

Secret Sink



SUBJECTS: Science and Social Studies

GRADES: 6-8

ACTIVITY SUMMARY: Students will work together as city planners to design a community. They must take into account the needs of community members, businesses and the environmental impact on the land itself.

DURATION: Two to three 45 minute periods (depending on amount of discussion)

OBJECTIVES:

The students will be able to:

1. Evaluate the environmental impact of various industries on land and water resources as well as the impact on plant and animal life.
2. Develop and express rights and responsibilities for themselves and others.
3. Investigate alternative perspectives.
4. Work together in a decision-making and problem-solving situation by considering multiple perspectives.

TEKS ADDRESSED:

6th grade-Science

1A-demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.

2E-analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.

3B-use models to represent aspects of the natural world such as a model of Earth's layers.

3C-identify advantages and limitations of models such as size, scale, properties, and materials.

7th grade-Science

1A-demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.

2E-analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.

3B-use models to represent aspects of the natural world such as human body systems and plant and animal cells.

3C-identify advantages and limitations of models such as size, scale, properties, and materials.

8C-model the effects of human activity on groundwater and surface water in a watershed.

8th grade-Science

1A-demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.

2E-analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.

3B-use models to represent aspects of the natural world such as an atom, a molecule, space, or a geologic feature.

3C-identify advantages and limitations of models such as size, scale, properties, and materials.

6th grade-Social Studies

6.5A—Identify and explain the geographic factors responsible for the location of economic activities in places and regions.

6.7B—Identify and analyze ways people have modified the physical environment such as mining, irrigation and transportation infrastructure.

6.23A—use a problem-solving process to identify a problem, gather information, list and consider options, consider advantages and disadvantages, choose and implement a solution, and evaluate the effectiveness of the solution.

6.23B—use a decision-making process to identify a situation that requires a decision, gather information, identify options, predict consequences, and take action to implement a decision.

7th grade-Social Studies

7.10A—Identify ways in which Texans have adapted to and modified the environment and analyze the consequences of the modifications.

7.23A—use a problem-solving process to identify a problem, gather information, list and consider options, consider advantages and disadvantages, choose and implement a solution, and evaluate the effectiveness of the solution.

7.23B—use a decision-making process to identify a situation that requires a decision, gather information, identify options, predict consequences, and take action to implement a decision.

8th grade-Social Studies

8.11B—describe the positive and negative consequences of human modification of the physical environment of the United States.

8.31A—use a problem-solving process to identify a problem, gather information, list and consider options, consider advantages and disadvantages, choose and implement a solution, and evaluate the effectiveness of the solution.

8.31B—use a decision-making process to identify a situation that requires a decision, gather information, identify options, predict consequences, and take action to implement a decision.

Natural Bridge Caverns, Inc.
26495 Natural Bridge Caverns Rd
San Antonio, TX 78266
210-651-6101
www.naturalbridgecaverns.com

NATIONAL SCIENCE STANDARDS:

Content Standard F: Science in Personal and Social Perspectives

Grades 5-8

Natural Hazards

- Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes.
- Natural hazards can present personal and societal challenges because misidentifying the change or incorrectly estimating the rate and scale of change may result in either too little attention and significant human costs or too much cost for unneeded preventive measures.

Risks and Benefits

- Risk analysis considers the type of hazard and estimates the number of people that might be exposed and the number likely to suffer consequences. The results are used to determine the options for reducing or eliminating risks.
- Individuals can use a systematic approach to thinking critically about risks and benefits. Examples include applying probability estimates to risks and comparing them to estimated personal and social benefits.
- Important personal and social decisions are made based on perceptions of benefits and risks.

VOCABULARY: Karst, sinkholes, groundwater, spring, run-off, pollution, community

MATERIALS REQUIRED:

- scissors
- masking tape
- glue
- surface map that includes a river, spring, and sinkhole (one per group)
- Secret Sink Community Sheet (one per group)

BACKGROUND:

All land use can dramatically affect an area. This is particularly true in a karst area. A karst area is distinguishable by the lack of surface streams and an abundance of sinkholes and springs. Following the properties of gravity, water consistently travels to the lowest point, the water table. In most areas of the United States the water travels along the surface as a stream or river. But in a karst area the water is more likely to sink underground to form sub-surface streams or rivers. Underground water may travel many miles before exiting as a spring near or along a surface river.

In a karst landscape, water drains underground by flowing into depressions called sinkholes. Sinkholes are areas where underlying rock layers have given way, causing the upper layers of rock to develop cracks and collapse. Karst terrain is very susceptible to groundwater pollution due to many sinkholes on the surface that quickly drain water into underground rivers.

When discussing land development in a karst region numerous issues should be addressed. All uses for land can dramatically affect an area, but the problems of groundwater pollution and an increasing human population have the most dramatic impacts on a given area. This is particularly true in a karst area where the abundance of sinkholes can funnel not only surface water but also all types of pollution into the groundwater. This run-off, or drainage of water and water-carried pollution, can create major community problems. Because of its numerous surface cracks and holes, a rainstorm within a karst terrain can swiftly wash soil, farming chemicals (including fertilizers, insecticides, pesticides, etc.), or animal waste from adjacent farm land into the underground waterways. Oil and gas residues can wash off area roadways or railway lines. Broken sewage or septic lines can carry human wastes into the underlying water streams. The polluted waters can be brought into area homes without the necessary filtration or cleansing. This affects the health and well-being of the community.

A community's greatest challenge is to develop a relationship with its surroundings so both can thrive. Planning is the key to a successful partnership with the land. By understanding the workings of a karst terrain and the vital role that water plays in this environment people can make informed decisions to insure that pre-existing plant and animal communities are not greatly disturbed. In the Secret Sink Community, industry, agriculture, and general services all must work together to produce a sustainable environment.

PROCEDURE:

1. Tell the students that they are responsible for planning a new community in the Secret Sink region. All components of the community must be arranged so that it maximizes the usefulness of this region. Review what needs to be developed and the importance of not leaving out any aspects of the community.
2. Divide the class into groups of three to five students. Each group represents a town planning committee. Working together as a team, their job is to plan the "perfect" community – a community which provides a clean, healthy environment for all its residents as well as the pre-existing plant and animal life.

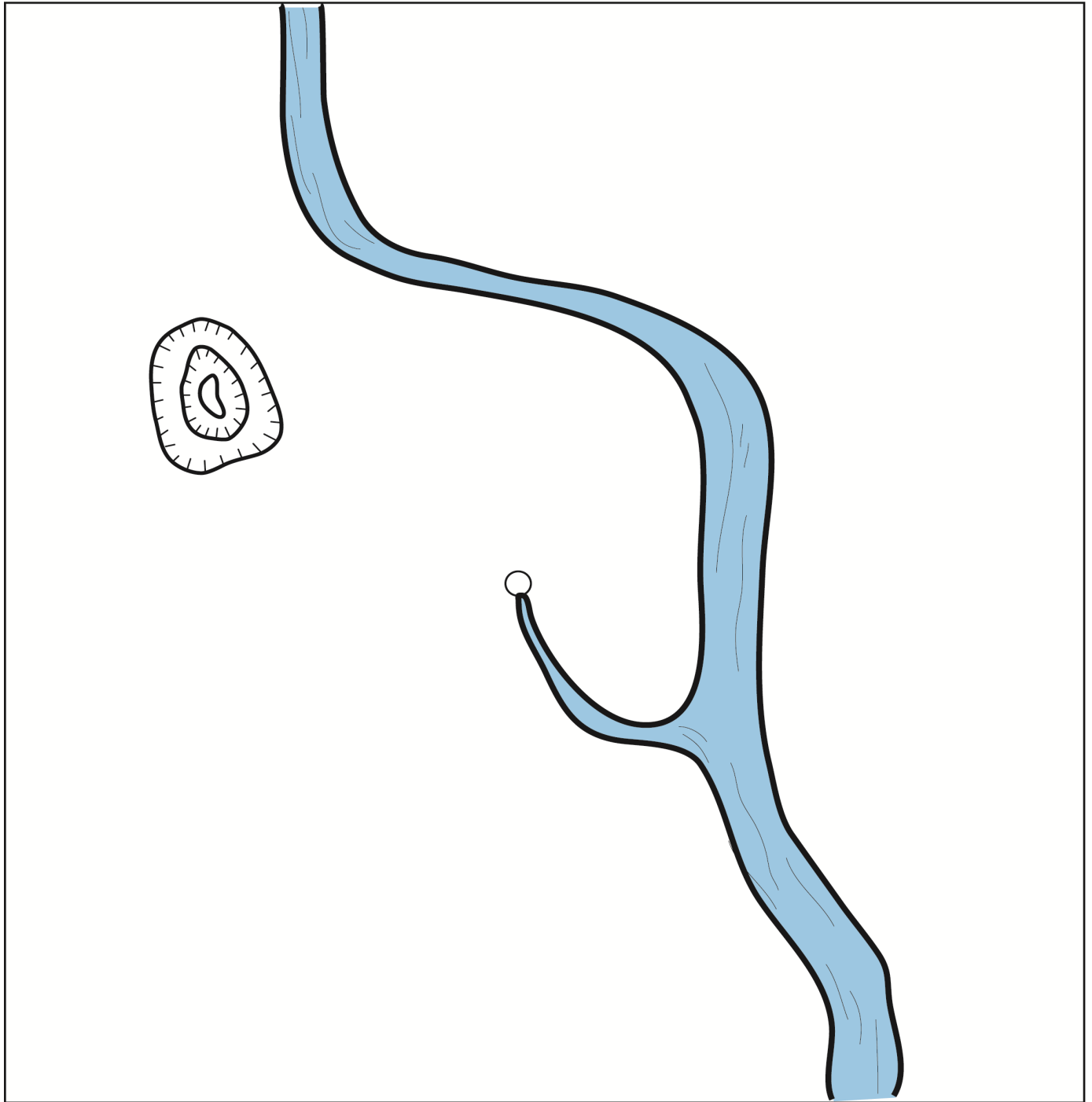
3. Review the components of the community*:
Residents—live in the area
Farmers—use the land to raise tobacco and livestock
Industry—uses the land for economic growth and trade
Small Business—provide local services
National Park—preserves and protects the unique environment
Transportation Department—issue appropriate transportation throughout the community. This can include highways, railroads and/or water transportation
Environmental Groups—protect the sinkholes under any circumstances
*Other groups can be added.
4. Before the students cut out the materials, brain storm the pros and cons of land use in the Secret Sink community. Record the pros and cons on the board.
5. Pass out the surface maps, scissors, glue, and the Secret Sink Community Sheets. The surface maps will serve as a base for each group's community. Explain that the group will need to use all the building cutouts provided. These cutouts can be made smaller or they can include more land, but all pieces must be used. The student may also develop other land uses. Do not paste items down at this time.
6. Have students work in their groups and begin to develop their ideal community. While doing this, keep in mind the priorities of each community group. Remember no land use is to be excluded, all community buildings must be used, plant and animal habitats need to be preserved, and everyone in your group should agree. Once all community members agree to the best layout, the pieces should be pasted or taped in place.
7. After each land use plan has been completed, each group now shares their "ideal" community with the rest of the class. During each presentation, community members should explain why they chose the placement of each component of their community. They should also explain how the placement of individual components helps protect, preserve, and maintain the health and well being of other community components.
8. As each presentation is completed, the teacher should tape or hang each completed community along the board or wall of the classroom. Place communities side by side, until each group has completed their presentations. Next, have the class focus on the string of communities found along the river. Point out that each represents a town, city, or farming community found along the Guadalupe River. Individual components of any one community may protect other components within its town limits, but how do they affect the next community downstream? Did the individual planning committees think about other communities while working the layout of their own town? Are there different choices that would have made a difference to neighboring communities?
NOTE: There is no "perfect" community. Every community will affect the plant and animal habitats around it, but proper planning can help to alleviate many environmental consequences.
9. To show that our Secret Sink community is not isolated, use a U.S. map to show that the Guadalupe River flows into the Gulf of Mexico. Now, as we look at our community, how are we affecting other communities down river and around the world?

EVALUATION: The teacher is able to evaluate the students by observing how the students interact with each other in their groups. Through the students' presentations and discussions the teacher will be able to evaluate problem solving skills and how well they adapt to different perspectives.

EXTENSIONS:

1. Relate Secret Sink to a sinkhole or other potentially hazardous area in or near your community. How is it being used? What kinds of connections can you make?
2. Find articles in local newspapers relating to sinkholes. What problems, concerns, and/or solutions are being discussed?
3. Attend a town meeting to see how your community discusses and plans for your area's development.
4. Brainstorm some changes that could be made within your school community. Prepare your ideas and present them to your school's student council.

SECRET SINK MAP



LEGEND



RIVER



SINKHOLE



SPRING

SECRET SINK
COMMUNITY SHEET

GROCERY	GAS STATION	DRY CLEANERS	DINER
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FARM FEED LOT	HOUSE	HOUSE	HOUSE
	HOUSE	HOUSE	HOUSE

TOBACCO FIELD

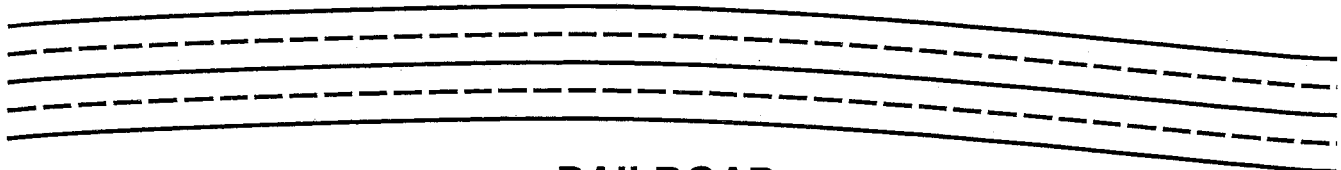
BLEACH
FACTORY

FIREHOUSE

NATIONAL PARK

CONDOMINIUM

HIGHWAY



RAILROAD

