How to Demonstrate the Bowker Creek Watershed Model

Please read the following pages thoroughly.

Transporting and storing the model

Avoid dragging, scraping or banging the wood model case when transporting, setting up or storing the model. A canvas sheet is provided to protect the wood case.

The model may be carried by one person with the top cover secured in position by the buckle straps provided. The model is best carried by two persons using the handles on the ends of the model. Strap handles and buckles should be arranged facing outwards with the drain port facing up as shown here:

The model should be rinsed clean with water after a wet demonstration and allowed to dry with the top cover off before securing the cover with the straps for storage.

The contents of the storage bucket should be set out to dry thoroughly before placing them in the Zip-loc bags into the bucket.

Do not rest or store the model on the drain port as this will damage the port threads.

A dolly is available to roll the model on floors.

Setting up for a wet demonstration:

The model is waterproof to allow for a wet demonstration with water. A drain port allows the model to be drained into a bucket or onto the ground.

1. Set up one or two standard 30”x72” plastic folding tables.
2. Arrange for two persons to carry the model by the inset handles and place the model on a table. The model has non-slip rubber grips to fit centred within the 30-inch width of the table.
3. Remove the model cover and set aside upright.
4. Open the model supply bucket and remove all the items onto a table or nearby surface:

5. Attach the drain hose securely to the drain port on the side of the model and place the open end of the hose into the empty storage bucket.

6. Fill the labelled water bottle and spray bottle with regular tap water.
7. Find the labelled ‘pesticide/herbicide' shaker bottle and refill with coloured drink powder before presentation if necessary. A small amount is enough.
8. Find the bottle labelled ‘oil’ (diluted 1:1 half water/half soya sauce) and refill if necessary before the demonstration.
9. Place the two painted removable culverted creek sections in their respective locations at Doncaster Drive/Hillside Avenue and along Shelbourne Street on the model. These pieces may be removed to reveal creek daylighting and public right-of-way raingarden concepts shown on the model.
10. Find four small green scouring pads from the storage bucket, and place them in the four recessed locations on the model surface: one at UVic, three in the middle of the model. These are used to indicate concepts for restored wetland function / storm water management facilities (SWMFs) where rainwater may be retained to reduce flooding and erosion of creek habitat during rainstorm events. The model is now ready for a wet demonstration.
11. When talking about pollution in the watershed, sprinkle a small amount of ‘pesticide/ herbicide’ (coloured drink powder) on the parks, on the green scouring pads (SWMFs), or anywhere within the watershed boundary on the model.
12. Sprinkle a few drops of ‘Oil’ (diluted soya sauce) on the model roadways.
13. Spray some ‘rainwater’ from the water bottles to dissolve the drink powder and soya sauce, washing it into the creek and to the ocean (down the drain into the bucket where it can be disposed of at a sink or onto the ground). The water will flow through the culverted creek reaches on the model.

Cleaning and drying the model – checklist:

1. When the wet presentation is finished, remove the four green scouring pad ‘SWMFs’ and the two removable culverted creek sections. Rinse them with water and set them out to dry. When dry, return them to their separate plastic bags before storing them in the bucket.
2. Rinse the model with enough clean water to wash any remaining dissolved drink powder and soya sauce out the drain port and into the bucket. Lift the model by the handles or prop the model up to allow most of the water to drain out.

3. Empty the ‘polluted water’ contents of the bucket into a sink or onto the ground. Rinse and dry the bucket thoroughly with a sponge or paper towels.
4. Disconnect the drain hose and set it aside to dry. Empty the water bottle and spray bottle and set aside to dry.
5. Pat the model dry with the sponge provided. Set the model aside to dry thoroughly with the wood cover off. Replace the cover when the model is completely dry.
6. Keep everything neat, dry and supplied for the next use. Put all the demonstration supplies into the bucket. Replenish the drink powder and soya sauce for the next demonstration if supplies are about to run out.
7. Sign and date the model checklist below when cleanup is done, noting anything missing or in need of repair.
8. If repairs are needed or supplies are low, contact the BCI at 250-360-3299.

Bowker Creek information

- Bowker Creek is known to the Songhees/ Esquimalt – Lekwungen people as ’Thaywun’ – ‘Coho salmon stream’.
- 60% of creek runs in culverts/ 40% runs in open channels
- 45% of the urban watershed is impervious surfaces.– roads, parking lots and roofs.
- Pollutants from pavements and tires wash into storm drains.
- Runoff during extreme rainfall events overwhelms storm drains and culverts causing flooding of residential areas.

What can we do to restore the urban watershed?

- Creekside plantings slow and filter intense rainfall events.
- Build a rain garden with native plants to absorb rainwater.
- Plant trees to shade the creek and cool the city during hot weather.
- ‘Daylight’ – open the culverted sections of the creek.
- Build graduated stream banks that can hold higher water levels to reduce flooding.

Presentation Script

Questions and answers:

Q: What is a watershed? Can you see the edge of the watershed shown on the model?

A: Think of a watershed as a big bowl in the landscape that collects rainwater.

The watershed boundary is shown as a teal line on the model, representing the high points in the landscape which are the dividing line between adjacent watersheds and rainwater flows outside the Bowker Creek watershed.

Q: How many Bowker Creek headwaters do you see?

A: There are two headwaters: one at UVic and one at the Cedar Hill Park Golf Course. Water flows in Bowker Creek year-round as it percolates through glacial till – sand and gravel, and clay soils in the watershed.

Q: How long is Bowker Creek and how big is the Bowker Creek Watershed?

A: The total creek, including the main tributary, measures 9.4 kilometres long; of that, 3.4 km remain as open channel and the remaining length flows underground through pipes and culverts. The creek mainstream (7.9 km) flows northwest from its headwaters at the University of Victoria, west and then south through Saanich in the Shelbourne Valley, and generally southeast through Victoria and Oak Bay to the outlet at Oak Bay. A major tributary (1.5 km) of Bowker Creek flows southeast through the Cedar Hill Park Golf Course and enters the main channel near Doncaster Drive and North Dairy Road.[1]

The Bowker Creek Watershed covers an area of 1,028 hectares (2,540 acres).

Q: What does ‘Thaywun’ mean?

A: *Bowker Creek was first known as Thaywun – ‘coho salmon stream’ – by the Songhees Nation of the lək̓ʷəŋən (Lekwungen) People. For thousands of years the salmon of Bowker Creek supported thriving Indigenous populations. First peoples living in this region fished for salmon, herring and rockfish and collected a variety of shellfish and plant materials. The creek endures as a tribute to the traditions of the ancestors.*[2]

Q: What do the numbers 1 to 17 mean?

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[1] Reference: *The Bowker Creek Blueprint*

[2] Reference: Thaywun – Bowker Creek Songhees History cairn at Cadboro Bay and Foul Bay road intersection.

A: The numbers 1 to 17 represent different reaches of the creek – some open, some underground in culverts – as identified in the *Bowker Creek Blueprint*. The open reaches are shown in clear blue on the model, the culverts are coloured grey.

Q: Where can you see Bowker Creek in real life? Do you know where Bowker Creek is in the city?

A: There are open reaches of the creek where you may see the creek flowing – shown as clear blue open sections on the model.

Q: Can you locate these open reaches of the creek on the model?

- at the UVic headwaters and forest,
- Browning Park on Shelbourne Street,
- Cedar Hill Golf Course Park,
- Lansdowne South Middle School,
- Kings Road Community Nature Greenspace
- Oak Bay Junction at Foul Bay,
- Oak Bay High School restoration and outdoor classroom,
- Oak Bay Park to St. Ann Street,
- the Monteith riparian restoration site to the mouth of the creek at Oak Bay.

Q: Looking at the model, can you see where Bowker Creek is buried in pipes and culverts? Why is 70% of Bowker Creek in pipes and culverts?

A: Bowker Creek once flowed freely through woodlands and wetlands, providing salmon, trout for food to Indigenous peoples. New settlers drained the wetland for farming and directed the water into roadside ditches. As more settlers moved onto the land and the city developed, flowing water was put into pipes and culverts to move it quickly into Bowker Creek. This has caused flash flooding of the creek and erosion of the creek banks, cutting the creek deep into the ground.

Q: Can we fix the erosion and flash flooding of the creek?

A: Yes, by working with nature – holding back rainwater in rain gardens, rain barrels, cisterns, and engineered stormwater management facilities, and by switching to permeable hard surfaces that allow the rainwater to seep slowly into the ground, instead of suddenly directing water into the creek.

Q: What is the water quality like in the creek?

A: Although the water quality is degraded by road runoff and pollutants, we are seeing improvements as we learn to keep pollutants out of the creek. Storm drains are now designed to trap oil and silt before it enters the pipes leading to the creek. CRD staff and community volunteers periodically test and asses the water quality in the creek for turbidity (how silty or cloudy the water is), and BOD (biological oxygen demand) levels. The Canadian Department of Fisheries and Oceans agreed conditions were determined to be good enough to allow the introduction of salmon eggs into the creek in Oak Bay.

Q: Why should we keep pollution out of the creek and ocean?

A: Pollution harms plants and animals, birds, fish, insects and tiny creatures and sea life that need clean water to live in a healthy balanced ecosystem.

Animals and plants in the watershed

Q: What kind of animals live in the watershed?

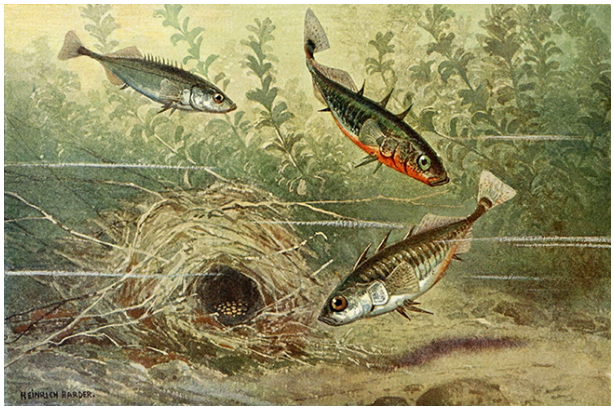
A: All kinds of creatures live in the watershed: fish, insects, birds, migratory ducks, microscopic life live in and around the creek.

Q: What kind of fish?

A: Stickleback[3] are found in Bowker Creek.

Q: Are there salmon in the creek?

On the model, can you see the salmon returning to the creek in Oak Bay?



Stickleback live in Bowker Creek

A: There were Chum salmon in the creek about 80 years ago until creek conditions became so poor they stopped returning to the creek to spawn. Evidence suggests that Bowker Creek also supported populations of Coho salmon and Coastal Cutthroat trout.

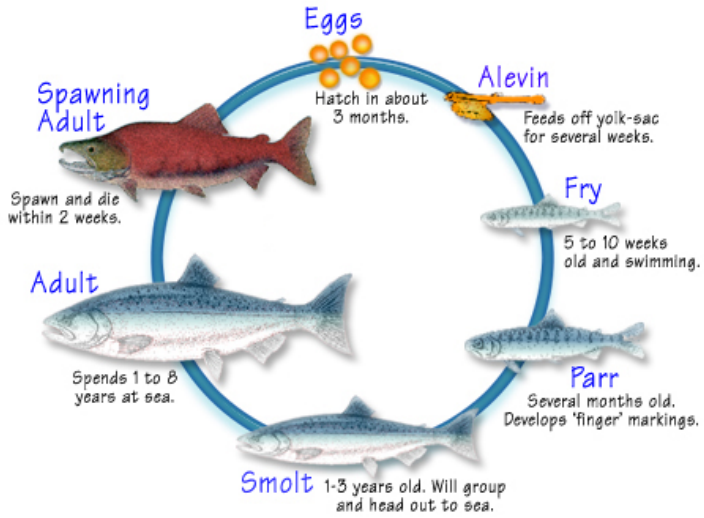
[3] Reference: https://en.wikipedia.org/wiki/Three-spined_stickleback

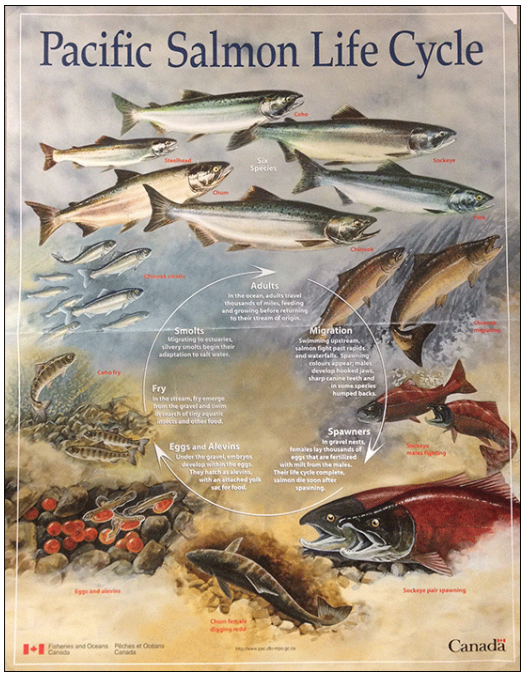
Volunteers from the Friends of Bowker Creek Society began the Chum Salmon Recovery Project. Preparations were made and 30,000 eggs[4] were placed in the creek in February 2022, hoping for a return of adult salmon in 3 to 4 years.

In the meantime, riparian (creek bank) restoration work will need to be done to maintain or improve water quality and prevent erosion of the creek banks and the buildup of silt in the creek bed which degrades the creek habitat for fish and the insects they feed on.

Volunteers can help with this restoration work, done by removing invasive plants; such as: Golden willow, Himalayan blackberry and English Ivy, and replacing them with native plants and trees suited to riparian areas and native habitat, helping to prevent erosion and provide habitat and forage for birds and animals. Planting trees will help provide shade to the creek in summer, preventing the creek from heating up – causing a reduction in oxygen levels, which will harm fish and insects in the creek.

***Salmon life cycle* diagrams:**





Q: Do owls live around the creek?

A: Yes, Barred owls are often seen in the trees near the creek where they hunt for rodents, mice and rats. (If an owl eats a rodent that has eaten poison, the owl might get sick and die).

[4] Reference: https://en.wikipedia.org/wiki/Chum_salmon

Red-tailed Hawk also come into the city, land in the trees and hunt for prey around the creek.

Go to the Bowker Creek Biodiversity Corridor iNaturalist Project to identify more creatures, tree and plants in and around Bowker Creek and add your own observations to the project.

What can people do to help restore the creek and watershed?

Raingardens

We can build raingardens at home and at school. A raingarden is basically a low spot in the ground that can hold rainwater and slowly release it. A raingarden may have native plants, trees and shrubs that help to take up rainwater. Microbes and mycorrhizal fungi around the plant roots help to break down pollutants and provide soil nutrients to the plants. Removing invasive plants and building a rain garden or native plant pollinator garden will help to expand biodiversity and forage for birds and insects in the urban watershed.

Raingardens can be placed almost anywhere in the watershed: they fit nicely in boulevards, alongside roads and public greenways – bicycle and pedestrian pathways.

(Find the City of Victoria raingardens along Hillside Avenue at the Hillside Centre on the model.)

Permeable paving

Homeowners might replace impermeable driveways with permeable pavers to allow rainwater to infiltrate into the ground. Commercial property owners and institutions such as schools might use permeable paving in parking lots, instead of impervious asphalt and concrete. They might install rain barrels or cisterns to capture rainwater for landscape watering – in a pond or waterfall feature.

Around the home and community

Being careful to recycle or dispose of household waste and chemicals properly will keep soil and groundwater healthy – not into the stormwater system and the creek.

People are encouraged to volunteer for watershed restoration work, removing invasive plants, helping to care for restored areas, remove discarded items, plastic and litter from the creek. The Friends of Bowker Creek Society has ongoing volunteer projects for riparian restoration. Anyone can pick up litter and organize their own cleanup projects.

Stormwater management facilities

Stormwater Management Facilities (SWMFs) are large areas in the watershed that can do a lot to prevent flooding of homes in the watershed during big rainstorm events. School fields are some of the best places to build a SWMF. A school sports field may be used most of the time for play and recreation, and then temporarily hold a lot of rainwater during a rainstorm, slowly releasing rainwater into the creek afterwards.

(Find the four SWMF locations on the model.)

What is 'daylighting?'

Daylighting is opening a culvert to expose the creek flow to daylight. This can be accompanied by riparian restoration – planting native plants to make the creek banks function naturally, and provide habitat for wildlife.

Daylighting involves engineering planning in cooperation with transportation and land use, extending the urban greenway and biodiversity corridor in the city. Designed to help prevent flooding, daylighting the creek will help the city adapt to climate change impacts. Daylighting will extend the urban greenspace, allowing more access to the creek for human health benefits.

Disclaimer: The terrain elevation on the model is exaggerated. Model details, buildings and features are merely representative and meant for discussion purposes only.

About the Bowker Creek watershed model

The Bowker Creek watershed model is made to demonstrate where rainwater in the urban watershed flows from impermeable surfaces – building roofs, roads, parking lots and into storm drains – picking up, oil, grit, pollution, pesticide and herbicide runoff – into Bowker Creek and to the estuary and Salish Sea at Oak Bay. By demonstrating the model, we learn how we may live in cooperation with and take care of natural ecosystems in the city. We all benefit from a clean, healthy watershed.

The following presentation script will help teachers and presenters demonstrate the model to students and public audiences. The script is in a Q&A format in a combined primary and high school level in preparation for post-secondary studies. Readers are encouraged to follow the links and references provided for further information and study.

By demonstrating the model, we learn about what goes into the stormwater system and what we can do to keep pollution out of Bowker Creek. We learn how to slow the flow of rainwater with rain gardens, bioswales, restored wetlands, rain barrels and cisterns to capture rainwater and slowly release it, where it may be used to water gardens, parks; or simply allow it to percolate down into the soil through permeable surfaces. Holding back and slowing the rainwater will help to prevent flash flooding and erosion of the creek banks and creekside (riparian) habitat.

The model may be demonstrated wet or dry, indoors or outdoors. A dry presentation requires minimal set-up and may incorporate the same information and discussion topics, but will be less interactive than a wet demonstration. With some preparation, a wet demonstration of the model may be easily made by a responsible adult or student using the items provided in the accompanying storage bucket. Be prepared to set up the model by reading in advance and following the instructions below, allowing time for cleanup of the model after the demonstration.

BCI Watershed Model Sign-Out Sheet

Please fill out after each use:

Where was the model shown?	by whom?	cleaned and dried by: (names)	Date	Notes