April 2018

Monitoring stormwater contaminants in the Puget Sound nearshore: an active biomonitoring tool using transplanted mussels (Mytilus trossulus)

Jennifer A. Lanksbury
*Washington Dept. of Fish and Wildlife, United States, jennifer.lanksbury@dfw.wa.gov*

Andrea J. Carey
*Washington Dept. of Fish and Wildlife, United States, andrea.carey@dfw.wa.gov*

Mariko M. Langness
*Washington Dept. of Fish and Wildlife, United States, mariko.langness@dfw.wa.gov*

Brandi Lubliner
*Washington State Dept. of Ecology, United States, BRWA461@ecy.wa.gov*

Laurie Niewolny
*Washington State Dept. of Ecology, United States, lnie461@ECY.WA.GOV*

*See next page for additional authors*

Follow this and additional works at: [https://cedar.wwu.edu/sssec](https://cedar.wwu.edu/sssec)

Part of the [Fresh Water Studies Commons](https://cedar.wwu.edu/collections/stream/), [Marine Biology Commons](https://cedar.wwu.edu/collections/158), [Natural Resources and Conservation Commons](https://cedar.wwu.edu/collections/256), and the [Terrestrial and Aquatic Ecology Commons](https://cedar.wwu.edu/collections/187)


This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Salish Sea Ecosystem Conference by an authorized administrator of Western CEDAR. For more information, please contact [westerncedar@wwu.edu](mailto:westerncedar@wwu.edu).
Puget Sound Mussel Monitoring

Long-term Active Biomonitoring of Contaminants in the Nearshore

Jennifer Lanksbury and Mariko Langness
Toxics-focused Biological Observing System (T-BiOS)
Washington Department of Fish and Wildlife
Puget Sound Mussel Monitoring

- Started with the NOAA’s Mussel Watch program
  - 1986 - 2011
  - Wild mussels
  - Biennial monitoring

- Evolved into Puget Sound Mussel Monitoring cooperative program
  - 2012 - present
  - Transplanted mussels
  - Biennial monitoring
Puget Sound Mussel Monitoring

- Mussel Watch Pilot Expansion study (2012/13)
- Stormwater Action Monitoring survey (2015/16)
  - First mussel survey in new, long-term status & trends stormwater monitoring program
Mussel Cage Deployment/Retrieval

• Cages left out between Oct/Nov. – Feb.
• Cages placed in center of intertidal zone
• 100+ volunteers/partners help deploy/retrieve cages over 4-5 nights of low tides
NOAA Mussel Watch assessed PAHs in mussels on a national scale from 1986 - 2011

National levels of PAHs from 2005:

- **Low** 63 – 1187
- **Med** 1188 – 4434
- **High** 4435 – 7561

ng/g, dry weight (parts per billion)
Significant positive relationship between conc. of PAHs and impervious surface

$r^2 = 0.42$
PAH fingerprinting
(of sites with >50% detected PAHs)

**Petrogenic**: unburned petroleum products
- Oil or gasoline spills
- Oil seeps
- Runoff with oil leaked from cars
- More Alkylated Homolog PAHs

**Pyrogenic**: incomplete combustion
- Petroleum burning – engine exhaust
- Biomass burning – wood, grass, coal smoke and ash
- More Parent PAHs
Alkylated homologs

Parent PAHs

Petrogenic (unburned)

Pyrogenic (combustion)
Petrogenic (unburned) Alkylated homologs Parent PAHs Pyrogenic (combustion)

Diagnostic Ratio
- pyro
- mix
- petro
- Petrogenic (unburned)
- Pyrogenic (combustion)

*Diagnostic Ratio*

- pyro
- mix
- petro

More smoke and exhaust?
More creosote influence?

Pyrogenic sources

3 ring PAHs
4-5 ring PAHs
Alkylated homologs

Parent PAHs

PC1
PC2
Petrogenic (unburned) Pyrogenic (combustion) Pyrogenic sources Creosote? Alkylated homologs Parent PAHs Diagnostic Ratio

- pyro
- mix
- petro
EYES OVER PUGET SOUND

...takes aerial photos of Puget Sound water conditions on a regular basis.

Their photographic evidence of frequent oil sheens in Salmon Bay and Lake Union support our fingerprint findings.

Conclusions to date

• Toxic contaminants are entering the nearshore food web of the Puget Sound, especially along shorelines adjacent to highly urbanized areas.

• Impervious surface in the watersheds adjacent to the shoreline affected the levels of organic contaminants and some metals in mussels.

• PAH patterns in mussels can help reveal potential contaminant sources.
Reports now available online:

Thank you!