

# 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 (SUMMER 2024)



Photo credit (left to right): Marlee St. Pierre (Yorkson Watershed Enhancement Society), Vicki Guzikowski (Mossom Creek Streamkeepers), Carmen Rosen (Still Moon Arts Society)

## COSMO DATA SUPPORT UNIVERSITY OF NORTHERN BC RESEARCH INITIATIVE

The PSEC Community Stream Monitoring (CoSMo) Project data are made publicly available on the [CoSMo DataStream page](#), along with contact info for Nikki Kroetsch (Lead Technician for the CoSMo Project), in hopes that those who use the data will share what they used them for. Recently, Dr. Stephen Dery, professor at the University of Northern BC, reached out to Nikki with the following message:

“This is a brief message to express our most sincere thanks for making available online the DFO PSEC Community Stream Monitoring (CoSMo) dataset ... The CoSMo data filled some notable gaps in the Lower Mainland and so please express our gratitude to all of the community champions and volunteers for their efforts. We hope our work will lead to a better understanding of how extreme events impact freshwater temperatures and thereby aquatic species like salmon and their habitat”

Dr. Dery’s message was a heartwarming and motivating reminder of the benefits of stream monitoring and data sharing.

Dr. Dery et al. recently published their paper, titled “*Extreme hydrometeorological events induce abrupt and widespread freshwater temperature changes across the Pacific Northwest of North America*”, in *Communications, Earth, & Environment*. Click [HERE](#) or visit <https://www.nature.com/articles/s43247-024-01407-6> to access the article.



Drawings by Clare Kilgour (UBC MSc)

### CONTENTS

#### CoSMo News (p. 1-4)

- CoSMo data support University of Northern BC research initiative
- CoSMo partners
- Project expansion + continued engagement

#### Road Salt and Salmon Project News (p. 5-11)

- Updates from our academic partners
- Spreading awareness about the Road Salt Project
- Fry trapping
- Invertebrate sampling
- Road Salt Project Annual Workshop

## **COSMO PARTNERS**

The CoSMo project is a multi-institutional collaboration that wouldn't be possible without the dedication of our network of volunteers, who are part of a variety of organizations, including not-for-profit organizations, municipalities, and academic institutions. In our previous newsletter, we gave a shoutout to our Streamkeeper partners who are involved with the Road Salt and Salmon Project, and here we'd like to shine the spotlight on our other CoSMo partners:

Our partners include:

### **Cougar Creek Streamkeepers**

The Cougar Creek Streamkeepers have been a dedicated CoSMo partner since early 2021. They started with one temperature logger in Cougar Creek and gradually expanded; currently they maintain a total of 8 data loggers in Cougar Creek, Blake Creek, and Eugene Creek!

### **Bowen Island Fish & Wildlife Club**

One of our first CoSMo partners, the BIFWC has been monitoring three creeks and one lagoon on Bowen Island since 2019! The temperature data they collect also helps them determine which habitats are suitable for juvenile salmon, which is useful information when deciding when and where to release their hatchery fry.



### **North Shore Streamkeepers**

The North Shore Streamkeepers monitor 7 creeks in North Vancouver as part of the CoSMo project. The data they collect are used by the NSSK to advocate for and evaluate their restoration projects, in particular a series of green infrastructure projects on Wagg Creek that are intended to slow and filter storm-water runoff before it enters the creek.

### **Nicomekl Enhancement Society**

One of our newer partners, we were excited to welcome the NES on board last year with the installation of two temperature data loggers near their hatchery.

### **Friends of McNally Creek**

A dedicated and reliable member of the Friends of McNally Creek stewardship group has monitored stream temperature in McNally Creek since 2021!

**Johnstone Heights Secondary School**

Three years ago, Ms. Hendry, an enthusiastic and nature-loving teacher at JHSS, felt that her students would have a better, more fulfilling learning experience if they could get outside their classroom and partake in real-world fieldwork. She took initiative to make that happen by partnering with the CoSMo project! Since then, she has been maintaining two sites in Serpentine Creek with the help of her students.



**City of Surrey**

The City of Surrey was our first municipal partner, and they've shown how mutualistic this type of government partnership can be. Since 2021, the City and PSEC have pooled resources - including materials, equipment, and staff time - to monitor 7 Surrey creeks, and the City uses these data to monitor stream health and evaluate the impacts and efficacy of some of their green infrastructure projects (such as retention ponds).

**West Winds Strata Complex**

Two dedicated volunteers from the West Winds Strata Complex have been monitoring stream temperature in Carlson Creek since 2021.

**City of Port Moody**

The City of Port Moody enthusiastically joined the CoSMo project last year and facilitated the installation of 3 depth/temperature/conductivity loggers. They have dedicated staff to do the data downloads and are looking forward to using the data to better understand factors affecting stream health in Port Moody.

**Capilano Golf & Country Club**

The CG&CC has been a fantastic, supportive partner of the West Vancouver Streamkeeper for many years, and an equally great partner for the CoSMo project since 2020. They not only allow access to the section of Hadden Creek that runs through their property whenever loggers need to be maintained, they also dedicate staff members to download the data from the loggers throughout the year.

**DFO Ecotoxicology group & UBC/SFU partners**

We partnered with the PSEC Ecotoxicology group and their partners at the University of BC and Simon Fraser University last year and have expanded our logger network to support their monitoring efforts for 6PPD-quinone (the "tire chemical").

Last, but absolutely not least, we have a handful of extra-awesome, dedicated **PSEC staff, former staff, and family members of staff** who have been maintaining data loggers in Stoney Creek (Burnaby), Silver Creek (Burnaby), and McDonald Creek (West Vancouver) for the last couple years!



## COSMO PARTNERS

Previously featured partners who are part of the Road Salt Project as well as the CoSMo project include:

- Alouette River Management Society
- Caribou Heights Forest Preservation Society
- Eagle Creek Streamkeepers
- Hoy/Scott Watershed Society
- Hyde Creek Watershed Society
- Mossom Creek Hatchery & Education Centre
- Seymour Salmonid Society
- Silver Creek Streamkeepers
- Still Creek Streamkeepers
- Stoney Creek Environment Committee
- WaterWealth Project
- West Vancouver Streamkeepers
- Yorkson Watershed Enhancement Society



## PROJECT EXPANSION + CONTINUED ENGAGEMENT

Earlier this year, PSEC staff were contacted by members of the Howe Sound Biosphere Region Initiative Society, who were interested in establishing a stream monitoring network on Gambier Island and wanted guidance. PSEC staff offered to install the HSBRS's data loggers, train them how to use the loggers and process the data, and to incorporate the data into the CoSMo dataset so they could be publicly shared and easily accessed by others. On July 31, a total of 4 loggers were installed in Grennon Creek, Whispering Creek, Mannion Creek, and MacDonald Creek.

We're thrilled to welcome the HSBRS on board and are excited about this new partnership!

## Looking to get involved?

We have a total of 4 loggers that are available to be adopted. Loggers only need to be accessed 3-4 times per year, at your convenience, which takes about 10 minutes per site. If anyone who stewards the following streams is interested in adopting one or more loggers, please reach out to Nikki Kroetsch! (Nikki.Kroetsch@dfo-mpo.gc.ca)

- Hastings Creek (2 sites) (North Vancouver)
- McDonald Creek (2 sites) (West Vancouver)



## ***ROAD SALT AND SALMON PROJECT NEWS***

### **UPDATES FROM OUR ACADEMIC PARTNERS**

**Website:** The Road Salt and Salmon Project website has been updated (thank you, Carley Winter!). Click [HERE](https://theroadsaltproject.wixsite.com/the-road-salt-projec) or visit <https://theroadsaltproject.wixsite.com/the-road-salt-projec>

#### **Simon Fraser University**

Several students in the Department of Biological Sciences at Simon Fraser University, under the supervision of Dr. Vicki Marlatt and Dr. Chris Kennedy, are examining the concentrations of road salt that harm invertebrate communities.

Two master's students, **Andy Ip** and **Sofia Ahmed**, are conducting controlled laboratory experiments on individual invertebrate species (mayflies, sledge worms, and mosquitoes) to investigate their sensitivity to road salt and how this may change at different temperatures. Both continuous and pulse exposure regimes will be tested to mimic road salt exposures and water temperatures typically observed in Vancouver Lower Mainland streams during winter when road salt use is highest.

**Puya Saberi** (Ph.D. student) and **Ross Yeung** (B.Sc. student) are creating experimental conditions that mimic the natural stream environment to examine the harmful effects of road salt on invertebrate communities that are typical in Vancouver Lower Mainland streams. Specifically, these experiments will investigate if road salt reduces invertebrate biodiversity in communities over time, with a particular focus on EPT taxa (mayflies, stoneflies, and caddisflies) due to their high sensitivity to pollution. The experiment has two phases: an acclimation phase, whereby conditions are kept stable to allow wild collected invertebrates to settle in; and, a stressor phase, whereby different levels of road salt concentrations will be added and changes in abundance of different invertebrate species will be measured to estimate alterations in invertebrate community biodiversity.



# ROAD SALT AND SALMON PROJECT NEWS



## UPDATES FROM OUR ACADEMIC PARTNERS, CONT.

### University of British Columbia

In our previous newsletter, **Carley Winter** (UBC M.Sc.) shared some of her preliminary findings from exposing juvenile rainbow trout to salt pulses. This year, similar experiments with coho salmon showed significant mortality when embryos were subjected to a 24-hour salt pulse post-fertilization (greater than 1800 mg/L Chloride). Additional experiments will explore if salt pulses may be impacting the water-hardening process of eggs post-fertilization.

Currently, Carley is analyzing samples taken throughout the experiment, measuring whole-body ion concentrations, molecular endpoints, and cortisol levels to gain a deeper understanding of the sublethal effects. Additionally, behavior, growth, thermal tolerance, and feed consumption will be monitored in the surviving fry to explore if the stress experienced during early life stages has any long-term, sublethal impacts on the fitness of coho salmon.

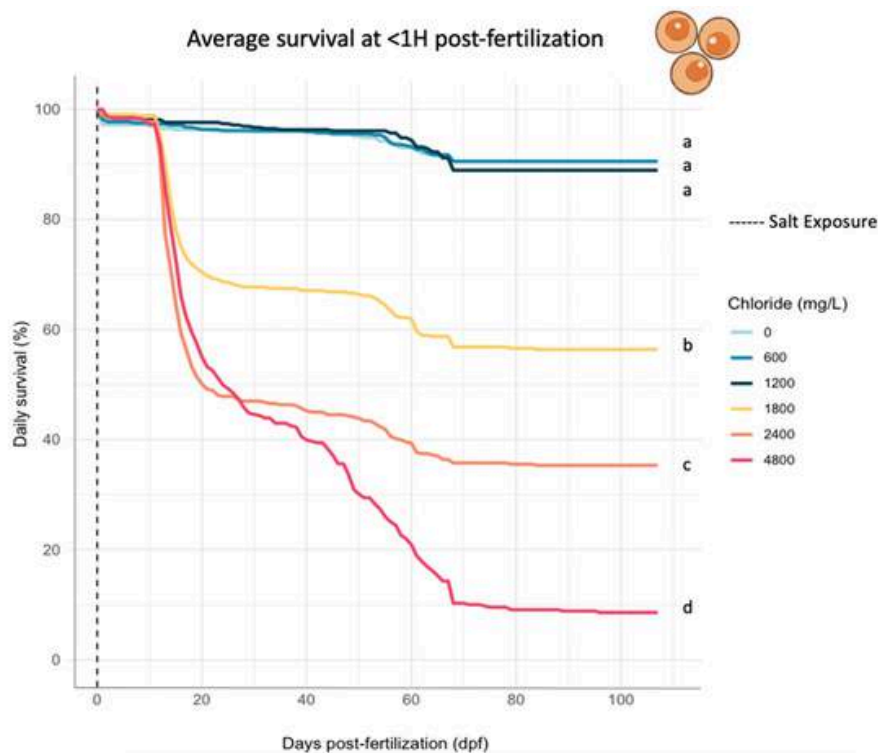


Figure: Average survival of coho salmon after being exposed to varying concentrations of salt for 24 hours, starting less than one hour post-fertilization

Figure credit: Carley Winter (UBC MSc)

# ROAD SALT AND SALMON PROJECT NEWS

SUMMER 2024

## University of British Columbia, cont.

Early last winter, **Clare Kilgour** exposed freshly fertilized coho eggs to road salt pulse regimes meant to mimic what they might realistically experience in a Vancouver stream. Eggs were exposed to either 1, 2, or 3 salt pulses, spaced 48 hours apart, at 2,400 mg/L Cl (4x the province’s acute guideline). As mentioned in the last newsletter, there were strong family effects on survival of eggs following exposure to salt. When looking across families, each subsequent pulse experienced by eggs in their first week after fertilization additionally decreased survival. In all exposure regimes, there was also an increased prevalence of major deformities compared to the control group. When larvae were exposed to salt pulses just after hatch, no significant decrease in survival was observed. It is likely that the period of “egg hardening” just after fertilization is a sensitive period for salt exposure in coho salmon.

This summer and fall, Clare is working to analyze samples taken throughout the “multi-pulse” experiment. These samples are looking at ion content, cortisol levels, and mRNA of eggs and larvae, to understand how multiple road salt exposures early in life may affect these parameters. Lastly, Clare has also been working to support the Road Salt Project Education Working Group by producing illustrations for some of their educational supports (see bottom right of page for examples).

In addition to their laboratory experiments, Carley and Clare collected grab samples in some of the study creeks this winter during a cold weather event. The grab samples were analyzed for salt content to confirm that the conductivity spikes recorded by the in-stream data loggers are indeed caused by road salt.

**Total Survival of Coho Salmon Eggs After Exposure to Salt Pulses**

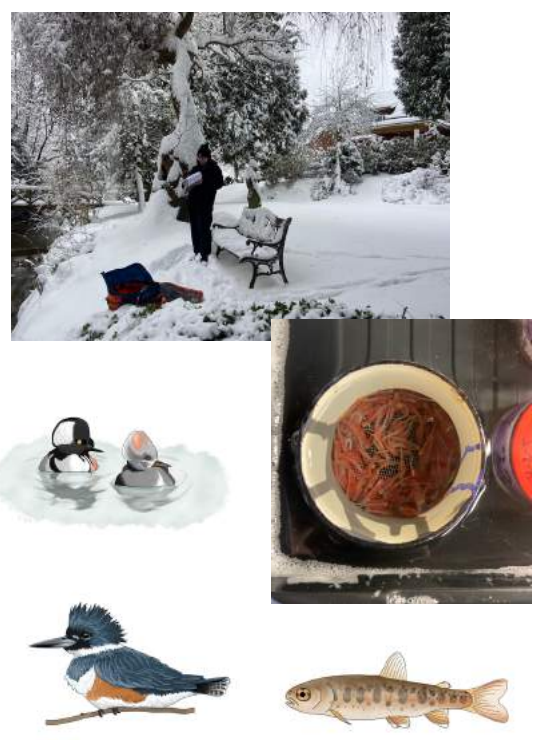
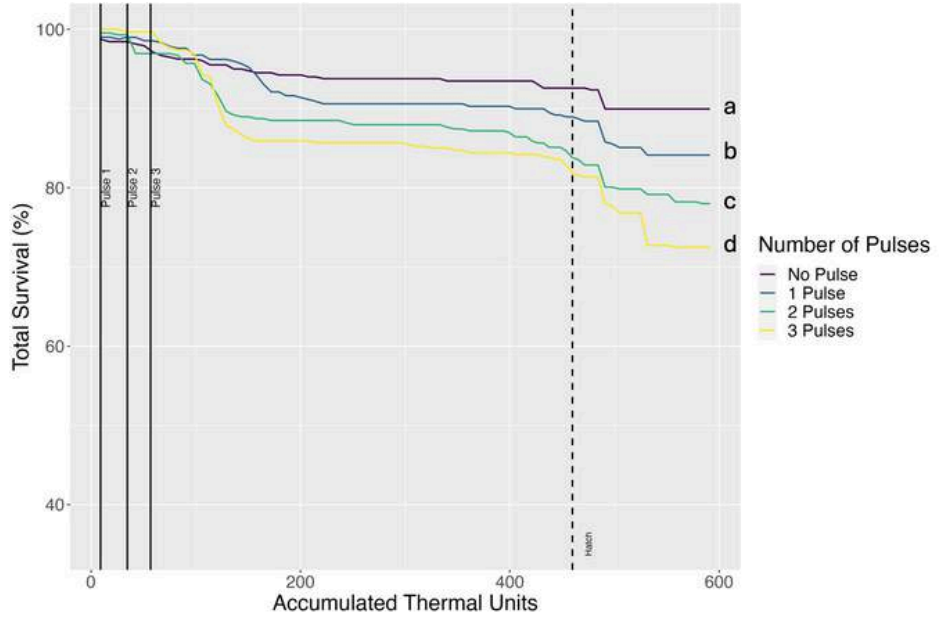


Figure: Total survival of recently fertilized coho salmon eggs after being exposed to varying number of salt pulses (2400 mg/L)  
 Figure credit: Clare Kilgour (UBC MSc)

## ***ROAD SALT AND SALMON PROJECT NEWS***

### **UPDATES FROM OUR ACADEMIC PARTNERS, CONT.**

#### **BC Institute of Technology**

Previously, BCIT and SFU ran a joint Masters of Ecological Restoration program. This program has since been retired; however, BCIT is thrilled to have received approval for their **NEW Masters of Science program!** Through this new BCIT MSc program, our BCIT partners hope to recruit new MSc students to join the Road Salt and Salmon project this September.



### **SPREADING AWARENESS ABOUT THE ROAD SALT PROJECT**

Spreading awareness and facilitating public education regarding impacts of road salt use has been an “all hands on deck” effort since the Road Salt Project was initiated more than 2 years ago - and the effort continues! Below are a few examples of how our community and academic partners are helping spread the word:

- PSEC staff worked with the Still Moon Arts Society and the Eagle Creek Streamkeepers to design 3-panel displays for use at community events.
- The Road Salt Project academic partners shared their research at the PSEC Open House event in June, which had over 600 attendees.
- The UBC team presented to 50 people at Bamfield Marine Sciences Centre in July.
- Carley Winter (UBC MSc) presented to a total of 92 high school students at two National Student Leadership Foundation events, held at PSEC.
- The WaterWealth Project intend to spread word about the project at their farmers market booth in August.





# ROAD SALT AND SALMON PROJECT NEWS

## FRY TRAPPING

As part of the Road Salt and Salmon Project, a subset of the partnering stewardship groups trap juvenile salmon twice per year (spring and fall). Traps are set in areas of each creek that we expect will be more or less impacted by road salt application in the winter months.

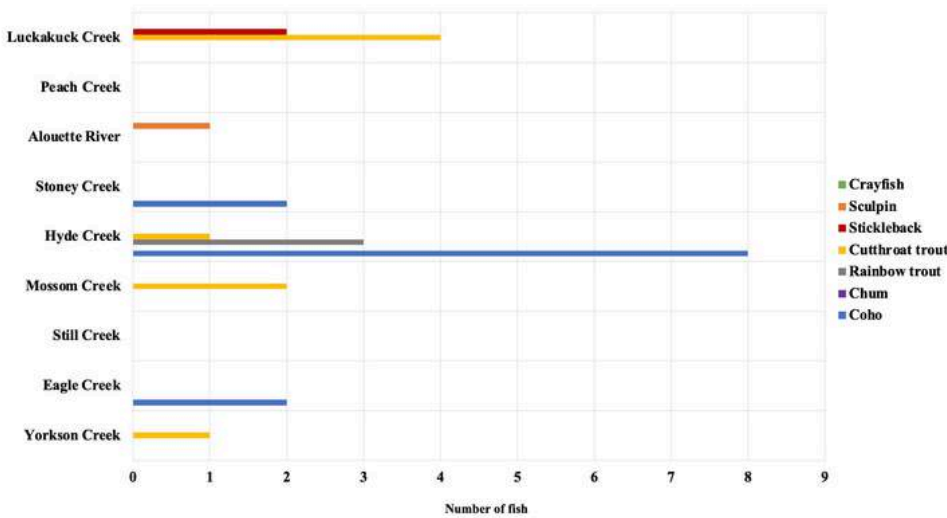
These data will help us gain a broader understanding of potential impacts of road salt contamination on salmon populations residing in urban creeks and can shed light on which areas may benefit most from restoration projects, such as green infrastructure, that could help filter road runoff before it enters salmon habitat.

### Figures:

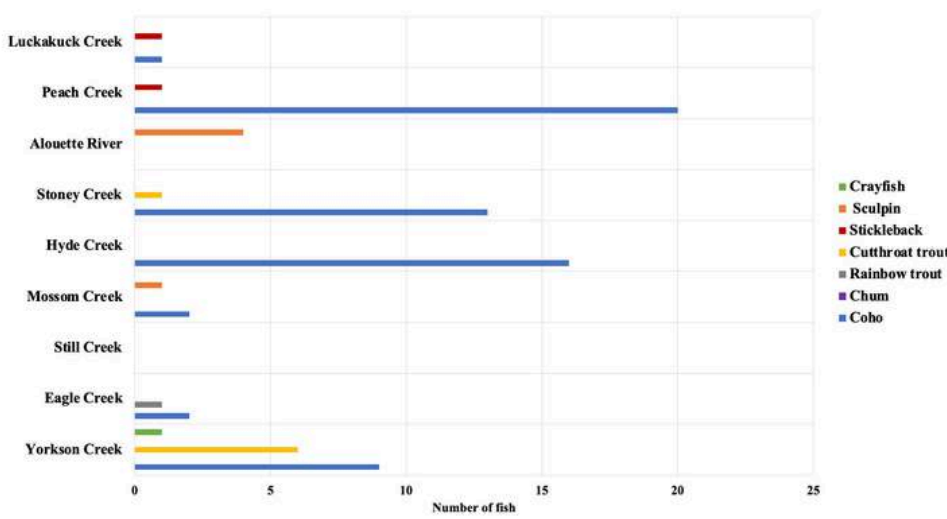
The top two figures on the right show the number of each species that were caught in the impacted and “unimpacted” sites in each creek. The bottom figure on the right shows the combined total of each species caught in all the creeks.

\*An important caveat regarding the apparent lack of coho in the Alouette River: staff turnover delayed the Alouette River trapping session, meaning trapping was conducted after the hatchery released their juvenile coho into the river. As such, despite the fact that many juvenile coho were caught in, and seen near, the minnow traps in the Alouette River, we elected to omit these data, as we cannot tell if they were wild coho or newly released fry.

Spring 2024 Fish Survey - Non-Impacted Site



Spring 2024 Fish Survey -Impacted Site



Spring Fish Trapping Data 2024

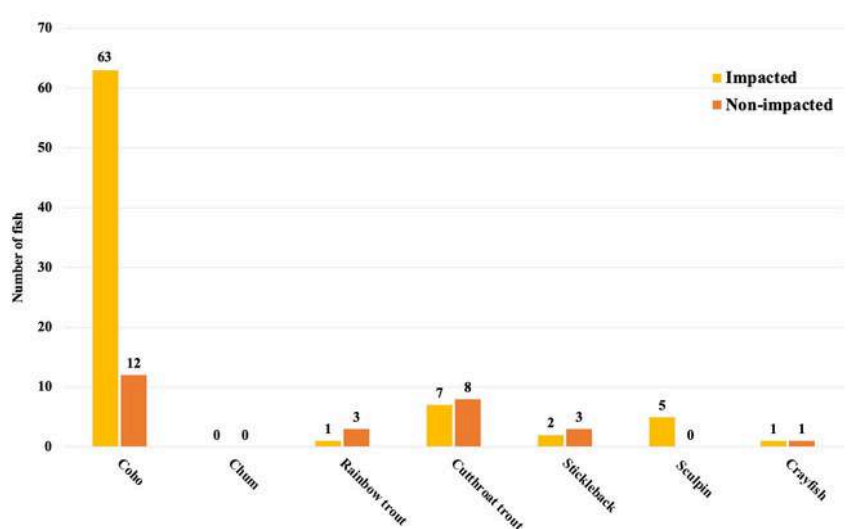


Figure credit: Carley Winter (UBC)  
Photo credit: Mossom Creek Streamkeepers

**ROAD SALT AND SALMON PROJECT NEWS**

**INVERTEBRATE SAMPLING**

This spring, volunteers from 9 of the stewardship groups that are partnered on the Road Salt Project set out to conduct invertebrate surveys in their creeks. The data they collect support the research by our partners at SFU regarding impacts of road salt on benthic invertebrate communities in urban Lower Mainland creeks.

**Invertebrate Diversity (# of taxa - Spring 2024)**



Figure credit: Sofia Ahmed (SFU MET student)

**Figures:**

The results of the spring 2024 invertebrate surveys are shown in a variety of ways in the figures on this and the following page. The above figure shows the diversity of invertebrates (# of taxa) collected during the spring surveys at the impacted and “unimpacted” sites in each creek. The below figure shows the overall abundance of invertebrates collected at the same impacted and unimpacted sites.

**Invertebrate Abundance (Spring 2024)**

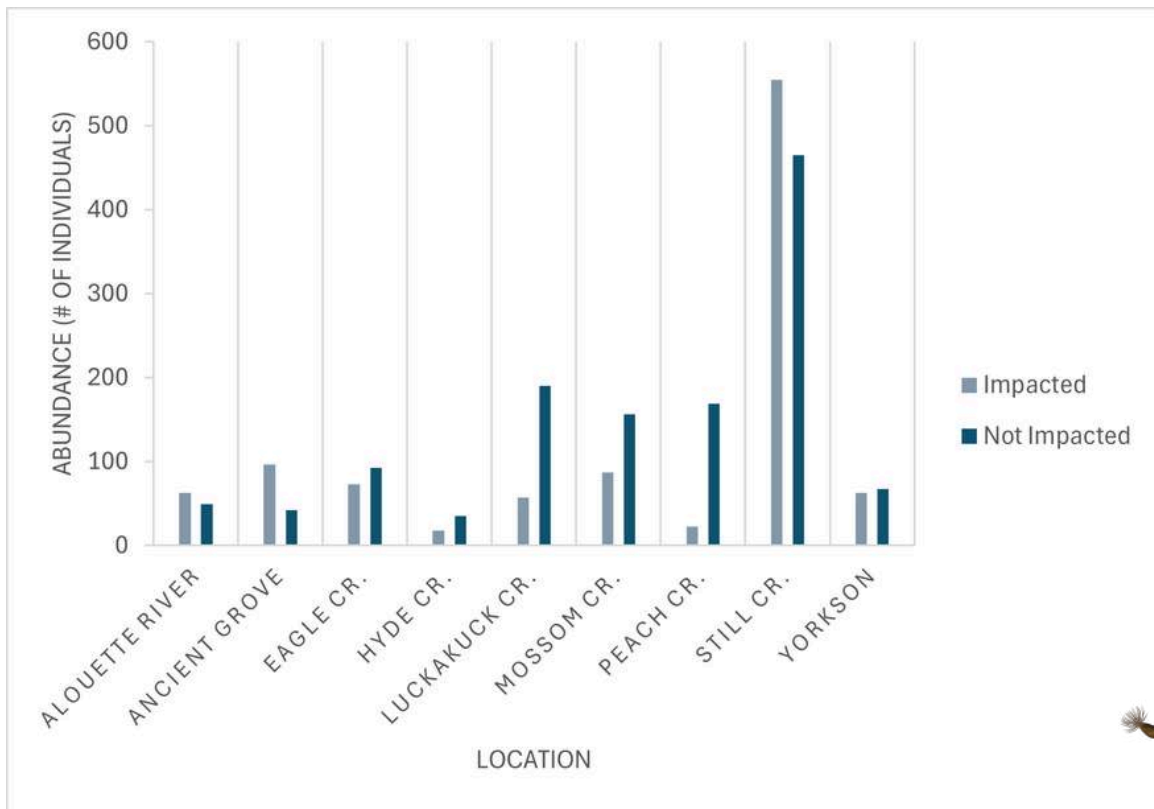


Figure credit: Sofia Ahmed (SFU MET student)

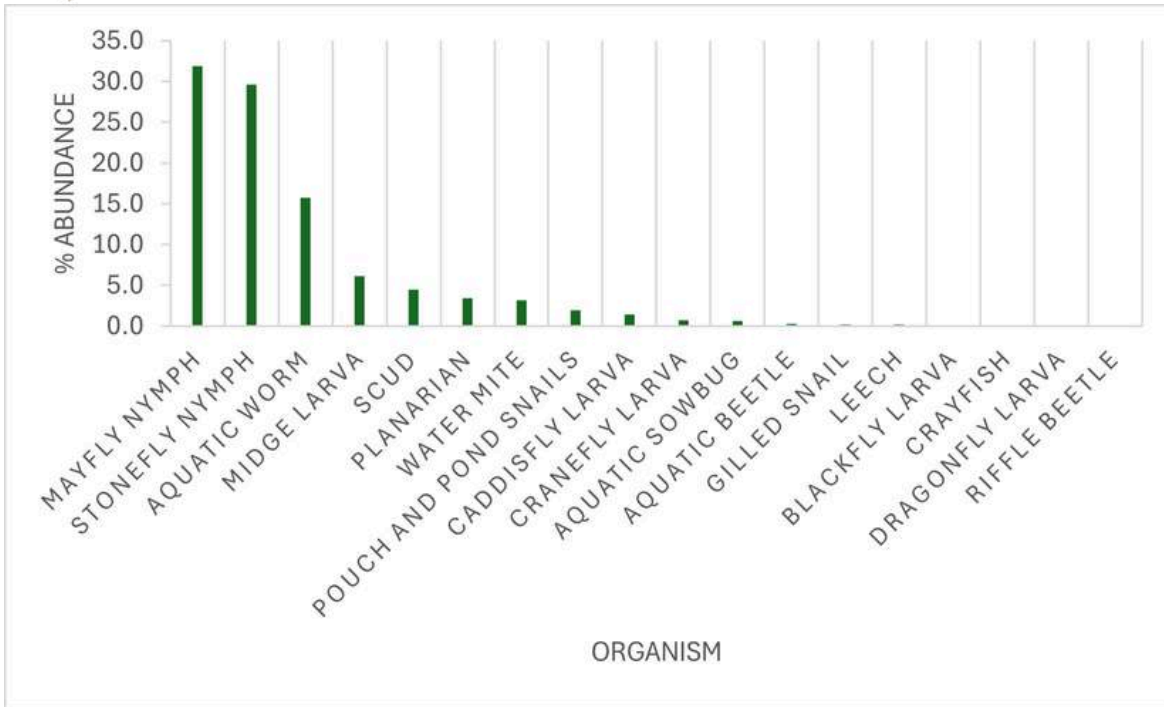
# ROAD SALT AND SALMON PROJECT NEWS



## INVERTEBRATE SAMPLING, CONT.

The top figure compares how many of each type of invertebrate were found, with the abundance of each shown as a percentage of the total number of invertebrates that were collected by all the groups.

Percent Abundance in Total Invertebrate Sample

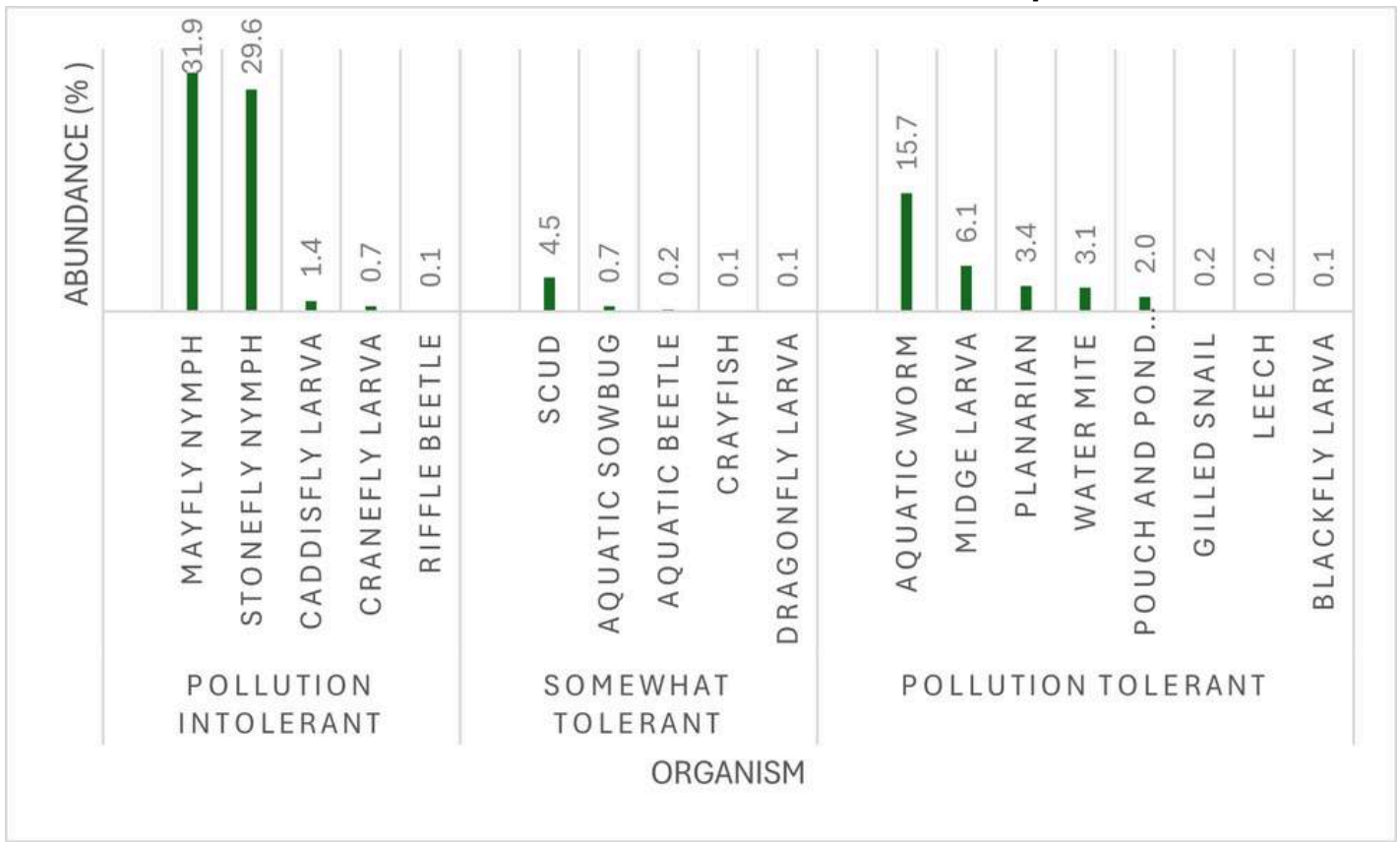


The bottom figure shows the same abundance data, but separated into “pollution intolerant”, “somewhat tolerant”, and “pollution tolerant” types of invertebrates.

Figure credit: Sofia Ahmed (SFU MET student)



Percent Abundance in Total Invertebrate Sample





## ROAD SALT AND SALMON PROJECT NEWS



### UPCOMING ROAD SALT PROJECT ANNUAL WORKSHOP - OCTOBER 5

Summer feels as though it just got started, but we're already looking forward to the 3rd Annual Road Salt and Salmon Project Workshop, which will be held at PSEC in early October. Regular updates via newsletters are a helpful way to keep people up-to-date on the project, including what goes on behind the scenes. but nothing compares to the dialogue and two-way exchange of thoughts, experiences, ideas, and inspiration that occur when we come together in-person, which is why the annual workshop is always a highlight of the year.

At this year's workshop, there will be a series of presentations from the graduate students involved in the project, which provides an opportunity for others to ask questions and learn more about their research. There will also be a section of time dedicated to receiving feedback from our Streamkeeper partners, which helps ensure the current stream monitoring, juvenile fish trapping, and invertebrate surveying protocols continue to be feasible (and ideally, fun!) and allows for collaborative troubleshooting if there's any issues that have surfaced.

Lastly, and perhaps most importantly, the workshop is an opportunity to celebrate all that we've achieved together and to express gratitude to all our Streamkeeper partners, as the Road Salt Project would not be possible without their dedication and support.

*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.*