

“Where does the water go?”



Photo from sdherps.org.

Specific Learning Outcomes

5-4-13: Explain how the transfer of energy from the Sun affects weather conditions.

5-4-14: Explain how clouds form, and relate cloud formation and precipitation to the water cycle.

General Learning Outcomes

5-0-2c: Record information in own words and reference sources appropriately.

5-0-4c: Work cooperatively with group members to carry out a plan, and troubleshoot problems as they arise.

5-0-4d: Assume various roles and share responsibilities as group members.

5-0-5a: Make observations that are relevant to a specific question.

5-0-6c: Identify and suggest explanations for patterns and discrepancies in data.

5-0-7a: Draw, with guidance, a conclusion that explains investigation results.

5-0-7b: Base conclusion on evidence rather than re-conceived ideas or hunches.

5-0-7f: Use prior knowledge and experiences selectively to make sense of new information in a variety of contexts.

Vocabulary

weather, wetland, lake, river, ocean, water cycle, water vapour, liquid, solid, gaseous state, precipitation, clouds, condensation, sublimation, desublimation, transpiration, evaporation, ground water, water table, surface runoff, sun’s energy, water vapour, filtration, temperature

Summary

Students will explore where water goes around our earth and atmosphere while learning how the sun’s energy affects weather conditions, and how clouds and precipitation form in the water cycle.

Materials

- *Print out game pieces (10 cover pages, 10 dice pages on card stock if possible) - please consider reusing for future use*
- *Set up game in room before starting lesson*
- *Print out Tally Sheets (4 tally sheets per page x quarter amount of students in class)*
- *Scissors (to cut out game cubes)*
- *Tape (to tape cubes together)*
- *Pencil for each student*
- *Projector and computer*
- *Print out one work sheet (double-sided) per student*

Procedure

Warm Up

Begin by showing students the provided image of the water cycle (without labels), asking students to look at the image and identify what they see (such as the sun, water, a river, plants, animals, snow etc.). Continue by asking students to identify different kinds of weather shown, and discuss how the sun might affect or influence these weather conditions.

Explain to students that the image shows the Earth’s water cycle (see definition), an important driver of weather. Show students the provided image of the water cycle (including labels), introducing students to the different processes listed. Ask students what they think each process does based on the image (i.e. how the water moves and changes through this process).

The Water Cycle, also known as the *hydrologic cycle*, is the movement of water throughout the earth and our atmosphere. The sun’s energy and gravity are the main drivers of water’s movement which result in the processes of evaporation, transpiration, condensation, precipitation, sublimation, desublimation, filtration, and surface run off.

Optional: You can go over the different water phases using the accompanying “Water Phases” image to help students understand how water changes properties as it moves through the water cycle.

Activity

Explain to students that they will be exploring the water cycle through an activity where they will each be a water droplet traveling the earth and its atmosphere.

This activity is called *Incredible Journey* and was developed by Project WET, an organization that develops and delivers water conservation education, resources, and special events. To learn how to facilitate this activity please visit **The Incredible Journey— A Project WET Activity** (<https://vimeo.com/5852533>) for a video describing the activity or download the free PDF with instructions (https://files.dnr.state.mn.us/education_safety/education/project_wet/sample_activity.pdf).

We have provided supplementary materials to help you facilitate this activity, including tally sheets (instead of using beads), ten station signs, and ten cubes. Please also reference our “Where does water go?” explanation sheets which explain what happens as water moves from one location in the water cycle to the next (including the processes of evaporation, transpiration, condensation, precipitation, surface runoff, and filtering into the ground).

Once students have gone through the *Incredible Journey* activity, have them compare their journeys (either by comparing their bracelets or tally sheets).

Recommended: Use the following as a water droplet’s journey example to ensure you discuss all of the terms included in the water cycle:

Wetland → **Animal** (animal drinks the water from the wetland) → **Ground** (water filters into the ground via animal’s urine; you can also describe what ground water and a water table is here) → **Plant** (water is absorbed from the ground through plant roots) → **Cloud** (water transpires from the plant, then condenses into a cloud) → **Mountain** (cloud becomes heavy with water droplets and precipitates onto the mountain) → **Ice & Snow** (temperatures remain cold on the mountain top so water either remains or turns into ice) → **River & Runoff** (when temperatures rise ice melts and runs off into a lake) → **Lake** (water evaporates then condenses into a cloud) → **Cloud** (cloud becomes heavy with water droplets and precipitates into the ocean) → **Ocean**.

Wrap Up

Wrap up this activity by having students fill out the Parts of the Water Cycle and/or the Key Terms for the Water Cycle worksheet either in class or assign as homework. Review the answers as a class.

Conclude by stating that weather is shaped by the water cycle, which is water moving throughout our world and atmosphere via a variety of processes driven by the sun's energy and gravity. Furthermore, water droplets can take very different journeys as they go through the water cycle.

Animal Highlight — the Boreal Chorus Frog

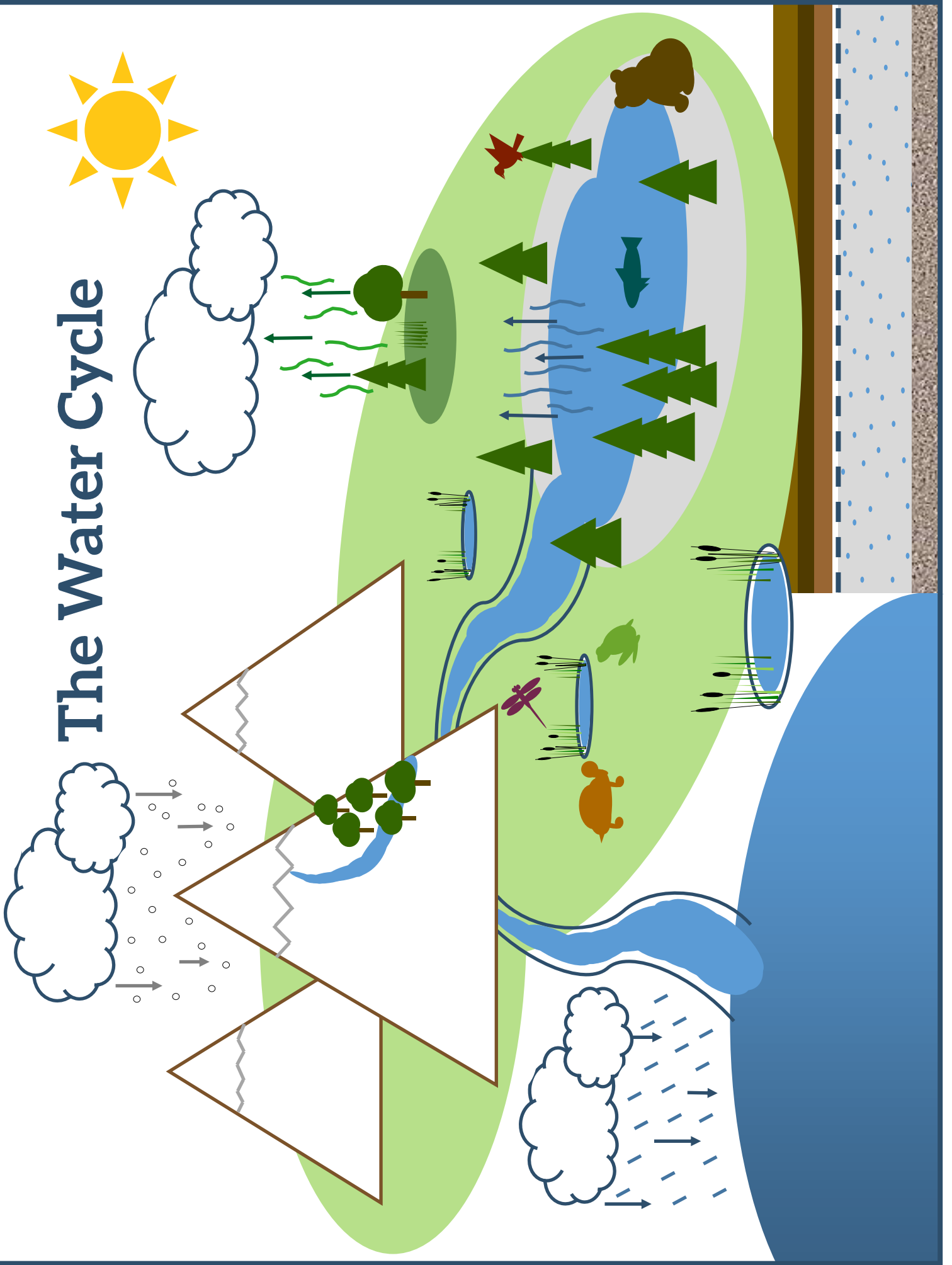
On the cover of this section, and in the insets you will see pictures of the Boreal Chorus Frog. In Canada, the Boreal Chorus Frog is found in the Northwest Territories and throughout the provinces of Ontario, Manitoba, Saskatchewan, Alberta, and the northeastern region of British Columbia. It is a small frog, only 4cm in length with three strips along the length of its body, and another strip that goes through the eye to the snout. Its colour and patterns vary from tan to green, from a bold strip to spotted.

The Boreal Chorus Frog is the earliest frog to breed in Manitoba, with the males calling by at least mid-April. Calls can be heard until the end of June and sometimes even into July and August, and especially after a rain fall. Probably the most common frogs in the province, the Boreal Chorus Frog's drawn out "prreep" can be heard in almost every place there is swallow water.

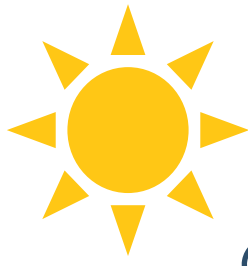
To listen to the call of the Boreal Chorus Frog, watch Judy Lehmborg's video 'boreal chorus frog' (https://www.youtube.com/watch?v=UmW_hSc4M18).

To learn more, visit: <https://www.naturewatch.ca/frogwatch/boreal-chorus-frog/>

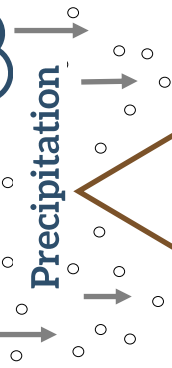
The Water Cycle



The Water Cycle



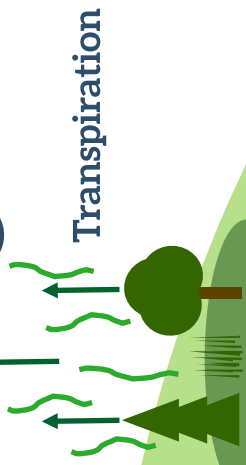
Precipitation



Runoff

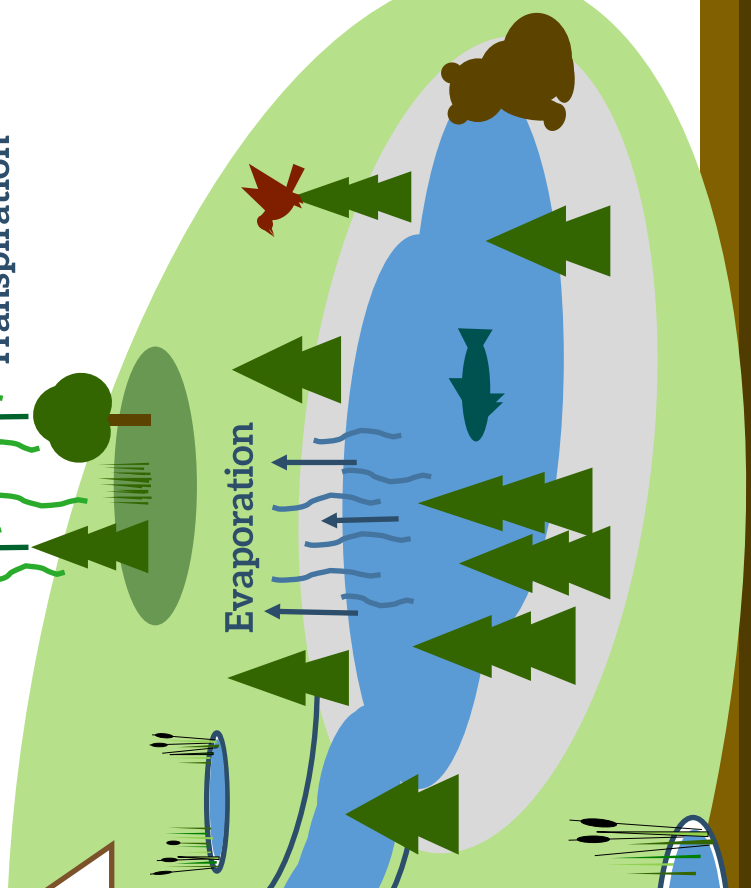


Condensation



Transpiration

Evaporation

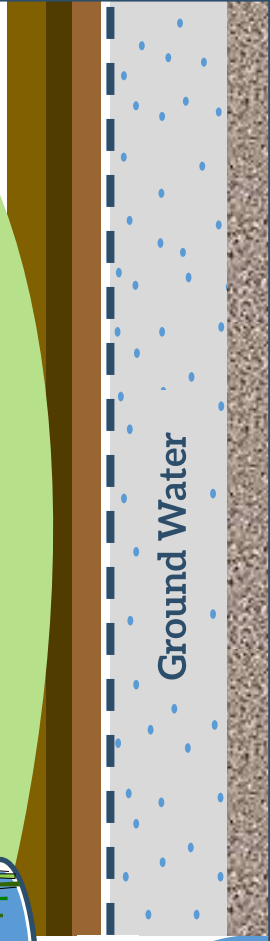


Ground Water

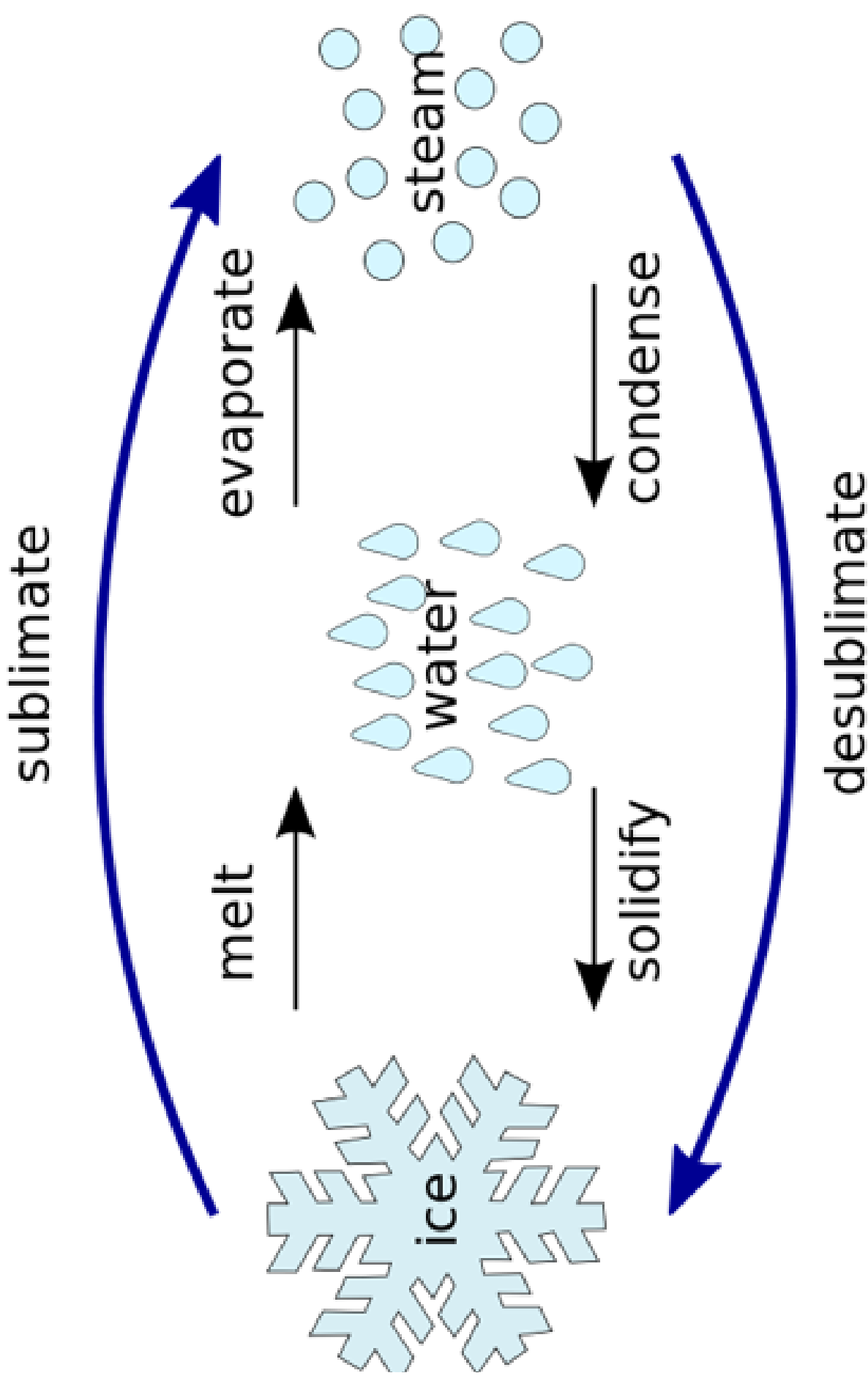


Precipitation

Water Table



Water Phases



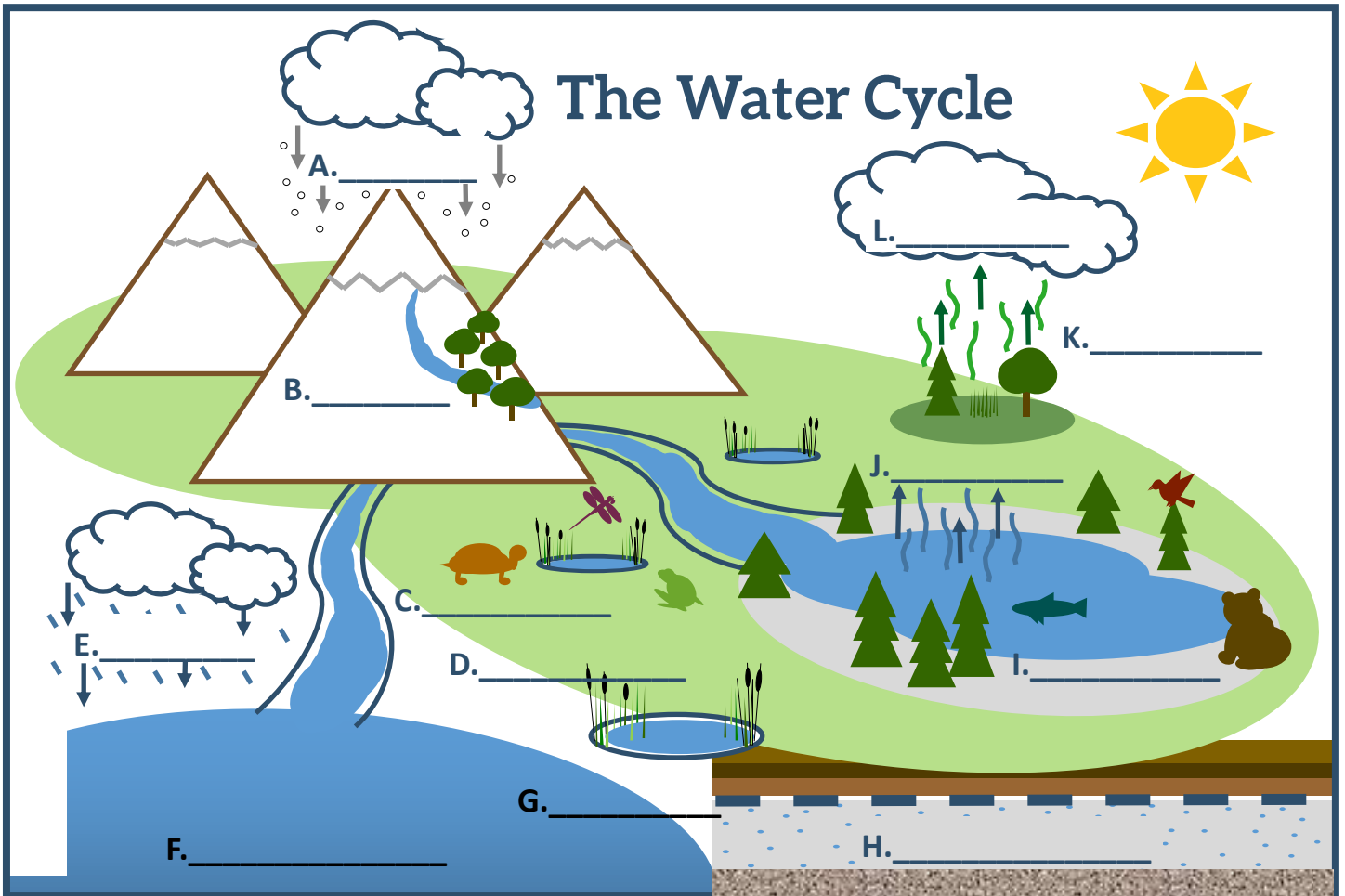
Parts of the Water Cycle

Using the word bank and diagram, fill in the blank spaces with the correct label for each part of the water cycle.

- A. _____ G. _____
- B. _____ H. _____
- C. _____ I. _____
- D. _____ J. _____
- E. _____ K. _____
- F. _____ L. _____

Word Bank

<i>Condensation</i>	<i>Evaporation</i>
<i>Precipitation</i>	<i>Transpiration</i>
<i>Runoff</i>	<i>River</i>
<i>Wetland</i>	<i>Ocean</i>
<i>Ground Water</i>	<i>Lake</i>
<i>Water Table</i>	<i>Precipitation</i>



Key Terms for the Water Cycle

Explain each term in the space provided **or** draw each concept (include detailed labels).

Term	Definition
Evaporation	
Transpiration	
Condensation	
Precipitation	
Surface Runoff	
Ground Water	
Water Table	
Wetland	
Lake	
River	
Ocean	

Parts of the Water Cycle

Using the word bank and diagram, fill in the blank spaces with the correct label for each part of the water cycle.

A. Precipitation

G. Water Table

B. Runoff

H. Ground Water

C. River

I. Lake

D. Wetland

J. Evaporation

E. Precipitation

K. Transpiration

F. Ocean

L. Condensation

Word Bank

Condensation

Evaporation

Precipitation

Transpiration

Runoff

River

Wetland

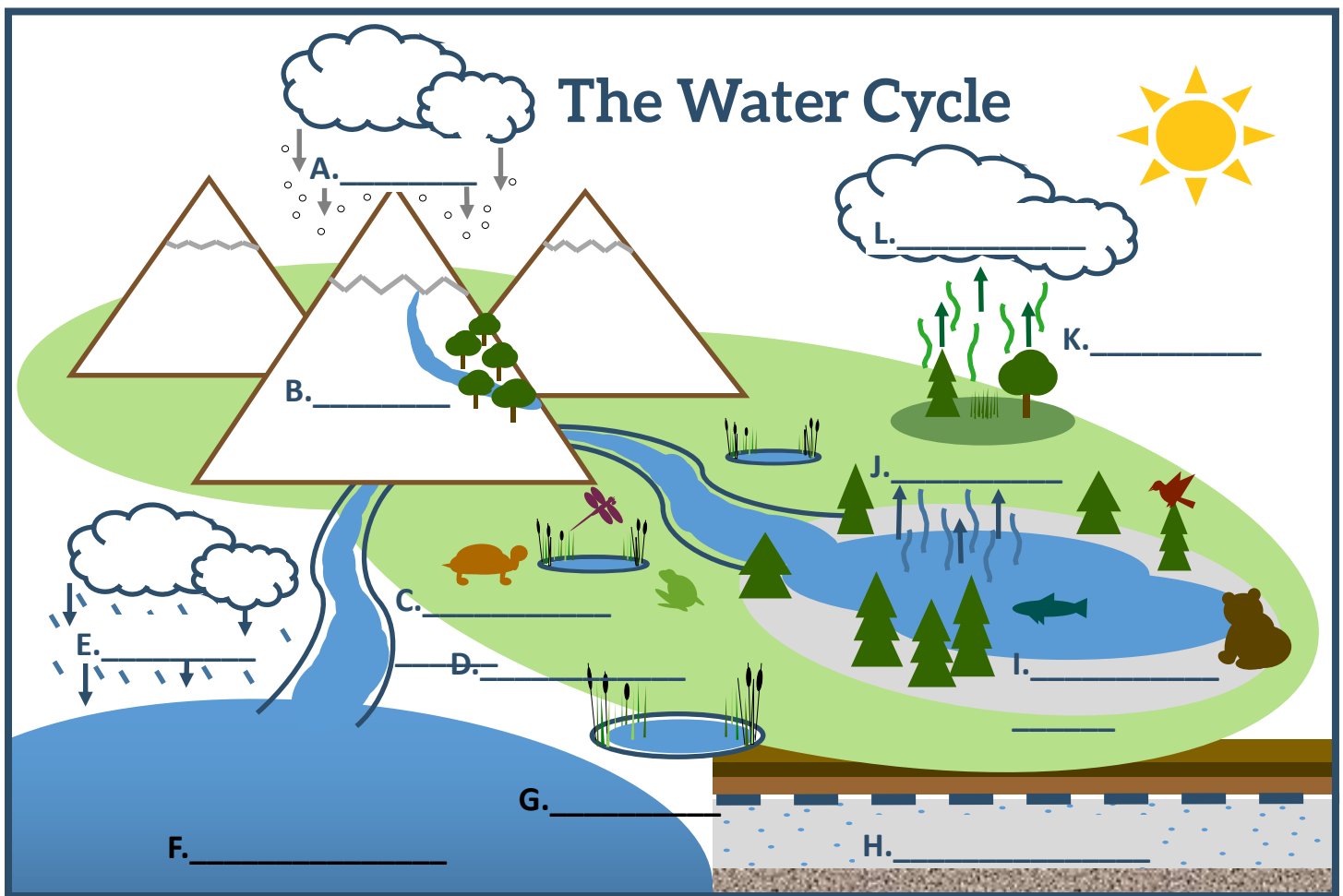
Ocean

Ground Water

Lake

Water Table

Precipitation



Key Terms for the Water Cycle

Explain each term in the space provided **or** draw each concept (include detailed labels).

Term	Definition
Evaporation	When water (in its liquid) is heated enough by the sun's energy it turns into water vapor (water in its gaseous state). The water vapor rises up into the atmosphere through a process called evaporation.
Transpiration	When plants produce their food through photosynthesis, water vapor (water in its gaseous state) is released from small pores in the plant. The process of the plant releasing water vapour into the atmosphere is called transpiration.
Condensation	After water vapor evaporates and rises higher into the atmosphere it cools and forms into clouds. The process of the water vapor (gas) turning into water droplets (liquid) or ice crystals (solid) is called condensation. When these water droplets or ice crystals mix with small dirt particles it sticks together and creates a cloud.
Precipitation	When many water droplets collect in a cloud it becomes heavy and falls. Depending on the temperature of the atmosphere as the water falls it can turn into either rain, snow, sleet, or hail. The process of the water falling is called precipitation.
Surface Runoff	Surface runoff refers to water as it flows over the land surface; it can be in the form of rain, snowmelt, etc. and flows towards the lowest point.
Ground Water	Water seeps from the surface downward, moving between the rocks and spaces in the soil until it cannot continue downward. The water collects and fills soil, rocks and minerals; this is called the zone of saturation and holds the water which we call ground water.
Water Table	The water table is the boundary or layer between the zone of saturation and the unsaturated ground. Depending on how much water seeps into the ground from the surface, this water table may rise or fall.
Wetland	A wetland is a body of water that has a maximum depth of two metres with moist-soil loving plants growing in and around the water. The shallow water is necessary for the plants in order for them to receive the sunlight they need. Water flows slowly through a wetland because there are so many plants that slow the water down, absorbing some of the water like a sponge and filtering it as it moves through. An example of a wetland would be Oak Hammock Marsh.
Lake	A lake is a large body of water that is surrounded on all sides by land. An example would be Lake Winnipeg.
River	A river is a flowing body of water which empties into an ocean, sea, lake, or another river. An example would be the Red River.
Ocean	An ocean is a large body of salt water that surrounds the continents. An example would be the Atlantic ocean.

“Where does the water go?”

Locations Where Water Can Go	What Happens to the Water
Mountains	<p>Clouds: When exposed to enough heat energy, water <i>evaporates</i>. As the water vapor reaches cooler temperatures higher in the atmosphere the water <i>condenses</i> (water turning from a gas to a liquid or a solid). The water droplets or ice crystals mix with dust particles and create clouds.</p> <p>Ice & Snow: If temperatures remain below freezing, water turns into ice and snow, storing the water on top of the mountain until there is enough heat energy to transform it into a liquid or gas.</p> <p>Rivers & Runoff: Water <i>condenses</i> and falls as <i>precipitation</i> into rivers and runoff the mountain, flowing from the highest to lowest point.</p> <p>Plants: Water (precipitation, ice/snow melt, etc.) is absorbed by plant roots.</p>
Clouds	<p>Oceans: Water <i>condenses</i> and falls as <i>precipitation</i> into the ocean. Oceans cover the majority of the earth, and so it is very likely for water to travel back and forth between oceans and clouds.</p> <p>Mountains: Water <i>condenses</i> and falls as <i>precipitation</i> onto mountain tops.</p> <p>Rivers & Runoff: Water <i>condenses</i> and falls as <i>precipitation</i> into rivers and runoff the highest to lowest point.</p> <p>Ground: Water <i>condenses</i> and falls as <i>precipitation</i> onto the ground, being absorbed by the soil.</p> <p>Clouds: Water droplets continue to stick to dust particles.</p>
Ice & Snow	<p>Ground: Once melted, water filters into the ground.</p> <p>Rivers & Runoff: Once melted, water runoffs, moving from the highest to lowest point, flowing into water bodies like rivers.</p> <p>Wetlands: Once melted, water runoffs, moving from the highest to lowest point, flowing into water bodies like wetlands.</p> <p>Lakes: Once melted, water runoffs moving from the highest to lowest point, flowing into water bodies like lakes.</p> <p>Mountains: Water <i>condenses</i> and falls as <i>precipitation</i> onto mountains. If temperatures remain below freezing on top of a mountain, water turns into ice and snow, which stores the water on top of the mountain until there is enough heat energy to transform it into a liquid or gas.</p> <p>Ice & Snow: Ice and snow stay frozen if temperatures remain below freezing.</p>
Wetlands	<p>Plants: Water is absorbed by plant roots. Many plants living in wetlands will act like a filter, cleaning the water. Plants also act like a sponge, absorbing the water then slowly releasing it back into the wetland; this helps reduce flooding when there is a great snow melt or heavy rain fall.</p> <p>Animals: An animal drinks water.</p> <p>Lakes: Water filters into a lake. Wetlands can help ensure the water filtering into water bodies, like lakes, is clean, reducing the amount of pollution that flows into water bodies.</p> <p>Rivers & Runoff: Water flows into a river.</p> <p>Clouds: When exposed to enough heat energy, water <i>evaporates</i>. As the water vapor reaches cooler temperatures higher in the atmosphere the water <i>condenses</i> (water turning from a gas to a liquid or a solid). The water droplets or ice crystals mix with dust particles and create clouds.</p> <p>Ground: Water is pulled by gravity and filters into the soil.</p>

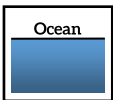
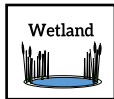
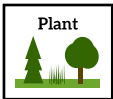
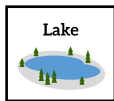
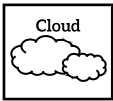
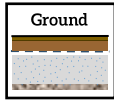
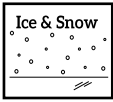
“Where does the water go?”

Continued...

Locations Where Water Can Go	What Happens to the Water
Lakes	<p>Ground: Water is pulled by gravity and filters into the soil.</p> <p>Animals: An animal drinks water.</p> <p>Rivers & Runoff: Water flows into a river.</p> <p>Clouds: When exposed to enough heat energy, water <i>evaporates</i>. As the water vapor reaches cooler temperatures higher in the atmosphere the water <i>condenses</i> (water turning from a gas to a liquid or a solid). The water droplets or ice crystals mix with dust particles and create clouds.</p> <p>Lakes: Water remains within the lake.</p>
Oceans	<p>Clouds: When exposed to enough heat energy, water <i>evaporates</i>. As the water vapor reaches cooler temperatures higher in the atmosphere the water <i>condenses</i> (water turning from a gas to a liquid or a solid). The water droplets or ice crystals mix with dust particles and create clouds.</p> <p>Oceans: Water remains in the ocean. Oceans cover the majority of the earth, and so it is very likely for water to travel back and forth between oceans and clouds.</p>
Rivers & Runoff	<p>Lakes: Water flows into a lake.</p> <p>Oceans: Water flows into an ocean.</p> <p>Animals: An animal drinks water.</p> <p>Clouds: When exposed to enough heat energy, water <i>evaporates</i>. As the water vapor reaches cooler temperatures higher in the atmosphere the water <i>condenses</i> (water turning from a gas to a liquid or a solid). The water droplets or ice crystals mix with dust particles and create clouds.</p> <p>Wetlands: Water flows into wetlands.</p> <p>Ground: Water is pulled by gravity and filters into the soil.</p>
Plants	<p>Clouds: Water leaves the plant through the process of <i>transpiration</i>, when water evaporates from the plant leaves.</p> <p>Plants: Water is used by the plant, and is stored within its cells.</p> <p>Animals: When an animal consumes a plant, it also receives the water stored within its cells.</p>
Animals	<p>Animals: Water is used by the animal, or is given to another animal when eaten.</p> <p>Ground: Water is excreted via scat and urine, or is released from a decomposing body.</p> <p>Clouds: Water evaporates from the animal’s body when sweating.</p>
Ground	<p>Wetlands: Water filters into wetlands.</p> <p>Lakes: Water filters into lakes.</p> <p>Plants: Water is absorbed by plant roots.</p> <p>Ground: Water stays underground within aquifers and the water table.</p>

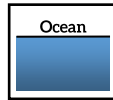
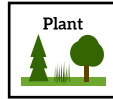
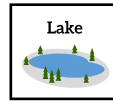
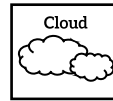
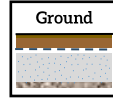
Tally Sheet

Name: _____



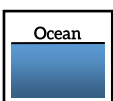
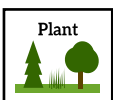
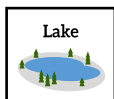
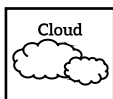
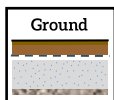
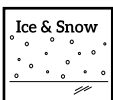
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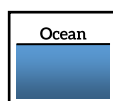
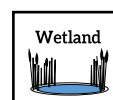
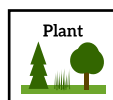
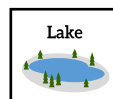
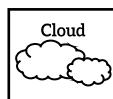
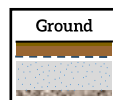
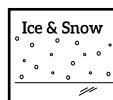
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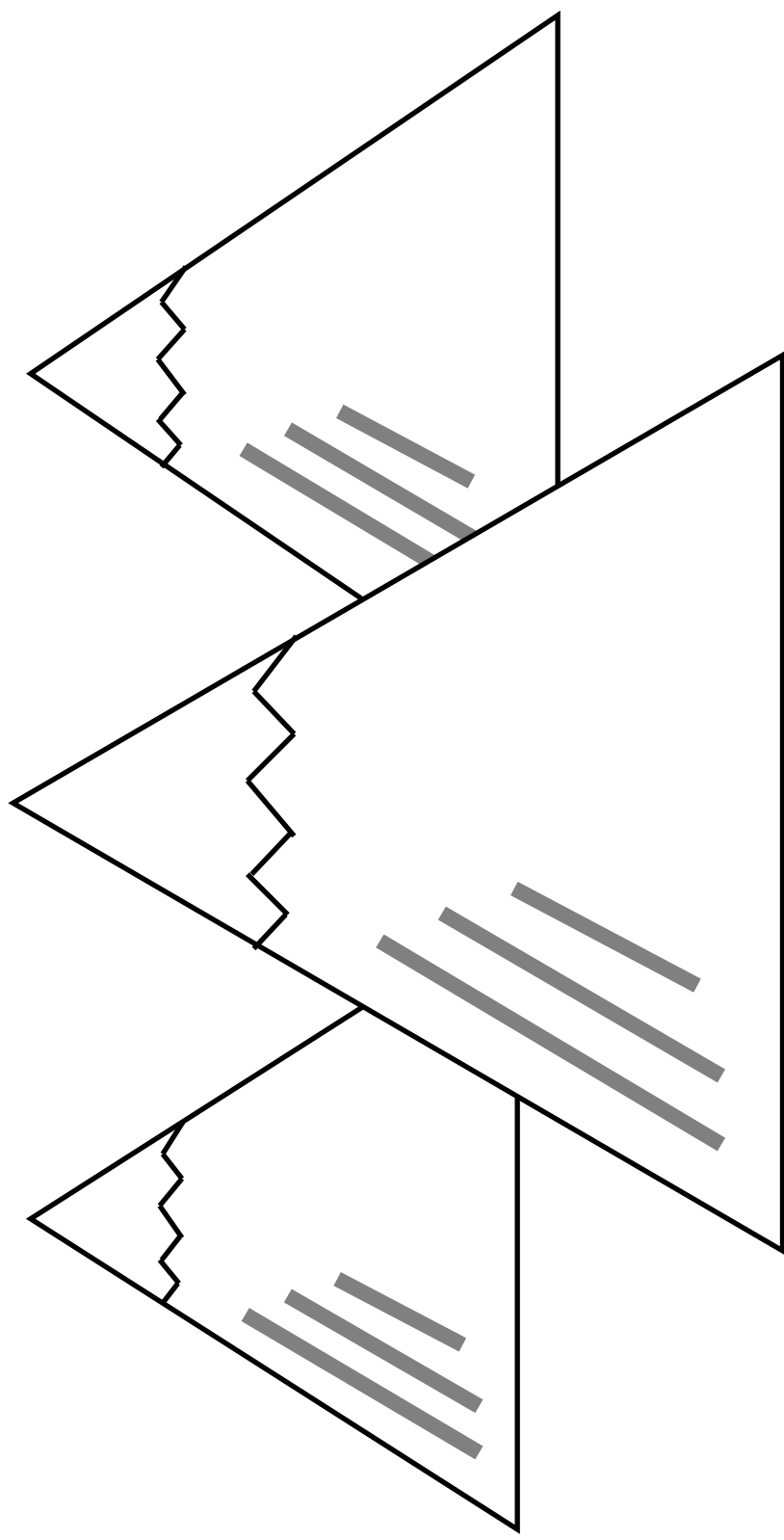


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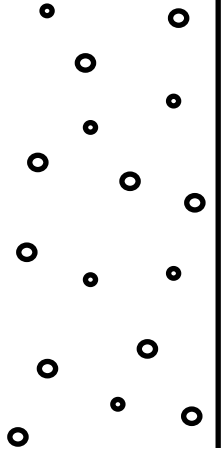
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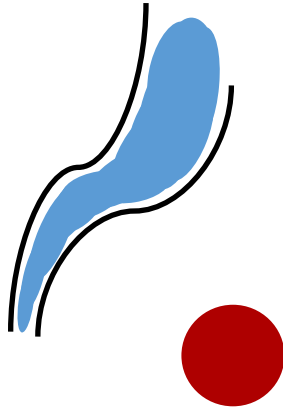
Mountain ●



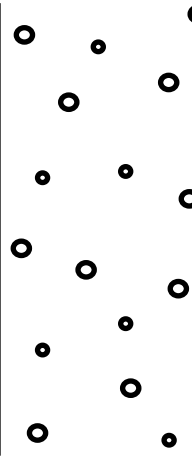
Ice & Snow



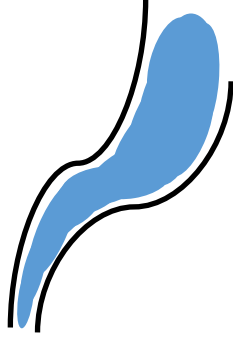
Rivers & Runoff



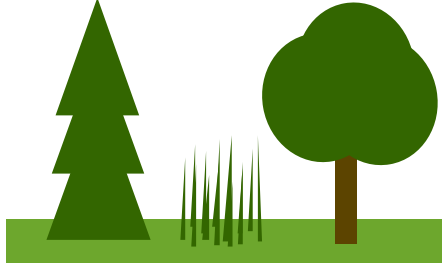
Ice & Snow



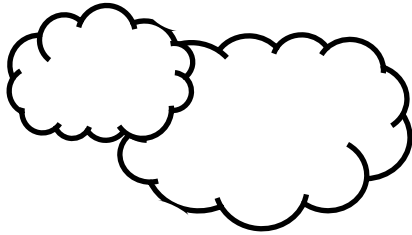
Rivers & Runoff



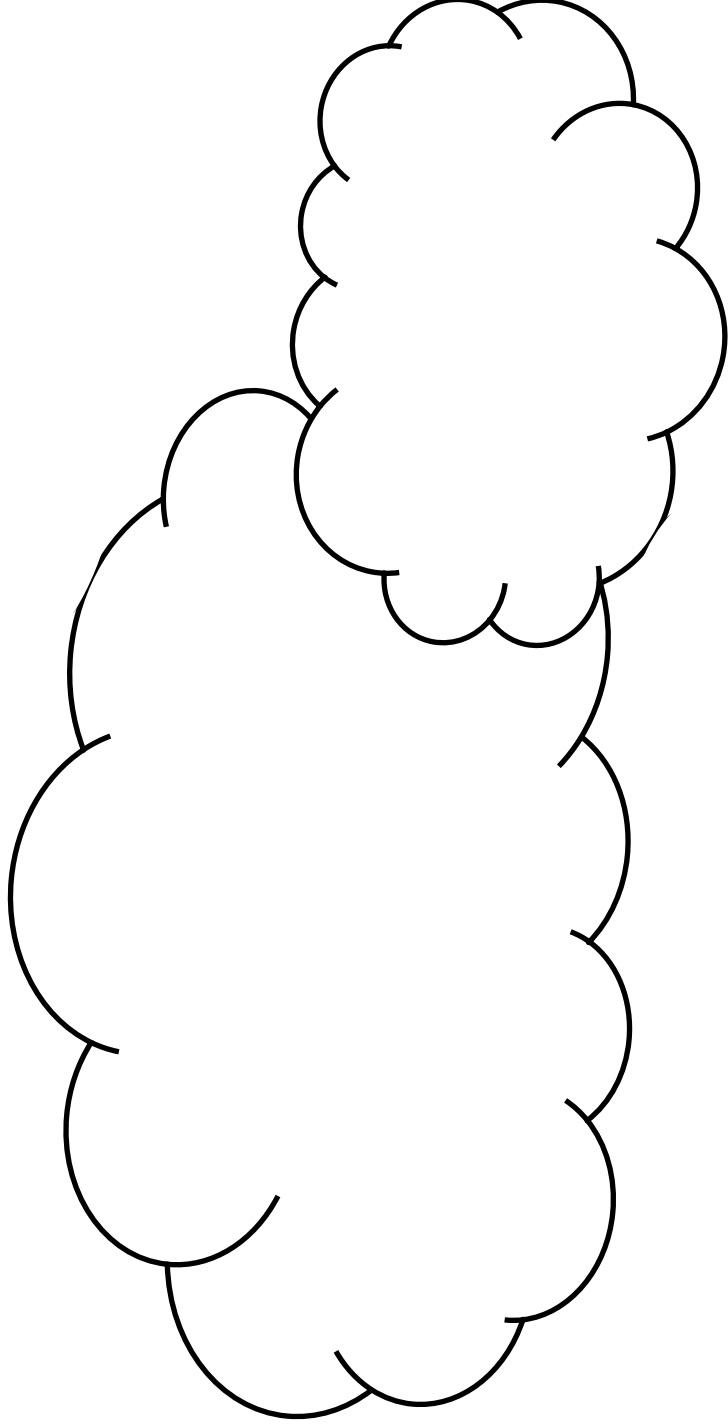
Plant



Cloud



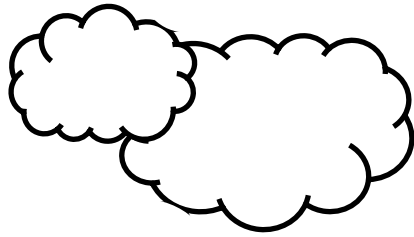
Cloud ▲



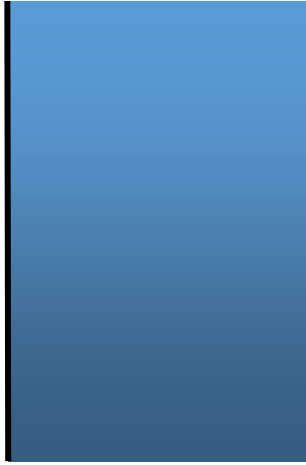
Rivers & Runoff



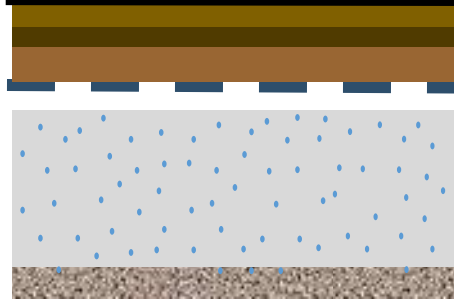
Cloud



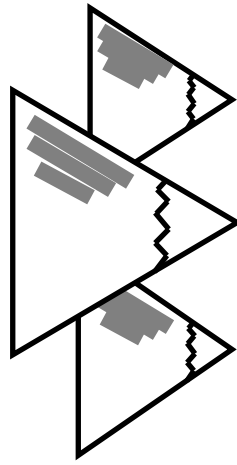
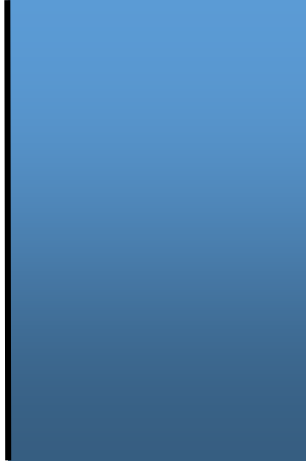
Ocean



Ground



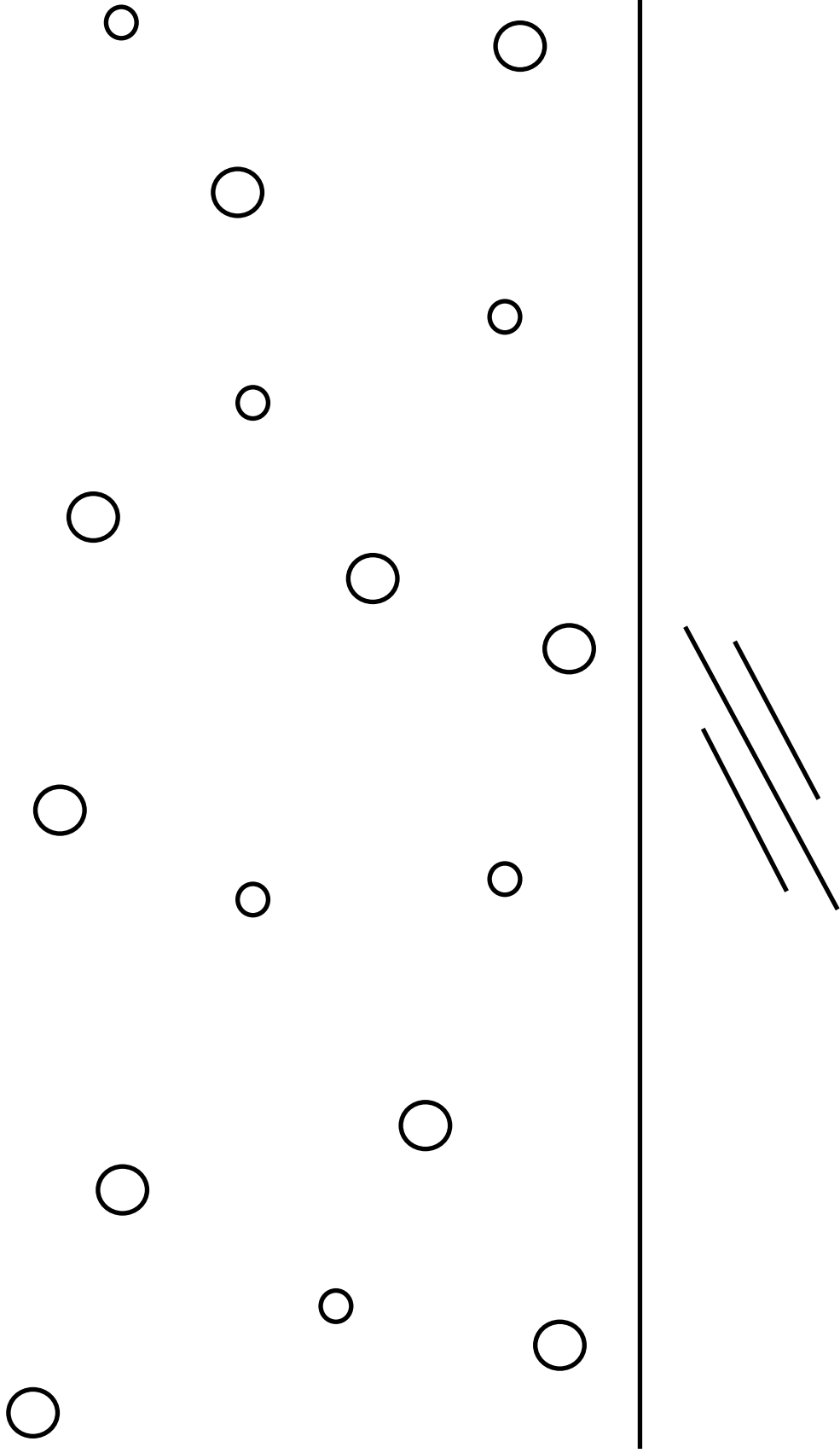
Ocean



Mountain

Clouds Cube

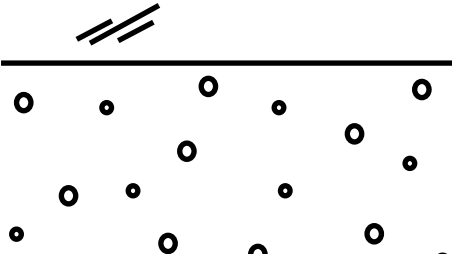
Ice & Snow



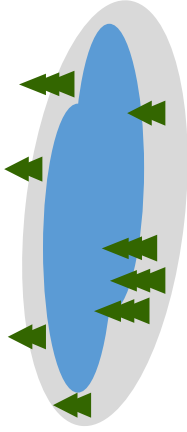
Rivers & Runoff



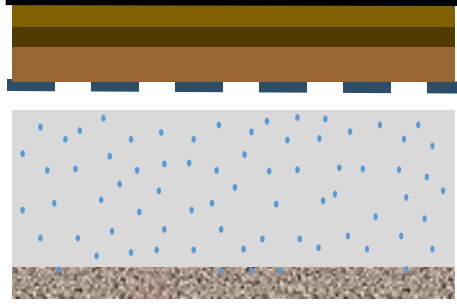
Ice & Snow



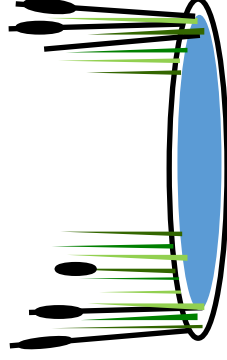
Lake



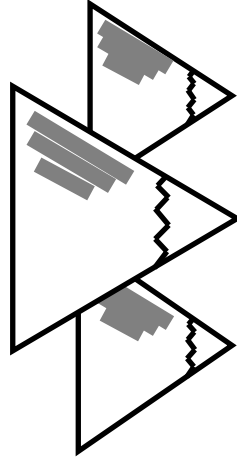
Ground



Wetland

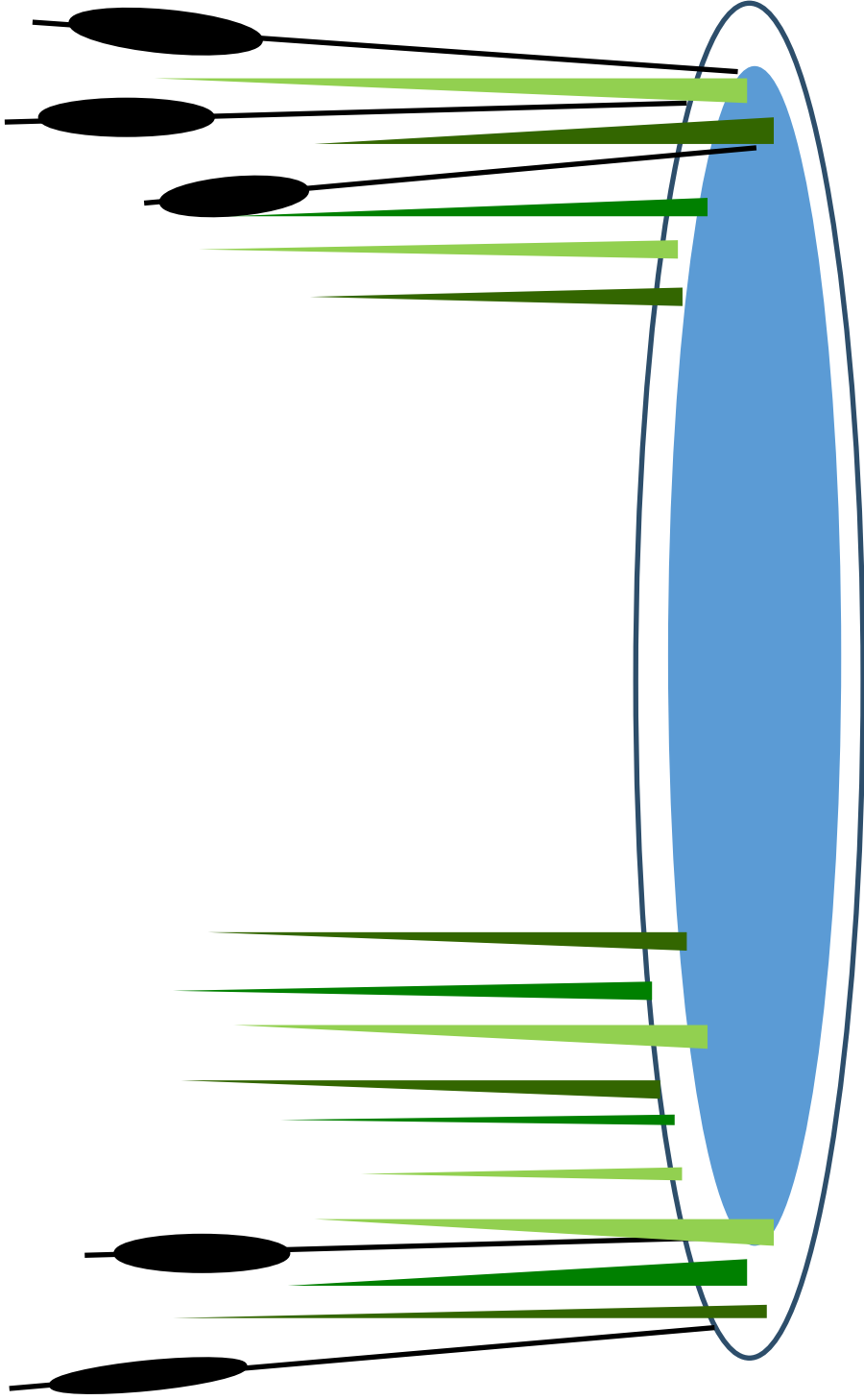


Mountain



Ice & Snow Cube

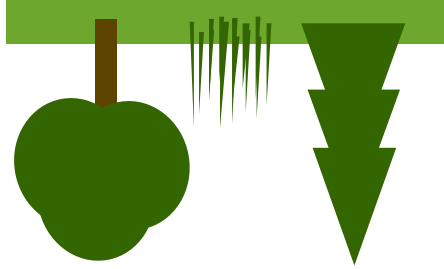
Wetland



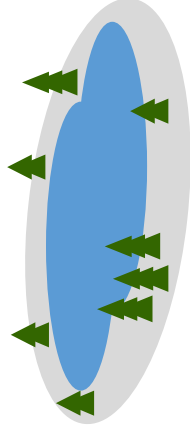
Rivers & Runoff



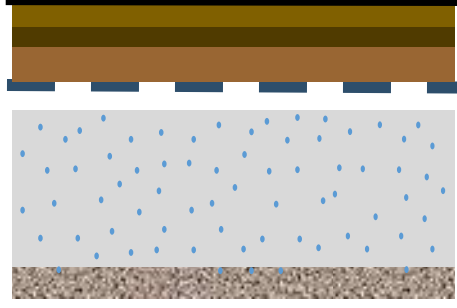
Plant



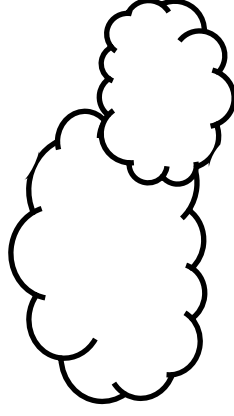
Lake



Ground

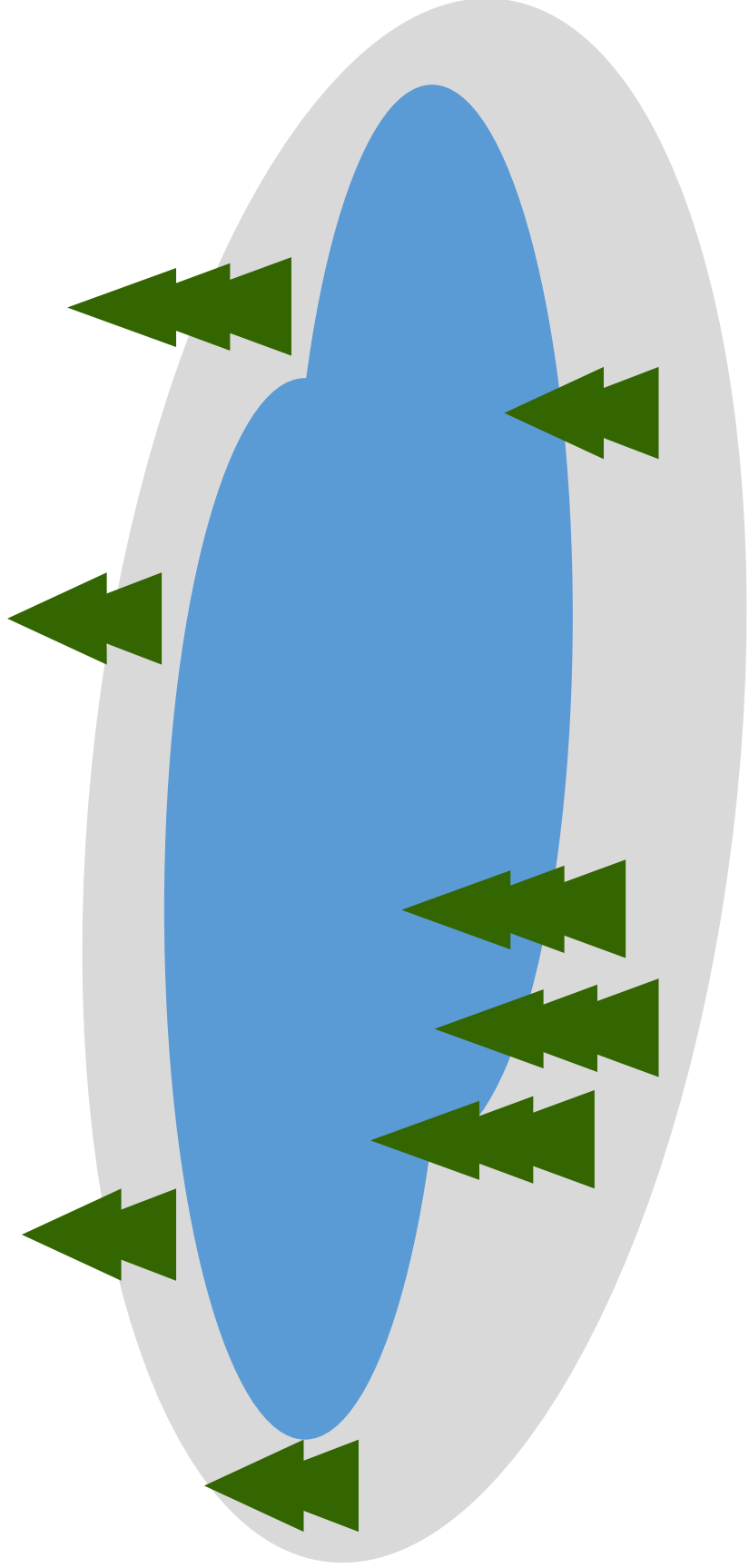
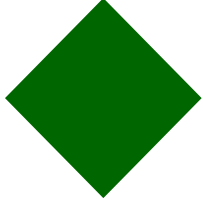


Cloud

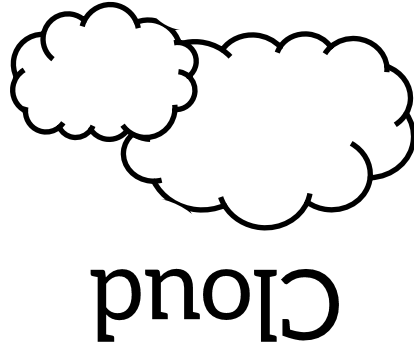
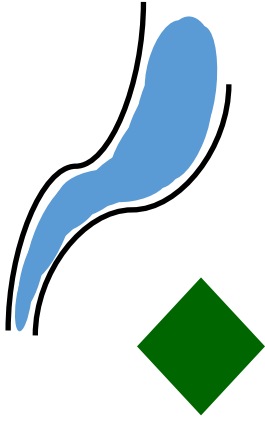


Animal

Lake

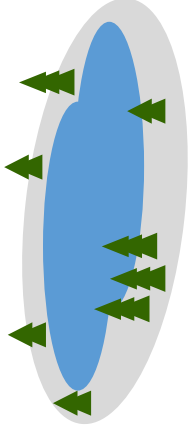


Rivers & Runoff

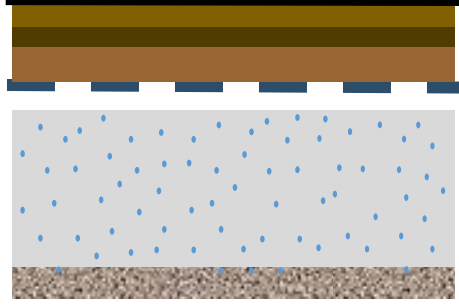


Cloud

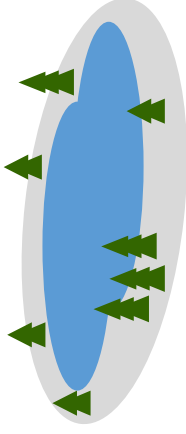
Lake



Ground



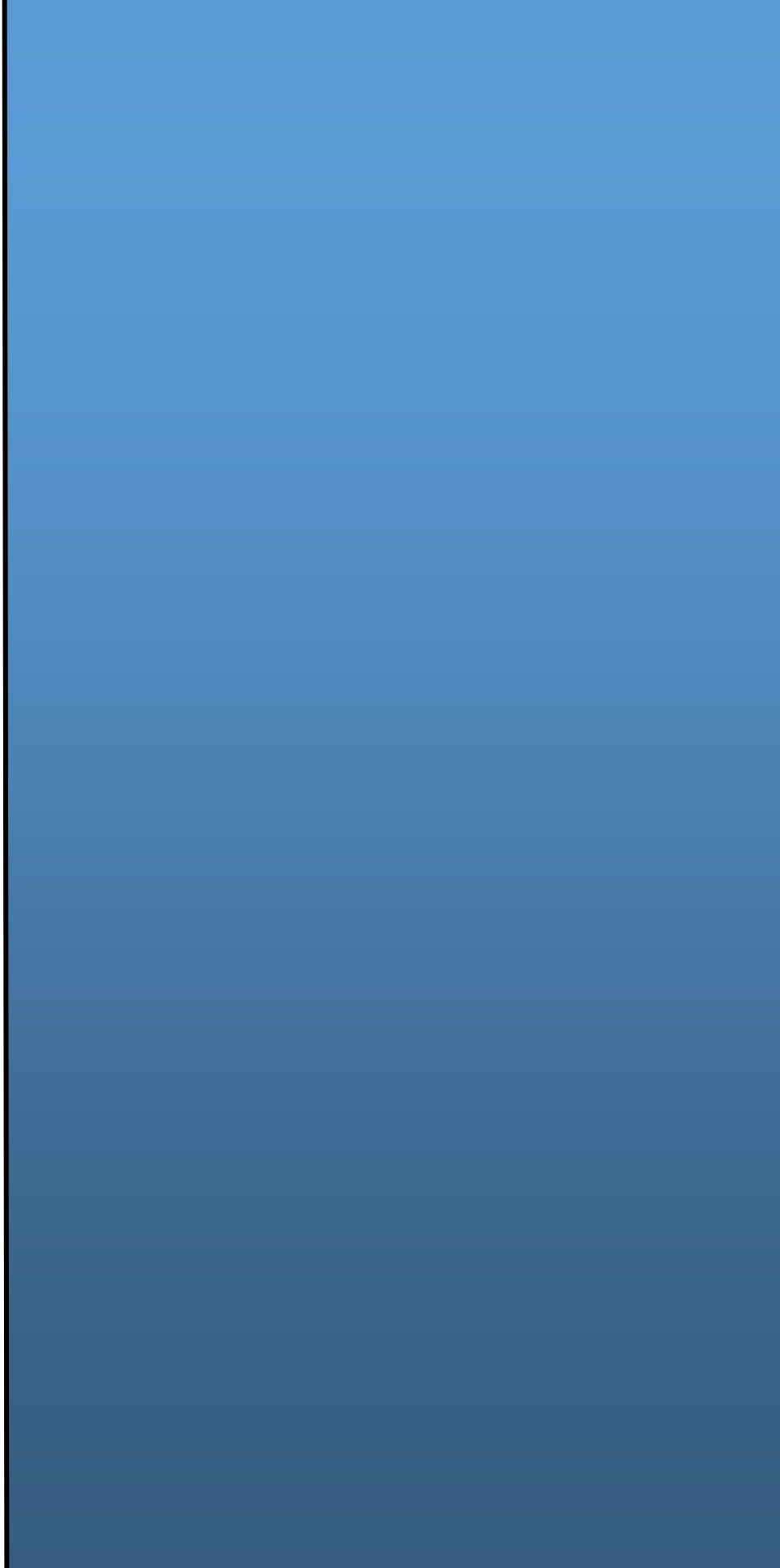
Lake



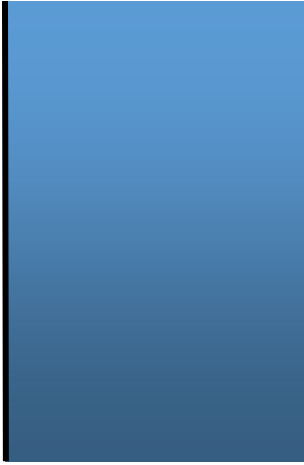
Animal



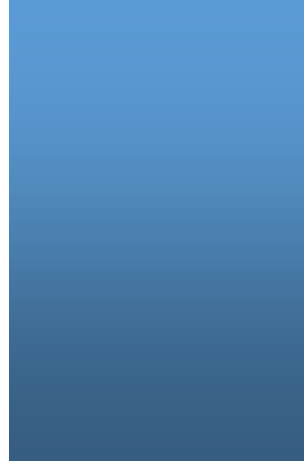
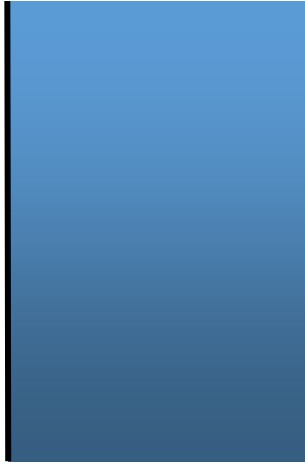
Ocean



Ocean

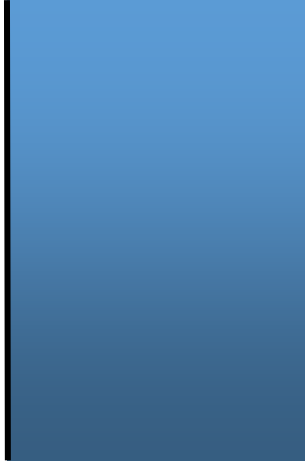


Ocean

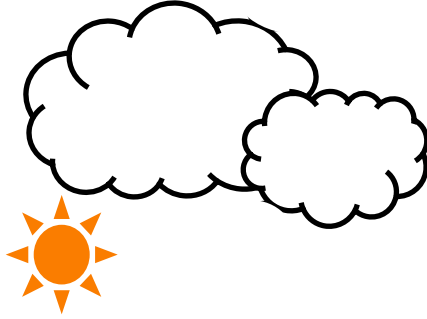


Ocean

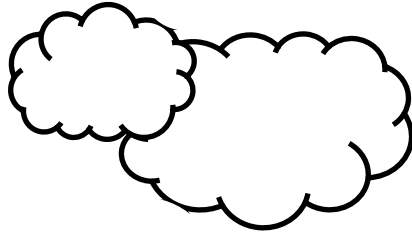
Ocean



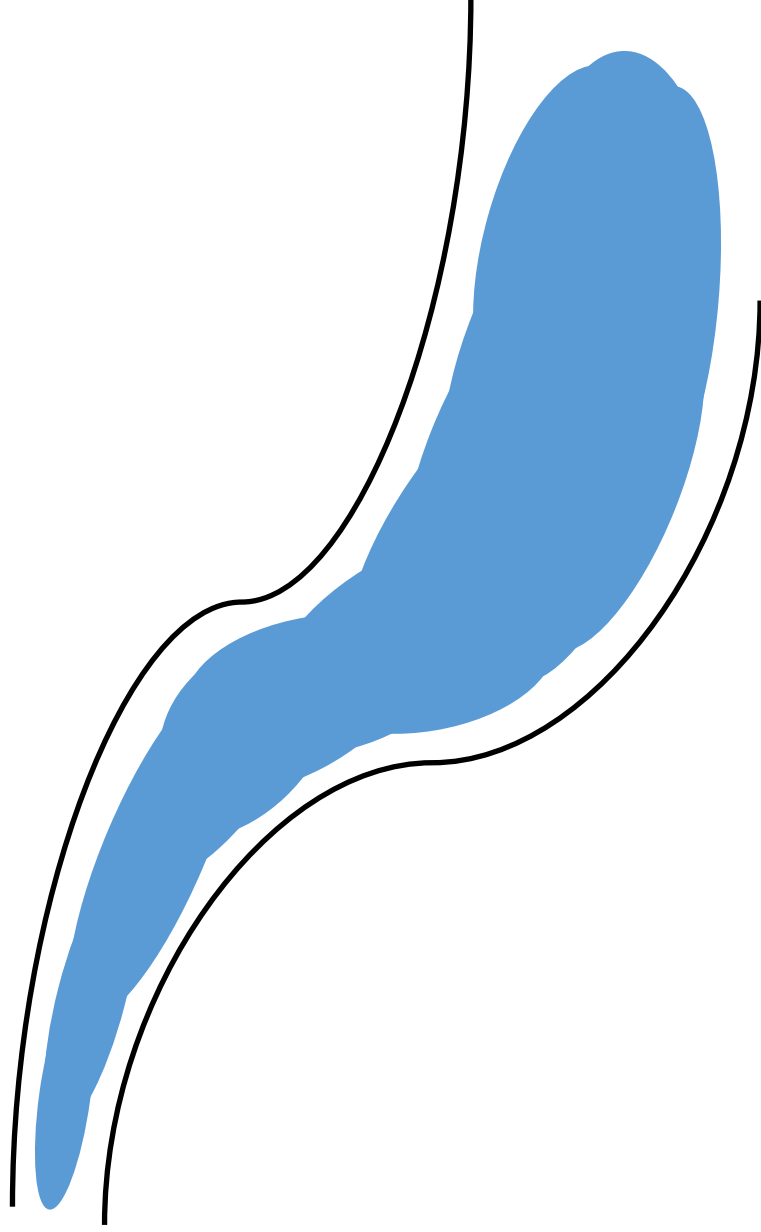
Cloud



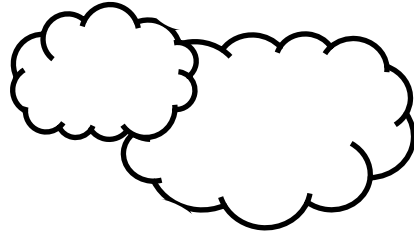
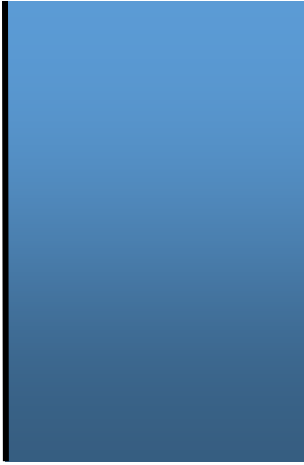
Cloud



Rivers & Runoff

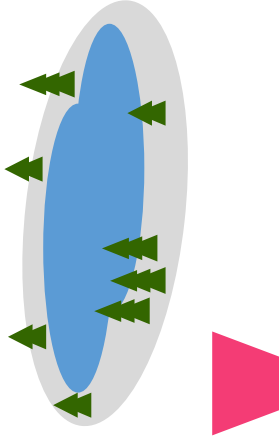


Ocean

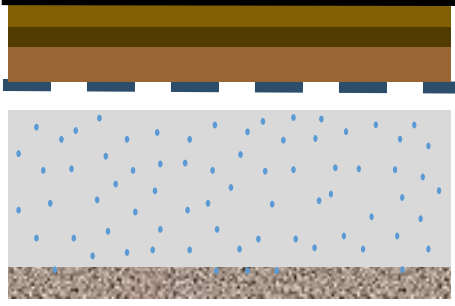


Cloud

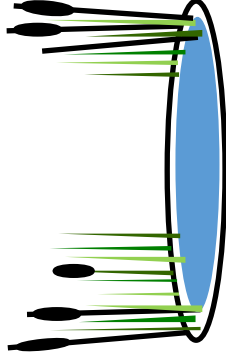
Lake



Ground

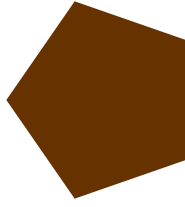


Wetland

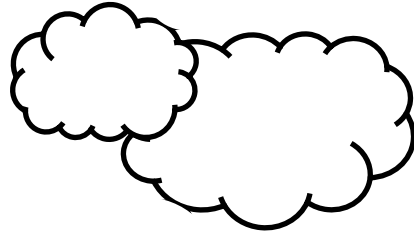
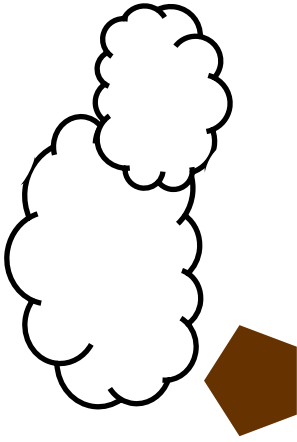


Animal

Plant



Cloud



Cloud

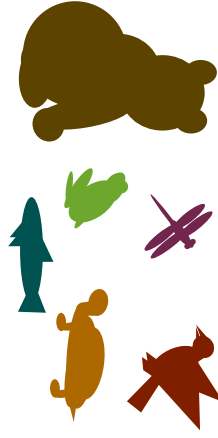
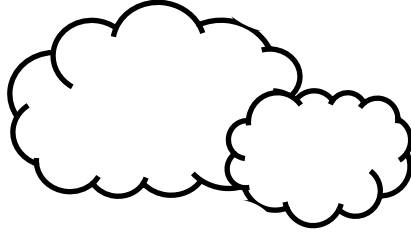
Plant



Plant

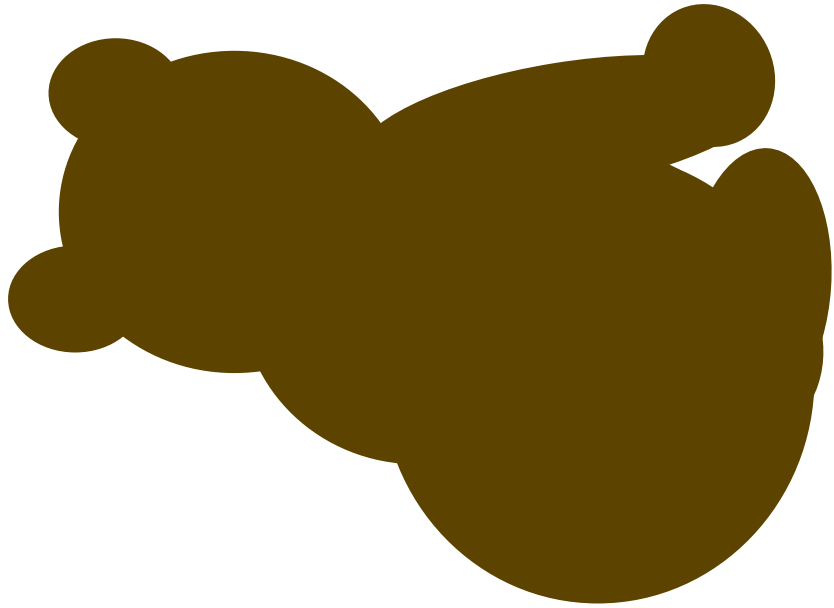
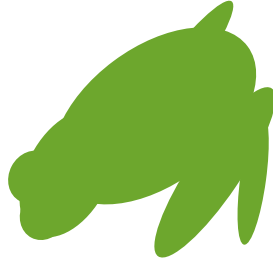
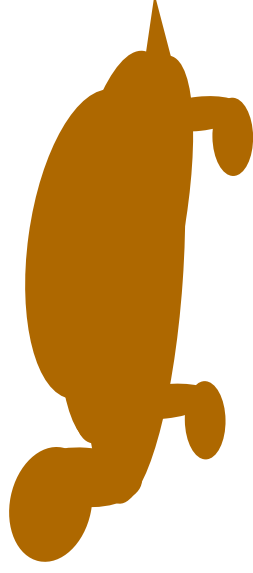
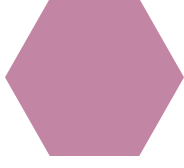


Cloud

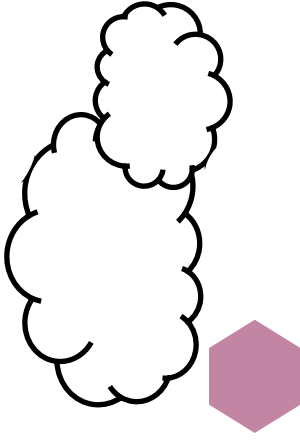


Animal

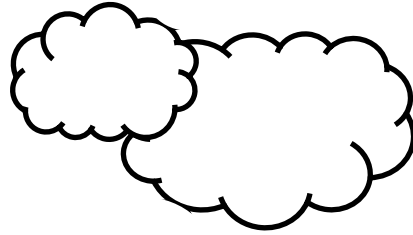
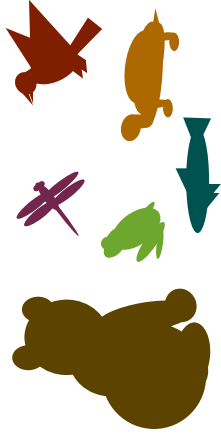
Animal



Cloud

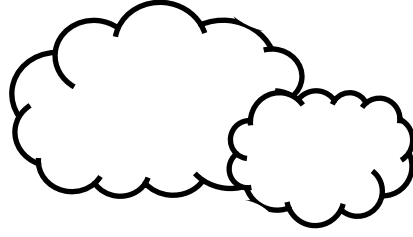


Animal

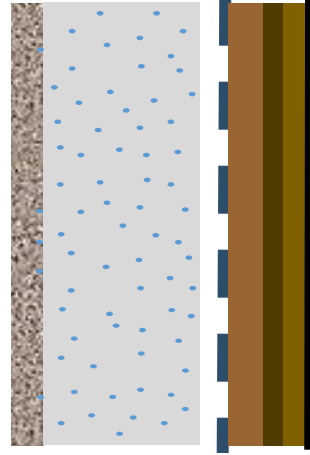
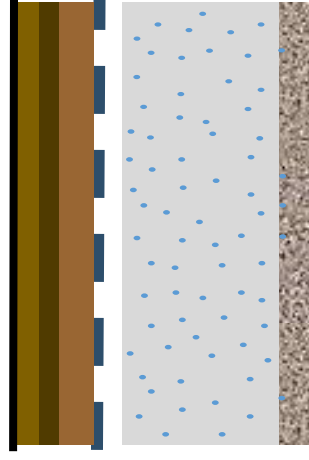


Cloud

Cloud



Ground

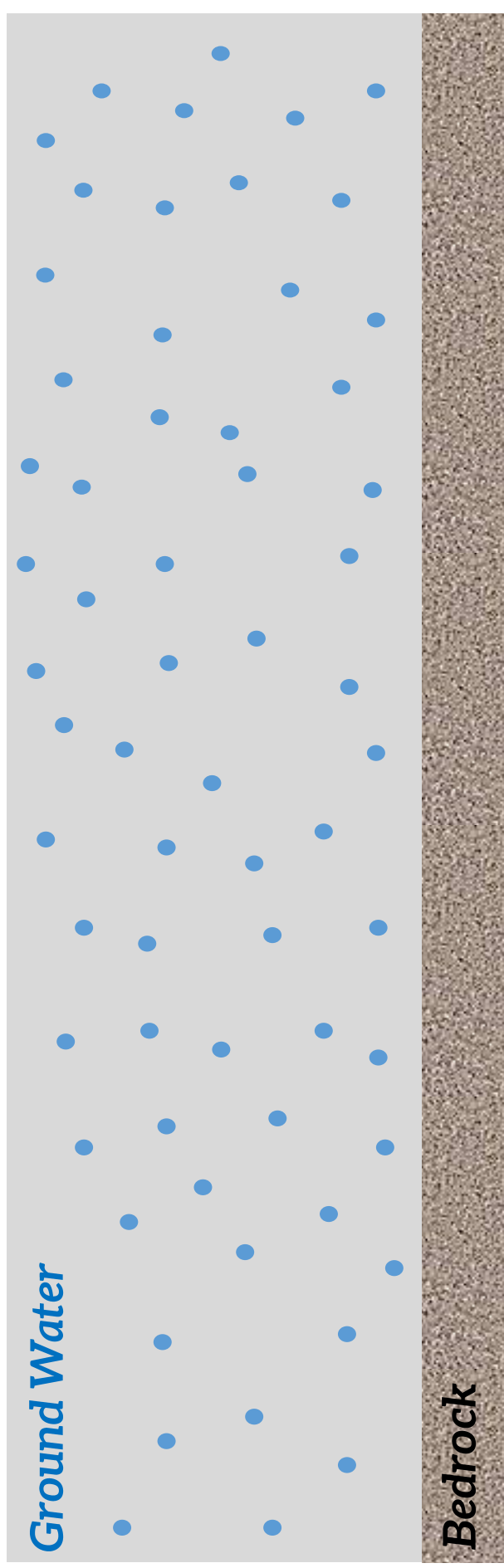


Ground

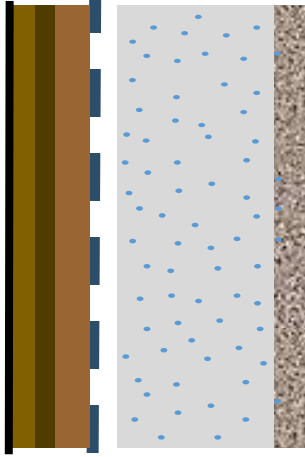
The Ground



Water Table The boundary between saturated (below) and unsaturated ground (above).



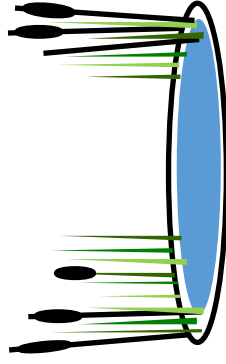
Ground



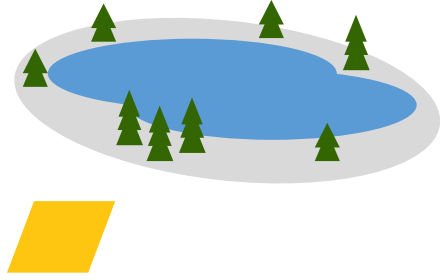
Plant



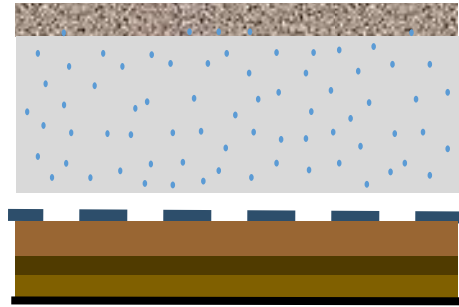
Wetland



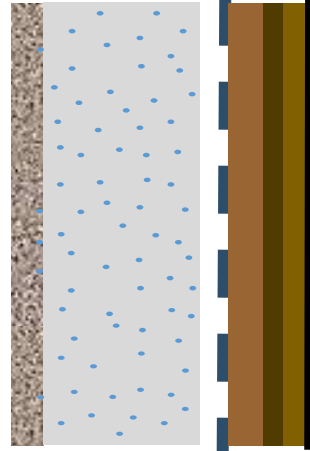
Lake



Ground



Ground



Ground Cube