



E I P a s o Water Education Series

Modeling the Meandering Rio Grande Lesson Plan

Grade 4

Subject
Earth and Space

Duration
60 minutes

Skills
Gathering Information
(observing,
measuring, recording),
Analyzing, Interpreting

Vocabulary
erosion, deposition,
flow, infiltration,
precipitation, riverbed

Science TEKS
Grade 4: 4.1(A-B), 4.2
(A-B), 4.3(A-B), 4.7(B)

Social Studies TEKS
Grade 4: 4.3(E),
4.5(A), 4.8(A-C)

For more lessons,
activities, and to
schedule a visit to
EPWater's Tech₂O
Water Resources
Learning Center visit:

tech2o.org

Lesson Overview: The Rio Grande river is different from many rivers because over 4 miles of its length is lined with concrete. Obviously, this was not always the case. In this lesson, students will construct and compare two stream models. The first will investigate the effects of erosion and deposition on a river. The second will model how human engineering can affect these processes.

Objectives:

1. Construct a river model to demonstrate the processes of erosion and deposition.
2. Integrate water cycle vocabulary with geologic process terms.

Engagement Questions:

1. Has the shape of the Rio Grande river ever changed?
2. What can cause a river to change shape?

Making Connections: The Rio Grande river is a shared water source and international boundary. After the river was established as a border between the US and Mexico, changes in the course of the river caused confusion and territorial disputes. In response to decades of territorial disputes in El Paso, the International Boundary and Water Commission decided to straighten and line 4.4 miles of the Rio Grande's riverbed with concrete to decrease the likelihood of unpredictable river meandering. Cementing the riverbed was a joint venture between the US and Mexico that changed the natural flow of the river through El Paso.

Materials: *(per student or small group)*

- (1) 100 cm length of string
- (4) cups of "moon sand": 2.5 cups sand, 1.5 cups flour, 0.5 cup oil
(Vegetable, baby, and mineral oils work well.)
- (2) cups of water
- (1) plastic spoon
- (1) metric ruler
- (1) scissors
- (1) paper towel tube
- (1) 13 inch by 9 inch disposable baking pan
- (1) Rio Grande river tracing pattern
- (2) toy figures
- (1) Modeling the Meandering Rio Grande worksheets

Procedure:

Pre-Activity Preparation

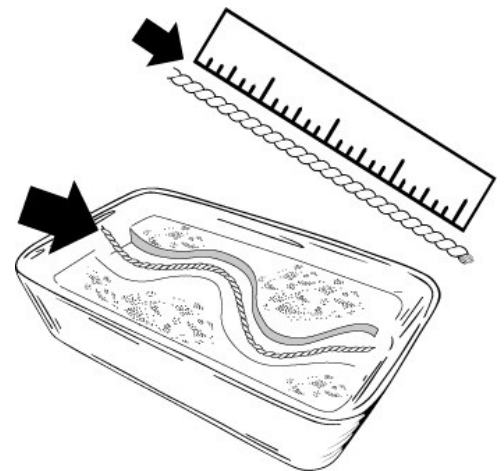
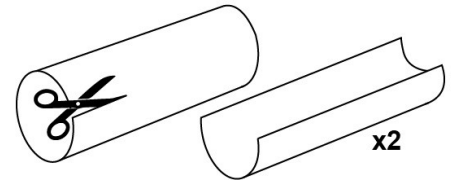
1. Watch [Tech2O The Meandering Rio Grande](http://tech2o.org/education) video at tech2o.org/education
2. Prepare the moon sand in each disposable baking pan or in a large mixing tub and deliver 4 cups to each pan.
3. Cut out a Rio Grande river tracing pattern (provided).
4. Halve the paper towel tube lengthwise.

Activity

Model Building - Part 1

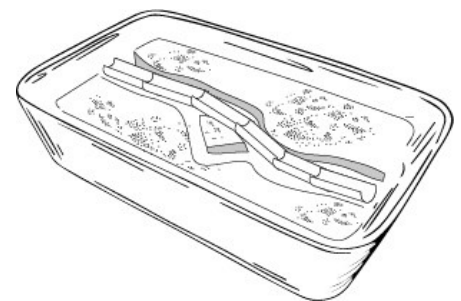
1. Compact the sand until it is evenly distributed in the pan and level.
Tip: Using the spoon is helpful for compacting around the edges of the pan.
2. Place the Rio Grande river tracing pattern on the compacted sand and use the handle of the spoon to trace the historical river pattern into the sand.
Tip: The activity works best if the channel is dug all the way to the bottom of the pan.
3. Spread the excavated sand away from the channel and compact it.
4. Use the string and ruler to measure the length of the channel. Record observations on the Modeling the Meandering Rio Grande-Worksheet.
5. Remind students that the Rio Grande serves as the US-Mexico international border.
6. Place each toy figure on opposite sides of the river to represent people living on either side of the border.
7. Raise one end of the pan to create an incline for water to flow.
8. Share with students that water flowing in the Rio Grande is stopped by multiple dams. Pouring water from the cup represents water being released from a dam.
9. Pour 1 cup of water into the top of the channel slowly.
10. Use ruler, string, and worksheet to record changes to the river model.

paper towel tube cut in half length-wise



Model Building - Part 2

1. Remind students that the US and Mexico agreed to cement a portion of the Rio Grande riverbed to limit changes to the river's shape at the Chamizal Convention of 1963.
2. Use scissors to cut the halved paper towel tube pieces to various lengths.
3. Reinforce the riverbed with paper towel tube pieces to simulate the cementing of the riverbed.
Tip: Encourage students to use the spoon to excavate and improve the fit of the tube pieces. Students may change the path of the river, but discourage making a straight path the entire length of the pan.
3. Spread and compact excavated sand.
Tip: Students may need to reposition their toys on either side of the model.
4. Use ruler, string, and worksheet to record observations.
5. Discuss the expected impact that an engineered riverbed will have on flow, erosion, and deposition.
6. Raise one end of the pan to create an incline for water to flow.
7. Pour the remaining cup of water into the top of the channel.
8. Use ruler, string and worksheet to record observations.



Check for Understanding:

Did students meet the lesson objectives? Can they answer the engagement questions? Below are some key takeaways and questions that students should be able to answer following the lesson.

Key Takeaways:

- The processes of erosion and deposition cause rivers to change over time.
- The natural process of water infiltration is impacted by cementing a riverbed.
- Human engineering can influence the natural processes of erosion and deposition in rivers.

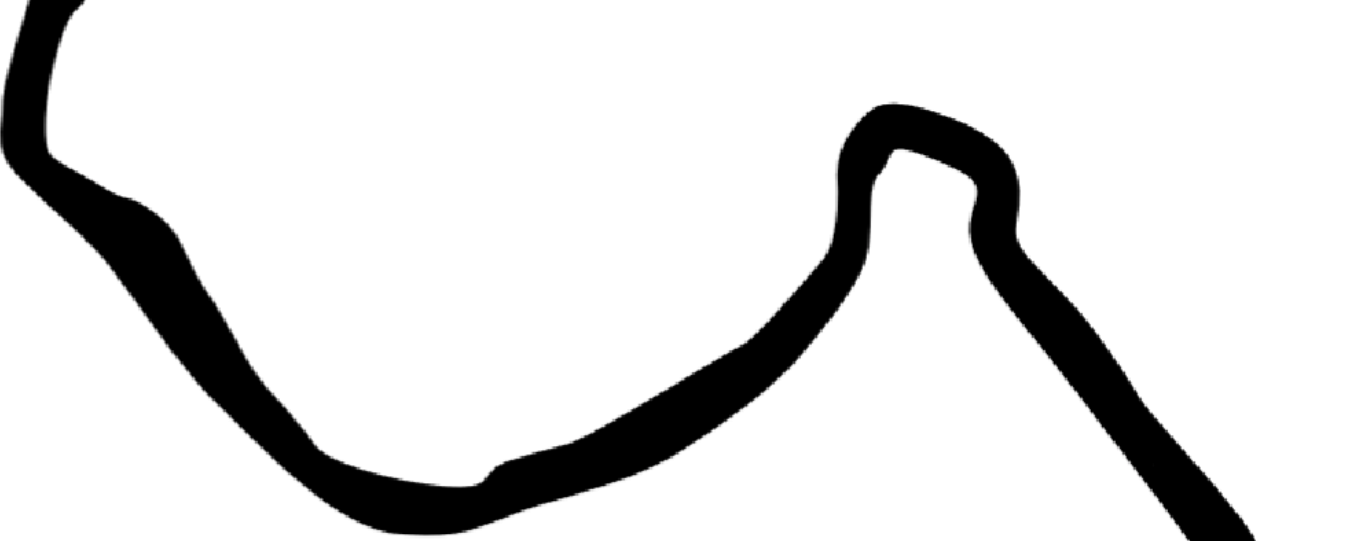
Questions:

1. What causes a river's shape to change over time?
2. How is erosion different than deposition?
3. How have people changed areas of the Rio Grande riverbed?
4. Why did people change portions of the Rio Grande's natural riverbed?



River Tracing Pattern B
Rio Grande - 1889

River Tracing Pattern B
Rio Grande - 1889



River Tracing Pattern C
Rio Grande - 1889



River Tracing Pattern C
Rio Grande - 1889



Modeling the Meandering Rio Grande-Worksheet

Name: _____ Date: _____

Instructions: Use this worksheet to record your observations and answer questions.

Before you begin, you should be able to answer the following questions. Fill in each blank using the word choices below. Not all words will be used.

CONDENSATION DEPOSITION EROSION FLOW INFILTRATION PRECIPITATION

1. When flowing water moves rocks and sediments, this process is called _____.
2. When water drops rocks and sediments in a new location, this process is called _____.
3. When water, frozen or liquid, falls from the sky, this is called _____. It is responsible for filling lakes, rivers, and streams.
4. When water on the surface soaks into the soil, this process is called _____.

Follow your teacher's instructions to set up a river model.

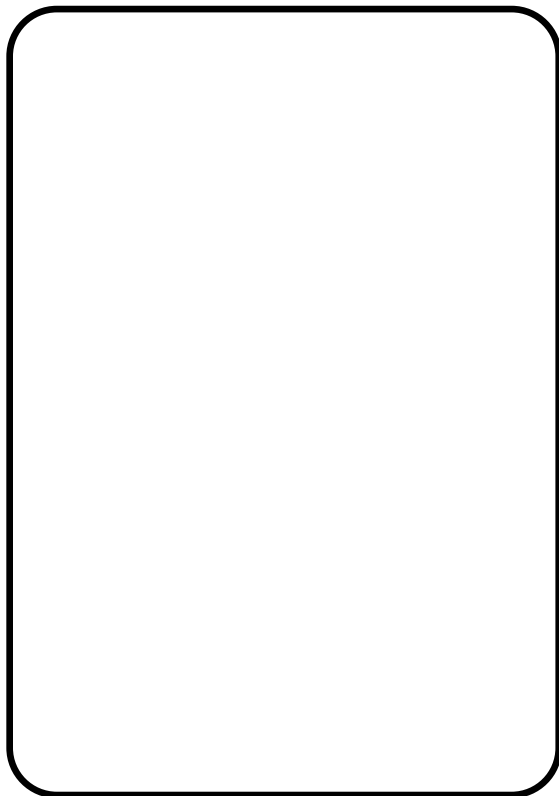
Question: How does flowing water affect the shape of a river?

Hypothesis: *Finish the statement.*

I expect that adding water will cause the shape of my river to _____

Draw Your Observations:

Draw your river model before adding water.



Describe Your Observations:

Describe the shape of your river model using complete sentences.

Measurements:

Year of River Tracing Pattern _____

Length of model river _____ cm
Use your string and ruler to measure

Width of model river _____ cm

Depth of model river _____ cm

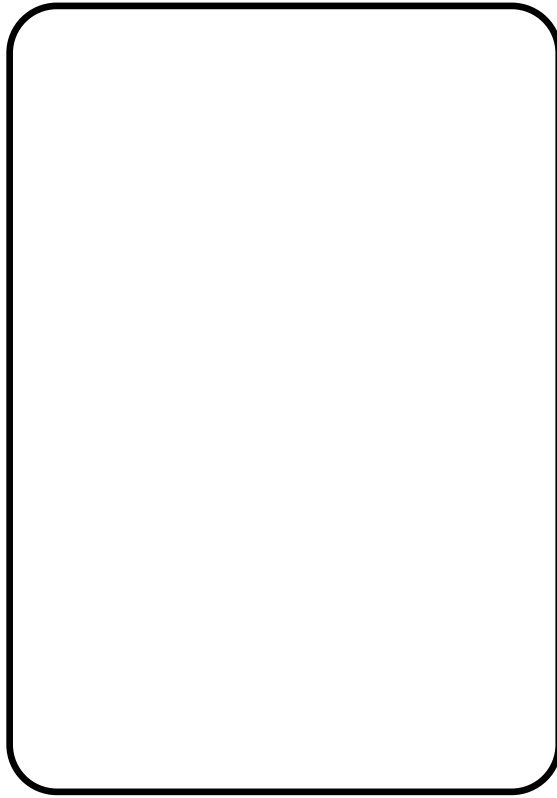
Modeling the Meandering Rio Grande-Worksheet

Name: _____ Date: _____

Instructions: Record your observations and answer the questions below.

Draw Your Observations:

1. Draw your river model after adding water.
2. Label areas where erosion occurred.
Areas where sand was carried away by flowing water.
3. Label areas where deposition occurred.
Areas that sand moved to but were empty before adding water.
4. Label areas where infiltration occurred.
Areas where water soaked into the sand.



Describe Your Observations:

1. Describe the shape of your river model using complete sentences.

2. Did the shape of your river change after adding water?

Analyze Your Observations:

1. Why do you think water flowed in the direction you observed?

Measurements:

Length of model river _____ cm
Use your string and ruler to measure

Width of model river _____ cm

Depth of model river _____ cm

Cultural Application:

If your river model represents the border between two different countries, how might the border be affected when the river changes shape?

Conservation Application:

If water can pick up sand and rocks as it flows, what else could be picked up by fast moving water?

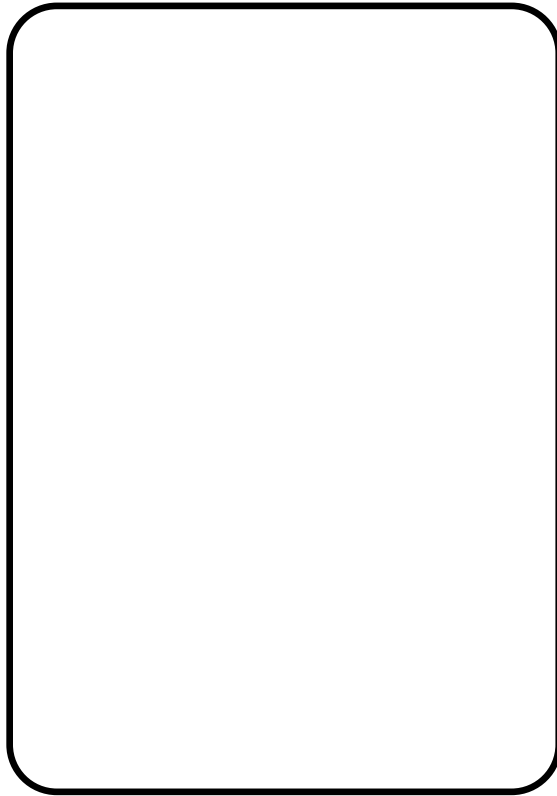
Modeling the Meandering Rio Grande-Worksheet

Name: _____ Date: _____

Instructions: Use your recorded observations and online research to answer the following questions.

Draw Your Observations:

1. Draw your river model after adding pieces of carboard tube and water.
2. Label areas where each of the following processes occurred. If a process was NOT observed, explain why it was not observed next to the term.
 - A. EROSION
 - B. DEPOSITION
 - C. INFILTRATION



Describe Your Observations:

1. Describe the shape of your river model using complete sentences.

2. Did the shape of your river change after adding water?

Analyze Your Observations:

1. Why do you think the water flowed faster after adding the pieces of carboard tube to your river model?

Measurements:

Length of model river _____ cm
Use your string and ruler to measure

Width of model river _____ cm

Depth of model river _____ cm

Cultural Application:

If a home is built near a river with a cemented riverbed, do you think this home is more or less likely to flood? Explain your answer.

Conservation Application:

Cementing a riverbed prevents water infiltration into the soil. How could less water infiltration affect the amount of groundwater available near the cemented portion of a river?

Modelando El Río Grande-Hoja De Trabajo

Nombre: _____ Fecha : _____

Instrucciones: Utiliza ésta hoja de trabajo para registrar tus observaciones y responder preguntas.

Antes de comenzar, deberías poder responder las siguientes preguntas. Completa cada espacio en blanco usando las opciones de palabras a continuación. No se usarán todas las palabras.

CONDENSACIÓN DEPOSICIÓN EROSIÓN FLUJO INFILTRACIÓN PRECIPITACIÓN

1. Cuando el agua que fluye mueve rocas y sedimentos, éste proceso se denomina _____.
2. Cuando el agua deja caer rocas y sedimentos en una nueva ubicación, éste proceso se denomina _____.
3. Cuando el agua, congelada o líquida, cae del cielo, ésto se llama _____. Es responsable de llenar lagos, ríos y arroyos.
4. Cuando el agua en la superficie penetra en el suelo, éste proceso se denomina _____.

Sigue las instrucciones de tu profesor para configurar un modelo de río.

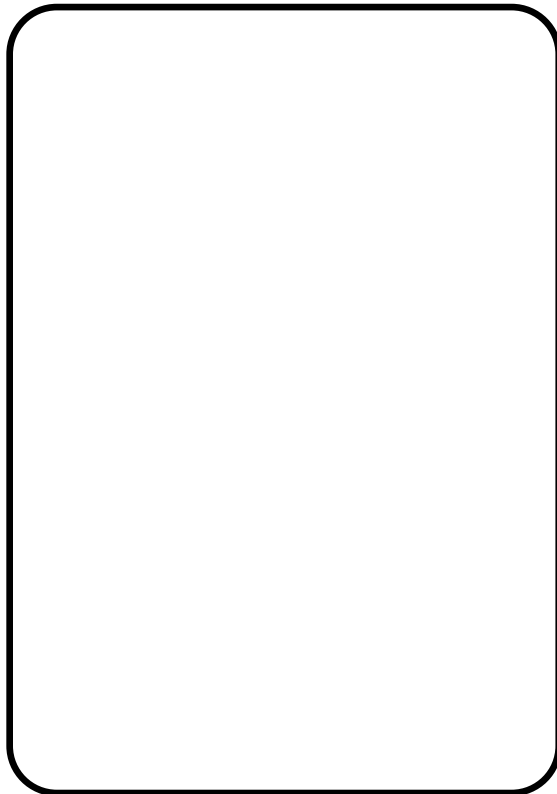
Pregunta: ¿Cómo afecta el agua que fluye a la forma de un río?

Hipótesis: *Finaliza la declaración.*

Espero que agregar agua haga que la forma de mi río _____

Dibuja tus Observaciones:

Dibuja tu modelo de río antes de añadir agua.



Describe tus Observaciones:

Describe la forma de tu modelo de río usando oraciones completas.

Medidas:

Año de River Tracing Pattern _____

Longitud del modelo de río _____ cm
Usa la cuerda y la regla para medir

Anchura del modelo de río _____ cm

Profundidad del modelo de río _____ cm

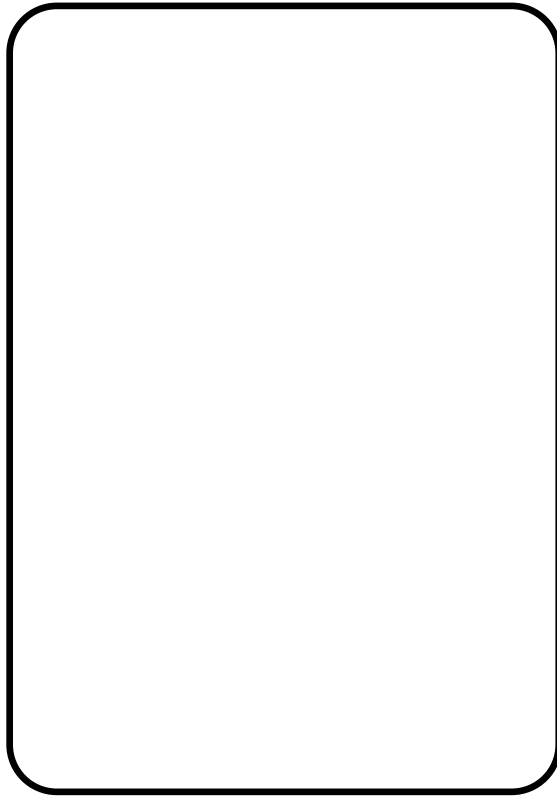
Modelando Río Grande-Hoja de Trabajo

Nombre: _____ Fecha: _____

Instrucciones: Registra tus observaciones y responde las siguientes preguntas.

Dibuja tus Observaciones:

1. Dibuja tu modelo de río después de agregar agua.
2. Etiqueta las áreas donde se produjo la erosión.
Áreas donde la arena fue arrastrada por el agua que fluye.
3. Etiquetar las áreas donde se produjo la deposición.
Áreas a las que se movió la arena pero que estaban vacías antes de agregar agua.
4. Etiqueta las áreas donde se produjo la infiltración.
Áreas donde el agua empapó la arena.



Describe tus Observaciones:

1. Describe la forma de tu modelo de río usando oraciones completas.

2. ¿Cambió ala forma de tu río después de agregar agua?

Analiza tus observaciones:

1. ¿Por qué crees que el agua fluyó en la direccion que observaste?

Medidas:

Longitud del modelo de río _____ cm
Usa la cuerda y la regla para medir

Ancho del modelo de río _____ cm

Profundidad del modelo de río _____ cm

Aplicación Cultural:

Si el modelo de río representa la frontera entre dos países diferentes, ¿cómo podría verse afectada la frontera cuando el río cambia de forma?

Aplicación de Conservación:

Si el agua puede recoger arena y rocas a medida que fluye, ¿qué más podría recoger el agua que se mueve rápidamente?

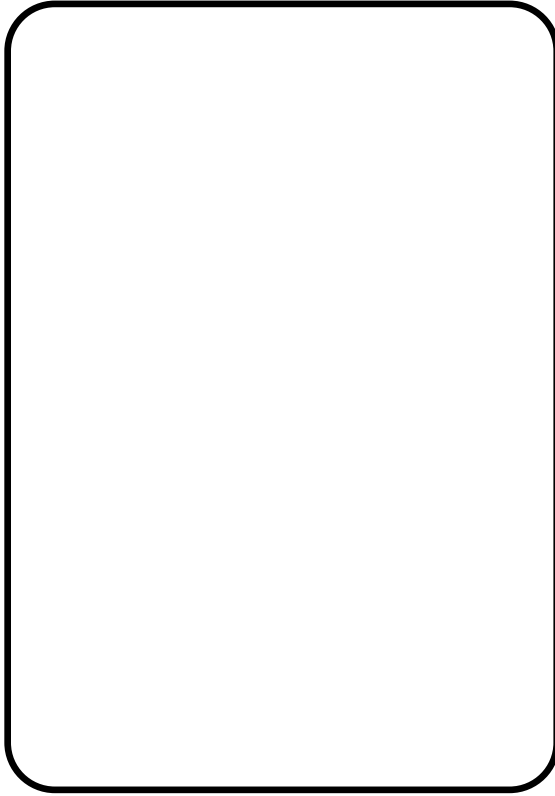
Modelando Río Grande-Hoja de Trabajo

Nombre: _____ Fecha: _____

Instrucciones: Utiliza tus observaciones grabadas y tu investigación en línea para responder a las

Dibuja Tus Observaciones:

1. Dibuja tu modelo de río después de agregar trozos de tubo de cartón y agua.
2. Etiqueta las áreas en las que se ha producido cada uno de los siguientes procesos. Si un proceso NO se observó, explica por qué no se observó junto al término.
 - A. EROSIÓN
 - B. DEPOSICIÓN
 - C. INFILTRACIÓN



Describe Tus Observaciones:

1. Describe la forma de tu modelo de río usando oraciones completas.

2. ¿Cambió la forma de tu río después de agregar agua?

Analiza Tus Observaciones:

1. ¿Porque crees que el agua fluyo más rápido después de añadir los trozos de tubo de cartón a tu modelo del río?

Medidas:

Longitud del modelo de río _____ cm
Usa la cuerda y la regla para medir

Ancho del modelo de río _____ cm

Profundidad del modelo de río _____ cm

Aplicación Cultural:

Si una casa se construye cerca de un río con un lecho de río cementado, ¿Crees que es más o menos probable que ésta casa se inunde? Explica tu respuesta.

Aplicación de Conservación:

La cementación del lecho de un río evita la infiltración de agua en el suelo. ¿Cómo podría una menor infiltración de agua afectar la cantidad de agua subterránea disponible cerca de la parte cementada de un río?