Deadly Waters: A Survey of Coho Pre-Spawn Mortality in Swan Creek

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Introduction

- Coho salmon (*Oncorhynchus kisutch*) once recognized for their vast populations are declining at concerning rates, particularly within urban streams (Spromberg et al. 2016).
- Scientists have documented high rates of salmon dying during upstream migration, but prior to spawning – a phenomenon called pre-spawn mortality (PSM) (Spromberg et al. 2016).
- PSM has been linked to a tire oxidation product called 6PPD quinone (Tian et al. 2021). Other common causes of PSM include disease and thermal stress.
- Little knowledge is known about coho PSM rates within the Puyallup Watershed.
- We estimated annual coho escapement (spawning population abundance) and PSM rates in Swan Creek (Fig. 1) from 2017-2025.

Figure 1. Puget Sound region, with Swan Creek location (Metro Parks Tacoma, 2011).

Methods

- Live coho and carcass data collected weekly between October and mid-December from 2017-2025.
- Coho carcasses were dissected and examined for evidence of pre-spawn mortality (Fig. 2).

Figure 2. Dissected female carcass that died from pre-spawn mortality.

- Post orbital to hypural plate length and origin (hatchery or wild origin) were noted for each carcass.
- Public education and outreach took place at TAF@Saghalie school and Salmon Saturdays (Fig. 3).

Figure 3. Community Outreach at Salmon Saturdays.

Results

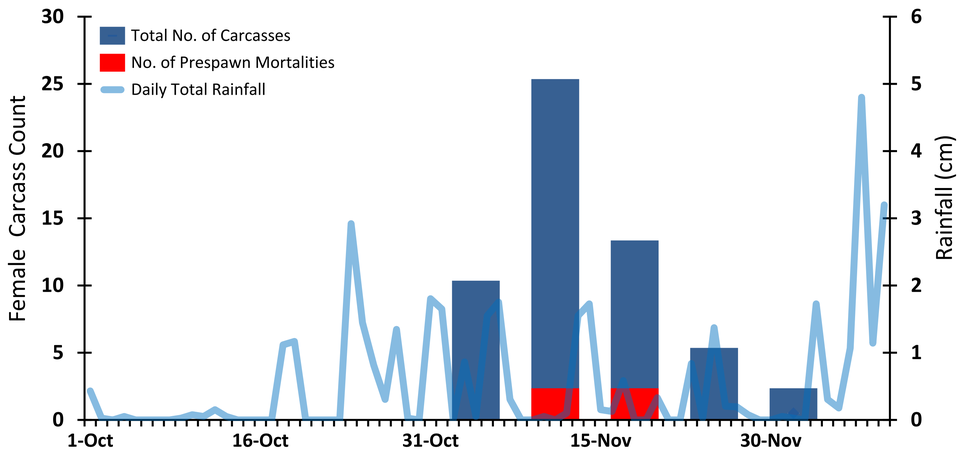

Figure 4. Total rainfall (blue line), female carcass counts (blue bars), and the number of PSM carcasses (red bars) observed in 2025.

Table 1. PSM and escapement data (2017-2025) at Swan Creek. N represents the total number of female carcasses that were examined.

Year	%PSM	N	Escapement
2017	26.7%	15	97
2018	0%	2	12
2019	0%	2	10
2020	0%	2	10
2021	0%	0	0
2022	100%	1	9
2023	9.3%	43	97
2024	17%	46	151
2025	4.65%	43	101

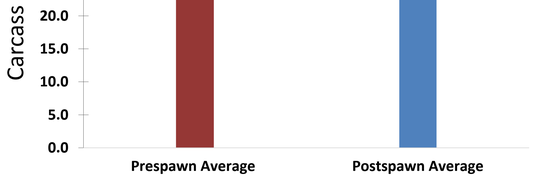

Figure 5. Comparison between pre-spawn (N= 19) coho body lengths and post-spawn (N= 128) coho body lengths. Error bars represent standard error.

- PSM occurred during peak spawner density with recent daily rain totals approximating 0.75 centimeters (Fig. 4).
- Overall PSM rate from 2017-2025 was 12.3%.
- No significant difference in body length between Coho pre-spawn and post-spawn (t-test, two-tailed, $P = 0.06$) (Fig. 5). Competition and body condition not likely playing a role in PSM.
- Annual escapement trends show high variability (Table. 1). 2017-2022 reveal a drastic decline in escapement, while 2023-2025 reveal a relatively high rate of escapement.
- Social Impact: We have worked with 156 students and over 700 community members through public outreach events since 2017.

Discussion

- The average PSM rate (12.3%) falls within the range predicted by Feist et al. (2017).
- PSM rates may appear lower within Swan Creek compared to King County likely due to lower traffic density (WSDOT, 2025).

Mitigation Strategies:

- Building green stormwater infrastructure in urban areas to prevent urban stormwater runoff (Spromberg et al. 2016).
- Removing 6PPD quinone from tires and providing sustainable alternatives.
- Educating local communities about the impacts of urban stormwater runoff.

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References