Mitigating Inputs of Tire Wear Toxins to Protect Salmonid Habitat on Vancouver Island:

Presentation Overview

BC Conservation Foundation (BCCF) and Vancouver Island University's Applied Environmental Research Labs (VIU AERL) are co-leading the *Mitigating Inputs of Tire Wear Toxins to Protect Salmonid Habitat on Vancouver Island* program. Together with local First Nations and stewardship groups, the team is working to identify which waterways along the east coast of Vancouver Island (ECVI) are most impacted by 6PPDQ.

In 2020, 6PPDQ was discovered as the cause of 'urban runoff mortality syndrome' in coho salmon. 6PPD is a compound that is put into tires to help prevent them from breaking down. When 6PPD reacts with ozone, it transforms into 6PPDQ, which is the toxicant known to cause mortalities in multiple fish species, with coho being the most vulnerable. Tire wear particles end up on roadways as tires wear away and when rain comes, these chemicals are washed into local waterways via stormwater runoff.

VIU AERL has developed an innovative sampling technique using Condensed Phase Membrane Introduced Mass Spectrometry (CP MIMS), which provides a fast, real-time, portable, and cost-effective means of measuring 6PPDQ. The technology allows the program team and participating groups to conduct a greater amount of sampling in a short period of time at a fraction of the cost of the conventional method through a commercial lab.

Sampling has been underway since 2022 but expanded to cover a greater amount of ECVI in September 2023. Sampling crews, primarily comprised of volunteers, are sampling before, during, and after major rain events to gain an understanding of which waterways are most impacted and which sources are contributing to the greatest amount of TWTs. In addition to wide-scale surveillance that BCCF/VIU AERL are coordinating, the program team is also beginning to investigate how 6PPDQ varies over time and space by sampling more frequently and at multiple sites along a single waterway.

To date, the program has trained over 150 volunteers and sampled 73 waterways at 170 locations between Campbell River and Victoria. Over 3,500 samples have been collected since September 2023 and of those samples ~33% of them have 6PPDQ detected in them.

General trends that the team has found include:

- Concentrations observed are very dynamic, emphasizing the timing of sampling is important;
- Different waterways have different response times, likely dependent on the amount of impermeable surfaces that exist within the watershed (i.e., watersheds with greater impermeable surfaces may have a quicker response time); and
- Although the 'first flush' of the season may be the most impactful for vulnerable fish species due to long dry periods/greater tire wear particles on the road and low flow conditions in small,

urban creeks, we do see 6PPDQ throughout the winter seasons; therefore, short dry periods can still result in harmful concentrations of 6PPDQ in our local waterways.

All data is available on the online interactive database. Additionally, there is more information about the project and the volunteer groups associated with the program at the program website. Beyond the sampling goals of the project, the team is also working with the University of Victoria students to invest different material types to use for nature based remediation techniques, such as retention ponds and rain gardens.

For those interested in some of VIU AERL's academic articles associated with the 6PPDQ research, find the links below:

- Method development article (October 2021)
- Automation and environmental monitoring article (September 2023)
- Intensive spatiotemporal characterization of 6PPDQ (*NEW - November 2024)