

## **SPEC Pollution Jar Activity**

In partnership with the students from the University of British Columbia

**Objective of this activity:** To promote discussion regarding water quality and the importance of protecting Vancouver's urbanized waterways. The following information will supplement the pollution jar activity and provide the presenter with information on each of the pollutants with an explanation regarding their relation to British Columbia's aquatic ecosystems.

### **Instructions:**

1. Display the pollution jars.
2. Ask the audience to either put up their hand or call out the name of the pollutant they believe is in the jar.
3. Once an audience member guesses the answer correctly or incorrectly (the correct answer can be found on the bottom of the jar), read the respective blurb of the script below.

### **Pollution Jar #1: Cement**

Cement is the key component and is well used in commercial and residential construction regions across North America. Cement plants are the third largest contributing source of pollution, emitting more than 500,000 tonnes of sulfur dioxide, nitrogen oxide, and carbon monoxide into the air annually<sup>1</sup>. These pollutants spread through both meteoric and aquatic systems. For example, sulfur dioxide, which is soluble in water, reacts with water and generates sulfurous acid ( $H_2SO_3$ ), which lowers the pH of the water. However, with the cooperation of the B.C. government, the cement industries in B.C. have decreased their emissions of sulfur dioxide and nitrogen oxide. Furthermore, cement itself can be a local pollutant in freshwater streams by its runoff into storm drains during local construction, especially in industrial parks. When the cement mixes with water, it can damage sensitive habitats in the streams resulting in a lower dissolved oxygen concentration, suffocating fish and other aquatic species.

### **Pollution Jar #2: Sediment**

Sediment is the result of land and rock erosion. Surface runoff caused by rain is a major contributor that results in severe soil erosion and flooding. In Vancouver, the annual precipitation is about 1000 mm, with over 90% of precipitation accumulating from September to March<sup>2</sup>. Sediment enters urban streams via runoff, which carries particles such as dirt, leaves and gravel to storm drains and directly deposits it into the freshwater streams. With Vancouver's expansion and increasing impervious surfaces (such as paved walkways), the concentration of sediments in runoff is increasing. Sediment, as a physical pollutant, in aquatic ecosystems may lead to loss of unique and sensitive habitats, decreasing biodiversity. Sediment as a chemical pollutant will also transport the sediment-associated organic chemicals from agricultural activities, such as pesticides, nutrients and metals, to local streams. These sediment-associated organic chemicals will enter into the food chain and be end up in the guts of top predators through bioaccumulation.

### **Pollution Jar #3: Paint**

Household paint, a common pollutant in urban streams, usually contains toxins or biocides such as resin, pigments, solvents and additives. Paint gets into the local water system through incorrect disposal of leftover paint and improper cleansing of paintbrushes over storm drains. The best and most efficient way to reduce paint pollution is to avoid paint waste. Painters need to dispose of paint safely by not washing brushes or paint tins in their driveways or gutters. They should refrain from pouring paint into stormwater drains, indoor sinks and toilets. A small amount of paint can be disposed into garbage bins after it is completely dried out. With large quantities of paint, a professional paint waste company<sup>3</sup> should be consulted. Toxic concentrations of copper in aquatic environments are often the result of paint drainage. Accumulation of copper in marine ecosystems will lead to an increase in the mortality of marine organisms<sup>4</sup>.

### **Pollution Jar #4: Soap**

Soaps and other detergents often contain artificial fragrances and colours, as well as various chemicals. These toxic materials, such as pigments and solvents, are absorbed by both soil and groundwater systems. Additionally, detergent destroys the external mucus layers of fish and other aquatic organisms. Most fish will not survive when the concentration when detergent exceeds 15 parts per million, while fish eggs will die when detergent concentrations are above 5 parts per million<sup>5</sup>. In Vancouver, soap that is used indoors passes through the wastewater treatment system and is treated as a biological process, which removes over 90% of the suspended solids and dissolved organic materials. For outdoor soap use, it is important to note that washing your vehicle in your driveway can significantly affect the quality of fresh water streams. Runoff soaps from washing your vehicle will enter the streams directly through storm drains without treatment. Soap will increase the pH of a stream, having a negative impact on fish habitat. To prevent soap runoff from your vehicle in storm drains, take your car to an appropriate car wash depot, which properly disposes the wastewater.

### **Pollution Jar #5: Oil**

Vehicles constantly drip oil on the road while running, an amount that is washed into storm drains by runoff, entering freshwater streams. Oil cannot dissolve in water and it forms a thick sludge. The formation of the thick sludge layer of oil in large quantities can suffocate fish and block light from reaching photosynthetic aquatic plants. Recreational boats are another source of oil pollution in local water systems. The amount of oil leaking globally is over 680 million litres per year<sup>6</sup>. Approximately 12% of oil in the ocean is the result of oil spills; the remaining 88% originates from leaking boats and individual runoff<sup>7</sup>. Oil spills are a major hazard to animals and natural habitats, as oil remains a part of the environment for decades.

## References:

1. U.S. Environmental Protection Agency (EPA). (2015). Cement Manufacturing Enforcement Initiative. Retrieved from <http://www2.epa.gov/enforcement/cement-manufacturing-enforcement-initiative>
2. Weatherstats. (2016). Vancouver Historical Total Precipitation. Retrieved from: <http://vancouver.weatherstats.ca/metrics/precipitation.html>
3. Environment Canterbury Regional Council. Stop and think about where that paint goes. Retrieved from: <http://ecan.govt.nz/advice/your-home/waste/hazardous-waste/pages/paint.aspx>
4. UK Marine Special Areas of Conservation. (2015). The Potential Effects of Antifouling Paints. Retrieved from [http://www.ukmarinesac.org.uk/activities/recreation/r03\\_03.htm](http://www.ukmarinesac.org.uk/activities/recreation/r03_03.htm).
5. Lenntech. (2016). Detergents occurring in freshwater. Retrieved from <http://www.lenntech.com/aquatic/detergents.htm>
6. Alabama Department of Environmental Management(ADEM). When Your Car Leaks Oil on the Street, Remember... It's Not Just Leaking Oil on the Street. Retrieved from: [http://www.adem.state.al.us/moreInfo/pubs/CWP\\_Car.pdf](http://www.adem.state.al.us/moreInfo/pubs/CWP_Car.pdf)
7. Water Pollution Guide. Oil Pollution. Retrieved from: <http://www.water-pollution.org.uk/oilpollution.html>



Society  
Promoting  
Environmental  
Conservation