

The influence of submicron particles on metal and metalloid accumulation by periphyton and benthic macroinvertebrates



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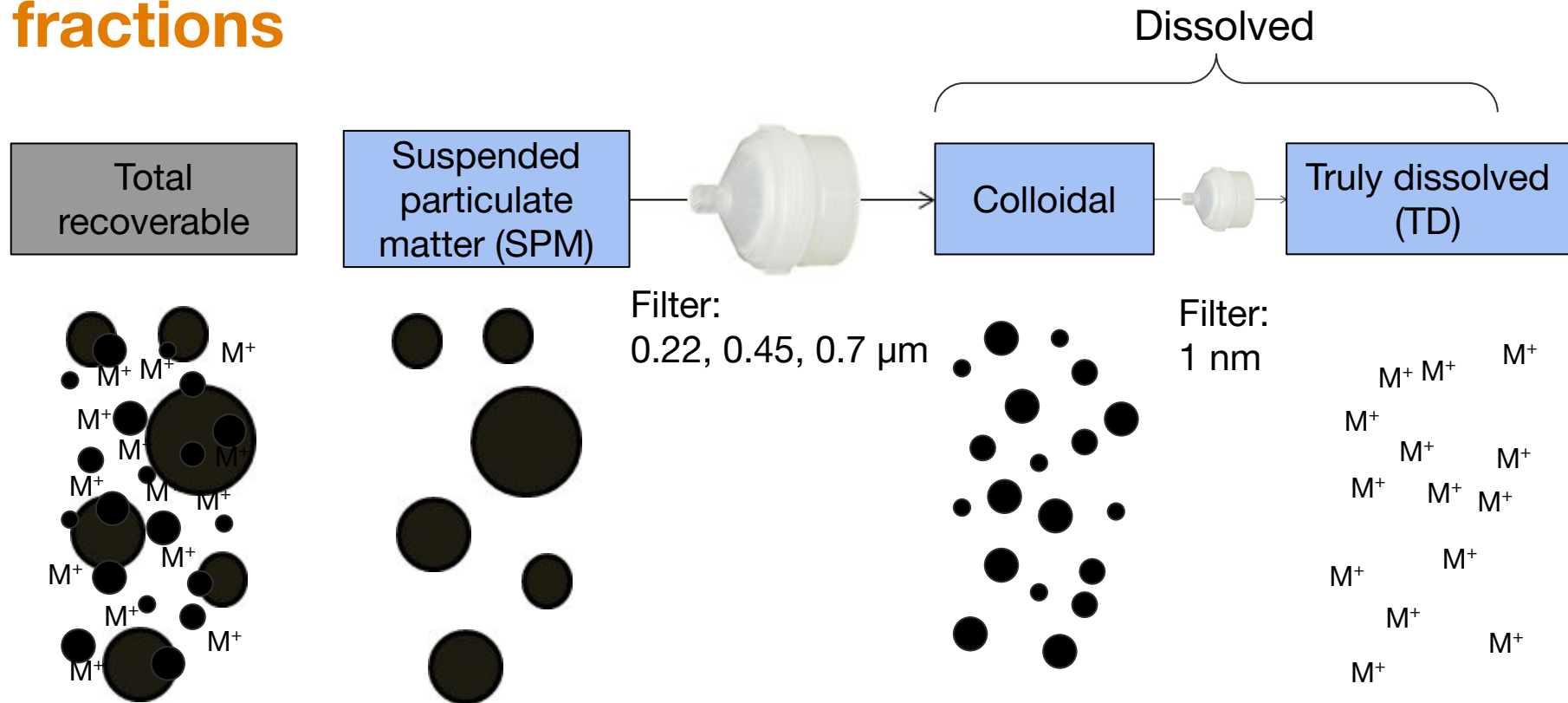
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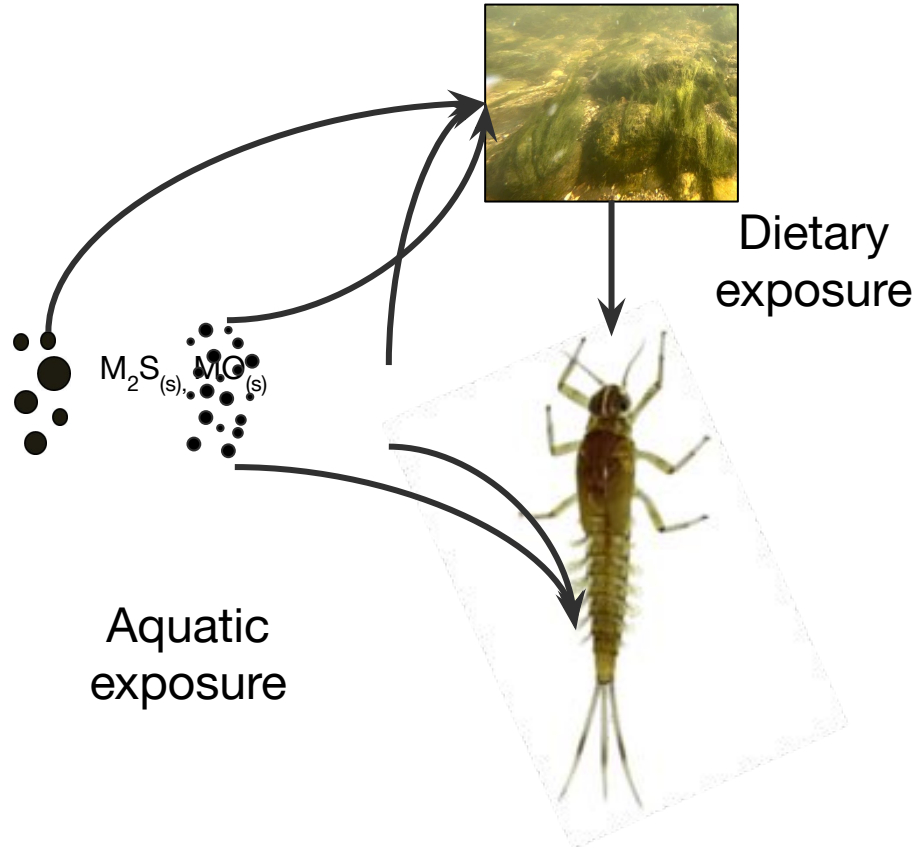


Josh Burnham

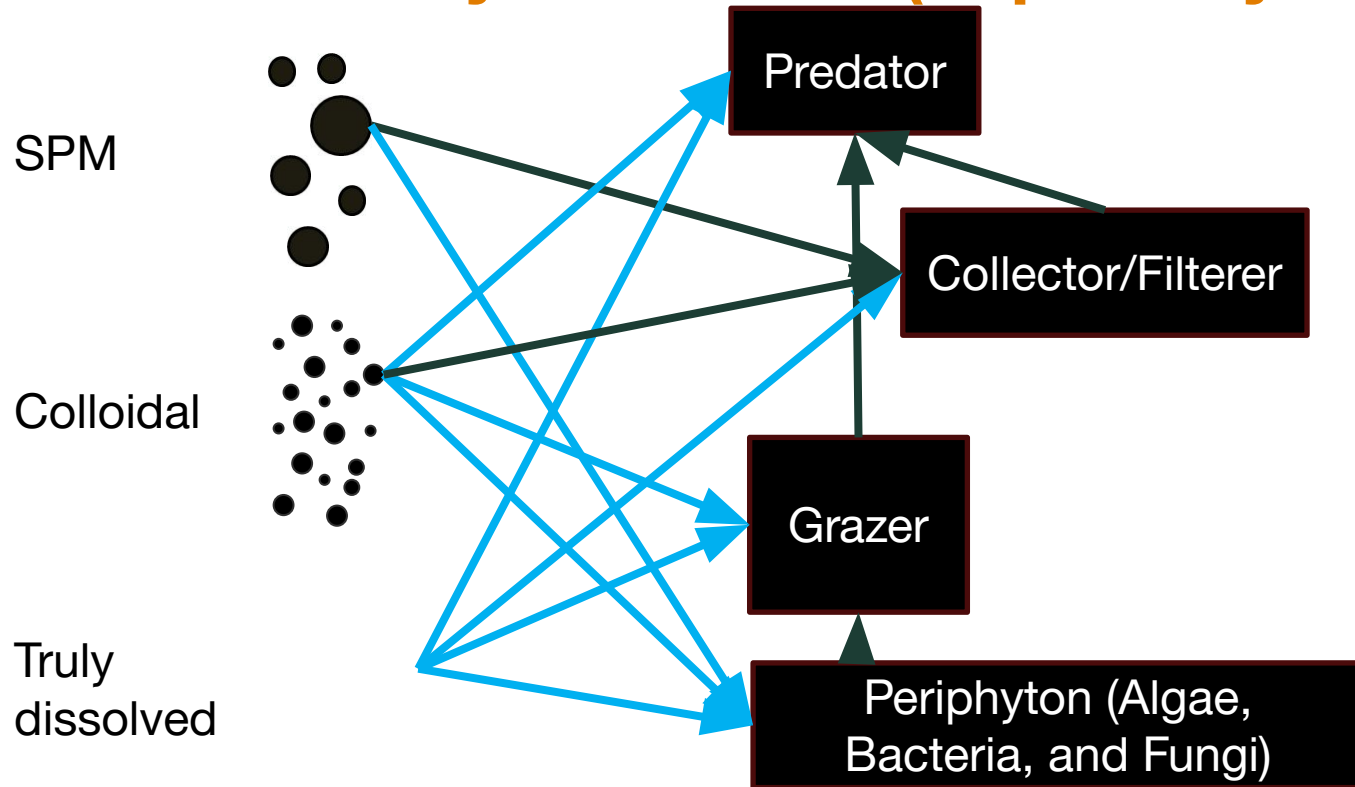
Metals and metalloids distributed among size fractions



Different routes of exposure

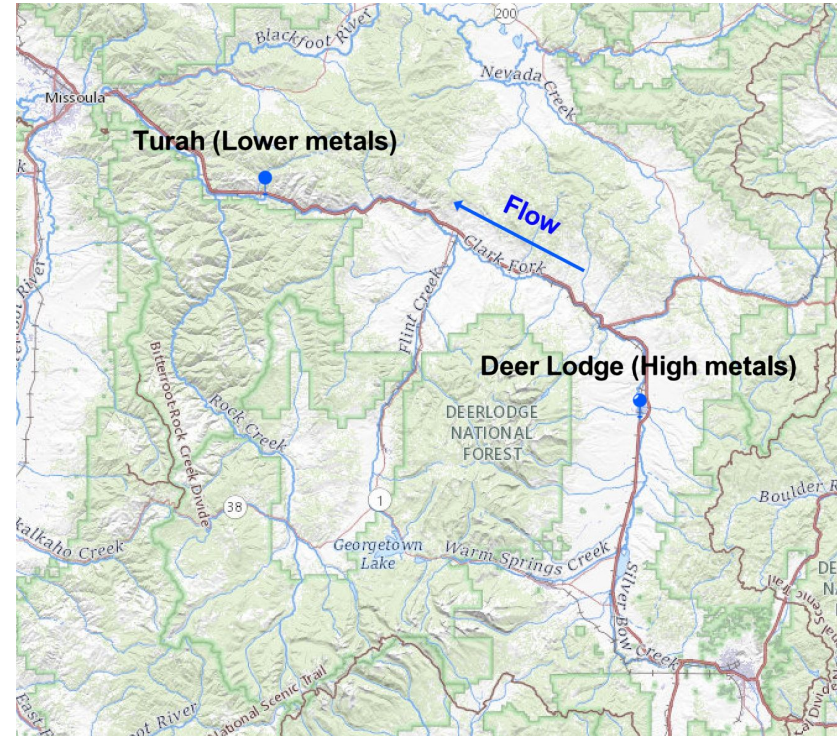


To what extent are different size fractions accumulated by the biota? (Especially colloidal)

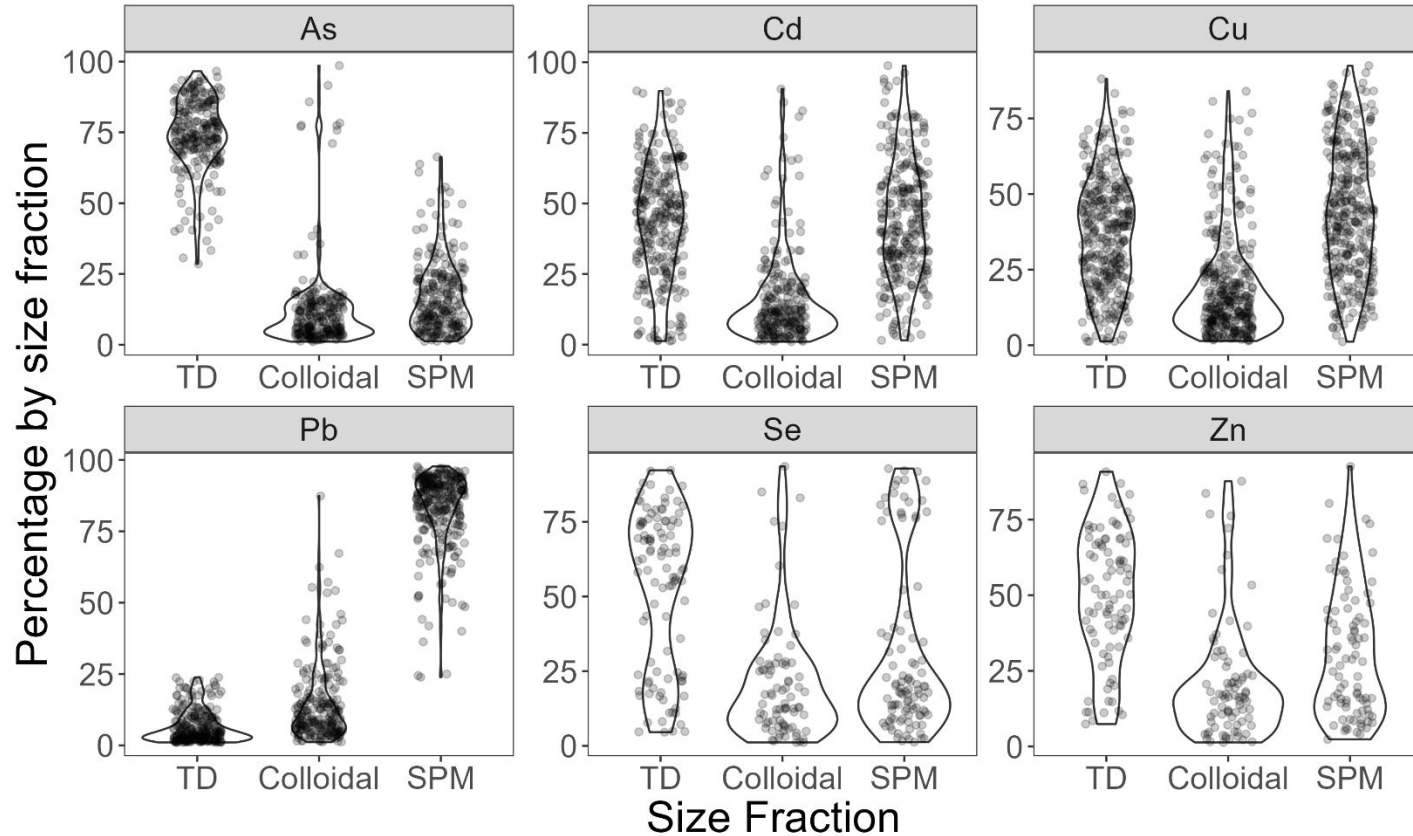


Clark Fork River as donor/study system

- Legacy of mine waste from copper mining
- Elevated As, Cd, Cu, Pb, Zn, (Se)



Importance of size fractions varies by element



Clark Fork in miniature: Mesocosms



Dylan White, Session 8, 10/11 8:50 AM

Mesocosm hydrology

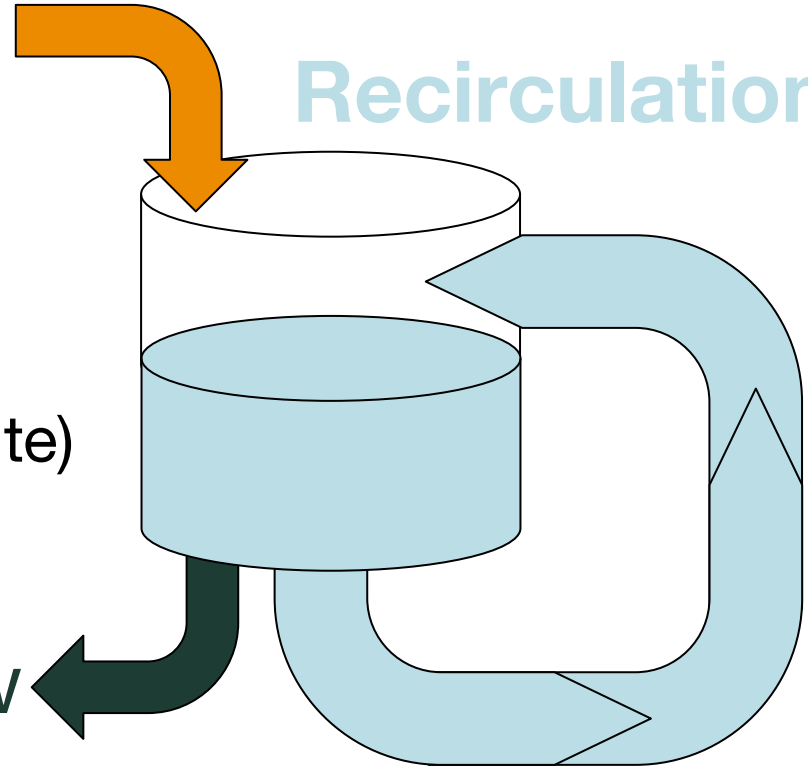
Inflow

Recirculation

Inflow = Outflow = 4 mL min^{-1}
(one-day water residence time)

Recirculation (~three times per minute)

Outflow

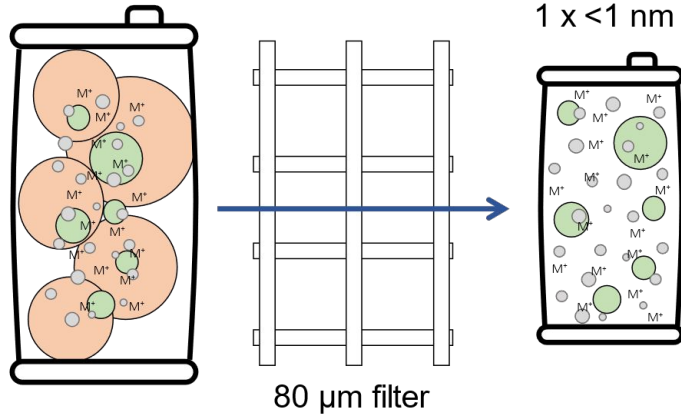


Filtering ~1400 liters to generate treatment water

Deer Lodge Unfiltered Water:

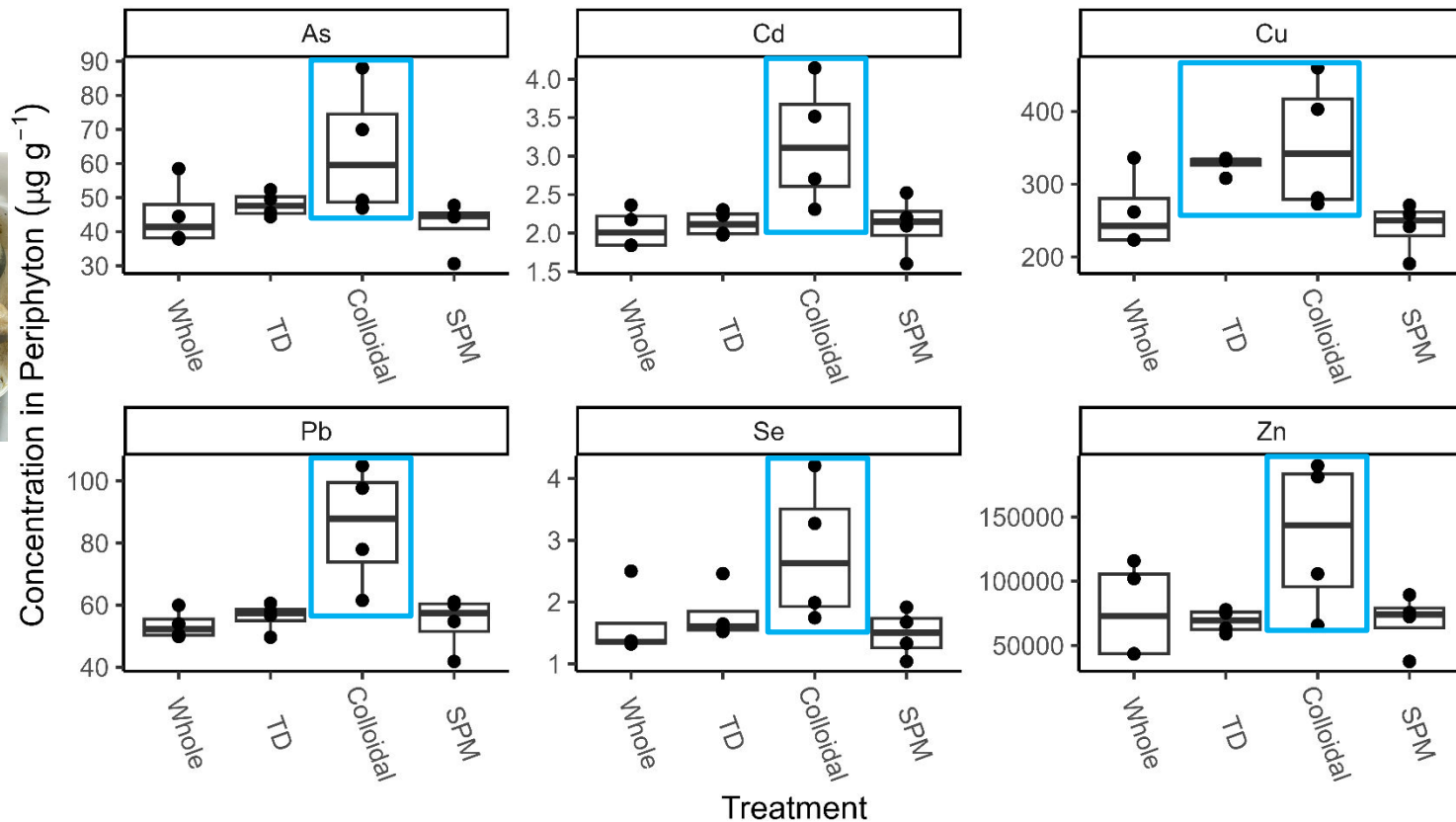
Whole water treatment:

- 1 x 0.45 to $<80\ \mu\text{m}$
- 1 x 1 nm to $0.45\ \mu\text{m}$
- 1 x $<1\ \text{nm}$



Four replicates per treatment, 15 day experiment

Periphyton accumulated metal(loid)s in colloidal treatment



Grazer/collector/ gatherer: Patterns varied by family and element



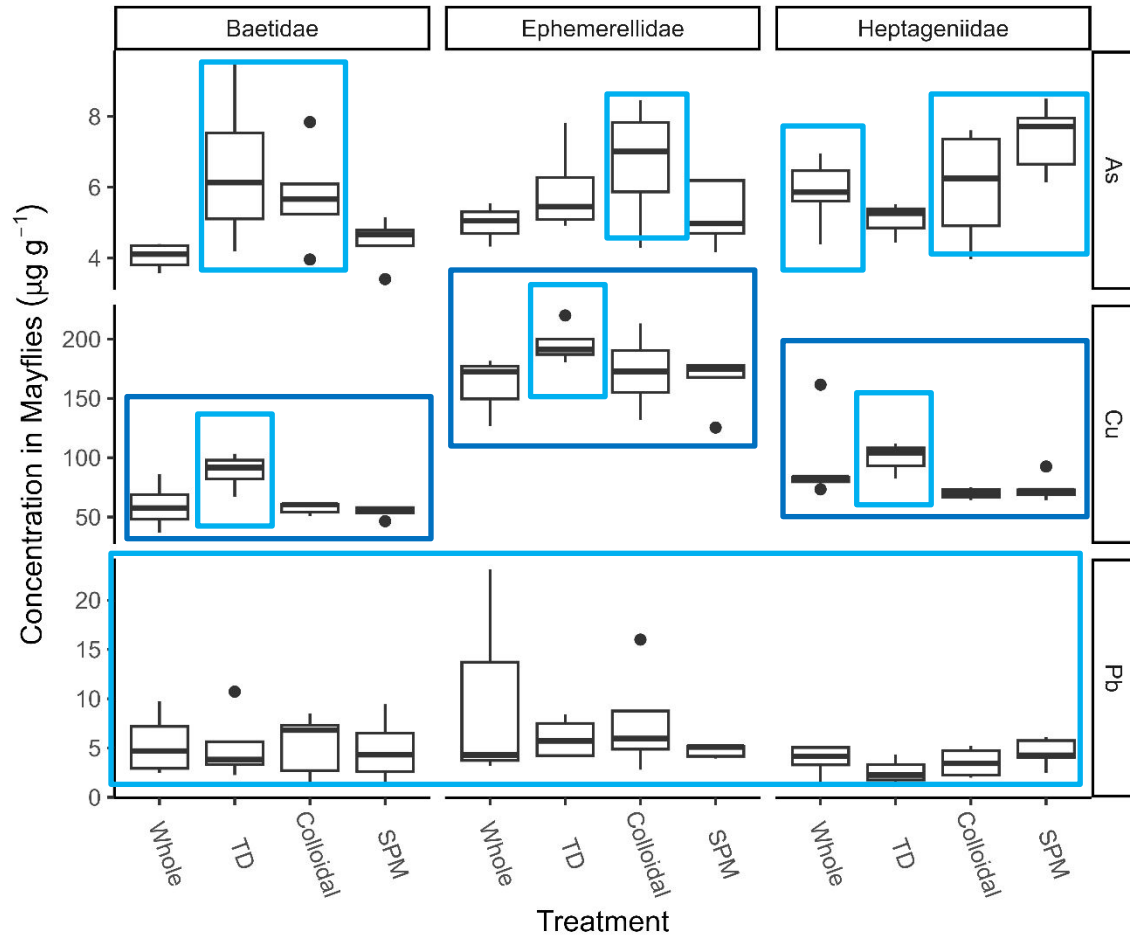
Baetidae



Ephemerellidae



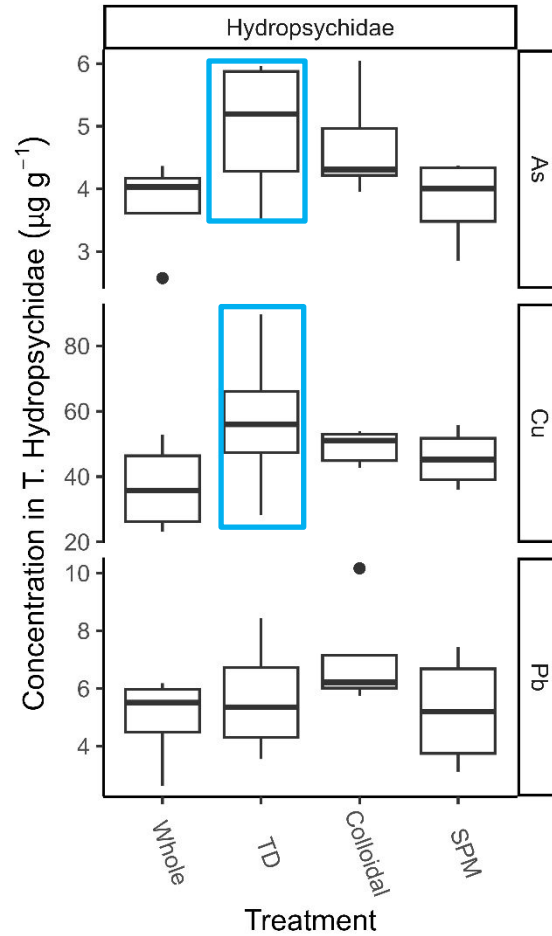
Heptageniidae



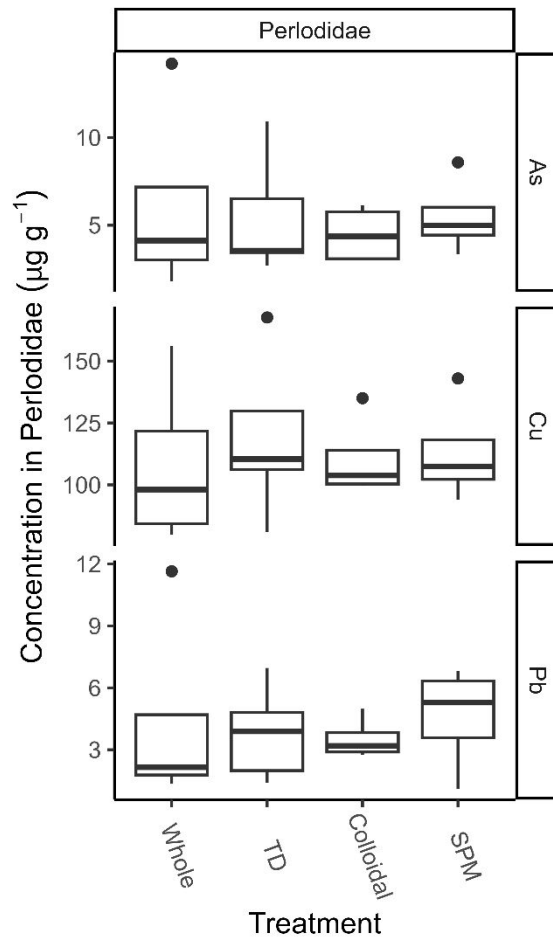
Collector/Filterer: Patterns more subtle



Hydropsychida
e



Predator: Nope



Summary

- Colloidal treatment had highest accumulation in periphyton
- Colloidal treatment had some accumulation in grazers (Ephemeroptera):
 - Highest treatment varied by element and family
- Colloidal particles did not drive accumulation in collector/filter feeder or predators

Emerging questions:

- Was the periphyton accumulating colloidal forms of these elements?
- Was the periphyton accumulating colloidal Fe and Mn particles, which were sorbing other elements?
- Was dietary accumulation in collector/filter feeder and predator slower?

