Coho Urban Runoff Mortality – An Overview

Cedar River Council March 23, 2021

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Problem

 ~20 years ago people saw adult coho dying quickly in streams before they spawned.

Longfellow Creek Coho Salmon - Bing video

- 40-90% mortality in urban streams
- Including May and Taylor Creeks



Urban Runoff Mortality Syndrome (URMS)

- Adult coho die prior to spawning
- Symptoms:
 - Mouth gaping
 - Fin splaying
 - Spasming
 - Disorientation
 - Loss of equilibrium
 - Retain silver ocean color of coho
 - No sign of disease or pathogens
 - Frequently documented in urban streams
 - Strong correlation with storm events in Fall
 - Only impacts coho, not chum



The Search

- Surveys and investigations (~2000-2014)
 - NMFS/NOAA
 - USFWS
 - Tribes
 - WSU Puyallup
 - UW
 - City of Seattle
 - King County
 - Wild Fish Conservancy
 - Others
- Cause unknown



Miller/Walker Creek Coho Mortality Rates



The Search Continued

- In 2014, UW chemistry professor (Dr. Ed Kolodziej) joined the hunt.
- He and students used new technology to identify chemicals unique to urban runoff.
- WSU Puyallup (Dr. Jen McIntyre) continued toxicity angle



Chemical Identified in 2020

- 6 PPD is in tire rubber
- Additive to prevent degradation (Anti-ozonant)
- 6 PPD-quinone is modified from 6 PPD



• Asphalt – not used unless recycled rubber asphalt

6 PPD-quinone Toxicity



Figure from Tian et al. 2020

Species Sensitivity



Juvenile coho are just as sensitive as adults. In same stream, coho will die but chum will not and are unaffected

Solutions – Source Control

- Industry-wide non-toxic substitute?
 - 3.1 billion tires manufactured each year
 - US Tire Manufacturers Association is aware and reviewing study
 - Would need alternative that prevents degradation



Solutions – Treat Stormwater

Stormwater treatment by filtration works!

i.e., Bioretention

- rain gardens
- bioswales

...but it is a tall order to treat all road runoff everywhere.



Solutions - Bioretention

Untreated runoff



After treatment



Related Work at King County

- Annual surveys of mortality at Miller/Walker Creek continue.
- Partnership with UW researchers who are developing a standard method to test 6 PPD quinone concentrations.

Other Work

- Western Washington Stormwater Work Group starting a workgroup focused on URMS.
- UW and WSU researchers continue to answer additional questions, such as

How does 6 PPD quinone cause death in coho?

Why are coho so much more sensitive than other salmon?

What other organisms are affected?

How long does this chemical persist in environment?

Does the chemical accumulate in fish?



Thank you!



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