**SWG 6PPD Subgroup Meeting – SUMMARY NOTES**October 6, 2021 from 10am-12pm

**Attending:**

Panelists: Julie Watson, Kathy Peter, Nat Scholz, Bob McKane, Jon Halama, Jana Crawford, Evan Lewis, David Troutt, Keith Dublanica

Co-chairs and staff: Eli Mackiewicz, Abby Barnes, Emma Trewhitt, Karen Dinicola

Subgroup members: Aaron Clark, Abbey Stockwell, Aimee Navickis-Brasch, Alyssa Barton, Andrea Carey, Ashley Bagley, Bob Black, Brandi Lubliner, Brian Muegge, Carol Maloy, Catherine Gockel, Cindy Callahan, Dan Kent, Dana de Leon, Dean Wilson, Derek Day, Don McQuilliams, Dylan Ahearn, Elene Trujillo, Ellen Southard, Heather Trim, Heidi Siegelbaum, Jeff Killelea, Jessica Atlakson, Jessica Stocking, Julia Ebert, Julie Panko, Keunyea Song, Kevin Hansen, Jen McIntyre, John Hermann, Lisa Rozmyn, Marissa Pauling, Mark Bozlee, Maureen Meehan, Melissa Ivancevich, Michelle Chow, Michelle Perdue, Mike Martinez, Misha Vakoc, Katie Rathmell, Nicholas Scoufaras, Nick Hehemann, Paul Oakley, Peter Murchie, Rob Zisette, Rod Swanson, Sandie O’Neill, Sean Dixon, Sean Moore, Sydney Clark, Tara Galuska, Taylor Hoffman-Ballard, Todd Hunsdorfer, Tyler Dearman, Val Chu, Zack Holt, and an unidentified guest.

This subgroup is focused on stormwater management of 6PPD and 6PPD-quinone (6PPD-q). We’re having a series of discussions to inform stormwater managers. We’re learning and our thinking is evolving. We’re not recording these discussions because we don’t want to hold anything to a statement they make while we’re in the middle of learning and asking questions while we don’t yet have a lot of answers.

**PANEL DISCUSSION** – (these notes have been reviewed by the panelists)

Today our panelists answered questions about Coho, 6PPD and 6PPD-q, and Southern Resident Killer Whales; specific geographic analyses that have been done related to Coho-pre-spawn mortality and 6PPD-q; transportation retrofits and fish passage projects; and tribal perspectives on this issue.

* Where and when do southern resident killer whales need Coho prey to survive? Where do the Coho spawn that are known to provide this crucial food source for these whales?
	+ Learning by looking at fecal matter, and location, to identify SRKW prey. Coho seem most important in the straits and San Juan Island area in late fall. Often north, toward Vancouver Island. More samples needed. PS Coho are already past their mouths when could have been consumed when they enter streams and face URMS. Impacts are on the overall size of the fishery.
	+ Low sample size. Modeling found low impact of eliminating entire fishery, so need to ask same question about Coho.
	+ Also important: Coho have A and B runs. The A runs are already back before it rains. The B runs in October are more likely to be affected by 6PPD-q
* What is the role of hatcheries versus wild runs in providing Coho that these whales need?
	+ We have increased hatchery production in PS by about 4 million smelts to a total of 26 million overall. Those Coho are making it back to the hatcheries, which are in larger river systems not small creeks where we see URMS.
* What do and don’t we know about the extent of Coho pre-spawn mortality events, or URMS, across the state?
	+ Data for a couple of decades, URMS is 40-90% of adult Coho in the streams. Only a few watersheds were there have been consistent surveys
	+ Lab studies show juveniles are also sensitive, but they are harder to study in the field
	+ Modeling relates incidence to urbanization – didn’t know about 6PPD at time
* How do 6PPD and 6PPD-q fit in the bigger picture you and your colleagues have been studying over the past decades about how stormwater impacts fish?
	+ We’ve been working on stormwater impacts since early 2000s – federal and City of Seattle trying to get a handle on where this is most severe and enough samples to do a forensic analysis. Complex mixtures. Biggest coastal pollution threat across the country
	+ Stressor is diffuse and complex and synergistic. Massive triage effort. Salmon and forage fish. Let the fish tell us what’s important – Coho have been telling us, especially in places in cities where we are opening access to habitat.
	+ Our stormwater management recommendations hold even without knowing about 6PPD-q; necessity of green infrastructure
	+ PAHs continue to be a huge issue. Challenging to tease out. If/when we have an oil spill.
	+ Need to always include stormwater and water quality when assessing habitat conditions and thinking about improvements.
* How consistent are local sites and conditions for this problem across the region?
	+ Understanding how road runoff makes it to stream and how that scales with traffic intensity, type of road, and other factors.
	+ Watershed scale level conditions – thinking about specific source types and data to inform those models
* Do we know anything about how this chemical impacts fish in the marine environment?
	+ We don’t’ but it’s a huge priority for us to understand cumulative impacts on the ecosystem – toxic to Coho and forage fish. 6PPD-q is targeting something unique, unlike other SW pollutants, other salmonids are not as sensitive. Losses of species that higher trophic species care about. Still have all of the other chemicals
	+ The modeling we’ve done in the past: in 2011 lot of concern about this not being WQ, but rather a disease or ammonia or DO problem. Got to line of evidence analysis that it is land cover. Needed more robust modeling than just a few streams to have more confidence and probability component.
	+ Not just imperviousness, but motor vehicle traffic
	+ Going back to LU gradient, map back onto 2017 work and look at B-IBI. What are the bugs telling us? How does that compare with what we’re seeing in fish?
* How can modeling help us address this problem?
	+ Models are helpful for establishing a virtual ecosystem that we can play games with to test specific questions and try to inform decisions making about stormwater management, where to put GI, how much is needed, what type
	+ Evaluating BMP use is at the heart of VELMA. Set up model for a watershed of interest built, then implement difference approaches (pervious roads, active carbon soils, increased bioswales) and compare results to understand how each could help reduce 6PPD-q.
	+ Jon Halama adapted VELMA for urban systems. Added urban stormwater system features from community databases to allow VELMA to simulate fate and transport of water and chemicals on impervious surfaces and within soils, including natural and engineered urban landscapes, and ultimately to streams and outlets to the estuary.
	+ VELMA allows users to simulate how much, where, and when contaminant deposition occurs.
	+ EPA’s online Comptox library provides chemical-specific parameter values that constrain simulation of contaminant sorption, decomposition, and transport within different soils. Soil carbon content is especially important.
	+ Currently modeling Longfellow Creek (Seattle); Miller Creek (Burien, SeaTac). Next: Thornton, Pipers, and Taylor creek watersheds (Seattle). Working with green and gray infrastructure data community stormwater managers have provided. Now possible to model much larger mixed urban-rural watersheds; the setup will take some time.
	+ Feist et al paper good for helping us think through the details of how to do this.
	+ Modeled 6PPD-q exhibits “first flush” hydrograph behavior, i.e. primary transport to streams is via roads and storm sewers. Given 6PPD’s short half-life (~3 days according to Comptox), if stormwater managers can use bioswales, rain gardens, other green infrastructure to divert road-surface flow into soils before reaching catch basins, that will slow transport and provide more time for decomposition to reduce loading. Potentially very helpful to Coho. 6PPD-q is more stable than the 6PPD parent compound, but its half-life is not yet known.
	+ Also looking at stormwater pipe outfalls to streams. Virtual green infrastructure treatments (green and gray) and O&M practices (street sweeping? catch basin cleaning?) could be included in VELMA, maybe as altered deposition.
	+ Early (2011) modeling gave us lines of evidence from 6-7 systems, then 50 in Feist, now going back to LU gradient with B-IBI and Coho side by side
	+ Link with hydrology and evaluate reduction in toxicant. Where are fish spending time and spawning, reduce exposure
	+ For returning adults, hatchery and wild fish may differ in their potential exposure to 6PPD-quinone so returning hatchery Coho may not be a good metric to evaluate impacts. For juvenile fish, 6PPD-q affects both hatchery and wild Coho, but hatchery and wild fish may not be equally exposed pending on the amount of time they spend in rearing habitats surrounded by roads.
* How as a region should we prioritize among highly urbanized streams to invest in stormwater projects?
	+ The million dollar question. We don’t have a direct answer yet. Bringing up some thoughts to consider in prioritizing regionally and among watersheds
	+ Specific sources – stormwater outfalls – prioritize spaces within specific watersheds
	+ Connectivity – address both upstream and downstream habitat
	+ Focus on suburban shouldn’t be lost – it’s a large land area, there would be positive impacts from those projects.
* Where are we making investments in fish passage improvement? How is stormwater being addressed at these projects? How does fish passage fit into your larger stormwater retrofit program?
	+ WSDOT has had a fish passage program in place since 1991, then a permanent injunction went into effect in 2013 requiring WSDOT to increase the pace @1000 locations. WSDOT began looking to include stormwater retrofits as part of these projects.
	+ All new projects have to meet current stormwater management standards. If a project increases the amount of impervious surface by a certain amount, they have to add treatment. Many small fish passage projects don’t hit the threshold, but ESA is often applicable and is more stringent.
	+ Lots of existing pavement – addressing untreated areas across the state. PS basin retrofits are held to a higher standard than the rest of the state – required to treat additional area.
	+ All of our fish passage projects are looking for opportunities even though not required by manual or ESA. Trying to improve water quality where habitat is being restores, as well as taking advantage of contracting opportunities.
	+ WSDOT does stand-alone stormwater retrofit projects funded separately by legislature. A two-fold process to rank as high, med, low priority - some of the criteria:
		- High traffic, near drinking water sources, priority habitat
		- Areas where there is not a lot of ground contact before discharge into receiving water.
		- Input from Tribes and public on priority habitat.
	+ Retrofits and fish passage projects are a small part of King County’s 2020 strategic plan for clean water healthy habitat
		- Prioritization process targeting toxics and focusing on existing land use (among other things) both of which partially capture concerns related to 6PPD-q but don’t specifically call it out. Process is iterative so likely will change.
		- Looking for bang for the buck – projects that translate into more fish
	+ What is the best habitat? Instream habitat and WQ. Working with tribes and stakeholders to set priorities among 950 barriers identified in the county. Consensus in July at approach, findings coming soon. 350 result in 80-90% of the total habitat gain.
* What characteristics make Coho so special to tribes, and how we can, or should, best protect watersheds where Coho are fished by native tribal fisherman?
	+ Talking about this issue – and others – is very important. There is tremendous urgency in the tribal community. We have to solve this problem. We’ve been modeling, we don’t know a lot, 20-30 years out is not a lot of time. The salmon don’t have a lot of time. They’re telling us, have been telling us since listing in 1991, that we need to expedite our efforts. We won’t have perfect information.
	+ We know we have a significant problem. This chemical is the DDT of our generation. We need to do something and do it quickly. Let’s get on with this work. Nisqually Tribe is testing a project on Hwy 7 to remove 6PPD-q and other chemicals from stormwater.
	+ We manage every fish, tribes are held accountable but other parts of society are not held accountable. Haven’t heard in this discussion today how we’re going to approach treaty rights. Not much different from fish blockages. Fish need the water itself. Account for treaty rights. You don’t have all of the resources to fix everything – so you need to hear the tribal voice in what are the priorities.
	+ Need to get 6PPD out of the tires, without another toxic substance.
	+ Also need an implementing strategy to remove it from stormwater. Emphasizing urgency. Nisqually open for Coho now. Down to 3000 fish. We’re fishing sustainably for fewer days every year. In Stillaguamish they don’t have enough fish for the tribes to have a fishery this year. Step up and implement strategies quickly.

To all panelists: What are your big questions about 6PPD-quinone?

* Uncertainties, need more data.
* What is distribution of inputs to stream reaches? What’s coming into the system? Understanding stormwater system better. Sediment traps?
* Big transportation infrastructure projects need to address pollutant transport and runoff.
* What are consequences of ecological traps?
* Ecosystem impacts from loss of species
* Types of sources, reservoirs of sources in receiving waters.
* Biggest question @ 6PPD-q: where to focus our efforts
* How to incorporate new information into long term priorities
* What it does in the marine environment
* What it does to other species of fish here and across the country.
* Beyond Coho, what are the food web interactions? Other forage fish?
* Impacts to prey availability: are they smaller and slower? If so, they’re easier to catch but not as nutritious. Orcas need big juicy fish.
* What are bioaccumulation impacts on SRKW at top op food chain?
* We know enough to act. We know that stormwater treatment in PS is not sufficient. When are we going to start funding this at a level that’s serious enough to address the problem. We don’t have time.

Do any of you have thoughts to share or questions to ask of each other?

* Modeling helps us not have to monitor everywhere. Accelerating land use changes facing the region. Small arterials will grow. Just a matter of time.
* Flip the question on what are the last best places: what do you want to save versus what are you willing to let go?
* Meetings like this lead to collaboration. Agree with David, EPA is sharing VELMA with anyone who wants to use it and providing training. Most users are connected with tribes. Small effort in the big scheme; others view it as important for this problem.
* VELMA work is changing the world, protecting forests and habitat and hunting and gathering places for tribes and others. I think it will have a similar impact in the urban area. Question is time: we’re running out of it!
* Forums like this are essential to link the research and the implementation. Making progress every day, bringing current tools to apply them in real time to act on best available information. What I learned today will be helpful in supporting my work.
* Appreciating and acknowledging this work and the cooperation. SRF is looking for pilot scale project site opportunities; chat with Keith Dublanica off line. Regional monitoring could be available for innovative approaches with topics.

**Unanswered questions from chat:**

* For the where to prioritize question, wouldn't the answers vary depending on what objective you're trying to achieve? Abundance (single stream vs PS wide) vs diversity vs protecting sensitive stocks vs simple water quality
* Are we comfortable that the two approved media (Contech Filterra + Oldcastle) treat 6PPDq? Are we actively working on getting more technologies approved so we have more options?
* Is there a data set that we think most closely aligns with pathways for 6PPDq? i.e. Impervious surface, Average trafffic. TSS, Total Phosphorous, Total Copper, Total Zn, Nitrate-Nitrite, Total Kjeldahl Nitrogen, Dissolved Zn, Total PAHs
* is there  any value/interest in developing public/private partnerships to advance implementation of BMPs or needed research?
* How do we leverage international corporations to remedy this issue if it is only impacting locally on the west coast?

**POLL RESULTS**

**Question: Based on your current understanding off the 6PPD-q issue, where should stormwater improvements to treat this pollutant be prioritized? (Rank top 3)**

**Results: (42 responses)**

1. High traffic local roads (included in 58% of respondents’ lists)
2. Upstream of priority habitat restoration projects (40%)
3. At priority fish passage project sites (38%)
4. In the densest urban areas (38%)
5. Highways, generally (33%)
6. Where local roads run parallel to streams (30%)
7. At the highest priority site for my local tribe (25%)
8. Highway bridges (25%)
9. Where most important for Orca prey availability (18%)
10. Other (15%)
11. Bridges, generally (3%)
12. My local watershed (3%)

**“Other” Responses:**

* Where Coho and other affected species are found
* Prioritize all areas near vehicular traffic not utilizing LID, BSM treatment or infiltration for retrofits.
* Where we are seeing the greatest impact to local salmon populations
* In places where 'end of pipe' --distol locations-- that aggregate lots of stormwater from significant pollution producing acreage.
* Waterbodies where we are observing URMS
* Everywhere. Right Now.

Thank you for attending today! Great info and additional considerations to take into account. Please reach out and collaborate! Stormwater managers are going to need resources to do these projects. Remember, this subgroup is not working on solving the product replacement issue in the tires, we’re focused on stormwater management of the 6PPD-quinone in the runoff.

We’re putting together a summary statement for each meeting to inform permit reissuance and priorities for SAM projects.

Current Plans for the next 4 meetings: Emma/Karen will send out a poll to pick meeting dates

* November: Services’ perspective on 6PPD and Coho recovery
* January: Source Control/O&M
* February/March: WQS process and LC50’s
* April: summary of what we’ve learned and how it should influence permit reissuance