Rainwater & Watersheds

A learning resource for elementary educators in the capital region

CRD
Making a difference...together

Supported by: RBC Blue Water Project™

Lesson 1

The Water Cycle

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

Supported by:

Lesson1

The Water Cycle

- Reading
- Writing
- Ecological literacy
- Media literacy, communication and information

45 minutes

Student computers with access to internet for videos and interactive website.
www.crd.bc.ca/students

For ideas about how students can earn a watershed warden badge, see lesson 10.

Access or order these and other support materials at:
www.crd.bc.ca/teacher
education@crd.bc.ca

Purpose

- To understand that water changes state (liquid, gas, solid) as it passes through the cycle.
- To understand the interconnectedness of systems such as the sun, gravity, weather (clouds, precipitation), river water, water in the ground, and plants and soil.
- To understand the role of the sun and gravity in the water cycle
- To know that the amount of water on Earth is finite.
- To know that the same water has been passing through the cycle since there has been water on Earth.

Preparation

1. Prepare copies of the student handout: *The Water Cycle.*
2. Preview the following resources to present the Water Cycle to students. Choose any additional resources to supplement the ProjectWet interactive site for student self inquiries.
   - CRD's student videos:
     Ollie the Otter's Guide to Watershed Stewardship:
     What is a watershed?
     How we have changed our watersheds
     Earning your watershed warden badge
     www.crd.bc.ca/students
   - USGS's interactive diagrams *The Water Cycle for Kids:*
     (beginner, intermediate and advanced)
     http://water.usgs.gov/edu/watercycle-kids-beg.html
     http://water.usgs.gov/edu/watercycle-kids-int.html
     http://water.usgs.gov/edu/watercycle-kids-adv.htm
   - ProjectWet's *Educator Resources* for the *Water Cycle Unit* information on the three states of water and interactive animation of the water cycle. **www.discoverwater.org**
   - Bill Nye the Science Guy video: *The water cycle*.
     www.youtube.com/watch?v=hehXEYkDq_Y

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Adapted from Waterdrops/Water Stewards.
Used with permission from Stella Weinert, Catherine McEwen, Marie Mullen & Tanya Grant.

Procedure

1. Introduce the watercycle to students using USGS's *The Water Cycle for Kids* interative diagram suitable for your class level (great for white boards):

   "The water cycle describes how Earth's water is not only always changing forms, between liquid (rain), solid (ice), and gas (vapor), but also moving on, above, and in the Earth. This process is always happening everywhere."

   - Beginner **http://water.usgs.gov/edu/watercycle-kids-beg.html**
   - Intermediate **http://water.usgs.gov/edu/watercycle-kids-int.html**
   - Advanced **http://water.usgs.gov/edu/watercycle-kids-adv.html**

2. Have students lead their self-inquiries exploring the ProjectWET website. **www.discoverwater.org**

Extentions and Adaptations

CRD videos *Watershed Stewardship*

We all live in a watershed

www.crd.bc.ca/watersheds

CRD Every Drop Counts (grade 2)

See these lessons for additional warm-ups, activities and worksheets about the water cycle:

- Lesson 5a - Water We Talking About?
  Introduction to the physical properties of water.
- Lesson 5b - Forms of Water
  Experiments for the three forms of water- liquid, solid and vapour.
- Lesson 5c - Water Actions
  Experiments for the three water actions- evaporation, condensation and precipitation.
- Lesson 5d - Water Cycle
  Summarize knowledge of the states and processes of water with the water cycle.

www.crd.bc.ca/teacher

SmartBoard Activities

Search and download free interactive water cycle activities such as *The Water Cycle* by Skool.

http://exchange.smarttech.com/search.html

ProjectWET Educator Resources

Visit the website for general activities, as well as ProjectWET activities (in the ProjectWET activity guide) that apply specifically to the water cycle.

http://exchange.smarttech.com/search.html

Read a Mat

This site offers a downloadable placemat of the water cycle, also useful for instruction.

http://ga.water.usgs.gov/edu/watercyclematsmallpage.html

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Name: _____ Date: _____

The Water Cycle

Draw the water cycle and label evaporation, condensation, precipitation, and transpiration. Include the sun, gravity and an aquifer in your drawing.

Bonus! What are the 3 different states of water within the water cycle?

_____ _____ _____

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The Water Cycle

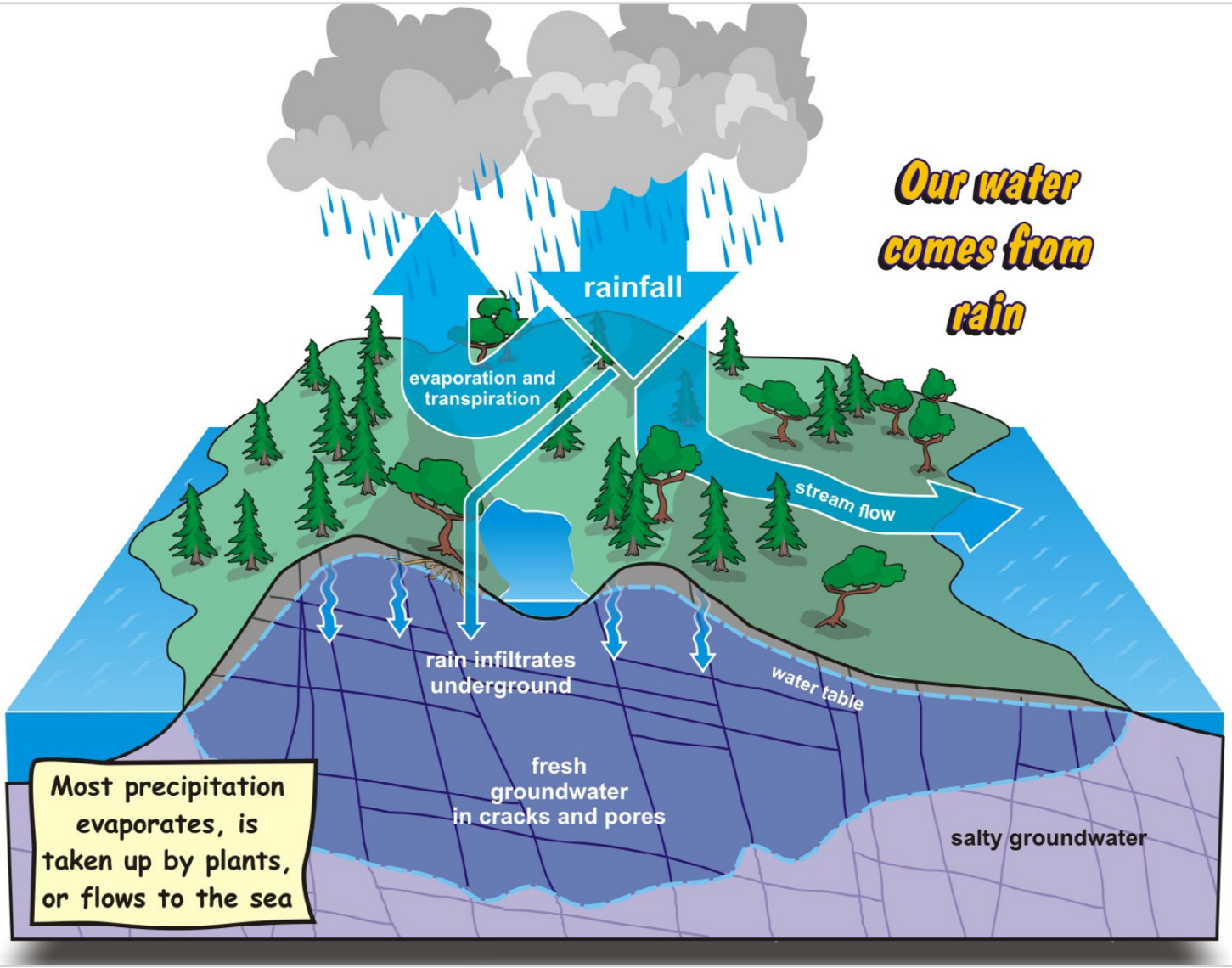

Image from CRD's *Water in Our Community* (grade 8-12) learning resource

Lesson 2

The Water Cycle: Rain Pathways

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

Supported by:

Lesson2

The Water Cycle: Rainwater Pathways

- Critical & creative thinking
- Ecological literacy
- Writing & oral language

30 minutes

Student handout:
Four Paths of Rain

How students can earn a watershed warden badge (see lesson 10)

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Purpose

- To kinesthetically make the sound of rain
- To understand the four pathways of rainwater in the water cycle

Preparation

1. This activity requires students have a prior understanding of the water cycle.
2. Prepare *Ollie the Otter's Guide to Watershed Stewardship:*

   What is a watershed?

   www.crd.bc.ca/students
3. Print copies of students handout: *Four Paths of Rain.*

Background Information: Rainwater Pathways

When it rains, the rain eventually lands on a landscape or a water surface (fresh or marine). Our discussions deal with how rain interacts with the landscape. Rainwater can take one of four pathways:

- infiltration into the pervious ground
- evaporation into the atmosphere
- transpiration from plants
- stormwater run-off

The pathway taken is dependent on a variety of influences including: air temperature, air moisture (humidity), land surface type (natural or developed, pervious or impervious, and kind), hardness of land surface, soil moisture, soil temperature and surface temperature. At any one time, the rain may travel all pathways or several or only one – it all depends.

Vocabulary

- **Infiltration** the downward movement of water through soil
- **Evaporation:** water changing state from a liquid to a gas and releasing heat
- **Transpiration:** water released by plants through the process of photosynthesis (using sunlight, water and carbon dioxide to create carbohydrates for the plant, releasing water and oxygen)
- **Evapotranspiration**: is the process of evaporation and transpiration
- **Stormwater run-off:** the flow of rainwater (or snow melt) over the land that picks up pollutants from any surface. It can flow directly into creeks, rivers, and lakes to **the oce**an or it can flow into these bodies of water from storm drains and ditches.

Procedure

1. Quickly review the water cycle with students, drawing a diagram (whether by a student or teacher) of the cycle for all to see and serve as reference.

Activity: Make it Rain

2. Use the following steps and narration to recreate the sounds of a passing storm and introduce rainwater pathways and vocabulary with students.

Student Actions	Teacher Narrative
	Let's imagine it is raining now. It's only a light rain – everyone snap your fingers.
Everyone snapping	Imagine the rain falling on the leaves and needles of the trees and shrubs outside, and gently onto the ground.
	Now the rain is getting heavier. Everyone slap your thighs.
Everyone slapping their thighs	It is raining harder now. The rain is falling on plants, the ground and roads.
	Now it's pouring
Some students stomp their feet while the others continue slapping their thighs.	Now the water is running off and the streams are swelling and the water is also running down the roads into the storm drains.
	Eventually the rain starts to abate
Students stop stomping and instead snap their fingers. Students slapping their thighs stop and instead snap their fingers. Half the class stops making any noise. Then all the class stops and sits quietly for a few moments (the hush after the rain).	

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Rain Pathways

3. *Ollie the Otter's Guide to Watershed Stewardship: What is a watershed?*
4. Brainstorm with the students where they think rainwater goes and develop a list of the four pathways. (They will likely need help arriving at the four and explore the definition of "evapotranspiration")

   1) infiltration 2) evaporation 3) transpiration 4) stormwater run-off
5. Present or project images provided
6. Discuss rain pathways and have students complete the student handout: *Four Paths of Rain.*

Reflection

7. Brainstorm the following
   - Why might it be important to understand where the rainwater goes?
   - What might influence which pathway(s) the rainwater travels? see background information

Extentions and Adaptations

- CRD *Water In Our Community* (grade 8-12) learning resource:
  - Lesson: Clean Water Factory

    Students view a demonstration and complete experiments demonstrating the natural filtration processes of forests.
- Get Outside

  Are your students interested in how we can reduce run-off? Expore Green Infrastructure in your neighbourhood or take a virtual tour.

  https://www.crd.bc.ca/education/low-impact-development/rainwater-management

Teacher Resources

- **CRD** *Watershed Stewardship* videos

  We all live in a watershed

  Everyone has a part to play

  Contaminants in Stormwater

  www.crd.bc.ca/watersheds
- **Green infrastructure** imitates the natural hydrology (or movement of water) of a property by managing rainfall where it falls, and uses techniques that allow infiltration, and that filter, store, evaporate, and detain runoff close to its source. This helps to protect and restore creeks, and create a more livable community.

  https://www.crd.bc.ca/education/low-impact-development

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Rainwater and Watersheds

Name: _____ Date: _____

The Four Pathways of Rain

Create a drawing showing the four pathways rain can take.

Bonus: What can influence the pathways rain and snow take?

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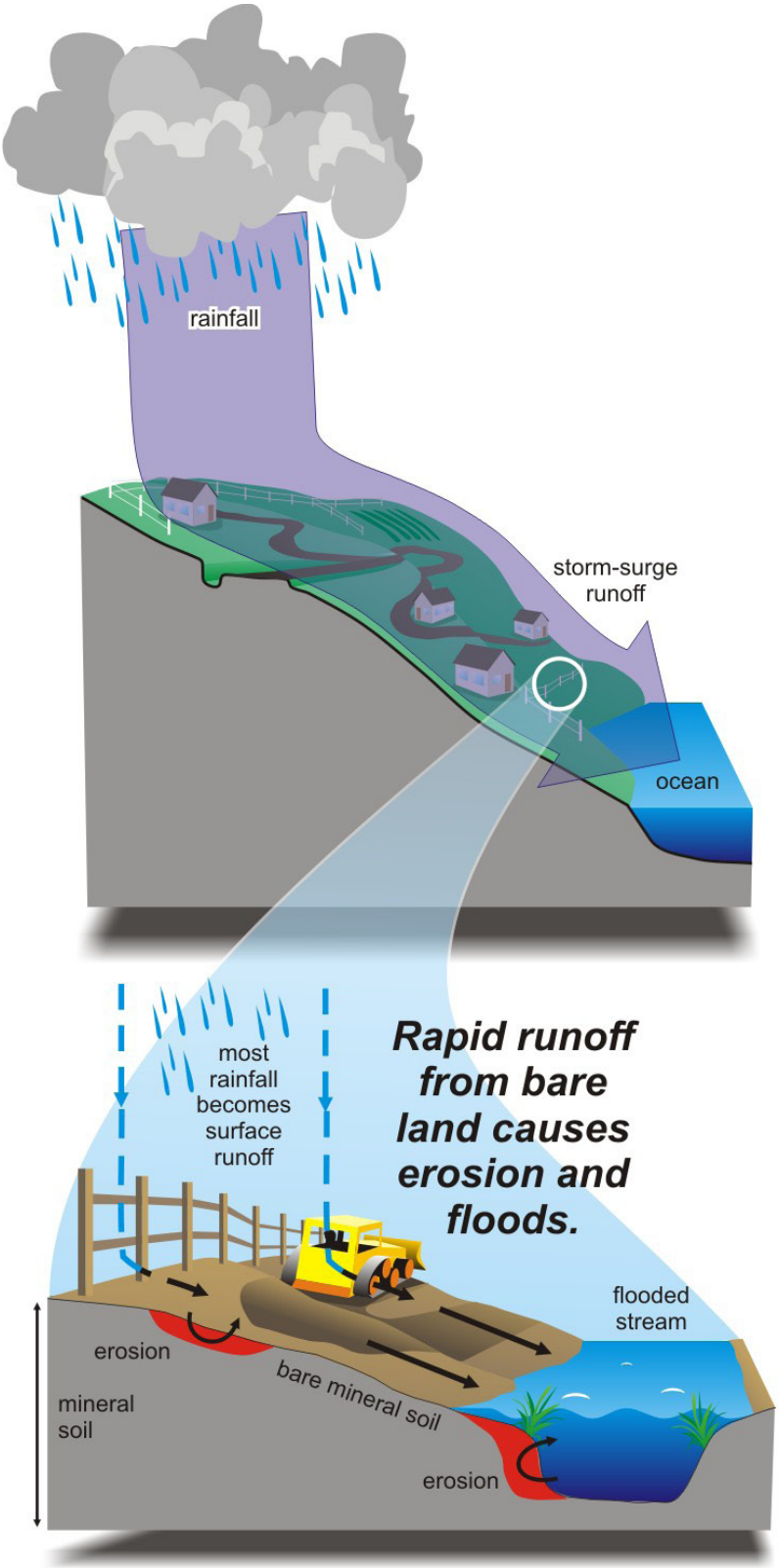
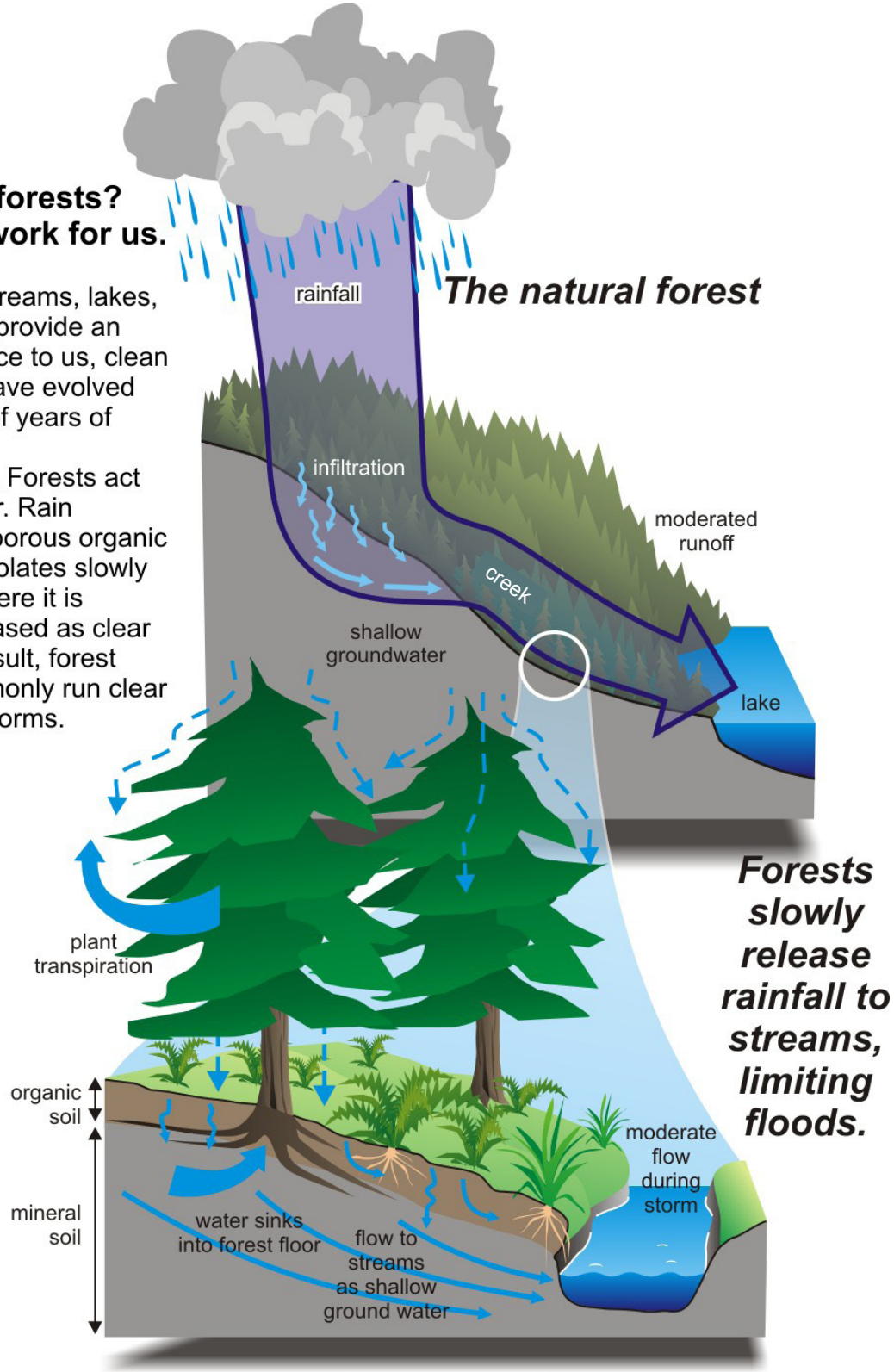


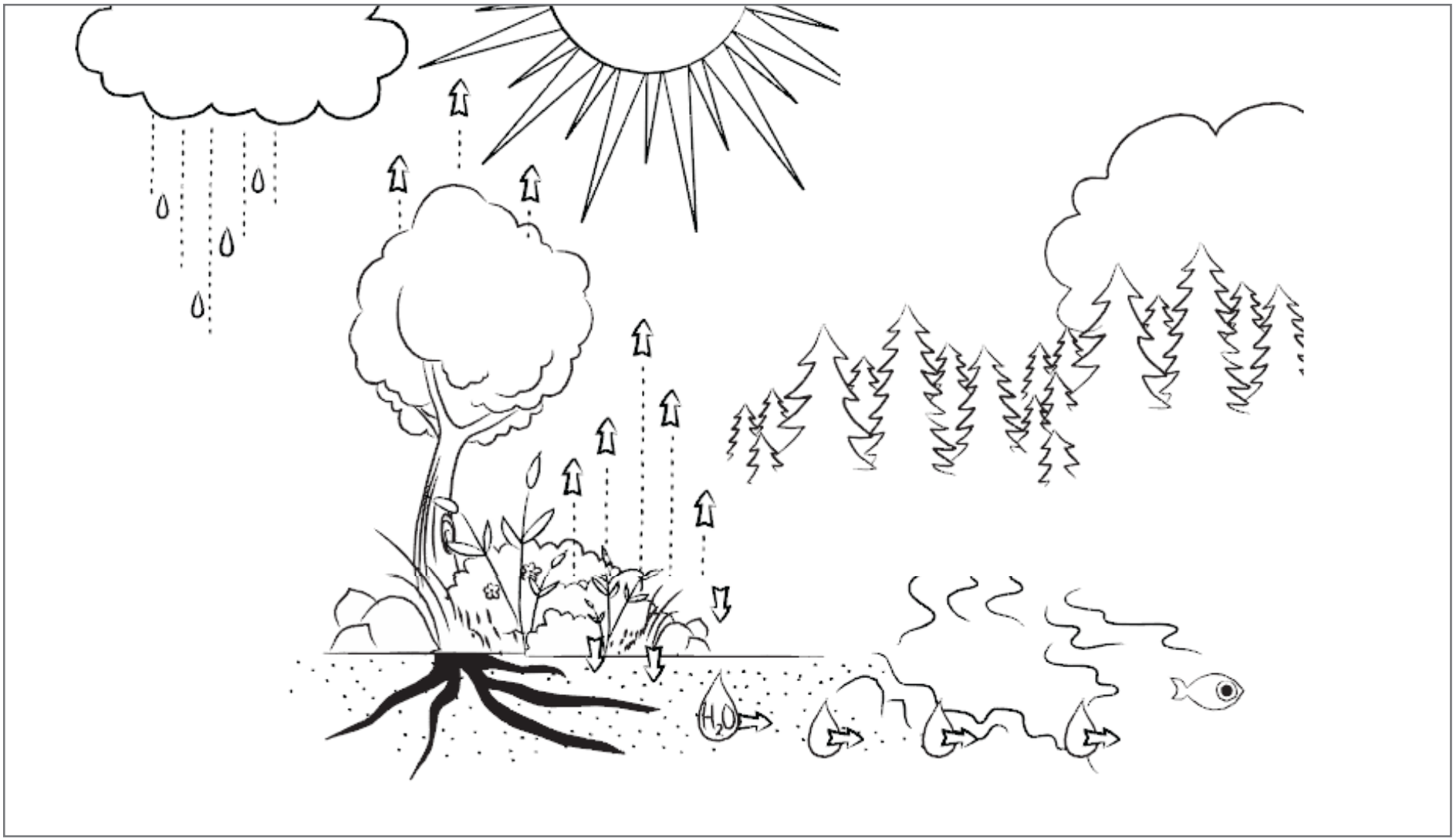
Cleared Land: Most rainfall becomes surface runoff

Hi-tech forests? How they work for us.

Our forests, streams, lakes, and wetlands provide an amazing service to us, clean water! They have evolved over millions of years of "research and development". Forests act as a giant filter. Rain infiltrates the porous organic soils and percolates slowly to streams where it is gradually released as clear water. As a result, forest streams commonly run clear even during storms.



Rainwater and Watersheds



Using this Resource

Lessons and Activities

The Rainwater & Watersheds resource was adapted by the Capital Regional District (CRD) from Waterdrops/Watersteward and used with permission from Stella Weinert, Catherine McEwen, Marie Mullen & Tanya Grant and with support from RBC BlueWater Project.

Rainwater & Watersheds was created for use by educators in the capital region. The lessons can be used individually or as a unit to supplement course material. They are aligned with BC Ministry of Education learning outcomes, in particular for Grade 4-5, however, links and adaptations for lower and upper elementary levels are also included.

This resource includes lessons and activities to:

- raise awareness about rainwater and local watersheds.
- empower students to protect our local waterways, ocean and environment.

Symbols

Look for these symobols to quickly find:


Student handouts


Assessment tools


Resources to support instruction


Videos


Time required

DOWNLOAD

These and other resources at
www.crd.bc.ca/teacher

Questions? Contact us about:

Environmental Education	**education@crd.bc.ca**	**250.360.3030**
Watersheds Information	**watersheds@crd.bc.ca**	

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Lesson 3

The Water Cycle: Run-off and Stormwater

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

Supported by:

Lesson 3

The Water Cycle: Stormwater Run-off

- Critical & creative thinking
- Ecological literacy

45 minutes
(15 minutes inside;
30 minutes outside and reflection)

- Student handout: *Stormwater Run-off*
- Clipboard & pencil for each student

* If it is raining have a plastic sheet or plastic bag over the clipboard to protect the student page.

How students can earn a watershed warden badge (see lesson 10)

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Purpose

- To observe how different impervious surfaces influence run-off
- To observe where run-off waters in the school yard go

Preparation

1. This activity requires students have a prior understanding of the water cycle.
2. Print copies of students handout: *Stormwater Run-off*

Background Information: Rainwater and Stormwater Run-Off

Rainwater run-off is rain or melting snow that falls on a surface and travels across surfaces and flows downhill. Hard man-made surfaces, such as asphalt, concrete and roofing, are impervious to water, and the rainwater runs off. (Natural surfaces such as dry soil can also be too hard to allow water absorption). Some buildings have rain gardens or ponds that capture the run-off to settle into, or green roofs or porous pavements that allow infiltration.

Stormwater is often directed into storm drains or ditches that drain directly into a nearby water body like a creek, lake or ocean. In these situations run-off influences the natural water body in a number of ways. The amount of run-off has the potential to be too great a volume for the creek to handle and the creek may overflow its banks. This increased creek flow can cause erosion. The increased water volume may be so great as to scour the sides and bottom of the creek, carrying away soil, gravel, young fish , salmon eggs and small aquatic insects. Run-off is a major source of pollution into natural water bodies, bringing with it contaminants it has picked up, such as pesticides, oil and gas, fertilizer, and litter. If water is running off that means it is not going into the ground and recharging the water table.

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Vocabulary

- **Stormwater run-off:** rain that lands on rooftops, roads and parking lots and is not able to flow into the soil (infiltrate) or other surface material. It flows over the surfaces and picks up pollution that collects on the surfaces.
- **Impervious surface** do not allow the penetration of water (and other liquids) and are most often artificial or human-made structures, such as roofing, pavement, glass, and concrete.
- **Impermeable (impervious):** material that does not allow the flow through of liquid such as water.
- **Pervious:** a surface that allows the flow through of liquid such as water.

Procedure

- NOTE: This activity requires a brief period of time inside to establish the map of the school yard and set the intention of the activity outside – to investigate impervious surfaces in the school yard and the pathways that run-off takes.

1. As a class, draw the general layout of the school yard from memory. A large drawing can be made on the front board while students follow along drawing their own on their student page. Include the location of the school, playing fields, pavement areas, fences and any landmarks.

2. Briefly review the four pathways of rainfall (see Lesson 2: Rain Pathways). Stormwater run-off is the water from rainfall (or snowmelt) that is not absorbed but runs off the landscape. Some surfaces are impervious and do not allow water to permeate or flow into them.
    - What are some examples of impervious surfaces that can be found in the school yard? Where does rainwater on the school roof go?
    - Does it ever go into the ground?
    - Does it go into a creek?
    - Are there any rain gardens or ponds to catch and retain the stormwater?
    - Where does rain on the pavement and concrete go?
    - What is a major force influencing where the stormwater run-off travels beyond impervious surfaces?
3. Using the student handout *Run-off and Storm Water*, students make predictions about where the run-off from the school will go.

Activity: Run-off pathways

4. As a class together, go to a place in the schoolyard to observe the rainwater on the roof to start the pathway of run-off, draw on the map downspouts, eaves, discover where water in the downspouts goes.
5. If possible continue off the school ground to storm drains; walk the driveway of the school to note other pathways of stormwater, are there storm drains here?
6. Draw/mark these on the map, note if and where any of it runs-off to natural surfaces for infiltration or if it is piped to the storm drain system.

Reflection/Discussion:

- Where did most of the stormwater go?
- Was there anywhere where the stormwater was directed to a natural surface for infiltration?
- If lots of stormwater runs off, what does that mean to the creek/river or lake?
- What might be in run-off that then gets added to the creek?
- Use illustrative resources to show pathways and consequences of run-off.

Extentions and Adaptations

Where does the rainwater flow?

1. Display the CRD Watershed Map for your community (see resources below).
2. Locate your school, the watershed it is in and make note of the nearest creek.
3. To see where the run-off from your school and community flows to reach the ocean, display your CRD Watershed Flow Diagram (listed by name) at **www.crd.bc.ca/watersheds**

For more runoff and watershed demonstration activities, see:

CRD *Every Drop Counts*

- Lesson 6a:
  - Demonstration - Runoff and Watersheds
  - Word Maps
  - Discussion - Watersheds in our Region
  - Experiments (erosion, sink/float, stopping erosion, pollution solution)
- Lesson 6 b Extensions and Adaptations:

  Recreate the water cycle relay using the "My Watershed Water Cycle Relay Map"

Teacher Resources

CRD Watershed Maps and Images

Download or view regional watershed maps, watershed flow diagrams and other useful images:

www.crd.bc.ca/watersheds

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Name: _____ Date: _____

Stormwater Run-off

What is stormwater run-off?

_____

The slope of the land determines where run-off will go.
I predict that run-off from our school will go _____

Create a drawing of the school and school yard and its boundaries. Mark downspouts from the roof, drain pipes, both on school and in school yard, and any other details of run-off.

When run-off travels over land or impervious surfaces what pollution can it pick up?

_____

The water on the school roof ends up: _____

Three negative things about run-off going into storm drains and into streams are:

1. _____
2. _____
3. _____

Two reasons why it is better if rainwater soaks into the ground are:

1. _____
2. _____

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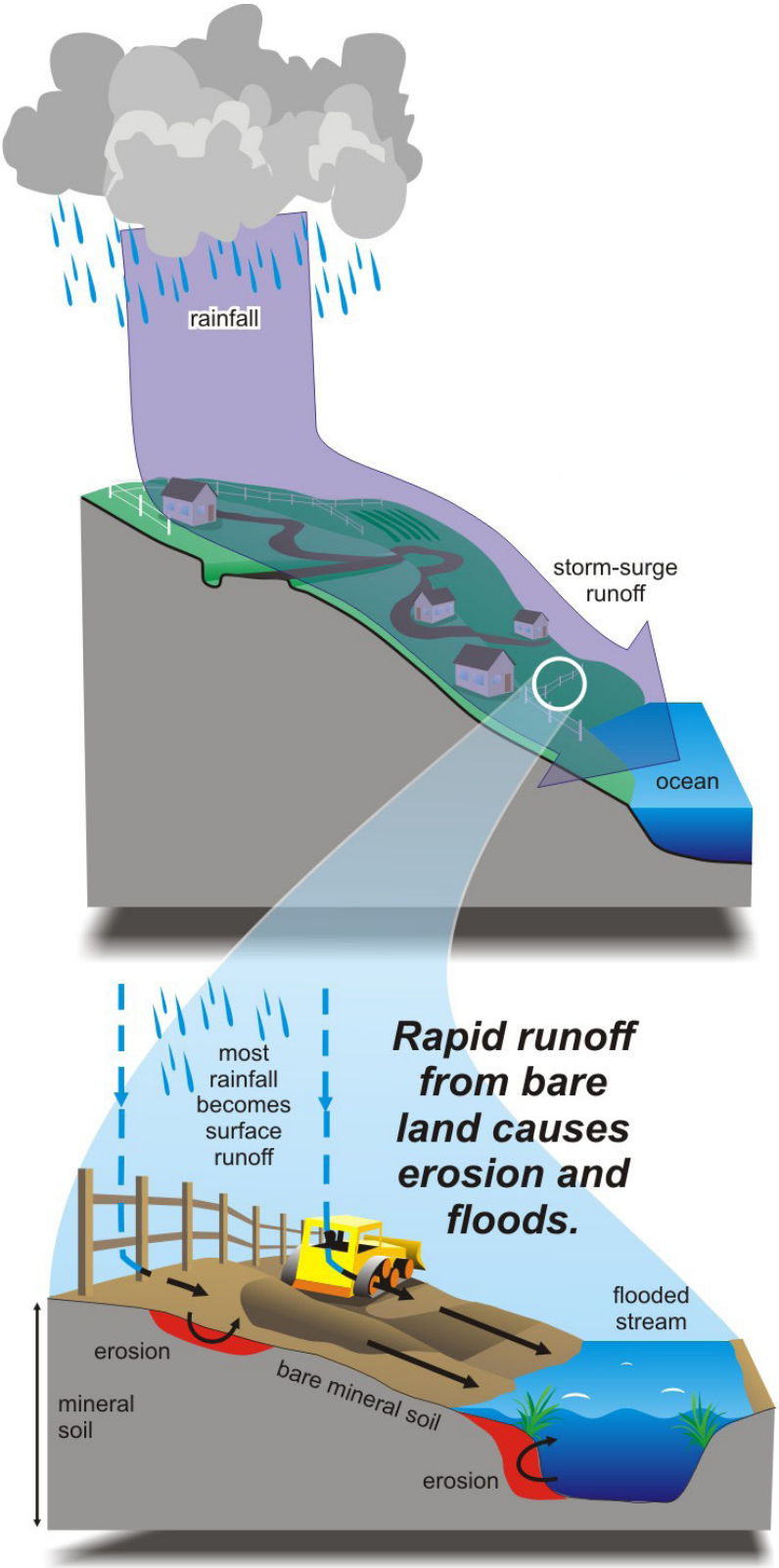
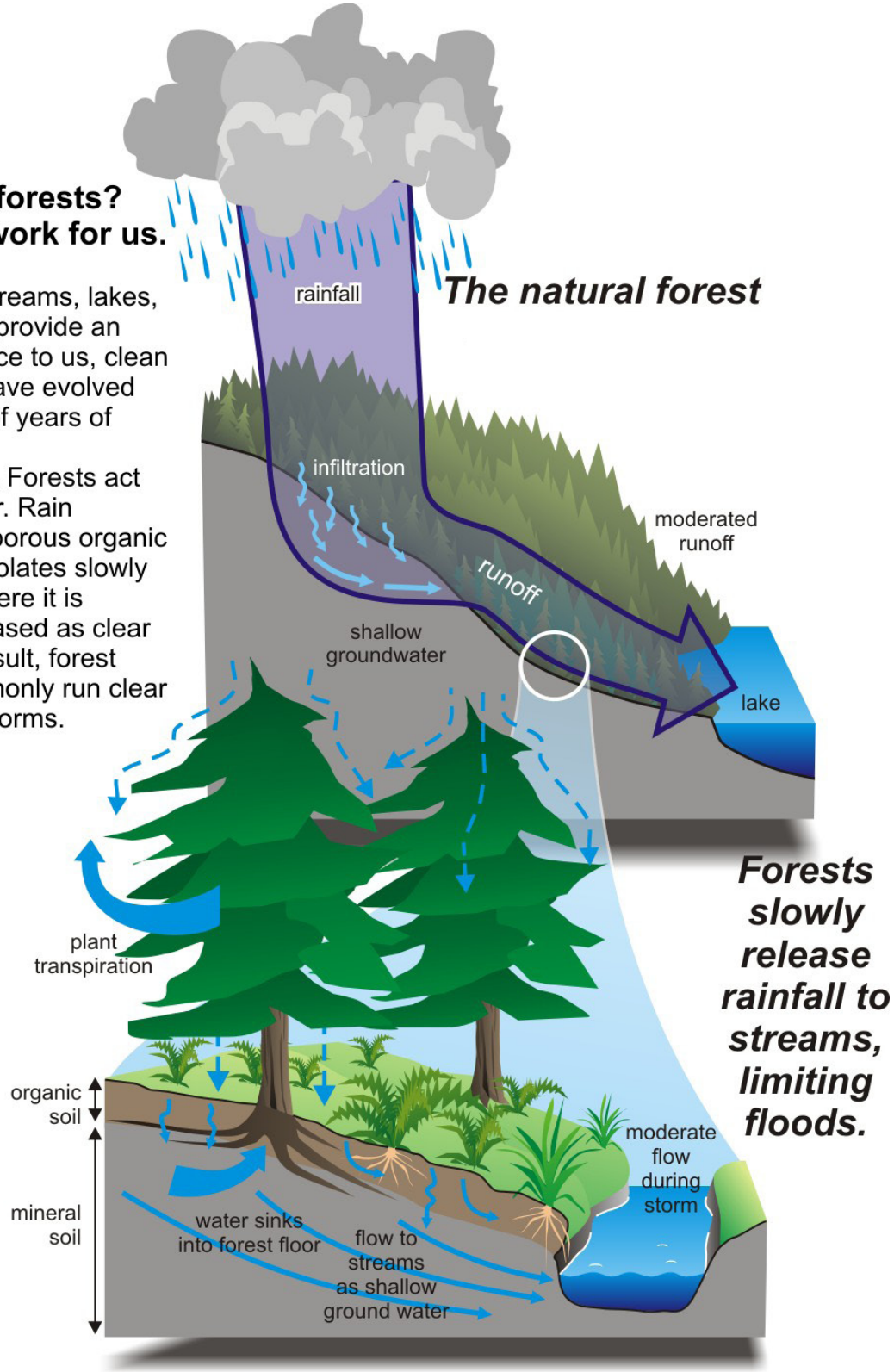


Cleared Land: Most rainfall becomes surface runoff

Hi-tech forests? How they work for us.

Our forests, streams, lakes, and wetlands provide an amazing service to us, clean water! They have evolved over millions of years of "research and development". Forests act as a giant filter. Rain infiltrates the porous organic soils and percolates slowly to streams where it is gradually released as clear water. As a result, forest streams commonly run clear even during storms.

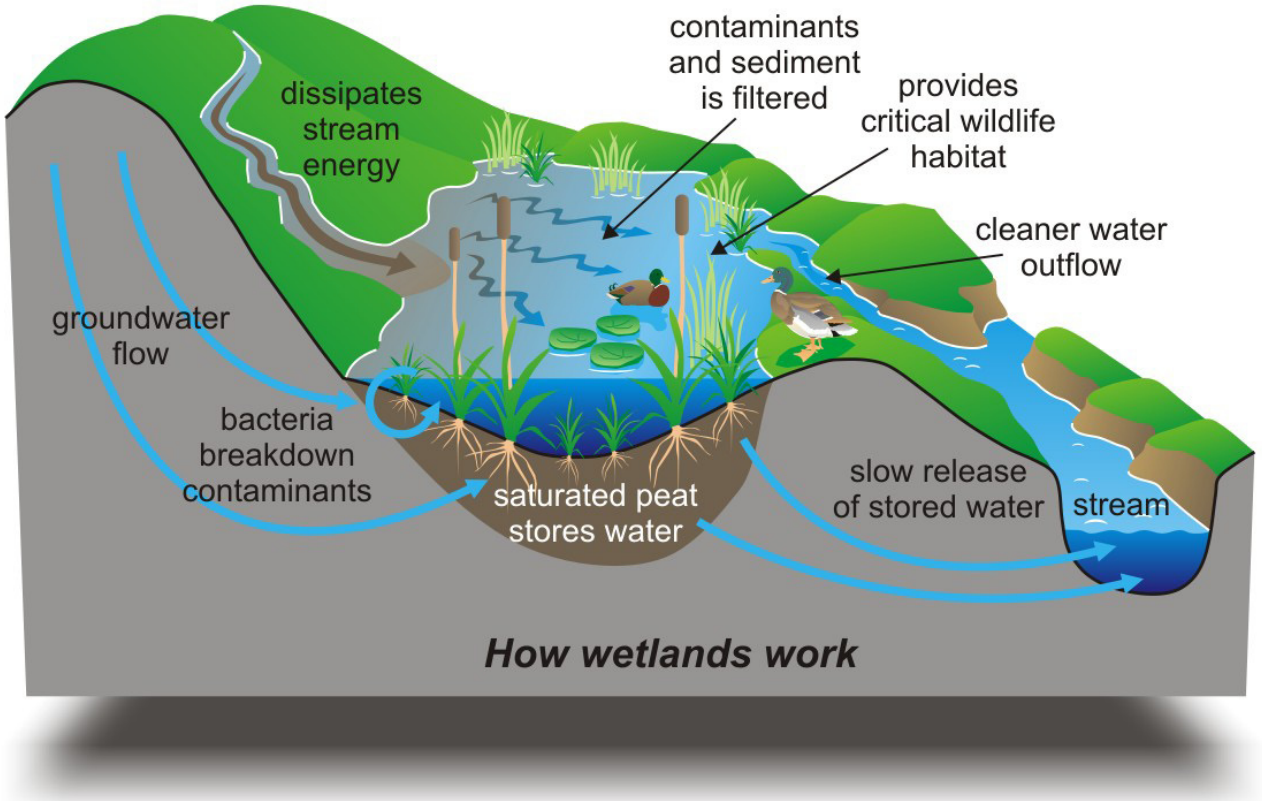


Forests: Most rainfall becomes shallow groundwater

Supported by: RBC Blue Water Project™

Wetlands: nature's sponge and filter

Wetlands swamps, marshes, bogs, and fens provide many services. They filter stream waters, store water, and offer critical habitat for many plants and animals. Wetlands fill with water during rains and slowly release water through droughts. Before we understood their critical role, we used to ditch and drain wetlands to create lawns, pastures, or farms.



Lesson 4

The Water Cycle:
Measuring rates of infiltration/percolation

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

Supported by:

- Math
- Critical and creative thinking
- Collaboration, teamwork, leadership

40 minutes

For each student:

- Student handout *Infiltration Rates of Different Surface Types*
- clipboard & pencil

For each group:

- Clipboard & pencil for each student
- coffee cans
- containers of water
- measuring cup
- stopwatch
- rulers
- hammer
- 2x4

How students can earn a watershed warden badge (see lesson 10)

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Lesson 4

The Water Cycle: Infiltration

Purpose

- To predict different infiltration rates with different ground surface types
- To test, measure, record and compare different rates of infiltration/ with different surface types
- To understand the influence of different land surfaces in the water cycle

Preparation

1. Prior to the activity, gather the following materials (1/group):
   - large coffee cans with both ends opened and duct taped around the edges for safety
   - containers of water (large enough to hold water for 4 coffee can tests)
   - 2 cup measuring cups (or mugs that are the same size)
   - stopwatchs (or timing device)
   - rulers
   - clipboard, pencil and student page (1 of each /student)
   - hammer & 2X4 (short length to cover across wide of can)
2. Print copies of students handout: *Infiltration Rates of Different Surface Types*

Background Information: Run-off

Rainfall is a source of recharge for groundwater and provides flow into lakes, creeks and wetlands. For recharge to happen, the rainfall must infiltrate through the ground. The soil serves to clean or filter water that passes through it. Different permeable ground surfaces and conditions influence how quickly, or the rate at which, water enters and flows downward. If there is a lot of clay in the soil, or the soil is compacted, or if the soil is super-saturated with water, water may be shed from the land as run-off or pond on top of the surface in places of no slope. (If the soil is hard-packed and dry it may not be able to absorb rainfall).

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Vocabulary

- **Stormwater run-off:** rainwater that is not able to flow into the soil (infiltrate) or other surface material and flows over the surface.
- **Infiltration**: the passage of water through soil (soil can act as a filter to water moving through, notice that parts of the word "filter" can be found in "infiltration") (similar to percolation)
- **Permeable**: having openings that allow the passage of a liquid (i.e. water)
- **Unsaturated soil**: flow is initially very fast
- **Saturated soi**l: the ground is wet and water moving through has a steady flow rate
- **Ponding:** when the ground is totally saturated and can no longer take any more water
- **Groundwater recharge:** a process where water moves downward from surface water to groundwater.

Procedure

1. Review the map of the schoolyard (lesson 3: Run-off). While that activity considered impervious surfaces, this activity investigates permeable surfaces. What might be a permeable surface in the schoolyard?

2. As a class, brainstorm a list of at least 4 locations of different permeable surfaces in the school yard:
   - playing fields (grass or gravel)
   - area under trees or shrubs in playground (soil)
   - garden (soil)
   - playground (gravel or woodchips)
   - walkways with pervious pavement
   - sandbox (sand)
3. Have students complete the "predictions" on the student handout: *Infiltration Rates of Different Surface Types*.

4. Organize students into groups, each with their compliment of measuring equipment.

5. If you there are too many locations and surface types for all groups to test, assign locations to the groups, otherwise each group should field test percolation at each site. Assign a different start site to each group. They can then proceed to their three other sites as they are ready.

6. Review the sampling procedure before heading outside.

   - Place the can on top of the surface and grind it down into the surface (unless it is asphalt, cement or pervious pavement) to prevent water from escaping out the bottom.

   - One student pours from the big water container while another student holds the plastic measuring cup for filling. Another student works the timing device. All other students are observers to note when all the water has drained out.

   - The student with the measuring cup says, start, as she/he pours the water into the can. Observers say, stop, when all the water is gone (absorbed into the soil). Time is recorded on the data sheet. If the water has not drained out in 5 minutes, measure the depth of water left and record on data sheet. Proceed to next site.

Reflection/Discussion:

7. Students write up their own reflections on their student handouts and compare their findings with their predictions.
8. As a class, dialogue on the findings.
    - How do the findings compare with the predictions?
    - Where was infiltration the fastest? What might be some reasons for this?
    - Where was the infiltration the slowest? Reasons why?
    - How is this information useful with regard to rain pathways?

Extension and Adaptation

Get Outside

- Green Infrastructure: Are your students interested in how we can reduce run-off? Expore Green Infrastructure in your neighbourhood or take a virtual tour to find a location near your neighbourhood.

  https://www.crd.bc.ca/education/low-impact-development/rainwater-management
- Impervious vs. Pervious: While walking around the school yard or neighbourhood, ask students if the rain will soak in? When on impervious surfaces (roads, sidewalk, pathways), jump with students on the spot and say “impervious… impossible”, precipitation cannot soak into these surfaces. On pervious surfaces (e.g. grass, soil) jump softly and whisper “pervious… possible”.

Teacher Resources

Illustrations

- Creek Channel Natural, Rural and Urban
- Natural Watershed (cross-section)
- Rain Garden (cross-section)
- Rainfall in 24 hours (measured in bathtubs)
- Rainfall in a Year (measured in bathtubs)
- Urban Run-off
- Rural Run-off
- Building Green in the City (Atrium, Victoria)
- Urban Watershed (birds eye view)
- Water Balance (natural vs urban)
- Watershed Slides (illustrated and real surfaces)

Illustrations by Murdoch De Greeff Inc.

Images

- Modified Landscapes
- Healthy Green Infrastructure
- Wetlands: nature’s sponge and filter

CRD Watershed Maps & Flow Diagrams

www.crd.bc.ca/watersheds

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Name: _____ Date: _____

Infiltration Rates of Different Surface Types

Surface Types

1. _____
2. _____
3. _____
4. _____

Predictions

The **fastest** rate of infiltration will be: _____

The **slowest** rate of infiltration will be: _____

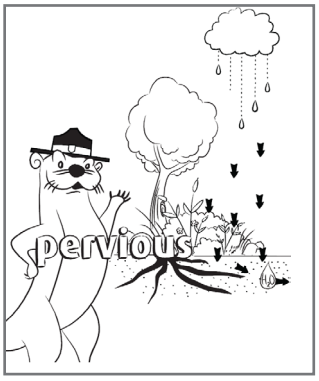
Findings

1. Surface type: _____
   Time of infiltration: _____ (min,sec)
   Depth of water left: _____ (cm)

2. Surface type: _____
   Time of infiltration: _____ (min,sec)
   Depth of water left: _____ (cm)

3. Surface type: _____
   Time of infiltration: _____ (min,sec)
   Depth of water left: _____ (cm)

4. Surface type: _____
   Time of infiltration: _____ (min,sec)
   Depth of water left: _____ (cm)



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Reflection Notes

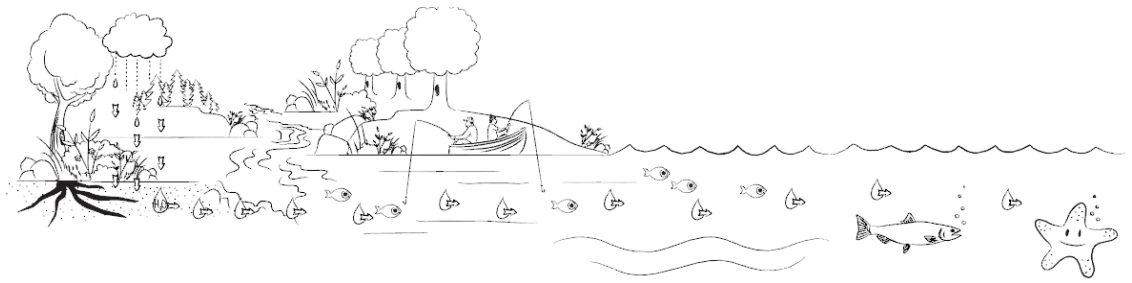
The surface type with the fastest infiltration rate:

The surface type with the slowest infiltration rate:

Comparing these findings to my predictions,

Reasons for these findings could be:

Something else I wonder about infiltration:



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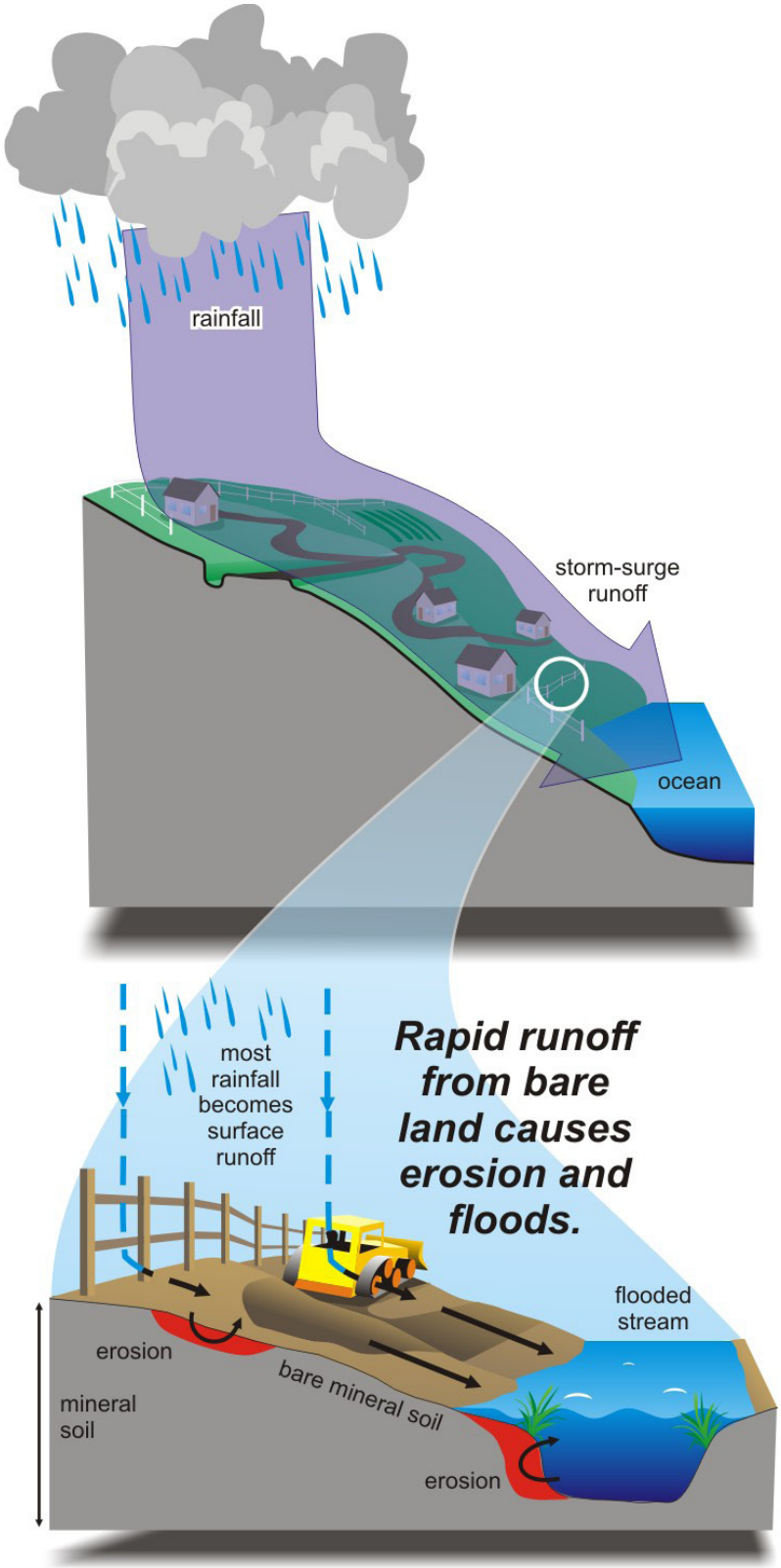
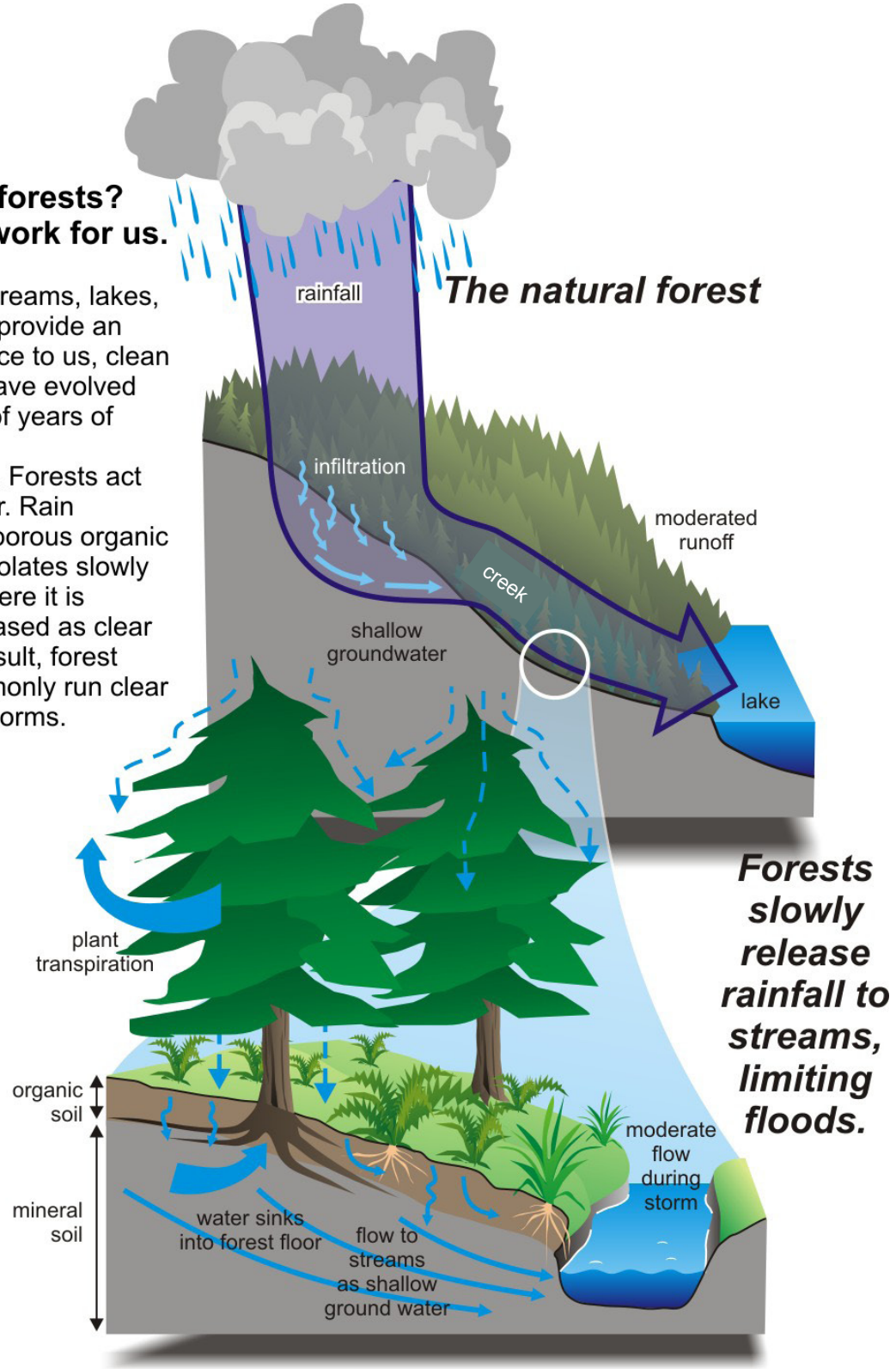


Cleared Land: Most rainfall becomes surface runoff

Hi-tech forests? How they work for us.

Our forests, streams, lakes, and wetlands provide an amazing service to us, clean water! They have evolved over millions of years of "research and development". Forests act as a giant filter. Rain infiltrates the porous organic soils and percolates slowly to streams where it is gradually released as clear water. As a result, forest streams commonly run clear even during storms.



Wetlands: nature's sponge and filter

Wetlands swamps, marshes, bogs, and fens provide many services. They filter stream waters, store water, and offer critical habitat for many plants and animals. Wetlands fill with water during rains and slowly release water through droughts. Before we understood their critical role, we used to ditch and drain wetlands to create lawns, pastures, or farms.

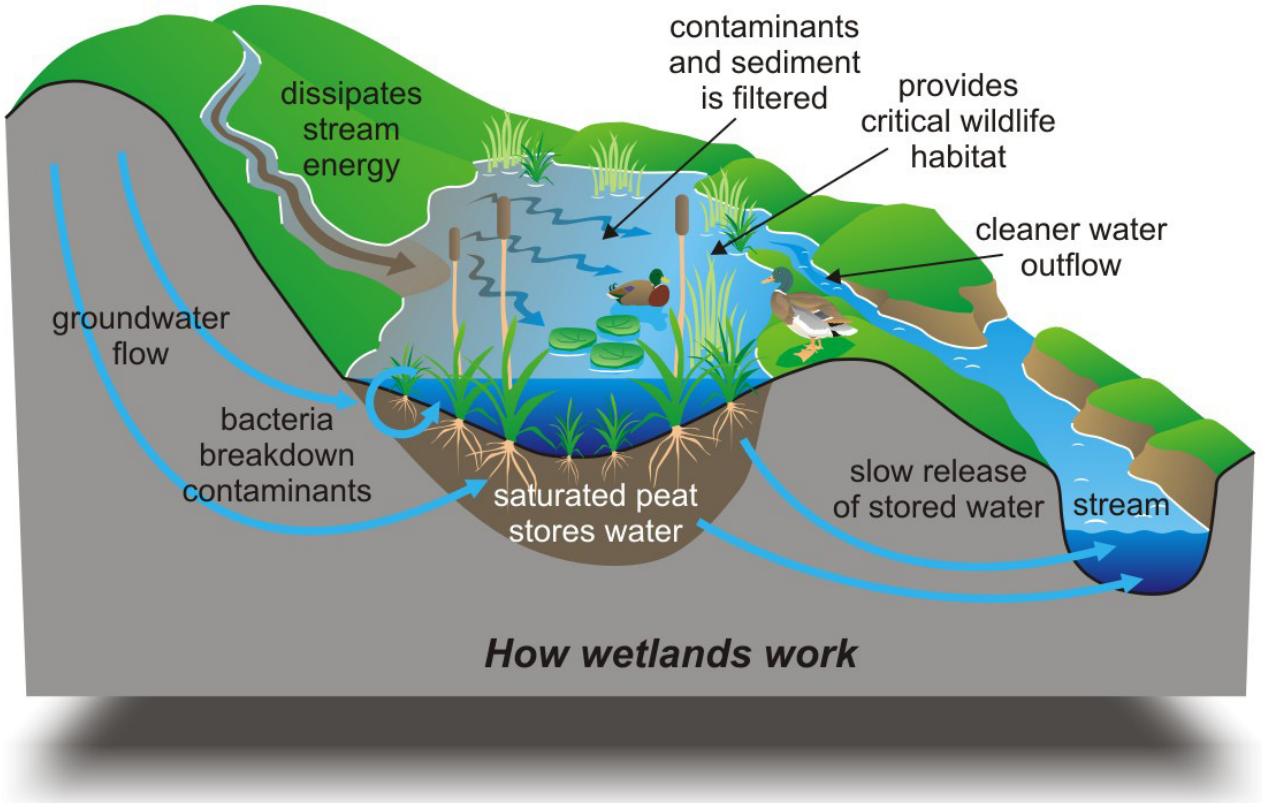


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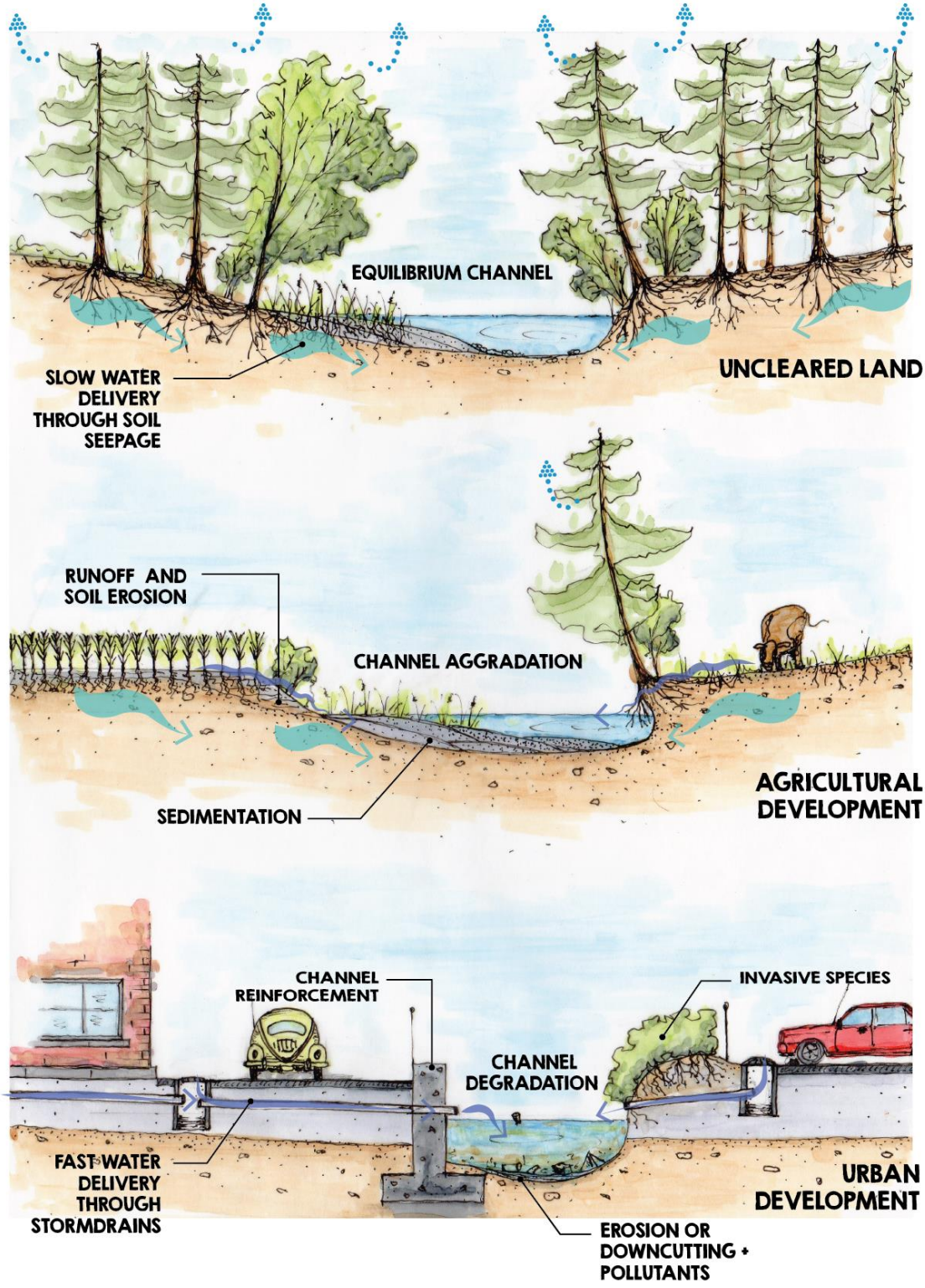
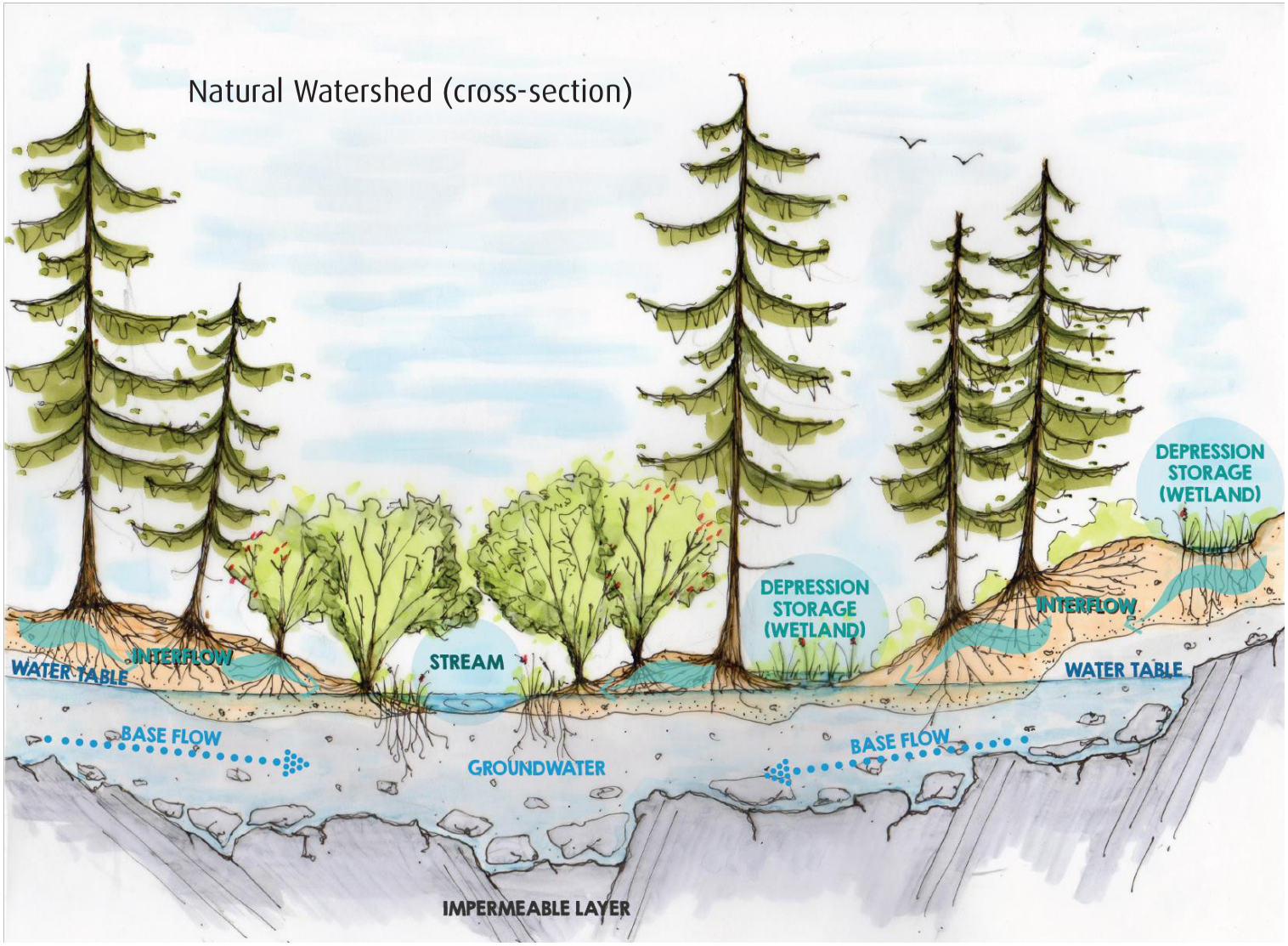
Image from the CRD Water in Our Community Learning Resource.

Creek Channel: Natural, Rural and Urban



Murdoch de Greeff Inc.

Rainwater and Watersheds



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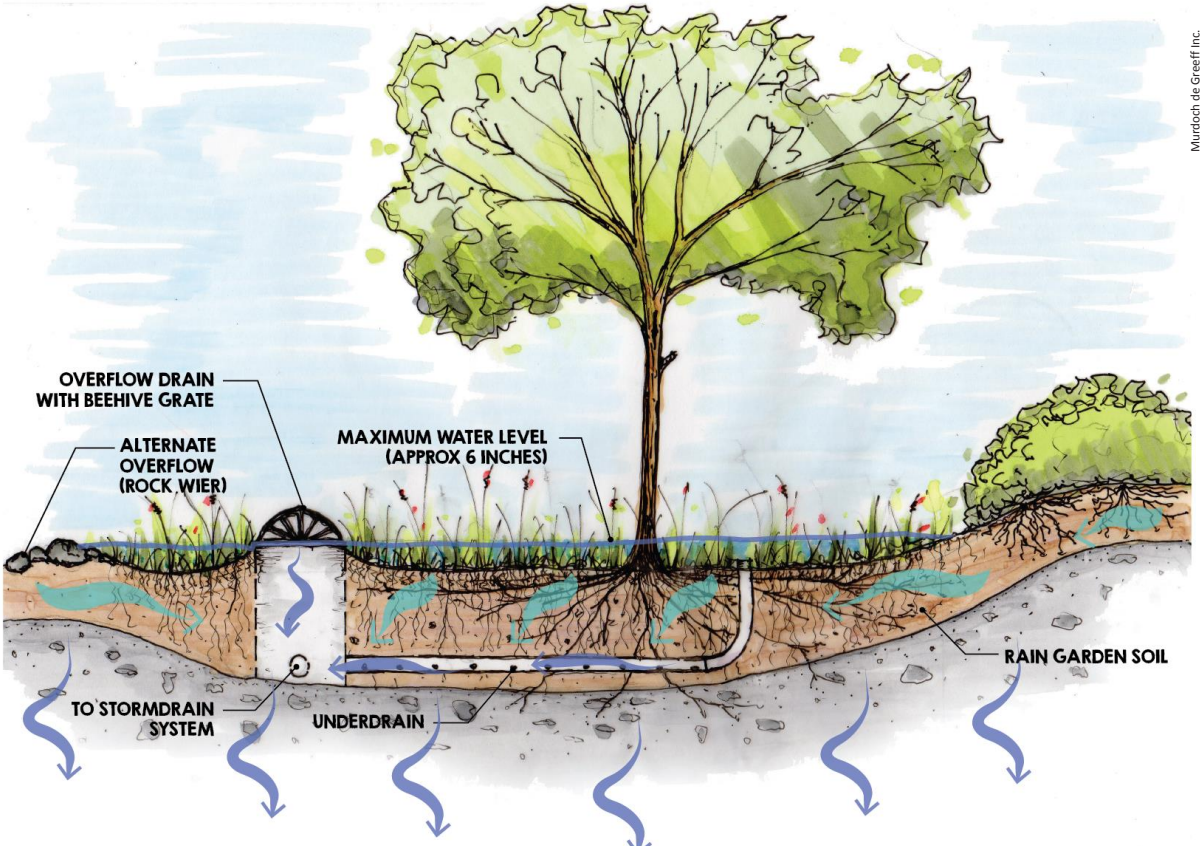
Rain Garden (cross-section)



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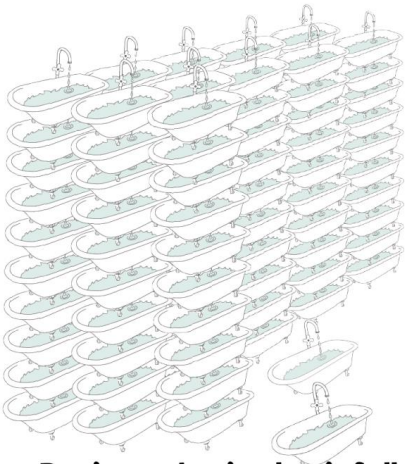
Rainwater and Watersheds

Murdoch de Greeff Inc.



During a typical rainfall (30mm/24hr) the volume of rain that falls on an average 1/4 Acre Lot could fill 112 Bathtubs.

Rainfall in 24 hours

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Rainwater and Watersheds

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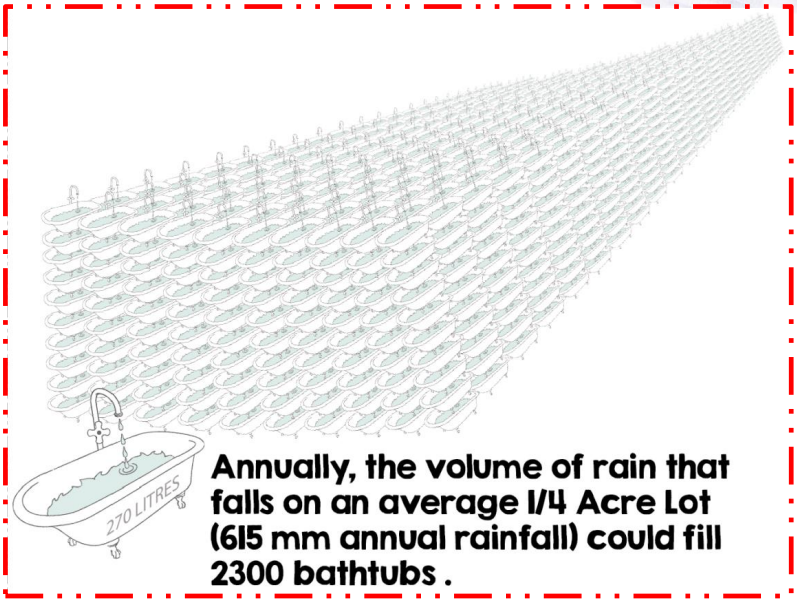

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Rainfall in Year

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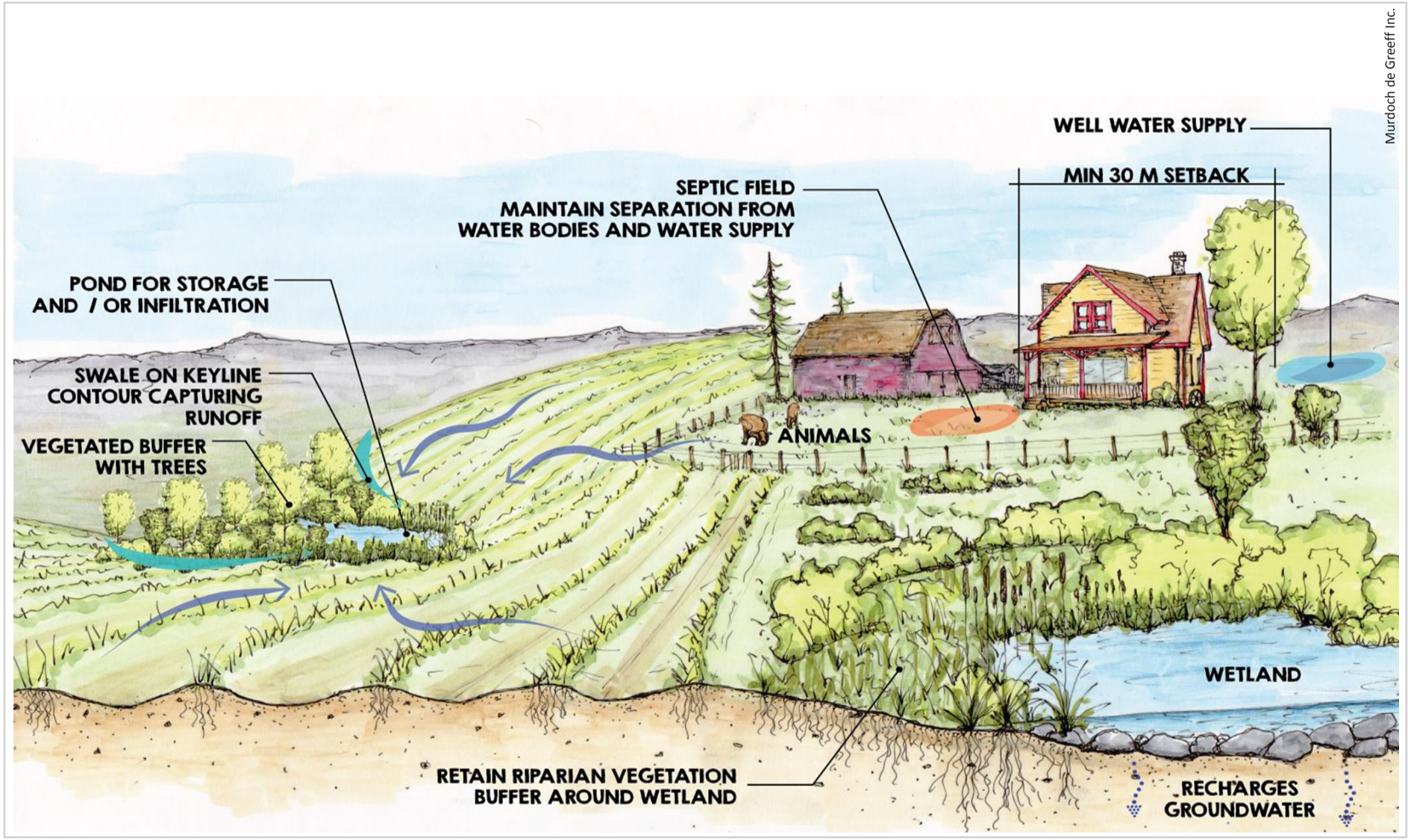
Rainwater and Watersheds



Rural Run-off

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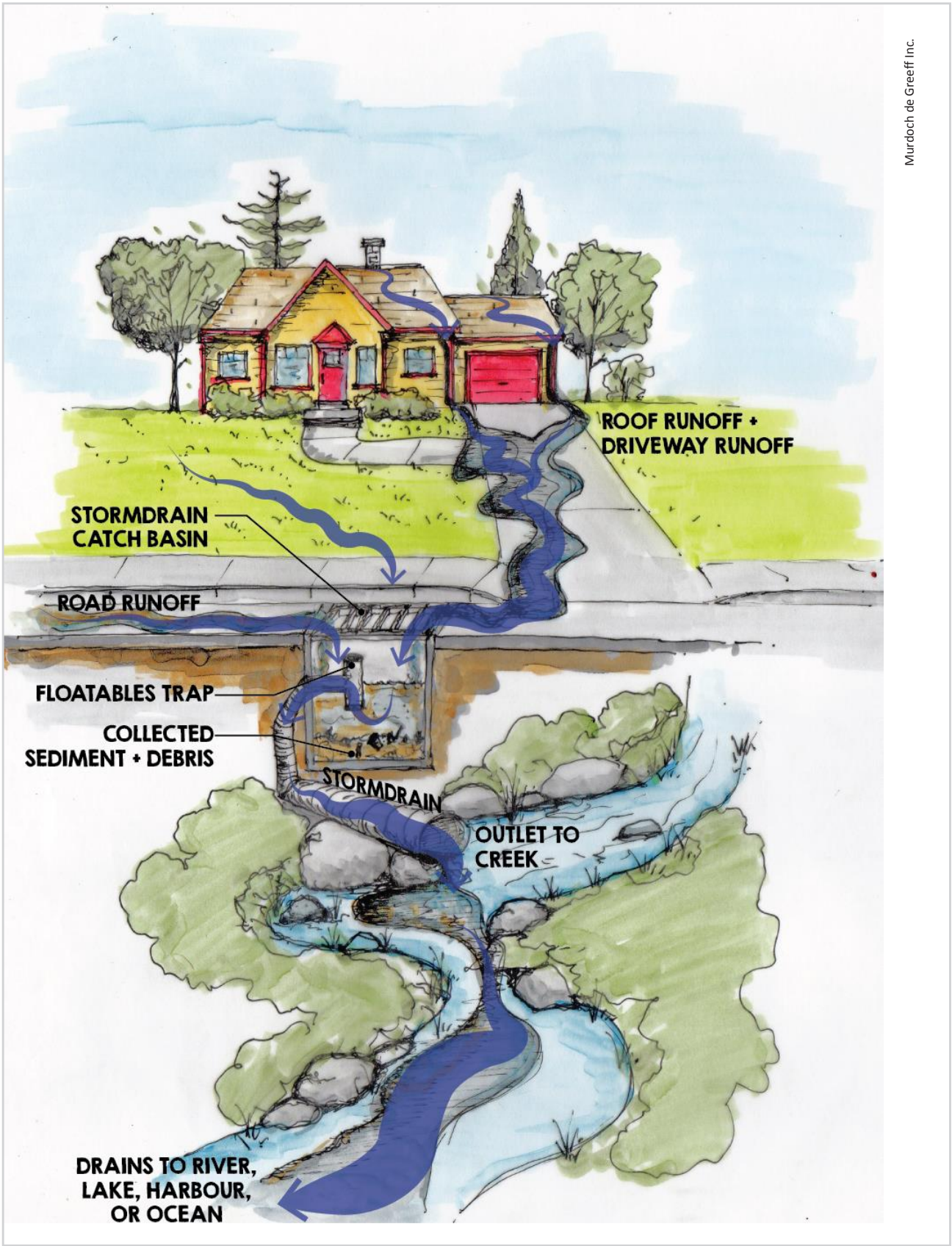

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Urban Run-off

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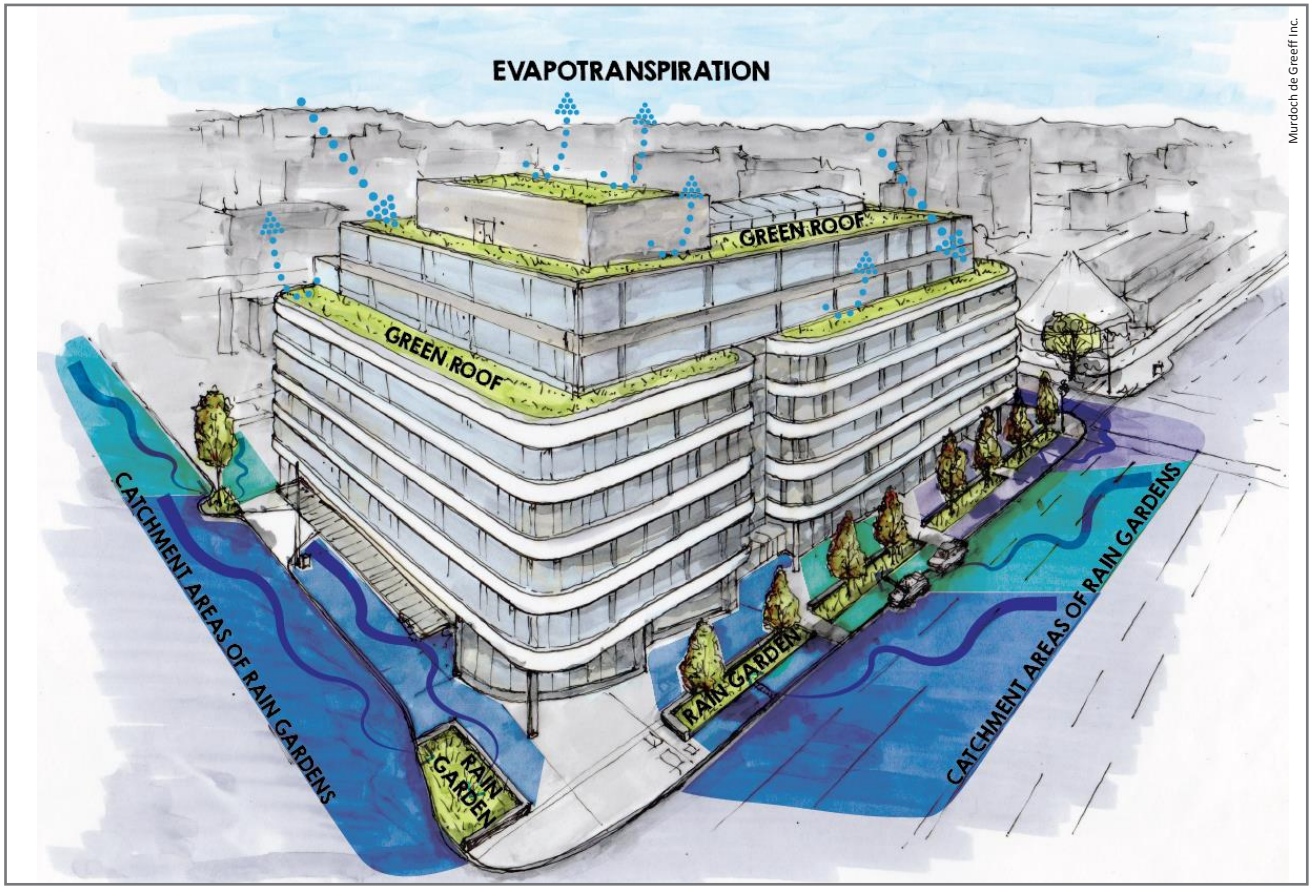
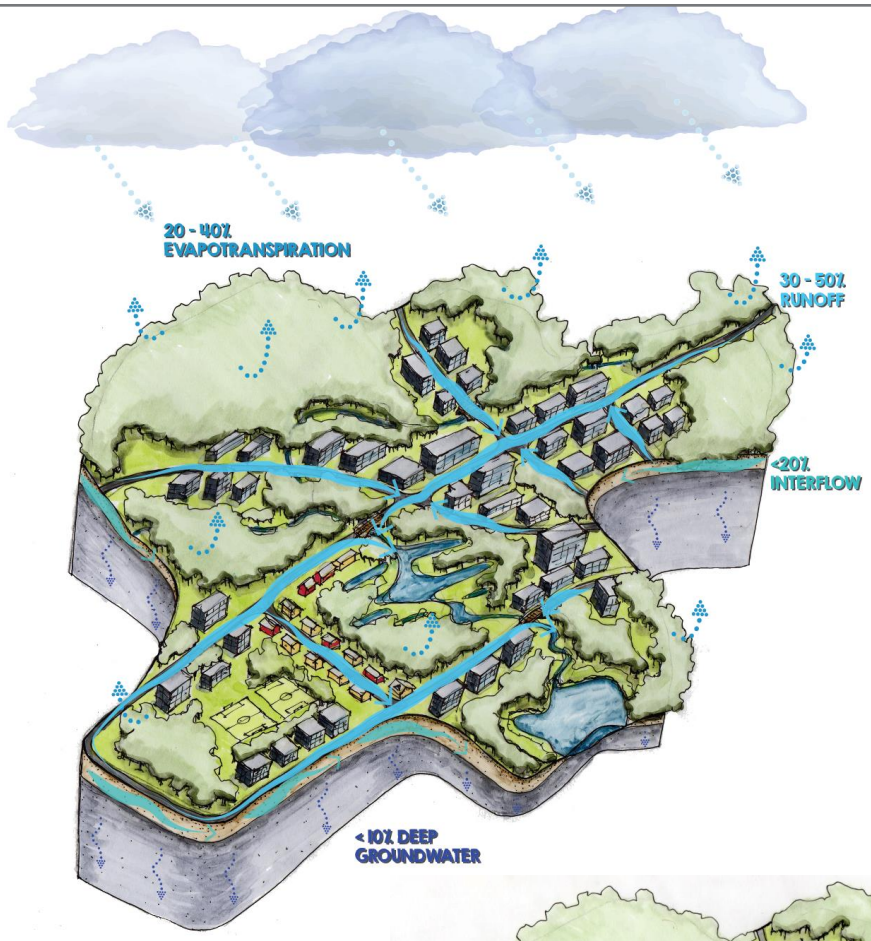
Rainwater and Watersheds



The Atrium, VIctoria BC

Rainwater and Watersheds



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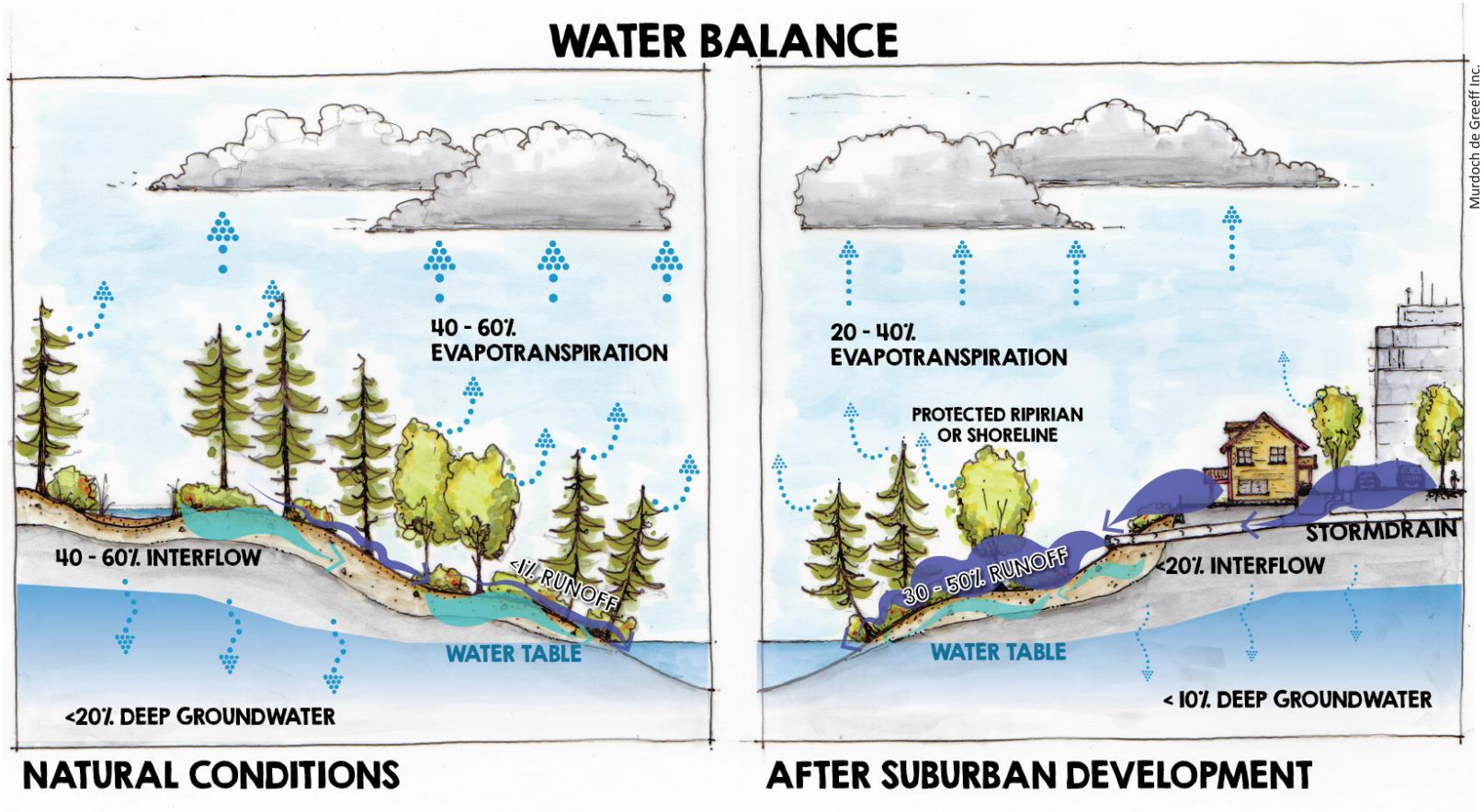
Urban Watershed (bird's eye view)



Water Balance (natural vs. urban)

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Lesson 5

Watershed:
Walking in your Watershed

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

CRD

Supported by: RBC Blue Water Project™

- Ecological literacy
- Critical and creative thinking

40 minutes (outdoors)

- Field trip permission slips
- First Aid kit
- cell phone
- camera
- whistle
- map and student list for parents drivers
- For each student:
- Student handout: *Walking our Watershed*
- pencil, clipboard, eraser
- light daypack with snacks and drinks
- weather appropriate clothing and footwear
- clipboard & pencil

How students can earn a watershed warden badge (see lesson 10)

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Lesson 5

Watershed: Walking in your Watershed

Purpose

- To experience the character of the creek/river
- To be explorers on a journey of discovery
- To understand a watershed flows downhill

Preparation

Note: This is an outdoor activity

- Use the CRD watershed maps to discover which watershed your school is in and flow diagrams to identify a nearby body of water. **www.crd.bc.ca/watersheds**
- Prepare field trip permission slips for the students.
- Coordinate parent volunteers as drivers or chaperone walkers.
- Remind students to dress for the weather, bring footwear suitable for hiking and the weather and some snacks and drink if it is to be a long outing.
- Be sure the creek/river is not in dangerous flood when you go.

Background Information: Watershed Walks

As this is a discovery activity, it is not important at this point for students to understand the concept of a watershed. Watershed walks can be in a watershed at any state: urban, rural or natural. You may not be able access or find a creek or a shoreline, but you are still in a watershed and can assess the land use cover. If there is no creek, nearby where is all that water going? Storm drains!

Vocabulary

- **Headwaters:** The ultimate starting point of a creek/river system – the source waters.

Procedure

1. Use the CRD watershed maps to discover which watershed your school is in. **www.crd.bc.ca/watersheds**
2. Prior to heading out set the stage for curiosity and imagination to be kindled. For example, you might use the context of early explorers:

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"Imagine the early explorers who came this way. They had never been where they were wandering. They too often followed rivers to travel through the country. We are off on a trip of exploration to discover the creek. What are some things to be mindful of while we are out? "

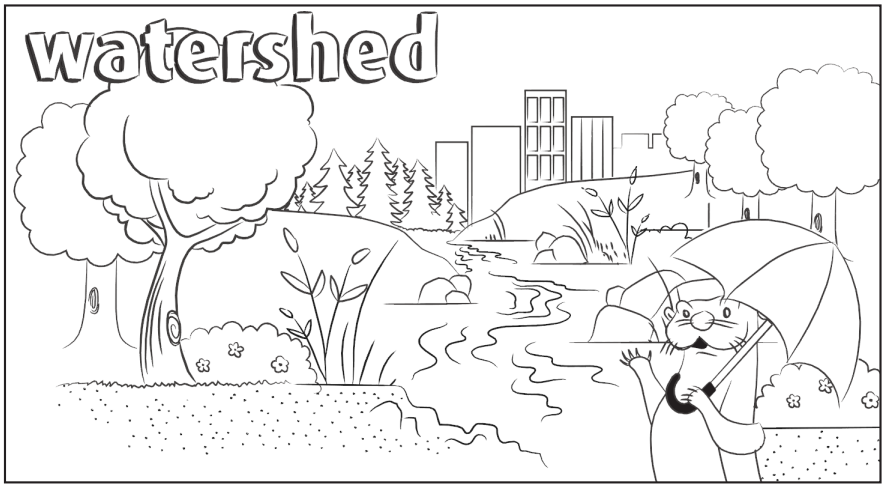
3. Review rules of conduct with the students before heading out with parent drivers/walkers.
4. Have a map ready for the parent drivers.
5. Exchange cell phone numbers.
6. Organize the students into groups each with a parent driver/walker.
7. Offer a list of the students in the group to each parent driver/walker.
8. Review: While walking, you will walk on various surfaces. Ask students "will the rain soak in?" When on impervious surfaces (roads, sidewalk, pathways), jump with students on the spot and say aloud "impervious... impossible", precipitation cannot soak into these surfaces. On pervious surfaces (e.g. grass, soil) jump softly and whisper "pervious... possible".

Watershed Walk:

1. Watershed walks can start anywhere, as we are always in a watershed. Once at the designated starting point of the creek exploration, organize the students into their respective group and parent.
2. Remind parents that they are supervisors to the students in their group.
3. Determine who will lead (teacher or resource person) and who will be at the end of the class.
4. At different places, have students stop to record their observations.
5. Stop for snacks and drinks at an opportune time and place.

Reflection/Discussion:

1. Ask for overall impressions and feelings of the exploration.
2. How do you feel after the exploration?
3. Was it different from what you were expecting and how?
4. What is your main comment about your experience exploring the watershed or creek's journey?
5. Follow up with Lesson 6: Mapping our Watershed



Extentions and Adaptations

1. Repeat the watershed walk during different weather conditions and/or seasons. Have students log their observations for comparison.
2. **Is the stream near your school piped underground?**
   - Walk the route that stream flows as best you can, given current development.
   - Discuss where it flows, what obstacles (e.g. streets, buildings) have been built over top.
3. Students can make and carry a banner, fish or a canoe to highlight how much of the stream has been altered by development. This can help raise community awareness during your field trip. Useful resources for this activity include:
   - **Lost Rivers of Victoria Map**

     www.crd.bc.ca/watersheds
   - **Lost Rivers Documentary**

     A copy is available through the CRD. Watch the trailer:

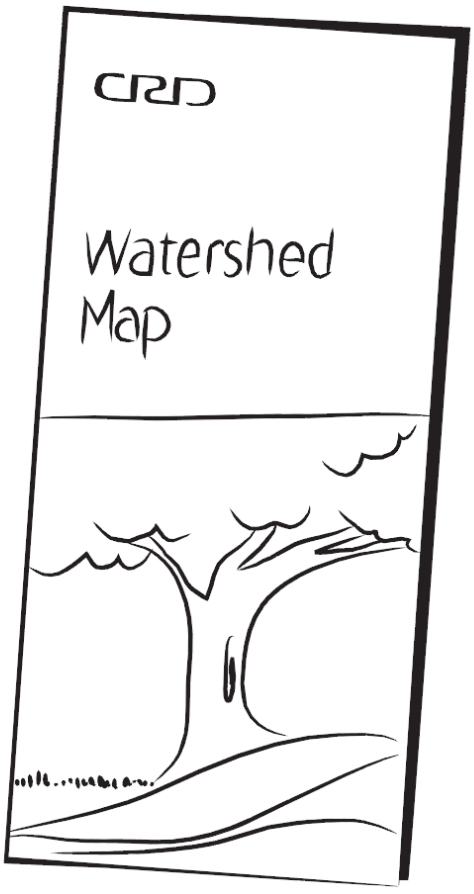
     http://vimeo.com/50839044

Teacher Resources

CRD Watershed Maps, Diagrams & Other Images

Download or view regional watershed maps, flow diagrams and other useful images:

www.crd.bc.ca/watersheds



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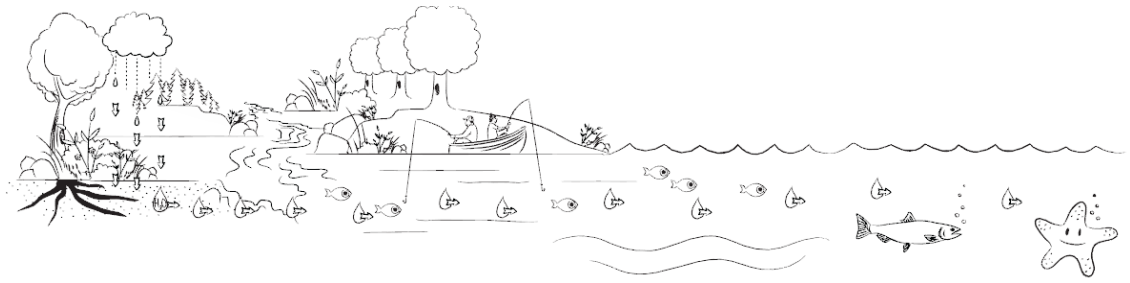
Rainwater and Watersheds

Name: _____ Date: _____

Walking our Watershed

My exploration observations:



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Rainwater and Watersheds

Name: _____ Date: _____

Walking our Watershed

Draw and write about the part of the watershed you walked

Where did the rain go?

_____

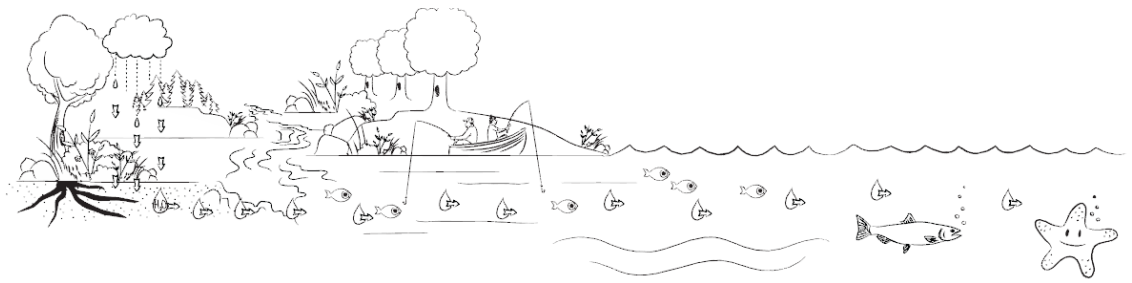
What did it look like? Was there anything in it?

_____

_____

Did you find a creek?

_____



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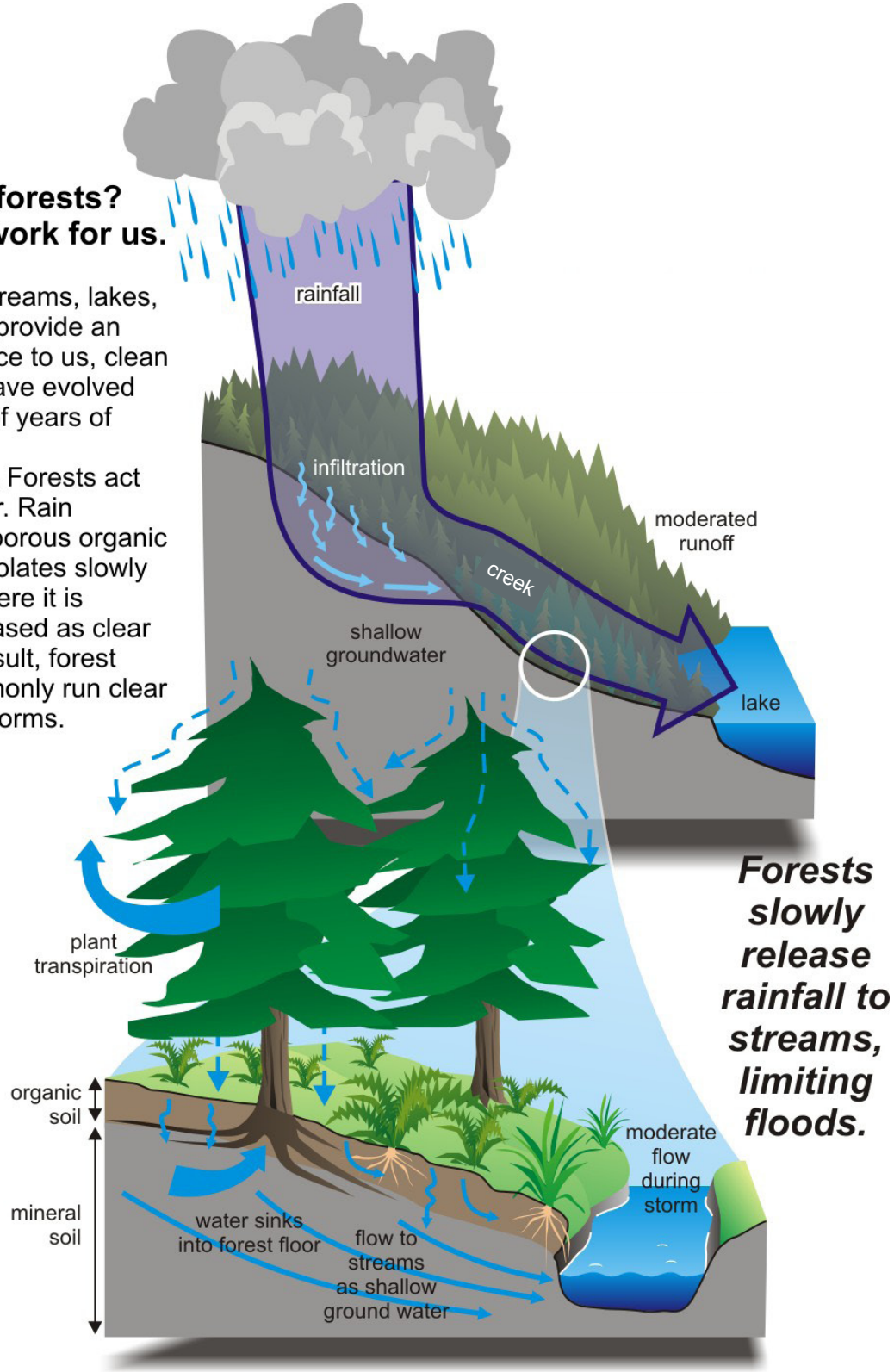
Rainwater and Watersheds

Hi-tech forests? How they work for us.

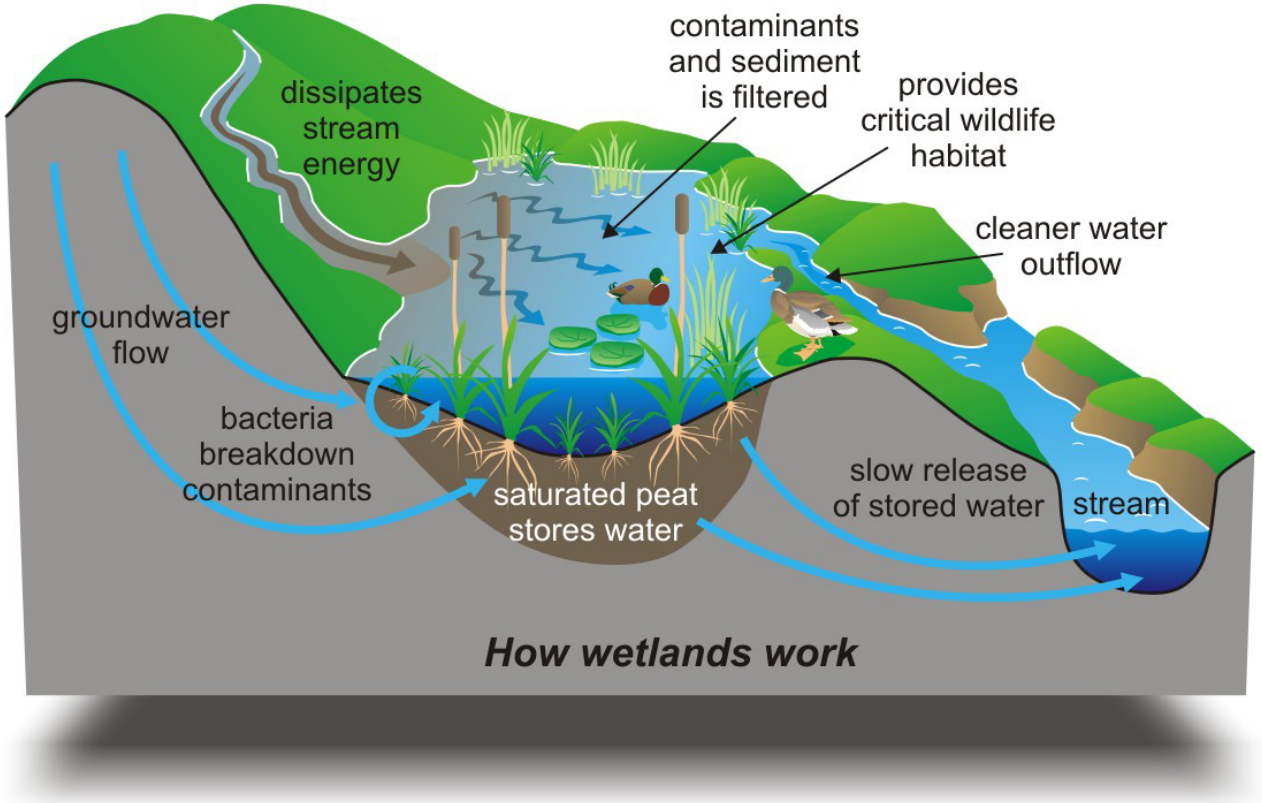
Our forests, streams, lakes, and wetlands provide an amazing service to us, clean water! They have evolved over millions of years of "research and development". Forests act as a giant filter. Rain infiltrates the porous organic soils and percolates slowly to streams where it is gradually released as clear water. As a result, forest streams commonly run clear even during storms.



Forests: Most rainfall becomes shallow groundwater

Wetlands: nature's sponge and filter

Wetlands swamps, marshes, bogs, and fens provide many services. They filter stream waters, store water, and offer critical habitat for many plants and animals. Wetlands fill with water during rains and slowly release water through droughts. Before we understood their critical role, we used to ditch and drain wetlands to create lawns, pastures, or farms.



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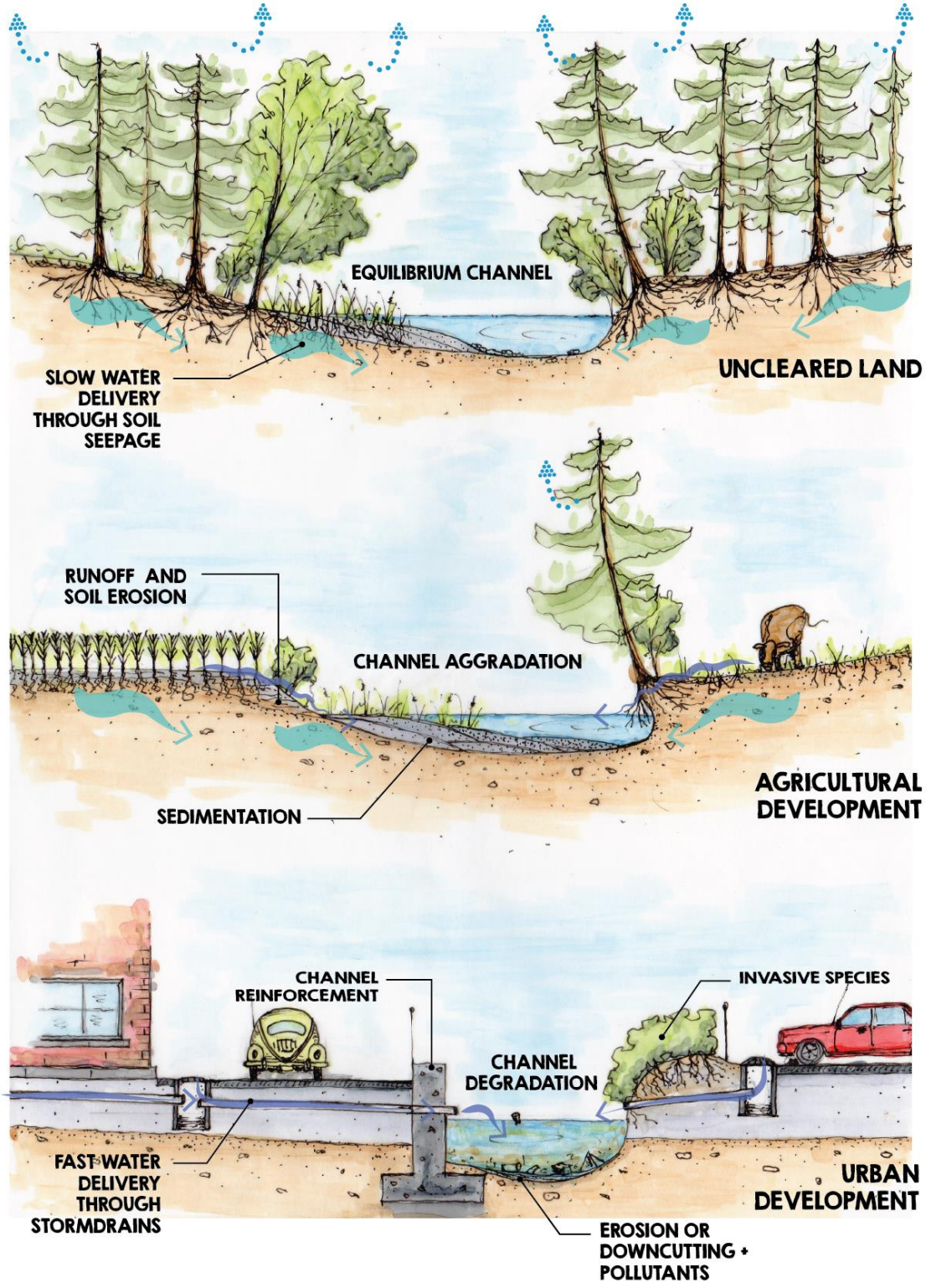
Creek Channel:
Natural, Rural and Urban



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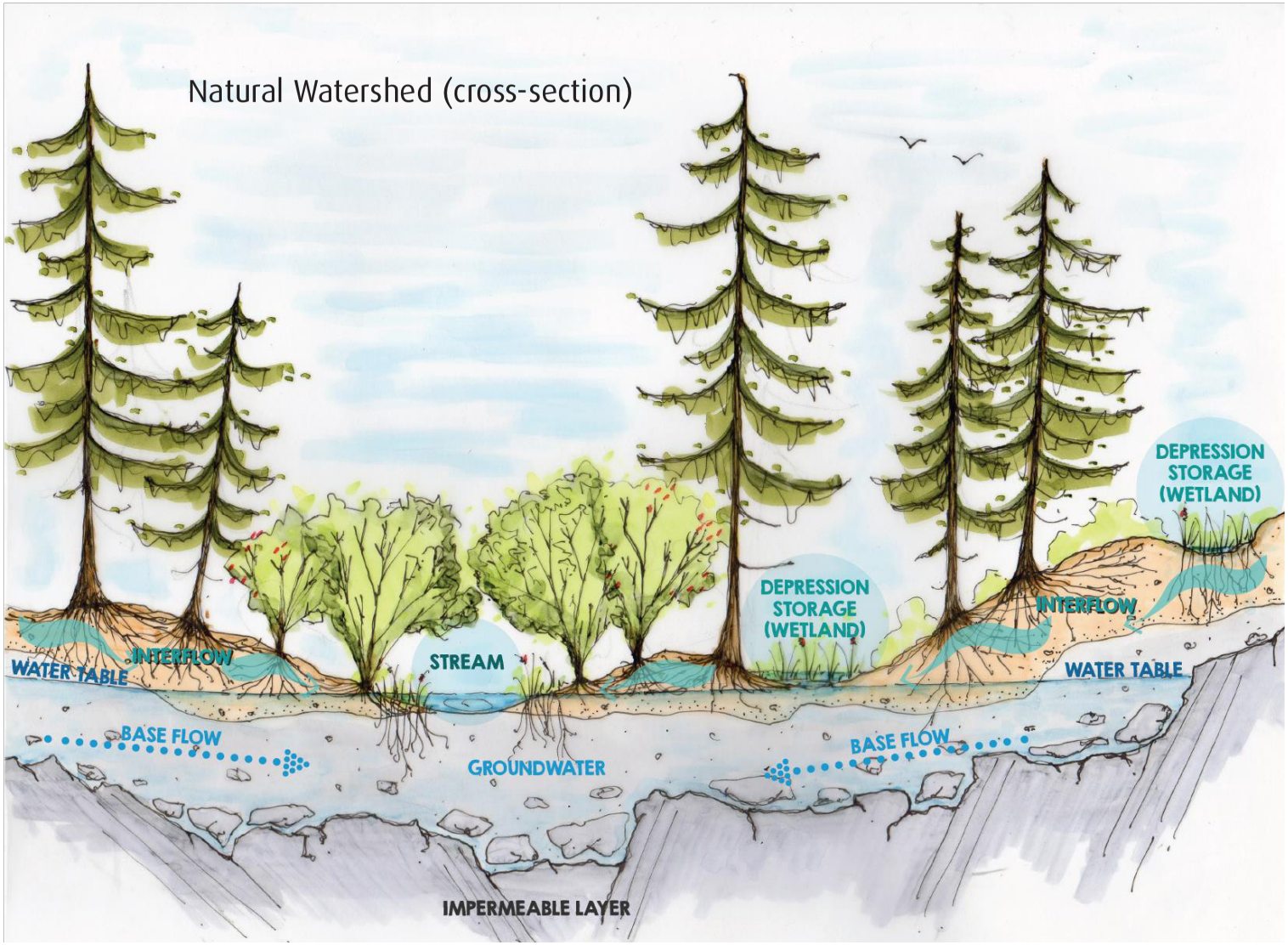
Rainwater and Watersheds



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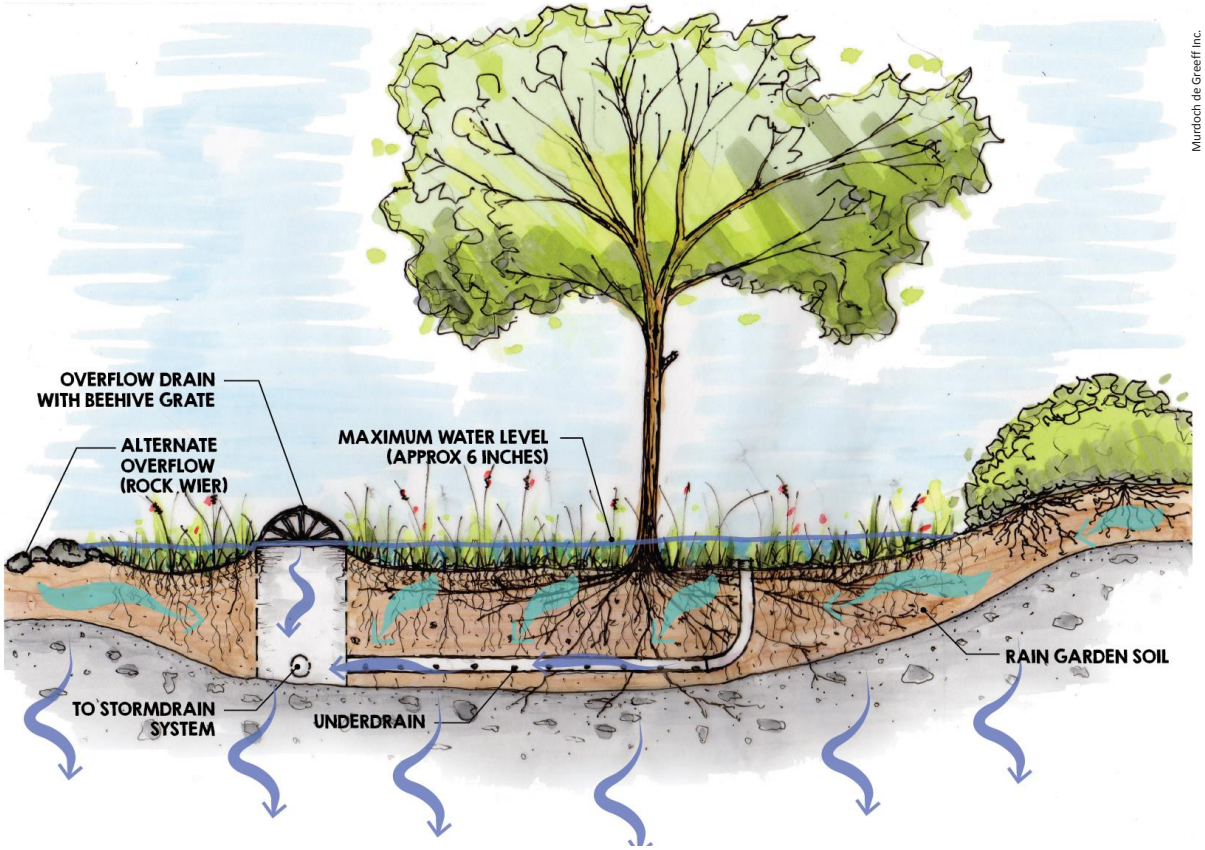
Rain Garden (cross-section)



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Rainwater and Watersheds

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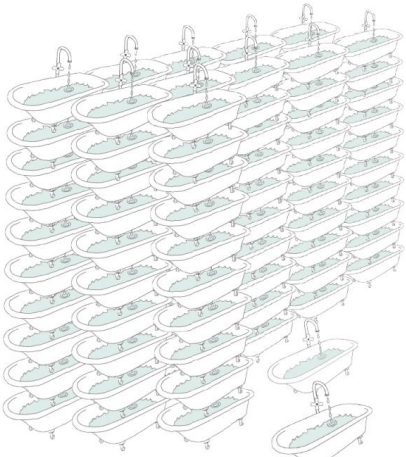

During a typical rainfall (30mm/24hr) the volume of rain that falls on an average 1/4 Acre Lot could fill 112 Bathtubs.

Rainfall in 24 hours

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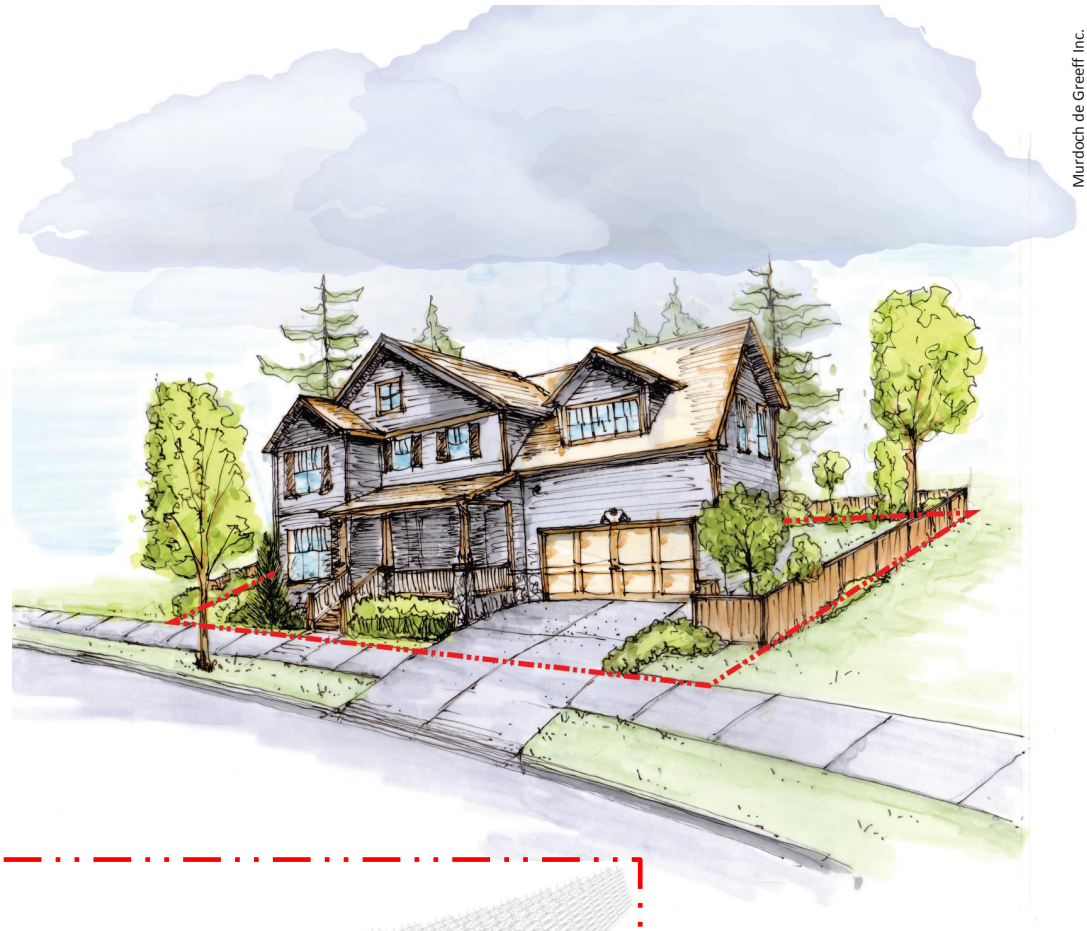
Rainwater and Watersheds



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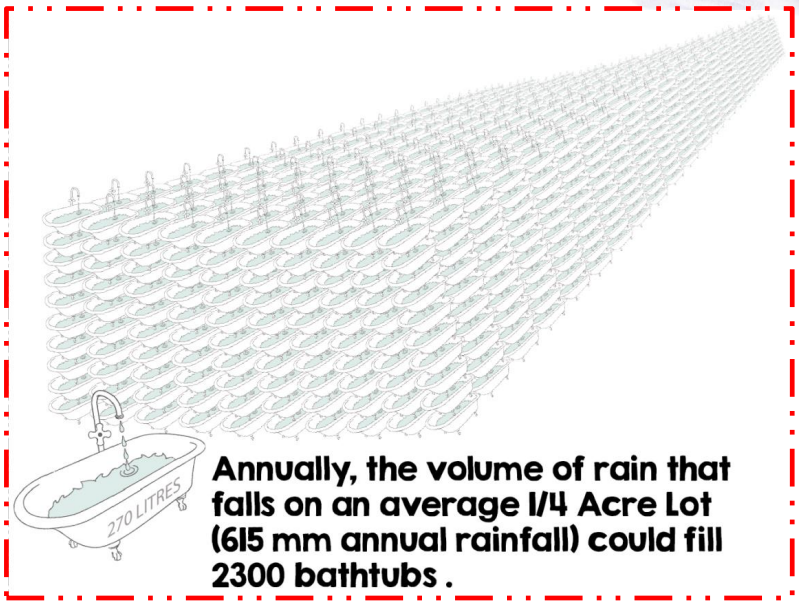

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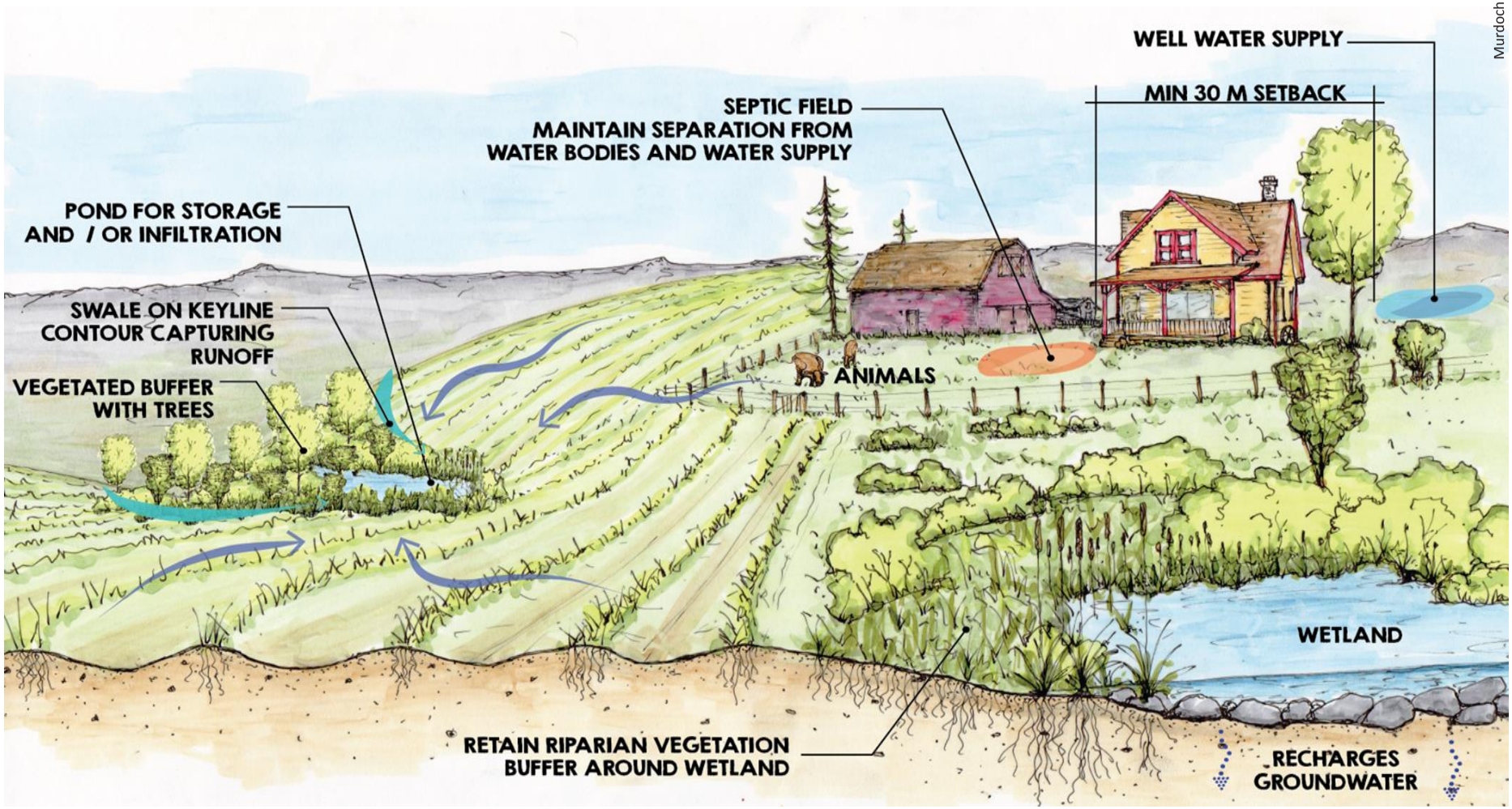
Rainfall in Year

Rainwater and Watersheds



Rural Run-off

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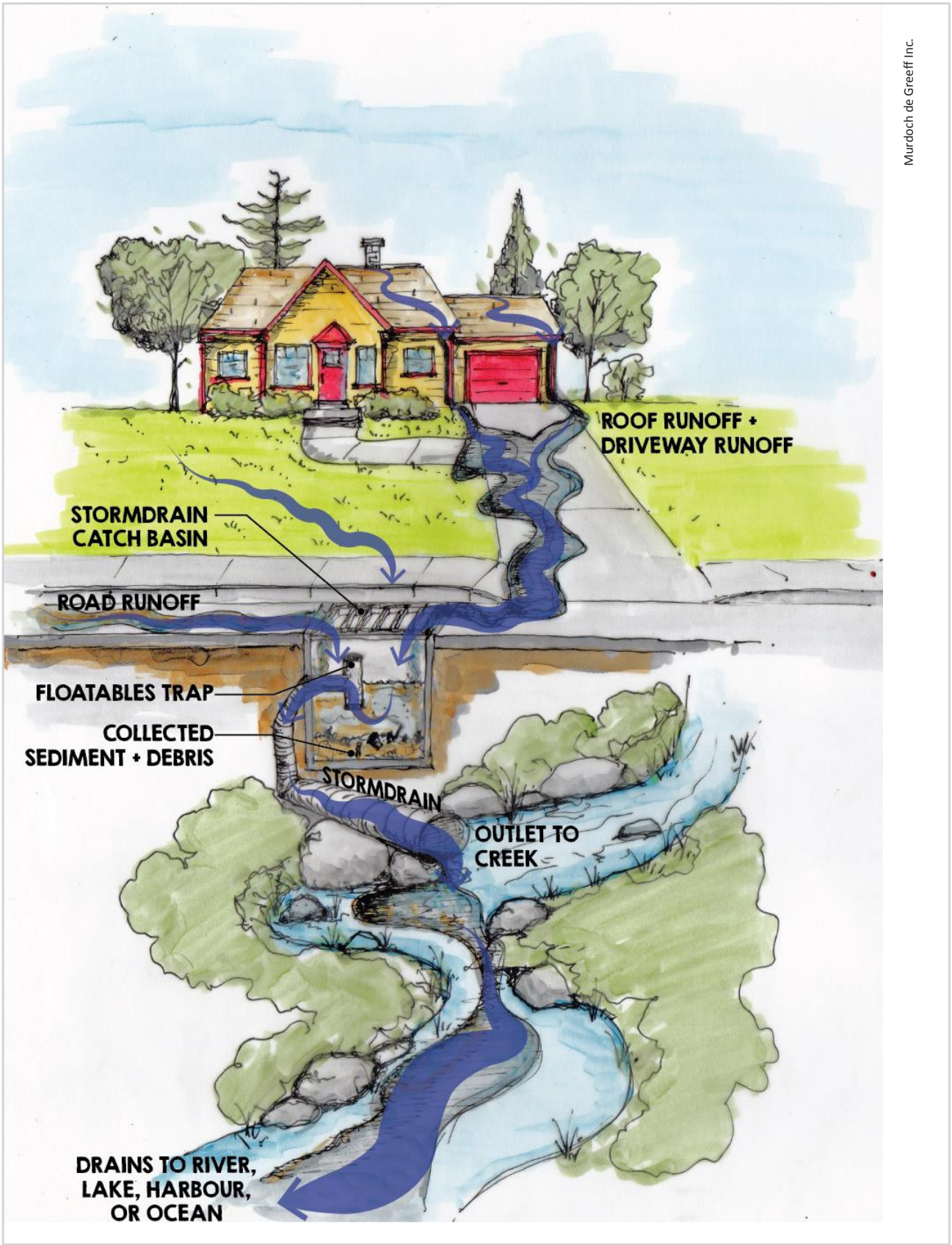

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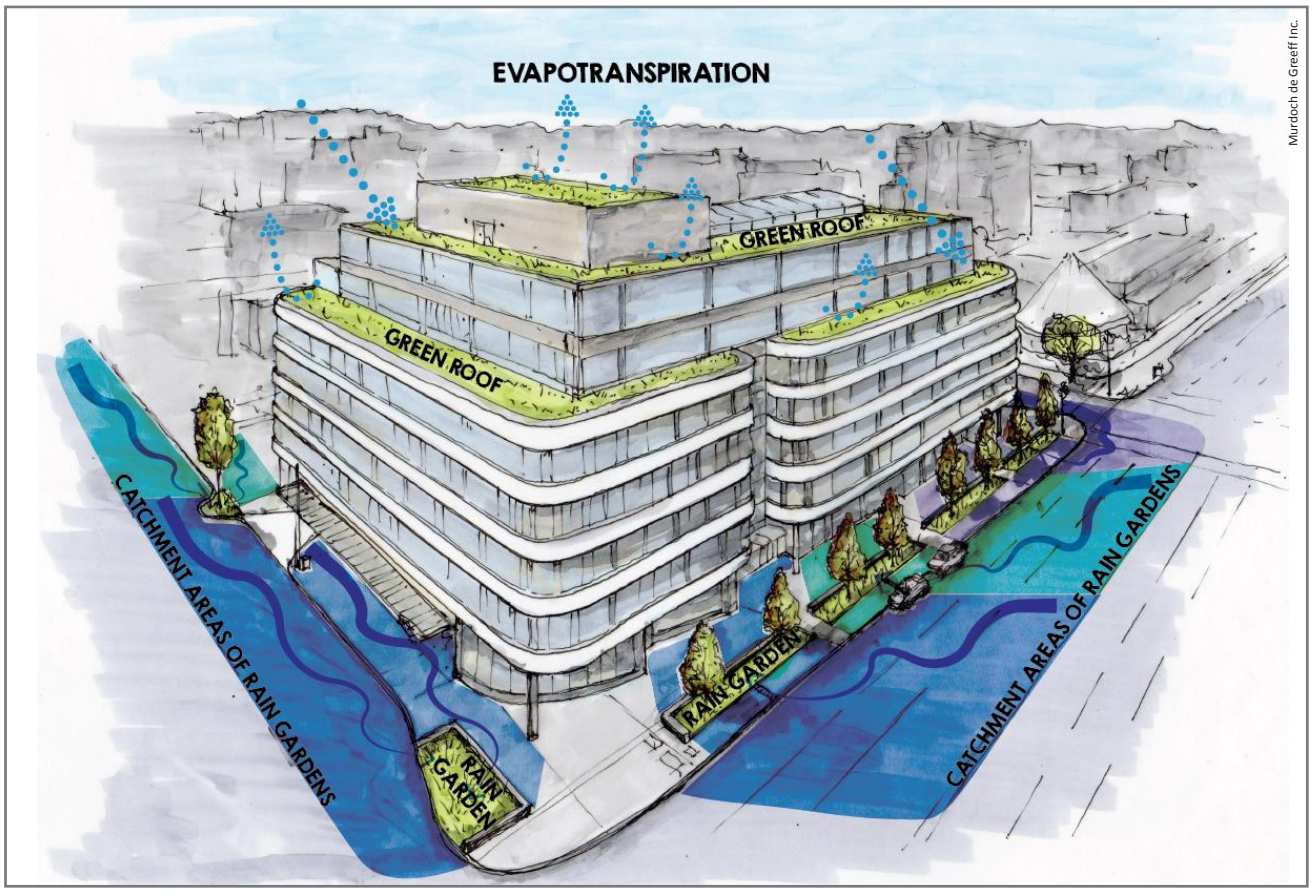
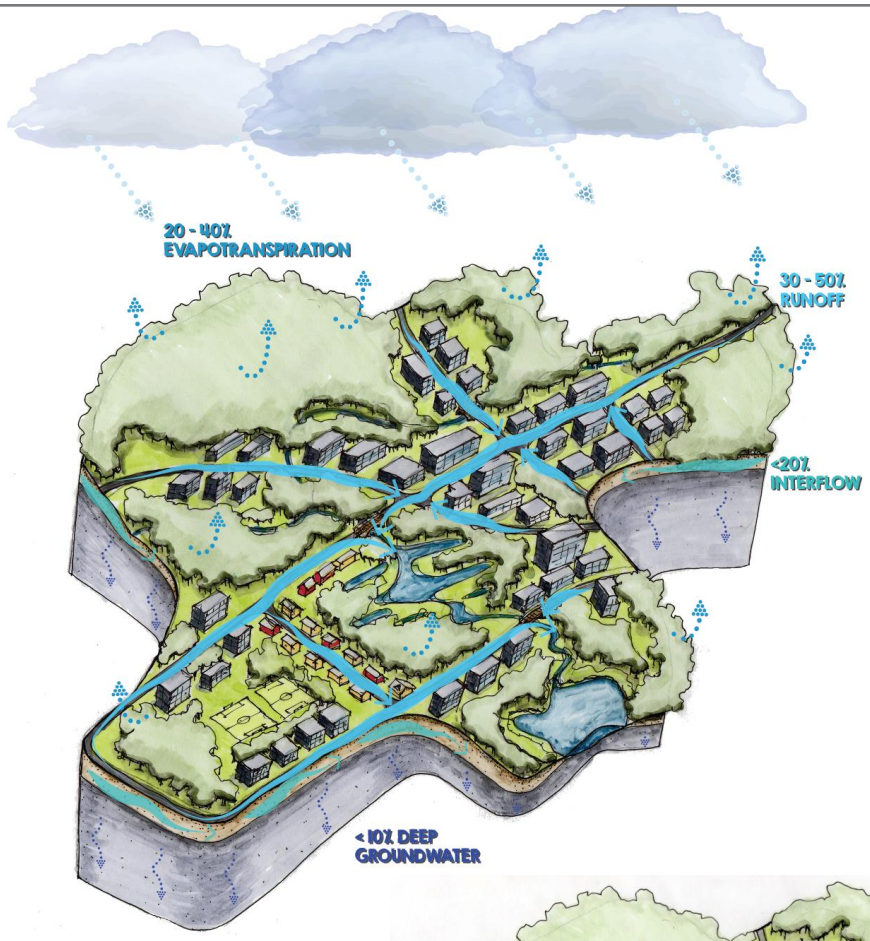
Urban Run-off



The Atrium, VIctoria BC

Rainwater and Watersheds



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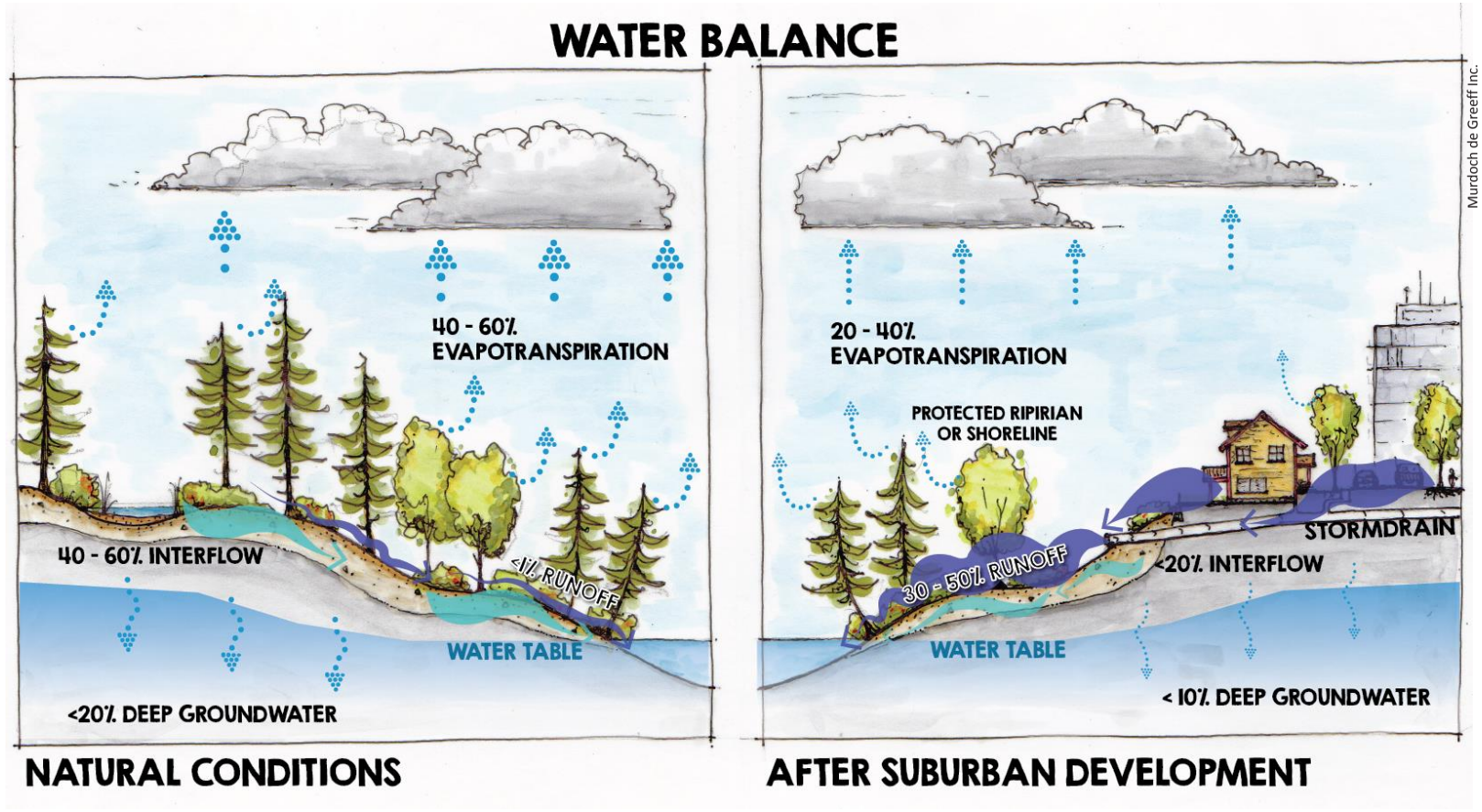
Urban Watershed (bird's eye view)

Rainwater and Watersheds



Water Balance (natural vs. urban)

Lesson 6

Watershed:
Mapping our Watershed

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

Supported by:

Lesson 6

Watershed: Mapping our Watershed

- Ecological literacy
- Critical and creative thinking

45 minutes x 2 classes

- 11″ x 17″ paper for drawing (1/student)
- pencils
- colouring pencils or markers
- examples of maps

How students can earn a watershed warden badge (see lesson 10)

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Purpose

- To transfer the kinesthetic experience of hiking and exploring the creek's watershed to a 2-dimensional map on paper
- To create a visual representation of the creek in the context of the watershed
- To establish what is personally important for marking on the map

Preparation

- Complete Lesson 4: Walking in your Watershed, even immediately after coming back from walking in your watershed.

Procedure

1. Start drawing the map following the expedition exploring the your local watershed and/or creek's length.

Watershed Mapping

1. Introduce mapping to students:
   - A map should **orient** the reader to a place. Offer some examples of handcrafted maps.
   - Recall with the students their walk along the creek. What are some of the important **landmarks** along the way that come to mind?
   - Make a class list of these features.
   - A map needs a **legend** or key to explain things to the reader. Offer an example of a legend, with symbols and definitions (this may well match the list of features, above).
   - A map needs a **title**.
   - A scale is also useful, and an orientation to north, if possible.
2. It can be challenging to transfer a 3-D experience to 2-D.
   - Offer suggestions as to where a good starting point on the paper would be for the creek to begin, and where a good place for the creek to end would be (i.e. in what part or corner of the paper). Then students can place their important features along

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the creek length as they encountered them. Working in pencil first is also a good idea.

- Depending on the expedition along the creek, it may serve as a good suggestion that students orient their drawing on the map with the creek in the upper left corner of the longest edge of the paper and then flow down (starting at the headwaters).
- CRD Watershed Maps depict the different areas by colour such as buildings and roads (red); agriculture (yellow); forest (dark green); lakes and creeks (dark blue); wetlands (light blue).

Reflection/Discussion:

1. Once complete, ask for volunteers to present their map.
2. Afterwards, dialogue as a class on the features of the creek that stood out the most.
3. Display all maps.

Extentions and Adaptations

1. Create an electronic community map for your school using VUE free software.
   http://mapping.uvic.ca/vue-how-to
2. *Islands in the Salish Sea, a Community Atlas*
   Harrington and Stevenson (eds). 2005. The Land Trust Alliance of BC. TouchWood Editions, Surrey, BC.

Teacher Resources

Uvic Community Mapping

http://mapping.uvic.ca

CRD Community Green Map

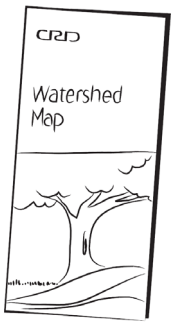
http://crdcommunitygreenmap.ca

GreenMap

www.greenmap.org/greenhouse/participate/youth_intro

Mapping our Common Ground: a community and green mapping resource guide

www.greenmap.org/images/mcg_promo_lores.pdf



Rainwater and Watersheds

Sample Student Watershed Map

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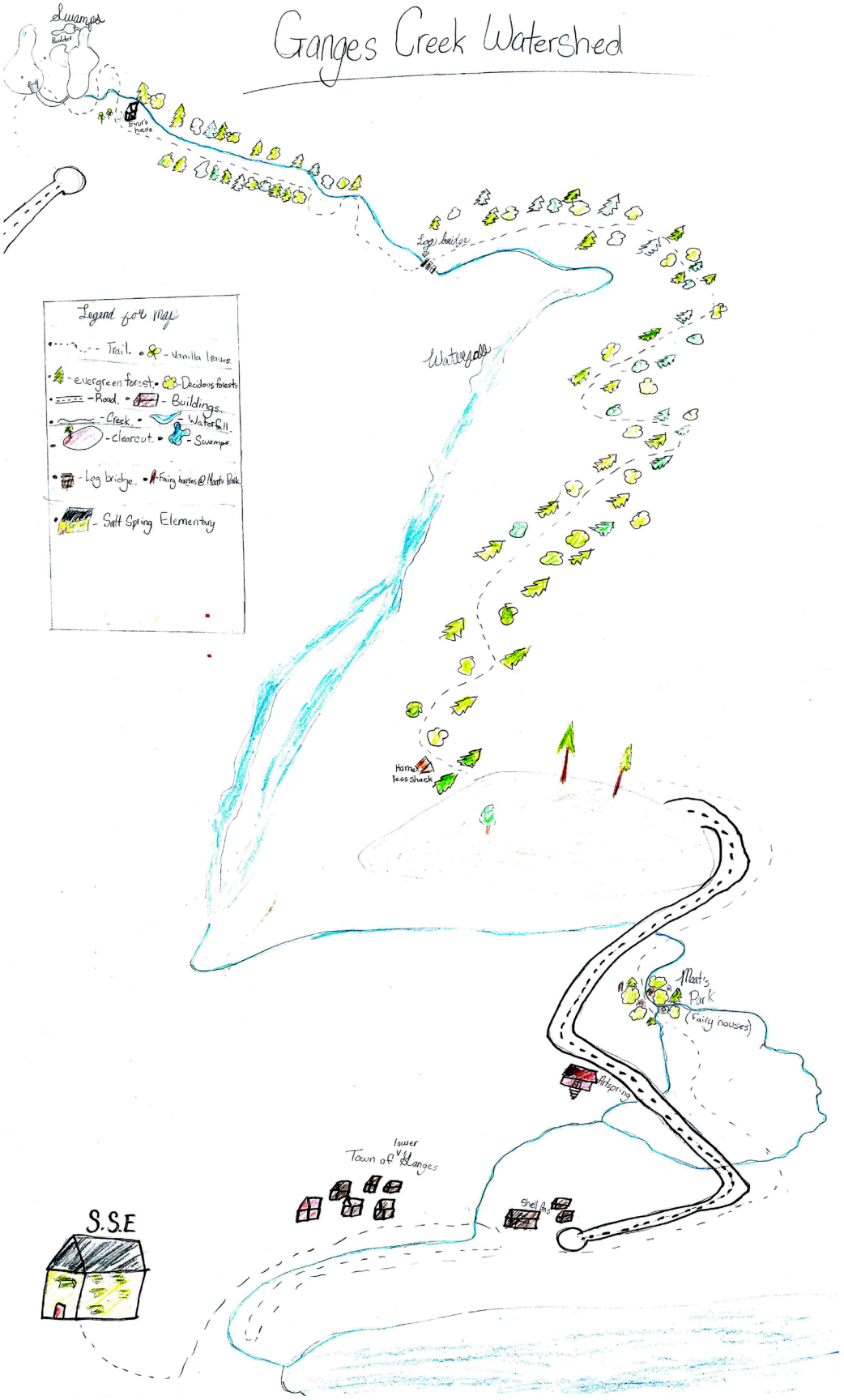
Rainwater and Watersheds



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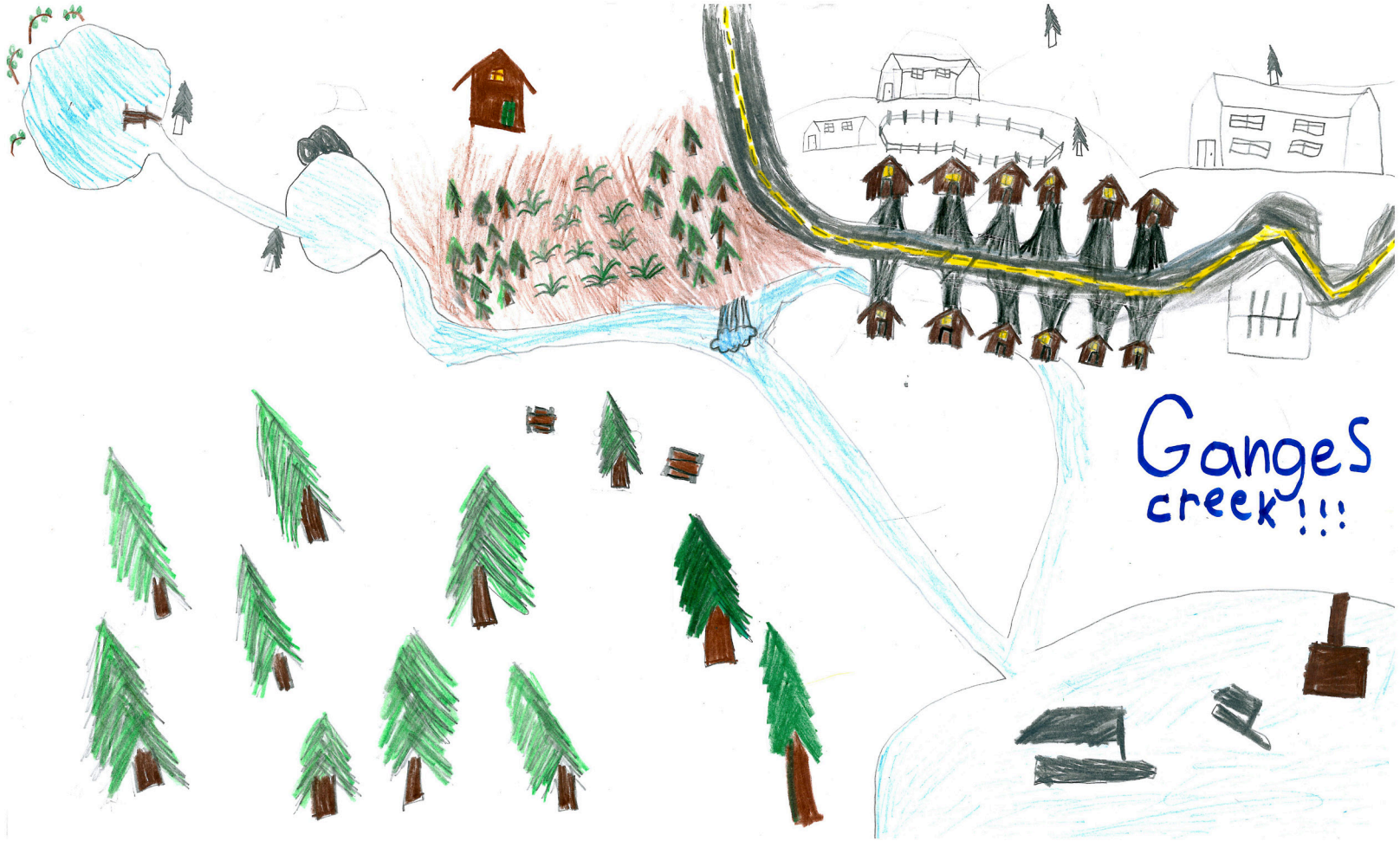
Rainwater and Watersheds



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Lesson 7a

Watershed:
Moving in a Watershed?

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

Supported by:

Lesson 7a

Watershed: Moving in a Watershed

- Critical and creative thinking

45 minutes (outdoors)

15 minutes to draw

20-30 minutes for the activity

- sidewalk chalk
- diagram of 4th order river
- CRD watershed flow diagrams

How students can earn a watershed warden badge (see lesson 10)

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Purpose

- To kinesthetically experience a watershed as a drop of water
- To understand the network of tributaries in a river system in forming a watershed
- To understand the shape of the land defines a watershed

Preparation

- In advance (or with students), draw a watershed on an asphalt surface in the school yard with sidewalk chalk. If there is a slope use that. See Procedure section for instructions.
- Prepare your watersheds's flow diagram and the following videos:
  - What is a watershed?
  - How we have changed our watersheds

  www.crd.bc.ca/watersheds

Background Information

A watershed is an area of land in which all water eventually drains into the same river, lake or water body. A sub-watershed can be part of a main watershed. Watersheds come in all shapes and sizes.

The streams in a watershed are ordered based on the streams that merge together, if any, to form the stream at that part of the watershed. For example:

- 1st order streams are the headwaters with no tributaries of their own
- 2nd order streams form when two 1st order streams merge
- 3rd order rivers form when two 2nd order streams, etc.

Vocabulary

Watershed: an area of land in which all water eventually drains into the same river, lake or water body. A small watershed can be part of a bigger watershed.

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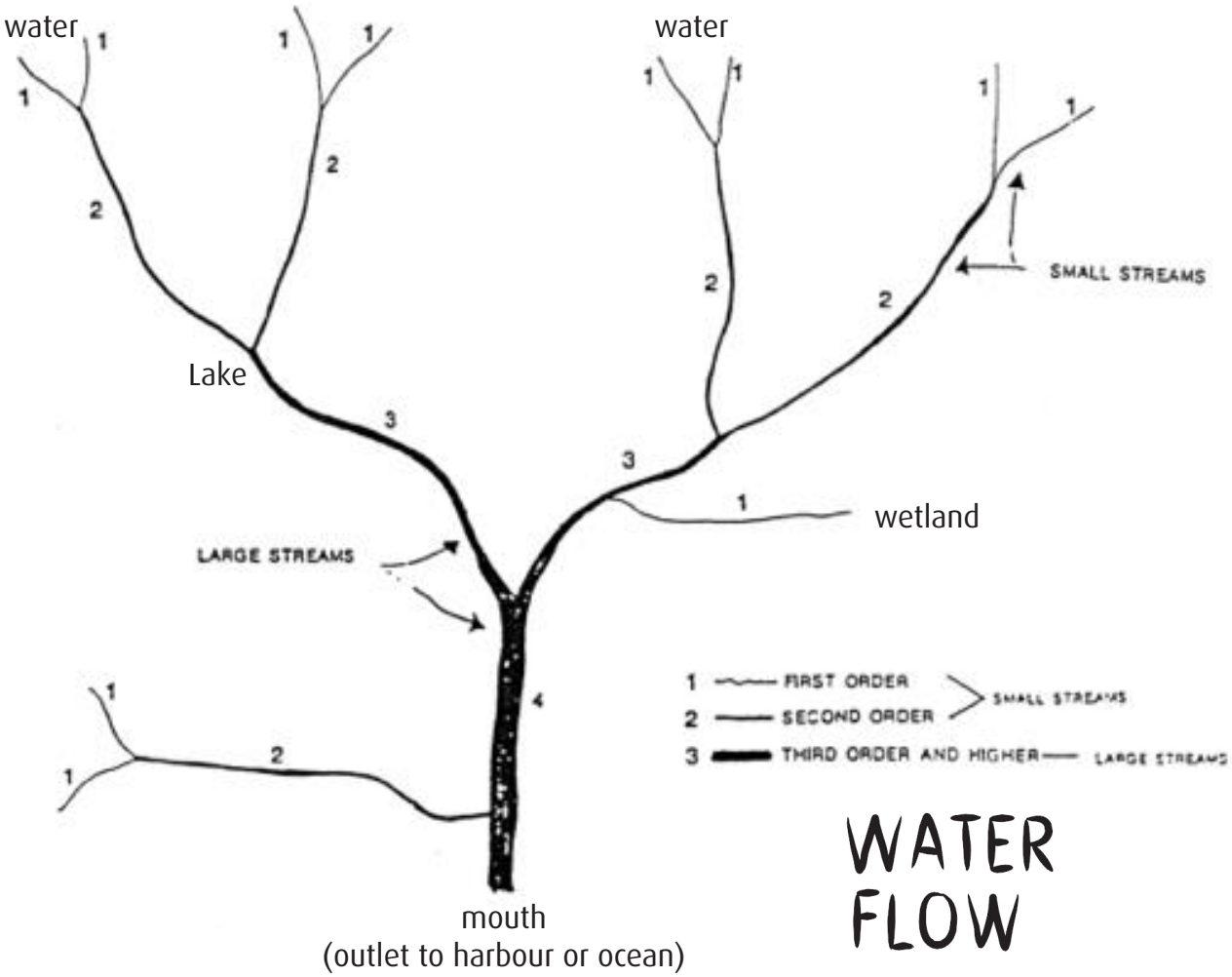
Procedure

Game Set-Up: Drawing a watershed

1. With sidewalk crayon or chalk draw a 4th order river on an asphalt surface. (See diagram below)
2. Using CRD watershed flow diagrams draw your watershed. Use a different colour to designate a different order of stream. For example:
   - Green – 1st order
   - Yellow – 2nd order
   - Red - 3rd order
   - Blue – 4th order.
3. Start drawing the watershed at the bottom (or mouth of the river) and draw up into the watershed, so to speak.
4. (optional) Draw a second watershed from the CRD flow diagrams for comparison.



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Rainwater and Watersheds

Introductory Discussion:

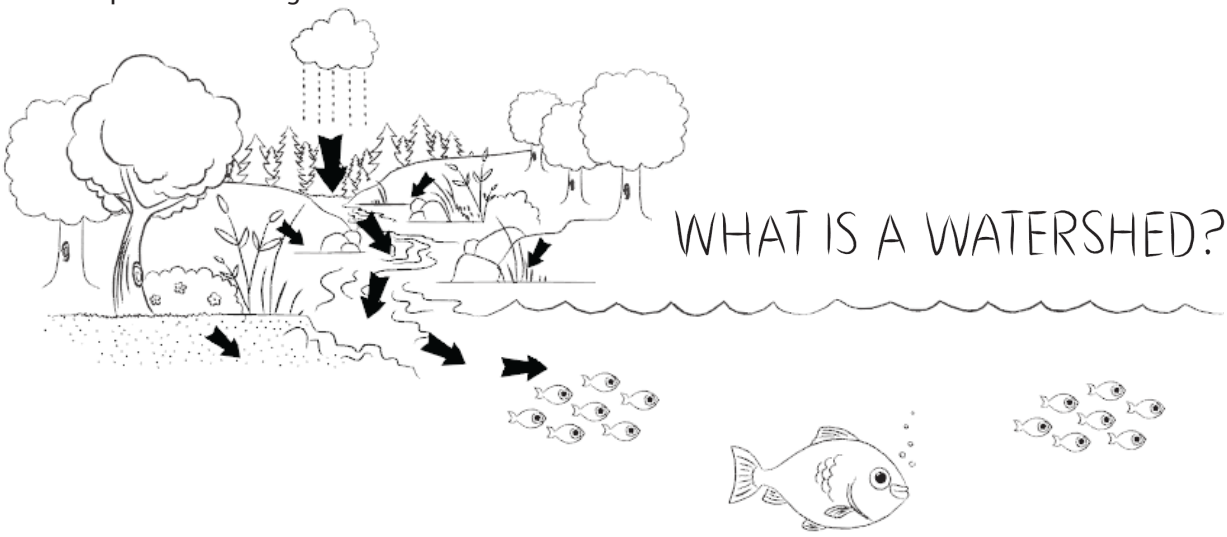
1. Ask the class, “What is a watershed?”
2. Explore their understandings by gathering their ideas and responses without providing them with a definition. It’s possible that someone in the class may know what a watershed is and it’s possible that no one may know.
3. Proceed outside to play the game, Moving in a Watershed.

Moving in a Watershed Game

1. Direct students to stand at the beginning of one of the Green lines.
2. Tell the students that each one of them is a water drop.
3. When they hear the word, “FLOW”, they are to walk down their line.
4. When they hear the word, ”STOP”, they stop on the spot.
5. Start the game by calling FLOW.
6. As the students begin to travel the lines, call STOP.
7. Ask students, with a show of hands, “How many of you are on Green? On Yellow? On Red? On Blue?
8. This sequence of commands and questions is repeated several times until everyone reaches the estuary. Then as fish have the students swim back up stream to repeat the game.
9. Before recommencing, ask students (transformed back to water drops) what they think the design is about, and where they think most of the water is. A popular game; don’t be surprised if students ask to play the game a 3rd time.

Reflection Discussion

1. When the game is finally finished reiterate the initial question, “What is a watershed?”
2. After playing the game, what do they understand about a watershed now?
3. To support their new understandings use the example of a local or regional river showing its watershed on a map and flow diagram.



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Extensions and Adaptations

Introduce, build or review watershed concepts with:

Videos

Ollie the Otter's Guide to Watershed Stewardship Videos

- What is a watershed?
- How we have changed our watersheds
- Earning your watershed warden badge

Watershed Stewardship Videos

- We all Live in a Watershed
- Contaminants in Stormwater (general audience)
- Watershed Stewardship: Everyone has a part to play

www.crd.bc.ca/watersheds

Lessons and Activities

Every Drop Counts (Grade 2) Lesson 6a activities:

- Demonstration - Runoff and Watersheds
- Experiments 1-4 Students a simple watershed model using paint trays to explore watershed erosion and pollution prevention.
- Discussion - Watersheds in our Region, Experiments (erosion, sink/float, stopping erosion, pollution solution)
- Word Maps

Every Drop Counts (Grade 2) Lesson 6 b Extensions and Adaptations:

- Use the "My Watershed Water Cycle Relay Map" to recreate the water cycle relay game.
- Lesson 10 activity: A Drop in the Bucket (borrow a kit from the CRD or recreate it using the instructions provided).

www.crd.bc.ca/teacher

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Lesson 7b

Watershed:
Building a Small Watershed

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

CRD

Supported by: RBC Blue Water Project™

Lesson 7b

Watershed: Building a Small Watershed

- Critical and creative thinking
- Collaboration, teamwork, leadership
- Ecological literacy

45 minutes

(outdoors & class time)

Materials for group work: (1/group)

- paint tray
- watering can or container
- sponge (pervious)
- pebbles or modelling clay (impervious)
- water

How students can earn a watershed warden badge (see lesson 10)

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Purpose

- To build a model of a watershed (in a wash basin)
- To discover the fundamental principles of a watershed and the diversity that allows
- To understand the shape of the land defines a watershed

Preparation

Prepare Ollie the Otter Watershed Warden Video:

How we have changed our watersheds

Have materials in replicates for as many groups as class will be divided into at least 4 groups:

- paint trays
- watering can or other container (e.g. beverage bottle with a lid with tiny holes in it) to release water onto watershed models
- water
- sponge, pebbles, modelling clay

Background Information

This activity builds on Lesson 7a: Moving in a Watershed.

Vocabulary

Watershed: an area of land in which all water eventually drains into the same river, lake or water body. A small watershed can be part of a bigger watershed.

Procedure

1. Divide students into their groups each with their respective model building materials. Alternately watershed models can also be designed in the sand at a nearby beach, see extension activities.

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Introductory Discussion:

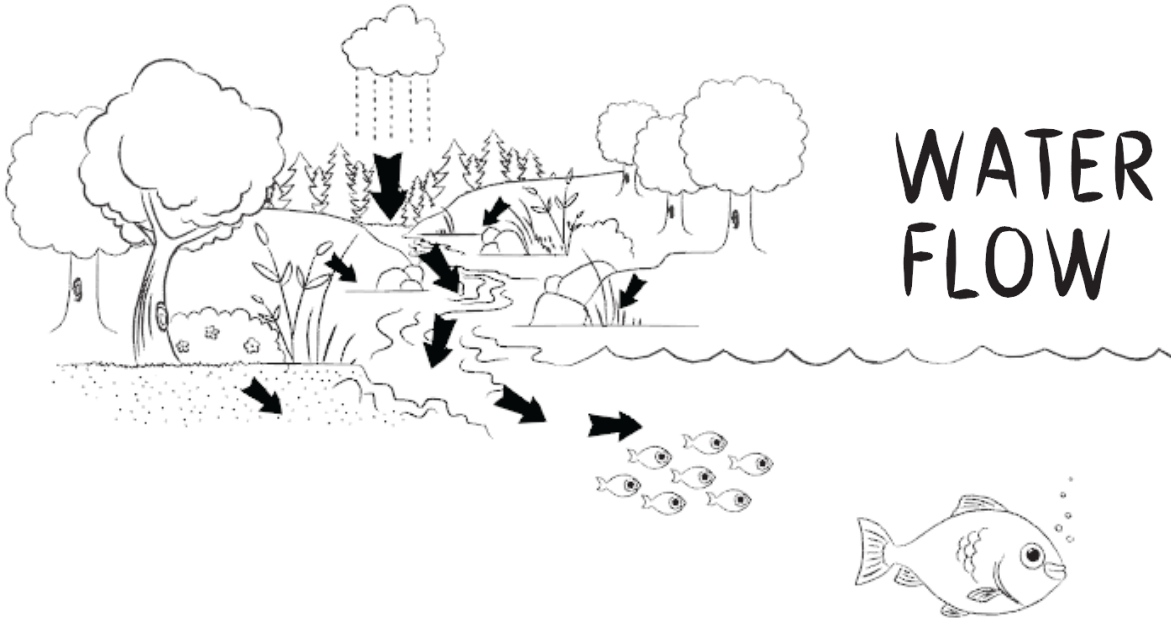
1. Assign students the task of creating a model of a watershed.
2. The details of the watershed are theirs to decide on, e.g.
   - headwaters
   - tributaries
   - main stem
   - watershed boundary
3. This is their opportunity to show what they understand about a watershed and water movement within it.

Building a Small Watershed

Students need about 10 or 15 minutes to create and test their model with a simulation of a gentle rain.

Reflection Discussion

4. Once every group is ready with their model, conduct a class tour of each model with the respective group of students explaining the features of their watershed.
5. Dialogue on the different features among the watersheds.
   - What features were common to all models?
   - What were some of the differences between the models?
   - How would they describe what a watershed is?
6. *How we have changed our watersheds* **www.crd.bc.ca/watersheds**.
7. How would this changes their watersheds models?
8. Pack up the model materials.



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Web Exploration

Back in class, explore web resources illustrating watersheds (see Resources).

ProjectWET Watershed Activity

- Click on the vocabulary to highlight parts of the watershed. Add "human factors" to see how we change and impact our watersheds.

http://www.discoverwater.org/explore-watersheds/

Kidfish (grade 5-7)

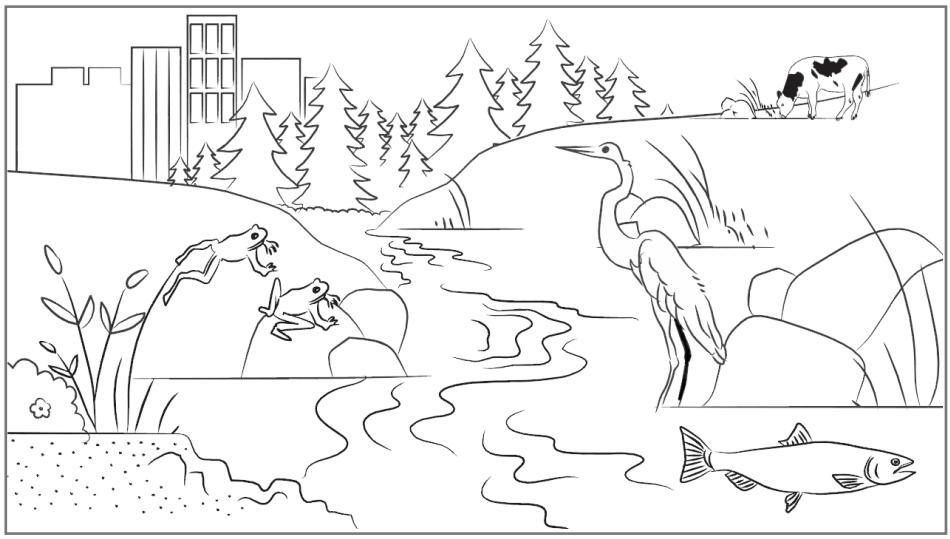
- All about lakes, rivers and fly fishing too, BC schools curriculum, covers topics of what is a river, what is a watershed – good static images of Fraser river watershed, no animation, no sound, but good text info.

http://www.kidfish.bc.ca/frames.html

Extensions and Adaptations

Building a watershed model is also well suited at the beach, where sand and water, and a diversity of natural found objects are in greater supply. Using bigger sheets of plastic, students can then take more time to create more elaborate watersheds, offering more detail than a wash basin sized watershed allows.

This activity can also be done in the schoolyard with sheets of plastic, using a natural slope to assist with the models, and having a garden hose handy with water. This size of activity in the school yard requires more cleanup.



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Lesson 8

Watershed:
What is a Your Watershed Address?

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

Supported by:

- Reading
- Critical & creative thinking
- Ecological literacy
- Writing & oral language

50 minutes

- student handout: *My Watershed Address*
- internet
- computer lab or class projector
- maps (print and/or projector)
- coloured markers for students
- coloured markers for overhead (if projecting)
- CRD watershed flow diagrams

How students can earn a watershed warden badge (see lesson 10)

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Lesson 8

Watershed: What is a Your Watershed Address?

Purpose

- To orient to a map
- To see a landscape as a watershed and understand that the shape of the land defines a watershed
- To understand that everyone lives within a watershed
- To recognize that Canada is a country with a lot of freshwater rivers and lakes and is surrounded by oceans on three sides

Preparation

1. Download and display electronically, print and project or order a poster of (see resources at end of lesson):
   - a map of your local watershed
   - the *Atlas of Canada*
2. Print the above maps for students and an overhead copy (if using).
3. Prepare copies of student handout: *My Watershed Address.*

Background Information: Watershed Walks

Watersheds are identified in a hierarchical approach, with individual watershed areas combining to create larger watershed areas.

Within a hierarchical approach, watersheds can be defined very locally or on a continental scale. Like tree branches coming into the same trunk or the fingers on a hand coming into the same palm, each watershed is individual yet part of the same big system.

Similarly, an upper reach of a large watershed can be named as a separate watershed. For example, a first order creek or river (being one in the upper reaches) shares a separate watershed from another first order creek or river on the other side of the valley. Yet each flows into the same bigger river that combines the entire area of both watersheds together.

Vocabulary

- **Watershed:** an area of land in which all water eventually drains into the same river, lake or water body. A small watershed can be part of a bigger watershed..

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Procedure

1. Start with a very brief animated video clip of a watershed.

   Watershed Animation (10 secconds)

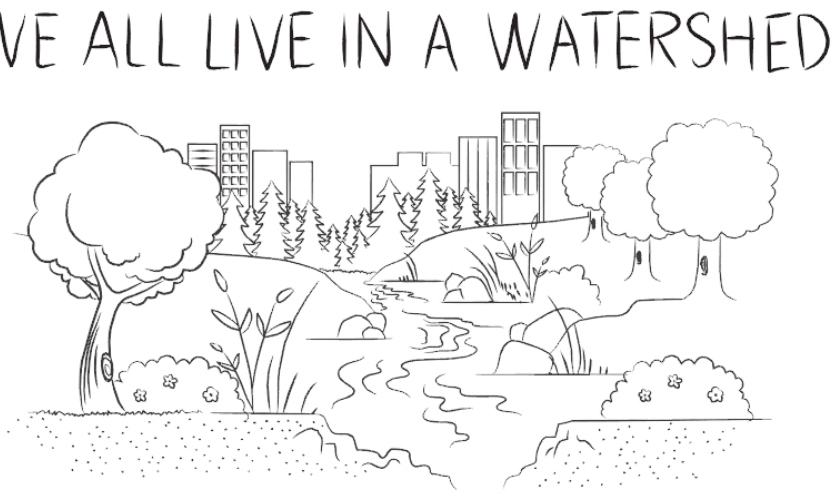
   http://techalive.mtu.edu/meec/demo/Watershed.html

Parts of a Watershed:

2. Project the *Atlas of Canada*. **http://atlas.nrcan.gc.ca/site/english/maps/water.html**
3. Orient to the image asking students for their knowledge of points of interest; consider provinces and territories, capital cities, mountain ranges, land types, major rivers and lakes, and oceans.
4. Determine how the watersheds are defined geographically (land contours of major mountain ranges, major rivers and basins). With each ocean watershed, identify major rivers. \
5. Notice the basin drainage into Hudson Bay and the closed watersheds that do not flow to an ocean.
6. If using paper maps have students use markers to delineate some of these features on their map.
7. If you are also using an overhead projector as well, switch to the overhead and delineate features with students so that they can follow along with you and mark their own maps.
8. Have students identify their ocean watershed.
9. Zoom in on the map for finer definition of the local watershed.
10. Students fill out their student page.
11. If you have downloaded a copy of your local watershed, use this image for even finer definition of your students' watershed address. **www.crd.bc.ca/watersheds**
12. Have students complete the Student Page : *My Watershed Address*

Reflection/Discussion:

1. Dialogue with students following their explorations on the Internet site and maps as to what defines a watershed (e.g. landscape and contour of land, gravity).
2. Dialogue on parts of a watershed, as in upper or lower tributaries, going from watershed map to a regional map to continental map.



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Teacher Resources

WATERSHED MAPS AND POSTERS

CRD Watershed Maps and Flow Diagrams

www.crd.bc.ca/watersheds

The Atlas of Canada.

Download the map in JPEG or PDF by Natural Resources Canada at:

http://atlas.nrcan.gc.ca/site/english/maps/water.html

Discover Your Watershed

Similar to the Atlas of Canada Map, but you can order it as a poster for free from the Canadian Wildlife Federation (CWF) at:

http://cwf-fcf.org/en/discover-wildlife/resources/posters--handouts/watershed_resource.html

or at **www.wildeducation.org**

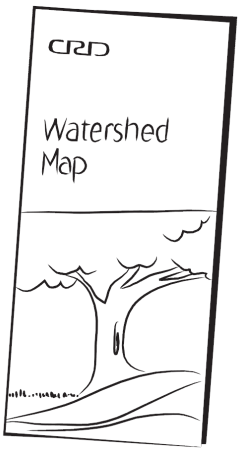
FEATURED WATERSHEDS

Cusheon Watershed Management Plan

http://www.islandstrust.bc.ca/ltc/ss/pdf/sscusheonlkwatershedplan.pdf

St. Mary Lake Watershed Management Plan

http://www.islandstrust.bc.ca/ltc/ss/pdf/ssstmarylkwtrshedmgntmplan.pdf



Need help locating your school's watershed addresses?

Contact CRD Integrated Watershed Management
by email at **watersheds@crd.bc.ca**

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Rainwater and Watersheds

Name: _____ Date: _____

My Watershed Address

Canada has _____ ocean watersheds.

The names of Canada's ocean watersheds are:

_____

_____

Canada also has some closed watersheds. A closed watershed ...

_____

_____

My continental watershed address is...

_____

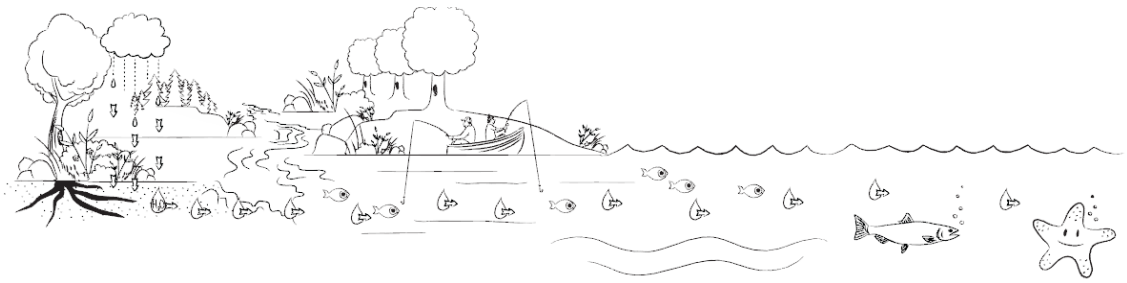
More locally, my local watershed address is ...

_____

Stormwater run-off from my schools goes to...

_____

(hint: lake or other body of water)



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Lesson 9

Watershed:
Build a 3-D Watershed Model

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

Supported by: RBC Blue Water Project™

- Critical & creative thinking
- Ecological literacy
- Oral language

- 30 hours to construct
- 2-3 hours student projects
- no limit to hours for model demonstrations.

- parent and/or high school student volunteers
- carpenter (helpful)
- workshop or storage space (for several weeks)
- topographic map of the watershed (costs ~$120)
- glue, paint, paint brushes, sand paper, varathane, lumber, bucket, xactoknives, styrofoam.

See Resources for manuals which list all materials needed.

Estimated cost $300-$400.

How students can earn a watershed warden badge (see lesson 10)

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Lesson 9

Watershed: Build a 3-D Watershed Model

Purpose

- To orient to a map
- To see a landscape as a watershed and understand that the shape of the land defines a watershed
- To understand that everyone lives within a watershed
- To recognize that Canada is a country with a lot of freshwater rivers and lakes and is surrounded by oceans on three sides

Preparation

To embark on building a 3-D watershed model requires strong commitment from parents. A carpenter parent with a shop and tools are an advantage. An artist parent to paint the landscape is also advantageous. (Neither is essential if the parents are keen to try something new). A team of high school students could also be useful. Someone (teacher or parent) needs to guide and supervise the project.

Background Information

The model is not meant to be exact, rather a teaching and demonstration tool. A good waterproofing layer means it can be used repeatedly. The power of this kind of 3-D model as an education tool cannot be understated. It's a big commitment of effort to build, but once done, well worth the effort. The 3-D watershed model becomes a permanent display and an excellent tool for both self-learning and educating others about how a watershed works, particularly a local watershed.

There is a cost to the many materials required estimated at $300-400. The actual expense is dependent on the amount of supplies donated by local stores (lumber (plywood), styrofoam, glue, paint, paint brushes, sand paper, varathane, bucket for ocean, xactoknives, portable stand for model, etc.)

Acquire a large print-out of a topographic map of the watershed (costs ~$120). The map should be the same size as the model will be, allowing immediate transfer of contour lines to the styrofoam model. A local non-profit organization, municipality or the CRD Integrated Watershed Management Program may be able to assist in sourcing an appropriate sized map.

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Procedure: Preparing for 3-D Model Construction (volunteers)

1. Parent volunteers gather the building materials and construct the model.
2. Ideally a carpenter parent is among the volunteers. Their knowledge, expertise, loan of tools, and possible use of workshop space makes all the difference. Models can be built without a carpenter too.
3. It's best to find workshop space that can be used for the life of the building project (which is a few to several weeks, dependent on how often volunteers are available).
4. The project is best done with a core group of volunteers who understand the project and follow it through its stages: making plywood and Styrofoam base, cutting out Styrofoam, piercing topographic map onto Styrofoam, carving and sanding Styrofoam, layering Styrofoam, gluing Styrofoam, carving the rivers, painting the model, waterproofing the model
5. Using the scrap Styrofoam, parents and student volunteers cut out buildings both generic and a few replicas of buildings in area. Alternately, use toys for houses, cars, farms depending on scale of the model.
6. Find out where you can recycle leftover construction materials at **myrecyclopedia.ca**.

Activity 1: Introduction to the model

1. Set the model up in a spacious area and out of the way of the flow of traffic.
2. Present the watershed model to the students explaining how it was constructed and who assisted in its creation.
3. Explain where the materials came from (it's not unlikely that a parent may have influenced the donation of materials).
4. Have the large topographic map handy to show them the transfer from map to model. The map is also useful to look at the elevations in the watershed.
5. Allow the students plenty of time to scan the mode. There will be lots of new detail to take in and an exchange of information as they explore the model with their eyes.

Activity 2: Add the details

1. Prepare an area for painting the houses and another for tree making.
2. Separate students in to small groups to:
   - paint houses which can be glued on once dried (remember if the building is a replica, let student know to paint it as replica).
   - pull apart donated wreaths to make trees.
   - add details to the model such as glue on sand and gravel for the ocean shoreline, and make and paint docks.
   - Some students may choose to make boats or cars from clay at home and add them to the model. Students paint several buildings each. If the building is a replica, let student know to paint it as replica.
3. Teacher and volunteer parent(s) assist students to glue the painted buildings and trees in place.
4. A designated student with neat printing can label the roads with an indelible ink pen.

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Activity 3: Model Demonstration

1. Small groups of students prepare to demonstrate the model to other classes of students in the school.
2. A ½ litre pop bottle is filled with water and tiny holes are made in its lid.
3. Red food colouring is used to denote pesticides.
4. Students refine their understanding of a watershed by having a clear and accurate definition of a watershed for their presentation.
5. Students in the small group work as a team, self-organizing as to who will do the speaking, who will demonstrate rain, demonstrate pesticide application to the land, etc. Then the magic starts to happen as they present their learning to others using the model.

Teacher Resources

WATERSHED MAPS AND POSTERS

CRD Watershed Maps and Flow Diagrams

www.crd.bc.ca/watersheds

3-D WATERSHED MODEL CONSTRUCTION MANUALS

Watershed Model Construction Manual by The Stream Team Society

Available by donation. Contact Angus Stewart at: **angstewart@shaw.ca**

Manual for the Construction and Use of Watershed Models

Jason Lasuik, World Fisheries Trust

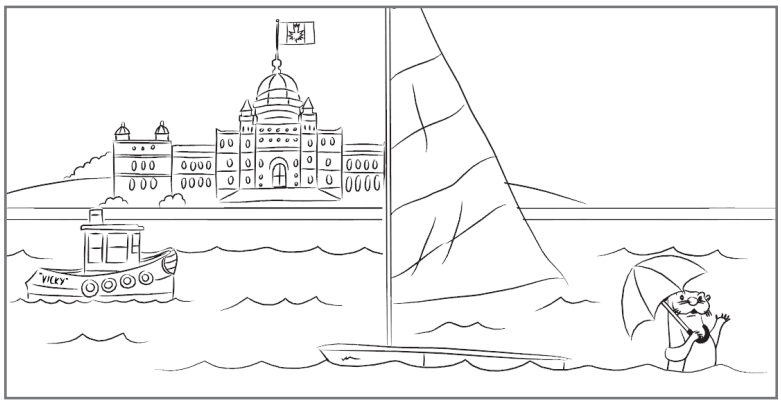
http://www.worldfish.org/PPA/PDFs/Semi-Annual%20VI/F-9%20ENG.pdf

WATERSHED MODELS IN OUR COMMUNITY

Gorge Waterway Nature House

World Fisheries Trust can also bring a watershed model to your school.

http://worldfish.org/



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Rainwater and Watersheds

3-D Watershed Model

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3-D Watershed Model: Town

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Rainwater and Watersheds

3-D Watershed Model: Hill

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Rainwater and Watersheds

3-D Watershed Model: Marine

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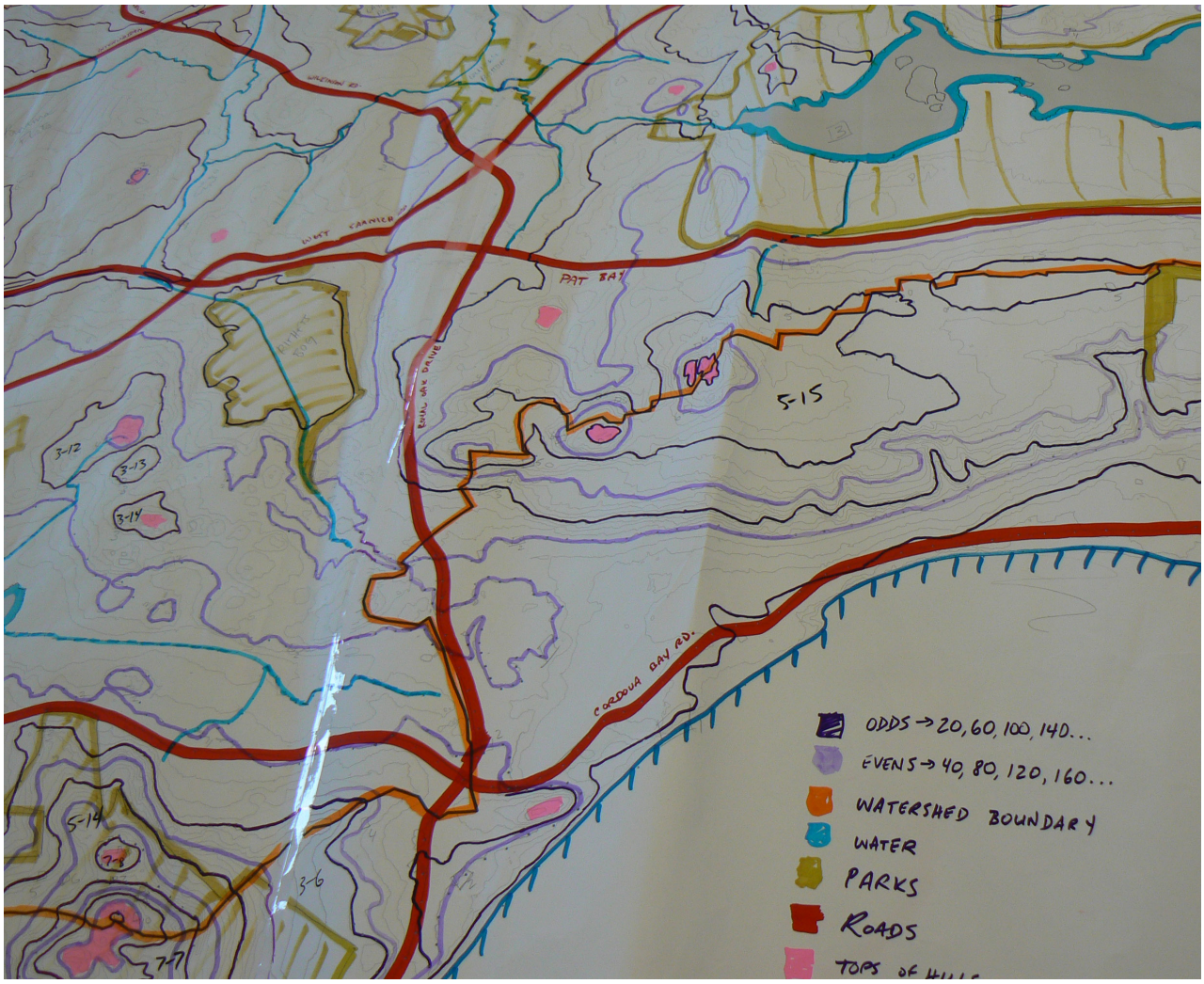

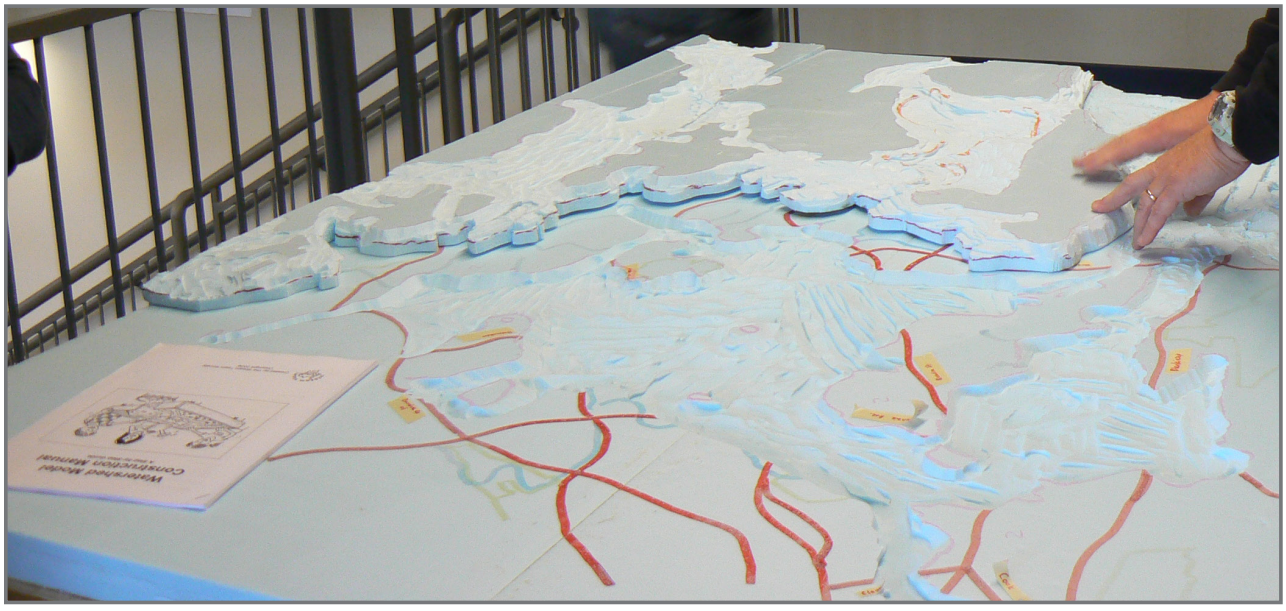

3-D Watershed Model: Map

Adapted from Waterdrops/Water Stewards.
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Lesson 10

Take Action:
Watershed Stewardship

Time

Resources

Student Handout

Video

Earn a Badge

Learning Outcomes and Assessment Tools

Supported by:

Lesson 10

Take Action: Watershed Stewardship

- Critical and creative thinking

45 minutes (outdoors)

15 minutes to draw

20-30 minutes for the activity

- Video
- *Watershed Warden Badge Action Projects*

Access or order these and other support materials at:

www.crd.bc.ca/teacher

education@crd.bc.ca

Preparation

Background Information

The CRD's Watershed Warden program celebrates and rewards eco-actions taken by elementary school-aged children (individuals, groups, or organizations) that:

- protect watershed habitats and ecosystems.
- protect and restore urban and rural watersheds.
- educate and practice rainwater and stormwater management.
- are innovative, progressive and display continued dedication and leadership within the community.

- **Preview the following student and general audience videos:**

Ollie the Otter's Guide to Watershed Stewardship Videos

How we have changed our watersheds

Earning your watershed warden badge

Watershed Stewardship Videos

- *We all Live in a Watershed*
- *Contaminants in Stormwater*
- *Watershed Stewardship: Everyone has a part to play*

www.crd.bc.ca/watersheds

Procedure

1. Preview Ollie the Otter's Guide to Watershed Stewardship Videos
   How we have changed our watersheds
   Earning your watershed warden badge
2. Children can earn an embroidered iron-on CRD Watershed Warden badge by taking part in watershed education and protection activity.
3. During or following the Rainwater & Watershed lessons, challenge students to take action to improve their local watershed.
4. Review what they have learned about watersheds and in particular your local watershed.
5. Who lives in a watershed?
6. How do impervious and/or pervious surfaces impact the watershed?

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7. Why is it important to have healthy watersheds?
8. What makes a watershed healthy?
9. In what ways could their local watershed be improved?
10. Brainstorms actions that your class could take to improve a local watershed (see *Watershed Warden Badge Action Projects* sheets)
11. As a class choose an action project(s).
12. Following the action project, have students complete the student handout and send the completed handouts by by email to watersheds@crd.bc.ca or by mail to:

    Ollie the Otter
    c/o CRD Environmental Protection
    PO Box 1000
    Victoria, BC, V8W 2S6

13. Ollie the Otter will send a reply letter and badge for each student within 2-3 weeks.

Useful Links

Volunteer Restoration

CRD Parks Volunteering Colleen Long Tel: 250.360.3329 or contact your municipality for other opportunities

School Workshops and Tours

- CRD 3R Programs and CRD Parks Nature Programs
  www.crd.bc.ca/teacher
- Stream of Dreams and Peninsula Streams
- Greater Victoria Compost Education Centre Programs
  www.compost.bc.org

Garbage, Recycling and Compost information

- Myrecyclopedia
  www.myrecyclopedia.ca

Others

- CRD watershed information
- How I can Help... otters
- Local examples of rainwater management and low impact development
- Maps, flow charts and more...

  www.crd.bc.ca/watersheds

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Watershed Warden Badge Action Projects

Eligibility

- Individual(s) must be elementary school-aged or younger.
- Individual(s) or their activity must reside/take place within the Capital Region.
- All eligible activities will be awarded Watershed Warden badges, regardless of size.

* Individual(s) over 12 years old may be eligible to participate on a per request basis. Ask Ollie the Otter at **watersheds@crd.bc.ca**

Hands On

- **Hand pull weeds and use compost**: stop chemical pesticides or fertilizers from washing down storm drains into our waterways where they could poison aquatic life.
- **Scoop the poop**: pet waste in our water is a health concern for animals and us.
- **Wash your bike or car on grass or gravel**: keep soap, grease and dirt from flowing along the street down the storm drain and into creeks and streams.
- **Sweep**: instead of using a hose to clean driveways and sidewalks.
- **Collect rainwater:** use it to water lawns or flower gardens and to slow rainwater flow down the storm drain reducing creek erosion & flooding.
- **Build a rain garden**: to absorb stormwater.
- **Remove invasive species and plant native plants:** they don't need chemicals or additional water to thrive.
- **Organize a Community Clean-Up or adopt a stream or beach:** rain washes litter into our storm drains and into our waterways where fish and other aquatic life could eat or live in it.
- **Participate in a restoration project**
- **Participate in a watershed workshop or tour**

Education and Outreach

- **Know the flow:** Trace where the water flows in your watershed, which streams lead to others and out to the ocean.
- **Discover your watershed's ecosystem**, the living and non-living things that are affected by our choices and actions.
- **Share what you know** about local watersheds with friends, family, your class, the school and/or the community.
- **Create, perform and use media to get the word out.**

  (e.g. a story, play or song)
- **Build a watershed mode**l.

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Rainwater and Watersheds

Organize and Influence

- **Join or organize a green team.**
- **Organize a watersheds awareness event.**
- **Organize a watershed friendly car wash:** with safe soap and where no dirty water goes down the storm drain or sell gift certificates to a commercial car wash.

Lifestyle Choices

- **Walk or bike to school** – this reduces chemicals from cars and break dust from being washed into our waterways and ocean.
- **Report a spill** – no spill is too small.
- **Reduce, Reuse, Recycle and Compost** – so litter and chemical fertilizers don't flow into our streams during rainy weather.
- Consumer Action
- **Buy local and organic**– reduces pesticides and fertilizers going into our waterways.

Global Cooperation

- **Explore and research** how people in different parts of the world protect watersheds.
- **Partner with a school overseas.**
- **Raise money** for a water project local or overseas.

Funding Opportunities

- CRD Community Clean Up Program
- TD Friends of the Environment
- Walmart-Evergreen Green Grants
- Victoria Foundation
- Investors Group
- Telus
- RBC Blue Water Project

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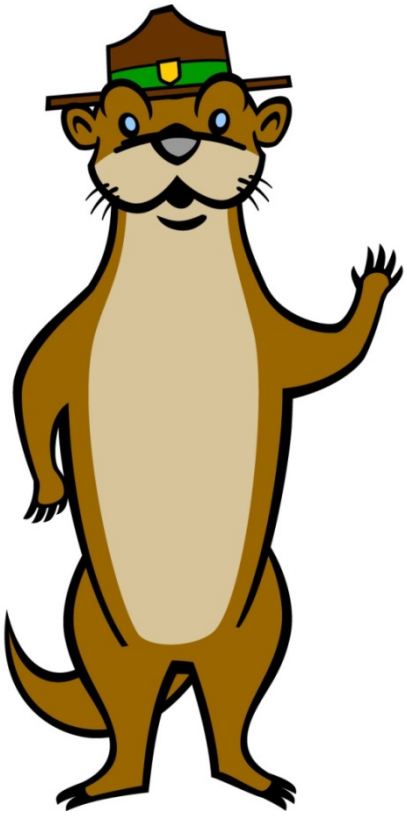

Hi, I am Ollie the Otter, leader of the Watershed Wardens.

I love watersheds! Because I live, work and play in a watershed. Guess what, you do too!

The capital region, where we live, is made up of hundreds of watersheds. A watershed is an area of land that drains rain, snow and groundwater to a common point, such as a creek, wetland, lake or ocean. A healthy watershed slows, cleans and stores water by allowing the water to absorb into the ground.

The flow of water is changed when we clear and build on the land. Roads, driveways, parking lots and buildings are impervious surfaces which make it impossible for water to absorb into the ground. Water runs off these surfaces, washing pollution, soil and litter into stormdrains leading directly to our creeks, harbours or ocean, without the benefits of healthy watershed.

There are a number of things we can do to protect our watersheds for all of us living here, from the smallest creature to the largest plant. Would you like to be a Watershed Warden?

Join our team of CRD Watershed Wardens and earn your badge. For activity ideas, visit **www.crd.bc.ca/watersheds.** Then, write to me about what you are doing to protect your watershed, by email at **watersheds@crd.bc.ca**
or mail to: Ollie the Otter
c/o CRD Environmental Protection
PO Box 1000
Victoria, BC, V8W 2S6

Ollie the Otter,
CRD Watershed Warden

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CRD Making a difference...together

Making a difference...together

Did you know that we all live in a watershed?

The capital region, where we live, is made up of hundreds of watersheds. A watershed is an area of land that drains rain, snow and groundwater to a common point, such as a creek, wetland, lake or ocean. A healthy watershed slows, cleans and stores water, because it can absorb into the ground and gently flow into lakes and creeks.

But water can't absorb through roads, driveways, parking lots and buildings. Instead it runs off these surfaces washing pollution, soil and litter into stormdrains leading directly to our creeks, harbours or ocean.

There are a number of things we can do to help keep our watersheds healthy and safe for all living things.

Draw what you do to protect your watershed here.

Ollie the Otter,
CRD Watershed Warden

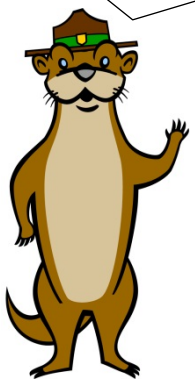
Join our team and earn your
CRD Watershed Warden badge!

If you are elementary-school aged, share what you are doing to protect your watershed and send by mail to:

Ollie the Otter
c/o CRD Environmental Protection
PO Box 1000
Victoria, BC, V8W 2S6

Or email: **watersheds@crd.bc.ca**

To find out more about watersheds and activity ideas visit: **www.crd.bc.ca/watersheds**



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Dear Ollie,

The watershed I helped to protect is called:

I help to protect the watershed's ecosystem by:

I am years old.

My community is (e.g. municipality/First Nation):

Please mail my Watershed Warden badge to...

Name:

Address:

City: Prov: Postal Code:

Personal information contained on this form is collected under the authority of the Local Government Act and is subject to the Freedom of Information and Protection of Privacy Act. The personal information will be used for purpose associated with the CRD Watershed Warden Program. Enquiries about the collection or use of information in this form can be directed to the Freedom of Information and Protection of Privacy contact: Manager, Risk, Insurance and FOI at 250.360.3000

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Ollie the Otter's Guide to Watershed Stewardship

Video Scripts

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Video Script

What Is a Watershed?

Oh hi, I'm Ollie the Otter, the CRD Watershed Warden. Perhaps you've seen me around. My natural habitat is all over the Capital Region. I can live on the land... in creeks and even in the harbours.

But today I want to talk to you about "watersheds" and how they work to slow down, clean and store rain and melting snow.

A watershed includes all the land that drains water into a creek, lake, harbour and ocean. You could say that the watershed is my kind of place. So, naturally, I want to keep it safe and healthy.

The things we do around our homes and neighbourhoods can help or harm the watersheds where we all live, go to school and play.

A healthy watershed has lots of trees and native plants that help to control the flow of rainwater allowing it to be slowly absorbed into the land.

Trees are a super important part of a healthy watershed. When it rains about half of the rainwater is pumped back up to the sky by the sun and trees.

This is called "Evapotranspiration". That's a big word!

The other half of the rain fall seeps into the earth where healthy vegetated soil is "PERVIOUS" - That means it will allow the rain to soak into the soil and slowly move downhill.

This underground movement of water is call "INTERFLOW".

This water slowly travels toward a wetland, lake, or creek and continues to flow into larger creeks and eventually, the ocean.

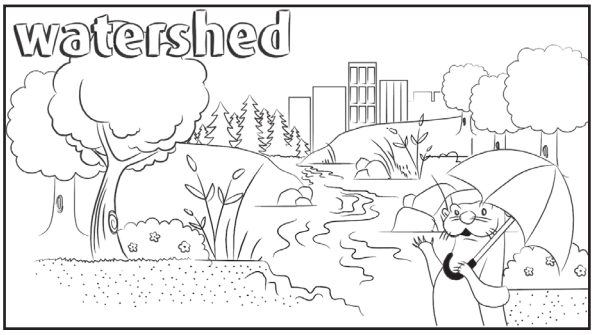
A healthy watershed includes "riparian areas" – the vegetated area around the banks of a lake or creek which acts like natural armour. The riparian area keeps the soil in place and cleans and cools the water for all of us that live in it. Ah, cool, clean water with trees all around me - that's what I call a healthy watershed!

But these days, not all of the watersheds in the Capital Region are this healthy.

Our region is now full of paved roads with cars and buildings and far fewer trees. And that's made for some big changes in our watershed.

Learn more about watersheds by watching my next video "How we have changed our watersheds". Then join my team and become a CRD Watershed Warden - to help clean, enhance and protect our watersheds. I'll see you there!

The CRD Making a difference...together.



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Video Script

How We Have Changed Our Watersheds

Hi! Remember me? I'm Ollie the Otter, the CRD Watershed Warden. My friends and I love healthy watersheds where we all live on the land and in the water.

Now that our region is full of paved roads with cars and buildings there are far fewer trees. And that's made for some big changes in our watershed.

Now, when rainwater falls, it doesn't always land on a nice soft forest. Sometimes it lands on a hard and "impervious" roadway or parking lot... where it is IMPOSSIBLE for water to soak in.

Rain that lands on roof tops, roads and parking lots, picks up all the pollution that collects on these impervious surfaces.

This is called "STORMWATER".

You've all seen these on the side of the road – this is a "storm drain". It leads to a network of underground pipes that carry all of this rain and stormwater away.

But where does all of this water go?

Well, stormwater rushes at full speed through the underground pipes and into our streams, lakes, harbours and ocean. It doesn't travel alone either - it brings things like, litter, oil and other fluids dripping from cars and trucks along with very little bits of metals that fall from engines, tires, breaks and exhaust.

Pollution can also come from fertilizers and herbicides used by your mom and dad in your yard, or by farmers when they grow food.

It can come from soaps and paint chips from washing your cars and houses.

Even droppings from pets and wild or farm animals, end up in our creeks and eventually the ocean.

As you can see, our watersheds are in danger and they need our help. Find out what you can do in my next video: "Earning Your Watershed Warden Badge". Then, join my team and become a CRD Watershed Warden - to help clean, enhance and protect our watersheds. I'll see you there!

The CRD Making a difference...together.

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Video Script

Earning Your Watershed Warden Badge

Hi, remember me? I'm Ollie the Otter, the CRD Watershed Warden. Our watersheds are in danger and we need your help to keep them clean for all creatures big and small.

Join my team and earn your CRD Watershed Warden badge!

There's a lot you can do to protect our watersheds and earn your badge. Here are some ideas...

Learn the name of the watersheds that you live and go to school in. Visit a nearby creek, lake, wetland or marine shoreline – to get to know your watershed

Go outside when it's raining! Try standing under a tree, on a grassy area or on the side of the road and watch where the rain goes. What's floating in the stormwater as it flows down the side of the road?

Participate with your family, class or club in riparian restoration and help make my habitat healthier! Plant and care for a tree or native flowers in the watershed, to provide a habitat for my friends.

Choose to walk or ride your bike to get around, less driving means less pollution getting onto our roads.

Remind adults not to allow the water from power washing your house or driveway to flow into the storm drain. We don't want those paint chips or oil floating in my habitat.

And, of course, never litter. You can also participate in a school yard or beach clean-up.

Those are just some ways that you can prevent pollution from getting into my habitat and help it better absorb the rain into the land.

If you do any of those or other things to help keep our watersheds clean, you can earn your CRD Watershed Warden Badge.

Send me a letter, a drawing or a photo to show me what you're doing and I'll send you your own CRD Watershed Warden badge.

My home is your home too, because we all live in a watershed. So let's work together to make our home clean and healthy.

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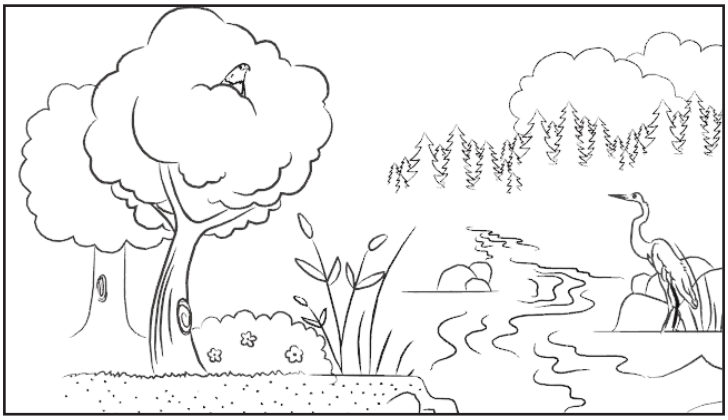
Watershed Stewardship



Video Scripts

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Video Script

Watershed Stewardship
We all live in a watershed

A watershed is an area of land where all the surface water and water seeping into the soil, drains to the same point- a wetland, a lake, a creek and eventually the ocean.

The capital region is made up of approximately 300 large watersheds and many more smaller watersheds, each with their own network of lakes and creeks leading to the ocean, while some coastal areas drain directly to the ocean.

These are all multi-use watersheds, where we live, work, and play- utlilizing the land and ground and surface water.

Watersheds cross property lines and municipal borders - we all live in a watershed.

For thousnads of years, watersheds on Southern Vancourver Island have supported people and a huge diversity of wildlife that live on the land and in and around our creeks, wetlands and lakes.

Healthy watersheds are important because they control the flow of water allowing it to be slowly absorbed into the landscape.

A healthy watershed includes ample trees throughout to absorb and slow the rain, as well as vegetated areas around the banks of a lake or creek which act as a filter for incoming water. This keeps it clean for the animals, insects and birds that live in these habitats.

Southern Vancouver Island - the capital region- is largely forest. These trees provide an important function in a healthy watershed.

When it rains in a natural watershed, about 50 per cent of that water is pumped back to the sky by the trees and sun. This is called evapotransipiration.

The other half soaked directly into the soil and slowly moved downhill. This underground movement of water is called interflow.

When the water eventually reaches a wetland, lake or creek, it then continues to flow toward larger creeks or lakes and eventually, the ocean.

As the population of Greater Victoria and across the capital region increased, forests were cleared for agriculture, roads paved and buildings began to dot the landscape. All of these changes have an impact on rainwater's interaction with the landscape. The loss of tree cover meant that less water was being returned to the sky and more water remained on the land.

As agricultural areas and towns developed, ditches were built to drain the water from the landscape as quickly as possible because there were no longer enough trees to naturally manage the water.

As the cities, further developed, ditches and creeks were converted into the underground pipes of our stormwater system.

Buildings, roads and parking lots create imprevious surfaces where the rain cannot soak in. The increase in impervious surfaces and storm drains creates two key impacts on our watershed.

The first impact is an increase in water flow.

In a healthy watershed, rain could take days or months to make its way to creeks. In an urban storm drian system, it could take just a few minutes.

During the rainy season, creeks can become overwhelmed when water that moves through them too quickly causes erosion of the banks and flooding which creates a poor habitat for fish.

The second impact is an increase in water pollution.

This is what happens when rainwater becomes storm water. Storm water is **the** major source of pollution to our local waterways and nearshore marine environment.

Whether natural, rural or urban, we all live in a watershed that is ours to keep clean, enhance and protect.

So get involved and learn about the ways you can clean, protect and enhance the watersheds in the CRD, visit: **www.crd.bc.ca/watersheds**

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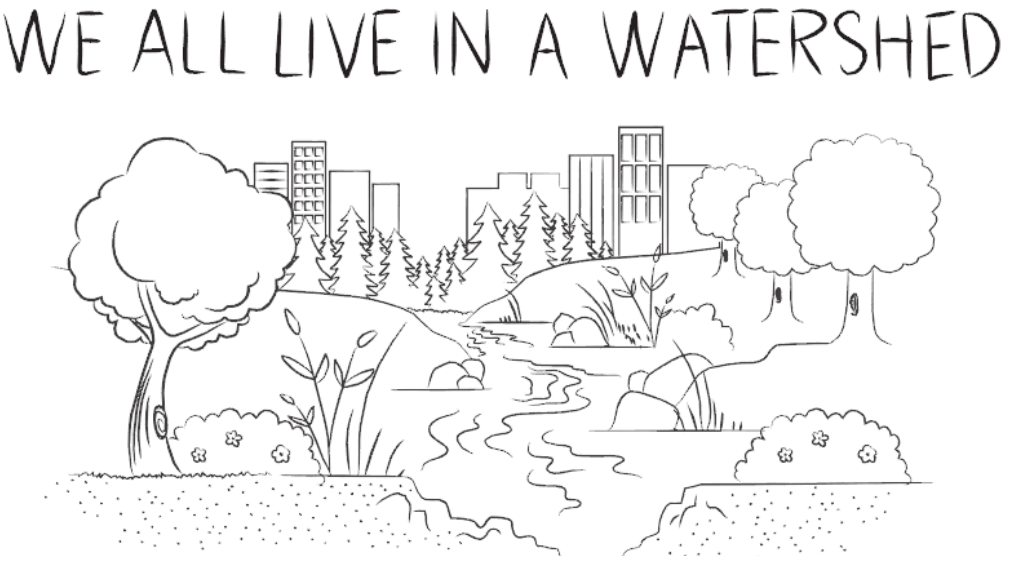

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Video Script

Watershed Stewardship Everyone Has a Part to Play

We all live in a watershed, whether natural, urban or rural. We are all affected by the rain that falls, the soil, plants, trees, wildlife and the flow of water through our watersheds.

Watersheds often flow across municipalities and up-stream activities affect those downstream, so it's essential that we work together. As individuals, as businesses and as a community, our daily activities impact our watersheds.

Storm water is the largest source of pollution to our local creeks and marine environment. The CRD monitors the water quality of storm water, lakes, creeks and the marine receiving environment.

The Capital Regional works to monitor, enhance and protect the health of our watersheds and the near shore receiving environment.

By working with municipalities, businesses and residents, the CRD reduces storm water contamination through regulation, restoration and education.

Groups such as the Gorge Waterway Initiative, Bowker Creek Initiative and the Esquimalt Lagoon Stewardship Initiative, are coordinated by the CRD so that citizens, businesses and all levels of government can actively care for our watersheds together.

You can also contribute in many meaningful ways to protect and restore the health of our local watershed.

The best thing we can do to contribute to a healthy watershed is to decrease the amount of pollution on our roads, parking lots and land and increase the amount of rainwater soaking into the ground. This will mimic the conditions and functions of a natural watershed.

If you're a property owner, here are just some of the things you can do:

To prevent sewer water from flowing into local creeks and the marine environment, ensure that your sewer and storm drain are not cross-connected, or that your septic system is well maintained.

If you have a home heating oil tank, be sure to inspect it seasonally to ensure oil is not leaking.

If you have a parking lot on your property with a catch basin, you can prevent pollution from entering our local creeks and harbours by having a spill response plan with a spill kit on site and having the catch basin pumped out annually.

When building or renovating, install green infrastructure such as a rain garden or a rooftop garden.

Plant and maintain a healthy tree cover on your property to reduce the runoff into local lakes, creeks and marine environments.

And here are some things everyone can do:

Get to know what watershed you live in. Participate in a local beach clean-up or become engaged with a local watershed stewardship group.

Drive less and maintain your vehicles. When rain hits the roads and parking lots, leaks and brake dust from vehicles are picked up and carried away in the storm water leading directly to our local creeks and marine environments.

Use less, keep it clean and go organic. Don't use fertilizers or pesticides, use minimal anti-icing agents, don't litter and avoid letting anything other than rain water enter into a stormdrain.

So get involved and learn about the ways you can clean, protect and enhance the watersheds in the CRD, visit: **www.crd.bc.ca/watersheds.**

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Video Script

Watershed Stewardship Contaminants in Stormwater

If we could see the contaminants in our creeks, lakes, harbours and near shore marine environments we might ask: Where is all of this coming from and how can we prevent it?

What we do on land directly impacts the health of our local water bodies. Let's find out how.

In developed areas where there are a lot of rooftops, paved surfaces or hard packed soil the rain is not able to soak into the ground. Instead, it runs off these surfaces as stormwater, picking up various contaminants along the way.

This polluted stormwater flows into storm drains or ditches which lead directly to our creeks and nearshore marine environments.

Contaminants accumulate on our land, roads and parking lots as a result of some of our daily activities.

Here are some of the most common sources:

One. Vehicles deposit oils, grease, metals and other contaminants on to paved surfaces.

For example, exhaust and brake dust are sources of metals and fluids can leak from engines.

Two. Washing and maintenance of outdoor surfaces can release contaminants such as metals, paint, oil and wood preservatives.

Three. Deteriorating heating oil tanks can leak oil into the soil and surrounding area.

Four. Agricultural and residential land where chemicals such as pesticides, herbicides and fertilizers may be used can be washed away into creeks or ditches. Bare soil and fame animal feces can also be a source of bacteria turbidity and nutrients in our creeks.

Five. Leaky sewers can get overwhelmed when heavy rains occur and lead to over flows into our storm drains, creeks and nearshore marine environment. As well, some sewer pipes are incorrectly connected to the storm drain network leading to natural waterbodies.

Six. And litter on our streets such as cigarette butts and food wrappers can get carried by the rain into the storm drains.

Throughout the year, CRD staff regularly monitor levels of contaminants in stormwater at over 500 locations where it flows into our freshwater and marine environments.

At times, particularly during and after heavy rains, the level of contamination in stormwater can be high enough to exceed guidelines that aim to protect aquatic life and to people using our waterways and ocean. But, there are ways this can be prevented to protect both human and sensitive ecosystem health.

For example, the CRD works with municipalities, businesses and residents to find the sources of these contaminants and minimize the amount entering into our storm drain network and our environment.

Routine street sweeping by municipalities as well as cleaning of catch basins along roadsides and in parking lots help to capture some of these contaminants. Municipalities and owners of properties with catch basins are responsible to maintain and pump out catch basins.

The CRD and municipalities work together to find storm drains and sewers that are crossconnected so that the municipalities or property owners can fix them to minimize sewage entering our water bodies.

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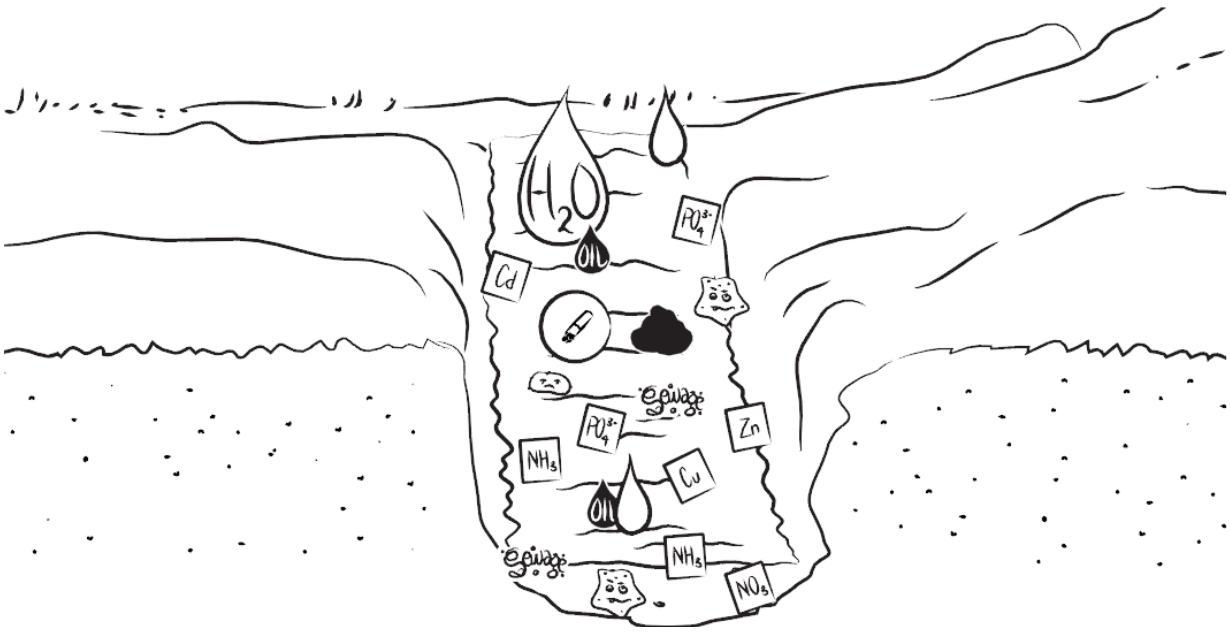
And local governments are also work together to enable the building of more green infrastructure such as green roofs, rain gardens and swales to minimize the amount of water flowing in storm drains overwhelming pipes and creeks.

Green infrastructure aims to infiltrate more rain and stormwater into the land to be slowed and naturally filtered by the soil, trees and vegetation.

And you can do your part! So get involved and learn about the ways you can clean, protect and enhance the watersheds in the CRD, visit **www.crd.bc.ca/watersheds.**

The CRD. Making a difference...together.



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Video Script

Watershed Stewardship
How to Maintain Your Catch Basin

If you own a business or a building with a parking lot or other paved surfaces - which drain into a catch basin, there are some important things for you to know about catch basin maintenance.

These areas almost always contain a catch basin designed to collect and remove pollutants in storm water run-off before it enters the storm water collection system.

And, as the property owner, you are responsible for maintaining any catch basin on your property.

So let's take a look at how a catch basin works:

Storm water run-off and any pollutants and debris picked up enter through the grate and fall into the basin. When the water level reaches the height of the outlet pipe it can flow to the storm water system which will run to a stream or the ocean.

Your catch basin may also have a hood over the outlet to prevent oils and floating debris from entering the outlet pipe.

Most debris will eventually sink and accumulate in the bottom of the catch basin.

As the accumulated sediment starts to fill the basin it reduces its working capacity and more sediment and pollutants may be discharged into the storm water system and eventually end up in a stream or the ocean.

These pollutants can harm aquatic life.

That's why regular maintenance is key to avoiding problems with your catch basin. In fact, your local municipality may have a storm water bylaw that outlines requirements for catch basin maintenance and record keeping.

So clean your grates often. Leaves, litter and other debris can clog the grate resulting in the flooding of your property and parking lots.

A complete pump out of your catch basin is recommended at least annually, preferably before the fall rains start. It is best to inspect your catch basin at least twice a year and make note of the amount of solids accumulating in the bottom.

A vacuum truck can be used to remove the solid and liquid portions of the catch basin. Remember, any waste water removed should not be returned to the catch basin. And the basin should be refilled with clean water where possible to enable it to be at full functioning capacity for the next rainfall.

Most often, the catch basin waste is made up of organic material and sand or grit that is not considered hazardous, and can be disposed of at a treatment facility or at the Hartland Landfill.

Finally, keep records regarding the frequency of inspection and maintenance. Some municipalities have enacted bylaws that require inspection and routine maintenance records be kept.

For more information on catch basin maintenance, visit **www.crd.bc.ca/catchbasin**.

And to learn how to prevent pollutants from entering our storm drains, visit **www.crd.bc.ca/watersheds.**

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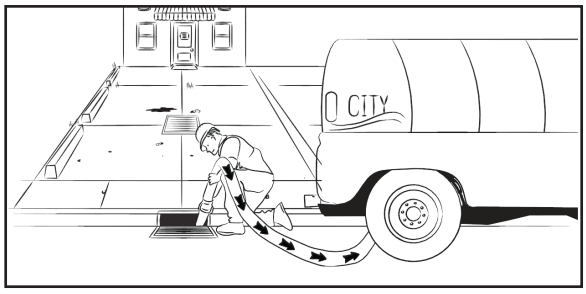

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