

Name _____

Appendix B

Flowing River Design Task

You are the mayor of a small town. A river flows through your town. Slowly, over time, the river has been changing the shape of the land. The town likes the river but wants to stop it from changing the land. The town comes up with two ideas. **Read the ideas below, and decide which one you think would work better and why.**

Solution #1: Build a dam upstream from the town. The river's flow would change from 10 miles per hour to 5 miles per hour.



Solution #2: Line the river with sturdy concrete material.



I choose Solution # _____, because

Teacher notes: Students may not yet understand how a dam works to regulate the flow of water for a river downstream. Students receive information that the river's speed would decrease from 10 mph to 5 mph in order to help them make this connection. It may be helpful to first discuss a local dam or a major dam in Tennessee with students and lead students to recognize that a dam regulates water flow for any rivers downstream.

Student response notes: Either solution could be feasible. The purpose of this design task is to have students evaluate the designs to understand how they would solve the issue.

- *Solution #1: Dam—Slows the flow of the river, which would prevent the river from carrying as much earth material away.*
- *Solution #2: Concrete lining—Prevents the earth material on the banks of the river from washing away and keeps the river set in its course.*

If student responses do not indicate an accurate reason for why the design solution would work, it may be beneficial to review the River Investigations from the Exploring phase so students can make stronger connections to the factors that influence how a river changes the land (i.e., rate of water flow and type of land that the river flows through).

Extension opportunity: *This design task has been written as a brief formative assessment to be done at the end of the Exploring phase. However, if time allows, this design task could be unpacked over several days and become the basis for a longer hands-on engineering activity. Students could use the models from the River Investigations and incorporate the design solution of their choice to the model, using additional material such as laying a ceramic tile at the head of their river to represent the construction of a dam upstream.*

Appendix C

Elaborating: Rivers Bend



The pictures above show a river changing its shape over 13 years from 1985 to 1998.¹

Now, imagine that people built a sturdy wall in this area. The wall is shown as a white color in the picture below. Sketch what you predict the river might look like after 13 years with the presence of the wall.



¹ Pictures from: Sylvester, Zoltan (2014, March 16). *Changing Ucayali River*. [NASA/USGS Landsat GIF File]. Retrieved from <https://hinderedsettling.com/2014/03/16/rivers-through-time-as-seen-in-landsat-images/>

Teacher note: Student drawings may vary in detail, but overall should indicate that the presence of the wall does not allow the river to form an oxbow lake in the same location as in the original photo. Student drawings may include an oxbow lake forming in either of the two locations to the left of the wall where the river bends.

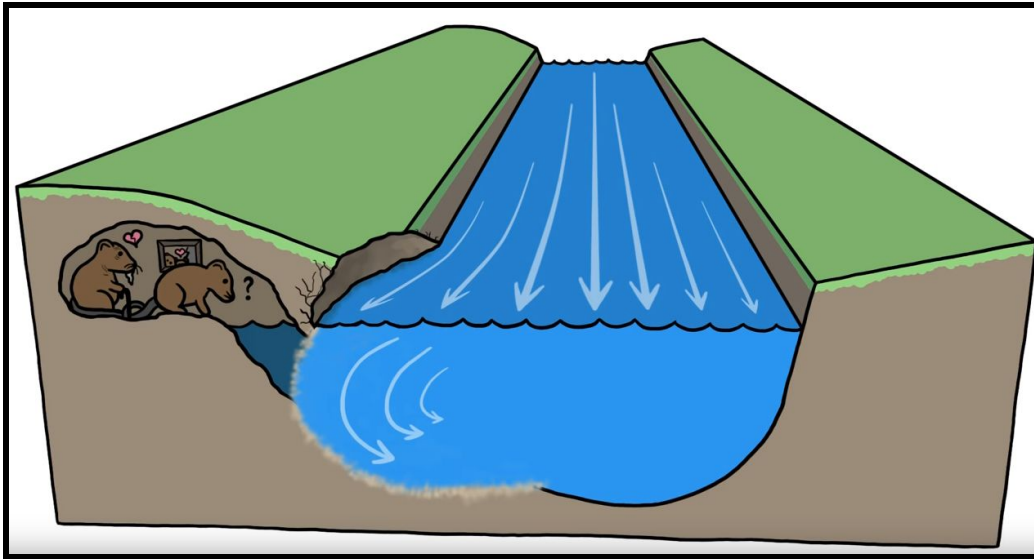


Name _____

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Appendix D

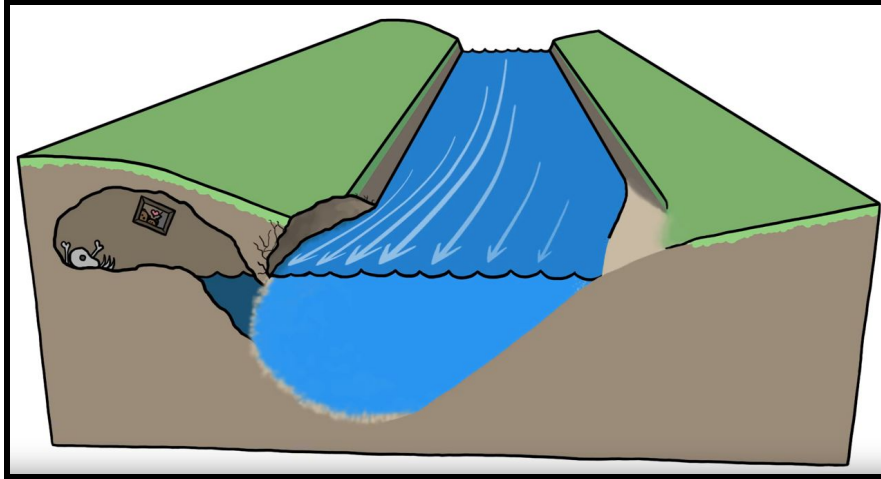
Why Do Rivers Bend?



1. In the picture above, what started to cause one side of the river to wash away?

2. What will happen next to the side of the river that is being washed away? (Circle one.)

- a. The river will continue to wash it away over time.
- b. The river will fill in the hole with new material.
- c. The river will dry up because it has become too wide.



3. In the image above, why do you think the animal turned into a skeleton as the river began to change? (Circle one.)

- a. because rivers are dangerous when they bend
- b. because rivers take a very, very long time to change
- c. because animals usually starve when building a home near a river

4. In the image above, why are there arrows of different sizes in the water? (Circle one.)

- a. to show that the water is not flowing
- b. to show that the water is flowing at different speeds
- c. to show that the water is flowing in different directions

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Appendix E
River Model Template

My river today

My river after 50 years