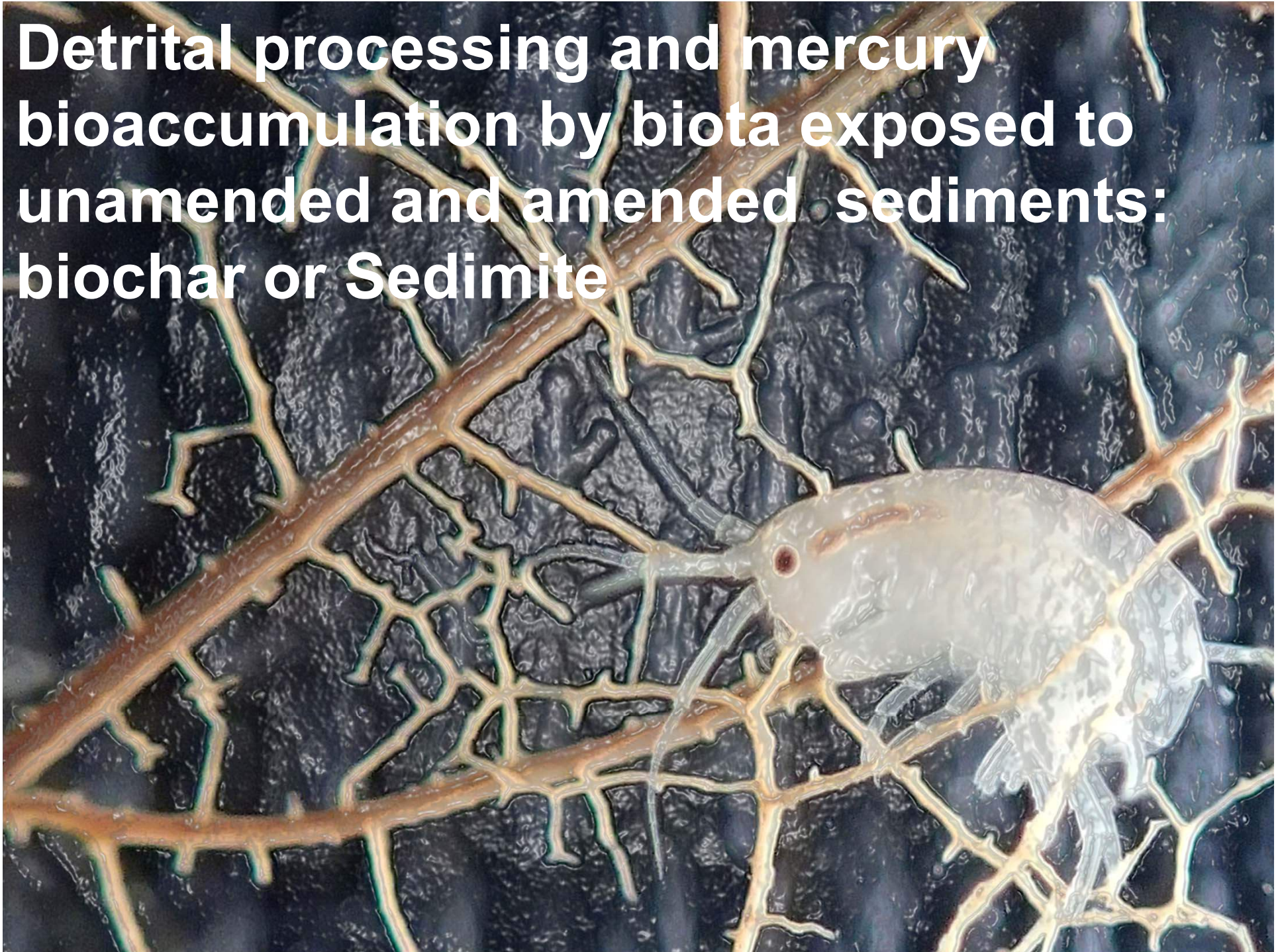


**Detrital processing and mercury  
bioaccumulation by biota exposed to  
unamended and amended sediments:  
biochar or Sedimite**



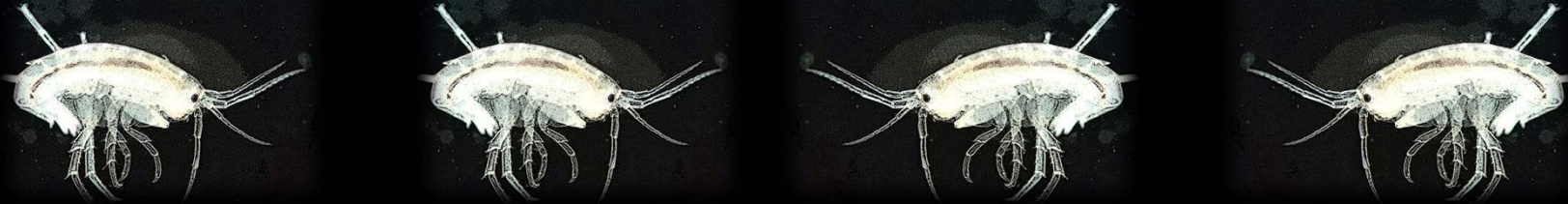
Red Maple  
Leaf After  
Grazing

Red Maple  
Leaf Before  
Grazing

*Hyaella azteca*



# Does Sorbent Influence Detrital Processing? Efficacy of Sorbent with Time (Bioaccumulation)?



## Design Optimized to Detect Effect on Detrital Processing

- One week, and again 1.5, 3, and 6 months after adding material
- Cowboy brand biochar or Sedimite

Change in mean amphipod leaf processing rate during 10 day assay

## Design Also Permitted Assessment of Amendment Efficacy

- One week, and again 1.5, 3, and 6 months after adding material
- Cowboy brand biochar and Sedimite

Change in mean amphipod mercury concentration at end of 10 day assay



- Expand our previous study with Sedimite that found:
- mercury in sediment decreased detrital processing
  - amending with Sedimite modified detrital processing
  - amending sediments influenced bioaccumulation

### Extended Ageing classes:

Extended from only 1<sup>st</sup> week to also 1.5, 3, and 6 months after amending sediments. Quantify effects of ageing.

### Extended treatment classes:

No sediment/only leaf disc & amphipod

North Oak Lane (low Hg), not amended\*\*\*

North Oak Lane, amended with biochar

North Oak Lane, amended with Sedimite \*\*\*

Dooms Crossing (high Hg), not amended \*\*\*

Dooms Crossing, amended with biochar

Dooms Crossing, amended with Sedimite \*\*\*

\*\*\* treatments also used in the Bunschuh et al. 2011 study.

# Experimental Treatments

North Oak Lane (Above historic source, 0.038  $\mu\text{g Hg/g dw}$ )

Unamended Sediment (n=30)

Biochar Amended Sediment (n=30)

Sedimite Amended Sediment (n=30)

Dooms Crossing (Below historic source, 8.1  $\mu\text{g Hg/g dw}$ )

Unamended Sediment (n=30)

Biochar Amended Sediment (n=30)

Sedimite Amended Sediment (n=30)

Assay Negative Control (leaf disk only, n=30)

Quantify change in weight of leaf disk due to leaching for 10 days

Assay Positive Control (amphipod and leaf disk, n=30)

# March/April 2013 Sampling

North  
Oak  
Lane  
Dooms  
Crossing





## GENERAL CHARACTERISTICS OF MATERIALS

### Mercury Concentration (ug/kg dry wgt)

Material	Mean	Std Dev	95% CI	N
Leaf Disc	0.0044	0.0013	.0030-.0060	5
Biochar	0.4693	0.0978	.348-.591	5
Sedimite	3.875	0.0562	3.805-3.945	5
North Oak Sediment	37.8	1.9	36.4-39.1	10
Dooms Sediment	8121	286	6991.0-9251.0	14

### Sediment Ashing Wgt Loss (%)

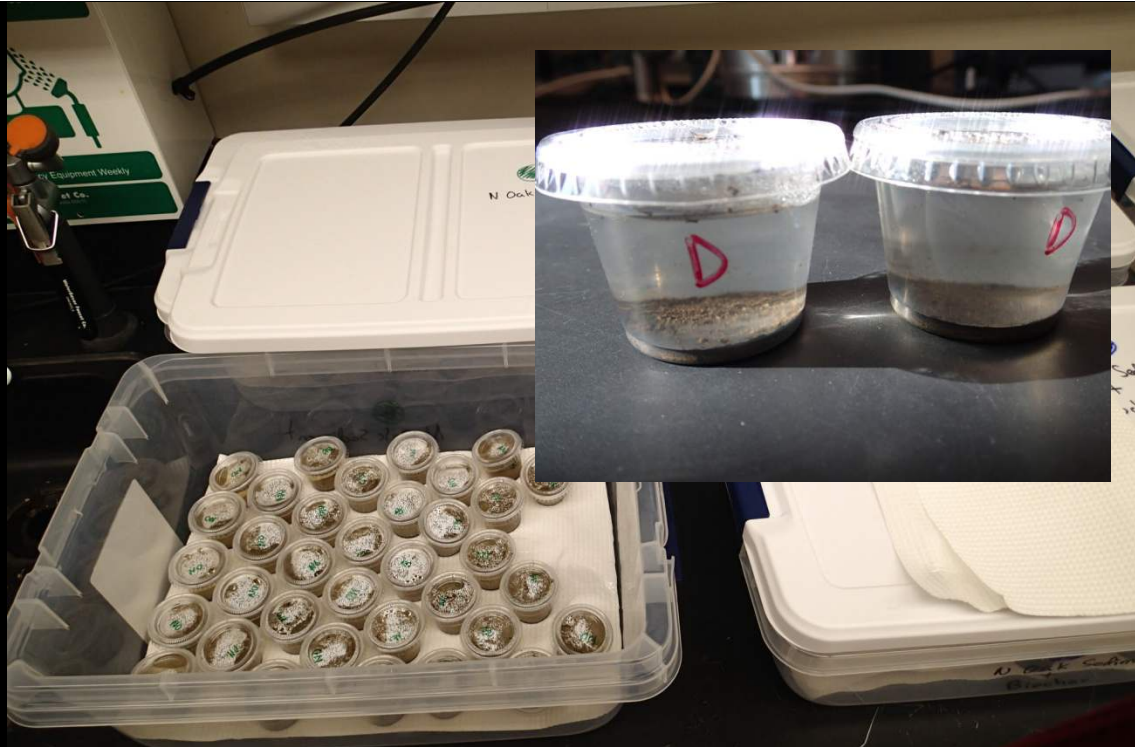
North Oak Sediment	9.02	0.86	7.95-10.09	5
Dooms Sediment	8.79	2.61	5.55-12.03	5

# Amended and Unamended Sediment, Weighed Leaf Disks and 6-well Plates for Assays





# Assay Set Up



Leaf  
Alone

Sediment

+Biochar

+Sedimite



**Dooms sediment [Hg] of 8 ug/g**

**Less than 10 ug/g [Hg]  
impacting rates in first study.**

**Any effect is that of the biochar  
or Sedimite**



AT END

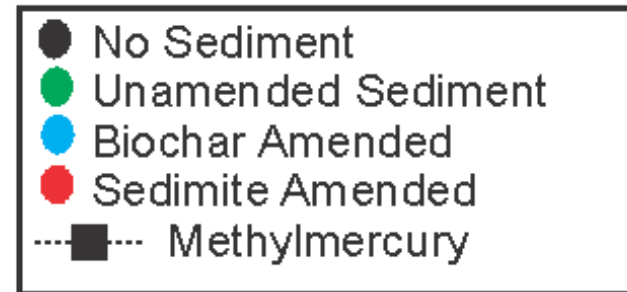
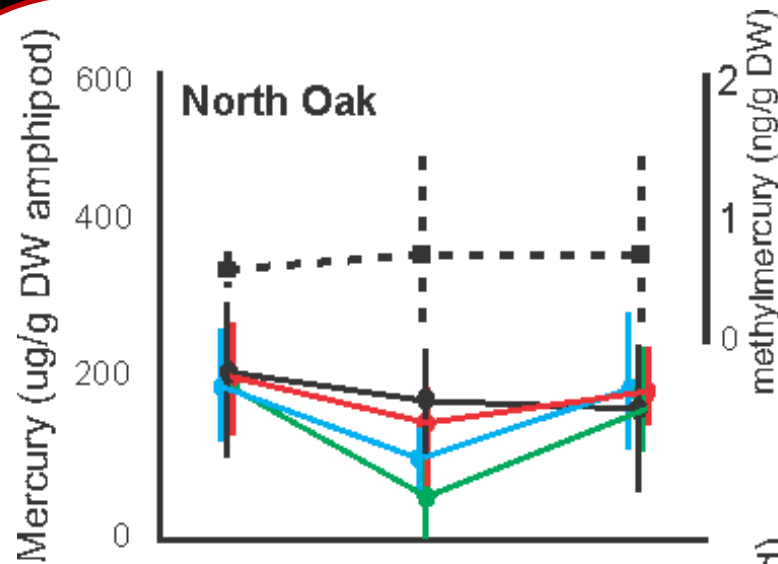
Leaf Disk Wgt

[Hg]<sub>Amphipods</sub>

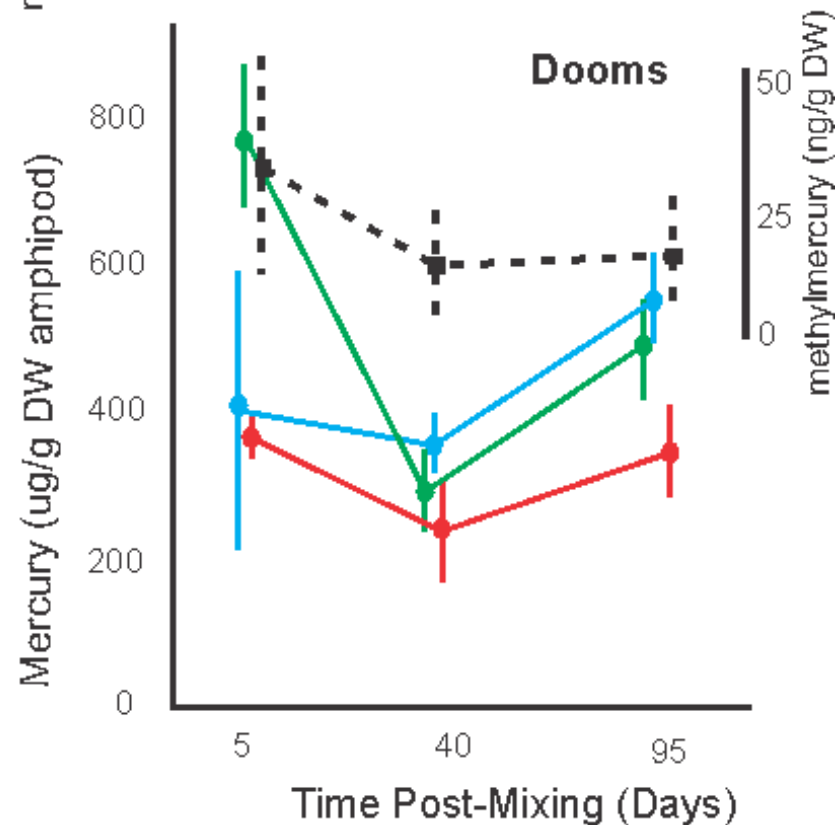
# Results to Date (1<sup>st</sup> three durations)



# Results to Date (1<sup>st</sup> three durations)

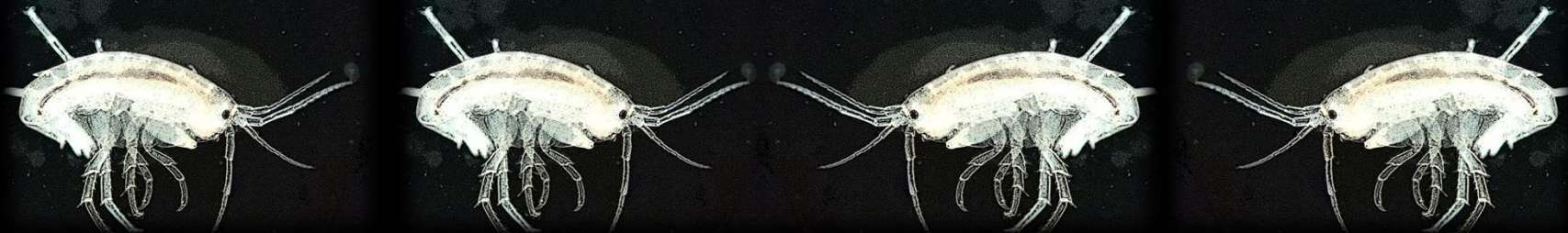


**Amendment Efficacy**  
**([Hg]<sub>Amphipod</sub> after 10 Days)**



# Preliminary Observations

- **Sedimite , but not biochar, reduced detrital processing for all assay periods and sediment types.**
- **Biochar efficacy transient?**
- **Sedimite efficacy more presistent?**



# Planned Approach to Data Analysis (Beyond 95% confidence intervals)

## Bayes Factor

The support (expressed as a probability) of one hypothesis provided by the data divided by the support for the alternative hypothesis.

P-value	Min BF	Strength of Evidence
0.10	0.26	Weak
0.05	0.15	Moderate
0.03	0.095	Moderate
0.01	0.036	Moderate/Strong
0.001	0.005	Strong/Very Strong

## **Minimum BF**

Simple convention of placing the most probable hypothesis in denominator of  $p(H_1)/p(H_2)$

## Example (First Assay, Influence of Amending Sediments on Bioaccumulation)

### **Unamended Sediment vs Biochar Amended**

Conventional t-test p-value of 0.003

Minimum BF of 0.03, i.e., moderate support

### **Unamended Sediment vs Sedimite Amended**

Conventional t-test p-value of 0.0001

Minimum BF of 0.0002, i.e., very strong support

### **Biochar vs Sedimite Amended**

Conventional t-test p-value of 0.6043

Minimum BF of .446, i.e., very poor support