Thurston County Storm & Surface Water Advisory Board

WASHINGTON STORMWATER CENTER

ASSISTANCE • RESEARCH • TRAINING

WHERE RESEARCH MEETS APPLIED STORMWATER NEEDS

WASHINGTON STORMWATER CENTER

UW TACOMA

WASHINGTON STATE UNIVERSITY

Neutral Convenors

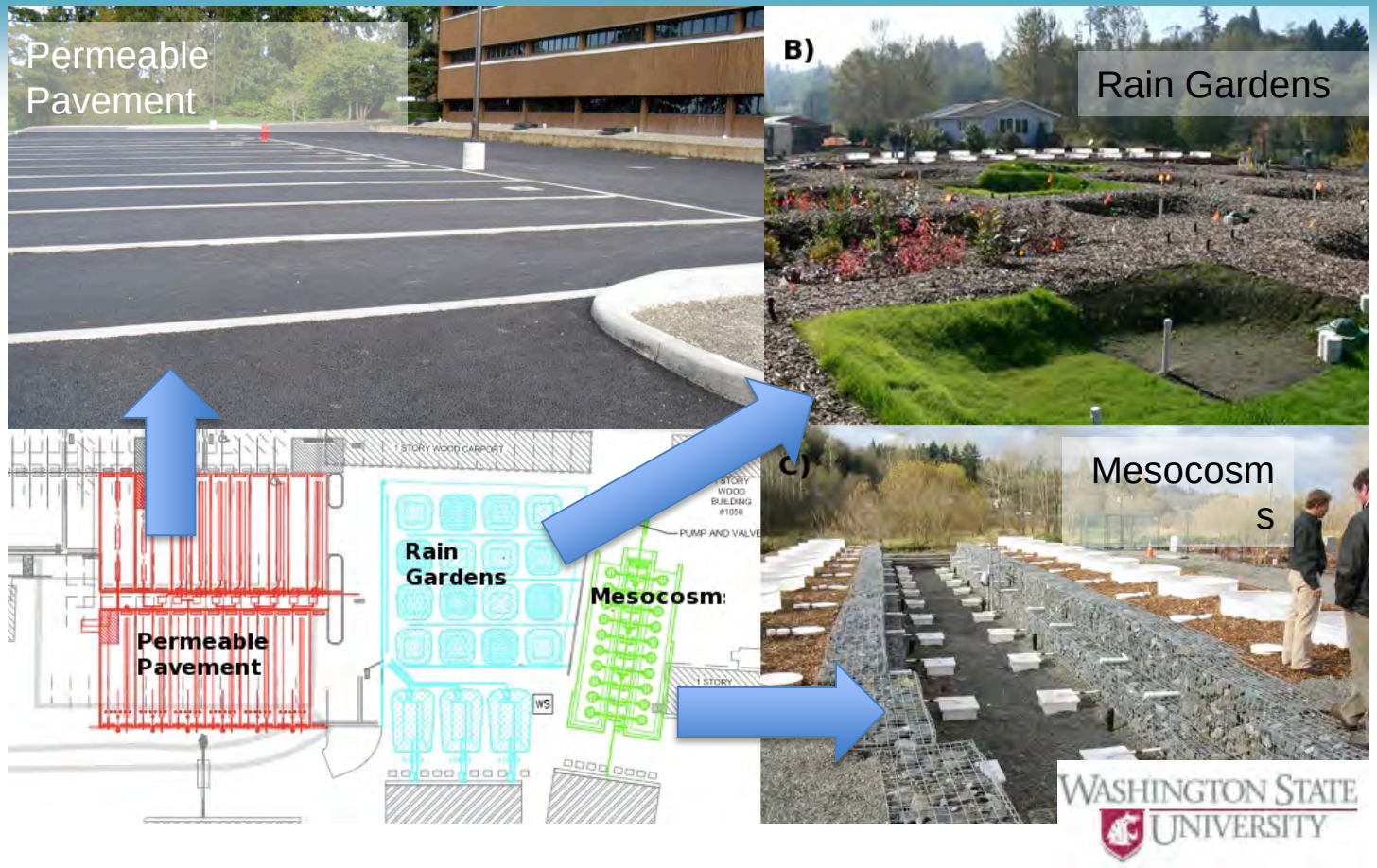
Washington Stormwater Center

Building capacity to manage stormwater by Washington NPDES permittees and stormwater managers by providing evidence-based information, training, permit assistance, research, emerging technologies and effective partnering approaches

- www.wastormwatercenter.org
- 1-855-WASTORM

2008 – WSU-P receives $1 million to build large-scale LID research and education program

Washington State University: Puyallup GSI Facility



WASHINGTON STORMWATER CENTER

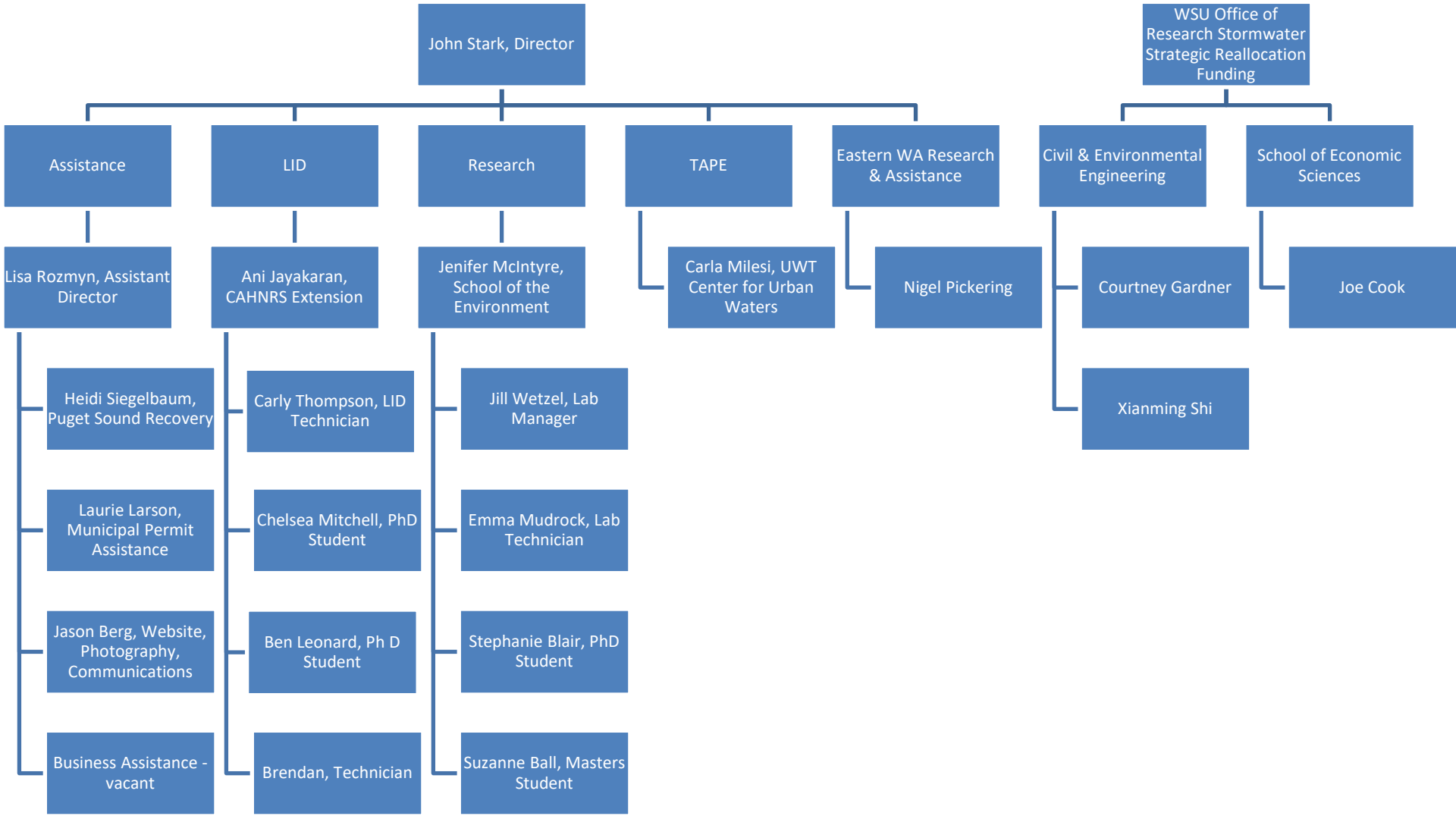
2015 - WSU-P receives $800,000 to build

the Aquatic Toxicology Laboratory

An expansion of the original salmon toxicology lab

The Washington Stormwater Center was created through a state legislative mandate (R.C.W. 90.48.545) for a stormwater technical and educational resource center for all stormwater permit holders in the state

A joint center between UW-Tacoma and WSU-Puyallup developed in 2010


John Stark, Director
WSU Office of Research Stormwater Strategic Reallocation Funding
Assistance
LID
Research
TAPE
Eastern WA Research & Assistance
Civil & Environmental Engineering
School of Economic Sciences
Lisa Rozmyn, Assistant Director
Ani Jayakaran, CAHNRS Extension
Jenifer McIntyre, School of the Environment
Carla Milesi, UWT Center for Urban Waters
Nigel Pickering
Courtney Gardner
Joe Cook
Xianming Shi
Heidi Siegelbaum, Puget Sound Recovery
Laurie Larson, Municipal Permit Assistance
Jason Berg, Website, Photography, Communications
Business Assistance - vacant
Carly Thompson, LID Technician
Chelsea Mitchell, PhD Student
Ben Leonard, Ph D Student
Brendan, Technician
Jill Wetzel, Lab Manager
Emma Mudrock, Lab Technician
Stephanie Blair, PhD Student
Suzanne Ball, Masters Student

PROGRAM PROFILES

- Research
- Consulting with stakeholders
- Technical Advice
- Teaming and communication approaches
- Complex Partnerships
- Providing evidence-based findings for policy makers and communities

Emerging Technologies (TAPE)

- Fostering the development and use of new technologies

Technology Assessment

- Vets stormwater treatment technologies
- Helps regulatory agencies establish goals and criteria that are achievable
- Works with manufacturer and user communities of practice
- Helps Enables permittees to make good investments using evidence
- Provides “more tools in the toolbox”

Research focuses on why stormwater is toxic and solutions for mitigation

50% OF 2020-21 STUDIES FOCUS ON SOLUTIONS

Research Focus Areas

- Contaminant Science-Ecotoxicology
- LID and Green Stormwater Infrastructure
- Microbial Communities and pollutant breakdown
- Soils
- Water Resources

Urban stormwater runoff affects juvenile coho

Aquatic Toxicology 214 (2019) 105231

Contents lists available at ScienceDirect

Aquatic Toxicology

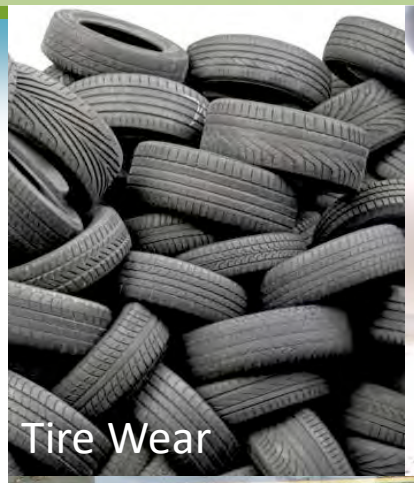
journal homepage: www.elsevier.com/locate/aqtox

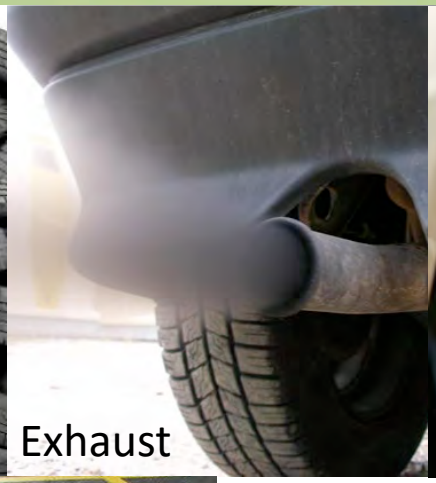
An urban stormwater runoff mortality syndrome in juvenile coho salmon

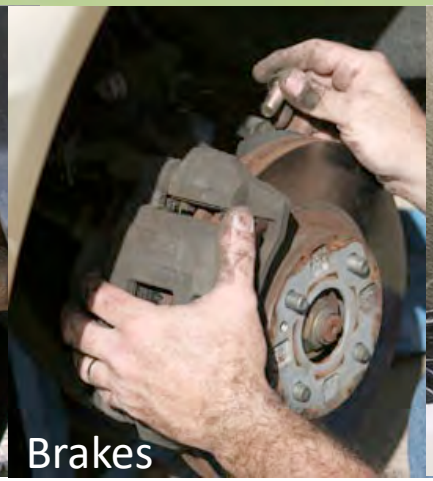
Michelle I. Chow[a], Jessica I. Lundin[b], Chelsea J. Mitchell[c], Jay W. Davis[d], Graham Young[a], Nathaniel L. Scholz[e], Jenifer K. McIntyre[c,*]

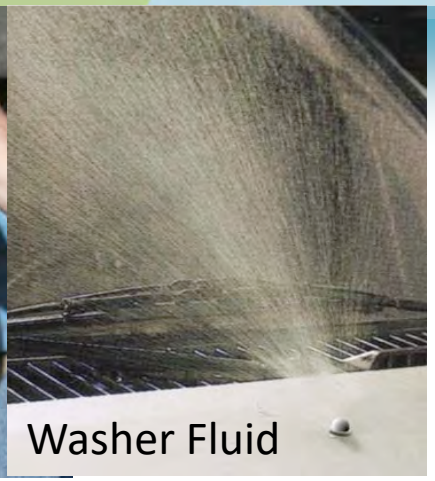
[a] University of Washington, School of Aquatic and Fisheries Sciences, 1122 Boat St., Seattle, WA 98105, USA
[b] National Research Council Research Associateship Program, Under contract to Northwest Fisheries Science Center, National Marine Fisheries Service, NOAA, 27 Montlake Blvd. E., Seattle, WA 98112, USA
[c] Washington State University, Puyallup Research and Extension Center, 2606 W. Pioneer Ave., Puyallup, WA 98371, USA
[d] U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office, 510 Desmond Dr. S.E., Lacey, WA 98503, USA
[e] Environmental and Fisheries Science Division, Northwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administr 2725 Montlake Blvd. E., Seattle, WA 98112, USA

Vehicle Sources of Pollutants to Road Runoff









<u>Automobile Leaks:</u>

- Fuel
- Engine Oil
- Brake Fluid
- Engine Coolant
- Transmission Fluid

Roofing materials leach metals

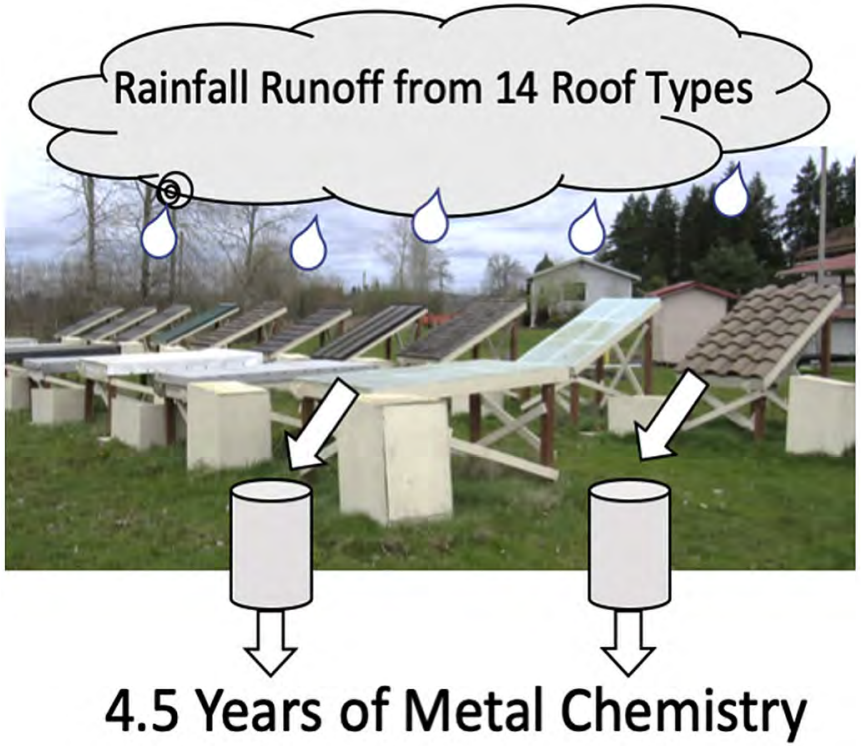
ELSEVIER
Environmental Pollution **2019**
journal homepage: www.elsevier.com/locate/envpol

Metals leaching from common residential and commercial roofing materials across four years of weathering and implications for environmental loading☆

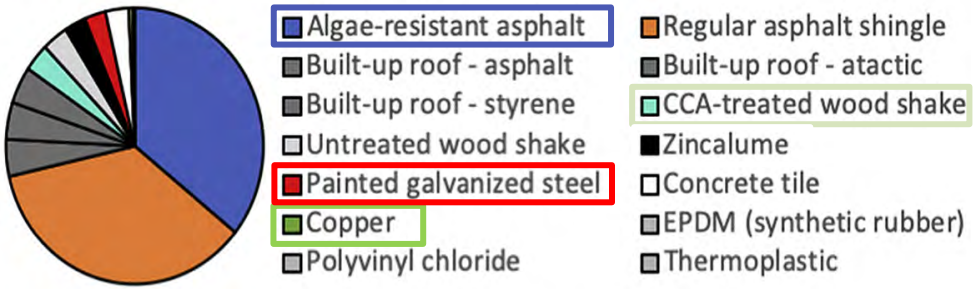
J.K. McIntyre*, N. Winters, L. Rozmyn, T. Haskins, J.D. Stark
Washington State University, Washington Stormwater Center, Puyallup Research & Extension Center, 2606 W. Pioneer Ave, Puyallup, WA 98371, USA

Material age = strongest predictor of metal concentration in runoff for most materials

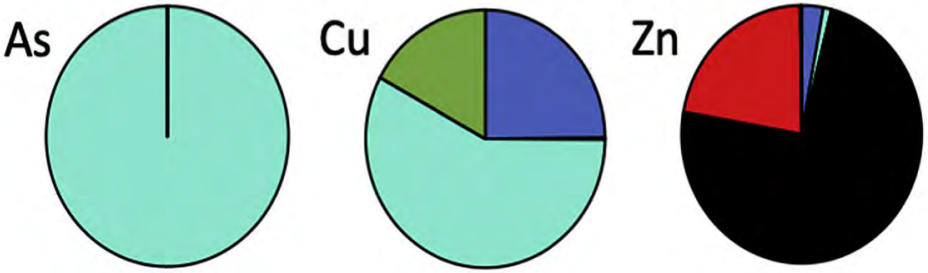
10-year extrapolation predicted 8 materials would still leach metals



Puget Sound (PS) Roof Area



Metal in Runoff from PS Roofs



Fungi and plants in bioretention

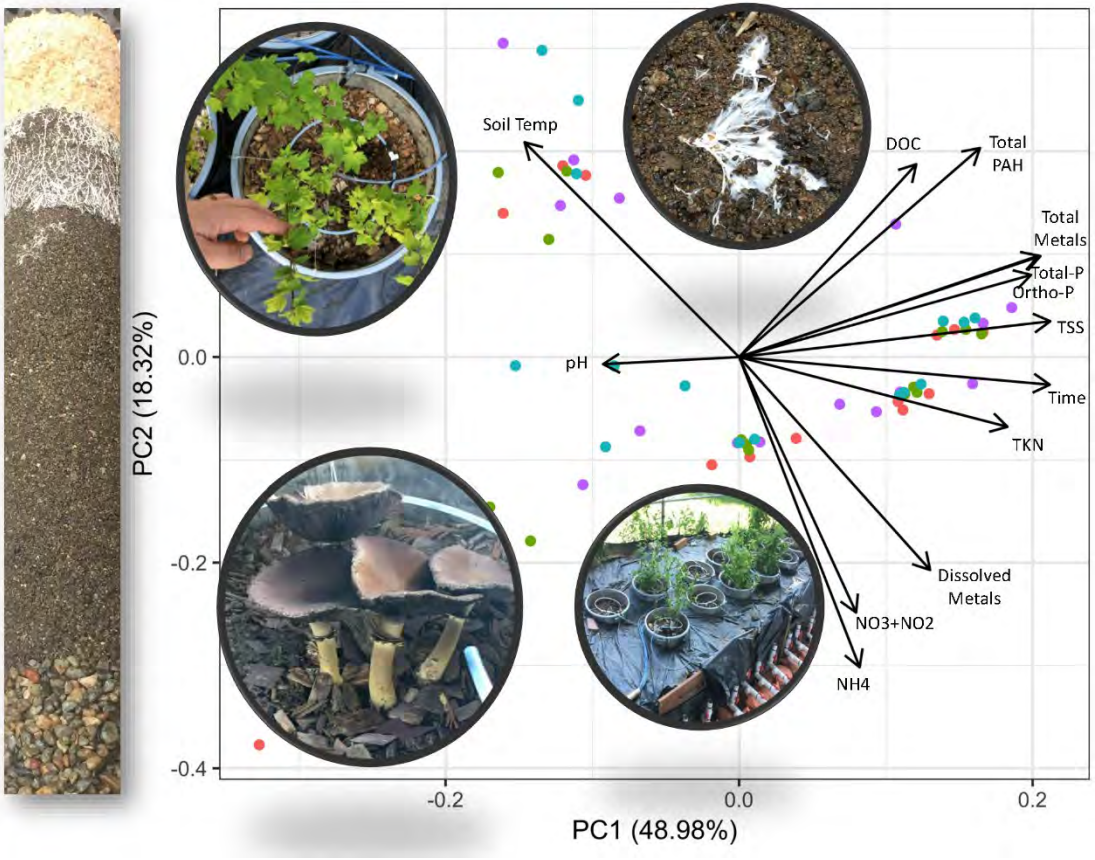
water

MDPI

Article

Engineering Analysis of Plant and Fungal Contributions to Bioretention Performance

Alex Taylor [1,2], Jill Wetzel [3], Emma Mudrock [3], Kennith King [4], James Cameron [5], Jay Davis [4] and Jenifer McIntyre [3,*]



Net export of nutrients

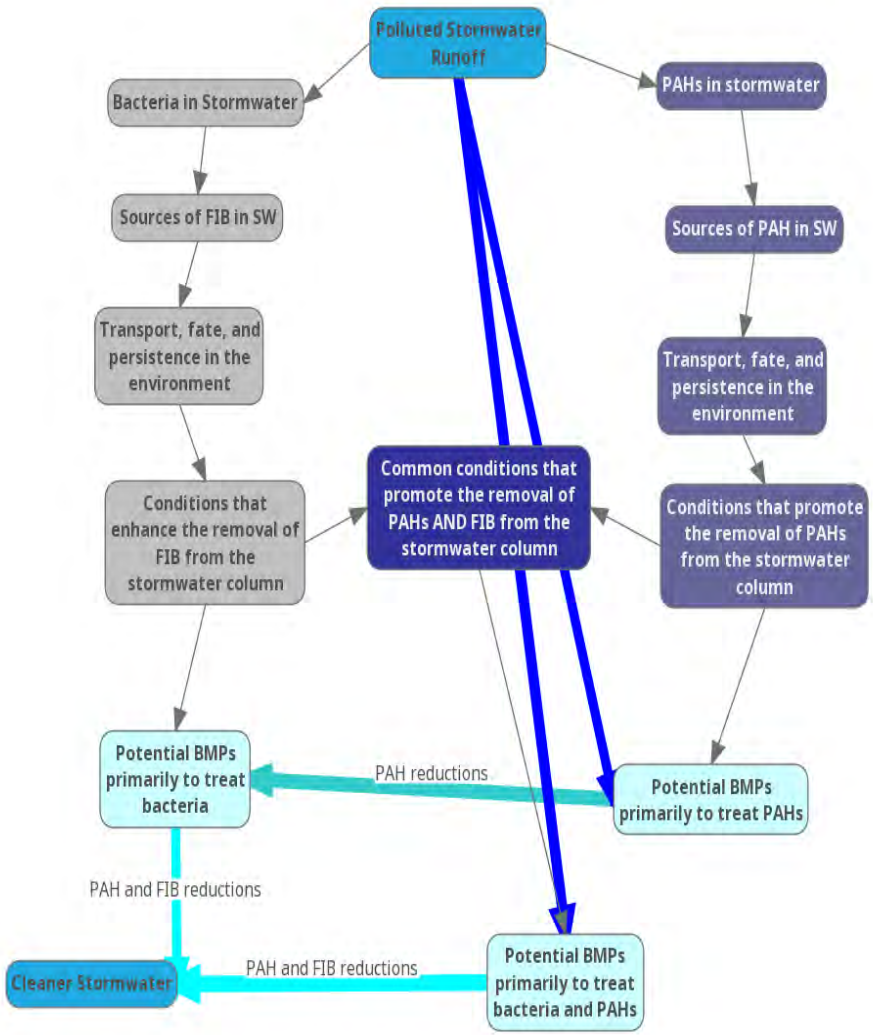
Amendments

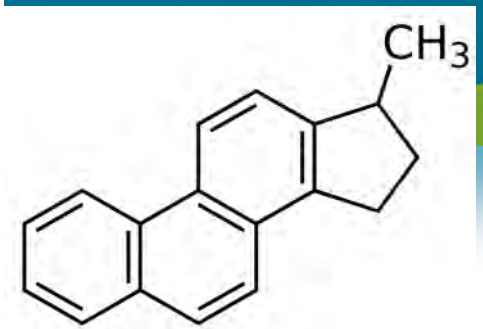
- Less P export with fungi
- No observed benefit of plants
- Inconsistent removal of toxicity

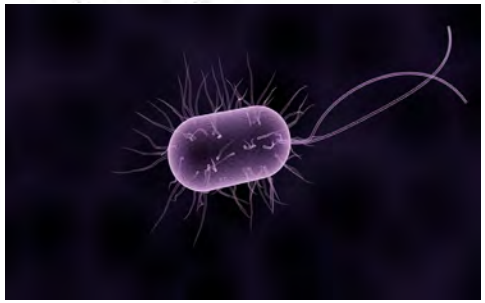
Attribute

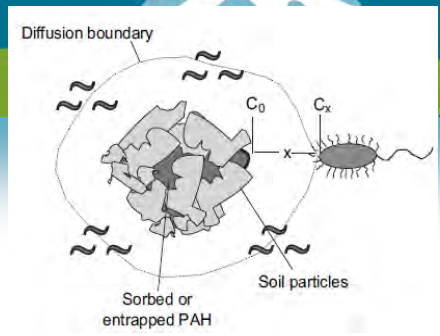
- Soil
- Plants
- Fungus
- Plant.Fungus

PAH & Bacteria Removal









Objective

1. Water quality remediation

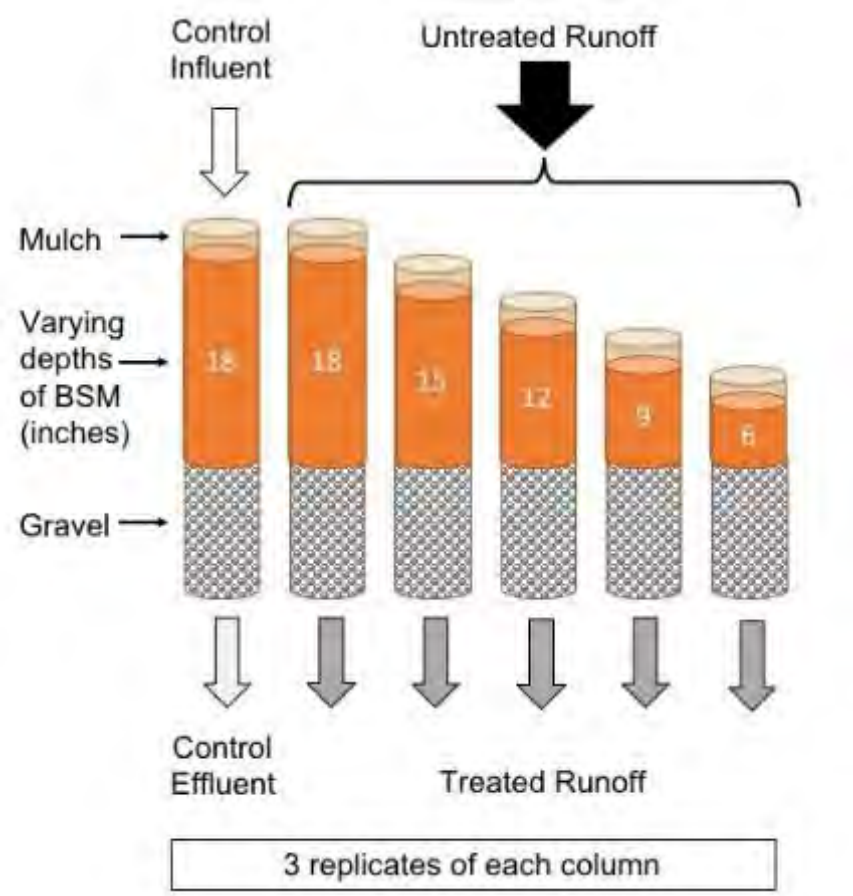
Bacteria and PAHs in Stormwater

Dept. of Ecology

WSU SOE
Chelsea Mitchell
PhD Student

WASHINGTON STORMWATER CENTER

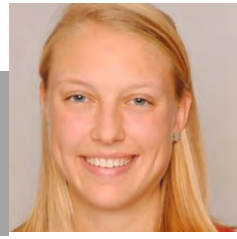
Depths of bioretention and longevity of treatment



Research questions:

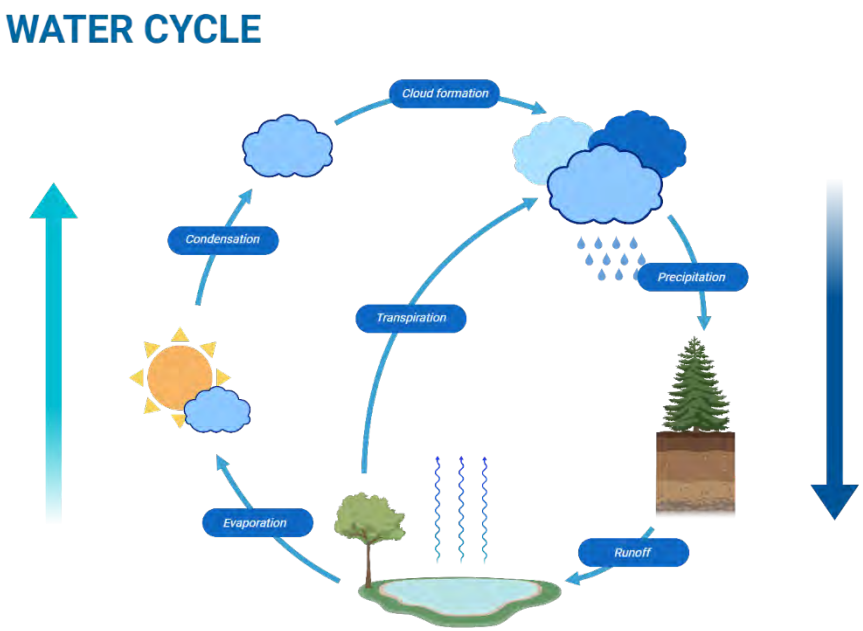
Stormwater Action Monitoring

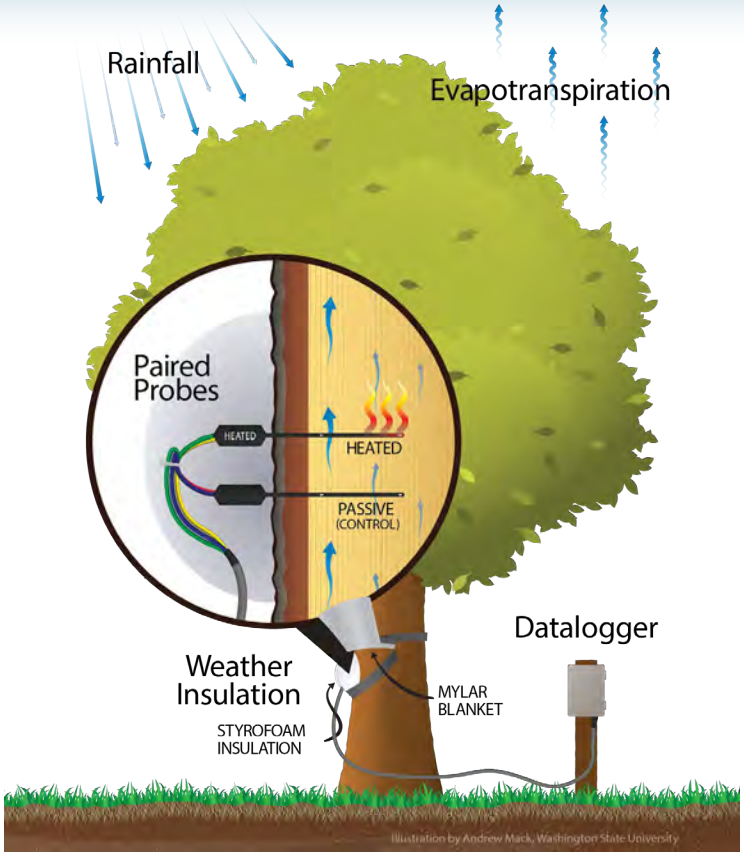
WSU SOE
Lane Maguire
M.S. Student



Urban trees and stormwater management

How much stormwater do





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SAM Stormwater Action Monitoring

WSU SOE Ben Leonard
PhD Student

Mulch Project

1. Bark mulch (fir)
2. Shredded bark mulch (cedar)
3. Arborist chips

Objectives

1. Water quality remediation by mulch choice
2. Weeding effort and mulch choice

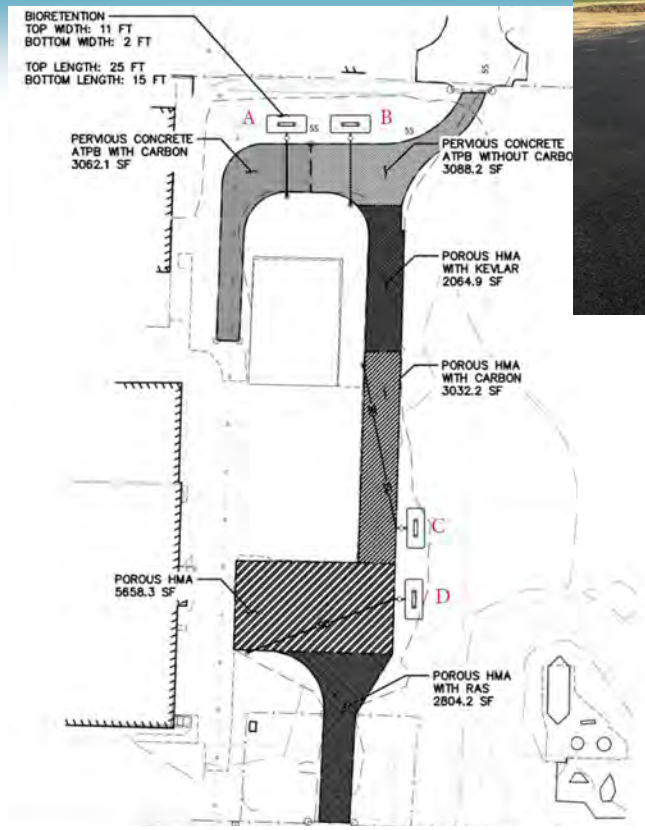
Bioretention and Mulch

Stormwater Action Monitoring Program

WASHINGTON STORMWATER CENTER

SAM Stormwater Action Monitoring

IDEA School Project



Objective

1. Water quality remediation

IDEA School – Carbon fiber reinforced permeable pavements

Boeing

LID Certificates- On-Line

WASHINGTON STORMWATER CENTER

LID Training Certificate

New Online Only LID Certificate Program is live!

We are pleased to be offering a new Online Low Impact Development (LID) Certificate Program! The training program has transitioned to an online only system. The online, self-paced courses include the theoretical basis for designing and maintaining LID systems. Registration links for those course spaces can be found below.

As always, thank you for your continued support! Feel free to email us with your ideas on how to move forward.

The LID Research & Education Team
Washington Stormwater Center | WSU Extension

Municipal Resource Program

Permit assistance for municipalities throughout Washington.

Issuance Date: August 1, 2012
Effective Date: September 1, 2012
Expiration Date: July 31, 2014

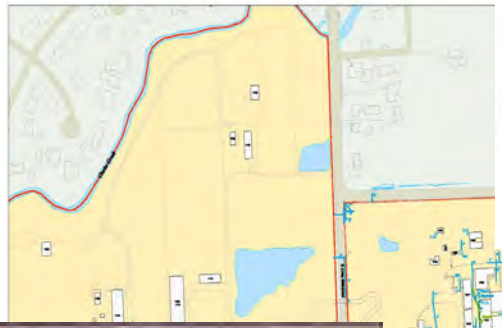
Eastern Washington Phase II Municipal Stormwater Permit

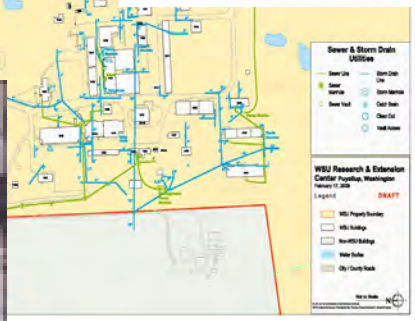
National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Discharges from Small Municipal Separate Storm Sewers in Eastern Washington

State of Washington
Department of Ecology
Olympia, Washington 98504-7600

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1251 et se

Until this permit expires, is modified, or revoked, Permittee tha
coverage under this permit are authorized to discharge to waters of
the special and general conditions which f





CITY OF PUYALLUP
ONLY RAIN DOWN THE DRAIN
Puget Sound Starts Here

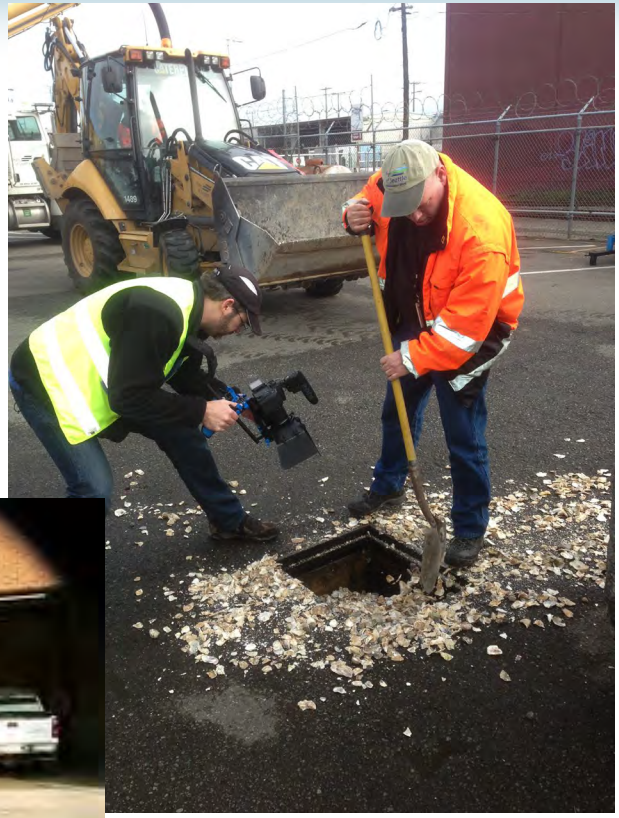
Municipal Program Services

Services Provided:

- Co-coordinate 4 Regional Municipal Stormwater Groups
  - ROAD Map, Business Inspection Group (BIG), South Sound & Central Ph. II groups
- Prepare/Submit proposals for project funding
  - Source Control guidance manual/inspector training: Olympia, Redmond, Tacoma,& King County
  - Education and Outreach Behavior Change guidance
- Respond to specific permittee requests for assistance (new /existing)
- Host municipal resources on WSC Municipal webpage
  - Permit compliance tables – Olympia, Thurston County, Gig Harbor, & Newcastle
  - Training and workshop materials and videos on website

Permit Assistance Program

- Helping Businesses with their Stormwater Permitting and Management Needs



Industrial/Business Services

Current Projects:

- Collaborating with ECOSS to provide small businesses the basics of the Industrial Stormwater Permit
- Providing an easy to understand "Steps to Compliance" format on our new website
- Hoping to expand program to include Construction General Permit assistance in the next biennium

Puget Sound Stormwater Strategy

Strategic Investments in stormwater in Puget Sound via:

- Strategies for Toxics in Fish/SRKW and BIBI
- Integrated social, economic and communication approaches
- Strategic funding decisions in research, outreach, technical and social approaches

https://pugetsoundestuary.wa.gov/

ROADSIDE DITCH MAINTENANCE IN WESTERN WASHINGTON

FIELD GUIDE

February 7, 2019

Intersecting and Supporting Roles

An important component of our work provides offramps for science, context for research and applied best practices in teaming and communication.

Building trust is at the core of this work.

SCIENCE COMMUNICATION

WEB SERVICES

LINKING WSU WITH WSU EXTENSION, UWT AND PULLMAN PRACTITIONERS

EXPERTISE IN TEAMING, PARTNERSHIPS, SOCIAL APPROACHES

LINKING WSU WORK WITH BROADER PUGET SOUND WORK

Funding Partners

BOEING

THE RUSSELL FAMILY FOUNDATION

BULLITT FOUNDATION

DEPARTMENT OF ECOLOGY
State of Washington

ALICE C. TYLER
PERPETUAL TRUST

Partnerships and Collaborations- Federal

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

Northwest Indian Fisheries Commission

THE SUQUAMISH TRIBE

Puyallup Tribe
Generous & Welcoming to ALL People

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE
NATIONAL MARINE FISHERIES SERVICE

Partnerships and Collaboration- NGOs

Stewardship Partners

Puyallup Watershed Initiative

ECOSS

PUYALLUPRIVER WATERSHED COUNCIL

Pierce Conservation District

Partnerships and Collaborations- State

DEPARTMENT OF ECOLOGY
State of Washington

SAM
Stormwater Action Monitoring

WASHINGTON STATE DEPARTMENT OF
Natural Resources

UNIVERSITY of WASHINGTON
TACOMA

Partnerships and Collaborations- Cities/Counties

City of OLYMPIA

City of Redmond WASHINGTON

City of Puyallup State of Washington

Tacoma

City of Spokane

Pierce County

King County

Washington Stormwater Center

Dora the Explorer- Monitoring

Toxics Monitoring in Puget Sound

WDFW's Toxics Biological Observation System (TBiOS)

https://wdfw.wa.gov/species-habitats/science/marine-toxics/tbios

Ecology's Stormwater Action Monitoring Program

https://ecology.wa.gov/Regulations-Permits/Reporting-requirements/Stormwater-monitoring/Stormwater-Action-Monitoring

Ecology's Marine Sediment Program

https://ecology.wa.gov/Water-Shorelines/Puget-Sound/Sound-science/Marine-sediments

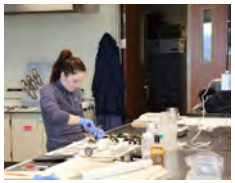
EIM Marine Sediment Monitoring Data

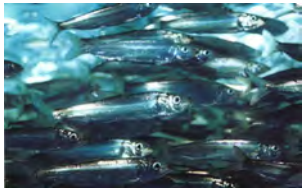
- Long term monitoring of indicator species

Tracking Puget Sound Ecosystem Health

WDFW's toxics monitoring team uses a Toxics-focused Biological Observation System (TBiOS) to evaluate the ***effects of toxic contaminants*** in Puget Sound's organisms to:

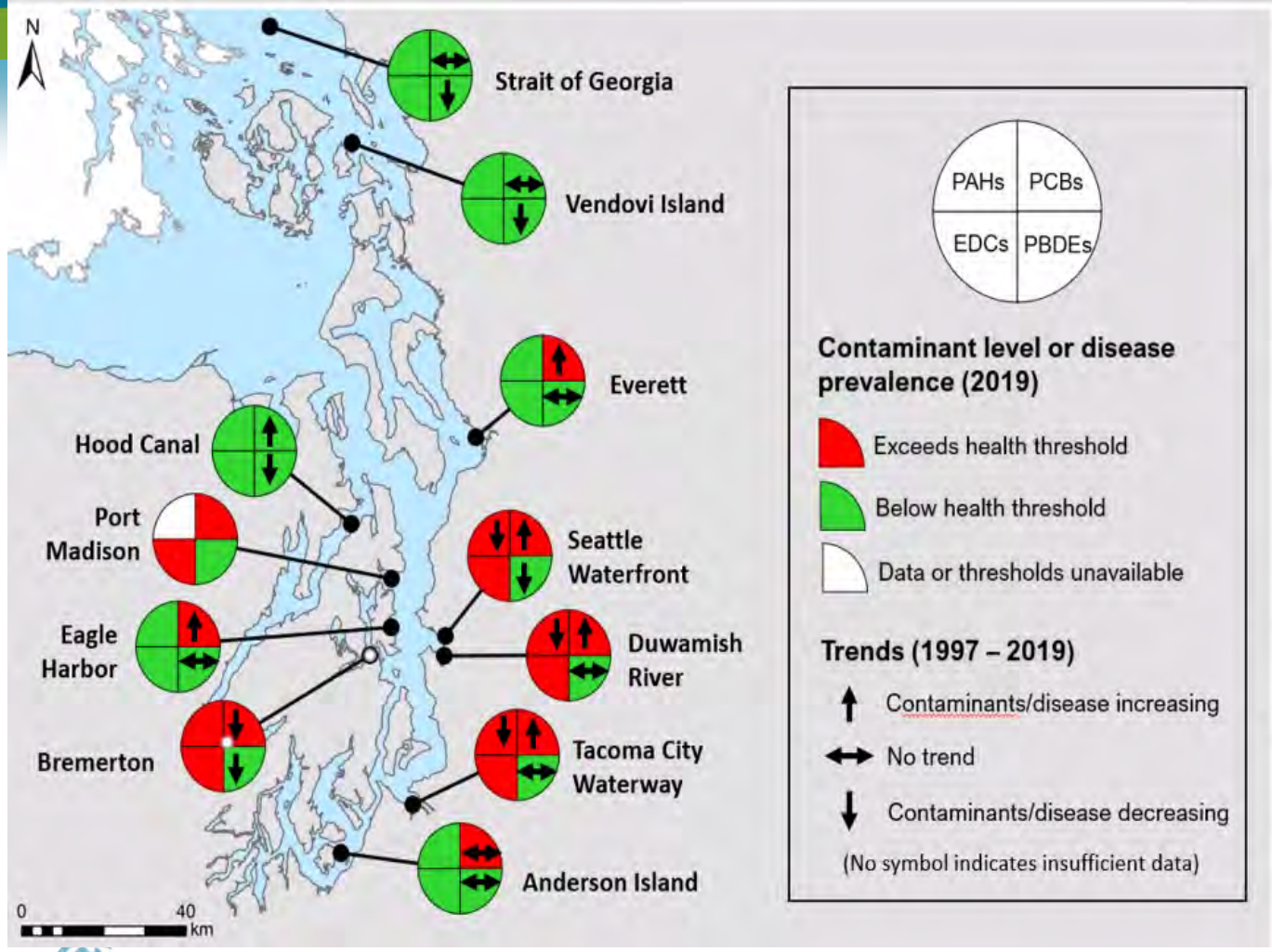
- ***protect fish and shellfish health***,
- ***ensure seafood safety***, and
- ***promote ecosystem recovery***.





Olympia Sailing Club Presentation October 13, 2020
James E. West, Washington Department of Fish and Wildlife
https://wdfw.wa.gov/species-habitats/science/marine-toxics/tbios

Overview of Findings



English Sole VS Indicator Map Summary Example

- Circles (locations)
- Status (color)
- Trends (arrows)

PSEMP Monitoring Program- Puget Sound Partnership

- 11 Workgroups
- Monitoring informs policy and communication
- Look at toxics, stormwater and freshwater
- Meetings open

PSEMP

PUGET SOUND ECOSYSTEM MONITORING PROGRAM

Thurston County Monitoring

- Environmental Health Stream and Lakes Reports (NOT toxics)

https://www.thurstoncountywa.gov/phss/Pages/wq-monitor-reports.aspx

About water levels and surface water quality standards

- Fecal Coliform, nitrites/nitrates,
- pH/temperature
- Turbidity
- Phosphorous

Focus on Toxics in Fish Strategy

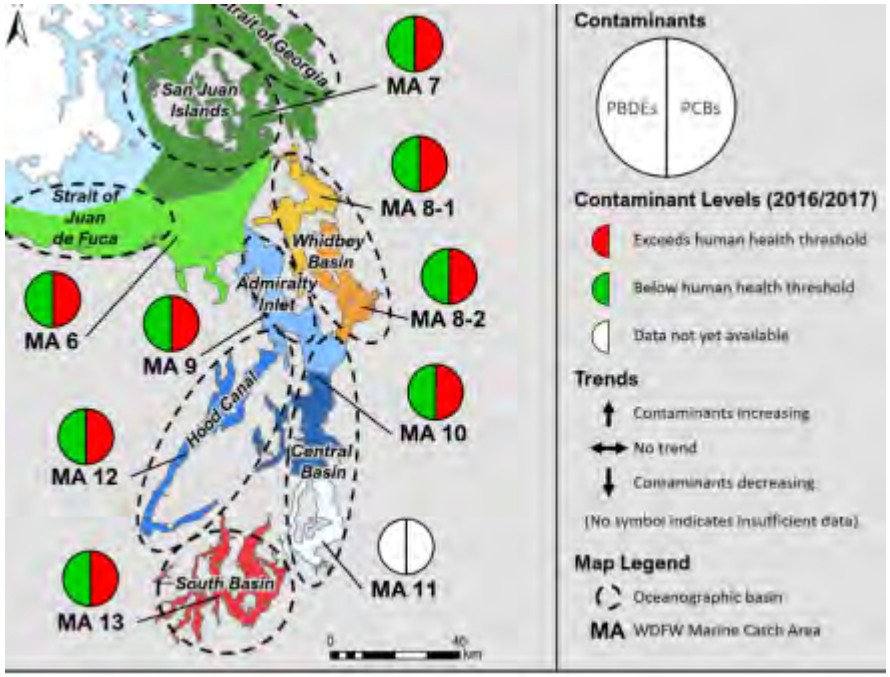
- Indicator identified by Puget Sound Partnership and developed by Stormwater Strategic Initiative Lead Team (SIL)
- 4 species, multiple chemicals

Overview of Findings-Chinook

https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignGoal/Detail/6

Chinook Salmon

- PCBs Problem
- You are Marine Area (MA) 13
- Bad for Orcas too (Chinook as Prey food)
- PCB levels exceed safe eating Guidelines from DOH



Toxics in Fish-

MARINE AREA –MA 13 (you!)

Higher contaminant inputs (population, industry, location- farther from northern clean ocean conditions)

https://pubmed.ncbi.nlm.nih.gov/16700427/

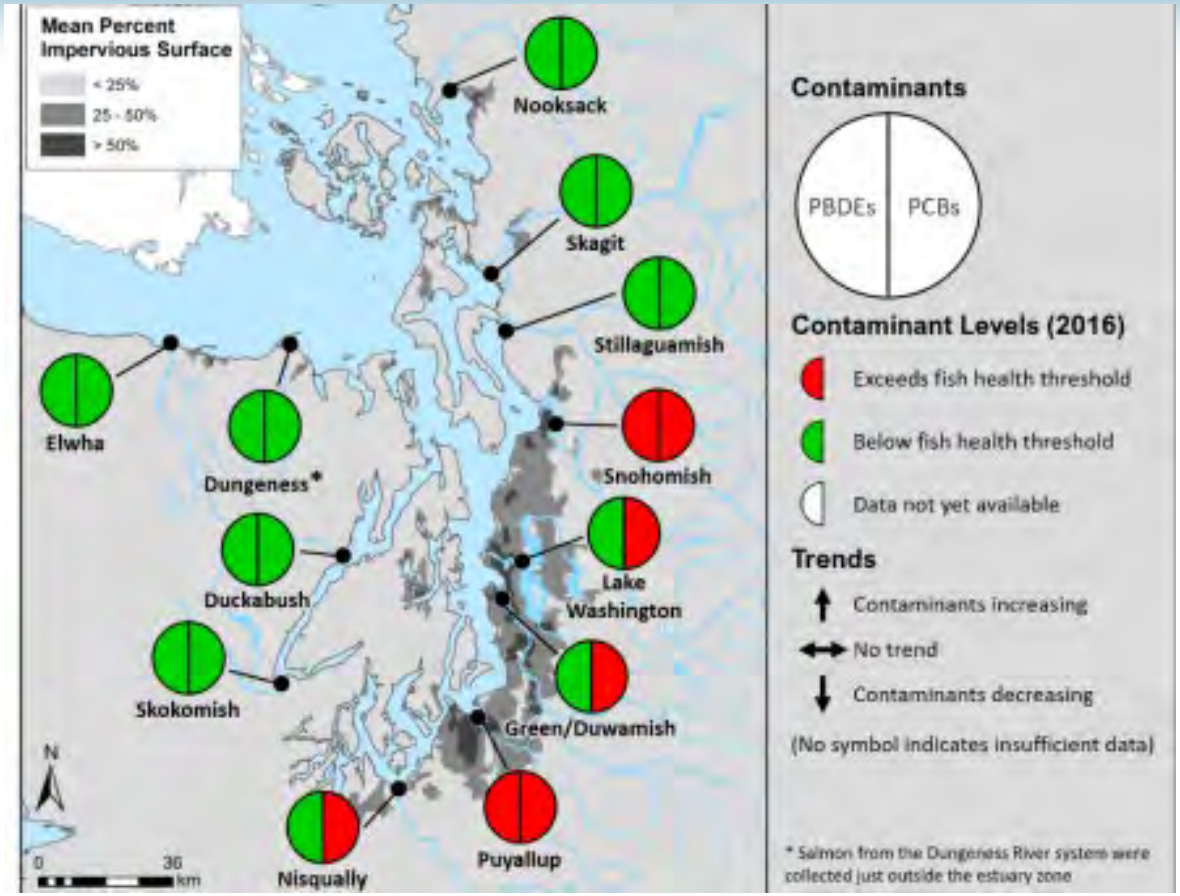
PCBs not good for human health either

Contaminants in Juvenile Chinook

PCBs and PBDEs (flame retardants)

PCBs exceeded fish health threshold in Nisqually (and Puyallup)

PCBs in Juvenile Chinook



Contaminants in English Sole

- Better results
- Met Human Health Criteria for PCBs and PBDEs
- No Liver disease from PAHs (petro-by product)

Chemicals of Emerging Concern (CECs)

Pharmaceuticals

- Antibiotics
- Antihistamine
- Antidepressants
- Antifungals
- Sedatives
- Stimulants
- Corticosteroids
- Metabolic regulators

Personal care products

- Surfactants (soaps & detergents)
- Antibacterials
- Insect repellent (DEET)

Industrial Compounds

- Plastics (bisphenol a)
- Alkylphenol Ethoxylates
- Perfluorinated Compounds

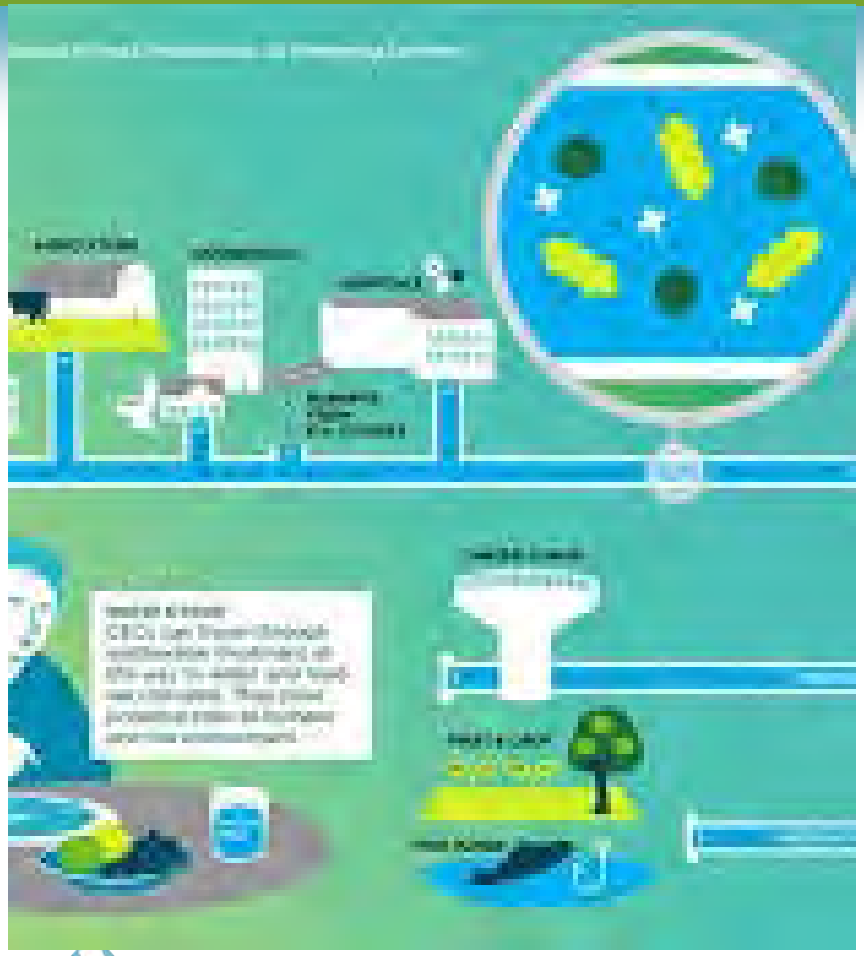
Other

- Caffeine
- Illicit drugs, etc.

Pacific Herring

- Snacks for other fish (forage fish)
- PCBs high in MA 13
- PBDEs declining

CECs- Contaminants of Emerging Concern



- Sampling in Nisqually and Budd Inlet
- Mussel Watch programs: PAHs, PCBs, DDT and metals
- CEC bioaccumulate via ingested water, prey (dissolve in water)

2014 Studies- Crab and Spot Shrimp

- WDFW Monitoring- Results sent to DOH for human health risk assessment

  MA 13: PCBs most abundant found of the POPs (persistent organic pollutants)

CECs in sculpin and Juvenile Chinook

- Nisqually Chinook: 13 analytes detected but low concentrations (except Nonlyphenol)
- More contaminated: failing septics? On 303(d) list (impaired waters list)
- Puget Sound wide 106 publicly owned wastewater treatment facilities

Meador et.al, https://www.sciencedirect.com/science/article/pii/S0269749116300884

Stormwater Action Monitoring

Status and Trends

Effectiveness (what works? Bioretention!)

Source Identification (who dunnit?)

Goodies from SAM

- Tips on what works to mitigate stormwater (bioretention!)
- Ideas for how to find out where the bad stuff is coming from (Illicit Discharge Detection and Elimination)
- How good or bad are streams over time?

https://www.youtube.com/playlist?app=desktop&list=PLXny_Je3KsDwN5iiiLJI9265_piHcclmV

Thank you!

- We are grateful for today, your participation and your energy and ideas
- We are grateful for our fabulous staff and all the people who work so hard to make this a nice place to live and play

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