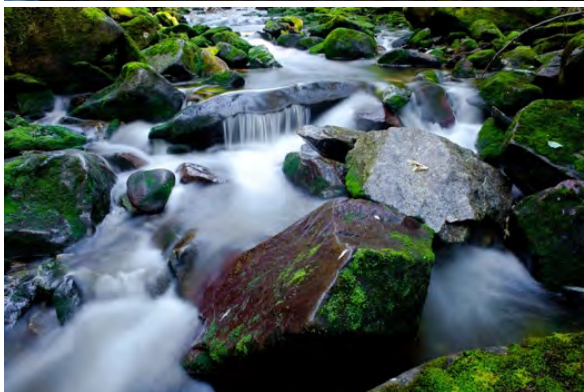


take a
STAND
YOUTH FOR CONSERVATION
Salmon Action Kit

*Inspiring youth
across B.C. to
conserve wild
salmon & help save
our planet*



Photos: Nicolas Teichrob

Table of Contents

<i>Introduction</i>	<i>3-6</i>
<i>More Than Just Food</i>	<i>4</i>
<i>A Life History Embroiled in Genetics, Mystique & Athleticism</i>	<i>5</i>
<i>Action Projects and Contest: You Can Make a Difference</i>	<i>6</i>
<i>Salmon Lifecycle infographic</i>	<i>7</i>
<i>Earn Badges and Prizes!</i>	<i>8</i>
<i>Enter Our Contest</i>	<i>9</i>
<i>Organize Your Contest Entry</i>	<i>10</i>
<i>Example 1: Educator</i>	<i>11</i>
<i>Example 2: Rescuer</i>	<i>12</i>
<i>Example 3: Innovator</i>	<i>13</i>
<i>Example 4: Grassroots-Changer</i>	<i>14</i>
<i>Who We Are</i>	<i>15</i>
<i>Acknowledgements</i>	<i>16</i>
<i>Glossary of Terms</i>	<i>16-17</i>
<i>Further Reading</i>	<i>18</i>
<i>Resources & Community</i>	<i>18-20</i>





Introduction

Wild Salmon are keystone species of immeasurable ecosystem, spiritual and cultural importance. As they provide food on our tables they are of great economic importance as well. In B.C., the main wild species of salmon are chinook, sockeye, pink, coho, and chum and there is considerable biodiversity within populations of those main species. There are over 137 other species that rely upon wild salmon for their food including resident orcas, bears, coastal wolves, eagles, osprey, and other wildlife. In the Great Bear Rainforest of B.C. – one of the largest intact temperate rainforests remaining in the world – the term “salmon forests” has been coined to exemplify the wonderful ability of salmon to support growth – not just of wildlife, but trees! The salmon that is not consumed by bears, wolves, birds and other wildlife decays and nitrogen (N) and other nutrients return to the soil. The nitrogen supports the growth of trees in the Great Bear; for example, the size of the growth rings of the trees is correlated with the extent of the salmon “run” each year.

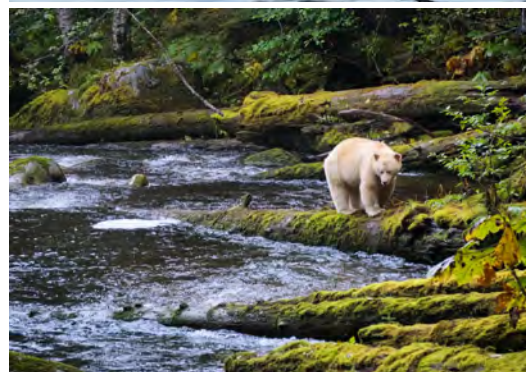
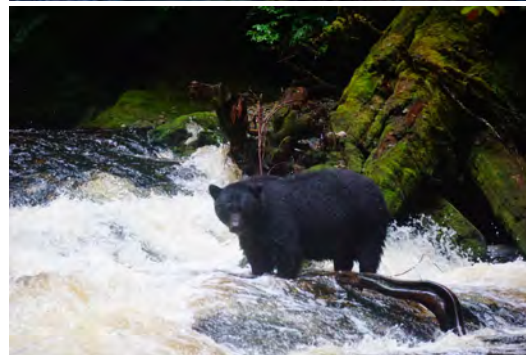


Photo: Left, top: Chris Christie, Left, bottom: Nicolas Teichrob. Right (top to bottom): Anthony Bonello, Ian McAllister, Norm Hann, NOAA Fisheries (with Federal Research permit), Norm Hann.



More Than Just Food

The vast cultural and spiritual importance of wild salmon is seen by the welcoming figures of First Nations carvers that pepper B.C.'s coastlines and coastal communities.



Photos: Left top: Ian McAllister, left middle: Andrew Wright. Photos of welcoming figure: Allison Kermode.

Welcoming Figure (Ambleside Beach, West Vancouver). A gift from the Squamish Nation, the figure marks K'aya'chtn (gathering of ocean canoes), and was created by Sekwilm Siyam Sintl', Stan Joseph Jr., with assistance from Wesley Nahanee and William Nahanee. The guardian woman has a beautiful salmon on her back; the figure is in honour of the teachings and wisdom of the Squamish Nation grandmothers and is meant to foster respect for the land, animals and people that occupy it.

Coastal First Nations, artists, storytellers and ambassadors tell of their people's sacred connections to salmon and honour all components of the salmon's life history.



Acclaimed Haida artist Juanita Ens portrays a salmon egg as a symbol of new beginning and growth. The artwork was created for Simon Fraser University's Indigenous Research Institute logo.

In our everyday lives, we may not think deeply about wild salmon – but we should, as these amazing fish that we rely upon for our food - as do a multitude of other species - are in fact an essential connector between people, animals, trees, and the environment. Clearly these species are to be honoured and revered.



A Life History Embroiled in Genetics, Mystique, and Athleticism

It is partly the migratory life history of wild salmon – in which their lives begin and end in fresh water – that makes these species particularly vulnerable to threats imposed by human activities (Infographic, p. 7). Wild salmon rely upon the vitality of multiple interconnected habitats – fresh water streams and rivers, estuaries, intertidal zones, and the open ocean. Just as one example, sockeye salmon spend the first few years of their lives in freshwater streams and watersheds before heading out for the open ocean. Pink and chum salmon juveniles head out to sea immediately. Prior to encountering the ocean habitat, the juvenile salmon must turn on a “pre-programmed” pattern of new gene expression and change their physiology so as to survive their new salty environment. After a variable period of time at sea (2-7 years for adult sockeye), the salmon begin their migration back home.

The incredible journey back home



Photo: Nicolas Teichrob

The athleticism and power of wild salmon are brought to the forefront when they must swim from the open ocean to the freshwater stream of their birth – a journey of hundreds or even thousands of kilometres leading the fish ultimately upstream to spawn in their freshwater hatching grounds. The annual migration of wild salmon is a beautiful sight to behold. If you have had the chance to witness

salmon migration, it is spellbinding and you will never forget the experience. Yet this inland journey is fraught with challenges that in today’s world are unprecedented. This means that wild salmon need our help.



Photo: Canada Wild Productions Ltd.

A beautiful portrayal of the wild salmon lifecycle from birth to death was presented in the summer of 2017 by the immense art installation called UNINTERRUPTED (Canada Wild Productions Ltd.), which was screened on the undersurface of the Cambie Street Bridge in Vancouver. As well as highlighting the human intimate connection to wild salmon, this at-dusk educational exhibit showed how B.C. rivers are among the world’s most vital for preserving wild salmon stocks, as billions of eggs are laid annually along these waterways and watersheds (see uninterrupted.ca).

*UNINTERRUPTED also captures the mystique and reverence surrounding the communal travel in which groups of salmon that hatch in a stream later return there to spawn. Known as “homing”, this process partly involves the group possessing a unique genetic code or a set of heritable DNA changes (**epigenetic** changes) that evolved or were maintained over thousands of years to match that particular waterway. Whatever the homing mechanism, as spawning time approaches, salmon have a seemingly inherited tendency to orient themselves toward the area of coastline where the waterway of their birthplace discharges.*

Their navigation may be guided by a suite of environmental cues that give the fish an ability to know their position and direction of travel - day length (a circadian calendar), the sun's position and angle, the earth's magnetic field, and water salinity and temperature gradients. After they find the correct river mouth and by the time salmon reach freshwater, they are guided largely by their sense of smell to the correct tributary. In fact, the memory and smell centers in a salmon's brain grow rapidly just before it leaves its home stream for the sea. A salmon can detect one drop of water from its home stream mixed up in 250 gallons of sea water (see Further Reading). Salmon will follow this faint scent trail, with the aid of the other methods mentioned above, back to their home stream to spawn.

So intriguingly, the direction-finding cues - unique chemical odors of their locale - are thought to be collected by a process known as imprinting which takes place at multiple earlier stages in their lives - during hatching, during emergence from their gravel nests, and when, as juveniles, they made their migration out to the sea. Yet amazingly these cues are put to use years later, when the adults attempt to return to their home streams.

Still legend has it that a grain of sand is taken by the salmon from the waterway of origin - and it is that unique grain of sand that allows the fish to return to its birthplace to spawn. The social aspects of the journey home are also spellbinding in which the salmon seem to ruminate in groups prior to entering the mouth of the correct waterway. Here they seem to take turns being in front and plan their journey first by swimming in circular formations that resemble a circle of life. This is captured by one of Richard Shorty's artworks (Northern Tutchone Nation, Yukon) called "Follow Me". Salmon circles and spindle whorls that depict a salmon in phases of its spawning cycle have also been integral to Coast Salish design and to the perpetuation of Coast Salish cultures.



Artwork by Richard Shorty, "Follow Me" (c. Canadian Art Prints & Richard Shorty)



Artwork by Susan Point (Musqueam First Nation), "Full Circle"

Action Projects and Contest: You Can Make a Difference

The infographic of the salmon lifecycle (p. 7) shows some of the human activities that are posing threats to Pacific wild salmon. The specific species of wild salmon (chinook, sockeye, pink, coho, and chum) have been differentially affected, but all of them have shown dramatically diminished numbers leading to some of the lowest recorded levels in recent years. When undertaken, the restoration of critical salmon habitat and fishing moratoria have yielded positive responses up and down the B.C. coast showing the vast interconnectivity of ecosystems and ocean regions. You can make a huge impact on tackling the issues surrounding declines in wild salmon populations, thus benefiting humans and the other ~137+ species that rely upon wild salmon for their livelihood. At the same time, we make our communities a better place to live by honouring the homes and vitality of all inhabitants, not just humans. **No action is too small.** For the youth contest (p. 8-14), all action projects need to be accompanied by a video or other artwork. This guide helps to make youth action projects feasible toward solving this seemingly complex problem. Ultimately, we hope to enable the formation of a **Wild Salmon Youth Coalition (WSYC) of British Columbia.**

Salmon Life Cycle

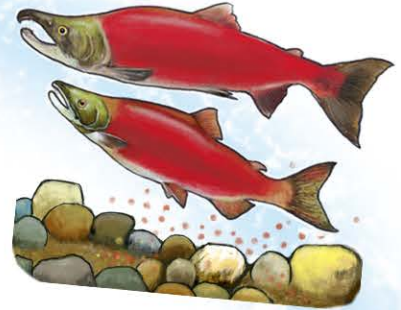
Death from:

- lack of fertilization/development
- excessive temperatures
- episodic drought/flooding
- disturbance of gravel
- pollution
- predators

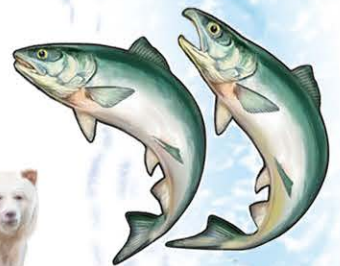


EGGS incubate in gravel nest called the "redd"

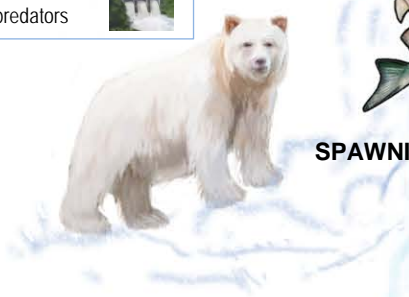
SPAWNING SALMON
return to the stream of their birth to lay eggs of the next generation before dying



COURTSHIP

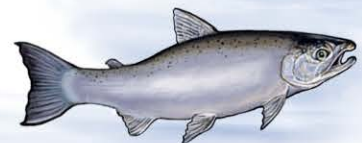
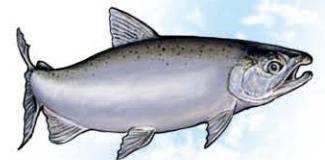
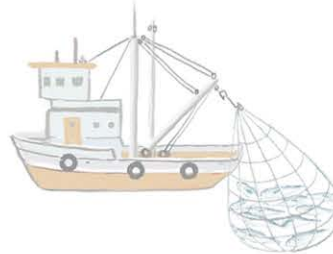


SPAWNING MIGRATION



Death from:

- migration obstacles
- dams, logs, rockslides
- climate change
- pollution
- predators



ADULT SALMON
mature in the ocean from two to seven years

Death from:

- fishing
- catch & release
- climate change-related delays in migration
- predators (seals, sealions, sharks, birds)
- ocean-fish farms (foreign pathogens & parasites)
- pollution



Death from:

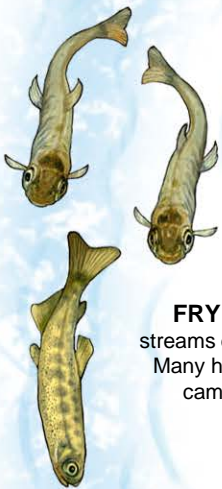
- habitat encroachment or destruction
- removal of trees near waterways
- predators
- pollution



ALEVINS emerge from gravel



SOCKEYE, COHO AND SOME CHINOOK LIVE IN FRESH WATER AS JUVENILES



FRY live and grow in freshwater streams eating chiefly terrestrial insects. Many have parr marks that give them camouflage to avoid predators.



CHUM, PINK, AND SOME CHINOOK MIGRATE DIRECTLY TO SALT WATER



SMOLTS remain in estuaries and tidal creeks feeding on small fish, insects, crustaceans and mollusks, and adapt to salt water

Death from:

- destruction of estuaries
- removal of trees from riparian zones
- pollution/contamination
- delays in downstream migration
- predators



Earn Badges and Prizes!

Your teacher can set up a system to monitor your actions and, on that basis award you with badges or small prizes. Share photos of your action projects on social media. Earn all 4 badges to unlock the coveted Wild Salmon Master Badge.



Create and maintain a Wild Salmon Youth Coalition to win one of the top prizes. Attend our annual fall gala and receive awesome prizes for your action projects and videos. [Figure icons (opposite), courtesy of Central Westcoast Forest Society (CWFS)]

Be an Ultimate Hero by Creating a Wild Salmon Youth Coalition

GRASSROOTS CHANGER

Earn this badge by causing a shift in community thinking toward stewardship & sharing with all earth's inhabitants. Also by helping to build systems to relay to the public the power of "one", designing public awareness campaigns and by influencing Federal leaders (DFO) to implement emergency measures.



INNOVATOR & SYSTEMS THINKER

Earn this badge by developing innovative ways to relieve pressures on salmon including welcoming local businesses into circular systems thinking & engaging sustainable architects & engineers for lowered urban encroachment and impacts on habitat.



EDUCATOR & INFLUENCER

Earn this badge by increasing your literacy about wild salmon and making posters, holding events and sharing what you've learned about wild salmon with your social groups, city leaders, and community.



RESCUER

Earn this badge by raising funds to support salmon conservation and by actively conducting ecological restoration to restore salmon habitat, including removing migration barriers and supporting other stream keeper activities.



Protect what you love

Innovation & Action: the sky's the limit

Challenge thinking

Hope = Power



Conservation

.... a personal choice...a social choice

Spearhead social change

Leadership in community



Become a steward of B.C.'s wild salmon – by becoming a Rescuer, Influencer/Educator, Innovator, or Grassroots Changer.

No matter which strategies you use to help B.C.'s wild salmon, the following principles can help to amplify your actions.

Knowledge is Power: Awareness campaigns are a first start to making a difference

Actions Speak Loudly: Change your behavior, create an action project, and influence others within your social groups

Spread the Word: Share this action kit at home, at your school, and in your community

Spearhead Policy Changes: by writing letters or making presentations to politicians

Prizes will be awarded to the top 3 action projects in each category - Rescuer, Educator/Influencer, Innovator, or Grassroots Changer.

Your entries will be judged by a panel of scientists, community leaders, and artists/filmmakers. Prizes will be awarded at a gala in late Fall.

What will you do to save wild salmon? Show the world why it is worth protecting!



Create an action project surrounding your role as Rescuer, Educator, Innovator, or Grassroots Changer. Create your exciting pitch to convey your idea or action project using a video, photos, scientific posters or some other art medium.



Use the simple Contest Entry Form supplied by your teacher to indicate the title of your action project and basic information. A suggested way to organize your entry form is noted on the next page of this resource. You can submit multiple entries if you wish. Students may work as individuals, in groups, or as an entire class.



The filled-out Contest Entry Forms can be collected by teachers and emailed as an attachment to: **kermode@sfu.ca**
The videos or other artworks linked to entries may be submitted via a USB stick or can be uploaded onto the Take a Stand Vimeo site.



Organize your contest entry

Who: Your name, school and grade

What: What is the environmental issue or community project?

Where: Where will your activity or project take place?

Why: Why do you care; why should others care?

How: How will you help? What are the elements of your pitch?

When: Contest Deadline

Example 1: Be a Youth "Educator" for Wild Salmon

What needs to change:

Many people have a narrow view of the importance of wild salmon. They may think of these species only as human food and therefore only of practical and economical value. Your mission is to change this! You can do this in many ways including educating others about the vital nature of these species to our culture, spirit, environment and ecosystems, and how salmon are critical to over 137 other species. Understanding how us humans have intervened in ways that threaten wild salmon - including its annual migration - and how fast we need to repair this - needs to be part of moving forward.

Where:

Your campaign can be focused in your local community, in B.C., or even in Canada.

Why:

Knowledge is Power: To move forward it is important to promote an understanding of wild salmon as a keystone species, and relay to others the urgency of reversing their dramatic decline in numbers. Communicating the dire consequences of low numbers of salmon for us and for the >137 species that rely upon salmon for their food will be an important tool to using multiple avenues to addressing the problem.

Listen, Understand, and Respect: Appreciating the knowledge and traditions of B.C. coastal First Nations surrounding wild salmon - knowledge acquired over thousands of years - is critical. As Bob Baker (elder, Squamish First Nations) states "learning is embedded in memory, history, and story".

Actions Speak Loudly: Recovery of wild salmon will require that we change our behavior, and create community shifts to reflect stewardship, and human sharing of wild salmon with other species. A shift in thinking can first be promoted within your circle of friends; a video or other artwork can amplify your voice to reach the community, Province and nation.

Spread the Word: As an influencer it will be important to share this "kit" or "resource" on wild salmon (actions & tips) at your home and school and in your community. This will help us solve the problem together.

Sockeye runs up the mighty Fraser River were predicted to be close to 5 million in 2019... now the estimate has plummeted to below 600,000. Think about that....



"Migration is a heady-mix of the grotesque and the sublime, of life, death and rebirth." (uninterrupted.ca). Photo: Nicolas Teichrob

How: How will you help?

By creating an artwork (e.g. sculpture or banner) about wild salmon for public display.

By making changes in my food choices to allow for recovery of salmon & sharing with my social circles.

By presenting to community leaders: I will get my friends together & make a 3-minute presentation to educate my city council on how urban sprawl & municipal projects can destroy salmon habitat. Our talk will also showcase the power of restoration of salmon habitat.

By creating a video as my creative pitch: This will generate awareness about the vast importance of wild salmon, our impacts on their habitats and food, and their fascinating biology. I will interview a salmon biologist & other experts.

By promoting campaigns: I will ask my friends to start their educator campaigns. This will increase my impact within the community.

By creating a wider network: Here I will connect with other groups that are improving wild salmon conservation or are participating in restoring wild salmon habitat. I will offer my services as a youth educator.

Resources: See last pages



Photo of salmon sculpture to honour Lawson Creek Bridge, West Vancouver

Example 2: Be a "Rescuer" of Wild Salmon

What needs to change:

During the last 50 years, human activities such as recreational and commercial over-fishing, habitat destruction and poor management have resulted in significant declines in wild salmon populations. The situation for wild salmon has clearly reached a tipping point in the negative direction - your mission as rescuer is to cause a tipping point in the positive direction! Conserving wild salmon involves many actions including restoring critical salmon habitat.

Where:

Watershed watch-, Streamkeeper-, and other wild salmon conservation organizations can be easily found in your local community. For those who want to venture further as a group or outdoor classroom – and perhaps experience the spellbinding event of salmon migration – there are opportunities within B.C.

Why:

The survival of wild salmon species is reliant upon the health of multiple interconnected ecosystems – streams, rivers, estuaries, intertidal regions, and oceans, and numerous factors pose hazards during the salmon's lifecycle (Infographic, p. 7). Despite laying thousands of eggs – only a few may survive – and several stages of the salmon lifecycle need to be successfully completed so that an adult salmon returns to spawn. Even as adults, salmon are now encountering warmer ocean temperatures - in which they need more energy, but their main food is the less nutritious types of zooplankton that have extended their range northward in the Pacific. Delays in salmon migration for spawning can reflect desperate attempts to deal with climate change (e.g. less rainfall). During the homing process, the salmon make their way back to their birth stream to spawn – a process that relies upon their biodiverse inherited makeup - genetic or epigenetic programs that evolved over thousands of years. The journey itself is amazing and can stretch inland for up to 3,000 km, in which their athleticism relies only upon reserves and a last meal taken from the ocean. Strong river rapids, currents, and dams and other human-caused obstacles are deterrents to successful migration. City developments that disrupt waterways & riparian (shoreline) zones, water shortages, and contamination pose major risks to migrating salmon. In your community you can likely see evidence of the destruction of vital salmon habitat. Beach spawning forage fish such as surf smelt and Pacific sand lance are important for the marine survival of chinook and coho salmon. Many of our roadways, ports, seawalls, marinas & other shoreline alterations have destroyed their spawning habitats.

"When human actions or a natural disaster wipe out an entire wild salmon stock, it may take another thousand years for salmon to return bearing the genetic makeup they need to thrive in that stream" (uninterrupted.ca) ...

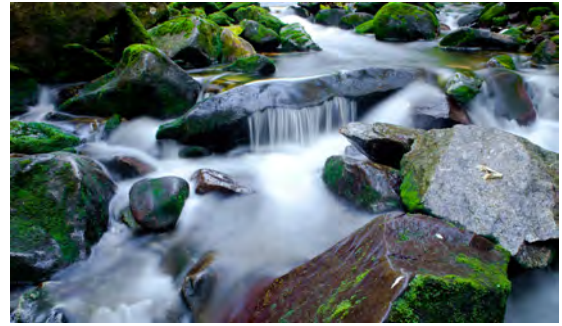


Photo: Nicolas Teichrob

How: How will you help?

By volunteering to gather important data about wild salmon within my local Streamkeeper- and Watershed Conservation-organizations. I will, for example, monitor their numbers in specific streams or other waterways.

By volunteering to restore or protect essential wild salmon habitat – to remove logs and debris, and plant essential vegetation in riparian zones, and to restore the shore spawning habitats of forage fish - species that salmon eat.

By raising \$\$\$\$ for salmon conservation: I will organize a fundraiser complete with an auction and include as auction items some of my wildlife photos, along with other donated gifts. I will ask my community for donations to get my fundraising campaign underway.

By organizing a salmon festival or other salmon celebration event within my school or community to celebrate the magnitude of these sacred species for humans and other inhabitants.

By attending events where I can witness salmon migration. For example, every four years at the Adams River, the Salute to the Sockeye witnesses one of the largest remaining migrations in North America.

My art creation to showcase my actions will include a series of photos, and a short video.

Resources: See last pages



Photo: Melissa Renwick

Example 3: Be an Innovator & Systems Thinker

What needs to change:

Wild salmon habitat is being encroached upon or even destroyed by urban (city) developments, industrial projects and forestry practices that may contaminate waterways and/or destroy critical habitat such as watersheds. Water shortages are a looming reality in our climate emergency causing even more stress to wild salmon. This means that cities and communities need to adequately manage water resources (supply and quality) and local governments and institutions must show leadership in water conservation. City planners need to be innovative so that new housing or other activities do not negatively impact salmon habitat or pose barriers to migration, and improved water use efficiency is essential. Your mission is to develop innovative ways to relieve pressures on salmon including welcoming local businesses into circular systems thinking and engaging sustainable architects and engineers for lowered urban impacts on habitat and better water management. This is an opportunity to engage collaborators who can participate in city planning, and provide expertise in public policy, economics, sustainable engineering, business, and entrepreneurship.

Where:

Your campaign can be focused in your local community. As well as local businesses and traditional knowledge, use the expertise of your local Universities.

Why:

As keystone species, wild salmon maintain the health of multiple ecosystems in our wild places; they also provide the same “ecological services” within our cities, including Vancouver. Wild salmon contribute marine-derived nutrients and biomass to forest-, stream-, and lake- ecosystems, and to coastal watersheds. We owe our diversity of wildlife – within the city, and especially within riparian communities, to wild salmon. Removal of trees close to riparian zones in our local communities in order to build houses or other structures, as well as logging in coastal watersheds can negatively impact salmon habitat; there can be significant temperature rises within streams (as the surrounding tree canopy that normally offsets this is removed), and in rainy climates, the ensuing soil erosion and unpredictable water flows - especially temporary flooding - can remove nutrients important for salmon, deplete spawning gravel, and potentially trigger egg smothering due to silting. In order to preserve birds, wildlife, salmon populations, and other aquatic life – cities need to be committed to preserving trees and restoring critical vegetation especially in salmon sensitive areas - as trees are critical for mitigating climate change, controlling water quality, and preventing the widespread consequences of climate change.

The power of innovation is strong; when combined with conservation, its power is infinite. Protect What You Love.



Photo: Kyler Voss

How: How will you help?

By showcasing buildings that demonstrate sustainable features – especially in relation to water and energy use efficiency, and the latest in water saving infrastructure, and interviewing an architect specializing in sustainable building.

By engaging businesses in my local community into circular systems thinking (e.g. those that harvest salmon, or sell salmon and salmon products - fishers, store owners, restaurants) toward contributing time or monetary investment in restoring salmon habitat.

By campaigning at the Provincial and Municipal levels for creation of jobs in ecological restoration, and for better bylaws to protect trees, and for stopping logging practices that destroy sensitive habitat.

By getting my friends together to present to my city/town council. We will show how municipal water use and water quality influences salmon habitat vitality, and the need for better management of this vital resource. We will focus on stewardship, knowledge and ingenuity in water conservation practices so that water supplies are maintained for freshwater and riparian ecosystems, and on the means to minimize the impacts of flooding and drought (e.g. minimizing impervious surfaces).

By connecting with sustainable engineering experts, and creating a pamphlet to educate my community and my city council. My brochure will focus on educating all local water resources users, and will include current or emerging technologies for storing sufficient runoff to support human use and sustain river flows during summer and fall, and for protection of surface and ground water resources from contamination.

Resources: See last pages

Example 4: Be a "Grassroots Changer"

What needs to change:

We need to understand that recovery of wild salmon will require that we fundamentally change our behavior - toward genuine stewardship. Stewardship entails caring for the lands and oceans so that future generations will thrive. This means that present generations need to make sacrifices so as to ensure the vitality of their children and of future generations. Some say that planning should be done with a view to 6 future generations. Your mission is to help spark a shift in the thinking of your local community toward stewardship and sharing with all of the earth's inhabitants. You can do this by championing your own personal stewardship and behaviors, by showcasing examples where communities have demonstrated true stewardship, by helping to relay to the public the power of one, and by designing awareness campaigns toward social change in your local community.

Where:

Your campaign can be focused in your local community.

Why:

Economic stability relies upon ecological vitality; when interconnected ecosystems are threatened by cumulative stresses, the health of those ecosystems and the many plants and animals that comprise them is intimately connected to our own quality of life. Communities that practice genuine stewardship and intergenerational learning are healthier and more socially advanced; if we take care of the earth's other inhabitants we are more likely to take better care of other humans. Does your community exhibit advanced thinking and behaviors? Another aspect of this is that certain wild salmon species and populations are so critically low as to warrant emergency measures surrounding their harvesting. This is the task of the Federal government - the Department of Fisheries and Oceans. Quotas put forth need to reflect sharing with the 137+ other species that critically rely upon wild salmon for their vitality, such as Northern & Southern resident orcas that rely upon Chinook salmon.

"Never has there been a more urgent need to create a new vision for nature – one that is fueled by passion, built with integrity and grounded in innovation...We need rising leaders to step forward with new ideas that can showcase through action that the environment is a family values, multi-partisan, geographically and ethnically diverse, human rights issue that must unite every single person". – Simon Jackson.



Photo: Ian McAllister

How: How will you help?

By highlighting examples of community stewardship – where the needs of the people were balanced with those of other species (e.g. the Mamalilikulla First Nation; see Resource below).

By creating and maintaining a Wild Salmon Youth Coalition to serve as a powerful group of youth for writing letters to government officials, and for creating positive communication and social change within a goal-driven movement.

By hosting an event in my school or community, in which I invite indigenous and non-indigenous storytellers to share their oral stories surrounding wild salmon or nature. This will help show my friends, classmates, and the community how stewardship relies upon the intergenerational passage of knowledge & caring.

By presenting to DFO to implement and/or maintain emergency measures surrounding harvesting of threatened salmon populations and to address the threats of fish farms located in the ocean. Be sure to support your presentation with scientific research and consultation with local First Nations.

By creating a video on the "Power of One" – defining examples of environmental stewardship in which one voice and small actions made a significant change & caused a tipping point toward conservation or protection.

By creating a video that includes examples of communication, nurturing and cooperation in nature – for example between wildlife, and even between trees! (resource sharing under stress conditions). This will broaden community thinking about sharing food and resources.

Resources: See also last pages

<https://www.cbc.ca/news/canada/british-columbia/mamalilikulla-first-nation-feeding-starving-grizzlies-1.5305820>

take a STAND

YOUTH FOR CONSERVATION

Our Mission

Our aim is to inspire, motivate and empower youth to protect and conserve the environment through art, film, and youth-driven actions. Youth represent honest and powerful voices for social change in their communities and are important advocates for better protection of plants, animals, and the natural communities they call home.

Our Team



Norm Hann is a professional stand up paddleboarder who spends his time training, exploring remote locations on his SUP, and continuing to pioneer the sport in Canada. He has worked in the Great Bear Rainforest for more than a decade as a guide, teacher and expedition leader.



Nicolas Teichrob draws his inspiration from the natural world and beautiful moments in time that surround us. He is co-founder of the outdoor adventure film production company Dendrite Studios, and his photographs have been published in many international ski, bike, and surf magazines.



Anthony Bonello is an adventure filmmaker whose storytelling style transports viewers beyond geography to convey the feel of a place and its people. Anthony co-produced STAND and is now a producer with Switch-back Entertainment where his work is focused on ski travel and exploration.



Allison Kermode is a Professor of Biological Sciences at SFU. Allison has a special connection to the Spirit bear and a passion for protecting the treasures of the natural environment of BC. She was inspired to develop this program along with her co-founders to galvanize youth through art and film and youth-driven 'tipping point' conservation actions.

Our Community

Taking action to engage with conservation issues in your own community is a powerful way to contribute to protecting the environment around you. Yet knowing where, when, and how to take action can seem like an insurmountable stumbling block. Our collaborating community organizations could help you come up with new ideas or new solutions to old problems - so check out www.takeastandforconservation.com under "Community". To help conserve wild salmon, use the resources supplied on the following pages.

Acknowledgements

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Glossary of Terms

Alevin: The newly hatched salmon still attached to the yolk sac (its food source). Alevins remain protected in the gravel nest (redd) within the stream. They must have cool, clear O₂-rich water to remain vital; excessive sediment or extreme water temperatures lead to their death, and they are at risk of big storm events which may scour the stream too much. Their primary predators are aquatic insects and other fish.

Biodiversity: Usually refers to variation in phenotype (physical appearance) and genetic background. Biodiversity is sometimes defined as levels: genetic, species, and ecosystem diversity. It occurs within a species (e.g. in different populations) as well as between species. Genetic variability within a species is related to their continued adaptation and evolution in the face of their biological, physical, and chemical environments.

Characteristics of Pacific salmon species & AKAs
Chinook (AKA: King, Spring, Tyee): Eggs hatch after ~12 weeks; fry have bar-shaped parr marks which are

larger than the spaces in between; some populations migrate immediately out to salt water, others after 1-2 years in freshwater; adults are the largest as compared to other species; mature after 4-7 years; spawn in large gravel & deep water with strong currents (summer-fall).

Chum (AKA: Dog): Eggs hatch after ~8-16 weeks; fry have small distinct parr marks (with spots on body); chum fry go to the sea almost immediately upon emergence and migrate at night; mature after 3-5 years; spawn in late fall, usually in the lower tributaries along the coast.

Coho (AKA: Silver): Eggs hatch after ~6-7 weeks; fry have bar-shaped parr marks and live in streams for about a year, in which they feed on zooplankton, insects and small fish; mature at 3-4 years; spawn in late fall.

Pink (AKA: Humpy, Humpback): Eggs hatch after ~8-16 weeks; fry are silvery and have no parr marks; migrate immediately to the sea; mature at 2 years; spawn in early fall usually over coarse gravel and sand in streams that are close to the sea.

Sockeye (AKA: Red): Eggs hatch after ~8-20 weeks; fry have short oval parr marks and are silver in colour with a tinge of blue in the back; live in fresh water as juveniles for an extended period (e.g. stay in lakes for 1 to 3 years) before migrating to the ocean; mature after 4-5 years; spawn in fine gravel in streams with lakes in their watershed; develop bright red body and green head when spawning.

Eggs (see also spawning): A single adult female can lay 1,000 to 17,000 eggs. However, very few eggs survive from fertilization to maturity; up to 85% can be lost even prior to hatching. Hatching times vary depending upon the salmon species; they also depend on the temperature, levels of O₂ and CO₂. After a variable length of time (depending upon the species) the salmon eggs are ready to hatch; at this stage their eyes are visible within the egg casing.

Epigenetic DNA changes: Refer to external modifications to DNA that can serve to turn genes "on" or "off" (gene expression controls). The modifications alter the physical structure of DNA but do not change the DNA sequence. While reversible, the modifications to the cell's DNA or histones (proteins that package DNA) can be passed along to future generations. At some stage, the epigenetic status of a given gene may be "re-set". Epigenetic modifications, or "tags," to the DNA include DNA methylation and histone modification; they alter DNA accessibility and chromatin structure, thereby regulating patterns of gene expression.

Fry: Develops from the alevin; once the yolk sac of the alevin is absorbed the very young salmon makes its way up through the gravel and becomes a free-swimming feeding fry. Fry live and grow in freshwater streams eating chiefly terrestrial insects. Many have parr marks (bars and spots on their sides) that give them critical camouflage helping them to avoid predators. They tend to take cover under rocks, undercut banks, and overhanging vegetation. Depending on the species and population, fry may go to the

sea shortly after they hatch or may spend several years in freshwater.

Great Bear Rainforest: One of the largest remaining temperate rainforests that is vital to the health of the planet covering 32,000 square km (12,400 square mi) on the Pacific coast of Canada associated with central Northern British Columbia. Here Pacific salmon from the sea migrate through the forest rivers to spawn in its creeks. The habitat provided by this area has converged and interconnected ecosystems and is a relatively unspoiled home to large carnivores such as grizzly bears, black bears, spirit bears, coastal wolves and cougars.

Great Nutrient Cycle: Pacific salmon typically die following spawning; as they decay, valuable nutrients are released. These nutrients fertilize the water that feeds the developing salmon, filter-feeding insects, and other aquatic and terrestrial plant life (see also “Salmon Forests”). The process of salmon accumulating marine nutrients and returning them to freshwater streams is referred to as “the great nutrient cycle.” Nitrogen and carbon isotopes can be used to quantify the uptake of salmon-derived nutrients by mosses, herbs, shrubs, trees, insects, songbirds, bears, and coastal wolves.

Homings: Process by which some adult animals (primarily aquatic) return to their birthplace to reproduce. In Pacific salmon adults return to their “natal” home – the body of freshwater where they were born.

Keystone species: A species that is critical to the vitality of other organisms found within the same ecosystem and sometimes within interconnected ecosystems. The demise of keystone species would likely ultimately lead to collapse of the entire ecosystem. Wild salmon species are examples of keystone species, providing critical food for 137+ species, and supplying important biomass and nutrients (especially carbon, nitrogen, and phosphorus) to freshwater ecosystems and soil, supporting the growth of plants, wildlife and microorganisms.

Population: Refers to a group of individuals of the same species, occupying a defined area or ecosystem. A given population is usually isolated to some degree from other similar groups; for example, populations can be reproductively isolated and adapted to local environments.

Redd: The gravel nest within which the salmon deposit their eggs. Once a female salmon selects a spawning site she engages in using rapid tail movements to create a depression in the stream gravel. Then after spawning, the female salmon expends much of her remaining energy to cover the newly deposited eggs under a layer of gravel (the redd) for protection.

Riparian: Pertaining to the shoreline of a waterway. The riparian zone acts as buffer between upland areas and open water; as such it helps filter pollutants such as nutrients and sediment. Healthy riparian vegetation helps to reduce

stream bank erosion and maintain stable stream channel geomorphology. Riparian zones represent important salmon habitat; by providing shade, trees and other vegetation function to lower water temperatures of the waterways.

Salmon Forests: The remains of the salmon that are not consumed by wolves, bears, birds and other wildlife contain vast quantities of nitrogen that plants need to grow. In the Great Bear Rainforest and other relatively unspoiled regions, it is estimated that eighty percent of the nitrogen in the forest’s trees comes from the salmon. In other words, salmon are critical for the forest’s long-term survival. The roots of trees are interconnected underground by mycorrhizal (fungal-filament) networks, which operate as a symbiotic relationship between trees and fungi. Because the nutrients from salmon carcasses peppered along streams undergo decay releasing nutrients, this allows the trees to absorb salmon nitrogen; the trees can then share the nitrogen with each other through the mycorrhizal network, forming an interconnected “fish-forest-fungi” network.

Salmonid: A fish of the salmon family

Smoltification: The process by which the young salmon undergo many physiological and physical (morphological) changes so that they can transition from living in fresh water to living in seawater. The changes occur as a prelude to entering the ocean and involve changes in gene expression connected to immunity, O₂ transport and ion regulation. Physical and physiological changes include altered body shape, silver coloration which increases skin reflectance, and increased activity of pumps (Na⁺/K⁺ ATPase) in the gills. Some of the changes must be reversed when the salmon return home to freshwater to spawn.

Smolts: Juvenile salmon on their way to the ocean. Smolts remain in estuaries and tidal creeks feeding on small fish, insects, crustaceans and mollusks, and gradually move into deeper, saltier water until they enter the ocean

Spawning: When salmon are mature (typically at 2-8 years), they return from the ocean to the natal river or stream to spawn. Spawning is the process by which the female salmon releases many unfertilized eggs into the water as part of the act of external reproduction. At the same time, a male or many males release a lot of sperm into the water. Only some of the eggs will be successfully fertilized. The eggs become protected in a gravel nest (redd) that the female salmon creates. Most Pacific salmon die after spawning.

Watershed: An area of land that drains rain water or snow into one location such as a stream, lake or wetland. It can constitute an area or ridge of land that separates waters flowing to different rivers, basins, or seas. These water bodies supply water to our cities and provide habitat to numerous plants and animals.

Further Reading & Literature Sources

Trees, Salmon & Other Cooperation Between Organisms:

Richard Grant. Do trees talk to each other? Smithsonian Mag. March 2018

How salmon help keep a huge rainforest thriving (BBC.com)

Importance of Forage Fish to Salmon:

From sand grains to salmon – Why forage fish matter! Haida Gwaii Observer (June 17, 2009)

Salmon Species & Stages:

Togiak National Wildlife Refuge (plus other resources specific for B.C. salmon species)

Homing Mechanisms in Salmon:

Megan McPhee (2009). How do spawning fish navigate back to the very same stream where they were born? Scientific American 2009. 299(6):122

Smoltification Mechanisms in Salmon:

How salmon adjust from fresh water to salt water, and back again. Evolution News. August 28, 2015.

Aimee Lee S Houde et al. (2019) Discovery and validation of candidate smoltification gene expression biomarkers across multiple species and ecotypes of Pacific salmonids. Conservation Physiology 2019; 7(1): cozo51.

General Interest & Conservation:

Ainslie Cruikshank (2019) Showdown over salmon: First Nations along Fraser River want sport fishing closed to save at risk species. The Star, Sept. 2019

Mark Nelitz, Clint A.D. Alexander, and Katherine Wieckowski (2007) Helping Pacific salmon survive the impact of climate change on freshwater habitats: Case studies: Perspectives from the Okanagan, Quesnel, Nicola, Cowichan, Nass, and Englishman river watersheds. Pacific Fisheries Resource Cons. Council

<https://uninterrupted.ca/uninterrupted-journey/>

Salmon Watersheds Lab
(www.jonwmoore.org)

Google Expeditions (Education) – Great Bear Rainforest – STAND film/Pacific Wild VR

Scientific Resources & Community Organizations in B.C.

Coastal BC

Spirit Bear Research Foundation
(Klemtu)

Friends of Wild Salmon (North Coast & Skeena Watershed)

Pacific Wild (Denny Island)

Vancouver and North Shore:

Raincoast Conservation Foundation
(coastal BC, Vancouver, Vancouver Is.)

Wild Salmon Caravan (Vancouver & BC).

Nature Vancouver

Salmon Girl (Raven Spirit Dance Society, Vancouver)

Urban Salmon Project (Metro Vancouver)

Uninterrupted.ca (Vancouver)

Salmon Safe BC - Fraser Basin Council (Vancouver, Interior BC, Northern BC)

Pacific Salmon Foundation (Vancouver)

North Shore Streamkeepers (North Vancouver)

Pacific Streamkeepers Federation

Lynn Canyon Ecology Centre (North Vancouver)

West Vancouver Streamkeeper Society (West Vancouver)

Coho Society of the North Shore

Tides Canada (Vancouver)

Stanley Park Ecology Society

Sea Shepard (Vancouver)

Wild First (Vancouver & BC)

Wilderness Committee (Vancouver & BC)

Burnaby, Coquitlam, Port Coquitlam, Port Moody

Salmon Watersheds Lab
(www.jonwmoore.org) (Burnaby)

Watershed Watch Salmon Society (Coquitlam)

Rivershed Society of BC (Port Moody)

Indigenous Corporate Training Inc. (Port Coquitlam)

Port Moody Ecological Society (Noons Creek)

Stoney Creek Environment Committee (Burnaby)

Byrne Creek Steamkeepers Society

Burnaby Streamkeepers Program (City of Burnaby)

Surrey/Delta

Cougar Creek Streamkeepers (North Delta/Surrey)

Burns Bog Conservation Society (Delta)

Salmon Habitat Restoration Program (Surrey)

Langley, Abbotsford, Pitt Meadows, Mapleridge, Chilliwack

Chilliwack Vedder River Cleanup Society

Fraser Valley Regional Watershed Coalition (Chilliwack)

Langley Environmental Partners Society (LEPS)

Yorkson Watershed Enhancement Society (N. Langley)

Katzie Slough Restoration Project (Pitt Meadows)

Interior of BC

Adams River Salmon Society (Scotch Creek)

Baker Creek Enhancement Society
(Quesnel)

Lake Babine Nation Fisheries

Skeena Wild

Skeena Watershed Coalition (Old
Hazelton, BC)

Salmo Watershed Streamkeepers
Society (Salmo)

Spruce City Wildlife Association (Prince
George)

Vancouver Island

Central Westcoast Forest Society
(Ucluelet)

Mid Vancouver Island Habitat
Enhancement Society (Parksville)

Peninsula Streams Society (North
Saanich)

Cowichan Land Trust – Friends of
Cowichan Creeks (Duncan)

Qualicum Beach Streamkeepers

Campbell River Restoration

The Salmon Forest Project (University
of Victoria)

Wild Salmon Forever

Bowen Island

Bowen Island Fish & Wildlife Club

Island Trust Conservancy (Bowen
Island)

Squamish & Sea-to-Sky communities

Squamish River Watershed Society
(Squamish)

Squamish Streamkeepers (Squamish-
Lillooet)

Squamish Environment Society

General & Throughout BC

AlexandraMorton.ca

BC Nature

E-Flora BC

Fraser Basin Council

Green Club Activities

Invasive Plant Council of BC

Rivershed Society of BC

Salmon Confidential – the documentary

DamNation – documentary

Stream of Dreams

Note: The above list of organizations
and resources is not intended to be
comprehensive.