Thinking Downstream –

Impacts on Fishes, Aquatic Invertebrates, and Our Water Supplies

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What kinds of pollutants may be in our rivers?

Contaminants in our streams and water supplies

Pollutants	Sources	Timeframe
Mercury	Natural sources; gold mining	1850s to present
Lead and other heavy metals	Mining, older plumbing	1850s to present
Hydrocarbons and oils	Fuel tank leakage, car exhaust; stormwater runoff	1920s to present
PCBs	Electrical insulators, electrical appliances	1930s to 1980s
Endocrine disruptors	Plastics, dioxin, organochlorines, birth control drugs	1940s to present
Nutrients/fertilizers	Lawn and ag runoff	1940s to present
High temperature	Mostly urban runoff	1950s to present
Fine sediments	Urban and ag runoff	1950s to present
Neonicotinoids	Urban and ag runoff	1990s to present

Neonicotinoids: Toxicity to aquatic organisms

Organism	Lethal Concentration for 50% Mortality (LC50s)
Waterflea, *Daphnia magna*	10 – 85 ppm (relatively low toxicity)
Rainbow trout	83 – 281 ppm (low toxicity)
Freshwater ostracods	185 – 719 ppb (100 times more sensitive)
Amphipod, *Hyalella azteca*	115 ppb for 2 day exposure
Amphipod, *Hyalella azteca*	7 ppb for 28 day exposure

Unexpected trend toward lower LC50s with increasing exposure time confirmed for sensitive invertebrates

Toxic effects are cumulative with time because neurons do not regenerate: time cumulative toxicity

General sensitivities of aquatic invertebrates to pollutants

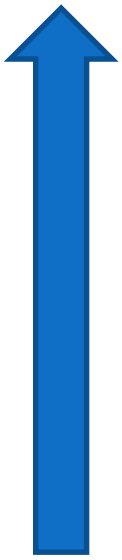
- SENSITIVE: mayflies, caddisflies, stoneflies

- TOLERANT: midges, blackflies, craneflies, snails

USEPA ECOTOX database for toxicity to aquatic organisms from neonic Imidacloprid

- EPT Aquatic insects (mayflies, caddisflies, stoneflies)
- Most Crustaceans (amphipods, ostracods, shrimp)
- Worms, mussels, midges
- Cladoceran crustaceans, waterfleas
- Fish

Most sensitive



Most tolerant

Occurrence of Neonicotinoid insecticides in US Streams

- 48 streams in 24 states. Surveys by USGS 2012-2014
- 63% of streams had at least one neonic insecticide
- Primary sources: urban use and cultivated crops
- Increased precipitation and floods resulted in higher loads of neonics
- 2 sites in OR: Deep Creek SE of Portland (no detection); Zollner Creek NE of Salem (3 neonics)

Hladik and Kolpin. 2015. First national-scale reconnaissance of neonicotinoid Insecticides in streams across the USA. Environ. Chem. Published online 18 Aug 2015.

Impacts to aquatic communities

Population and community effects commonly reported at levels well below LC50s of species tested

- Reduced abundance of aquatic insects
- Biodiversity of macroinvertebrates decreases as sensitive species drop out
- Waterfleas, fly larvae and other more tolerant species increase in abundance

What is the upshot for fish populations and aquatic communities?

- Reduced food for fishes and amphibians
- Reduced capacity for decomposition of organic material
- Reduced nutrient recycling
- Numerous sublethal effects
- Much we do not know!

Pesticide occurrence in Clackamas River Basin
--USGS Sci. Investigations Report 2008-5027

What's in the water? 26 pesticides detected in mainstem Clackamas. 5 pesticides exceeded EPA benchmarks for aquatic life.
15 pesticides in finished drinking water from treatment plant (11 herbicides, 3 insecticides, 1 fungicide)

Where does it come from?
Nursery and greenhouses, pastures, urban landscapes, applications along roads, tree farms.

What is at risk? Impaired macroinvertebrate populations; steelhead, listed coho salmon; Chinook salmon; humans

Sublethal effects of pesticides can devastate trout and salmon populations

- Reduced feeding
- Reduced growth
- Poor survival compared to non-exposed fish
- Poor homing ability and increased straying

"Four-day exposures that are representative of seasonal pesticide use may be sufficient to reduce the growth and size at ocean entry of juvenile Chinook salmon."
--Baldwin et al. 2009. Ecological Applications 19(8).

What can we do?

Learn more – stay informed!
Coming here today is a good step!

Eliminate or reduce your family's use of fertilizers and insecticides

Participate in stream clean up, habitat restoration and stream monitoring projects

Join up to give your voice more volume