

COSMO AND ROAD SALT AND SALMON PROJECT NEWSLETTER

AN UPDATE ON THE PACIFIC SCIENCE ENTERPRISE CENTRE (PSEC) COMMUNITY STREAM MONITORING (COSMO) PROJECT AND THE MULTI-INSTITUTIONAL ROAD SALT AND SALMON PROJECT (WINTER 2026)



Photo credit: Clare Kilgour (UBC, middle-left photo) and Puya Saberi (SFU, middle-right photo)

COSMO DATA USED BY YOUNG LEARNERS IN SURREY

Publicly shared data (referred to as Open Data) are the gift that keeps on giving. Because the data can be accessed by a wide variety of potential end-users, they can contribute to many projects - and can be used for education! The CoSMo data are publicly available on our [CoSMo DataStream page](#), and on the page we ask end-users to share how they used the data, so we can keep volunteers informed of the fruits of their labour. This winter, we received an email from a Grade 5/6 teacher in Surrey, who wrote:

"We are currently engaged in an integrated unit on watersheds, Indigenous relationships to land and water, and community-based scientific monitoring. As part of this learning, we will be visiting [our local watershed]... where we will explore local water systems and connect our observations to stewardship practices in our region. In our research, we learned about the PSEC Community Stream Monitoring (CoSMo) project, and my students were especially excited to hear that community volunteers help collect and share real water-quality data across Surrey... I wanted to reach out to let you know that we are using [the data] to help students deepen their understanding of water quality, salmon habitat, and human impacts on local streams."

To the network of dedicated volunteers who help collect the CoSMo data, I hope you feel proud knowing your efforts may help inspire the next generation of stream stewards!

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2026 - From Nikki to Nicole!

Since 2021, PSEC Community Engagement Coordinator, Nikki Kroetsch, has managed the CoSMo project. However, Nikki is currently creating a future stream steward and will be taking a year off for maternity leave starting in April. Filling Nikki's shoes will be Nicole Peshnak, one of PSEC's fish culture gurus who also has a passion for engaging with external partners!

Nicole is excited to meet and support the CoSMo and Road Salt Project volunteers until Nikki returns in April 2027.



ROAD SALT AND SALMON PROJECT NEWS

ROAD SALT PROJECT OVERVIEW

It has been a very mild winter here in southwest BC, but road salt is still top of mind for the researchers and volunteers involved in the Road Salt and Salmon Project (aka., the Road Salt Project)!

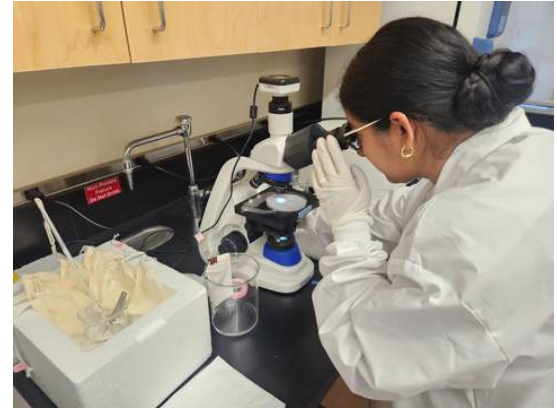
The Road Salt Project is a 5-year research initiative led by the University of BC (UBC), Simon Fraser University (SFU), and the BC Institute of Technology (BCIT), in collaboration with the DFO Pacific Science Enterprise Centre (PSEC) and 14 Streamkeeper groups across the Lower Mainland. The overarching goals of the project are to learn more about the impact road salt contamination has on urban salmon populations and to spread awareness about responsible road salt application. With the help of a dedicated and hard-working network of volunteers, the project involves a substantial amount of fieldwork - including water quality monitoring, juvenile fish surveys, and benthic invertebrate surveys - as well as laboratory and field-based experiments conducted by our academic partners, and a plethora of public engagement/education efforts from everyone involved.

Below, we share the most recent project updates. For more information about the project, including summaries of preliminary results from laboratory experiments, please see www.theroadsaltproject.com.



Photo credit: Paul Lhotka (North Shore Streamkeepers - top photo) and Hayley Watt (bottom photo)

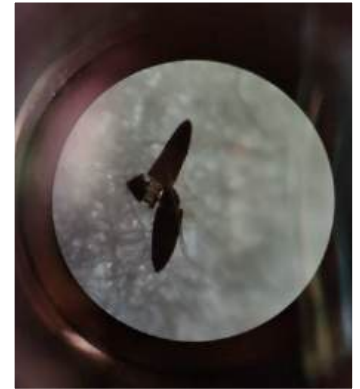
ROAD SALT AND SALMON PROJECT NEWS



UPDATES FROM OUR ACADEMIC PARTNERS

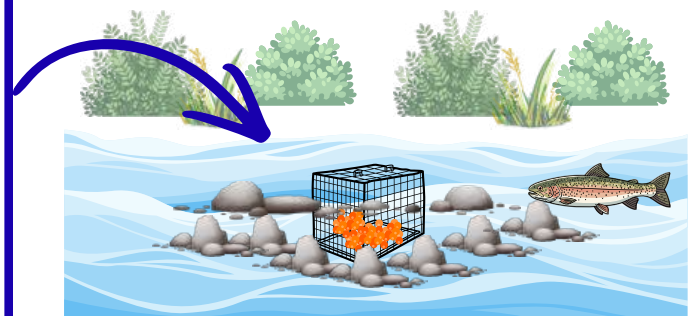
Simon Fraser University

Sofia Ahmed is a Master of Environmental Toxicology student at Simon Fraser University, co-supervised by Dr. Vicki Marlatt and Dr. Chris Kennedy. Her research looks at how road-salt exposure affects mosquito larvae (eggs), as mosquito larvae provide a food source for juvenile salmon. Using eggs from a type of mosquito called *Aedes aegypti*, Sofia has been conducting toxicity studies, which involve exposing the mosquito eggs to a range of salt concentrations that resemble salt concentrations observed in urban runoff throughout the Vancouver Lower Mainland and evaluating things such as hatching success, larval development, and survival. Further, to determine whether water temperature plays a roll, she exposed her mosquito eggs to salt pulses while they were living in a variety of water temperatures that are representative of temperatures we would find in local urban creeks in the winter.



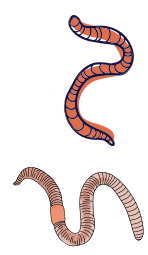
Puya Saberi, a Ph.D. student at SFU co-supervised by Dr. Vicki Marlatt and Dr. Chris Kennedy, is researching whether road salt exposure affects early life stages of coho salmon, using a case study in Stoney Creek, Burnaby, BC. He began with a pilot study in Stoney Creek from March to May last year, to identify suitable sites for future experiments. The pilot study involved deploying coho salmon embryos (fertilized eggs) in four hatch boxes* at four sites within Stoney Creek, and then monitoring the baby salmon's survival and development until the swim-up fry stage (~56 days). Based on the results of Puya's pilot work, the study has now expanded to six sites, including both forested, low-impact reference locations and more urbanized sites. Field experiments are currently underway and will continue through the winter, when road salt concentrations in creek waters are known to periodically spike.

*A hatch box provides a safe enclosure for the baby salmon so they don't get eaten by other creek creatures during the study period (and so they can't escape once they hatch!). By raising the eggs in a hatch box, researchers can look at the effects of the environment (e.g., the water quality) without having to worry about predators impacting their study results.



ROAD SALT AND SALMON PROJECT NEWS

Andy Ip, a graduate student at Simon Fraser University supervised by Dr. Chris Kennedy and Dr. Vicki Marlatt, has completed a second round of experiments on two freshwater oligochaete (worm) species, *Tubifex tubifex* and *Lumbriculus variegatus*. These squishy critters make a tasty treat for juvenile salmon living in urban creeks, so Andy sought to learn whether they're affected by road salt contamination (which would indirectly affect juvenile salmon by impacting their food source). He exposed his study worms to salt water at varying water temperatures and found that *L. variegatus* is more sensitive to pulses of road salt than *T. tubifex*, especially when they were exposed to salt pulses in cooler water (the LC_{50} at 6 °C was approximately half of that observed at 20 °C). Andy has also completed some sediment experiments and is currently analyzing his data to examine how salt distributes and persists in sediments over time.



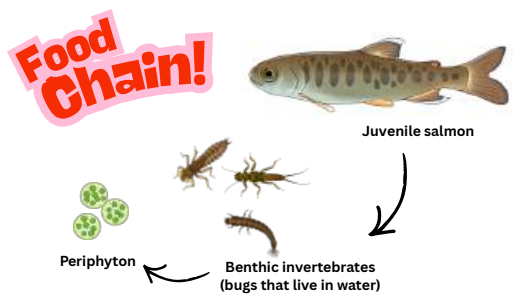
BC Institute of Technology

James King is a graduate student in the BCIT Ecological Restoration program who is researching whether salt contamination correlates with (1) decreased abundance of periphyton (a microscopic community composed mostly of algae) and other food sources of benthic invertebrates (bugs that live in the water, which provide a food source for juvenile salmon), (2) decreased diversity and abundance of benthic invertebrates, and (3) interference with the microbial processes that condition leaves so they're in a state the water



bugs will eat. This research involves deploying cultures of periphyton on ceramic tiles, and precisely-measured leaf packs, in impacted and unimpacted study sites in creeks across the Lower Mainland. Results will be determined by comparing the dry weight biomass of each of the periphyton and leaf samples from the impacted site against those from the unimpacted site of each stream. The research is being conducted between August and March, during which period the benthic invertebrate populations will be sampled twice for abundance and richness, and water quality will be sampled three times for conductance and other relevant indicators.

Elementary School Throwback:



ROAD SALT AND SALMON PROJECT NEWS

University of British Columbia

Clare Kilgour, a PhD student at UBC supervised by Dr. Chris Wood and Dr. Trish Schulte, has been researching the effects of road salt exposure on juvenile salmon. Previous work by her and Carley Winter (UBC MSc) has revealed that juvenile salmon are most vulnerable to road salt exposure during the first 24 hours after fertilization - but Clare is hoping to learn more about this window of vulnerability; in particular, is there a smaller window within this 24 hour time period where the baby fish are most sensitive? And if so, could identifying this smaller window help us better understand the mode of action (i.e., how the road salt exposure affects the juvenile salmon, from a physiological perspective?)

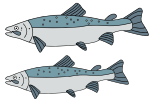


A spawned chum salmon in Stoney Creek, Burnaby. The Stoney Creek Environment Committee conducts regular spawner surveys every year. Photo credit: Clare Kilgour.

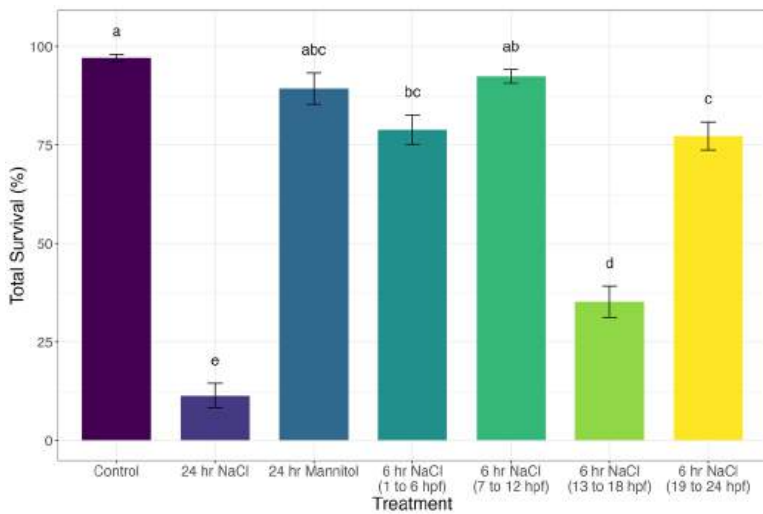
To investigate these questions, in the next few months, Clare will be conducting a replicate of a previous experiment, where rainbow trout eggs will be exposed to a single six-hour road salt pulse during one of four time periods within the first 24 hours of development. During this experiment, Clare will be taking samples to stage the embryos, which will allow her to pinpoint exactly when the embryos die following a lethal road salt exposure. In the previous replicate of this experiment, we saw that embryos exposed to salt between 13-18 hours post-fertilization showed increased mortality compared to other timepoints, and also showed increased sodium uptake!



SPAWNER DATA NEEDED!



Survival of Rainbow Trout Eggs Exposed to Road Salt



Figures: Total survival of rainbow trout (*Oncorhynchus mykiss*) eggs following exposure to road salt for the entire 24 hr period following fertilization (second column from left), or for 6 hours during one of the four periods within the 24 hr window following fertilization (hpf = hours post fertilization).

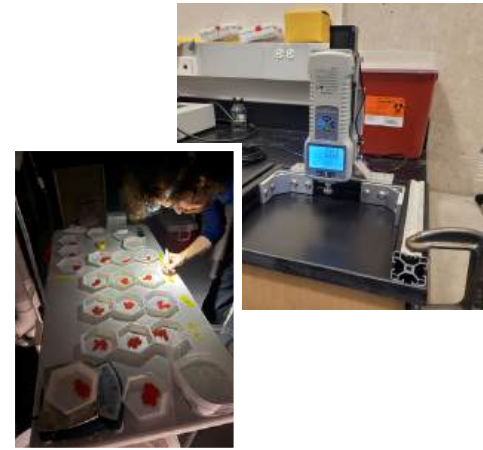
Clare is also collecting data for a risk analysis, which will incorporate the field measurements of conductivity, lab measurements of salt toxicity, and spawner count data from stream steward groups. If you volunteer for one of the partnering Road Salt Project Streamkeeper groups and have weekly spawner count data (historical or recent) for coho or chum (even if it is just a photo of field notes), Clare would be grateful if you'd be willing to share! She can be reached at ckilgour@zoology.ubc.ca.



A big congratulations to **Carley Winter** (UBC MSc), who has officially wrapped up her research and defended her thesis! Carley has been an integral part of the Road Salt Project for the past three years. We're grateful for all the work she's put in and wish her all the best in her next endeavours!

ROAD SALT AND SALMON PROJECT NEWS

Jack Hall is a UBC MSc student, co-supervised by Dr. Chris Wood and Dr. Patricia Schulte, who's researching the effects salt pulses on chum salmon (a common urban salmon species). Jack spent last year determining which salt concentrations at which time are dangerous to developing eggs, and found that, similar to coho, chum are especially vulnerable in the first 24 hours. Further experiments indicated that if the eggs could survive this first day, they were much more resistant to salt pulses throughout the rest of development. Right after fertilization, salmon eggs undergo a "hardening" process, where they go from soft and spongy to strong and durable. The team hypothesized that the mortality we've been seeing in other experiments might be due to salt interrupting this process, so this past fall, using a programmable force meter, Jack led an experiment to investigate whether salt exposure impacts egg's ability to harden. While egg strength was affected, the changes didn't line up well with the patterns of mortality seen in other experiments, and therefore was not the smoking gun the team thought it might be. This year, Jack will investigate whether salt exposure comes with other sub-lethal effects – whether the survivors of a given salt pulse are damaged or otherwise affected in some way. To do so, he is looking at salt's impacts on gene expression (which genes are turned up and which are turned down), energy and size at hatch, swimming ability, and smolt timing (whether salt exposure affects the salmon's ability to go to sea).

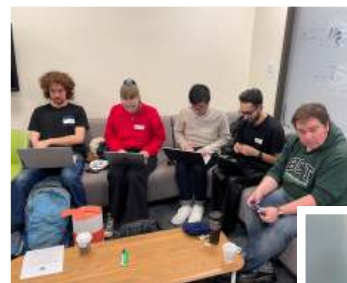


ANOTHER SUCCESSFUL ROAD SALT PROJECT WORKSHOP!

Every fall, PSEC hosts the Road Salt Project Annual Workshop. The event - which includes presentations from the graduate students involved in the project - provides an opportunity to thank volunteers for all the work they've put in; to share the preliminary results of the research the community-gathered data contributed to, and to facilitate an exchange of feedback regarding the project more broadly.

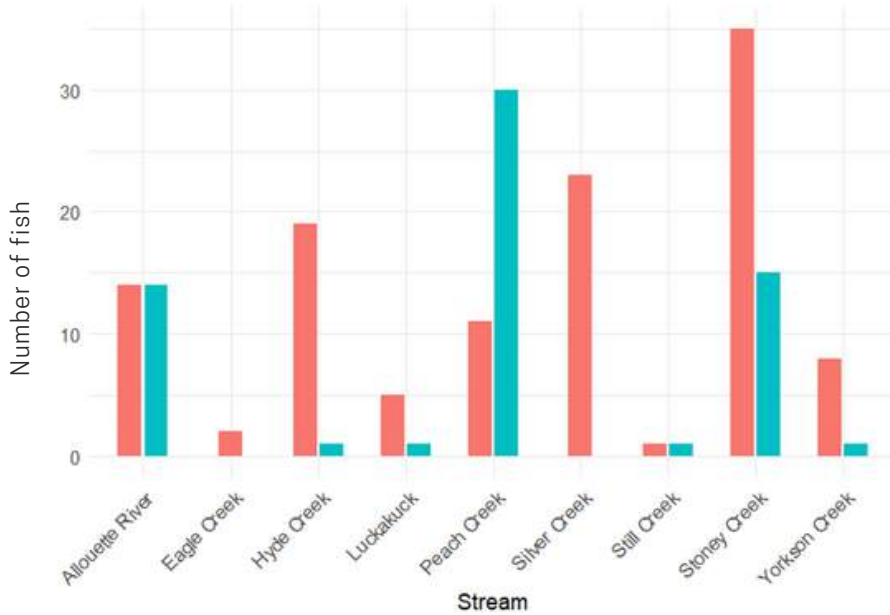
Sharing the 'behind the scenes' updates with our Streamkeeper partners is especially important, not only because the research was made possible in part because of their contributions, but also because the groups involved in the Road Salt Project are active in their communities, and many contribute to public education regarding stream health and stewardship. Consequently, the presentations from the students helps ensure that volunteers have the most up-to-date information, which means they can provide their community members with accurate and helpful information regarding how road salt affects urban salmon populations, and - even more importantly - what communities can do to help mitigate those impacts.

This year, we also had members of the press at the workshop, which resulted in the Road Salt Project being featured in the [Global News](#) and the [Vancouver Sun](#)!

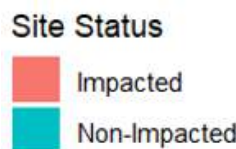
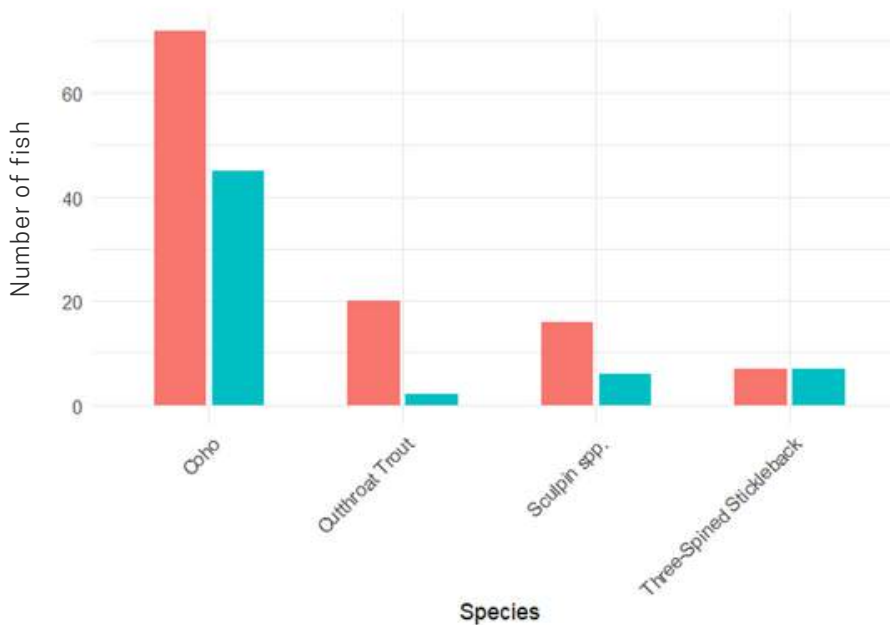


ROAD SALT AND SALMON PROJECT NEWS

Fall 2025 Fish Survey



Fall 2025 Fish Survey Species



FRY TRAPPING

Spring and fall are fry-trapping seasons for several of the stewardship groups participating in the Road Salt Project! These optional, biannual juvenile fish surveys are conducted in areas of the study creeks that we expect will experience more road salt contamination (“impacted” sites) and less road salt contamination (“unimpacted” sites).

The volunteers record the species and length of the fish they catch, before promptly releasing them back into the creek. These important data provide information about the state of the streams and the salmon populations that inhabit them.

Figures: The figures to the left show the number of fish that were caught in each creek (top figure), and the number of species caught by the collective group (bottom figure) at “impacted” and “unimpacted” sites during the fall trapping sessions. *Figure credit: Jack Hall (UBC).*

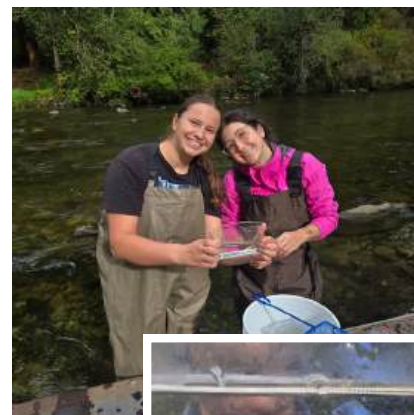


Photo credit: Alouette River Management Society (top) and WaterWealth Project (bottom)

INVERTEBRATE SAMPLING

Benthic invertebrates are bugs that live in water. These bugs play a number of roles in their aquatic habitats, including acting as an important food source for juvenile salmon living in creeks. Further, these little critters can also convey important information regarding the quality of the water, as some are very sensitive to pollution, whereas others are quite tolerant. This is why several of the partnering Streamkeeper groups conduct invertebrate surveys in the study creeks as part of the Road Salt Project.

The invertebrate surveys involve collecting, counting, and identifying benthic invertebrates in areas of the creek that are “impacted” by road salt contamination and areas that are less impacted (“unimpacted”), which can shed light on how road salt may affect benthic invertebrate diversity and abundance.

ROAD SALT AND SALMON PROJECT NEWS



Invertebrate Abundance (Fall 2025)

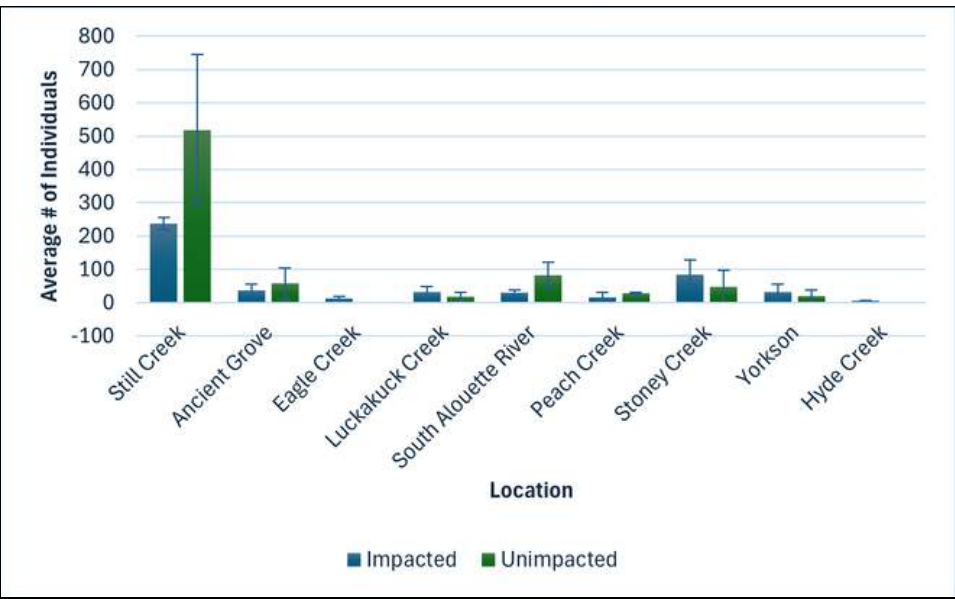


Photo credit: Utta Gagel (Cariboo Heights Forest Preservation Society)

Invertebrate Diversity (Fall 2025)

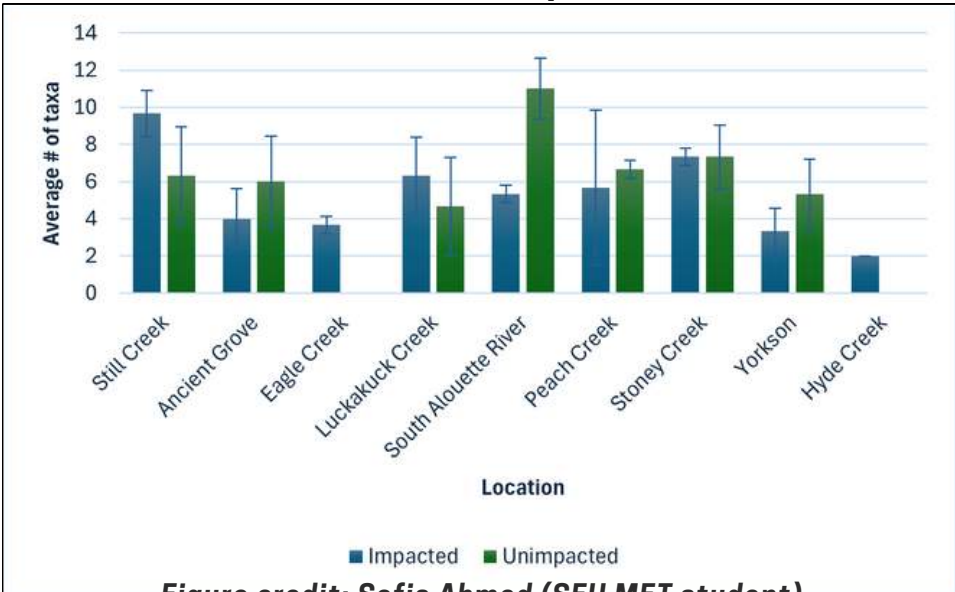


Figure credit: Sofia Ahmed (SFU MET student).

Figures: The figures to the left provide an overview of the fall 2025 invertebrate survey results. The top figure shows the abundance of invertebrates (# of individuals) collected at the “impacted” and “unimpacted” sites in each creek, and the bottom figure shows the diversity of invertebrates (# of taxa) collected at the same sites. The values shown are the average of the 3 replicates at each site, with bars showing standard deviation. Worth noting is that the Hyde Creek “unimpacted” site did not have enough water to conduct an invertebrate survey this fall.

ROAD SALT AND SALMON PROJECT NEWS



RESOURCES FOR ELEMENTARY SCHOOL TEACHERS

A subset of volunteers who are involved in the Road Salt Project and have experience designing education programs worked together to produce the Road Salt Project Stream Scientists Kits. The kits, which align with school curriculums, are educational programs full of fun, hands-on activities for teachers who want to teach their Gr. 3-7 students about stream ecology, human impacts to stream habitat, and how to be good stewards of aquatic ecosystems.

In an effort to make the Stream Scientists Kits as accessible as possible, there are several options for teachers, including free activity downloads available online, options to purchase or borrow a Stream Scientists Kit, and the opportunity to bring in a Streamkeeper Leader to help support teachers with field activities. See the Road Salt Project website for more info! (<https://www.theroadsaltproject.com/education>)

PUBLISHED SCIENTIFIC PAPERS!

The Road Salt Project Research Team has now published three papers in well-respected scientific journals. The papers went through rigorous peer review prior to publication. You can access these papers on the [Road Salt Project website](https://www.theroadsaltproject.com/education) (UBC>Research Findings) or by clicking the following links:

- Kilgour, C.L., Winter, C.E., Brauner, C.J., Chara-Serna, A.C., James, A.C., Kroetsch, N.C., Schulte, P.M., & Wood, C.M. (2025). Tracking road salt contamination through community monitoring: Annual surface water chloride trends in streams of a major urban area, the Vancouver Lower Mainland, B.C., Canada. Archives of Environmental Contamination and Toxicology. <https://doi.org/10.1007/s00244-025-01156-3>
- Winter, C.E., Kilgour, C.L., Brauner, C.J., Schulte, P.M., & Wood, C.M. (2026). Effects of pulse exposures to road salt at various stages of early development in rainbow trout (*Oncorhynchus mykiss*). Comparative Biology and Biochemistry. <https://doi.org/10.1016/j.cbpc.2025.110334>
- Winter, C.E., Kilgour, C.L., Brauner, C.J., Schulte, P.M., & Wood, C.M. (2026). Road Salt Creates a Slippery Slope for Pacific Salmon: Environmentally Realistic Salt Pulses Have Lethal and Sublethal Effects on Developing Coho Salmon (*Oncorhynchus kisutch*). Aquatic Toxicology. <https://doi.org/10.1016/j.aquatox.2026.107737>



Abstract: Urban freshwater streams across northern latitudes are undergoing increasing salinization due, in part, to road salt inputs during winter months. Road salt contamination has been monitored across Canada for over 40 years; however, the scale of contamination in the Pacific Northwest, which experiences relatively mild and rainy winters, is not well understood. A network of almost 40 water quality loggers in the Lower Mainland of Vancouver, B.C., Canada (VLM) was leveraged to better understand the scale of road salt inputs to local streams and identify factors that influence the magnitude and occurrence of these contamination events. Specific geochemical data from these loggers indicate that road salt is entering creeks, resulting in brief salt pulses months and even an CT by its reach at surface in the warm salt inputs detected occur in VLM and local Pacific rainforest biotic invertebrates.



Abstract: Road salt inputs to freshwater streams including those in urban areas that are subjected to human activities, in the Pacific Northwest (PNW) of British Columbia, Canada, that of winter use of road salt (primarily NaCl) is substantial and increasing. The potential for road salt contamination of streams, and the potential for stream biota to be exposed to sublethal salt concentrations (SSCs) is not well understood. We investigated the effects of road salt pulses on rainbow trout (*Oncorhynchus mykiss*) at various stages of early development. We exposed rainbow trout to a 24-h salt pulse (200-7000 mg L⁻¹ Cl⁻¹) in natural development using rainbow trout (rainbow trout) at various stages of early development (1-3 days post-hatch, 7-14 days post-hatch, 21-28 days post-hatch, and 35-42 days post-hatch). We found that rainbow trout exposed to a 24-h salt pulse (200-7000 mg L⁻¹ Cl⁻¹) in natural development using rainbow trout (rainbow trout) at various stages of early development (1-3 days post-hatch, 7-14 days post-hatch, 21-28 days post-hatch, and 35-42 days post-hatch) showed significant mortality and sublethal effects on growth, survival, and development. We found that rainbow trout exposed to a 24-h salt pulse (200-7000 mg L⁻¹ Cl⁻¹) in natural development using rainbow trout (rainbow trout) at various stages of early development (1-3 days post-hatch, 7-14 days post-hatch, 21-28 days post-hatch, and 35-42 days post-hatch) showed significant mortality and sublethal effects on growth, survival, and development. We found that rainbow trout exposed to a 24-h salt pulse (200-7000 mg L⁻¹ Cl⁻¹) in natural development using rainbow trout (rainbow trout) at various stages of early development (1-3 days post-hatch, 7-14 days post-hatch, 21-28 days post-hatch, and 35-42 days post-hatch) showed significant mortality and sublethal effects on growth, survival, and development.



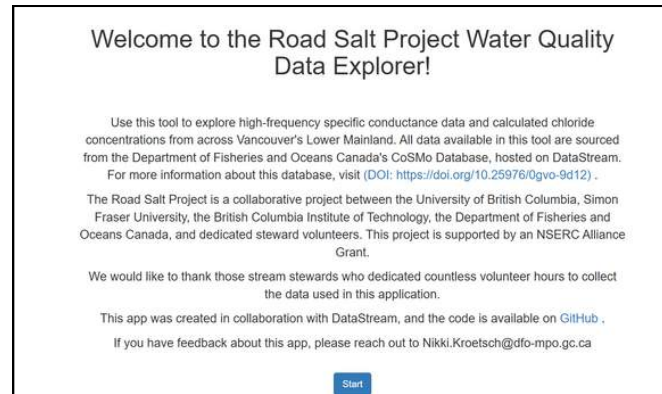
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ROAD SALT AND SALMON PROJECT NEWS

ADDITIONAL COSMO AND ROAD SALT PROJECT RESOURCES

Want to learn more about the Road Salt Project and/or access the CoSMo and Road Salt Project data? Visit the below links!

1. For info about the Road Salt Project, including summaries of preliminary results from the graduate student research, check out the Road Salt Project website (www.theroadsaltproject.com)
2. To access and download water quality data collected as part of the CoSMo project and Road Salt project, visit the CoSMo DataStream page (<https://doi.org/10.25976/0gvo-9d12>)
3. Want to conveniently plot the conductivity data for a creek of interest? Clare Kilgour (UBC) has created an app that allows users to easily pull data from the CoSMo DataStream page and automatically turn them into a pretty little graph (<https://psecengagement.shinyapps.io/WaterQualityRShinyApp/>)
4. Lastly, Clare Kilgour (UBC) has produced a series of Stream Steward Reports that summarize the conductivity data collected in the study streams, which can be accessed here: <https://drive.google.com/drive/folders/1fDVSiGdYvAXIViU8sFnYJ3NEKagW1jxu?usp=sharing>.



Thank you to the dedicated volunteers and collaborators who make CoSMo and the Road Salt Project possible. You are a constant source of motivation and inspiration, and we are so grateful for your ongoing support.

If you have questions about the CoSMo or Road Salt and Salmon projects, or would like to provide feedback, please email Nikki Kroetsch (PSEC Community Engagement Coordinator) at Nikki.Kroetsch@dfo-mpo.gc.ca.