turn to load the dishwasher or the washing machine, make sure you have a full load before starting the dishwasher or washing machine.

4. **Put a pitcher of water in the refrigerator.**
   Instead of waiting for running tap water to become cold, place a pitcher in the refrigerator so that you always have cold water on hand.