GET THE GROUND WATER PICTURE
CLASSROOM ACTIVITY

from *Project Wet*

SUMMARY

In Get the Ground Water Picture (from *Project WET*), students use the data provided to draw well logs, then combine the logs to get a picture of the subsurface geology and water movement. After finishing the activity, students will be able to identify the parts of a ground water system; compare movement of water through diverse substrates; and relate different types of land uses to potential ground water contamination.

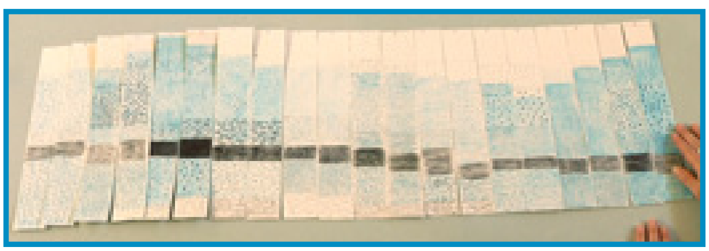
For *It's Our Water*, we suggest you replace Part I with the Ground Water Infiltration Demonstration, which shows how ground water moves through different types of geologic materials.

TIME REQUIRED

- 55 minutes

TIPS FOR GET THE GROUND WATER PICTURE ACTIVITY

The activity asks you to distribute 25 strips of white paper, 1″ x 12″, to the class. Each vertical inch on the paper strips represents 50 vertical feet in the well log. Probably the easiest way to make these strips is to use several pieces of 8.5″ x 14″ paper and a paper cutter. Trim the paper so that it is 8″ x 12″. Before you cut it into strips, use a pencil and straightedge to make eleven horizontal, parallel lines, 1″ apart. That way, the strips will already be marked off in 1″ increments when you cut the paper into eight strips. That will make class time a little more efficient.



You might also want to make one extra-large example to demonstrate to students how to fill in their strips. One area of possible confusion is indicating the presence of water (or aquifers) with a blue colored pencil. There are two aquifers. For one aquifer, the area to be colored in is the area below the water table and above the clay layer (which is impermeable). The other aquifer to be colored is between the clay layer and the granite layer.

NORTH CAROLINA ACTIVITY

In the North Carolina Well Log Activity, students use the well-log data to graph four wells that show the locations and depth of some of North Carolina's aquifers. Students also discuss the challenges facing eastern North Carolina in regard to freshwater aquifers.

2012 North Carolina Essential Standards

for 8TH GRADE SCIENCE GOALS & OBJECTIVES

8.E.1: Understand the hydrosphere and impact of humans on local systems and the effects of the hydrosphere on humans.

8.E.1.1: Explain the structure of the hydrosphere including:
- Water distribution on earth

for EARTH/ENVIRONMENTAL SCIENCE GOALS & OBJECTIVES

EEn.2.3: Explain the structure and processes within the hydrosphere.

EEn.2.3.2: Explain how ground water and surface water interact.
- Illustrate the water cycle to explain the connection between ground water and surface water, detailing how ground water moves through the lithosphere. (Emphasize the processes of evaporation and infiltration in the conceptual diagram of the hydrologic cycle.

GROUND WATER INFILTRATION DEMONSTRATION

To give students a quick and memorable way to visualize how ground water moves through different rock materials, replace Part I of Get the Ground Water Picture with this demonstration.

MATERIALS

- 3-large, clear, plastic containers (at least 6”x6”x12”)
- large bag of blue marbles
- large bag of brightly colored marbles
- 10 to 15 two-inch Styrofoam florist balls
- 15 to 25 one-inch Styrofoam florist balls
- 25 to 35 one-half-inch Styrofoam florist balls
- 2 small containers with lids to hold the marbles

PROCEDURE

Explain to the students that the geology under their feet is made up of many kinds and sizes of rocks. They are generally found in layers where certain types or combination of rocks or particles are dominant. Explain that the three sized of balls represent gravel, sand and clay.

Fill the large, clear, plastic container with large balls, explaining that they represent gravel. Then show the class a blue marble and tell them that it represents water. Ask them if they think that the water will drain through the gravel quickly or slowly and why. (The large spaces between the balls will allow the water to pass quickly through.) Pour the marbles over the balls and demonstrate how the marbles move easily through the balls. You may have to jostle the container slightly. Then remove the large particles from the container and drain the marbles back into their container.

Next, fill the clear container with the medium balls, explaining that they represent the sand. Ask the audience what they notice about these particles compared to the gravel. Can you fit more or less sand balls into the container (more)? Are the spaces between them larger or smaller than gravel (smaller)? Will water pass as quickly through the sand particles as they did through the gravel (no)? Why (because the spaces are significantly smaller)? Then pour the blue marbles over the balls and see as some move to the bottom while others are suspended throughout the container. Then, remove all the balls and drain the blue marbles back into their original container.

Fill the container with the smallest balls and explain that these represent the clay particles. Ask the class whether they think the marbles will pass more or less quickly through the clay particles than the others (less). Ask them about the size of the spaces between the particles and note that there is very little space between these particles at all. Ask them what they think will happen when you pour the marbles onto the clay and then pour the marbles into the container. They will actually sit right on top.

Explain that clay is relatively impermeable, meaning that the particles are so close together that water cannot pass through them. Gravel is very permeable and sand is somewhat less permeable than gravel.

Then explain that in reality, the particles are generally mixed together with one particle size or mixture generally dominating. Mix the balls together in the plastic container. Be careful not to put in too many balls, especially the clay balls. Explain that the bottom of the container represents an impermeable layer in the ground like clay or solid bedrock. Then pour the marbles into the container. Shake gently in necessary to help the balls move to the bottom of the container.

Because the bottom is impermeable, the water will not be able to pass through it and will begin to back-fill the spaces between the particles. Explain that if this container represented an aquifer, the area at the bottom where the spaces are filled with water would be the zone of saturation. (Refer students to the *Project WET* diagram of an aquifer from Get the Ground Water Picture or the diagrams about ground water from *The Water Connection* available at http://www.ncwater.org/Reports_and_Publications/primer/.) The beginning of the zone of saturation is called the water table. The area above where the spaces are filled with air is called the zone of aeration. When a well is constructed, it must reach down into the zone of saturation in order to extract the ground water.

For more information on North Carolina’s ground water, see *The Water Connection: Water Resources, Drought and the Hydrologic Cycle in North Carolina* at http://www.ncwater.org/Reports_and_Publications/primer/. It’s a 14-page brochure produced by the Division of Water Resources that reviews the hydrologic cycle, North Carolina’s climate (including hurricanes, floods, and drought), surface water, ground water (including aquifers, saltwater intrusion, and contamination), and water-use planning. The photographs and diagrams are particularly helpful.

IT'S OUR WATER

Get the Ground Water Picture

■ **Grade Level:**
Middle School, High School

■ **Subject Areas:**
Environmental Science, Mathematics, Government

■ **Duration:**
Preparation time:
Part I: 30 minutes
Part II: none needed
Part III: 15 minutes

Activity time:
Part I: 30 minutes
Part II: 30 minutes
Part III: 50 minutes

■ **Setting:** Indoors

■ **Skills:**
Organizing (matching, charting); Analyzing (identifying patterns); Interpreting (inferring, translating)

■ **Charting the Course**
To help students appreciate the amount of time water can spend underground and how ground water relates to the water cycle, they can participate in "The Incredible Journey" and "Imagine!" Issues concerning ground water contamination are addressed in "The Pucker Effect" and "A Grave Mistake." Students investigate soil profiles in "Wetland Soils in Living Color."

■ **Vocabulary**
ground water system

Have you ever wished you had a window into the earth so you could see what's beneath your feet?

▼ **Summary**

Students will "get the ground water picture" and learn about basic ground water principles as they create their own geologic cross section or earth window.

Objectives

Students will:

- identify the parts of a ground water system.
- compare movement of water through diverse substrates.
- relate different types of land uses to potential ground water contamination.

Materials

- *Clear, 12-ounce plastic soda bottles or the same number of plastic cups* (with top cut off and holes punched in bottom)
- *Gravel*
- *Sand*
- *Clay* (If unable to obtain clay locally, place unscented, nonclumping kitty litter in a blender and grind until fine. Mix with enough water to make moist.)
- *Hand-held magnifying lens*
- *25 1″ x 12″ strips of white paper* (Number the back of the strips 1 through 25.)
- *Blue crayon or colored pencil*
- *Copies of* ***Well Log Data Chart***
- *Copies of* ***Ground Water Student Page***

Making Connections

Out of sight is out of mind. Because ground water is hidden below Earth's surface, students do not have a visible reference point as they do when they look at water in lakes or rivers. However, because ground water is so widely used as a source of drinking water, students likely drink ground water every day. Students may have seen a windmill or pump that draws water from the ground. Windmills can serve as surface indicators of ground water. They also generate electricity. Creating a geologic cross section helps students become aware of this hidden source of water.

Background

Ground water is one of Earth's most valuable natural resources. The water stored in the pores, cracks, and openings of subsurface rock material is ground water. Wells dug by hand or machine have been used throughout history to retrieve water from the ground. Scientists use the word *aquifer* to describe an underground formation that is capable of storing and transmitting water.

Aquifers come in all shapes and sizes. (See pages 140-141 for identification and definition of the parts of a ground water system.) Some aquifers may cover hundreds of square miles and be hundreds of feet thick, while others may only cover a few square miles and be a few feet thick. Water quality and quantity vary from aquifer to aquifer and sometimes vary within the same system. Some aquifers can yield millions of gallons of water per day and maintain water levels, while others may only be able to produce small amounts of water each day. In some areas wells might have to be drilled thousands of feet to reach usable water, while in other areas water can be located only a few feet down. One site might contain several aquifers located at different depths, and another site might yield little or no ground water.

The age of ground water varies from aquifer to aquifer. For example, an unconfined surface aquifer might hold water that is only a few days, weeks, or months old. On the other hand, a deep aquifer that is covered by one or more impervious layers may contain water that is hundreds or even thousands of years old.

The rate of movement of ground water varies based on the rock material in the formation through which the water is moving. After water percolates down to the water table, it becomes ground water and starts to move slowly down gradient. Water movement responds to differences in energy levels. The energies that cause ground water to flow are expressed as gravitational energy and pressure energy. (These are both forms of mechanical energy.) Gravitational energy comes from the difference in elevation between the recharge area (where water enters the ground water system) and discharge area (where water leaves the system). Pressure energy (hydraulic head) comes from the weight of overlying water and earth materials. Ground water moves toward areas of least resistance. (Ground water encountering semi-impervious material, such as clay, will slow down significantly; when it moves toward an open area, such as a lake, water's rate of movement will increase.)

Hydrogeologists, scientists who study ground water, know that the above variables exist and that to really "get the ground water picture" they must drill wells. Wells provide the best method of learning the physical, hydrologic, and chemical characteristics of an aquifer. As a well is drilled deeper and deeper into the ground, the drill passes through different rock formations. The driller records the exact location of the well, records the depth of each formation, and collects samples of the rock material penetrated (sandstone, sand, clay, etc.). This data becomes part of the well's record or *well log*. The driller's record provides valuable information for determining ground water availability, movement, quantity, and quality. The well driller then caps and seals the well to protect it from contamination.

If hazardous waste, chemicals, heavy metals, oil, etc. collect on the surface of the ground, rain or runoff percolating into the soil can carry these substances into ground water. When hydrogeologists or water quality specialists analyze the quality of ground water, they consider land-use practices in the watershed and in the vicinity of the well.

Procedure

▼ *Warm Up*

Tell students they are about to learn how they can "get the ground water picture." Explain that hydrogeologists study wells to learn the types

Many small streams are fed by ground water.

of rock material located below ground. Ask students to draw pictures representing what they think it looks like underground (texture and color of rock formations) or to write brief descriptions of what happens to water after it seeps into the ground.

The Activity

Part I

Ground Water Demonstration.

Have students conduct the following activity to learn how water moves through rock materials such as gravel, sand, and clay.

Place gravel, sand, and clay in separate clear containers. Have students look closely at each container. (A hand-held magnifying glass works well.) To demonstrate that ground water moves through underground rock formations, pour water into each container; observe and discuss the results. Which container emptied the fastest? The slowest? How would the different materials influence water movement in natural systems?

Part II

(May be appropriate for younger students.)

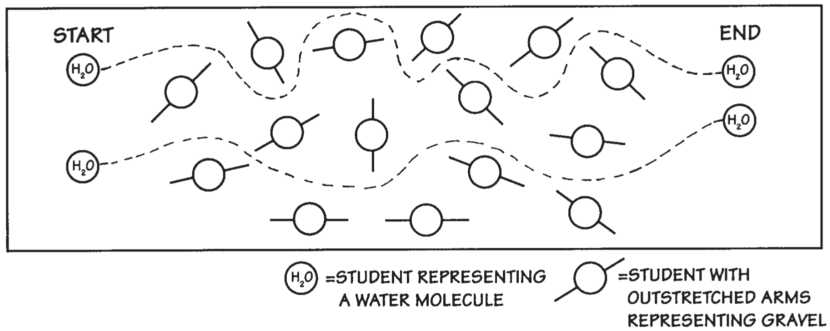
Ground Water Movement Activity.

Conduct the following activity to show how different sizes and kinds of rock material affect water movement. Select three or four students to become molecules of water. The rest of the students will be rock material.

a. Water Movement Through Gravel: Students become gravel by raising arms outstretched. Students should be able to rotate and not touch other students. The goal of the students representing water molecules is to move (flow) through students representing gravel to the other side of room. (See illustration A.)

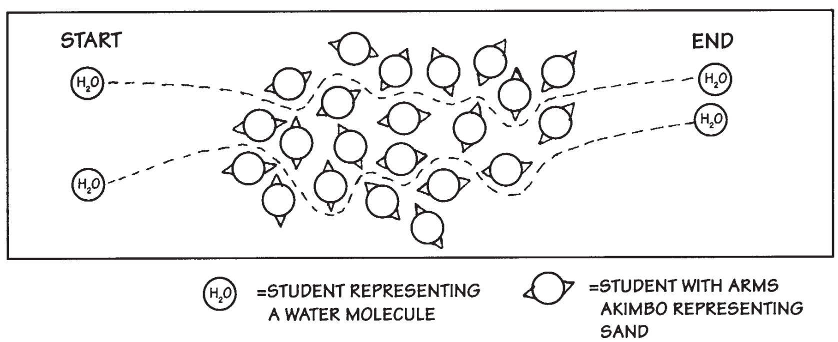
A

WATER MOVEMENT THROUGH GRAVEL



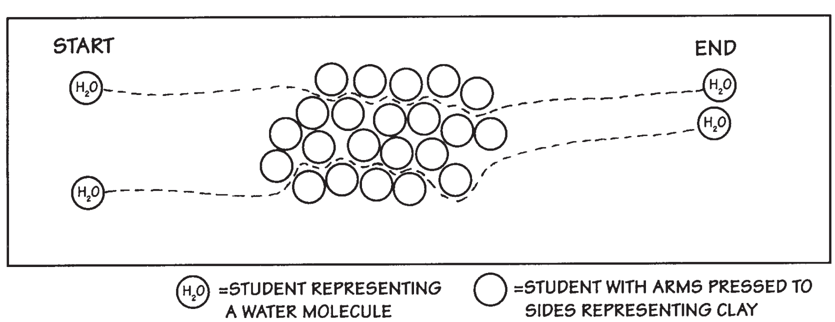
B

WATER MOVEMENT THROUGH SAND



C

WATER MOVEMENT THROUGH CLAY



b. Water Movement Through Sand: Students become sand by extending arms, bending them at the elbows, and touching waists with fingertips. Students should stand so their elbows are almost touching. The water molecules will experience some difficulty this time, but should still reach the other side. (See illustration B.)

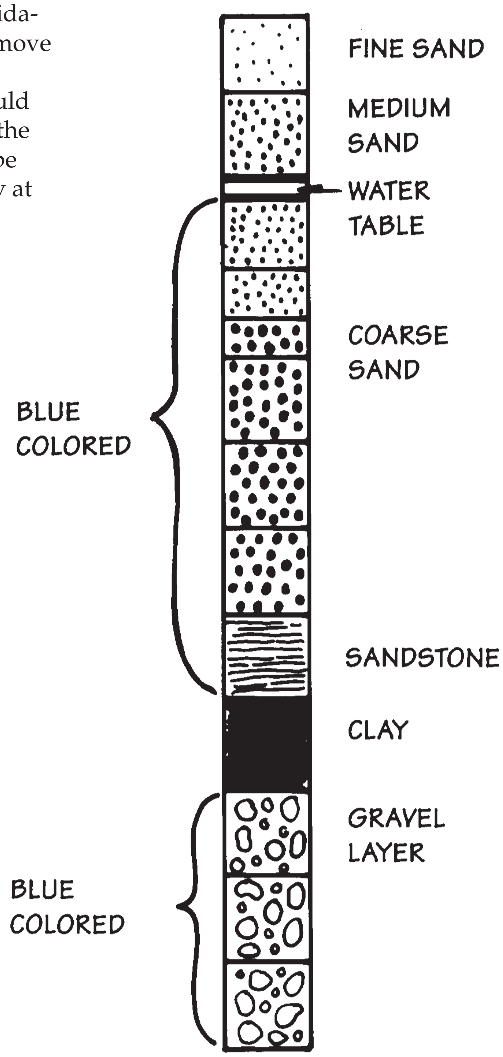
c. Water Movement Through Clay: Students become clay particles by keeping arms at their sides and huddling together. They should be very close together, making it a formidable task for water molecules to move through the clay. Without being rough, the water molecules should slowly push their way through the clay. The water molecules may be unable to move through the clay at all. (See illustration C.)

Part III

1. **Hand out strips numbered 2-24 to students (students can work individually or in pairs) and copies of the *Well Log Data Chart*. The paper represents the length of a well that has been dug. They will receive data about the location and types of rock materials in their wells, and transfer this information to their strips of paper to make well logs**.

2. **Demonstrate how to record the types of rock materials. Divide the strip labeled 1 into 12 inches. Show students the data from Well #1. Mark the level of the water table by drawing a double line at the appropriate point (2″ from the top) of the paper strip; this corresponds with the level found in the first column of the chart. In the second column find the level of fine sand (0–1). Measuring from the top of the column, the first inch should be speckled with dots**. From 1″ to 2 ½″, the formation is composed of medium sand. Course sand exists from 2 ½″ to 6″, and so forth, until the gravel layer, which exists from 8″ to 12″. Complete the drawing by coloring (light blue) the area between the water table and the top of the clay layer. Also color the gravel layer.

SAMPLE STRIP



3. **Have students fill in their log based on the number on their strip of paper (if a strip is labeled 6, the student uses data from Well # 6) and the information in the *Well Log Data Chart*. Make sure students note the land use existing above their well sites**.

4. **When they have completed their well logs, ask students to answer questions based on their well logs**.

   a. The horizontal scale of the cross section is 1 inch = 1 mile. The vertical scale is 1 inch = 50 feet. How many miles are horizontally represented in the cross section? How many feet are vertically represented in the cross section?

   b. How many feet below the surface is the water table?

   c. Ask each student to imagine a drop of water falling on the surface above his or her well. What pollutants might this drop of water pick up as it filters into the ground? (Students can refer to the land use practice above their well, but may conclude they need additional information.)

   d. Have students describe the drop's movement down the column. Through which layers would it move the fastest? The slowest?

   e. At which layer might the drop's movement be restricted? Explain to students that only a slight amount of water would pass through the clay. Have them speculate on the source of the water beneath the clay level (in the gravel layer).

To demonstrate surface water filtration of sediment and materials carried by water, ask four students to represent water molecules and to lightly attach balloons to themselves with tape. These balloons represent materials picked up by water molecules as they move across the surface of the ground. Have several students representing soil particles stand elbow to elbow to form Earth's surface. As the "water molecules" pass through the "soil," the balloons will be "brushed off" (because of the proximity of the students). This represents how soil can filter out sediment and debris carried by water.

Have each of the water molecules rub a little flour on the sides of their arms. The flour represents the small but visible materials that can still be carried by water as it moves downward from the surface as it becomes part of ground water. The students who were soil particles are now rock particles and stand side by side to represent different types of rock material (gravel, sand, and clay). As the water molecules move through the rock material, some of the flour rubs off on the rock material. Although some material is removed by rock filtration, some is still retained by the water molecules.

Water that looks or tastes pure and is odorless is not necessarily potable. Water quality specialists know that odorless, colorless, and tasteless contaminants are found in water. These substances are detected through testing; a sample of water is collected and analyzed for specific contaminants (bacteria, nitrates, arsenic, and so forth).

Assign half of the students in class to be water molecules and the rest rock particles. Cut small pieces of paper and on each write one of the following: bacteria, nitrate, arsenic, lead, etc. Secretly distribute these pieces of paper to about half of the water molecules and tell students to hide them in their pockets. Have the water molecules move through the students, standing side by side, who represent rock particles.

After they have all passed through, ask students (except for the "contaminated" water molecules), "Do you believe that the water that just filtered through the rock particles is clean; that is, would you be willing to drink it?" Students will likely answer yes. Have the contaminated water molecules remove the contaminants from their pockets. Remind students that even though water may "appear" clean, it may still carry contaminants that are only detected through testing.

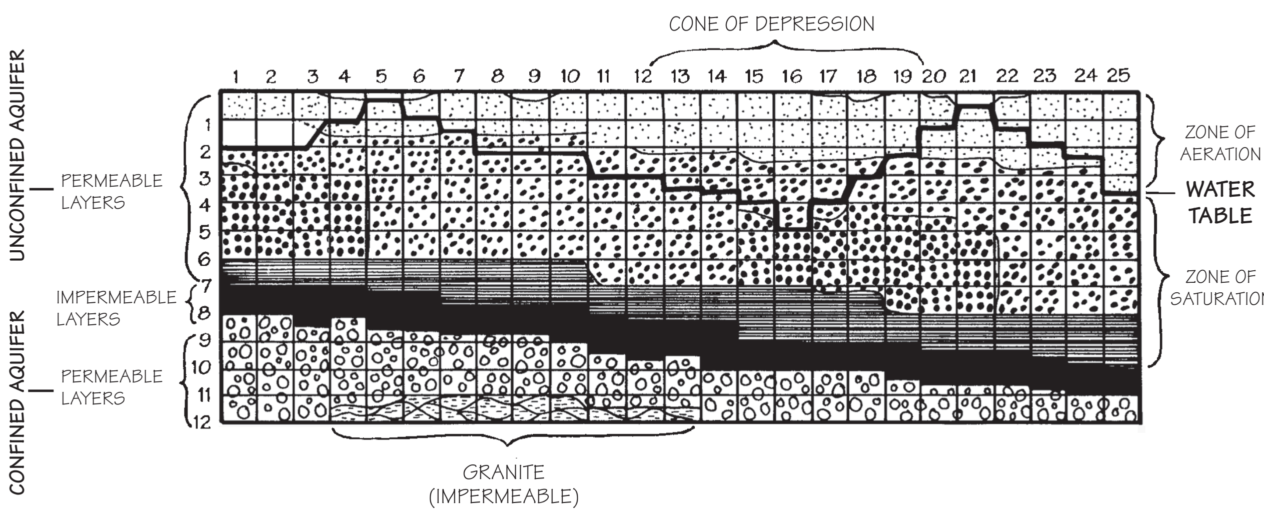
Resources

Ground Water Flow Model: A Plexiglas sand tank model, video, and user's guide that demonstrates basic ground water principles and management concerns. Contact: Project WET, 1001 West Oak Street, Suite 210, Bozeman, MT 59715, toll-free: 866.337.5486, fax: 406.522.0394, info@projectwet.org, www.projectwet.org

Hoff, Mary, and Mary M. Rogers. 1991. *Our Endangered Planet: Ground water*. Minneapolis, Minn.: Lerner.

Taylor, Carla, ed. 1985. *Groundwater: A Vital Resource*. Knoxville, Tenn.: Tennessee Valley Authority.

WELL LOG GROUND WATER CHART (CROSS SECTION)



Student Page #1

Well Log Data Chart

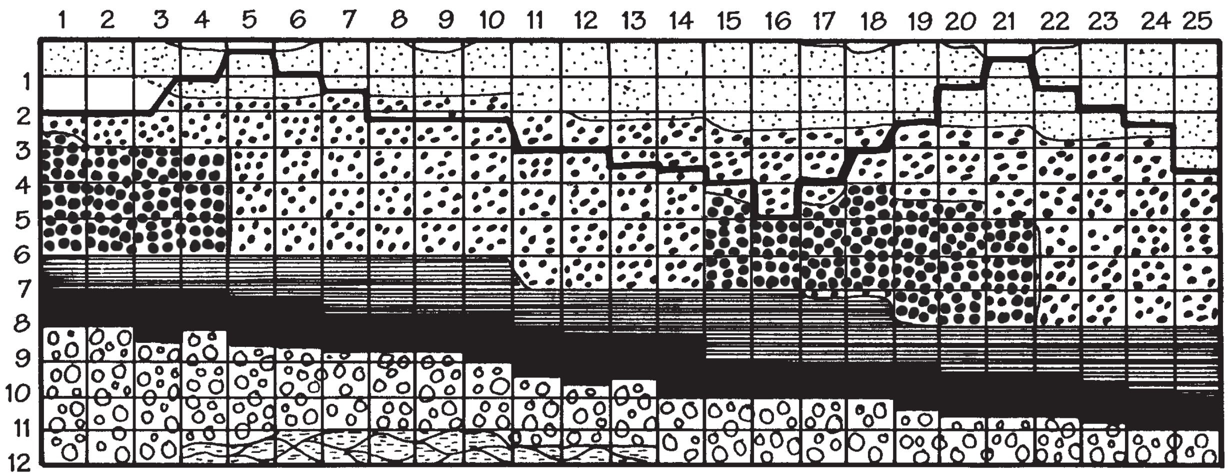
KEY
Note: numbers in vertical columns are in inches

Well No.	Land Use Type	Water Table	Fine Sand	Medium Sand	Coarse Sand	Sand-stone	Clay Layer	Gravel Layer	Granite
1	farmland	2	0 - 1	1 - 2 ½	2 ½ - 6	6 - 7	7 - 8	8 - 12	—
2	farmland	2	0 - 1	1 - 3	3 - 6	6 - 7	7 - 8	8 - 12	—
3	farmland	2	0 - 1 ½	1 ½ - 3	3 - 6	6 - 7	7 - 8 ½	8½ - 12	—
4	wetland	1	¼ - 1 ½	1 ½ - 3	3 - 6	6 - 7	7 - 8 ¼	8 ¼ - 11 ½	11 ½ - 12
5	wetland	¼	½ - 1 ½	1 ½ - 6	—	6 - 7 ¼	7 ¼ - 8 ¼	8 ¼ - 11 ½	11 ½ - 12
6	wetland	1	¼ - 1 ¾	1 ¾ - 6	—	6 - 7 ¼	7 ¼ - 8 ½	8 ½ - 11	11 - 12
7	farmland	1 ¾	0 - 1 ¾	1 ¾ - 6	—	6 - 7 ¾	7¾ - 8 ¾	8 ¾ - 11	11 - 12
8	farmland	2 ½	0 - 1 ¾	1 ¾ - 6	—	6 - 7 ¾	7 ¾ - 8 ¾	8 ¾ - 11	11 - 12
9	landfill	2 ½	¾ - 1 ¾	1 ¾ - 6	—	6 - 7 ¾	7 ¾ - 8 ¾	8 ¾ - 11	11 - 12
10	industry	2 ½	0 - 1 ¾	1 ¾ - 6	—	6 - 7 ¾	7 ¾ - 9	9 - 11	11 - 12
11	industry	3	0 - 2	2 - 7	—	7 - 8	8 - 9 ¼	9 ¼ - 11 ½	11 ½ - 12
12	urban area	3	0 - 2 ¼	2 ¼ - 7	—	7 - 8 ¼	8 ¼ - 9 ½	9 ½ - 11 ½	11 ½ - 12
13	urban area	3 ½	0 - 2¼	2¼ - 7	—	7 - 8 ¼	8 ¼ - 9½	9 ½ - 11 ½	11 ½ - 12
14	urban area	3 ¾	0 - 2 ¼	2 ¼ - 7	—	7 - 8 ½	8 ½ - 9 ¾	9 ¾ - 11 ½	11 ½ - 12
15	urban area	4	0 - 2 ¾	2 ¾ - 4½	4 ½ - 7	7 - 9	9 - 9 ¾	9 ¾ - 12	—
16	urban area	5	0 - 2 ¾	2 ¾ - 4 ½	4 ½ - 7	7 - 9	9 - 9 ¾	9 ¾ - 12	—
17	farmland	4	0 - 2 ¾	2 ¾ - 4 ½	4 ½ - 7 ½	7 ½ - 9	9 - 10	10 - 12	—
18	wastewater treatment plant	3	¼ - 2 ½	2 ½ - 4	4 - 7 ½	7 ½ - 9	9 - 10	10 - 12	—
19	farmland	2½	0 - 2 ¼	2 ¼ - 4 ½	4 ½ - 8	8 - 9	9 - 10 ¼	10 ¼ - 12	—
20	river	1 ½	¼ - 2 ½	2½ - 4½	4 ½ - 8	8 - 9 ¼	9 ¼ - 10 ½	10 ½ - 12	—
21	river	½	1 - 2½	2 ½ - 5	5 - 8	8 - 9 ¼	9 ¼ - 10 ½	10 ½ - 12	—
22	river	1 ½	¼ - 3	3 - 8	—	8 - 9 ¼	9 ¼ - 10 ½	10 ½ - 12	—
23	national park	2	0 - 3	3 - 8	—	8 - 9 ½	9½ - 10 ¾	10 ¾ - 12	—
24	national park	3 ¼	0 - 2 ¾	2 ¾ - 8	—	8 - 9 ¾	9 ¾ - 11	11 - 12	—
25	national park	3 ¾	0 - 3	3 - 8	—	8 - 10	10 - 11 ¼	11 ¼ - 12	—

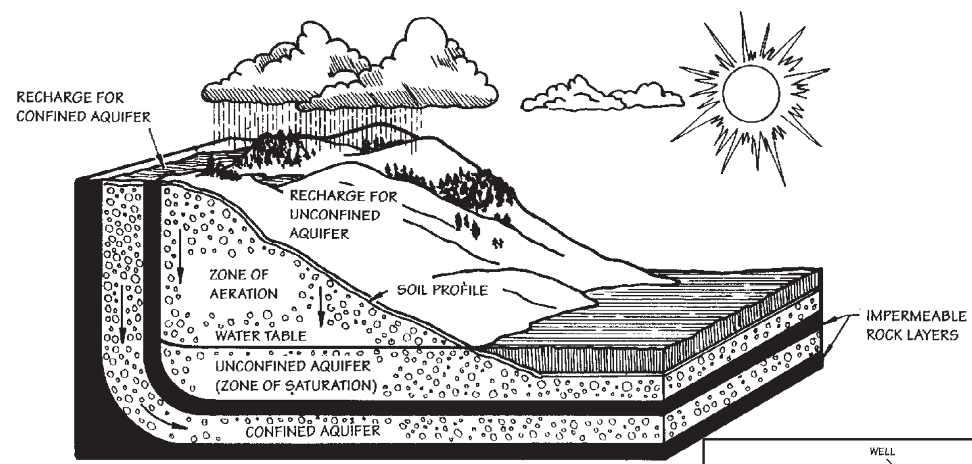
Student Page #2

Ground Water Student Page

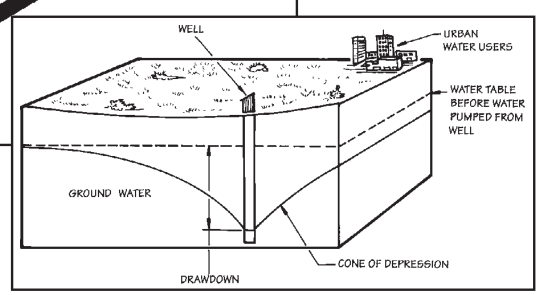
Name:____ Date: ____________________



WELL LOG GROUND WATER CHART (CROSS SECTION)



GROUND WATER SYSTEM (SIMPLIFIED)



CONE OF DEPRESSION

MATERIALS

- Copies of North Carolina Well Log Data
- Copies of Well Location Map
- Copies of Graph Paper for Student Well Logs
- Colored pencils: 6 different colors plus black

Instructions for Drawing Well Logs of the North Carolina Coastal Plain

Have students use the well-log data and to draw four North Carolina well logs. You may want to do the first log together as a class, and then let students complete the other three logs on their own.

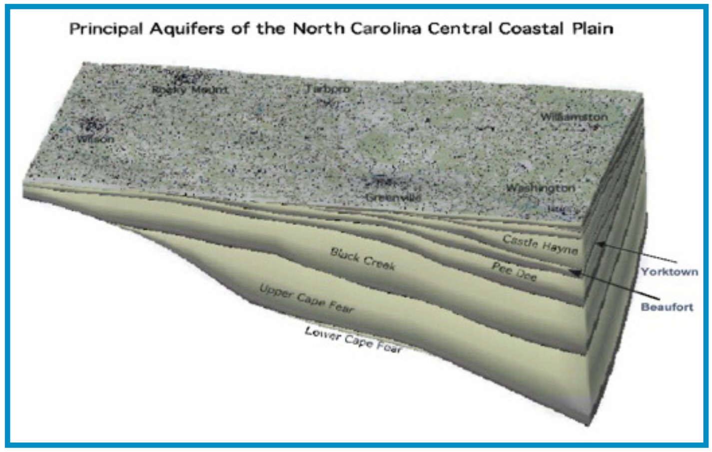
For each well, draw a line to represent the land surface. If no formation is specified at the top of the well, leave the space below the line blank. Use a pencil to mark the bottom and top of each aquifer and confining unit on the well log. Choose a different color for each aquifer and color them in. Color the confining units (CUs) black. Identify which colors represent which aquifers in a legend. The Castle Hayne Aquifer is used for drinking water in much of eastern North Carolina.

After you have drawn the well logs, answer the following questions:

1. Of the four counties provided, list those in which the Castle Hayne Aquifer is present.
2. In which county is the Castle Hayne Aquifer the thickest? How thick is it?
3. In which county is the Castle Hayne Aquifer the thinnest? How thin is it?
4. In which county is the Castle Hayne Aquifer closest to the surface? At what depth is it? (Give answer in feet below sea level.)
5. In which county is the Castle Hayne Aquifer farthest from the surface? At what depth is it? (Give answer in feet below sea level.)
6. Look at the map your teacher gave you to locate all four wells. Do you notice any trends in the well logs, west to east? If so, describe them.
7. If your school is in the Coastal Plain, print out some well log data from your county: Go to www.ncwater.org and click on Ground Water. Then click on Ground Water Data, then click on Hydrogeology. Click on the letter your county starts with, then choose a well. Compare and contrast the well log with the well logs you drew for this activity.

CLASS DISCUSSION

To give your students context for the information they learn in this activity, show them this diagram showing the layered wedge shape of the Coastal Plain aquifers. (A full page version of diagram is included at the end of this activity.)



Discuss some of the challenges facing eastern North Carolina in regard to freshwater aquifers. The aquifers in eastern North Carolina supply water for drinking as well as agricultural and industrial purposes. Over the years, as more and more water has been pumped out, some aquifers have developed a large cone of depression, which is a reduction in the amount of water or water pressure around a well or pumping station. This is particularly a problem for the Upper Cape Fear and the Black Creek. In addition, there is concern that increased pumping could pull in saltwater from the eastern part of an aquifer – this is called saltwater encroachment. Water that becomes too salty would not be good for drinking water.

To address these problems, the Division of Water Resources proposed the Central Coastal Plain Capacity Use Area rules, which went into effect in 2002. The rules are intended to protect the aquifers and ensure that they remain productive. The rules require that large users obtain permits and encourage users to develop alternative water supplies, such as different aquifers, surface water and water from other systems. Both the Upper Cape Fear and the Black Creek have shown recovery since the implementation of the rules.

INSTRUCTIONS & QUESTIONS

For each well, draw a line to represent the land surface. If no formation is specified at the top of the well, leave the space below the line blank. Use a pencil to mark the bottom and top of each aquifer and confining unit on the well log. Choose a different color for each aquifer and color them in. Color the confining units (CUs) black. Identify which colors represent which aquifers in a legend or on the graph.

After you have drawn the well logs, answer the following questions:

1. The Castle Hayne Aquifer is used for drinking water in much of eastern North Carolina. Of the four counties provided, list those in which the Castle Hayne Aquifer is present.

2. In which county is the Castle Hayne Aquifer the thickest? How thick is it?

3. In which county is the Castle Hayne Aquifer the thinnest? How thin is it?

4. In which county is the Castle Hayne Aquifer closest to the surface? At what depth is it? (Give answer in feet below sea level.)

5. In which county is the Castle Hayne Aquifer farthest from the surface? At what depth is it? (Give answer in feet below sea level.)

6. Look at the map your teacher gave you to locate all four wells. Do you notice any trends in the well logs, west to east? If so, describe them.

7. If your school is in the Coastal Plain, print out some well log data from your county: Go to www.ncwater.org and click on Ground Water, then click on Hydrogeology. Click on the letter your county starts with, then choose a well. Compare and contrast the well log with the well logs you drew for this activity.

Student Page #2

NORTH CAROLINA WELL LOG DATA

GUILFORD MILLS, KENANSVILLE
DUPLIN COUNTY

LATITUDE: 35
LONGITUDE: -77.9
DEPTH OF WELL: 410 FT

Aquifer	Elevation (ft.) 0 = Sea Level
Land Surface	62
Peedee Confining Unit (CU)	-8
Peedee	-30
Black Creek CU	-83
Black Creek	-118
Upper Cape Fear CU	-320
Upper Cape Fear	-336

TOWN OF RICHLANDS
ONSLOW COUNTY

LATITUDE: 34.9
LONGITUDE: -77.5
DEPTH OF WELL: 557 FT

Aquifer	Elevation (ft.) 0 = Sea Level
Land Surface	46
Castle Hayne Confining Unit (CU)	32
Castle Hayne	25
Beaufort CU	-69
Beaufort	-91
Peedee CU	-133
Peedee	-173
Black Creek CU	-282
Black Creek	-308

TOWN OF MAYSVILLE
JONES COUNTY

LATITUDE: 34.9
LONGITUDE: -77.2
DEPTH OF WELL: 503 FT

Aquifer	Elevation (ft.) 0 = Sea Level
Land Surface	35
Castle Hayne Confining Unit (CU)	23
Castle Hayne	-5
Beaufort CU	-117
Beaufort	-249
Peedee CU	-331
Peedee	-351

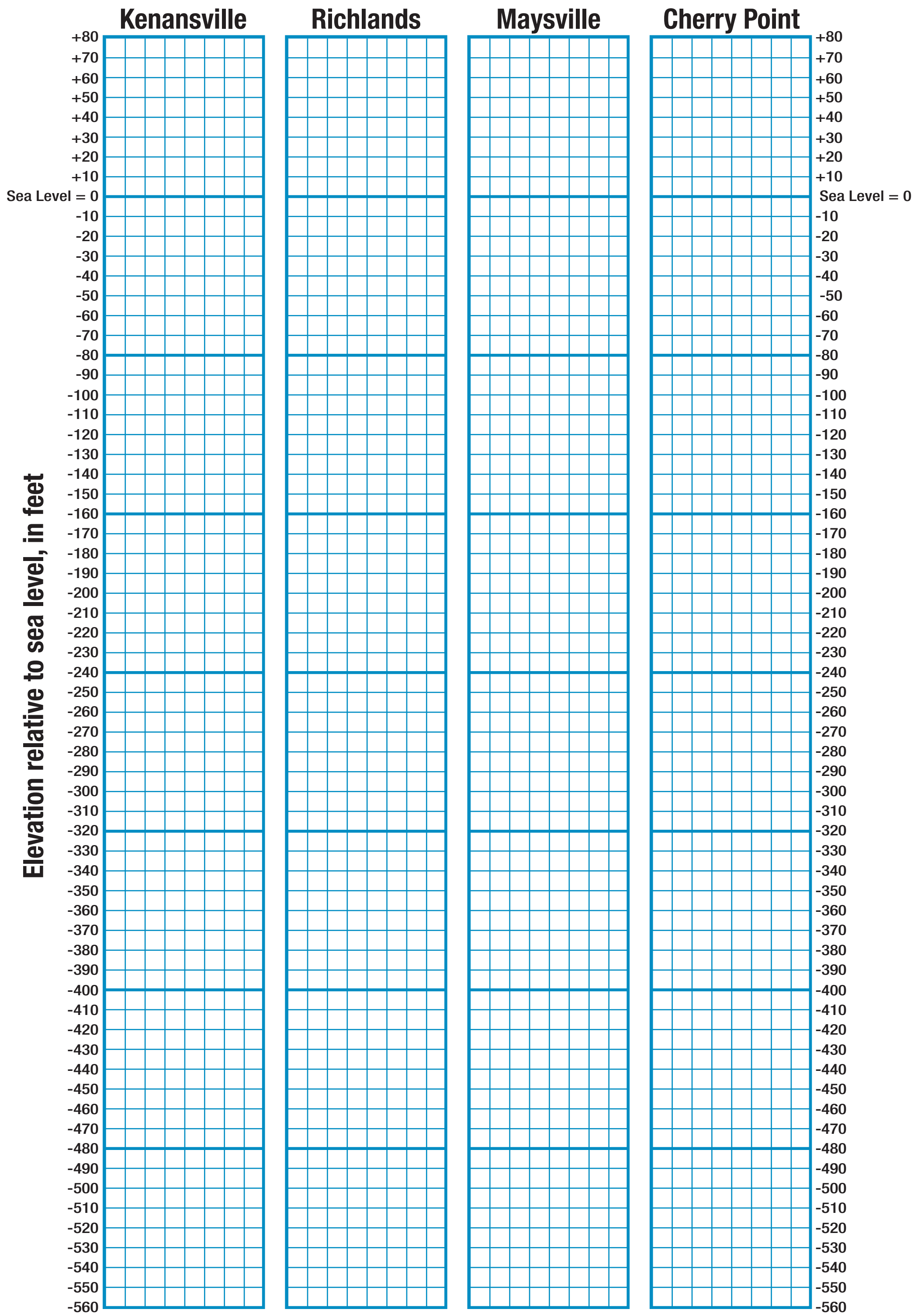
USMC CHERRY POINT STATION
CRAVEN COUNTY

LATITUDE: 34.9
LONGITUDE: -76.9
DEPTH OF WELL: 1425 FT

Aquifer	Elevation (ft.) 0 = Sea Level
Land Surface	26
Yorktown Confining Unit (CU)	-21
Yorktown	-34
Castle Hayne CU	-74
Castle Hayne	-84
Beaufort CU	-489
Beaufort	-516

NORTH CAROLINA WELL LOG DATA

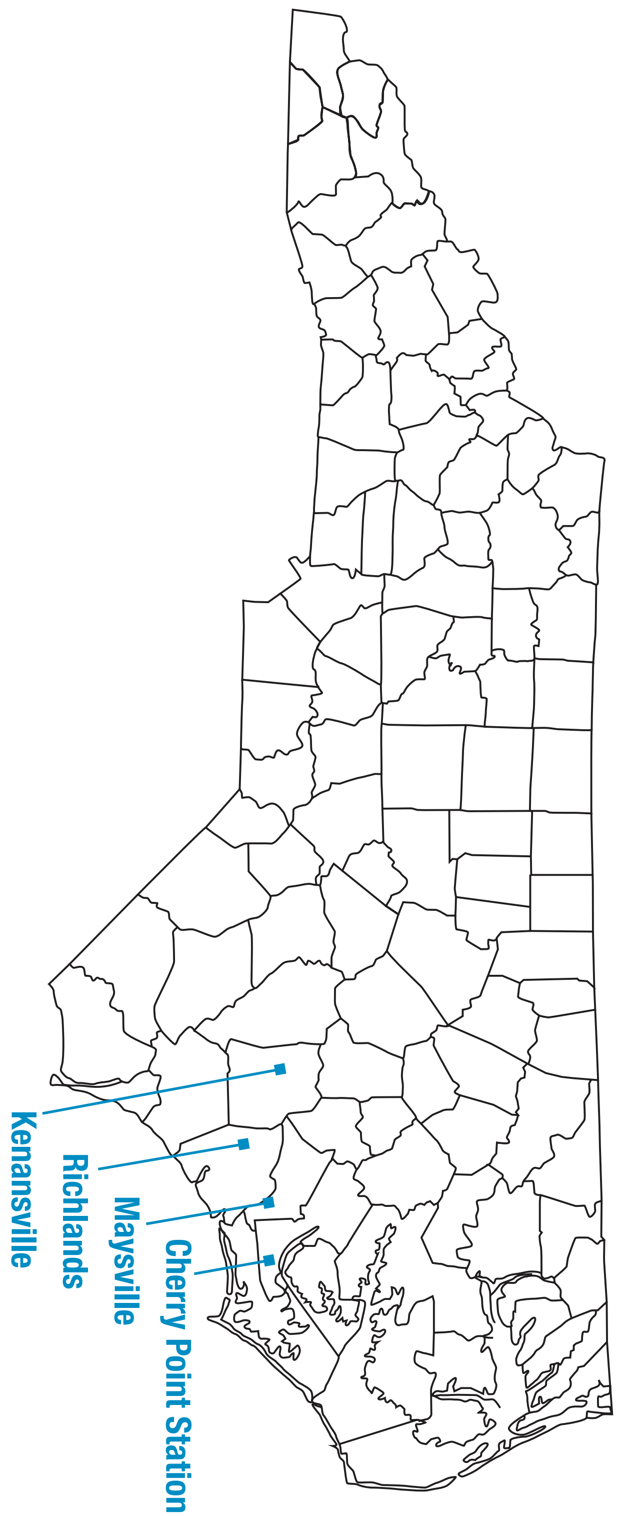
Location of Well



Data from selected wells in North Carolina

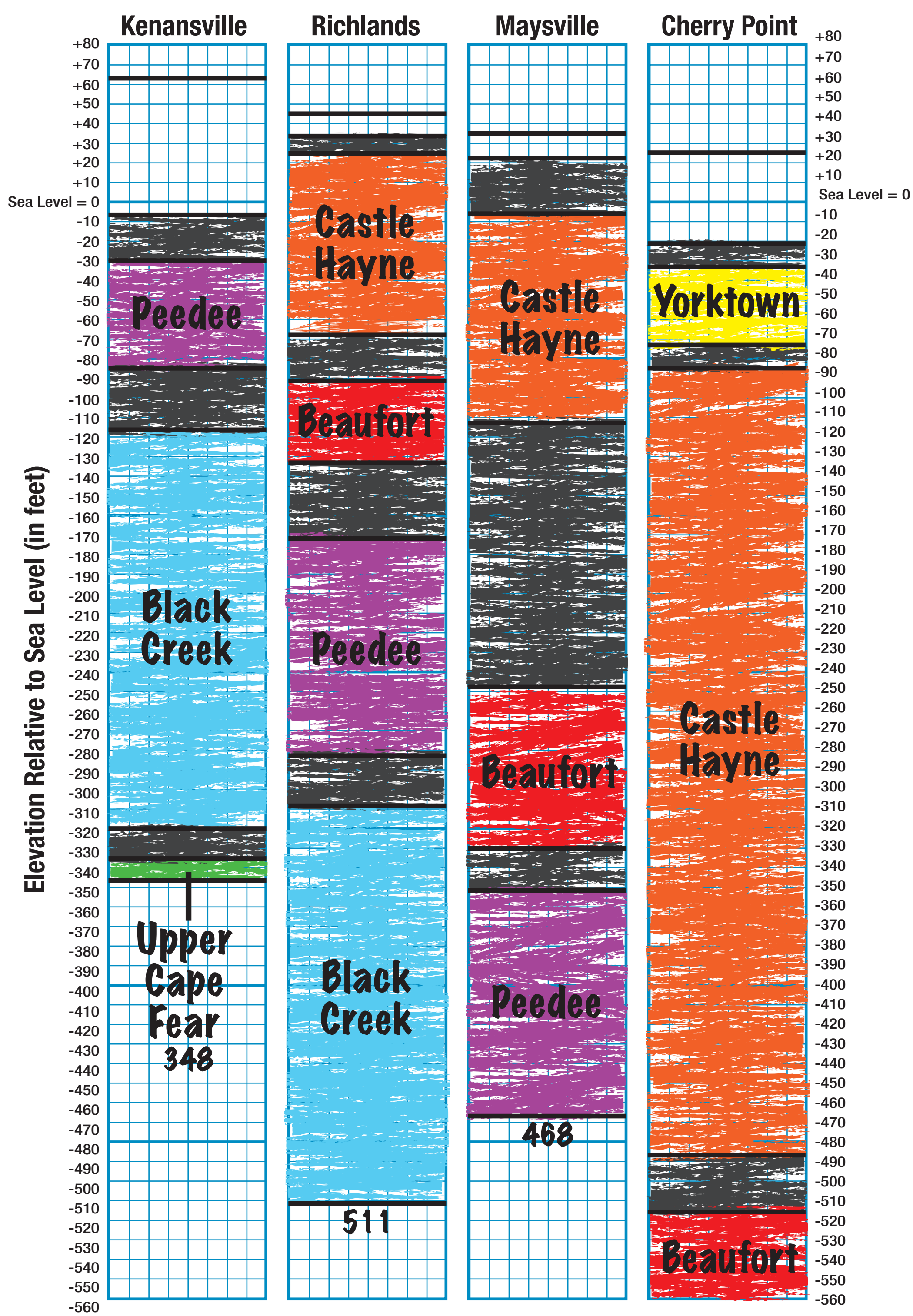
Student Page #4

NORTH CAROLINA WELL LOCATION MAP



NORTH CAROLINA WELL LOG DATA

Location of Well



Data from Selected Wells in North Carolina

PRINCIPAL AQUIFERS OF THE NORTH CAROLINA CENTRAL COASTAL PLAIN