

Brief Summary of State of the Science Forum



- Same syndrome that kills adults also kills juveniles
- Study found ~80% juvenile mortality in each storm
- Concentrations up to ~100 ng/L in each storm
- Impacted developing embryos as well

WASHINGTON STATE UNIVERSITY
EXTENSION

Nathan Ivy

CANARY IN THE CREEKBED: REAL-TIME EVIDENCE OF 6PPDQ-INDUCED MORTALITY AND DEVELOPMENTAL IMPAIRMENT IN COHO

Nathan Ivy¹, Jenifer McIntyre¹, Marlee Brown², Edward P. Kolodziej³, Justin Greer⁴, John Hansen⁴ and Anastasia Madelaine McConachie¹, (1)Washington State University (WSU), (2)University of Washington, (3)University of Washington, Tacoma, (4)U.S. Geological Survey (USGS)

PRESENTED BY NATHAN IVY – DECEMBER 9, 2025

Thanks,

4:50 / 2:57:21

- Increasing stream temperatures appear to magnify 6PPD-Q uptake

Day 1: 6PPD State of the Science Forum – Lightning Talks | Dec. 9, 2025

Increasing temperatures magnify the uptake of tire wear contaminant 6PPD-Q in juvenile coho salmon (*Oncorhynchus kisutch*)

Amirah M. Casey, Denis da Silva, Julann A. Spromberg, Nathaniel L. Scholz, Mark D. Scheuerell

University of Washington, and I'm going to be talking about how increasing temperatures magnify the uptake of tire wear contaminant

zoom

15:57 / 2:57:21

- Box of Rain with new media worked well and didn't export other pollutants of concern
 - Mulch top
 - 70/30/10 mix of sand / coco coir / biochar middle
 - 90/7.5/2.5 mix of sand / activated aluminum / iron bottom

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Dylan Ahearn

Treating Conventional and CECs in Stormwater with a High Performance Bioretention Soil Media

A Field Effectiveness Study

Chelsea Mitchell¹, Jenee A. Colton¹, Sam Nilsson², **Dylan Ahearn²** and Jennifer Lanksbury¹

1. King County Dept. of Natural Resources and Parks
2. Herrera Environmental Consultants

All right

26:50 / 2:57:21

- 6PPD-Q may be correlated with chromium, copper, and/or zinc

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Characterizing 6PPD-Q concentrations and hotspots in salmon-bearing creeks in Southwest British Columbia

Tanya M. Brown, Sofya Reger, David Lai, Timothy F. M. Rodgers, Mina Hassan Aghaei, Carys Gallilee, Katerina Colbourne, Simon Drew, Ruth Joy, Edward P. Kolodziej, Lisa Loseto, Andrew Ross, Gopal Sharma, Rachel C. Scholes, Xiangjun Liao

Okay. Okay, perfect.

SFU Fisheries and Oceans Canada Pêches et Océans Canada UNIVERSITY of WASHINGTON UBC

6PPD State of the Science Forum December 7, 2025


- One metabolite was non-toxic while the another had similar toxicity to 6PPD-Q

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Regioselective *in vitro* toxicity of aromatic hydroxylated metabolites of 6PPD-Quinone

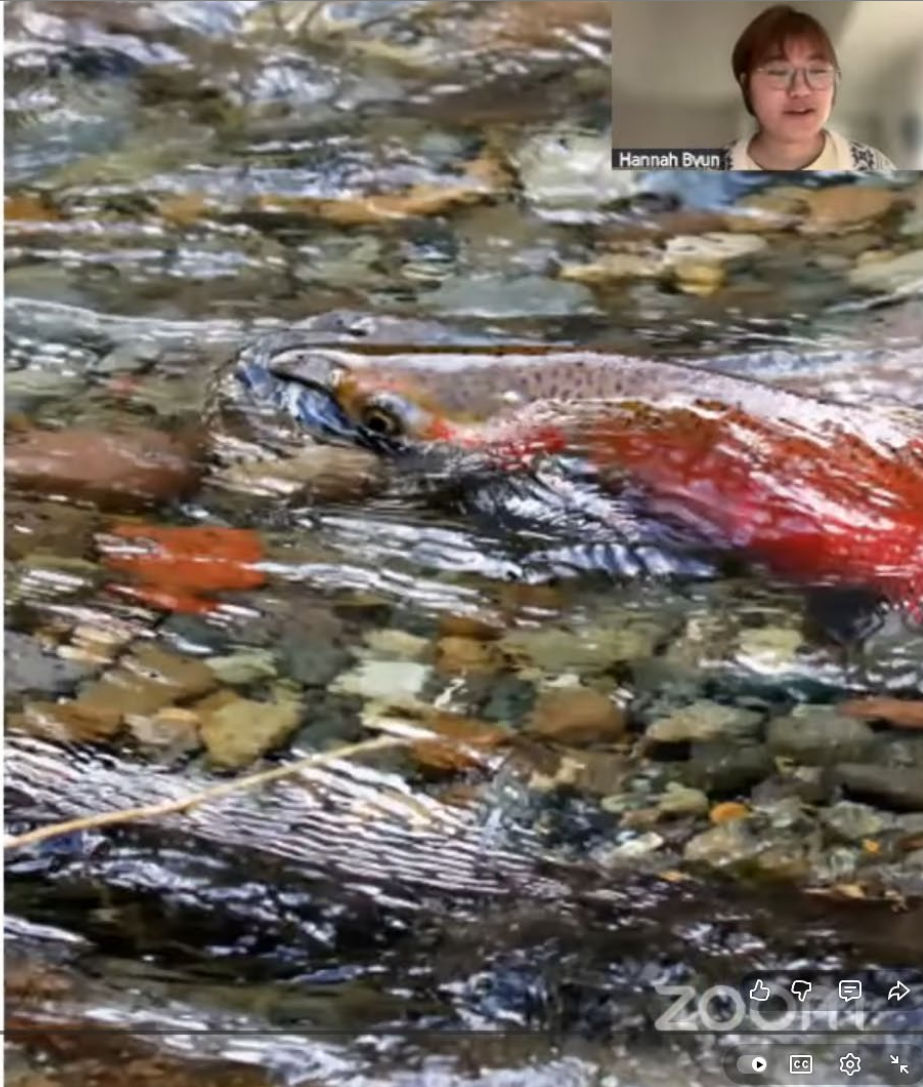
Hannah Byun

Dec 9th, 2025
University of Toronto, Peng Group



Yeah,

47:46 / 2:57:21



6

- Concentration in studied streams peaked in first 24-hours of wet weather and then reduces to near baseline
- Concentration generally correlated well with stream stage, especially in first 24 hours

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Time series 6PPD-Q concentrations in urban salmon streams

Mason D. King, PhD
Postdoctoral Research Fellow
Simon Fraser University

Tanya Brown (PI)
Simon Fraser University

Tim Rodgers, Rachel Scholes, Gopal Sharma, Simon Drew
University of British Columbia

Xiangjun Liao, Andrew Ross, Mackenzie Mueller
Fisheries and Oceans Canada

Agnes Richards, Felix Quillet
Environment and Climate Change Canada

SFU

Hi, thanks so much

56:12 / 2:57:21



- Non-urban runoff from coastal Hwy 1 can have high 6PPD-Q concentrations (>100 ng/L)
- Estuary lagoons may be a major exposure area





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Stormwater 6PPD-Q Monitoring in the Bar-Built Gualala River Estuary/Lagoon

Monitoring Partners:

Friends of Gualala River
(FoGR)

CA Urban Streams
Alliance (The Stream
Team)



The Stream Team.org
So, first, thanks to our team, Tim Marie Hamill, our partner from the Stream

zoom

1:06:58 / 2:57:21

- Washington DOE is identifying 6PPD-Q hotspots
- Passive sampling seems like a useful method

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Sentinels of Aquatic Recovery



Presenter: Rhea Smith

Uh, I'm the 6PPD Cradone Environmental Monitoring Lead at Washington Department of Ecology.

Photo: Clear Creek coho
(courtesy of Wild Fish Conservancy, 2021)



1:15:27 / 2:57:21

zoom

- Other chemicals in tires are also bad for aquatic life
 - HMMM; 1,3 DPG

Day 1: GPPD State of the Science Forum – Lightning Talks | Dec. 9, 2025



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Analytical Testing for 6-PPD quinone in Perth, Western Australia

Dr. Bob Symons

Regional Technical Manager
Eurofins Environment Testing Australia



www.eurofins.com

1:27:52 / 2:57:21

- Can batch process large volumes of samples
- Retrofit 3D printer for automatic mass spectrometer
- >100 samples/day
- Processed >6,600 samples so far from volunteer collectors
- Long dry periods (e.g. Jan 2025) lead to similar first flushes as first samples at end of summer



- Mobile mass spectrometer for real-time field testing
- Time and space both very important for concentrations
- Biggest peaks in streams are in first rain after dry period
- Tire particles keep leaching
- Biochar grabs 6PPD-Q quickly

Day 1: 6PPD State of the Science Forum – Lightning Talks | Dec. 9, 2025

Leveraging High-Throughput Real-Time Chemical Analysis for Fate and Distribution of 6PPDQ



6PPD State of the Science Forum
Dec 9, 2025

Angelina Jaeger, Haley Tomlin, Lily Eggert, Misha Zvekic,
Erika Sorensen, Niki Gholamiaval, Tess Weaver, Chris Gilt,

Erik T. Krogh
Centre for Health and Environmental Mass Spectrometry

I'm gonna, um...

VANCOUVER ISLAND UNIVERSITY

University of Victoria

I respectfully acknowledge the Coast Salish Peoples of the Snuneymuxw, Snaw-naw-as, Quw'utsun, K'ómoks and Hl'amin First Nations, on whose traditional territory we live, learn, and share knowledge

1:47:02 / 2:57:21

- 6PPD-Q is detectable in sediment near tire reefs, but not a major source

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URBAN WATERS

Kiersten Maxwell

DETECTING TIRE CHEMICALS IN PUGET SOUND TIRE REEFS

Kiersten Maxwell, University of Washington, kjmaxwel@uw.edu
Dr. Jeffrey Peralá-Dewey, University of Washington Tacoma,
Center for Urban Waters, Tacoma, WA

UNIVERSITY of WASHINGTON

Hi, I'm Kirsten, and I'm a graduate student at

Dr. Edward Kołodziej, University of Washington, University of Washington Tacoma, Center for Urban Waters, Tacoma, WA

2:07:56 / 2:57:21

ZOOM

- USGS national-scale 6PPD-Q heat map

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Stephanie Gordon

National-scale 6PPD-quinone Relative Heat Index and Map Tool

Stephanie Gordon, USGS, Eastern Ecological Science Center
Brianna Williams, USGS, NJ Water Science Center
Daniel Jones, USGS, UT Water Science Center

December 2025

Great. Um, yep, as she said, I'm Stephanie Gordon. I am with



- Lots of emerging work on possible human toxicity
- Much is from mammal models
 - Disruption of intestinal lining, increased: colorectal cancer, incidence of Parkinson's disease, polycystic ovary syndrome, fatty liver disease, anemia, increased death of mother and/or child during birth
- No reference dose of environmental exposure for humans



Day 1: 6PPD State of the Science Forum - Lightning Talks | Dec. 9, 2023

HUMAN TOXICITY AND EXPOSURE TO 6PPD AND 6PPD-QUINONE



Thank you, Tanya. Hold on. All right. Hello, everyone. My name is Mallory Little, and I'm a toxicologist at the Toxicologist

Environmental Public Health

- Substantial transfer of 6PPD-Q from road->basketball->hands when kids played in a cul-de-sac

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 | Environment


Andrew Patterson



Determining Potential Mass Transfer of 6PPD-quinone from a Suburban Roadway to Hands via Basketballs During Neighborhood Play

December 2025
Andrew Patterson

And I heard my kids argu

VP Innovation and Development, Eurofins Specialty Services



2:38:49 / 2:57:21

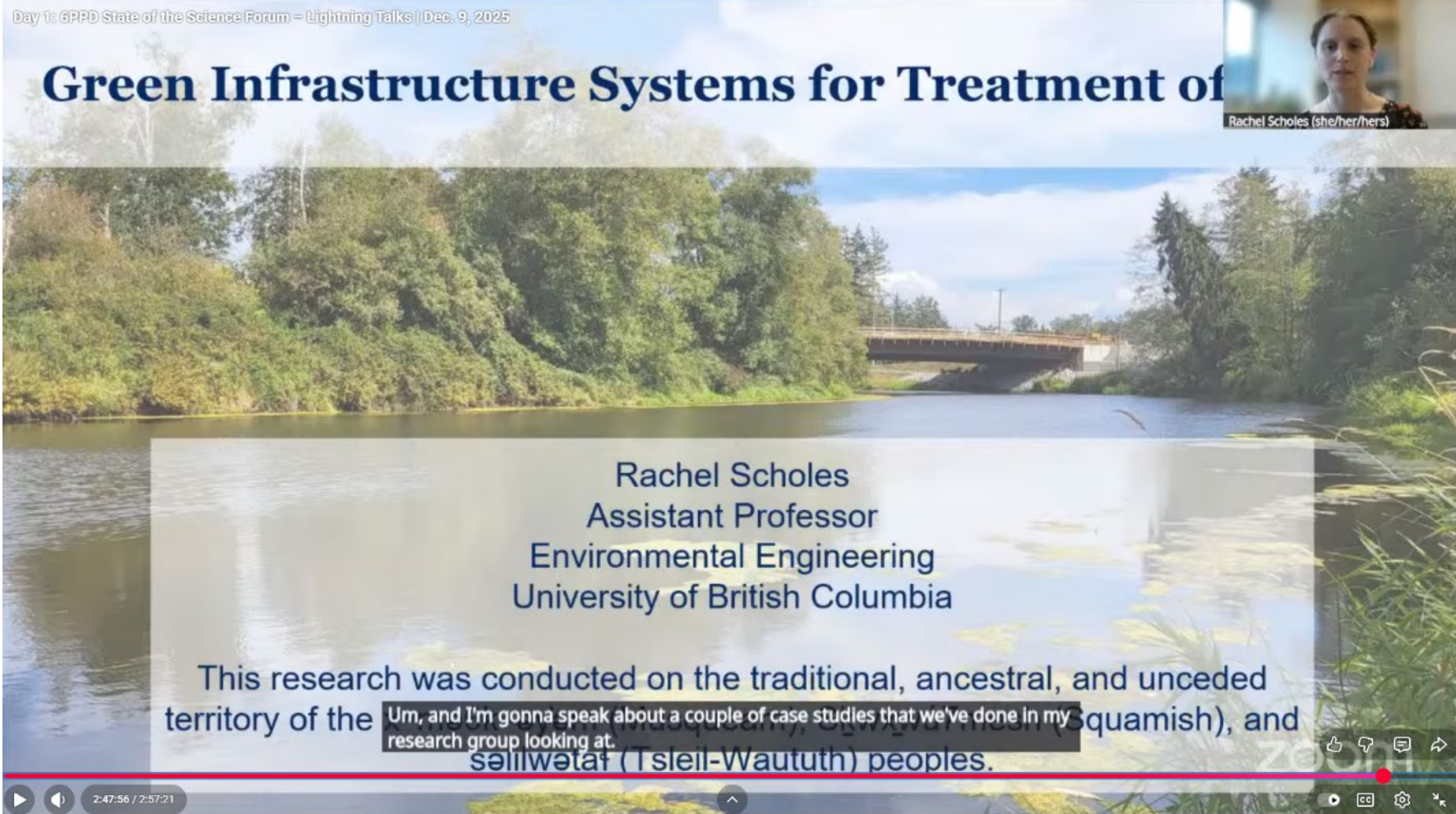
2:37:48



- Not much removal of 6PPD-Q in small horse-shaped stormwater ponds
- Filtration through bioretention generally good
- Biochar even better

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Green Infrastructure Systems for Treatment of



Rachel Scholes (she/her/hers)

Rachel Scholes
Assistant Professor
Environmental Engineering
University of British Columbia

This research was conducted on the traditional, ancestral, and unceded territory of the səlilwətał (Tseil-Waututh) peoples.

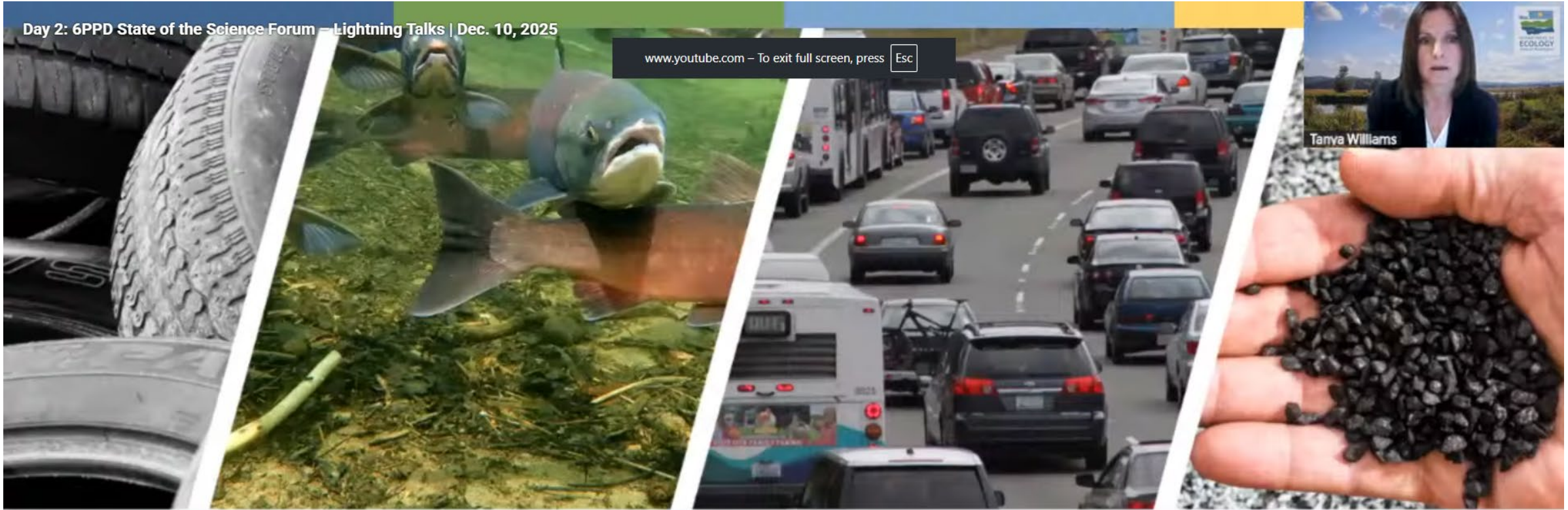
Um, and I'm gonna speak about a couple of case studies that we've done in my research group looking at.

2:47:56 / 2:57:21

www.youtube.com – To exit full screen, press Esc



Tanya Williams



6PPD State of the Science Forum

Dec. 10, 2025

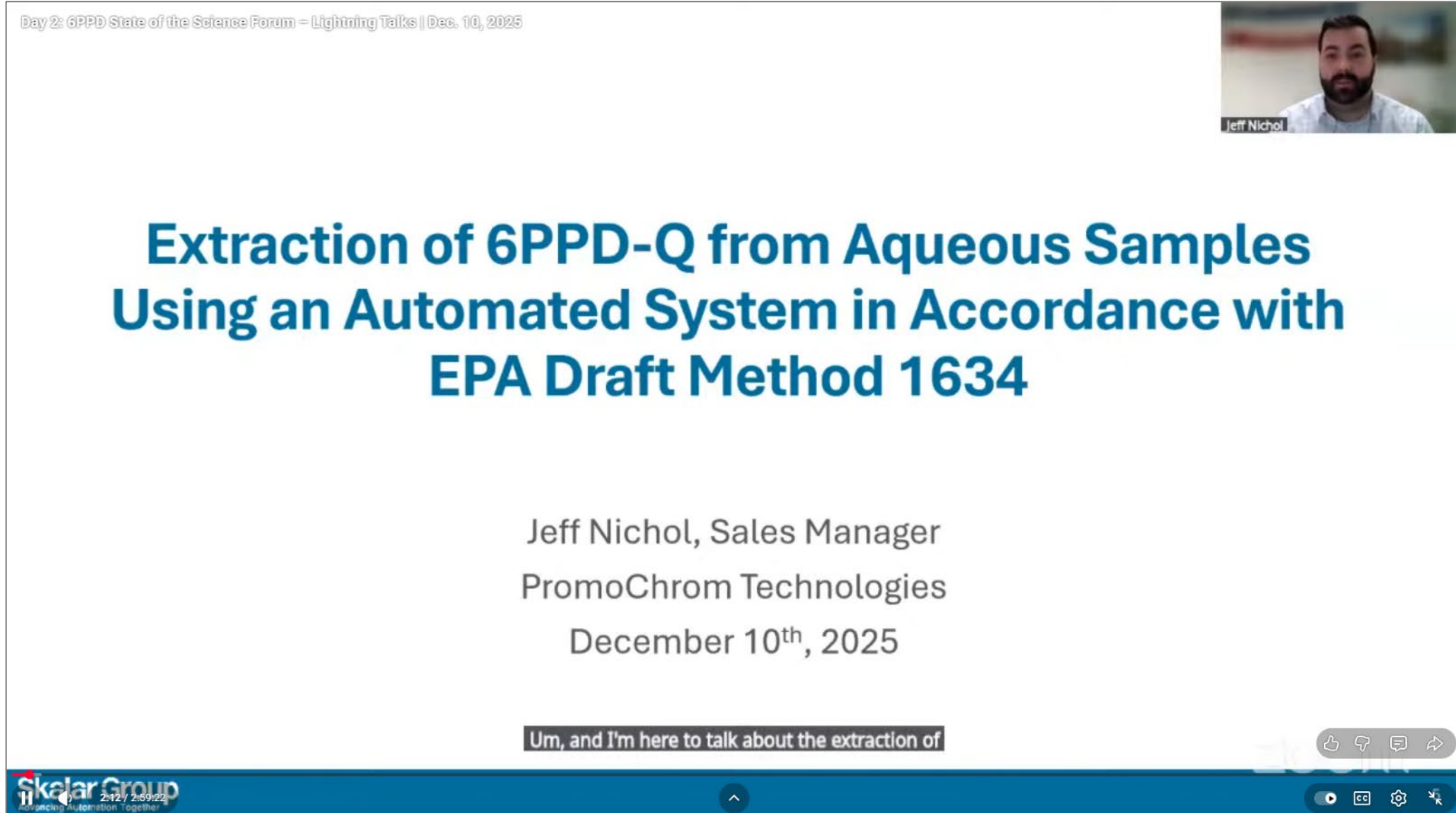
We are going to get started right away to support complet

1:39 / 2:59:22



- Manual extraction is difficult

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Jeff Nichol

Extraction of 6PPD-Q from Aqueous Samples Using an Automated System in Accordance with EPA Draft Method 1634

Jeff Nichol, Sales Manager
PromoChrom Technologies
December 10th, 2025

Um, and I'm here to talk about the extraction of

Skalar Group
2:12 / 2:39:22

19

- Extrapolated from LC50 tests
- In order not to “take” any coho, stream concentration must be <1 ng/L
- 11-12 ng/L water quality standards would lead to 2-3% mortality

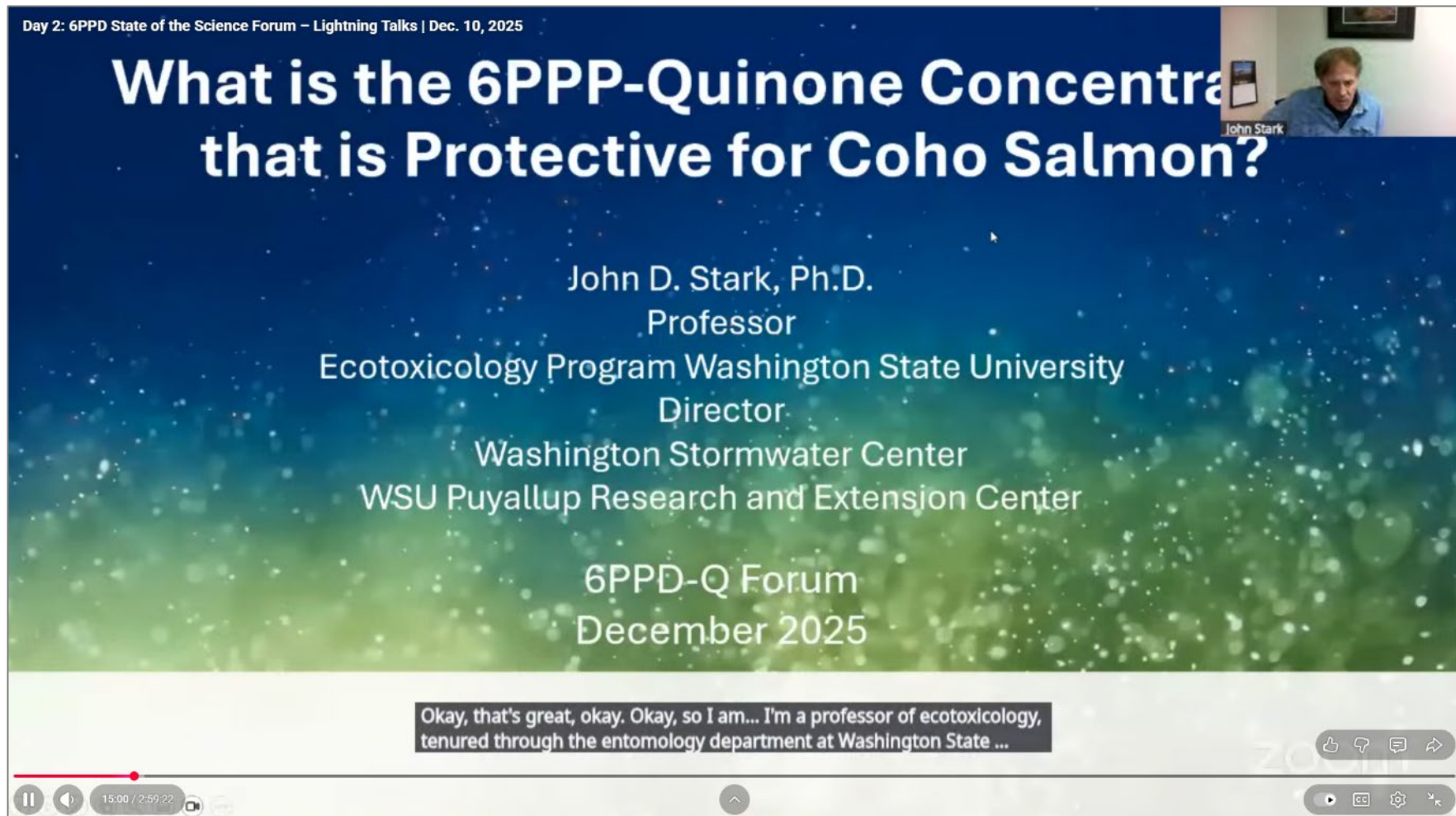
Day 2: 6PPD State of the Science Forum – Lightning Talks | Dec. 10, 2025

What is the 6PPD-Quinone Concentration that is Protective for Coho Salmon?

John D. Stark, Ph.D.
Professor
Ecotoxicology Program Washington State University
Director
Washington Stormwater Center
WSU Puyallup Research and Extension Center

6PPD-Q Forum
December 2025


Okay, that's great, okay. Okay, so I am... I'm a professor of ecotoxicology, tenured through the entomology department at Washington State ...

A video player interface showing a presentation slide. The slide has a blue and green background with white text. The title is "What is the 6PPD-Quinone Concentration that is Protective for Coho Salmon?". The speaker is identified as John D. Stark, Ph.D., Professor, Ecotoxicology Program Washington State University, Director, Washington Stormwater Center, and WSU Puyallup Research and Extension Center. The event is the 6PPD-Q Forum, December 2025. A video player control bar is at the bottom, showing a progress bar at 15:00 / 2:59:22, a play button, and other controls. A small video inset in the top right corner shows the speaker, John Stark, in a blue shirt.

- “High-performance bioremediation mix” works well for 6PPD-Q and doesn’t export other pollutants
- 70/20/10 mix of sand / coco coir / high-carbon wood ash with mulch on top

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Curtis Hinman



HPBSM Performance for Removing 6PPD-Q and Preventing Coho Salmon Mortality

Curtis Hinman and Associates

I want to start off just by mentioning the
King County

DEPARTMENT OF
ECOLOGY
WASHINGTON

6PPD-Q FORUM, DECEMBER 2025

25:21 / 2:59:22

- Bioremediation mixes removed 6PPD-Q well without vegetation

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Non-Vegetated Bioretention Soil Media Study

12/10/2025

Aimee Navickis-Brasch, PhD, PE
Project Manager & Principal Investigator



36:02 / 2:59:22



- Floating treatment wetlands can reduce 6PPD-Q

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Floating Treatment Wetland / Biomechanical Modules Reduce Contaminants in Stormwater

Lizbeth Seebacher, PhD, PWS
Senior Research Scientist
University of Washington

6PPD State of the Science Forum
December 9 & 10, 2025


There are a lot of constraint

46:49 / 2:59:22

zoom

- WSDOT has a stormwater retrofit prioritization map
- Working on retrofits with bioretention and Box of Rain

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Tatiana Dreisbach

6PPD State of the Science Forum

WSDOT Stormwater & 6PPDQ Mitigation Efforts

Tony Bush, Stormwater Branch Manager
Tatiana Dreisbach, Stormwater Retrofit Outreach & Innovation Lead
December 10, 2025

And we're at the



56:47 / 2:59:22

- Porous pavement may reduce 6PPD-Q

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Porous pavement as a cost-effective and saving way to reduce 6PPD-Q loads




Katie Holzer, PhD
Senior Environmental Scientist
City of Gresham, Oregon

Vegetated storm

1:06:21 / 2:59:22

- CCPD a possible safer alternative

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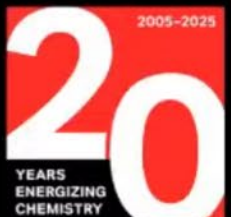


CCPD: A Promising Safer Alternative to 6PPD
A Comparative Aquatic Toxicity and Environmental Fate Assessment

Audrey Batoon PhD
6PPD State of the Science Forum, 10 December 2025

Carson, D.S., Remuzat, P., Essers, M., Wiedemeier-Jarad, M., Batoon, A.

Hello, everybody. My



- Graphene a possible alternative

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Graphene in Tire Formulations:
Reduce or Eliminate 6PPD
Troy Tack, EVP, Faradyne Power



6PPD State of the Science Forum
10 December 2025

I represent Faradyne Power, and basically. Uh, we

Troy Tack

1:28:19 / 2:59:22

27

- Proprietary non-PPD compound a possible alternative

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FLEXSYS

6PPD Replacement Update WA DOE State of the Science

Neil Smith
Dec 10, 2025


We have a great group of chemists and technicians there. We've been working for the last 5 years or so on finding a replacement for 6PD.

1:36:58 / 2:59:22

zoom

- Trout Unlimited is engaged with 6PPD-Q
- Working with schools and passive samplers

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Broadening Partnerships to Track 6PPDQ

Alix Lee-Tigner
Lake Sammamish UWRP Manager,
Trout Unlimited

Um, research and science presentations in the last, um, hour, and now I'm going to talk to you about

Every River Needs A Champion



1:45:57 / 2:59:22

Alix Lee-Tigner

Video player controls: play, volume, full screen, settings, share

- Safer Products for Washington Program working on assessing alternatives
- Recommendations expected at the end of 2026

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6PPD Regulation under the Safer Products for Washington Program
Craig Manahan, Dec. 2025

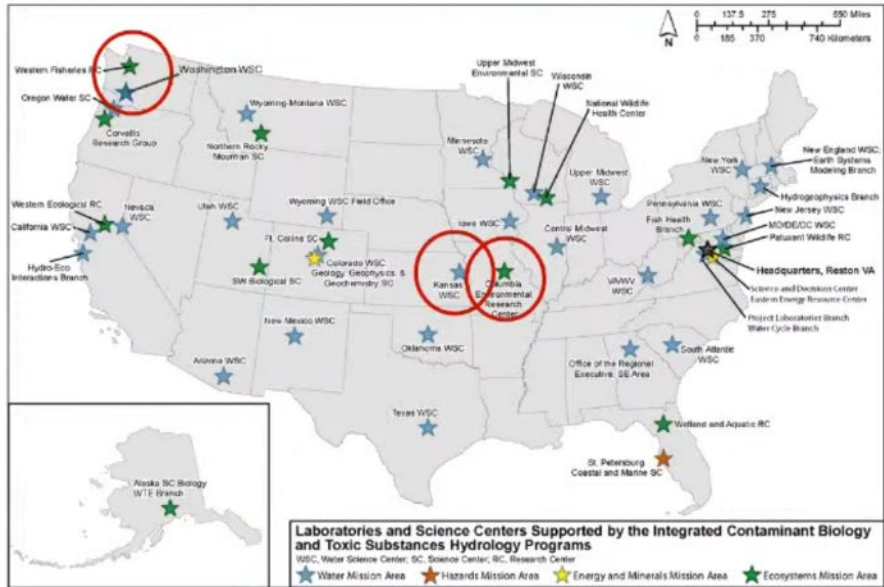
I'm Craig Manahan, I'm a chemist at the Washington State Department of Ec

1:56:22 / 2:59:22

- Use glass bottles for collection
- New fish tissue method
- USGS has a fish toxicity testing center

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Overview of 6PPDQ Research Within the USGS



Analytical Methods
Fate and Transport
Biological Effects
6PPD Alternatives

Justin Greer
 Computational Biologist
 Western Fisheries Research Center
 jgreer@usgs.gov


Here's a map of just some of the USGS centers

USGS
 science for a changing world

2:06:41 / 2:59:22

- Bill proposed in 2026 Washington legislative session
- Long-term: Ban the sale of 6PPD-tires
- Short-term: Fee on 6PPD-tires

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6PPD-Free Tire Bill



Protecting Salmon and Trout from Tire Wear Toxins

Andrew M. Kenefick
Chair, Advocacy Committee
Washington Council of Trout Unlimited

Washington Department of Ecology
6PPD State of the Science Conference
Dec. 10, 2025

Chair of the

Every River Needs A Champion



2:17:30 / 2:59:22

- 6PPD never evaluated under Toxic Substances Control Act (TSCA)
- TSCA may be an avenue for 6PPD-Q regulation
- Creates systemic vascular barrier disruption

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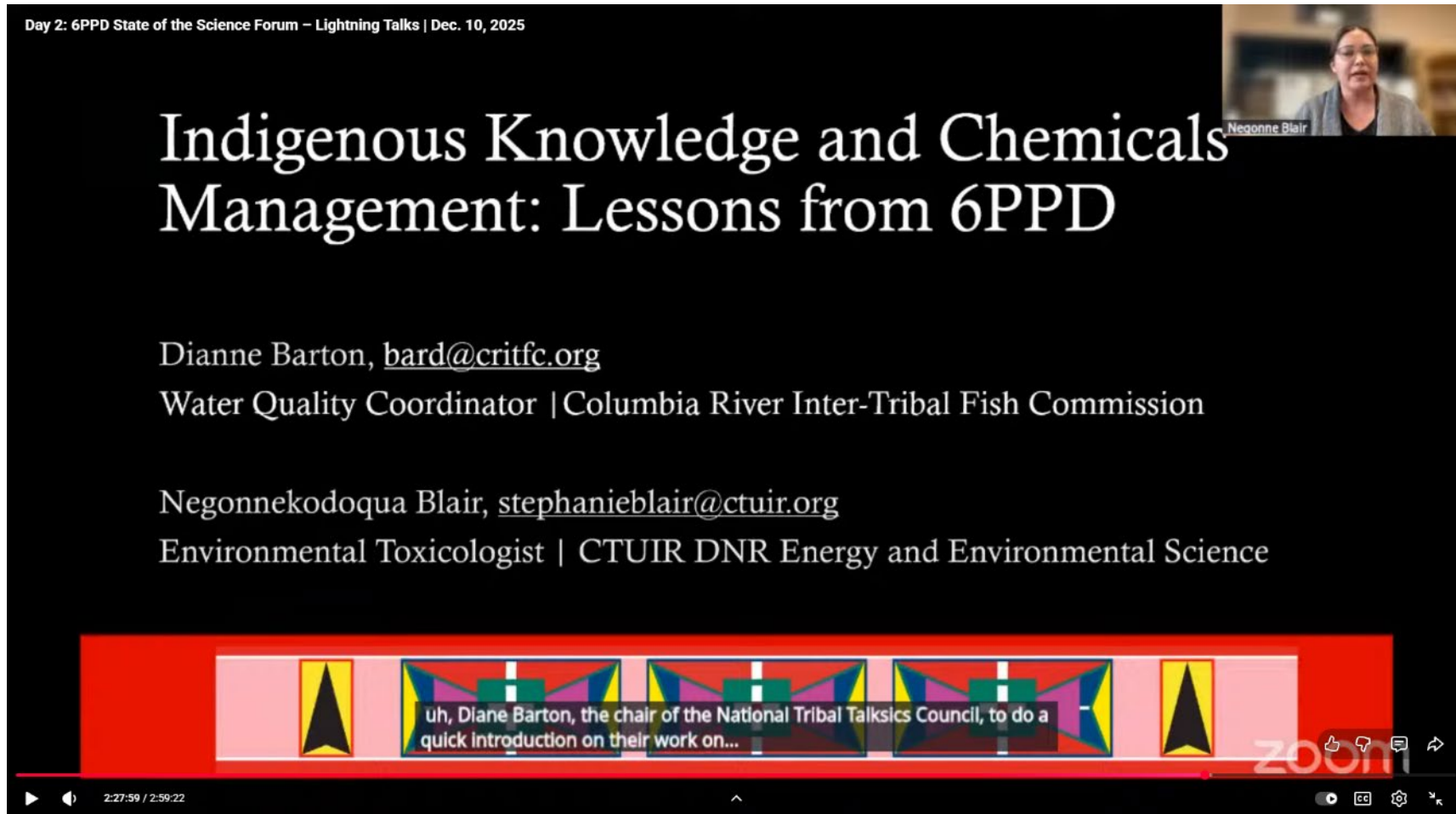
Indigenous Knowledge and Chemicals Management: Lessons from 6PPD

Dianne Barton, bard@critfc.org
Water Quality Coordinator | Columbia River Inter-Tribal Fish Commission

Negonnekodoqua Blair, stephanieblair@ctuir.org
Environmental Toxicologist | CTUIR DNR Energy and Environmental Science

uh, Diane Barton, the chair of the National Tribal Talksics Council, to do a quick introduction on their work on...

2:27:59 / 2:59:22



- University of Washington made research priorities
 - Sub-lethal impacts
 - Additional produce sources
 - Safe alternatives
 - Toxicity in various species
 - Effectiveness of stormwater control measures



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Sandra Domingo

A Co-Developed 6PPD/6PPD-Q Research Agenda for Puget Sound

University of Washington Puget Sound Institute:
Sandra L. Dorning, C. Andrew James, Marielle Kanojia
Contact: sdorning@uw.edu

6PPD State of the Science Forum, 12/10/2025

UNIVERSITY of WASHINGTON


PUGET SOUND INSTITUTE

Thanks so much for having me today. My name is Sandra Dorning, and I

- WA DOE Product Study Unit assessing alternatives of crumb rubber for turn field fill
 - Some possibilities: cork, engineered wood particles infill, crushed olive pits
 - Paint colors in rubber coating may contain tire chemicals

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Assessing Toxic Chemicals in Stormwater Runoff from Artificial Turf Fields and in Artificial Turf Components



6PPD State of the Science Forum
December 10, 2025

Amy Salamone
Product Studies Unit, Environmental Assessment Program

DEPARTMENT OF
ECOLOGY
State of Washington

And In

2:48:47 / 2:59:22

Amy Salamone

Links to recordings

- Day 1: <https://www.youtube.com/watch?v=dllSn6EHq3I>
- Day 2: <https://www.youtube.com/watch?v=pVLjnAcDce0>

