NEBRASKA
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DEPT. OF NATURAL RESOURCES

Nebraska Department of Natural Resources

Stream Simulation 2: Effects of Groundwater Pumping on Streamflow

Read the introduction screen, click OK, and complete the Tutorial for Stream Simulation 2. Click Next until you Exit Tutorial, then answer the following questions. You may turn the Tutorial Mode back on at any time to assist with explanations, as well as reference your Word Bank.

After exiting the tutorial mode, be sure the drop down in the top right corner of the screen says **Gaining Stream and** *then answer the following questions.*

1. Does a pump have any effect on water interactions if it is turned off?
    a. Yes
    b. No

2. When the pump is turned on, the water table _____ and the stream depth _____.
    a. decreases/increases
    b. increases/decreases
    c. decreases/remains unchanged
    d. decreases/decreases

3. According to the simulation, which has a greater effect on the water table, a pump near the stream or a pump far from the stream?

4. According to the simulation, which has a greater effect on the stream depth, a near pump or a far pump?

5. When the stream depth decreases from pumping, this is known as _____.
    a. Recharge
    b. Baseflow
    c. Depletion
    d. Precipitation

6. Experiment moving the pump slider between **Near** and **Far** in the simulation. Make sure the **pump** is set to **on**. What effects does the pump having on groundwater flow?

Use the drop down arrow in the top right corner of the screen and select **Losing Stream.** *Read the introduction screen, click OK, then Turn On the Tutorial Mode in the top right corner of the screen. After you complete the Tutorial Mode, answer the following questions.*

7. When the pump is turned on, the water table _____ and the stream depth _____.
    a. decreases/increases
    b. increases/decreases
    c. decreases/remains unchanged
    d. decreases/decreases

8. If the water table falls below the streambed, the stream is then
    a. Gaining
    b. Losing
    c. Disconnected
    d. At equilibrium

9. Which causes depletion at a faster rate, a pump near the stream or a pump far from the stream?

Use the drop down arrow in the top right corner of the screen and select **Disconnected Stream.** *Read the introduction screen, click OK, then Turn On the Tutorial Mode in the top right corner of the screen. After you complete the Tutorial Mode, answer the following questions. Keep in mind a stream can be naturally disconnected or it can become disconnected as a result of groundwater pumping.*

10. When the pump is turned on, the **water table** _____ and the **stream depth** _____.
    a. decreases/increases

b. increases/decreases
c. decreases/remains unchanged
d. decreases/decreases

11. Explain what happens when a stream is disconnected and the effect of pumping on streamflow.

*Use the drop-down arrow in the top right corner of the screen and select **Transient Stream and** then answer the following questions.*

12. Extraction means *the action of taking out something using force*. In the groundwater pumping simulation, extraction refers to taking water out of the aquifer via pumping. No extraction is occurring when the slider in the top left is set to **off**. While off, the stream in this simulation is _____.
    a. Losing
    b. Gaining
    c. Disconnected
    d. At equilibrium

13. Experiment moving the slider between **Low** and **Very High** for pumping volume. Explain what happens to the streamflow and connectivity.

14. Based on your answers in this section, define a Transient flow.

15. *Background:* At Pumpkinseed Creek in western Nebraska, farmers' water availability has severely declined over the past 50 years due to a combination of substantial groundwater use and drought, thereby negatively changing the creek's connectivity to the aquifer. The disconnection has decreased streamflow and water availability for wildlife, recreation, and irrigation. Farmers have adapted their management decisions to conserve water.

    You are a farmer in the middle of the irrigation season who wants to irrigate your crops. You will need to install groundwater pumps to use water from the aquifer. The aquifer is associated with a Gaining Stream. As a farmer who is conscious of hydrological effects, you want to minimize depletion and maintain stream connectivity.

    How will you accomplish that goal? Be sure to emphasize groundwater extraction (number of pumps used) and the location of the pumps used. Based on what you've learned from these simulations, describe all of the effects your pumping will have on the stream. *Your answer should be in paragraph form.*