

Environmental Education: Harbour and Watershed Protection

What is a Watershed? (Middle and High School)

Background Information

A watershed is an area of land that drains rain, snow and ground water to a common point, such as a creek, wetland, lake or ocean. Watersheds can be different sizes and scales. Small watersheds can be part of larger watersheds. The capital region is comprised of over 300 watersheds (drainage areas with a creek or river) which are over 100 hectares in size, plus numerous smaller named and unnamed watersheds.

Watersheds provide many beneficial services to us and the environment. A functioning watershed slows, cleans, filters and stores water by allowing water to absorb into the ground. This process improves water quality, reduces risk of flooding, reduces risk for invasive species to establish and increases resilience within a changing climate. Natural watersheds allow for precipitation to infiltrate the ground and slowly flow into lakes, rivers, creeks and eventually out to the ocean. Urban watersheds are mainly covered in impermeable surfaces (parking lots, buildings, roads, etc.) causing water to flow quickly across surfaces, picking up debris and pollution, and draining into storm drains which lead directly to waterways including our harbours and ocean. Over the years we have changed many of our natural watersheds into urban watersheds.

An urban watershed's functionality can be improved by installing green infrastructure such as permeable pavements, rain gardens, green roofs and by changing human behaviour. We can protect our watersheds by limiting the introduction of pollutants (oils, gas, pesticides, fertilizer, chemicals, etc.), collecting rainwater, maintain native plant gardens plus many more ways. For more ideas on how to help protect watersheds see more example [here](#).

Activity types in this lesson:

Warm-Up: Podcast and Video
Hands-On: Watershed Study
Expand and Connect

Warm-Up

If watersheds is a new term or you would like a review, listen to the "How Watersheds Work" podcast episode or watch the "Watersheds" video below.

Podcast

Please note this podcast is not specifically made for children. While they do give warnings before any episodes that may not be suited for younger audiences, please listen in advance to make sure it would be appropriate for your students.

- **Stuff You Should Know: How Watersheds Work** (34 min) – January 12, 2017 [<https://www.iheart.com/podcast/105-stuff-you-should-know-26940277/episode/how-watersheds-work-29467332/>]
"Unless you happen to be standing on a hilltop or swimming in the ocean right now, you are on a watershed. These unsung wonders of topography and hydrology are an important contributor to the rain cycle and yet we humans tend to abuse them."

Video

- [Watersheds](#) (5:41) by BC Tomorrow — simple video describing watersheds, watershed services and highlighting the nine watershed basins of BC.

Hands-On

Study a watershed.

Choose a location to use as a reference point for the activity to follow. You can use your home address, your school or another location you visit regularly. Use this location to complete the “Watersheds Worksheet” provided to gather information and insight into your watershed.

Below is some information and tips to help you complete the worksheet.

Watershed Information

Use the regional [watershed maps](#) to find which watershed your chosen location falls in and answer the question in the Watershed Information section of the worksheet.

What is the name of the main creek or stream in your watershed? Hint: watersheds are usually named after the main catchment waterway within a watershed.

Pay close attention to the legend on the regional watershed map. If you live in a watershed that does not have creek or river in the name, you most likely live in watershed that drains directly to the shoreline or moves through storm drain networks. You may need to choose a different watershed depending on the questions and follow-up activities you are doing.

How many tributaries, smaller creeks or branches, flow into the main stream of your watershed? Use the regional [watershed flow diagrams](#) to track how water flows in your watershed. Some of watersheds have a complex water flow, while others have a more simplistic flow. It is important to note that in urban areas, water flow could be through a network of storm drains and pipes. Creeks may flow in and out of these networks as well and are not depicted on the flow diagrams.

Try using Google Maps, the land cover watershed map or another map you may have to determine which creek or tributary is closest to your study location.

Watershed Land Cover

Land coverage mapping is used to track the physical qualities of ground surface coverage. Mapping can be done on any scale, from local watersheds — to entire countries — to the globe. Land coverage can track a variety of topics or can focus on specific surface types such as ice and snow, major biome type, crop type, urban infrastructure, water, bare soil as well as many more. Information gathered from studying and mapping land cover can be used to inform decisions and planning for environmental, economic and even social strategies. With regard to watersheds, land coverage mapping can give clues to watershed health, provide basic information on how water flows and allow for planning and strategies to improve or maintain watershed health.

Examine your watershed’s land use types and coverage areas. Use the regional [land cover watershed maps](#) to answer the “Watershed Land Cover” questions on the worksheet.

Additional Videos

CRD Watershed Stewardship videos: [What is a watershed?](#) and [How have we changed our watersheds?](#)

[Pervious vs. Impervious Surfaces](#) (2:53) by San Antonio River Authority — short and simple YouTube video demonstrating water landing on pervious vs impervious surfaces.

[Managing Stormwater Runoff](#) (2:04) by MetroVancouver — animated YouTube video describing stormwater runoff.

[Ever wonder where the rain goes?](#) (3:34) by susdrain — YouTube video showing what happens to rain after it falls.

Watershed Worksheet

Watershed Information

Use the regional [watershed maps](#) and [watershed flow diagrams](#) to answer the following:

1. Study location: _____
2. Name of the watershed my study location is found in: _____
3. Name of main waterway (river, creek or stream) in the watershed: _____
4. Number of tributaries (smaller creeks or branches that flow into the main stream): _____
5. Tributary closest to study location: _____
6. Harbour or ocean out flow point your watershed leads to: _____

Watershed Land Cover

Use the regional [land cover watershed maps](#) to answer the following:

7. How many schools are in your watershed? _____
8. What is the total size of your watershed? _____
9. What percentage of land is covered by the following land cover types?
 - lake or pond: _____
 - riparian area, or wetland: _____
 - grass, shrub, bare ground, exposed rock: _____
 - tree cover: _____
 - impervious surfaces (buildings, roads, parking lots, etc.): _____
 - agricultural field: _____

10. What are some challenges or threats to the health and functionality of your watershed?

11. What are some potential actions to protect or rehabilitate your watershed?

12. Are there any groups (governments, community organizations or volunteer) working on protection and/or rehabilitation efforts within your watershed?

Expand and Connect

Estimate the land cover for your neighbourhood or another chosen area. Choose a study area (e.g., 2km², 1 block, 1 hectare,). Identify different types of land cover and estimate the percent coverage for each type. You could do this by walking through the area and estimating with a visual scan and/or use Google Maps or Google Earth.

- Check your land cover estimates with the online [CRD Regional Map](#). The map will give percentages of impervious surface and forest land cover for quadrants across the region.
 - Open [CRD Regional Map](#)
 - Click “I want to...” — click “Change visible map layers” — check box beside “Environmental/natural areas” and click + to expand options — check box for “Land cover analysis” — zoom in to study area or search by address by entering your address into the search bar on the top right.
 - Once you have the land cover analysis set, the map will be divided into quadrants — click on the quadrant that encompasses your study area. The quadrant should be highlighted and a white box will appear — click “View additional details” — information will appear to the left of the map.
- What are some ways your neighbourhood could adjust to improve watershed health (plant more greenery, rain capture systems, replace impervious driveways, behavioural changes to prevent introduction of pollutants such as fertilizers, pesticides and other chemicals, etc.)?

Look at different examples and uses for land cover maps. Natural Resources Canada has many maps and data sets available:

- [Water](#) - web page discussing distribution of water across Canada
- [Land Cover Map](#) - interactive map with various land cover types across Canada
- [Land Cover](#) - information about land cover datasets and remote sensing techniques used
- [Fundamentals of Remote Sensing](#) tutorial - a course for later high school to university-aged students about different methods and applications for remote sensing

Research options for adding green infrastructure to a home, school or business. Write a proposal outlining best options for green infrastructure additions for your chosen building. Consider cost, local weather and climate patterns, maintenance and upkeep. For some examples of green infrastructure and basic descriptions see the Environmental Protection Agency’s [What is Green Infrastructure?](#) web page.

Study biodiversity within your watershed. Are there any unique or endangered species that live within your watershed? Are there special habitats that support important species such as salmon-bearing streams, old-growth forests, Garry oak meadows, eelgrass beds? How might some of the challenges or threats you identified in your worksheet affect the biodiversity as a whole or a specific species?

Still Curious?

More information about CRD services related to harbour and watershed protection and management:

[Harbours](#) and [Watersheds](#)

[Stormwater, Wastewater and Septic](#) and [Pollution in Stormwater Runoff](#)

[Impervious Surfaces](#)

If you have any questions about watersheds in the region, or are looking for ideas on how to connect this topic with other learning opportunities, contact us at education@crd.bc.ca.

Watershed Worksheet - SAMPLE ANSWERS

Watershed Information

Use the regional [watershed maps](#) and [watershed flow diagrams](#) to answer the following:

1. Study location: Hartland Landfill
2. Name of the watershed my study location is found in: Tod Creek Watershed
3. Name and length of main waterway (river, creek or stream) in the watershed: Todd Creek - 9.5 km
4. Number of tributaries (smaller creeks or branches that flow into the main waterway): 21
5. Tributary closest to study location: Heal Creek
6. Harbour or ocean out flow point watershed leads to: Tod Inlet

Watershed Land Cover

Use the regional [land cover watershed maps](#) to answer the following:

7. How many schools are in your watershed? 2
8. What is the total are of your watershed? 2344 hectares
9. What percentage of land is covered by the following land cover types?
 - lake or pond: 4.1%
 - riparian area, or wetland: 5%
 - grass, shrub, bare ground, exposed rock: 11.6%
 - tree cover: 68.2%
 - impervious surfaces (buildings, roads, parking lots, etc.): 5%
 - agricultural field: 6.1%
10. What are some challenges or threats to the health and functionality of your watershed?
 - municipal landfill operations - vehicle traffic, landfilling of waste
 - agriculture and farming - potential for pesticides, fertilizers other materials to enter watershed system
 - human activity - people leaving pollutants, illegal dumping, septic systems, vehicles, off-trail hiking
 - development for increasing population - removing natural areas and increasing impervious surfaces
11. What are some potential actions to protect or rehabilitate your watershed?
 - protect, maintain and expand parks to preserve natural areas (Francis King, Mount Work, Gowland Todd)
 - rehabilitate and expand creeks and wetlands (add habitat, design to slow water)
 - developments should install green infrastructure (bioswales, rain gardens, permeable pavement, etc.)
12. Are their any groups (governments, community organizations or volunteer groups) working on protection and/or rehabilitation efforts within your watershed?
 - Capital Regional District — environmental controls and monitoring of landfill operations, regional parks, harbours and watershed protection program, stormwater, wastewater and septic program
 - Province of BC — provincial park
 - Municipalities — Saanich, Highlands, Central Saanich
 - Community groups — [Friends of Tod Creek Watershed](#) and [Peninsula Stream Society](#)