

Hawaiian Watershed Adventure

GAME PREPARATION

1. Print board game (20 x 30 inches), 1 per 5 students.

2. Print game card double sided, 1 set per game board. One side of card will have the game text and a photo and the other side will be blue with the game title and a leaf. Cut game cards out.

3. Print and cut out game pieces, 1 set per game board.

**Game pieces should be assembled by an adult prior to playing.*

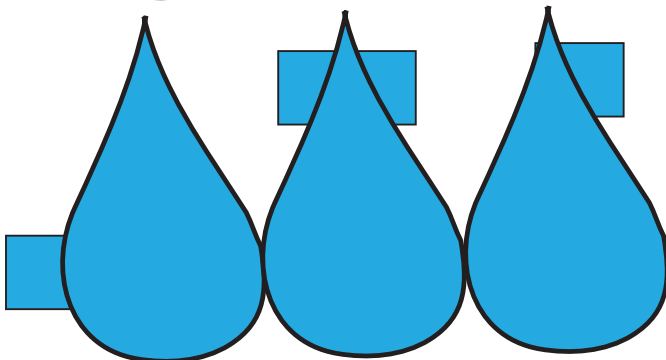
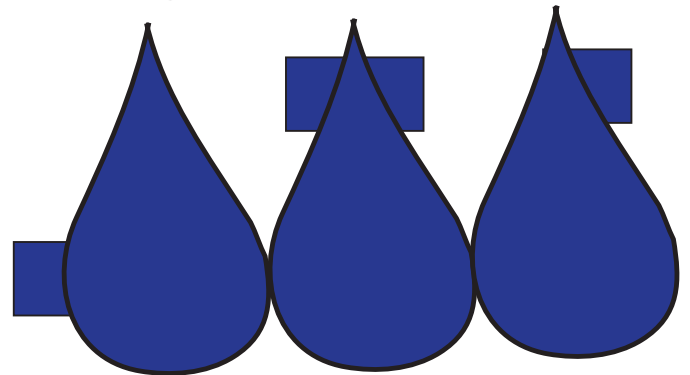
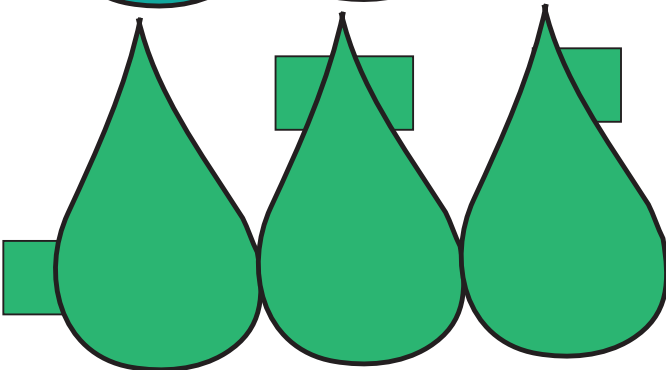
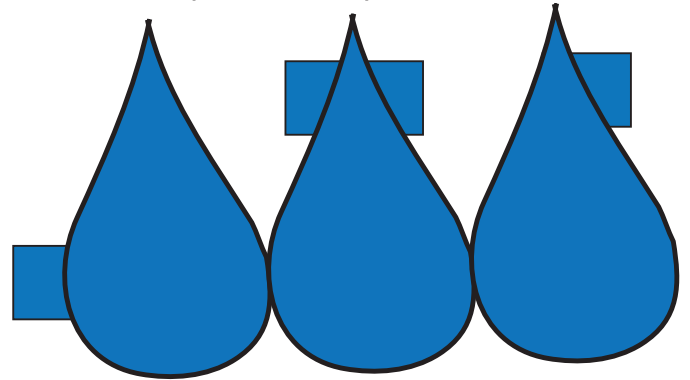
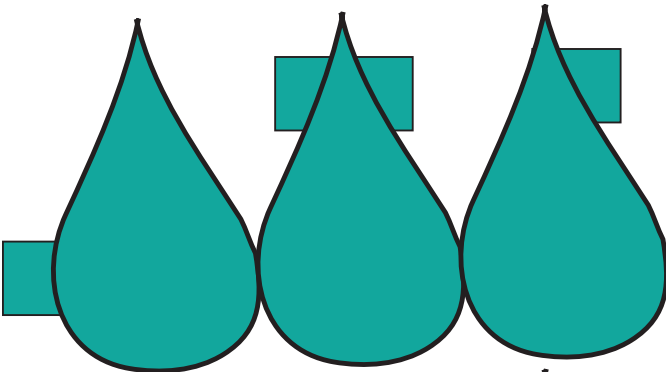
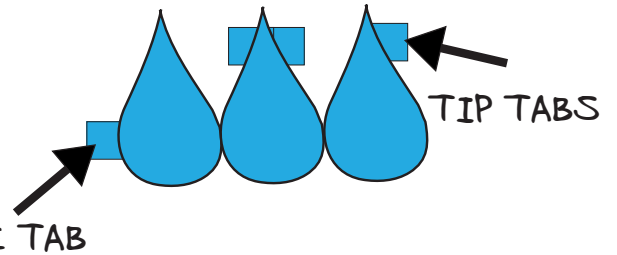
1. Cut out game pieces below. Laminate for durability.

2. Fold all tabs in (away from front of game piece.

3. Fold raindrops in a triangle-like shape.

4. Using a hot glue gun, glue tip tabs at drop tips first so points meet at a single point like a pyramid.

5. Glue base tab at the bottom of the drop to connect end drop to start drop.



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GAME RULES

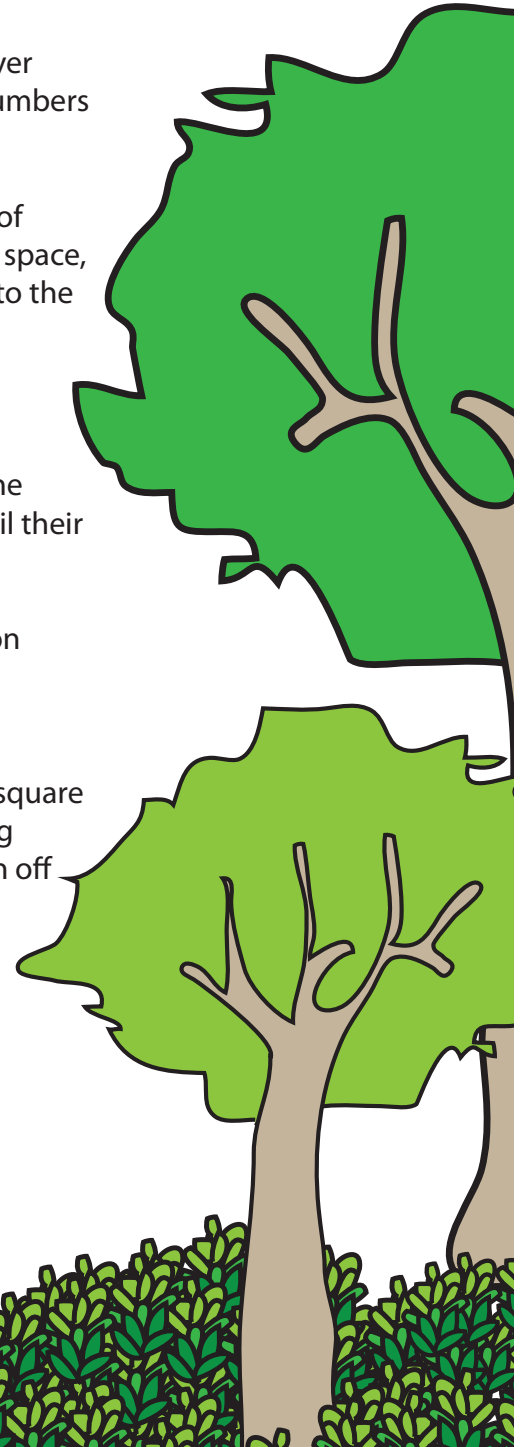
1. Have each player choose a game piece and place it at the start on the game board.
2. To determine the order of players, have each player roll the die. The player with the highest number will go first. The players with the next highest numbers will follow.
3. Each player rolls the die in turn, and move the game piece the number of spaces indicated by the die. If the player lands on a "Leaf with water drop" space, the player must pick up a card, read it aloud, show the photo on the card to the other players, and follow the instructions on the card.
4. If the player lands on:

Waterfall: The waterfall allows the player to skip a set of spaces. The player will end at the bottom of the waterfall and remain there until their next turn.

Erosion Zone: The erosion zone skips the player's next turn. Erosion happens when soil is not anchored by the roots of plants washes away with rain.

Leaf Landing: Allows the player to roll again and play the second square landed on. In a watershed, leaves slow rain drops down, preventing them from hitting the ground with impact and causing soil to run off the landscape.

5. The player only plays the first square landed on. If the first space landed on instructs the player to move again, the player will move but not play the second space landed on unless the second space is a leaf "Leaf Landing: Roll Again" space, in this event, the player will roll again and not play the next space (3rd space) landed on.





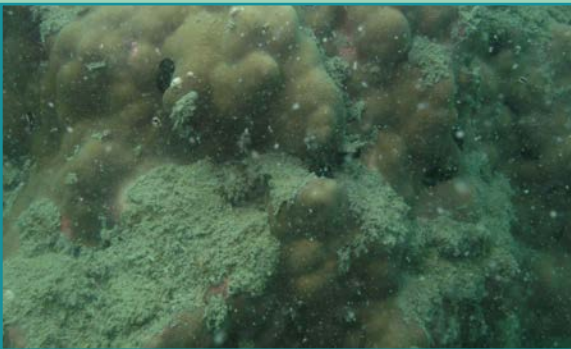
Leaves, branches and understory plants intercept rain before it reaches the ground. This prevents rain drops from hitting the ground with impact and washing the soil away.

Move 3 spaces forward.



An abundance of mosses growing in the rain forests of the Pu'u Maka'ala absorbs rain as it falls. Saturated mosses slowly release water into the aquifer long after the rain has fallen.

Move 2 spaces forward.



Cattle graze the forests located on the coastal slopes of Kohala. Over time the forest disappears and there are no longer any roots to hold the soil in place. With every rain, soil washes into the ocean and smothers the coral reef below.

Move 3 spaces back.



The forest provides leaf surfaces for water vapor to condense on. The forest collects water from passing clouds, drips it down to the ground and eventually into the aquifer. You have more water for drinking!

Move 2 spaces forward.



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Photo by: Jack Jeffrey

Protecting our watersheds also protects all the spectacular organisms that live there.

Move 1 space forward.



TEAM PLAY

Fresh water is a precious resource that all people need. All players who can name a way that they use water moves 1 space forward. Answers must be different among players.



Photo by: Jack Jeffrey

Feral pigs root, trample, and eat the plants in the forest understory. Over time the forest disappears and can no longer collect or hold water. Less water is added to the aquifer.

Move 3 spaces back.



Pollution is a negative change in the quality of water, making it non-usable. Chemicals improperly disposed of washes into the aquifer and contaminates our source of fresh water.

Move 3 spaces back.



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The roots of trees and understory plants hold the soil firmly in place, Even with heavy rains, no soil erosion takes place.

Move 2 spaces forward.



Photo by: Robert Stephens

A herd of sheep move across the forested slopes of Mauna Kea eating the tender māmane and naio seedlings that sprouted last winter. Over time, the adult trees die and there are no new trees to take their place. The forest disappears, and no longer collects and holds water.

Move 3 spaces back.



Photo by: Robert Stephens

The forests of Mauna Kea have been destroyed by browsing sheep. There are no longer any roots to hold the soil in place, With every rain soil is washed away.

Move 2 spaces back.



A koa forest is logged for wood. There are no longer any trees to collect water from passing clouds. Less water is added to the aquifer.

Move 2 spaces back.



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Lichens are an two-part organism consisting of a fungus and an algae. Lichens in a forest help to slow rain as it falls to the ground. Lichens also absorb rain fall and slowly release it into the aquifer.

Move 1 space forward.



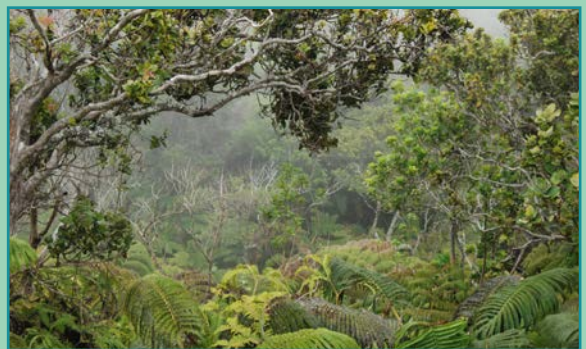
Fences protect forests from ungulate damage (damage from hoofed animals such as sheep, pigs, goats and deer). These protected forests are large contributors of water to our aquifers.

Move 3 spaces forward.



Greenhouse specialists grow plants to reforest areas where the forest has been removed or disturbed.

Move 1 space forward.



The beautiful forests of Kohala continues to thrive with the care of natural resource managers and the surrounding community.

Move 3 spaces forward.



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Community members volunteer to plant Koa trees at Keahou—a once beautiful and thriving forest that has been denuded by cattle ranching over the last 200 years.

Move 4 spaces forward.



Photo by: Robert Stephens

A herd of hungry sheep destroy a large area of high elevation forests in a very short time. With just a few trees remaining the land becomes dry and less water is delivered to the aquifer.

Move 2 spaces back.



The community helps to restore the goat decimated forest of Ka'ūpūlehu. Over time plants start to sprout on their own, and the forest begins to heal.

Move 3 spaces forward.



Photo by: Jack Jeffrey

Many community members volunteer to plant koa trees in effort to restore Hakalau forest. Over time these trees mature and provide habitat for native birds.

Move 3 spaces forward.



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Ferns in the understory are a sign of a healthy forest and a healthy watershed!

Move 1 space forward.



Hawai'i's youth take part in planting native trees to restore the watersheds of Hawai'i.

Move 2 spaces forward.



After 200 years of browsing by goats and cattle, the forests of Kaho'olawe have disappeared. With each rain soil washes into the reefs below. In some areas up to 12 feet of soil have washed into the ocean.

Move 4 spaces back.



Large tracts of forest are cut down to make room for development. This increases the surfaces that prevent water from soaking into the ground. Areas such as parking lots, roads and rooftops reduces ground water levels.

Move 3 spaces back.



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As a watershed becomes developed, trees, shrubs, and other plants are replaced by surfaces such as parking lots that do not allow water to soak into the ground. This results in lower ground water levels.

Move 3 spaces back.



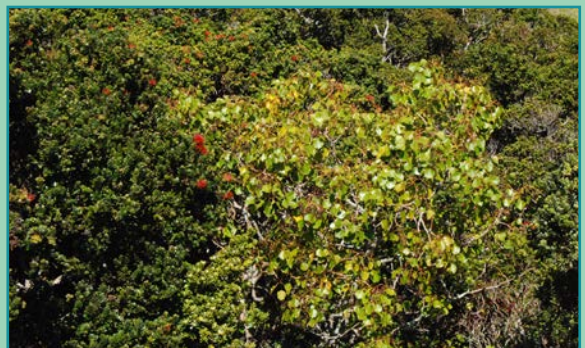
Polluted storm water carries heavy metals and other chemicals into streams and other bodies of water. This contaminates our ground water and the environment.

Move 2 spaces back.



Hawaiian forests are highly efficient at capturing and retaining water. They have a multi-layered structure of canopy trees, understory plants, ferns, and mosses which act as a giant sponge. These forests absorb water and allows it to slowly travel to the aquifer.

Move 1 space forward.



The tall, closed forest canopy provides shade that results in less water loss to evaporation and transpiration.

Move 1 spaces forward.



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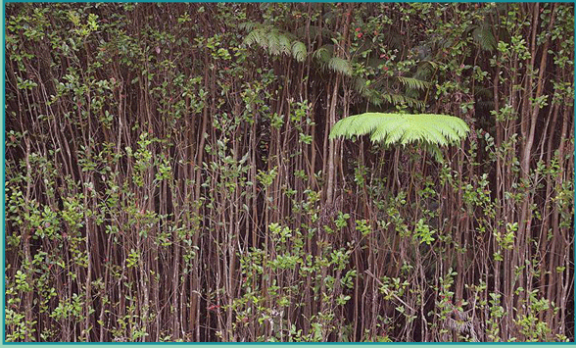


Photo by: Jack Jeffrey

When native forests are damaged and eroded, opportunistic non-native plants invade. While these new plants can hold the soil and prevent further erosion, the new structure it creates is typically simple and not as effective as native forests at capturing and retaining water.

Move 2 spaces back.



Community members remove large amounts of invasive weed species that harm our watershed areas.

Move 1 space forward.



Hawai'i's communities conserve water by not letting their water run and shortening their showers.

Move 3 spaces forward.



Fixing pipe and faucet leaks around your house is a good way to conserve water.

Move 1 space forward.



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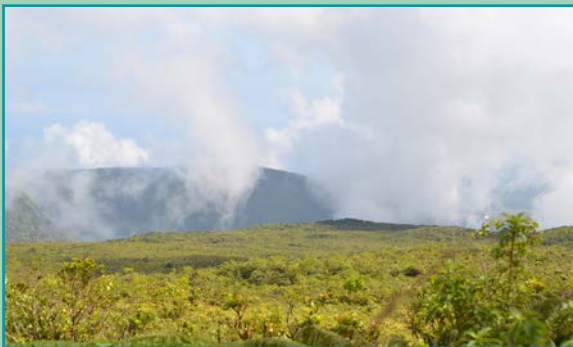
A Big Island Family plants trees around their house to prevent the soil from eroding into the nearby bay.

Move 2 spaces forward.



The moss covered trees of Kohala collect water from rain and passing clouds which slowly drip and percolate into the aquifer. This increases ground water levels.

Move 2 spaces forward.



The forests of Kohala collect moisture from passing clouds. The water collected slowly enters the aquifer and provides fresh water for the Island of Hawaii.

Move 2 spaces forward.



A rain storm hits Hilo town. Because Hilo has been developed with parking lots, buildings, and paved over roads the rain water moves above ground and picks up chemicals as it washes into Hilo Bay.

Move 1 space back.



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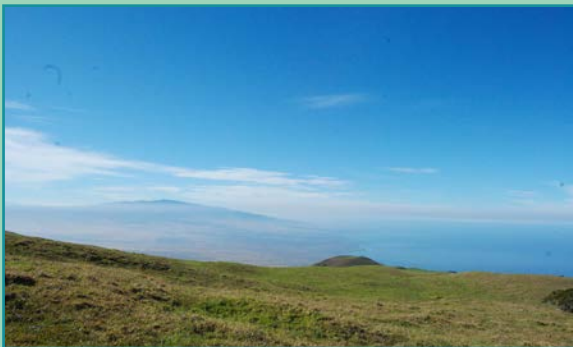
The forest has been damaged by non-native invasive plants and animals. The once closed canopy is now open due to less trees. Each rain evaporates in the harsh sun before it can soak into the aquifer. There is less drinking water available.

Move 2 spaces back.



Students in the 'Imi pono no ka 'Āina environmental education program learn about the plants in the watershed that contribute to water collection.

Move 2 spaces forward.



Conversion from forest to pasture land and many years of cattle grazing has greatly reduced the forests of Hawai'i. With fewer forested areas, less water is captured, and thus less water in the aquifer.

Move 2 spaces back.



As clouds move past this healthy native forest water droplets collect on leaves and gently drip to the ground. The water collected by this forest makes its way to the aquifer, contributing higher ground water levels.

Move 3 spaces forward.



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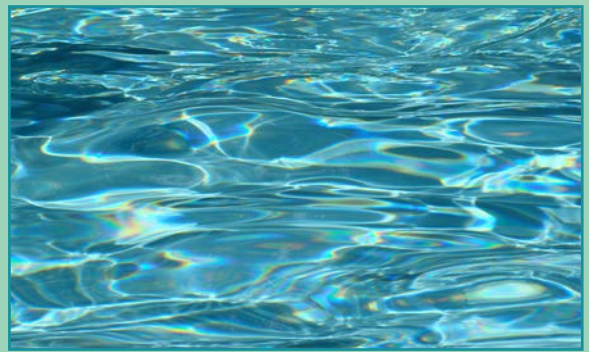


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As the soil of a disturbed forest erodes, weed species begin to grow in place of the natives that used to grow there.

Move 2 spaces back.



TEAM PLAY

Fresh water is a precious resource that all people need. All players who can name one way that they can save water moves 1 space forward. Answers must be different among players.



Leaving the water running while you brush your teeth wastes up to 8 gallons of water! If you turn off the faucet while brushing you'll save up to 200 gallons of water a month!

Move 1 space forward.



Watering your lawn or garden while it is sunny wastes water because much of it evaporates in the heat. Instead you water your lawn early in the morning or late evening while it is cool and save lots of water

Move 2 spaces forward.



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A leaky toilet is like flushing the toilet 50 times a day for no reason! Your toilet has a leak and you fix it. This saves you about 200 gallons of water every day.

Move 1 space forward.



You decide to take a shower rather than taking your bath in a tub. Filling up a bath tub takes 70 gallons of water while taking a shower only uses 10-25 gallons. You save even more water by keeping your shower to 10 minutes.

Move 2 spaces forward.



A school group plants over 200 trees in effort to reforest an area that has been converted into pasture. In the future it will grow into a forest that will once again collect and store water.

Move 2 spaces forward.



The community helps to plant native saplings in a fence-protected area. These saplings will eventually grow into a forest that will contribute fresh water to our aquifers.

Move 2 spaces forward.



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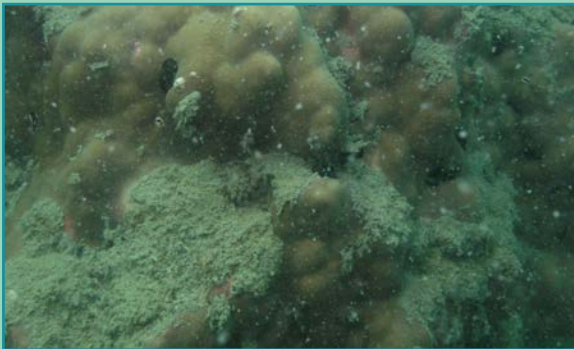
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