

Yellow Fish Road

Program Guide



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1.0 Introduction

1.1 What is Yellow Fish Road?

Trout Unlimited Canada (TUC) is Canada's leading freshwater conservation and education organization. Our mission is to conserve, protect, and restore Canada's freshwater ecosystems, and their coldwater resources, for current and future generations.

The Yellow Fish Road (YFR) program is Canada's premier water education program and aims to reduce water pollution. Since 1991, this fun and exciting, curriculum-linked and action-oriented program gets youth participants involved in their community while making a difference to the water they need and use every day. The Yellow Fish Road program offers first-hand experiences that help participants understand their connection to water, and how storm drains often direct water to their local water bodies without purification or treatment.

YFR educates the public about the impact of pollution entering our storm drains and how storm water pollution can harm fish, wildlife and reduce water quality for human use. Participants mark local storm drains with yellow fish symbols and distribute educational door hangers to homes in the area. These symbols and materials help to raise awareness of storm water pollution and serve as a reminder that ***only rain should go down the drain***. This program generally takes place from early spring until late fall and is ideal for Grades 1-9. See page 9 for the curriculum links.

In celebration of the 25th Anniversary of Yellow Fish Road, we have launched the new self-delivery program. This new model gives educators the ability to deliver the program at their own time and pace in a convenient and affordable package.



1.2 What's in the new YFR model?

- Easy to use Teacher's Guide
- Yellow Fish Road introductory presentation video
- How to video for the storm water painting project
- Storm drain painting supplies for 24 participants
- Cross Canada curriculum links for Grades 1-9.

1.3 Our Specific Goals

- Prevent and reduce storm water pollution in urban settings
- Protect our rivers, lakes, and streams and their ecosystems
- Inspire youth to take stewardship action in their communities
- Inform citizens of the need for and importance of water protection

This unique program builds on a culture of caring for our most precious resource, water.

1.4 What is a Storm Drain?

Storm drains or catch basins, are the grates found along the roadside. They drain runoff water from our yards, driveways, sidewalks and roads, into a network of underground pipes, which lead to an outfall into the local water body. Without storm drains, excess runoff from impervious (hard) surfaces would flood our homes and streets, damaging the communities we live in. In most cities storm drain systems are not connected to a treatment plant, however some cities have combined storm drain and sewer systems, which treat storm water and waste water.



1.5 What is Storm Water Pollution?

Storm water pollution is anything other than clean water from rain, snow, or hail that enters the storm water system through storm drains. Common contaminants include garden chemicals (fertilizer, pesticides and herbicides), construction and landscaping debris dirt (sand and gravel), de-icing salt, car fluids (oil, gasoline, windshield washer fluid, car soap), pet waste and garbage. These all impact our waterways and the life they support. Polluted runoff happens anywhere people use or alter the landscape and water cannot seep into the ground. When rain falls on a solid surface, a greater amount of runoff is generated compared to runoff from the same storm over a forested area. These impervious surfaces create large volumes of runoff and swift pathways for pollutants to be carried directly to our waterways causing flooding, erosion and pollution. By participating in the Yellow Fish Road program, we can work together to slow the rate and volume of storm water flows and reduce sediment, nutrients and other storm water pollutants from reaching our waterways ensuring the health of our freshwater ecosystems for everyone.

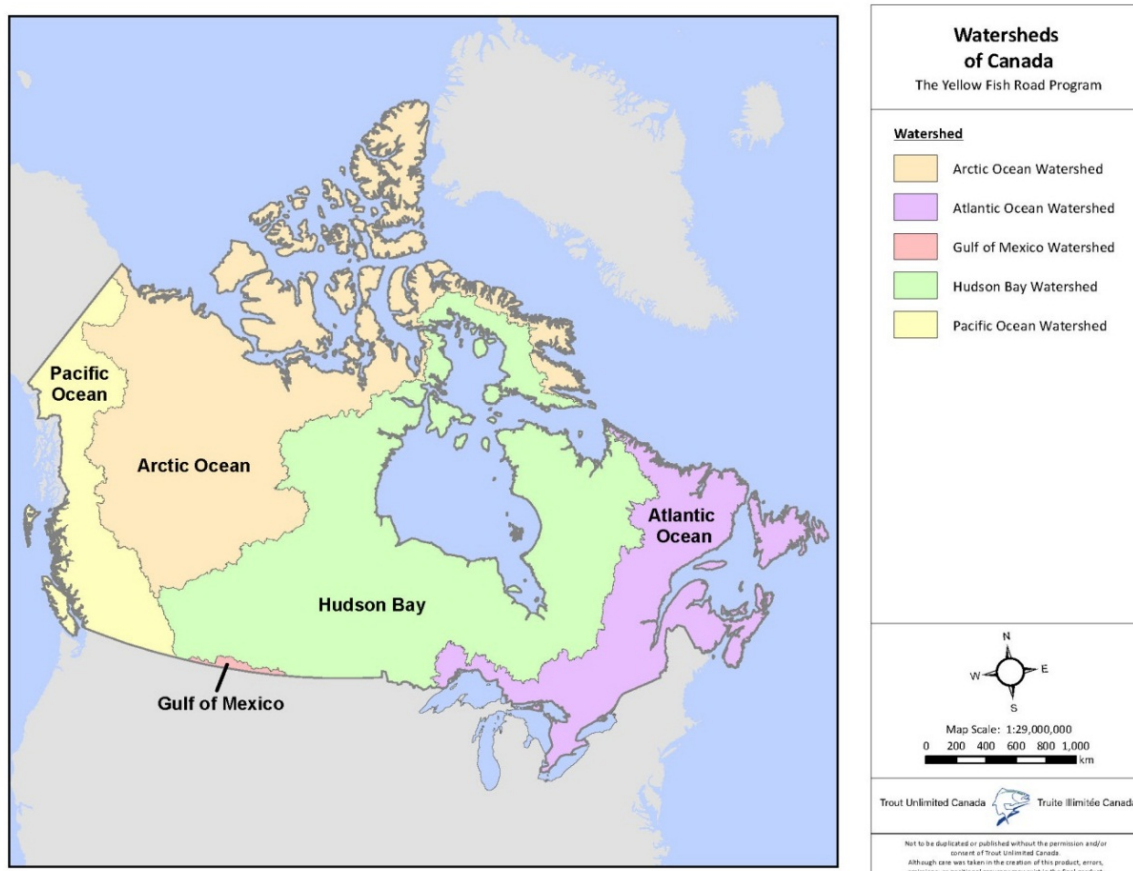


1.6 What is a Watershed?

A watershed is an area of land that drains to a common water body. Like a giant funnel collecting and draining water from up high by the way of smaller brooks and streams, wetlands and riparian areas, to lakes and rivers lower in the watershed. We all live in a watershed with the very few exceptions (endorheic basins). Eventually all the water from our rivers flows into the oceans.

All this water comes from precipitation like rain, hail and snow and is drained into local water bodies. Some water soaks into the ground where it becomes groundwater. The water in urban areas that flows across streets, parking lots, sidewalks, driveways, lawns and gardens is storm water runoff. Watersheds are home to plants and wildlife and places for people to live, work and play. We depend on water within our watersheds for clean drinking water, food production, laundry, water to bathe in and water to power our homes.

Canada has five major watersheds (see below). Which river basin or watershed do you live in? Where do you think the water flowing in your rivers and creeks begins? Where does this water eventually go?



1.7 The Value of water

Canada is home to 20% of the world's freshwater and according to the 2017 RBC Canadian Water Attitudes Survey¹, Canadians value freshwater as our most important natural resource but see it as unlimited because it is viewed as being cheap. While providing easy access to clean drinking water does come at a cost in terms of the operation and maintenance of its conveyance and treatment. Despite improvements to water conservation, Canadians use an average of 251 litres of water a day, one of the highest rates of water use in the world². We need to take measures to ensure that our water is not being polluted, over-used, and poorly managed so that there is abundant clean water for all Canadians.

1.8 Case Study

The Nose Creek Watershed in Calgary, Alberta came under pressure after decades of negative cumulative effects of agriculture, transportation, development and storm water discharge. This resulted in degraded water quality, loss of riparian habitat, reduced channel length and increased water flows at certain times of year. Typical post development land practices can produce 5 to 100 times more runoff compared to predevelopment conditions.³ The increase in storm water flows are caused by an increase in paved surfaces, soil compaction, the drainage of wetlands, and the loss of native vegetation. This can lead to more channel erosion, higher pollutant loads, deterioration of stream water quality and adverse impacts to aquatic species. To protect and restore water quality and riparian areas, the Nose Creek Watershed Partnership was formed in 1998 by the City of Calgary and surrounding municipalities, with technical assistance from Alberta Environment, Ducks Unlimited and Fisheries and Oceans Canada.

The Nose Creek Watershed Water Management Plan (NCWWPP) outlines goals and policies to guide jurisdictions to protecting Nose Creek from further degradation. It contains an integrated storm water management plan which focuses on restoring natural processes required to manage water and create a healthy urban environment. It incorporated Low Impact Development (LID) strategies which mimic the natural hydrological cycle, where precipitation captured at the source can be returned to water pathways through infiltration and evapotranspiration. These practices incorporate the reduction of paved surfaces and increasing green infrastructure features, while utilizing water quality Best Management Practices (e.g. bioretention areas, cisterns and rain barrels) to control runoff and ensure water quality objectives. The plan was completed in 2007 with the assistance of Alberta Environment but is a living document that changes as monitored conditions change in the watershed.

1. 2017 RBC Canadian Water Attitudes Study: http://www.rbc.com/newsroom/news/2017/20170320-cwas_cnews.html
2. Environment Canada, Residential Water Use: <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/residential-water-use.html#ftn1-ref>
3. Nose Creek Watershed Water Management Plan (NCWWPP) <http://nosecreekpartnership.com/wmplan>



2.0 Yellow Fish Road – Optional Activity

2.1 Frankie the Fish

Is adopted from a well-known model, “Fred the Fish”, which was originally adopted from Water, Stones, and Fossil Bones which was written by Patricia Chilton-Stringham and Janet Wolanin. Try adapting this activity for your classroom as a way to introduce water pollution to your students.

Objectives

Participants will:

- Identify sources of storm drain pollution in their community
- Understand how storm drains and storm water pollution are connected to water bodies
- Learn about the harmful effects of pollution on aquatic ecosystems
- Brainstorm solutions to reduce or prevent storm water pollution

What to do: Students will follow Frankie the Fish down a stream as it becomes polluted from storm water runoff. Students observe how everyday activities can pollute the stream, changing the water quality and eventually make Frankie and the other animals and plants in the water sick.

Materials and instruction for Frankie the Fish (*Not Included)

- 2 litre, clear plastic container with storm drain lid
- Yellow sponge
- Re-useable straw for blowing in water to demonstrate ‘Oxygen’
- Plastic mayfly/stonefly nymph, provides food for the fish
- Plastic plant, represents shelter and shade for the fish
- Take off the lid and fill the container with tap water then place the fish, plant and mayfly inside.



Storm water Pollutants

You can collect the following ingredients to represent pollutants:

- Green Kool-Aid powder (plant fertilizer)
- Red Kool-Aid powder (weed killer)
- Orange Kool-Aid powder (bug killer)
- Dish Soap (car soap)
- Vegetable oil (oil/car fluids)
- Brown sprinkles (dog feces)
- Colored sprinkles (garbage)
- Brown Cocoa powder (soil/sediment)
- Table salt (road salt)

Assign the nine roles from the following script to various students to read. Distribute the containers with the storm water pollutants to students. As the students read the script cards, those with the corresponding pollutants come up and sprinkle the pollutants into Frankie’s container of water. The rest of the students will say ‘**Only Rain down the Drain**’ as each pollutant is added. Have students describe what the water looks like after each pollutant is added. More importantly, discuss what is happening to Frankie as they are asked “How is Frankie?” Promote the careful use of lawn and garden chemicals, proper disposal of litter and pet waste, the use of natural or green alternatives, and Low Impact Development techniques.



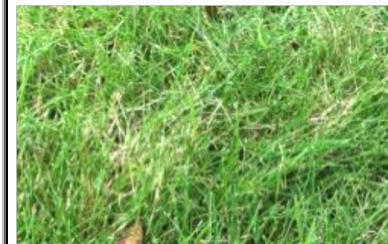
1. Cold, Clean Water...



Photo Credit: Aubrey Brown

Imagine a clean, healthy stream, as it flows from a mountain lake through a wilderness area. Meet Frankie the fish, a healthy, strong fish who has lived here all its life. This habitat provides a good supply of food to eat, (bugs and smaller fish), sheltered habitats with plants to hide in and cover to keep cool, clean healthy water to swim in. Plants and the moving water in the river help provide oxygen to breathe. Frankie is about to embark on an adventure.
FRANKIE IS HAPPY AND HEALTHY

2. Fertilizer (N-P-K nutrients)
(green)



Frankie nears a city. Someone has been using too much fertilizer on their lawn, which has been washed into the river by rain. (Place the green power into Frankie's habitat.)

What happens? The fertilizer made the plants and toxic algae in the river grow very fast and thick. The plants and algae keep growing and get tangled in the storm water outfall and algae reach dangerous levels which become toxic to fish and people. Other invasive species of plants like Eurasian milfoil and purple loosestrife grow out of control. **HOW IS FRANKIE?**

3. Weed killer/Herbicide
(red)



Frankie swims by a beautiful green park setting with a golf course. The thick green grass is weed free because of the use of weed killer to get rid of dandelions, chickweed and thistles (Add the red into Frankie's habitat).

What happens? The weed killer kills the plants in the water and now Frankie has no shade to keep it cool or cover for protection from predators. The water is warming up and there is less oxygen to breathe in the water. Frankie has a preferred temperature range that makes he/she happy (12-20°C) just like us! **WHAT WILL HAPPEN TO FRANKIE?**

4. Bug killer/Pesticide
(orange)



Frankie is swimming by a nice older community with lovely lawns and gardens. Some people have had trouble with ants getting into their homes, aphids sucking plant juices from the leaves, grasshoppers eating their tree leaves. Bug killer is used to rid their yards of these pests, now they are in the storm water.

What happens? The bugs that Frankie and other animals like birds, frogs, turtles, salamanders and snakes eat are dying too, and toxic chemicals are entering the water! The whole food chain is being compromised! Pesticides contain harmful chemicals which can damage the nervous systems and cause cancer. What will Frankie eat now? **WHAT WILL FRANKIE DO?**

5. Soap
(dish soap)



Some residents of a nearby town want to wash their cars. Instead of going to a carwash where the water gets recycled and treated, they decide to wash their cars in their driveways. (Pour dish soap into Frankie's habitat.)

What happens? The soap starts to eat away at Frankie's protective slime! The soap contains phosphate, which is an important nutrient for plants and causes excessive growth or eutrophication. Now there is a carpet of green on the water surface which sunlight can't penetrate so plants in the water die and decay and use up oxygen in the process. **HOW WILL FRANKIE BREATHE?**

6. Oil/Car fluids (vegetable oil) 	Frankie swims under a highway bridge where many trucks tend to leak oil and vehicle fluids on the road. (Pour the chocolate sauce into Frankie's habitat.) What happens? Car fluids flow into the river with the rain water. Now there are poisons in the river like hydrocarbons (oil and gas) and methanol (windshield washer fluid). It only takes one drop of oil to make 25 litres of water undrinkable! Oil is toxic to plants and animals and their habitats. Oil spreads in a thin layer over the water's surface stopping light from entering for plant photosynthesis and stopping oxygen from getting to any animal life. HOW'S FRANKIE?
7. Dog Waste (brown sprinkles) 	People have taken their dogs for walks and let them do their business (poop/feces) without cleaning up after them. (Add chocolate sprinkles). What happens? Frankie sees some dark globs in the water, it is dog waste! Their feces contain germs: bacteria such as E. Coli, Salmonella, viruses and parasites like tapeworms. Frankie may try to eat it thinking it is food, causing Frankie and other aquatic organisms in the water to become seriously ill. HOW DOES FRANKIE FEEL?
8. Litter (colored sprinkles) 	Frankie swims past a city park. Some picnickers didn't throw their trash into the garbage can. The wind is blowing and picks up the trash carrying it into the river. (Add colored Sprinkles) What happens? Garbage breaks down and these small pieces end up in the storm water system. Frankie swims into the trash and gets tangled up in it. He can't swim very well to get away from bigger fish! Then he tries to eat the garbage thinking it is food and it gets caught in his stomach! Poor FRANKIE, WHAT WILL HAPPEN NOW?
9. Soil and sediment (brown powder) 	Frankie swims past a construction site where there they are also landscaping, so dirt and debris is being carried down the storm drain (Add brown power). What happens? Frankie can't see in the water to find food, escape predators, or find a mate because the water is dirty and cloudy. The water becomes very turbid; otherwise known as cloudy, unclear or muddy with many total suspended solids (T.S.S.). High concentrations of silt, clay and sediment can change light penetration. This soil can clog or damage Franke's gill structures, compromise its resistance to disease, prevent proper egg development and reduce light penetration for photosynthesis? WHAT IS THE FATE OF FRANKIE?
10. Road salt (table salt) 	Winter is coming, and people and cities are using road salt and deicers to clear their driveways, sidewalks, and roads of ice and snow (add salt). What happens? Commonly used road salts contain chloride salts. These salts dissolve and get carried away in runoff and deposited into ground water and surface water streams. Frankie's water becomes increasingly salty, making it hard to balance levels of water in its body (called osmoregulation), affecting all of Frankie's body systems (metabolism, reproduction etc.). POOR FRANKIE

2.2 Modifications for Grade and Age:

Grade 1: Needs and Characteristics of Plants and Animals

- Focus on pollutants 1, 3-4, 7-8.
- Focus on the changes to water, plants and animals and the effects by pollutants.
- Focus on simple connections: we all need, food, water, shelter and space.
- Pollution solutions: look at how youth can bring nature into their yards; plant more trees and shrubs and build bird houses to attract insect eating birds to nest and feed on insect pests. Keep the plants in the yard healthy with proper care and watering.

Grade 2-3: Animal and Plant Growth and Changes, Air and Water in the Environment

- Focus on pollutants 1, 3-8.
- Focus on how pollutants change the growth, reproduction and life cycle of plants and animals.
- Look at all the connections in the food chain.
- Pollution solutions: emphasize maintaining balance in their lawns and gardens; fertilize naturally with new top soil, compost and keep grass clipping on to grass-cycle. Keep yards clean; pick up and dispose of garbage and pet waste, get rid of weeds naturally e.g. host a weed pulling party.

Grade 4: Habitats and Communities, Waste and Our World

- Focus on pollutants 1, 3-9.
- Focus on how pollutants change water habitats for animals and the aquatic ecosystem.
- Look at the minor changes to homes and habitats caused by pollution, and tie this into the community.
- Solutions: focus on how we can prevent storm water pollution around our home and school; dirt and debris is swept into the garbage and ensure lawn chemicals are placed onto the lawn or garden where they were intended.
- Learn about the tools and resources for recycling (what can and cannot be recycled) and how to compost to decrease waste of all kinds.

Grade 5: Renewable and Non-Renewable Resources, Wetland Ecosystems, Earth and Space Science

- Focus on pollutants 1-10.
- Consider changes at the watershed scale and include links to wetlands for Alberta.
- Highlight changes in the water and watershed from storm water pollutants and their sources and effects to water and life. Focus on changes to wetlands in Alberta.
- Solutions: look at prevention at the watershed level and emphasize the importance of wetlands and storm ponds and healthy riparian habitats for cleaning water through filtering and slowing the movement of surface water before it reaches water bodies.

Grade 6: Diversity of Life, Trees and Forests

- Focus on pollutants 1-10.
- Provide an ecosystem approach that looks at the diversity of life in our aquatic ecosystems.
- Look at how pollutants affect the diversity between and within species, ultimately affecting the flexibility and strength of the ecosystem allowing it to be more resilient to stress.



- Solutions: focus on our yards looking more like natural ecosystems with less pavement and grass and planting more native and diverse species of plants for food gardens and flower beds. Invite nature into our yards with water **Decomposer**s such as ponds, fountains and bird baths to attract a diversity of insect, bird, and mammal species.

Grade 7: Interactions and Ecosystems, Interactions within Ecosystems

- Focus on pollutants 1-10.
- Take an ecosystem approach when focusing on the interactions and connections of species.
- Focus on the numerous interactions and connections that are lost or broken with pollutants
- Solutions; emphasize Low Impact Development techniques, which mimic our hydrological (water) cycle; slow water movement with rain barrels and rain gardens and filter it with more porous pavement, bio-swales, or naturalized landscapes.

Grade 8: Fresh and Saltwater Ecosystems, Water Systems, Systems and Interactions

- Talk and demonstrate for all pollutants 1-10.
- Provide a whole aquatic ecosystem approach to looking at the journey of water from fresh to salt water, and back again.
- Look at the connectedness of water and how humans impact it, from its source to the ocean.
- Solutions: highlight best management practices to ensure pollutants are maintained on the land in both urban and rural areas, and reducing impacts from development (environmental reserves), transportation (healthy riparian areas and wetlands), agriculture (riparian buffer zones), industry, ranching (good ground cover and fencing), resource extraction (less linear disturbance or roads), and recreation (responsible use) before they reach our waterways.

Grade 9: Biological Diversity, Environmental Chemistry, Sustainable Ecosystems and Human Activity

- Focus on pollutants 1-10.
- Take an ecosystem approach to highlight the importance of sustainability and maintaining a balance between nature and human needs.
- Discuss the effect of pollutants on water quality parameters: chemical (pH, dissolved oxygen, nitrates and phosphates) physical (temperature, turbidity) and biological (macro invertebrates).
- Solutions: focus on the prevention of point source (wastewater treatment plants, chemical plants and industrial factories) and non-point sources (urban and agricultural runoff) of pollution through the best management practices and the use of Eco-Friendly household and lawn care products.
- Research case studies such as the Experimental Lakes Area (ELA) with Dr. David Schindler.
- Take action by informing others about the problems and solutions to storm water pollution.



3.0 Storm Drain Painting

3.1 Storm drain Painting Checklist:

Teachers/Leaders

- Call your local municipality or local Yellow Fish Road partner to ensure they know when and where you are doing the storm drain painting. Staff may be available for safety and guidance.
- Complete the attached Participant Agreement, which is also available online or use the one in this guide (p.13).
- Take a walk to the area where you are planning your activities and scout the streets and storm drains near you that you want to paint and map their locations for groups. Contact your local municipality and ask to use their storm drain maps if available.
- Pick only residential streets with low traffic volume and no busy bus routes.
- Depending on the age of your group, on average 6 youth can paint 6 storm drains in an hour.
- Plan for an alternate 'Rain Day' for the painting in the case of bad weather.
- Submit your storm drain data online at <http://tucanada.org/yellow-fish-road/> or use the app epicollect5, so we can track your progress. We keep records nationally and use your statistics for our grants, reports and evaluations.
- Ensure you use an Eco-Friendly outdoor latex paint, that has low VOCs (Volatile Organic Compounds) with no extra additives or solvents.

Volunteers

- Organize your volunteers: you will need one adult helper for every 6 students. Plan to have one or two extra volunteers in case others can't make it, extra hands are always helpful.
- Distribute and assign the streets you have chosen amongst the group leaders. Providing group leaders with simple maps of where you want them to mark or paint.

Students

- Paint does not come out of clothing easily, so it is best to wear some "old painting" clothes.
- Have everyone stay with a partner for safety; most jobs will be done with a partner.
- Remind students to stay hydrated, wear sunscreen, and/or bug spray if needed
- Most importantly **have fun!** You are making a difference in your watershed!



3.2 Yellow Fish Road Terms and Conditions

By participating in Trout Unlimited Canada's Yellow Fish Road™ (YFR) Program, you also participate in the following terms and conditions. User of the program are teachers, scout or guides leaders, community groups, or other individuals who purchased and/or are using Trout Unlimited Canada's Yellow Fish Road Kits.

1. Designate a group leader to read and understand the YFR Program Guide and be responsible for the group while implementing the YFR Program.
2. Obtain the necessary supplies and permissions as outlined in the YFR Program Guide, whether through an YFR Partner or through our own means.
3. Ensure group members understand and follow the safety and painting procedures outlined in the YFR Program Guide (or by an YFR Partner or the municipality).
4. Ensure that all groups are supervised at all times.
5. Ensure that any class/group members under the age of majority have written parental consent to participate; and ensure that parents understand that the group leader, not Trout Unlimited Canada, will be supervising the storm drain painting activities.
6. Ensure a minimum of 1:6 adult to child ratio for the painting/markings.

As participants in Trout Unlimited Canada's Yellow Fish Road™ Program, your group will **not** be covered by Trout Unlimited Canada's (TUC) commercial general liability insurance for the storm drain marking. Trout Unlimited Canada is not responsible for bodily injury incurred or damage to or loss of personal property incurred while implementing the Yellow Fish Road™ Program. Insurance will be the responsibility of the participants and their leaders for the duration of the storm draining marking project.

**Should you have any questions about the above Terms and Conditions,
please contact our Education Department at kmason@tucanada.org**

3.3 Storm Drain Painting Instructions:

Ensure each group that has a kit has a 6:1 ratio of 6 youth:1 adult leader to supervise.

There are three jobs: safety people, painters and door hangers. Rotate the duties so everyone gets a chance at them all. One group of two can hang door hangers while the other four paints, but they must always be within sight of the adult leader.

1. Safety First (1 leader: 2 people as 'Safety Heroes')

- **Adult:** Sets up a safety zone, places two pylons on the road away from either side of the storm drain and 1 metre out from the storm drain.
- For Ontario, place eight pylons tapered into the curb on both sides of the storm drain, 1 metre out from the storm drain. Once the pylons are in place the 'Safety Heroes' can stand guard from the curb or the street.
- **Safety Heroes:** Two children will stand on the curb and wait until the pylons are set on the curb or the street. They then put on the safety vests and step out inside the safety zone onto the curb or the street. Their job is to ensure everyone remains within the safety zone. The curb is a safer choice.
- If a vehicle approaches, observe it, notify your group and ensure that everyone remains with the safety zone. If the vehicle comes too close, stop your work and move to the curb for safety until it has passed by.



2. Clean and Paint (2 people)

- Two painters: Wear protective gloves (cloth or vinyl) and use the broom provided to sweep debris around the storm drain into the dustpan and then deposit it into the garbage bag.
- Secure the stencil provided down on the road or pavement beside the storm drain, whatever is smoothest and carefully squeeze paint into the fish shape (loonie size).
- Use the paint roller to fill the stencil shape and add more paint as needed. Using too much paint smudges. When doing the words, flip the roller on its end and dab paint into the letters (like a bingo dabber).
- Carry onto the next storm drain covering the roller with a sandwich bag provided so it doesn't dry out or get paint on your clothing as you walk.



3.4 Hanging door hanger Instructions:

3. Door hangers (2 people)

- Stay on the same street as the group and go door to door to hang the door hangers. If a door has a sign that says 'No Flyers' respect their wishes and do not leave a door hanger.
- Door hangers: Please ensure they are tightly secured so they do not become litter. Place one fish-shaped door hanger at each house by opening the tail and fitting it around the mailbox hanger or doorknob (in the following preference).

1. In or hanging on the mailbox
2. On the doorknob of the door
3. Inserted securely into the door



4. Fill out the Tally Sheet

Keep a record of your work. This information is very important! Note the following:

- Adults and children participated
- Storm drains were painted
- Door hangers hung

Then to <https://forms.gle/icHvXTg8ZREbAMTk7> to tell us how many door hangers and storm drains you worked with. We appreciate your feedback as we use it in our grant applications and reports.



Kit Contents	School Kit	Family Kit
Carrying Caddy for supplies	4	2
Clipboard & Pencil (Instructions, and tracking locations)	4	2
Safety Vests	4	2
Dustpan/Broom to cleaning around drain	4	2
Garbage Bag to collect garbage around drain	8	8
1 Plastic Locking Bag for carrying the wet roller or brush	4	2
Bottles to hold paint	4	2
Pairs of gloves	8	4
Paint roller	4	2
1 Reusable 'Water Only' stencil	4	1
Informative Yellow Fish Road door hangers	100	50



4.0 Yellow Fish Road Resources

4.1 Storm water Pollutants-Source and Effects

Pollutants	Source	Effects
Soap/Detergent	- Washing cars in the driveway - Dumping wash water onto the street - Washing siding or windows	- Can strip away the protective mucous coating on a fish – without this protective coating, fish will absorb more chemicals and are more susceptible to disease. - High concentrations can kill fish eggs and adult fish.
Litter/Garbage	Litter from people, houses, industrial areas and construction sites	- Can cause unsightly debris and unpleasant odors. - When ingested by an animal, litter can be dangerous, causing death. - Dangerous litter can harm people or animals (e.g. glass).
Heat	Even heat can be a pollutant! Storm drain water is coming from runoff over land and roads and is usually warmer than the local water body	- Increased temperatures can affect certain species of fish, invertebrates, and plants, which are adapted to living in a certain range of temperatures. Fish are particularly sensitive to temperature changes during spawning. - Warmer water holds less dissolved oxygen, which can be a problem for species that require a certain oxygen level in the water. Coldwater fish, such as trout, prefer waters that are cooler than 14°C.
Heavy Metals (i.e. Aluminum, copper)	- Industrial sites - Washing cars in the driveway - Metal corrosion (e.g. from cars and pipes) - Pesticides and herbicides	The levels of heavy metals found in water are generally low, however, due to bioaccumulation, higher concentrations can be found in wildlife. Bioaccumulation is an increase in the concentration of a chemical in an organism over time. As an organism drinks and eats contaminated sources, it will accumulate chemicals in its body over time. Accumulation can lead to a reduction in aquatic biodiversity and hinder plant growth.
Nitrates/Phosphates	- Nitrates come mainly from fertilizers, and some from animal waste - Phosphates are found in detergents and fertilizers. Some comes from animal waste and car fluids	- Can cause eutrophication or algal bloom. - Nitrates and phosphates are nutrients that plants need for growth. Algae will grow very quickly if there is a high concentration of these nutrients in the water, causing algal blooms. - Too much algae in the water leads to less oxygen for other organisms, less light reaching other plants can clog the gills of fish and clog water drainage systems.
Oil/Grease (Hydrocarbons)	Leakage of oil and other lubricating agents from cars and other motorized machines	- There is a wide array of hydrocarbon compounds, some of which are known to be toxic to aquatic life. - More oil comes from storm drain pollution than from oil tanker spills! For instance, one drop of oil can contaminate 25 litres of water.
Pathogens (Disease causing organisms)	Can be found in pet and livestock wastes, and faulty septic systems	10 harmful pathogens are associated with dog feces, including: bacteria like E. coli and Salmonella, protozoan parasites like Giardia lamblia (beaver fever), and viruses like Norwalk. - They can cause disease in humans and wildlife.
Pesticides	Excess herbicides and insecticides from residential and agricultural lands	- Can harm plants, wildlife and humans through chronic low concentration or sudden high concentration exposures. - Effects include: loss in production, changes in growth, development and/or behavior and death of species.
Salts	- Sidewalk and roadway application - Irrigation practices	- Salt dissolves very easily in runoff and can increase the salinity of the local waterbody. In some places, spring runoff can cause the salinity of the local waterbody to reach ocean salinity levels! - Freshwater species of plants and animals are not adapted to the high level of salinity. - The dissolved salts are difficult and expensive to remove. - High salinity water may also be corrosive to piping systems
Sediments	Includes organic debris, silt and sand from roadways, improperly managed construction sites, crop and forest lands and eroding stream banks	- Can increase turbidity, or the cloudiness of the water, which can clog fish gills, decrease the amount of dissolved oxygen in the water and suffocate trout and other organisms' eggs. - Added sediments can change the course of a river or a stream and damage habitat – it doesn't take much sediment to do this. Sediment and particles such as silt, clay, and organic matter are suspended in water. Total Suspended Solids (TSS) are often a vehicle for which contaminants are transported. High TSS concentrations degrade fish and aquatic environments.
Chlorine, Bromine, Copper and Muriatic Acid	Swimming pool water	Pool water has chemicals that are very toxic to fish and other organisms in the water. Please drain it into the sewer system or down your house drains.

Other pollutants can be found in our waterways that do not necessarily come from the storm drain system, including:

Acid deposition (e.g. smog, acid rain.) Pharmaceutical and personal care products (e.g. lotions, soaps, make-up) and medications (antibiotics, aspirin and hormones) these products may not be completely filtered out at the wastewater treatment plants



4.2 Yellow Fish Road Curriculum Connections

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9
BC	Needs of Living Things	Animal Growth & Changes	Plant Growth & Changes	Habitats & Communities	Renewable & Non-Renewable Resources	Diversity of Life	Ecosystems		
AB	Needs of Plants & Animals	Water, Small Crawling & Flying Animals	Life Cycles	Waste & Our World	Wetland Ecosystems	Trees & Forests	Interactions & Ecosystems	Fresh & Saltwater Ecosystems	Biological Diversity & Environmental Chemistry
SK	Needs & Characteristics of Living Things	Air & Water & the Environment, Animal Growth & Changes	Plant Growth & Changes	Habitats & Communities	Earth & Space Science	Diversity of Living Things	Interactions within Ecosystems	Water Systems on Earth	
MB		Air & Water in the Environment		Habitats & Communities	Properties & Changes of Substances	Diversity of Living Things	Interactions within Ecosystems	Water Systems on Earth	
QU	Cycle 1 - Natural sources of fresh water Cycle 2 - The Water cycle Ways water quality affects living things Living Things, Ecology								
ON	Needs & Characteristics of Living Things	Growth & Changes in Animals	Growth & Changes in Plants	Habitats & Communities	Understanding Earth & Space Systems	Biodiversity	Interactions in the Environment	Systems & Interactions	Sustainable Ecosystems, Sustainable Ecosystems & Human Activity
Atlantic Provinces		Animal Growth & Changes	Plant Growth & Changes	Habitats	Properties & Changes in Materials	Diversity of Life	Interactions within Ecosystems	Diversity of Living things & Interactions	
NWT	Characteristics of Living Things	Air & Water in the Environment, Growth & Changes in Animals	Growth & Changes in Plants	Habitats & Communities	Earth & Space Systems	Diversity of Living things	Interactions & Ecosystems	Fresh & Saltwater Ecosystems	
Yukon Territories	Characteristics of Living Things	Air & Water in the Environment, Growth & Changes in Animals	Growth & Changes in Plants	Habitats & Communities	Earth & Space Systems	Diversity of Living Things	Ecosystems	Water Systems	



4.3 Yellow Fish Road 'Action Ideas'

There are many actions we can take to conserve fish habitat, improve water quality, reduce the impact of storm water flows and protect native aquatic life. Here are a few easy things we can all do...

Take action around home:

- Use lawn chemicals carefully and sweep and clean up any excess that is on the pavement.
- Pull weeds by hand, use small specialized tools or have a work day to get the job done.
- Do companion planting, plant native grasses, add grass seed or wildflower mixes to your lawn.
- Snip, prune and discard insect infested leaves and branches to keep them from spreading.
- Dislodge insect pest with insecticidal soap or a high-pressure spray of water.
- Grass cycle: leave grass clippings on the lawn after mowing to allow the nutrients to be recycled.
- Drain your swimming pool water into the wastewater system or down your household drain.
- Apply natural insecticides such as diatomaceous earth and set out ant and wasp traps.
- Invite insect predators to your yard by building bird houses, leave leaf litter for ladybugs habitat, keep spider webs intact and install water elements for dragonflies and frogs.
- Fertilize with natural materials like new top soil, compost, compost tea, bone meal or peat.

Take action around the community:

- Wash your car at a car wash, not in your driveway where soap and water drain to the river.
- Clean up after your pets and ensure their wastes are disposed of properly in the garbage.
- Maintain your vehicle(s) and safely dispose of chemicals (oils, antifreeze, etc.) at lube shops.
- Stay on bike and walking paths to avoid sediment and soil from eroding into the river.
- Dry sweep dirt /debris from landscaping /construction projects before it washes down drains.
- Harvest rain water in rain barrels and use it to water your lawn and garden.
- Plant groupings of plants and use native and water-wise plants that require less water.
- Plant roof-top green gardens, container plantings, bio swales and bio-retention gardens.
- Have more porous surfaces enabling surface water pollutants to drain and filter into the soil.

Take action around your school:

- Learn more about water pollution and water issues in your own watershed.
- Start your own Water Conservation or Protector Club at school or in your school or community.
- Find out where to dispose of harmful chemicals properly in your community (i.e. Fire Halls).
- Protect storm water through Low Impact Development practices that mimic the water cycle
- Recognize labels for environmentally-friendly products and learn green gardening methods.
- Urge and support federal, provincial and municipal action on non-point source pollution issues.
- Join and support environmental groups that work to solve non-point source pollution.
- Inform your friends and family and help educate others about storm water pollution.

Take Action and lead a Yellow Fish Road™ Storm Drain Stenciling activity in your community!



5.0 Glossary:

Biodiversity: General measurement of the many kinds of organisms living and interacting within a biotic environment.

Decomposer: Bacteria, fungi, and other organisms which help break down decaying organic matter.

Eutrophication: The condition in which an aquatic ecosystem has an excess amount of a limiting nutrient like phosphorous or nitrogen, which causes accelerated proliferation of plant or algae growth.

Freshwater ecosystem: All living and non-living components related to the ecosystems found in and around water (e.g. lakes, streams, rivers).

Groundwater: Water that flows or seeps underground and saturates soil or rock, supplying springs and wells. Groundwater flows underground through rock crevices and pores of the geological materials which make up the earth's crust.

Hydrological cycle: Pertains to the water cycle, starting from evaporation of water from land and water bodies, to condensation as moist air rises cools and condenses to form clouds, and then precipitation, when moisture in the clouds returns to the ground.

Impervious: A surface which is hard, and water cannot easily soak into.

Indicator: A substance used to indicate chemical conditions or changes, e.g. large algae blooms in lakes (eutrophication) is an indicator of pollution.

Macro invertebrate: A small organism, without a backbone, which can be seen with the naked eye.

Non-point Source Pollution: Pollution spread over a large area and not from a specific location; this type of pollution is hard to trace (e.g. urban runoff, acid rain).

Pathogens: A disease-producing agent; usually applied to a living organism; any viruses, bacteria, or fungi that cause disease.

Photosynthesis: The process by which plants produce sugar and oxygen from carbon dioxide and water in the presence of light.

Point Source Pollution: Pollution that is easy to trace to its source (e.g. factories and sewage or wastewater treatment plants).

Porous Pavement: Alternatives to hard pavement or asphalt surfaces that utilize a variety of porous medium. These surfaces allow water to filter or percolate through the surface.

Purification: The act of making pure or clean (e.g. filters are used in the purification of water)

Riparian: The riparian zone includes the area adjacent to a water body where terrestrial (dry) and aquatic (wet) ecosystems meet and interact.

Saturate: Soak thoroughly; fill to capacity with water.

Surface water: Water that is on the earth's surface, such as in a stream, river, lake or reservoir. Surface water can become groundwater and vice versa.

Turbidity: The combination of dissolved and suspended solids in water, which causes the water to be muddy or cloudy (e.g. the turbidity of the river was increased by rainfall).

Wetland: A wetland is a place where water and land meet. Wetlands are often shallow, slow moving water, without a permanent bank and are temporary in nature; some may last just one season.



Help protect our waters one storm drain at a time!