

Watered States

Objective: Students play a matching game relating to the three states of water (solid, liquid, gas) in different forms. Advanced students may review how water can be polluted and sometimes can be cleaned. Students practice the skills of matching and classifying (sorting things into groups and labeling the group).

Materials: For each group: one set of Watered States Cards (These may be photocopied from the following pages.), ice cubes, a glass of water, and a cold spoon.

ACTIVITY SUMMARY:

Students play a matching game relating to the three states of water, and *for more advanced students* an extension reviewing the subjects of water pollution and ways of cleaning polluted water.

BACKGROUND INFORMATION:

Water on our planet is present in three different states: solid, liquid and gas. Water is the only substance on Earth found naturally in all three states.

Water in the solid state is either in ice or crystal form. The solid form includes glaciers, hailstones, frozen lakes and rivers, and ice cubes. Water in the crystal form is called snowflakes. Water temperature must be freezing (32° Fahrenheit or 0° Celsius) to form and sustain the solid state. Slow and still parts of the Bronx River may freeze solid under these conditions.

Water in its gas state is comprised of small molecules suspended in the air and is not visible to the naked eye. This water vapor is usually called steam. By applying heat to water (until water temperature reaches a boil at 212° F or 100° C), it can be changed from the liquid to the gaseous state. An example of this is when water is boiled in a kettle and steam is seen coming out of the spout. When water evaporates, it enters the atmosphere as vapor.

Water in its liquid state can be found in the Bronx River, lakes, streams, oceans, and underground as ground water. Water temperature must be above freezing and below boiling to remain in the liquid state.

Water pollution is the contamination of water resources by harmful wastes such as sewage, man-made chemicals, litter, and run off from

EVERYBODY

IN THE CLASSROOM

Skills:

Communication, Teamwork, Critical Thinking, Observe/Compare.

Subject/Discipline:
Science.

Science Standards:
S1, S3, S4, S7
Grades K – 3+

Time:

One, possibly two class meetings.

The Inside Track:

For more information on the health of the Bronx River visit the Bronx River Alliance website: www.bronxriver.org
See IS THE BRONX RIVER HEALTHY? Intro section.

For more information and resources for teaching about water pollution see the DEP's education website:
<http://www.nyc.gov/html/dep/html/educres.html>



Most pollution stems from human activities and can therefore be lessened or halted through changes in practice, planning, and perceptions of (sometimes unseen) ecosystems around us. See The Inside Track in the box above for resources on this topic.

PROCEDURE:

1. Using the ice cube, glass of water and cold spoon, and show students examples of each state of matter. Use the cold spoon to demonstrate water vapor by breathing on it and show students the condensed droplets of water that have formed.
2. Tell the students they will be playing a game to match pictures of water as a solid, a liquid and a gas with the same water state. Hold up one set of Water Match Cards (excluding the Bronx River Polluter Joker and Wild Washer Cards) and ask students to identify the state of water that each card represents.
3. Divide the class into groups (groups of four work best). Hand out one set of cards to each group and direct them to evenly distribute cards among players. Tell students to look at their cards without letting the other players see them.
4. Explain the rules of the game.
 - Each player lays down any matches in their hand face up on the table. A match consists of two cards with water in the same state (river and ocean waves, hail and glacier, breath and evaporation, etc.)
 - Decide who will go first, second, etc.
 - The first player draws a card from any other player's hand. If the card matches the one they have, the player lays the match down and goes again, if not the next player takes his or her turn.
 - Continue taking cards until all cards are paired. The player with the most matches wins!
5. Depending on student interest, play multiple games.

ADVANCED:

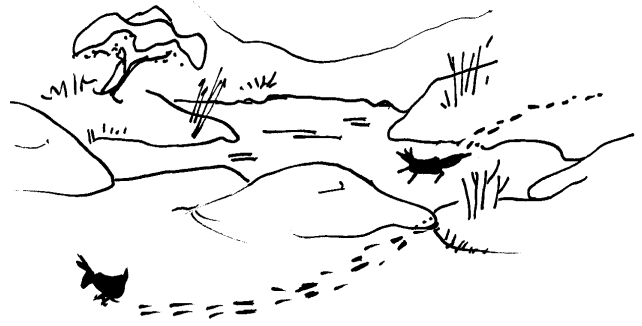
1. Have students stop playing and ask them to describe water pollution. Ask what types of water pollution they have seen and how it makes them feel. Discuss ways that water can be polluted.
2. Tell students they will play the game again, but with a new card, The Bronx River Polluter Joker. Explain that this is a card they do not want. If they draw it, they miss their next turn.
3. Distribute one Joker card to each group. Tell students that the player with the Bronx River Polluter Joker Card should not let the other players know, as they want someone else to draw it from their hand.
4. Have students deal cards and play until one student is left with the Bronx River Polluter Joker Card.
5. Talk about how the player left with the Polluter Card felt. Discuss ways that pollution can be removed from the water, both naturally through wetlands, and human made devices like wastewater treatment plants. Distribute the Wild Washer Card. It can be used as the match for the Polluter card. Repeat the game.
6. Have students identify and discuss which strategies may work better for which types of pollution. Don't forget to weigh the social, environmental and economic costs of engineered versus natural solutions.



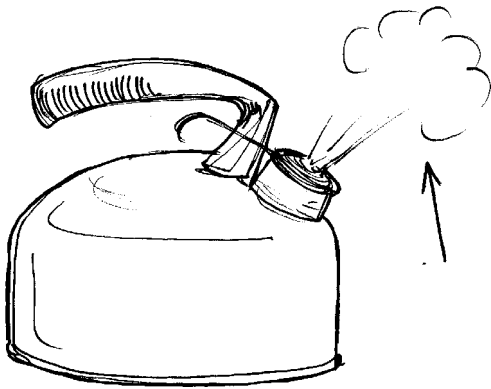
*Submitted by Sara May.
Edited and illustrated by Jill Weiss.*



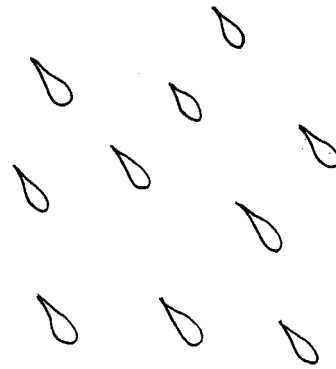
POND



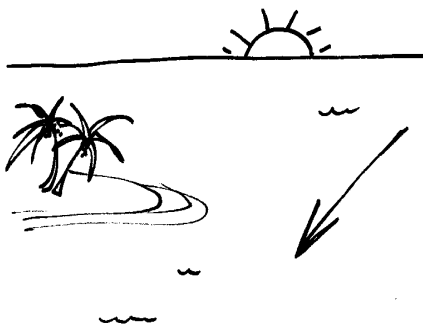
**FROZEN
POND**



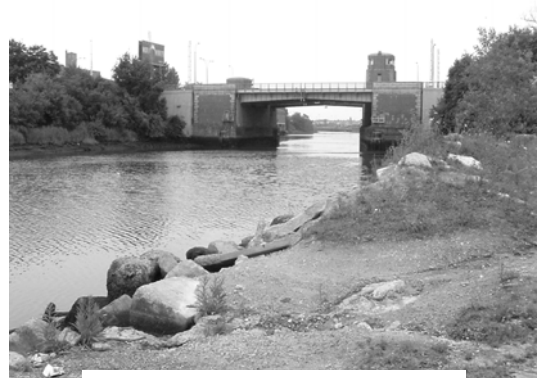
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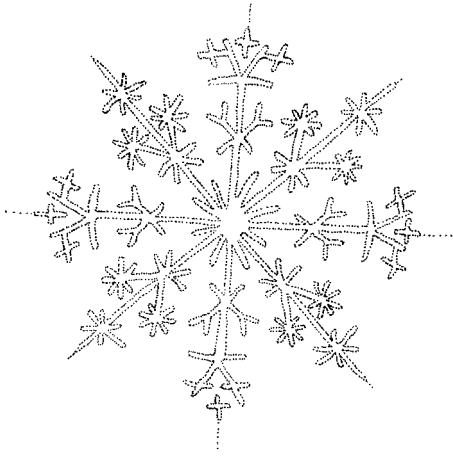
RAIN



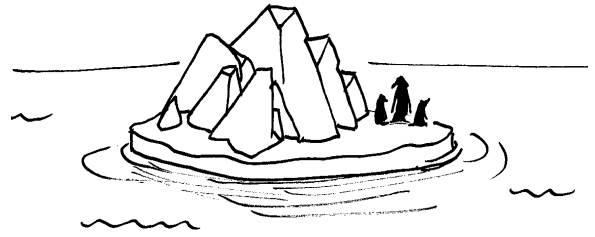
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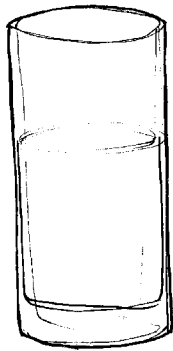
**BRONX
RIVER**



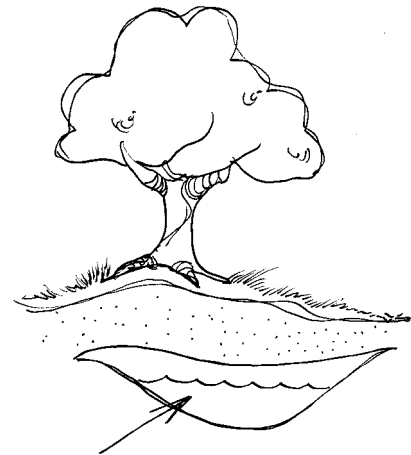
SNOWFLAKE



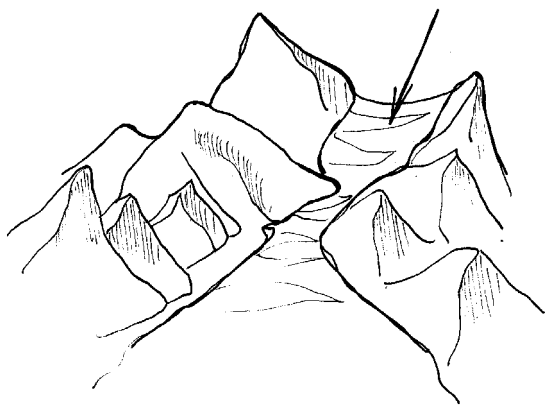
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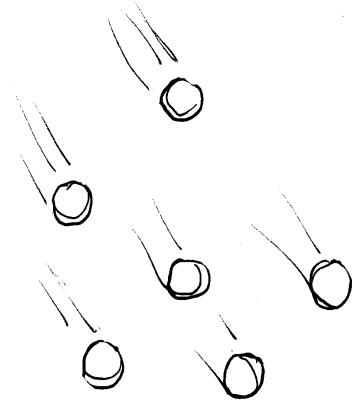
**GLASS OF
WATER**



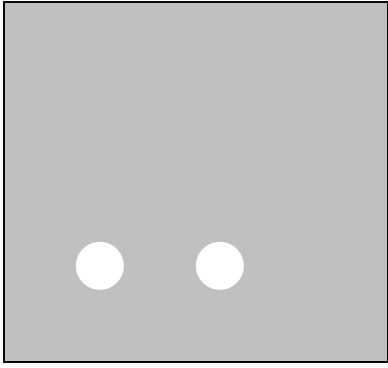
**GROUND
WATER**



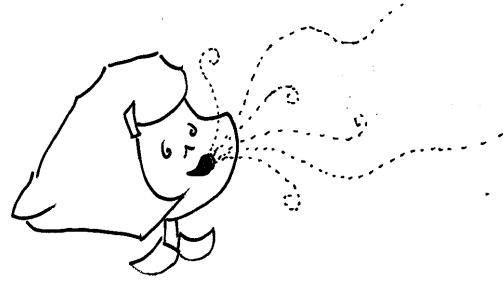
GLACIER



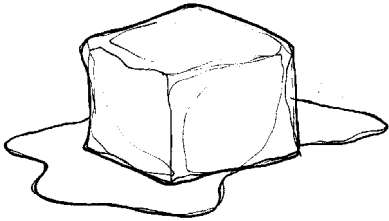
**HAIL
STONES**



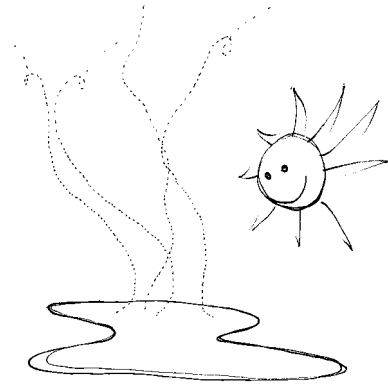
FOG



BREATH



**ICE
CUBE**



EVAPORATION



