Illinois Driftless Education Lesson Plans and Resources

Compiled by the

GALENA-JO DAVIESS COUNTY HISTORICAL SOCIETY

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Lesson Plans

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Driftless Visuals

Additional Resources

List of local Driftless field trips

LESSON PLAN 1: INTRODUCTION TO GLACIERS: DRIFT VS. DRIFTLESS

Overview:
During the past 2.5 million years, numerous continental glaciers advanced and retreated across much of the upper Midwest, with the last melting some 12,000 years ago. Four major periods of glacial activity shaped and deposited both the topography and soil types that we see today across much of the Midwest.

However, areas of Illinois, Wisconsin, Iowa and Minnesota along the Mississippi River somehow escaped the scouring and depositional effects of glaciation. Scientists believe that glacial lobes of ice during different periods came from different directions, completely surrounding yet somehow missing this area. Because the area wasn't covered with glacial drift (sand/gravel) it was named "The Driftless Area". Saved from the impacts of glaciation, The Driftless Area gives scientists a rare look at pre-glacial geology that also harbors rare species that are true Ice Age relics.

Duration: 30-45 minutes

Grade Levels: 5-8

Subject Areas: Earth Science, Physical Science, Geography

Standards Addressed:
4-PS3-1
PS3.1
4-PS3-4
5-ESS3-1
MS-ESS2-5
MS-ESS2-3
MS-ESS1-C
MS-PS2-4

Objectives:

- Students should learn the process of glacier formation over a very long time period.
- Students should learn how glaciers move and the resulting land formations.
- Students should learn glacial features found in the Midwest.
- Students should learn the difference between glacial drift and driftless areas and the resulting land features of each.
- Students should learn factors that influenced the glacial movement.
- Students should learn the implications of no glacial activity on the land, as well as which plants and animals are likely to thrive in that area.

Teacher Background:

A glacier is made up of thick layers of compressed ice formed from repeated snowfalls that has the ability to move. It flows like a slow river of putty and physically changes the shape of the land in the process. The size of a glacier can vary from as small as a football field to hundreds of kilometers. A glacier forms when the amount of accumulating snow is greater than the amount that melts. This accumulation remains year-round and compresses the lower layers into ice. The extreme weight of the glacier deforms the lower layers of ice similar to putty. This characteristic, along with the pull of gravity, causes the ice to move through mountain valleys or across plains. It can change speed and at times retreat, altering the land beneath by a combination of forces.

As a glacier moves, it carves away land by erosion and also deposits and sculpts new landforms. Sculpting and deposition can form moraines, kettles, drumlins, and eskers. These depositional features are formed with glacial drift that is made up of sand, gravel, rocks, and boulders created and transported by the forces of the moving ice.

This portion of Northwest Illinois that was not covered by glaciers and the resulting glacial drift is called "The Driftless Area." The preserved land features in this area include deeply-cut, v-shaped river valleys and rugged bluffs that were not affected by glaciers. The Driftless Area is surrounded by land that was glaciated at different times in history. Scientists have discovered that the Driftless Area was formed in stages by glaciers advancing from different directions during four different periods ranging from 2.2 million to 12,000 years ago. The Driftless Area is rich with historic and geologic information free from glacial impact.

Vocabulary:

Glaciers: a slowly moving mass of ice formed by the accumulation and compaction of snow
Glacial drift: material (sand, gravel, rocks, boulders) created by, transported, and left over after a glacier melts
Driftless Area: area without glacial drift deposits that reveals pre-glacial landscapes such as deep cut river valleys and sharp edged bluffs

Activity: The Glacial Path

Supplies Needed:

Tray
Sand
Index Cards
Blank Paper Map of the Driftless states
Crayons or Markers
Reference Maps of the Driftless Region (for teacher)
Computer with internet

Activity Steps:

1. Using the teacher's image as a guide, have each student shade in areas on the map where glacial ice covered the land. The remaining area is considered "The Driftless."
2. Go to Google Maps. Find your home on the map and see where it would lie within your Driftless map. How close were the glaciers to your town?
3. Using Google images, look up pictures of examples of glacial drift and glacial carving. This is what happened to the landscape elsewhere when glaciers passed through.
4. Now, see if you can find photos of the Driftless area. How is it different from the other images you looked at?
5. Set up a shallow pan or tray and pour sand in the bottom of the tray. Take turns moving the sand at first with their finger, then with a flat index card.
6. Describe the results:

    • What kind of path is made?
    • What happens to the sand in front?
    • What happens to the sand alongside the finger? The card?
    • Dampen sand slightly and repeat activity.

7. See if you can replicate what happened in the Driftless with the sand.

Discussion Questions:

- What are some different ways in which glaciers can affect the landscape?
- What does the landscape look like after glaciers come through?
- How can geologists tell glaciers passed this area by do you think?

LESSON PLAN #2: Creating the Driftless: A Study in Glacial Movement

Overview:

Glaciers are moving mountains of ice. They move like slow rivers and actually flow. Gravity and the sheer weight of the ice mass are the causes of glacial motion. Ice is softer than rock so is easily deformed by the pressure of its own weight. Movement at the underside of a glacier is slower than movement along the top. Glaciers retreat and advance, depending on snow accumulation, evaporation, or ice melt.

Glaciers transport materials as they move. They also sculpt and carve the land beneath them. A glacier's weight combined with gradual movement, reshapes the land over hundreds to thousands of years. The ice erodes the land surface and carries broken rock and soil debris far from their original places, resulting in some interesting glacial landforms.

Due to the nature of land formations, some areas in northwest Illinois along with southwest Wisconsin, southeast Minnesota, and northeast Iowa were missed by the four glaciers that at different times covered the rest of these states. This area not covered by glaciers and the resulting glacial drift is called "The Driftless Area." This Driftless Area is rich with historic and geological information free from glacial impact.

Duration: 30 minutes

Subject Areas: Earth Science, Physical Science, Geography

Standards Addressed:
4-PS3-1
4-PS3-4
5-ESS3-1
MS-ESS3-1
MS-ESS2-5
MS-ESS2-3
MS-ESS1-C
MS-PS2-4

Objectives:

- Gain an understanding of how glaciers move
- Understand the types of landforms created from glacial movement and glacial scraping
- Define what is meant by The Driftless Area

Teacher Background:

Glaciers are made up of fallen snow that, over many years, compresses into large, thickened ice masses. Glaciers form when snow remains in one location long enough to transform into ice. What makes glaciers unique is their ability to move. Due to share mass, glaciers flow like very slow rivers. Some glaciers are as small as football fields, while others while others grow to be over a hundred kilometers long. Glaciers made up most of the landforms that we have in Illinois including glacial lakes, kettle lakes, till, and moraines.

Till is material deposited as glaciers retreat, leaving behind mounds of gravel, small rocks, sand and mud. It is made from the rock and soil ground up beneath the glacier as it moves. Glacial till can form excellent soil for farmland. Material a glacier picks up or pushes as it moves forms moraines along the surface and sides of the glacier. As a glacier retreats, the ice melts away from underneath the moraines, leaving long, narrow ridges that mark its path. Glaciers don't always leave moraines, because sometimes the melt water carries the material away.

Streams flowing from glaciers often carry some of the rock and soil debris out with them. These streams deposit the debris as they flow. Consequently, after many years, small steep-sided mounds of soil and gravel begin to form adjacent to the glacier. These mounds are called kames.

Kettle lakes form when a piece of glacier ice breaks off and becomes buried by glacial till or moraine deposits. Over time the ice melts, leaving a small depression in the land, filled with water. Kettle lakes are usually very small and are more like ponds than lakes. Glaciers leave behind anything they pick up along the way, and sometimes this includes huge rocks. Called erratic boulders, these rocks might seem a little out of place, which is true, because glaciers have literally moved them far away from their source before melting away.

Glossary:

Moraine: a ridge, mound, or mass of unstratified glacial drift like boulders, gravel, sand, and clay
Kame: a short ridge, hill, or mound of stratified drift deposited by glacial meltwater
Glacial till: unstratified glacial drift consisting of clay, sand, gravel, and boulders
Kettle lake: a steep-sided hollow without surface drainage especially in a deposit of glacial drift

Activity: Glacier Simulation

Supplies Needed:

Access to freezer
Plastic cup
Angular gravel
Tap water
Plastic wrap
Tape
Paper plate
Smooth piece of wood

Activity Steps:

1. Review with your students what they have learned about glaciers. They should be able to define glacier and explain why glaciers move over landforms.

2. Ask students how they think scientists can tell if glaciers have moved over the land in a particular area. Explain that rocks and gravel freeze into the ice and are dragged over the land by the bottom surface of a glacier. How would the land over which a glacier has moved be affected? What evidence of glaciation do glaciers leave behind?

3. Tell your students that they will participate in an activity that will simulate the way landforms are affected by glaciation.

4. Divide the class into groups. Have each group create its own miniature glacier as follows:

    - Have students half-fill a paper cup with angular gravel.
    - Cover the gravel with about an inch of water.
    - Securely tape plastic wrap over the top of the cup.
    - Flip the cup onto a paper plate.
    - Leave the inverted cup in a freezer overnight.

5. When the "glaciers" are frozen solid, have students peel off the paper and scrape them, gravel end down, over a smooth piece of wood. To simulate the action of a glacier, students should scrape in only one direction, since glaciers move only one way.

6. Ask students to observe the patterns the gravel has made on the wood. How would they compare these to the patterns made on landforms by a real glacier? (If possible, provide photographs of actual glacial scraping.)

7. Have each student sketch their patterns and write a short paragraph explaining what they can infer about the way real glaciers affect the landforms over which they move.

Discussion Questions:

- Discuss with the class how patterns of glaciation provide clues to the climate in a particular area over time. For example, if evidence of glacial scraping is found in an area that is too warm for glaciers to exist, what can we infer about how the climate in that area has changed over a long period of time?
- Discuss how we can tell that the area we live in is considered Dritless. What evidence do we have to support that conclusion?
- Discuss the physical differences between the Driftless Area and land that has been covered by glaciers.

Lesson plan inspired by: http://209.7.198.36/geologyonline/lessons/6.1/lesson.pdf

LESSON PLAN #3: How is the Driftless Ecosystem Unique?

Overview:

The Ecosystem of the Driftless region is unique. The landscape in this area is called "karst". It is made of limestone, which is very porous, like a sponge. With the land being like a sponge, water soaks in easily, and sinkholes are formed. This makes pollution of groundwater a danger. Since we have limestone, there are also areas called "Algific Slopes." This combination of landforms has developed unique plants and animal species, such as the Pleistocene Snail and the Northern Monkshood.

Duration: 30 minutes

Subject Areas: Earth Science, Physical Science, Life Science, Geology, and Ecosystems

Standards Addressed: 4-ESS2
5-LS2
MS-LS2
MS-ESS2

Objectives:

- Identify unique wildlife and plants
- Define karst and why it is important to our area
- Identify the significance of sinkholes in the area

Teacher Background: The word "karst" describes a landscape that over time, water has dissolved part of the rock, which is usually limestone. The movement of water creates fractures, sinkholes, and even over longer periods of time has created caves and caverns. The water moves so quickly through these features that it caries sediment, nutrients, pathogens and other contaminants into the groundwater.

Sinkholes are areas where the water has dissolved the limestone or bedrock, thus allowing the soil to fall in. The sinkholes start as very small fractures, about the size of a chipmunk burrow, and over longer periods of time, can grow to be an acre or more in size. Small ones often appear each year, but with tilling of the farmlands, are often covered back up. These small sinkholes provide a direct route for surface water to enter the groundwater. In the past, some farmers would route drainage tiles directly into the sinkholes, but this is now considered illegal.

Algific talus slopes are an amazing mini-ecosystem. We are lucky enough to be in an area where these exist. "Algific" means cold producing, and "talus" means broken rock. The Algific talus slope is also known as a cold air slope – which is much easier to remember. The slopes were first noted in the early 1980's and can be found here in Illinois, along with the Driftless region in Minnesota, Wisconsin, and Iowa.

Limestone, with its sinkholes and crevices that run through the many layers of the rock, is the first of three factors needed to create an algific talus slope. The second item needed is very dense vegetation. The vegetation provides cool air and moist shade. The last thing needed is a north facing slope, the less sun the slope receives the less radiant heat the slope will receive. With this unusual topography, the slopes stay cool in the summer and warmer in the winter, allowing for many species not found in other parts of the Midwest and even the world to thrive.

The Driftless area as we have come to learn is an area that the glaciers have not touched and is located between the Eastern Forests and Western Prairies. This area's rugged topography supports a wide range of habitats today, however it was previously more prairie and savannah. Only about 1/10 of 1% of the original prairies still exist here today; what does remain prairie wise is known as "hill prairies". The "hill prairies" are considered "globally rare" and contain many unique, but declining species of plants and animals.

One of the unique animals that can be found in the area is the Iowa Pleistocene snail. This snail is smaller than a shirt button (about ¼ of an inch in diameter). This snail has survived in small areas where the temperature, moisture and food have been suitable for them. They seek the cool, rocky slopes around coldwater streams, cliffs, valleys, and sinkholes. Since their habitat is considered fragile, the total population is very small. With the small size of their population this snail has been put on the Federal Endangered Species List. As of right now, there are only thirty-seven known colonies left of the Pleistocene Snail, of which, thirty-six colonies are in northeast Iowa, with only one population located in northwest Illinois. The areas inhabited by this snail are closed to the public in order to protect it.

One of the unique plants that can be found in the area is the Northern Monkshood, which belongs to the buttercup family. It grows on the Algific slopes and is found mainly in northeast Iowa. The Monkshood is know for its blue hood-shaped flowers that are about 1 inch long, and many of the blooms can be found on one single stem. The stems, themselves, can range in size from 1 foot to 4 feet. The leaves that are found on the stem are very broad and have toothed lobes. The flower is considered a perennial and reproduces from both tubers and seed. The flowers bloom between June and September and are pollinated by the bumblebees. With the problems facing the bumblebee population, the Monkshood has been on the endangered species list as well.

Glossary:

Karst: an area of limestone terrain, characterized by sinkholes, caves, and underground streams
Sinkhole: a hole formed in soluble rock by the action of water, serving to conduct surface water to an underground passage
Fracture: a break in the bedrock
Limestone: consists chiefly of calcite from concentrated shell, coral, algae, and other debris.
Algific Talus Slope: a cold air slope, not touched by glacier movement
Prairie: tract or area of grassland; meadow
Savanna: a grassland region with scattered trees grading into either open plain or woodland

Activity: Making a Sinkhole

Adapted from "Project Underground: A Natural Resource Education Guide"

Supplies needed:
8 oz. foam cup
scouring pad or very thin sponge
empty 2-liter soda bottle
sugar
sand
scissors
piece of paper

Activity Background:

Sinkholes are natural depressions in the land caused when limestone and soils dissolve. They form when groundwater removes rock underground. They can form by slow gradual sinking or by sudden collapse of an underlying hole.

Sinkholes are common in about one quarter of the U.S. You can usually identify them as circular or oval low spots in fields that may gather standing water after rains. They can be small or larger than a football field. A sinkhole of any size indicates there was a cavity in the bedrock near the surface. Sinkholes are evidence of a subsurface groundwater, either in the past or present. Formation of a new sinkhole or continued collapse of an existing sinkhole indicates present day groundwater.

People can affect the location and rate at which sinkholes form. One way sinkholes form is by the removal of large amounts of water from the ground for human use, livestock, or irrigation. This may lower the water table rapidly. Because of the loss of the water, the land surface can collapse into holes already formed in the underlying limestone.

Time needed: One hour (if you set it up earlier in the day, less time is needed).

Activity Steps:

1. Make a hole about the size of your thumb in the bottom of the foam cup.
2. Cut a circle the size of the cup bottom from a thin scouring pad. Place this circle in the bottom of the cup.
3. Place a column of sugar in the center of the cup and surround it by sand. To do this, make a tube by rolling up a piece of paper and place it in the center of the cup. The paper tube should be about the same height and one half the diameter of the cup. Fill the inside of the tube with sugar and the outside of the tube with sand (the sand should be between the paper tube and the sides of the cup). Carefully remove the paper tube. Place a thin layer of sand over the sugar.

4. Cut the bottom off a two-liter soda bottle at about the same height as the foam cup to create a dish. Fill it about one-third full of water. This will symbolize groundwater.
5. Place the cup with the sugar and sand in the water. Watch as the water fills into the cup and the sugar dissolves and runs out. A sinkhole is formed in the cup as the surface sand sinks into the area where the sugar dissolved. (You may need to remove the cup from the dish of water to allow the water to drain out of the cup and the sinkhole to form).

Discussion Questions:

- What type of rock does the sugar represent?
- What characteristics does a rock have to have to be suitable to form sinkholes and caves in algific slopes?
- What has made the ground so unique in this area?
- Why is it so important to protect our groundwater?

LESSON 4: Humans' Effect on the Driftless Landscape

Overview:

Humans have changed the Driftless in many ways. First, early Native Americans built mounds to bury their dead and also as a place to conduct religious and social ceremonies. A second way the Driftless region was changed was men came to this region to mine. They dug deep holes and tunnels in the earth to dig out the lead. They also cut down many of the trees to heat lead smelters and to fuel the steam engines that carried the lead to sell. Farmers then followed. They stopped burning the prairies and they plowed fields , disrupting the native prairies and causing erosion to the Driftless landscape, particularly the Algific slopes.

Duration: 30 minutes

Grade levels: 5-8

Subject Areas: Earth Science, Physical Science, Life Science and Social Studies

Standards Addressed: 4-ESS3
5-ESS3
MSESS3-2
SS.G.3.6-8.LC

Objectives:

- Students should learn the significance of the mounds to the Native Americans who first lived in the Driftless region
- Students should be able to identify three types of Native American Mounds in the area
- Students should learn how lead mining changed the shape of the Driftless region
- Students should learn how farming changed the landscape of the Driftless region

Teacher Background:

The first occupants of this region didn't leave any written or spoken records that would allow us to know about their daily lives. However, they did leave very important clues in the mysterious burial mounds that can be found on the high banks of the Mississippi River from its beginning in Minnesota to its end in Louisiana. Built over one thousand years ago, the mounds were ceremonial and sacred sites that commemorated the passing of loved ones and illustrated the sacred beliefs of the ancient peoples. Called the Mound Builders, these people left us traces of the prehistoric age in which they lived. The mounds, which contain skeletons, household utensils and implements of war, tell us how people lived in this area. The silent monuments of a prehistoric age have fascinated scholars for centuries. Some of the mounds are linear or conical, beaten down by centuries of wind and harsh weather. Others represent effigies of birds or animals such as eagles or bears.

The earliest way of smelting is an example of how mining disturbed the landscape. The Indians dug a hole in the face of sloping ground about 2 feet deep, and two feet wide at the top and narrowing at the bottom to an 8 OR 9 inch square. It was lined with flat rocks. At the point at the bottom narrow stones were laid making a grate. A trench was dug beside the hole leading to the bottom of the hole. This trench was a foot wide and foot deep. It was filled with dried branches and leaves. The original hole was filled with ore. The dry wood was set on fire and in a few minutes the molten lead fell through the stones at the bottom and through the trench over the earth. The fluid mass was then poured into a rough wooden mold.

Early mining was done by squaws. In the spring of 1829, thousands of miners came to Galena to dig for lead. There was so much lead to be found near Shullsburg that 9 log furnaces were running. A miner would sink a perpendicular shaft down to 10 to 20 feet into the earth. The shaft would be about 4x6. It would be lined with planks of wood. At this depth, limestone was found. If it was soft, the miners would go down with a pick and dig it out, but usually gun powder was used to blast the rocks away until they reached rock where they expected to find the lead. Then they would build "rooms" underground, sometimes from 4 to 15 feet high and sometimes 40 feet in width and as long as several hundred feet. Many times the roof of the cut was lined with wood to make it secure. These "rooms" were lighted with tallow candles. The ore was carried back to the main shaft by a wooden hand run railway. From 1821-1858, 820,622,839 lbs of pigs or melted lead was shipped out. Think of all the logs needed to line the shaft and melt that into liquid.

This area was primarily prairie and savanna. Less than 1/10 of 1% of our original prairies remains today. In the Driftless Area, much of these remaining prairies are "hill prairies." The prairies are now considered "globally rare" and contain many unique and declining species of plants and animals. Most prairie types were lost primarily to plowing. The "hill prairies" however, disappeared because with farming came the control of fires. Farming especially in more recent years has had and continues to have a large impact on our ecosystems. Stripping the land of trees and prairie grasses, changing the contours of the land itself, allowing farm runoff to seep into our groundwater, and in more recent years, the use of chemicals are some of the farming practices that have a negative effect on our environment. Fortunately, farmers and environmentalists are working together to find ways of better controlling these effects.

Glossary:

Effigy- a burial mound in the shape of a bird or other animal
Conical- cone shaped mound
Linear- long, narrow mound
Smelting- to melt rock that contains metal in order to get the metal out
Erosion- the gradual destruction or wearing away of something by natural forces (such as water, wind or ice)
Lead - a metal, also known as galena. Used to manufacture bullets and household items
Silting – earthy matter, fine sand carried by moving or running water and deposited as a sediment

Activity: Recreating a Burial Mound

Supplies Needed:

Large playground space
Chalk
Brown butcher paper, enough for each child in class to trace their bodies while lying flat
Crayons
Scissors
Images of mound shapes

Activity Steps:

1. Give each student in class a length of butcher paper and a crayon.
2. Working in pairs, have each student trace around their partner.
3. Have the student cut out silhouette.
4. Ask the students to draw on their silhouette treasured items with which they might wish to be buried.
5. Using chalk, find a space on playground. Step off 700 feet, which is the size of some of the known mounds.
6. Draw a circle.
7. Students will place as many silhouettes as will fit in the circle.

Discussion Questions:

- How did Native Americans change the landscape?
- How did mining change the Driftless region?
- How did farmers change the Driftless region?
- Pros and Cons of mound building, lead mining and farming over saving prairies and original Driftless landscape.
- In what ways do we affect the land today?
- Are there ways in which we can alter the landscape in positive ways?

LESSON PLAN #5 Conservation and the Future of the Driftless Area

Overview:
As seen in past lessons, the Driftless Area has been affected by human interaction especially mining and farming activities. In recent years conservation efforts have been put in place to help maintain and restore our prairies, water quality, and native species.

Jo Daviess Conservation Foundation has taken a leadership role in creating, restoring, and maintaining parks and recreational areas. Land and water preservation is one of its main focuses. Another organization committed to the protection and management of native prairies and savannas in our county is the Prairie Enthusiasts.

The Galena League of Women Voters has been instrumental in developing a plan to address the poor water quality of the lower Galena River. Their efforts led to the formation of The Galena River Watershed-based Planning Committee which continues to develop plans to improve water quality and to protect and preserve ground water.

In 2008 a group of Jo Daviess County concerned citizens created a grass roots organization called HOMES to stop the establishment of a megadairy consisting of over 5000 head of cattle. This group's main concern was the porousness of the soil in the county. The karst allowed run off to enter the water table. The concern was what would happen with that many cattle located in one space. Because of their continuing activism over a number of years, the plans for the dairy were finally halted. County citizens also have a concern about the building of a four lane highway from its east to west borders and continue to monitor its planning.

The Stephenson, Carroll, Winnebago and Whiteside County Soil and Conservation Districts have several programs designed to conserve soil and protect water quality. One such is the Conservation Practice Program which provides cost share assistance and other financial incentives for the construction of or the adoption of projects that reduce soil erosion and improve water quality. Another program is the Water Well Decommissioning project to help protect against groundwater pollution. Stephenson County also has a Wetland Reserve Program where they offer landowner the opportunity to protect, restore and enhance wetlands on their property. Freeport, in Stephenson County, has a Illinois Nature Preserve for prairie land.

These major initiatives in the preservation and conservation of resources in our counties are also enhanced by numerous smaller groups and efforts.

Duration: 30 - 50 minutes

Subject Areas: Earth Science, Physical Science, Life Science, Social Science

Standards Addressed:

5-ESS3-1
ESS3.C
MS-ESS3-1
MS-ESS3-3
SS.G.2.4
SS.G.1.5
MS-LS2-1
MS-LS2-4

Objectives:

- Define what is meant by The Driftless Area. What other factors affect the conservation of our county's resources
- What is the importance of maintaining these resources

Glossary:

Conservation: the prevention of injury, decay, waste, or loss of resources
Groundwater: surface water that has seeped down beneath the surface
Watershed: the region or area drained by a river, stream, etc.
Wetlands: land that holds water; marshes or swamps
Point source pollution: a single identifiable source of water pollution
Nonpoint source pollution: a source of pollution that is widely distributed or a wide spread environmental element.

Activity: Recreating the Driftless Watershed

Supplies needed for each group:

Spray bottle
Large aluminum baking pan or plastic tub (16 x 11)
Large (18inch wide) sheet of aluminum foil
Five to six crumpled soda cans
Masking tape
Thin sponge (red or yellow for visibility)
Scissors
Food coloring (yellow, red, blue)
Cup of fine soil or cocoa powder

Activity Steps:

Phase 1: Building the Model

1. Break the class into 3-4 groups of students
2. Give each group a large aluminum baking pan or plastic tub
3. Instruct students to tape together a pile of crumpled soda cans in the center of the pan
4. Have the students gently mold a continuous sheet of aluminum foil over the cans and the bottom areas of the pan. The goal is to create a model with several hills and sloping sides. Note: Be careful not to tear or punch a hole in the foil.

5. Give each group a a spray bottle tinted with yellow food coloring (adjusted to provide a mist and not a stream of water.)
6. Instruct the students to gently "rain" on their watershed model and observe where the water flows and the resulting lakes and streams that form.
7. Students should note how the rivers and streams stop flowing shortly after it stops "raining."

Phase 2: Addition of Wetlands and Groundwater systems:

8. Each groups should cut three or four small strips of sponge and gently place these in various locations on the model. (The strips are wetlands and groundwater areas that are often "recharged" by surface water. These areas then in turn contribute water the rivers, streams and lakes.
9. The students should again gently rain on the models and observe the effects of the wetlands and groundwater systems.(sponge strips)

Phase 3: Track point source and nonpoint source pollution:

10. The teacher should place a drop of blue food coloring on a sponge near the top of each model. (Explain this is an example of a pollutant such as an oil spill or a raw sewage leak.)
11. Have the students gently "rain" on their watersheds and observe what areas the pollutant impacts.
12. Next the instructor should sprinkle fine topsoil or cocoa powder on each watershed model and have the students create a gentle rain. The students should observe the movement of the soil or cocoa powder towards waterways and the effects on these systems. (Explain to the students that the soil or cocoa powder represents nonpoint source pollutants that can result from construction sites, agricultural practices, lawn care products and hard surface run off.)

Discussion Questions:

- How did the placements of wetlands and groundwater sites(sponges) affect the flow of water on your model?
- How did pollution move through you watershed model?
- Give three examples of point source pollution. Nonpoint source pollution
- In what ways could water users downstream of the pollution source be impacted?
- What are strategies that could be adopted to help protect watersheds.
- What are pros and cons of maintaining our resources?
- What can we do as individuals to maintain the resources of the Driftless Area?
- What can we do as a community to maintain these resources?

LESSON PLAN 6: VIRTUAL DRIFTLESS: SHARING YOUR NEW KNOWLEDGE

Overview:

Over the last five lessons students have learned about how glaciers form, what forces cause them to move, and how that movement has affected the local landscape. The Driftless Area is home to wildlife and geology that is unique to the region. Previous lessons also examined humans' impact on the land, from mining and farming to Native American burial practices, and plans to preserve the land for future generations. This lesson has students use those building blocks of knowledge about the Driftless to create a virtual fieldtrip of the area.

Duration: Two class periods

Grade Levels: 5-8

Subject Areas: Earth Science, Physical Science, Geography

Standards Addressed:
4-PS3-1
4-PS3-4
5-ESS3-1
MS-ESS2-5
MS-ESS2-3
MS-ESS1-C
MS-PS2-4
SS.G.1.5

Objectives:

- Provide overview of previous Driftless lessons and knowledge acquired
- Ability to consolidate information from numerous lessons into a comprehensive understanding of the how glacial movement affected the local landscape
- Use technology to highlight the unique features of the Driftless are for the public

Teacher Background: Review background sections from lesson plans 1-5.

Activity: Creating a Virtual Field Trip

Supplies Needed:

Computers with Google Slides or PowerPoint

Previous Lesson Plans

Activity Steps:

1. Spend a few minutes reviewing key terms and ideas from previous lesson plans

2. Split students up into 4-6 groups. Have each group open up a new Google Slide or PowerPoint file. Ask students to create a virtual fieldtrip for someone not from the area. How would you teach visitors about the Driftless? What information do you think they should know about the region's unique geologic past?

3. Presentations should include one slide each for the following categories:

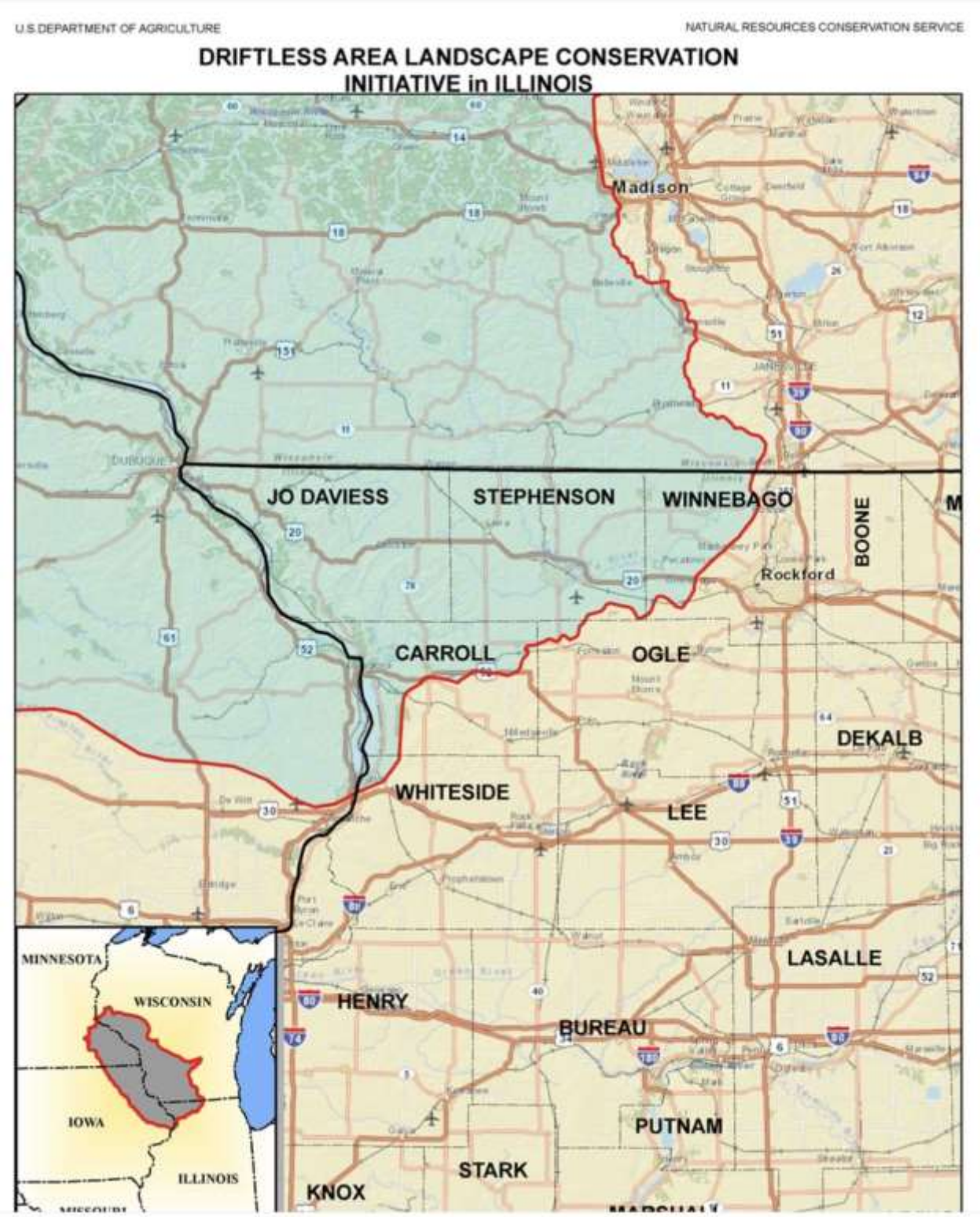
- A slide with brief text to explain the difference between Drift vs. Driftless
- A slide featuring a geologic feature, plant or animal unique to the Driftless ecosystem and an accompanying photo
- A slide with 3-5 bullet points about how human have impacted the Driftless over time
- A slide about one location to take a virtual field trip, including an image, text, and map (see list of locations in Appendix)

4. Time may require the activity to be broken into two class periods. The second class session can allow for students to finish edits of their slides and present their virtual tours.

Discussion Questions:

- Discuss the difference between Drift and Driftless
- What is unique about plant and animal life in the Driftless ecosystem?
- Talk about different ways in which humans have altered the landscape such as:
    - Farming
    - Mining
    - Development
    - Pollution
    - Mound Building
    - How do you think you humans continue to alter the landscape?
- How do you think the location you chose for your virtual field trip was affected by glacial movement? Would it look different if the glaciers passed through this region?
- What do you think someone from outside of this area would think about the Driftless?

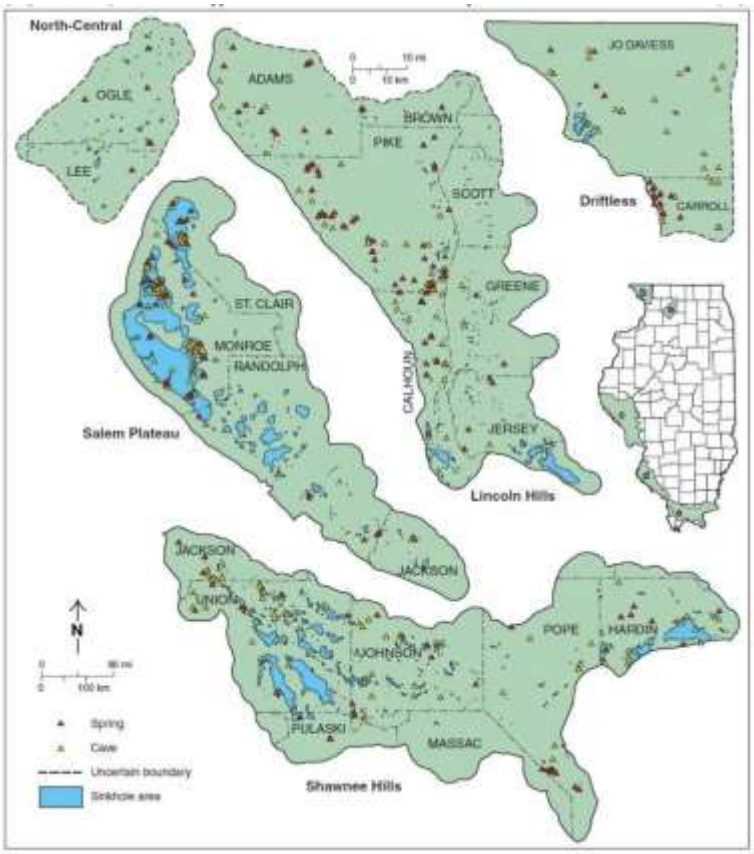
Driftless Visuals



Detailed map of local Driftless Area with county outlines

Map of entire Driftless Region

Regions in Illinois with karst



Areas in Illinois with caves, springs and sinkhole

Additional Resources

Glacial Geology Lesson Plans - http://intotheoutdoors.org/topics/ice-age-mysteries/

Illinois Department of Natural Resources, Driftless Area at a Glance- https://web.archive.org/web/20140714132812/http://www.dnr.state.il.us/orep/pfc/assessments/dap/ataglance.htm

Glacier Videos- https://www.neok12.com/Glaciers.htm

Illinois' Ice Age Legacy, GeoScience Education Series 14. Champaign, IL: Illinois State Geological Survey. http://www.isgs.uiuc.edu/servs/pubs/edshome.htm

Quaternary Glaciation in Illinois. Champaign, IL: Illinois State Geological Survey. http://www.isgs.uiuc.edu/servs/pubs/edshome.htm

Information on Karst of region: http://isgs.illinois.edu/maps/county-maps/karst-terrain/jo-daviess-0

Info on Algific Slopes: https://www.dnr.illinois.gov/OI/Documents/Jan07AlgificSlopes.pdf

US Fish and Wildlife Service info on Driftless Wildlife Habitat and Species: https://www.fws.gov/refuge/Driftless_Area/wildlife_and_habitat/index.html

Illinois Natural History Survey of the Driftless http://wwx.inhs.illinois.edu/research/rra/site1/

Studies in Natural History (1921) –Chapter 3 on the Erosional History of the Driftless https://play.google.com/store/books/details?id=XptJAQAAMAAJ&rdid=book-XptJAQAAMAAJ&rdot=1

Contributions to Ordovician Paleontology (Ebook) - Chapter on local lead and zinc mining https://play.google.com/store/books/details?id=YK4eAQAAIAAJ&rdid=book-YK4eAQAAIAAJ&rdot=1https://web.archive.org/web/20140714132812/http://www.dnr.state.il.us/orep/pfc/assessments/dap/ataglance.htm

Endangered and Threatened Species of Illinois, Illinois Department of Natural Resources https://www.dnr.illinois.gov/publications/Documents/00000593.pdf

National Parks Service Map and Images of karst and Caves nationwide: https://www.nps.gov/subjects/caves/upload/CaveKarstServicewidePoster2012.pdf

Glacial Striations – US Geologic Survey Lessons https://education.usgs.gov/lessons/schoolyard/glacialstriations.html

Wiggers, Ray. *Geology underfoot in Illinois*. Mountain Press Publishing, 1997.

List of local Driftless field trips

Gramercy Park
Beecher St
East Dubuque, IL
(815) 747-3196

Gramercy Park is a10 acre park overlooking the Mississippi River. This site is the home to 26 ceremonial and burial mounds from the Hopewell Native American culture.

Casper Bluff
870 South Pilot Knob Road
Galena, IL
(815) 858-9100

Casper Bluff is a 85 acre site that contains the Aiken Mound Group. There are 38 long wall-like structures, 12 conical mounds and one thunderbird effigy.

Beattie Park
401 N Main St.
Rockford, IL
(815) 987-8800

Beattie Park includes a grouping of Late Woodland period Indian mounds, including three conical mounds, an effigy mound in the shape of a turtle, and a linear mound.

Keough Effigy Mounds
1683 N. Cross Road
Galena, IL
(815) 858-9100

This site contains early lead mine diggings and Late Woodland Native American mounds, including the only intact bear effigy mound in Illinois.

Historic Lead Mine Shaft
Galena/Jo Daviess Country Historical Society
211 S. Bench Street
Galena, IL
(815) 238-0239

The museum has an original 30 foot deep 1830s lead mine shaft, the only one in the state of Illinois. There are also other exhibits displaying the history of lead mining in the area.

Long Hollow Scenic Overlook
2918 US Hwy 20 W
Elizabeth, IL 61028

This overlook along Highway 20 offers great views of Driftless rolling hills, as well as a picnic area and restroom facilities.

Mississippi Palisades State Park
16327A IL-84
Savanna, IL
(815) 273-2731

The trails at the 2,500 acre Mississippi Palisades State Park put you in touch with the former routes of Native American pathfinders, as well as Driftless landscape including caves and bluffs.

Horseshoe Mound Preserve
1679 N Blackjack Rd
Galena, IL

The preserve, run by the Jo Daviess Conservation Foundation, features scenic outlooks with views across three states. Hiking trails extend throughout the property and offer close views of the city of Galena, plus distant views of Bellevue and Dubuque in Iowa, the Mississippi River, and several other geological mounds in Iowa and Wisconsin.

Apple River Canyon State Park
8763 E Canyon Rd
Apple River, IL
(815) 745-3302

This park features limestone bluffs, deep ravines, springs, streams and wildlife characteristic of the Driftless. Once a part of a vast sea bottom that stretched from the Alleghenies to the Rockies, the scenic canyon area was formed by the winding waters of the Apple River.

Hanover Bluff Nature Area
8995 S. Hanover Hill Rd.
Hanover IL 61041
(815) 745-3302

Hanover Bluff is located on a high dolomite ridge that forms a valley wall of the Mississippi River. Here, six native plant communities survive: sand hill prairie, dry dolomite prairie, dolomite cliff, dry-mesic and mesic upland forest and seep springs. Rare Driftless area plants are found on the highest slopes, including little bluestem, sideoats grama, hairy grama and over 80 other native prairie species.