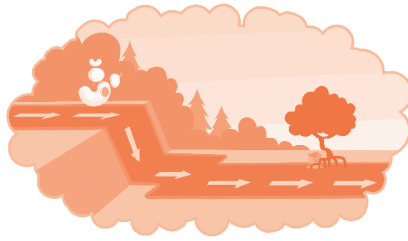


Water Ins and Outs



What Is This Activity?

What can water pass through? Families model and test surfaces that absorb water and those that don't. Families also observe how water passes through plants and human skin.

Learning Goals

Big Science Idea:

- Water passes through grassy surfaces, soil, plant leaves, and human skin because they have tiny holes. Water flows or puddles over solid surfaces like pavement.

Skills kids will use to investigate it:

- Model how paved surfaces block rainwater and soil let water pass through
- Observe and compare water flow on paved surfaces and soil and through plant leaves (transpiration) and human skin (sweating)
- Define and communicate solutions to a problem: Paved surfaces can make rain and melted snow flood a city

How Do You Get Ready?

- Read the activity and gather the materials.
- Print out one copy per family of the "Water Ins and Outs" and the "Where Does Water Go in a City" handouts.
- Scout out a space with both pavement and grass (or dirt). Make sure there are bushes or plants with leaves nearby. Your program's yard, a park, or a playground will do.
- Troubleshoot safety concerns (traffic, poison ivy, sharp objects, etc.).
- If you don't plan to show "The Hidden Alligator Mystery" video that is paired with this activity on the website, watch it ahead of time and jot down concepts to share with families during the activity.

pbskids.org/plumlanding/parents

Curriculum Topics

water, plants, human impact

Activity Type

outdoor (warm and sunny or mostly sunny days are best, but cloudy days work too)

Group Size

whole group, small groups

Activity Time

40–60 minutes

Materials

- Plastic sandwich bags with ties or string (one per family)
- Bottles of water (one per kid; have kids carry their own)
- "Water Ins and Outs" and "Where Does Water Go in a City?" handouts (one per family)
- Optional: "Explore Water Around You" handout

Next Generation Science Standards

Disciplinary Core Ideas

LS1.A: Structure and Function

PS1.A: Structure and Properties of Matter

Science and Engineering Practices

Asking Questions and Defining Problems

Planning and Carrying Out Investigations

Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts

Cause and Effect: Mechanism and Prediction

Warm-up (5-10 minutes)

(Science Skills: Model how paved surfaces block rainwater and soil lets water pass through)

Falling Raindrops

This Red Rover-type game models how rainwater behaves on pavement versus grass, sand, or soil.

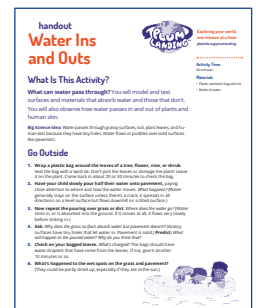
1. In an open space outdoors, **divide families into two teams**, the Raindrops and the Ground. (You may want the kids to be the Raindrops.)
2. **Position the teams** about 20 yards apart.
3. **The Ground team stands in a line** shoulder to shoulder. Explain that they are like a solid, paved surface (e.g., asphalt) with no openings.
4. On your signal, **the Raindrops “fall” by running toward the Ground team**. Each Raindrop tries to pass through “the asphalt” without touching it. Impossible! They have to stop (“puddle”) or divert (“stream” right or left around either end of the line).
5. **Repeat the game**, but this time Ground team models soil. They open holes by placing their right arm on the shoulder of the person next to them. The Raindrops can now slip through those spaces.
6. **Discuss:** *How does this game remind you of raindrops falling to the ground?* (On hard solid surfaces such as streets, sidewalks, and parking lots, rain can't pass through, so it either puddles in place or streams away. Rain can slip through soil, which has tiny holes.)

Activity (30-40 minutes)

(Science Skills: Observe and compare water flow on paved surfaces, soil, and through plant leaves (transpiration) and human skin (sweating))

Water Ins and Outs

1. **Pass out the “Water Ins and Outs” handout and materials. Review the activity with families.**
2. **Have families predict what they think will happen.** They will discover the answer later in the activity. (Water droplets form in the bags. Note that it can take 30 minutes or so for water droplets to form in the bag, depending on the plant, how wet the air is, and the temperature. Heat speeds up transpiration—water vapor flowing out of the plant through the leaves.)
3. **Tell families to follow the directions on the handout**, beginning with wrapping a bag around the leaves of their choice. Move from family to family to answer questions and offer support.
4. While the baggies are collecting droplets and the poured water is drying up, **have the group play shadow tag for 10 to 15 minutes to work up a sweat.** The goal is for the person named “It” to tag someone else “It” by stepping on his or her shadow. Players must stay in the sun—no hiding in shaded areas.
5. **Ask:** *Does your skin let water out?* (Yes! Sweat flows out of skin.) *What will happen to the sweat?* (It will dry up—or evaporate, turning from water to water vapor.) Explain that when sweat dries up, it evaporates and turns into water



vapor. The water vapor takes heat away with it, making you feel cooler. Wind speeds up the process. Have families wave a sweaty arm in the wind, blow on it, and use the handout to fan their faces. **Ask:** *How does that feel?*

- 6. Tell families to check their plastic bags.** **Ask:** *Which bags fogged up? Which ones have tiny water droplets? Were your predictions accurate?*
- 7. Have them compare their sweat to the bagged leaves.** Explain that, like sweat through skin, water passes out of the leaf and evaporates, or turns to water vapor (a gas). The bag traps the water vapor, which cools and condenses, or turns back into liquid.

Wonder aloud: *Why do plants let water escape? Don't they need water to survive? (Same reason we sweat—to cool off!)*

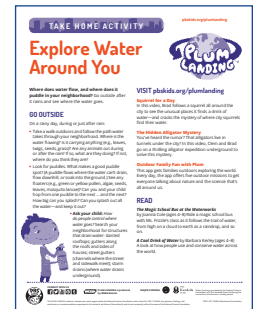
- 8. Have kids look at and touch what they're wearing.** **Ask:** *Which fabrics let sweat through and so feel damp? Which ones keep water out, trapping sweat on the skin? Why are rubber boots and plastic raincoats waterproof? (They don't have tiny holes that let water through.)*

Evaporate
Water that dries up, or evaporates, doesn't disappear! It changes from liquid to an invisible gas called water vapor.

Wrap-up (5–10 minutes)

(Science Skills: Define and communicate solutions to a problem: Paved surfaces can make rain and melted snow flood a city or town)

- Ask kids to **share their favorite part** of the activity.
- Look around:** *What hard surfaces don't absorb water? How many can you name? (Streets, stoops, parking lots, roofs, glass skyscrapers, metal benches, etc.)*
- Define a problem:** *Why can lots of rain be a problem for cities and towns? (Too much water can flood places where it can't soak in.) What could cities and towns do about it? If kids struggle for ideas, remind them that soil absorbs water (plant more green spaces, have less pavement). What could carry the extra water out of the city? Let kids get creative here in imagining structures or vehicles or other water-carrying or water-storing systems.*
- Encourage families to take home the “Water Ins and Outs” handout** to repeat the activity in their neighborhoods. **Point out the “Where Does Water Go in the City?” activity** that is on the handout. If you wish, **give them the “Explore Water Around You” handout** to provide them with more ideas on how to continue investigating water together.



Explore Some More

Where Does the Snow Go?

Watch this short video in which Plum sings a song about what happens to snow in the city after a storm. **Ask:** *Why can't the snow soak through concrete? (The pavement is hard and solid and the snow is in solid form—frozen water.)*

VISIT pbskids.org/plumlanding/parents to find more activities, games, and videos.



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handout

Water Ins and Outs



Exploring your world,
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What Is This Activity?

What can water pass through? You will model and test surfaces and materials that absorb water and those that don't. You will also observe how water passes in and out of plants, and out of human skin.

Big Science Idea: Water passes through grassy surfaces, soil, plant leaves, and human skin because they have tiny holes. Water flows or puddles over solid surfaces like pavement.

Go Outside

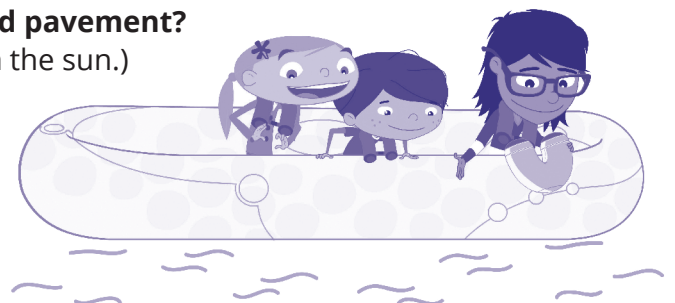
- 1. Wrap a plastic bag around the leaves of a tree, flower, vine, or shrub.** Seal the bag with a twist tie. Don't pick the leaves or damage the plant! Leave it on the plant. Come back in about 20 or 30 minutes to check the bag.
- 2. Have your child slowly pour half their water onto pavement,** paying close attention to where and how the water moves. *What happens?* (Water generally stays on the surface unless there's a crack; it spreads in all directions on a level surface but flows downhill on a tilted surface.)
- 3. Now repeat the pouring over grass or dirt.** *Where does the water go?* (Water sinks in, or is absorbed into the ground. If it moves at all, it flows very slowly before sinking in.)
- 4. Ask:** *Why does the grass surface absorb water but pavement doesn't?* (Grassy surfaces have tiny holes that let water in. Pavement is solid.) **Predict:** *What will happen to the poured water? Why do you think that?*
- 5. Check on your bagged leaves.** *What's changed?* The bags should have water droplets that have come from the leaves. If not, give it another 10 minutes or so.
- 6. What's happened to the wet spots on the grass and pavement?** (They could be partly dried up, especially if they are in the sun.)

Activity Time

60 minutes

Materials

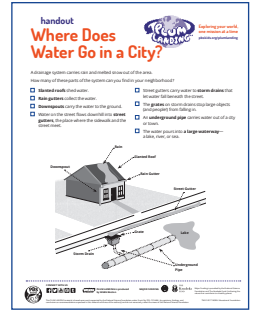
- Plastic sandwich bag with tie or string
- Bottle of water



Explore Some More

Go with the Flow

Go on a scavenger hunt with your child around your neighborhood to look for the parts of a drainage system, the structures that carry rainwater and melted snow out of the city or town. (See “Where Does Water Go in a City?” handout.) As you explore, note how much of your neighborhood is paved versus a grassy or other natural surface. *How many steps does it take to walk from one green space to the next?*



Flood Map

Using Google Earth, enter a local address in the search box and then drag the “street view” icon onto the map. Note the elevation readout at the bottom of the screen. Enter other addresses and use the elevation readings to locate high and low points in your neighborhood. *What spots are lowest and so most likely to flood?*

Outdoor Family Fun with Plum App

This app gets families outdoors exploring the world. Every day, the app offers five outdoor missions to get everyone thinking and talking about nature and the science that’s all around us.

Find the app and more fun resources on pbskids.org/plum.



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handout

Where Does Water Go in a City?

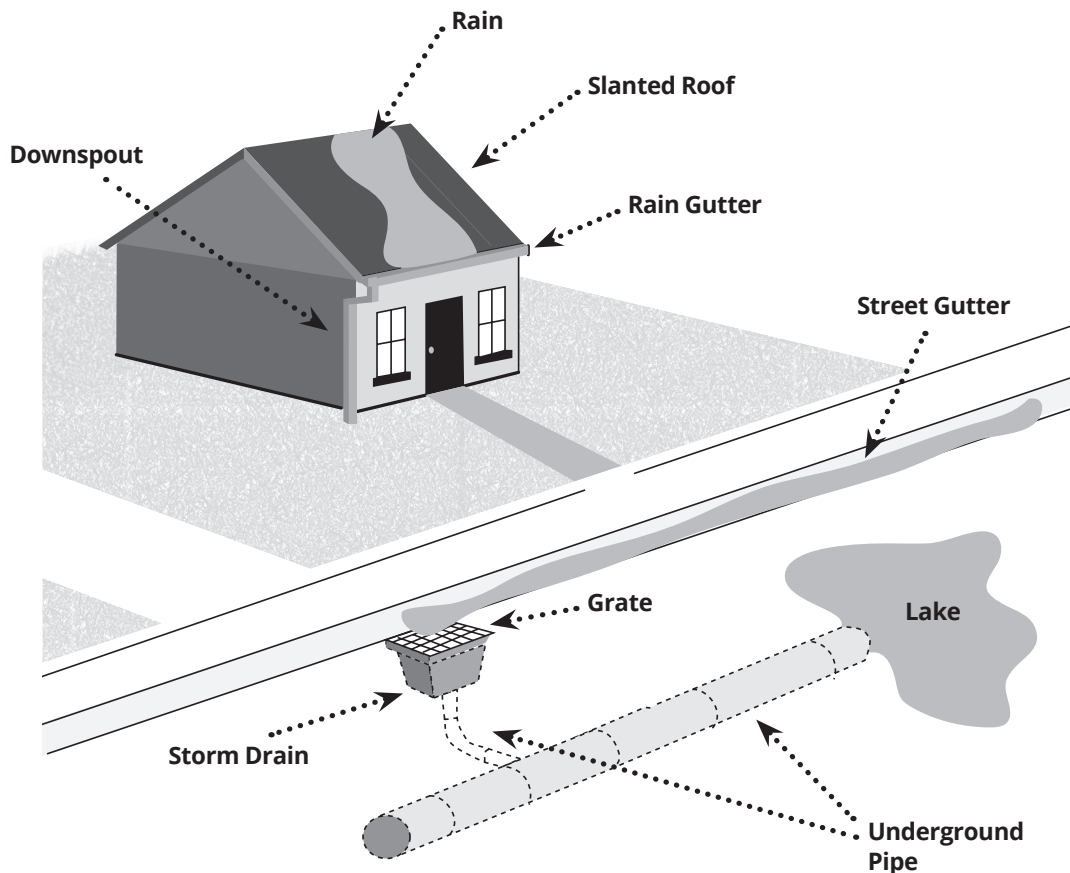


Exploring your world,
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A drainage system carries rain and melted snow out of the area.

How many of these parts of the system can you find in your neighborhood?

- Slanted roofs** shed water.
- Rain gutters** collect the water.
- Downspouts** carry the water to the ground.
- Water on the street flows downhill into **street gutters**, the place where the sidewalk and the street meet.
- Street gutters carry water to **storm drains** that let water fall beneath the street.
- The **grates** on storm drains stop large objects (and people!) from falling in.
- An **underground pipe** carries water out of a city or town.
- The water pours into a **large waterway**—a lake, river, or sea.



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hoja para repartir

El cómo y el porqué del agua



Exploramos tu mundo,
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Duración de la actividad
60 minutos

Materiales

- Bolsa plástica tamaño sándwich con alambre atador, o una cuerda
- Botella de agua

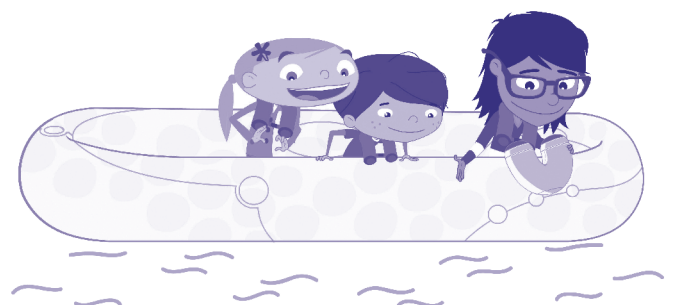
¿De qué trata esta actividad?

¿Qué puede atravesar el agua? Modelarán y pondrán a prueba superficies y materiales que absorben agua y otros que no. Observen cómo el agua entra y sale de las plantas y sale de la piel humana.

Megaconcepto científico: El agua atraviesa superficies como el césped, la tierra, las hojas de plantas y la piel humana por lo que tienen agujeros diminutos. El agua corre o se encharca en superficies macizas como el pavimento.

Salgamos al aire libre

- 1. Envuelva una bolsa plástica alrededor de las hojas de un árbol, una flor, una enredadera o un arbusto.** Selle la bolsa con un alambre atador. No arranque las hojas. Déjelas en las plantas. Regrese a los 20 a 30 minutos para revisar las bolsas.
- 2. Pídale al niño que vierta lentamente la mitad de su agua sobre el pavimento,** prestando cuidado hacia dónde y cómo corre el agua. *¿Qué pasa?* (El agua por lo general permanece en la superficie a menos que haya una grieta; se dispersa en todos los sentidos cuando la superficie es plana pero corre hacia abajo cuando es una superficie inclinada).
- 3. Ahora vierta la misma cantidad de agua sobre césped o tierra.** *¿Hacia dónde corrió el agua?* (El agua es absorbida por la tierra. Y si corre, fluye muy lentamente antes de ser absorbida).
- 4. Pregunte:** *¿Por qué la superficie del césped absorbe el agua y el pavimento no?* (El césped tiene agujeros diminutos que dejan entrar el agua. El pavimento es macizo, sólido). **Predicción:** *¿Que le pasó al agua que se vertió? Explica por qué.*
- 5. Revisen las hojas en la bolsa.** *¿Qué ha cambiado?* En las bolsas deben verse gotitas de agua que provienen de las hojas. Si no, esperen otros 10 minutos.
- 6. ¿Qué pasó con las manchas mojadas en los espacios de césped y pavimento que se mojaron?** (Deben haberse secado parcialmente, sobre todo si están al sol).



Exploremos más

Sigamos por donde va el agua

Hagan una búsqueda de tesoro con el niño. Recorran el vecindario buscando partes del sistema de desagüe y alcantarillado de la ciudad, o sea las estructuras que se llevan las aguas de lluvia y la nieve derretida del pueblo o la ciudad. (Ver la hoja para repartir "¿Adónde va el agua en una ciudad?"). Al explorar, observen qué proporción de la vecindad es pavimentada en comparación con la proporción de césped u otra superficie natural. *¿Cuántos pasos tienes que dar para pasar de un espacio verde al siguiente?*



Mapa de inundaciones

Abran Google Earth e ingresen una dirección local en la casilla de búsqueda. Luego coloquen el ícono de *street view* (vista a nivel de la calle) sobre el mapa. Observen las cifras sobre elevación que figuran en la parte de abajo de la pantalla. Ingresen otras direcciones y usen las cifras de elevación para encontrar los puntos altos y bajos del vecindario. *¿Cuáles son los sitios más bajos y por lo tanto los que más probablemente se inundarían?*

Diversiones familiares al aire libre con el app de Plum

Este app invita a las familias a salir al aire libre a explorar el mundo. Cada día, el app ofrece cinco misiones al aire libre que ponen a todos a pensar y a hablar sobre la naturaleza y las ciencias que tenemos a nuestro alrededor. Disponible en inglés solamente.

Encuentren estos y más recursos divertidos en: pbskids.org/plum.



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hoja para repartir

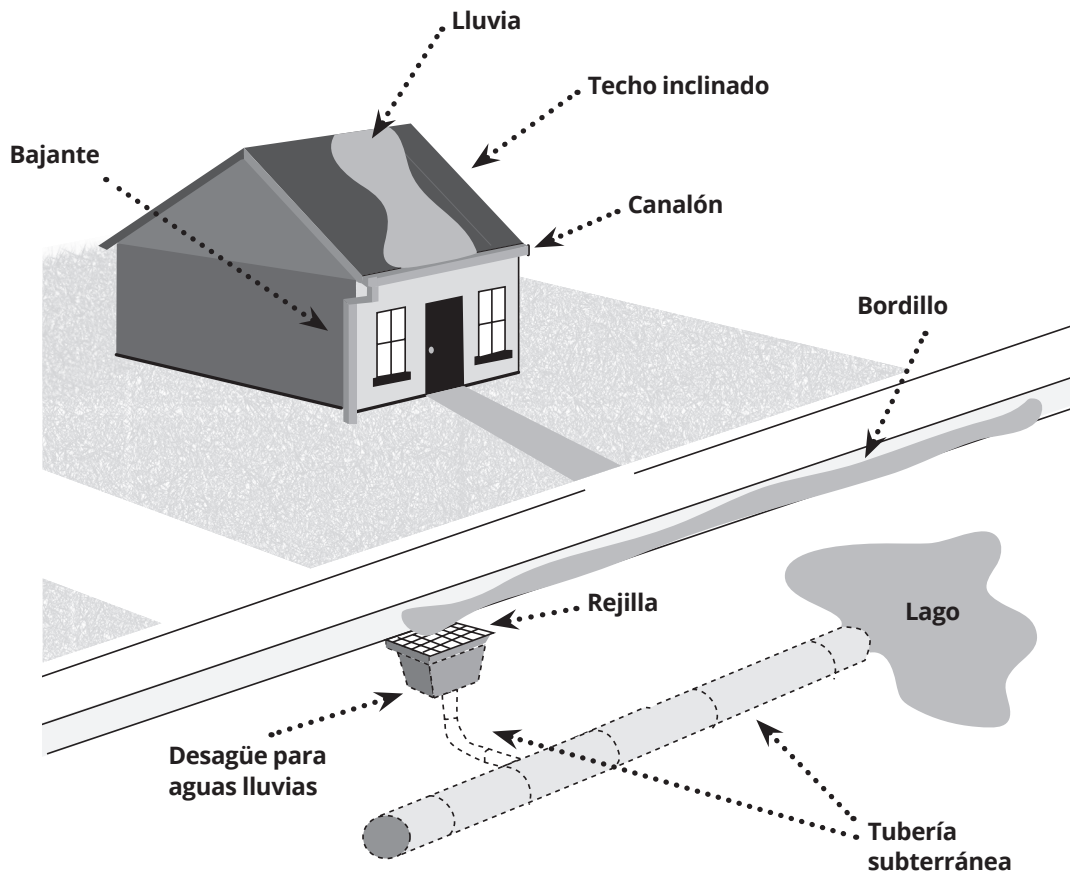
¿Adónde va el agua en la ciudad?



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Un sistema de desagües se lleva las aguas lluvias y la nieve derretida de la ciudad. ¿Cuántas de estas partes del sistema puedes encontrar en tu vecindario?

- Tejados inclinados** que repelen el agua.
- Canalones** que recogen el agua.
- Bajantes** que bajan el agua a la tierra.
- El agua que fluye cuesta abajo en la calle a **bocas para aguas lluvias** ubicadas en el bordillo donde la acera y la calle se encuentran.
- Por las bocas para aguas lluvias el agua pasa al **sistema de desagüe** que yace debajo de las calles.
- Las **rejillas** en las bocas para aguas lluvias impiden que objetos grandes (¡y hasta personas!) caigan en el sistema de desagüe.
- Unos **tubos subterráneos** transportan las aguas y así las sacan de la ciudad.
- El agua sale a gran velocidad por un **aliviadero** y desemboca en un lago o río, o en el mar.



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