

The influence of climate-induced alterations in DOM on metal toxicity and UV radiation in Rocky Mountain streams

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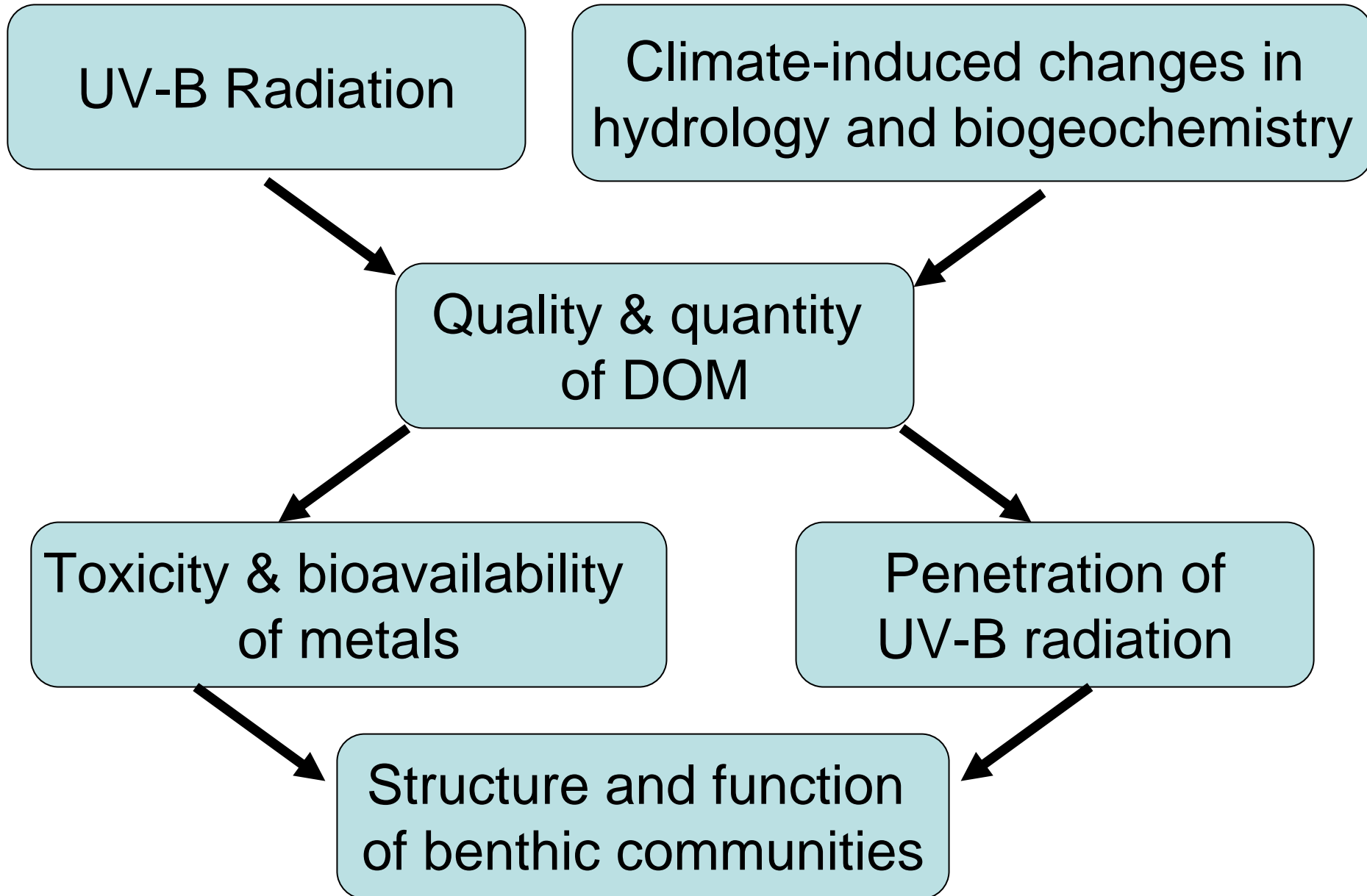
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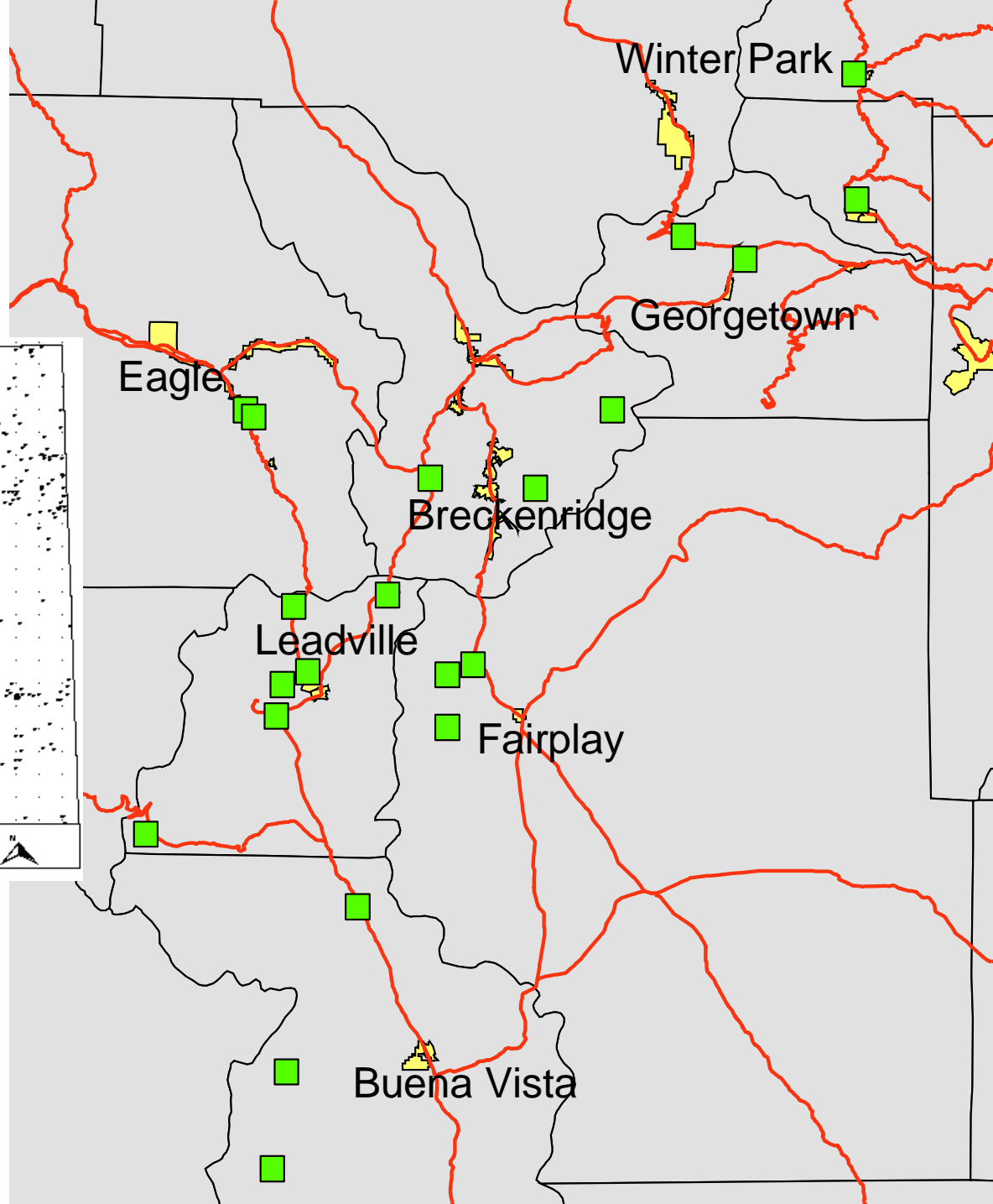
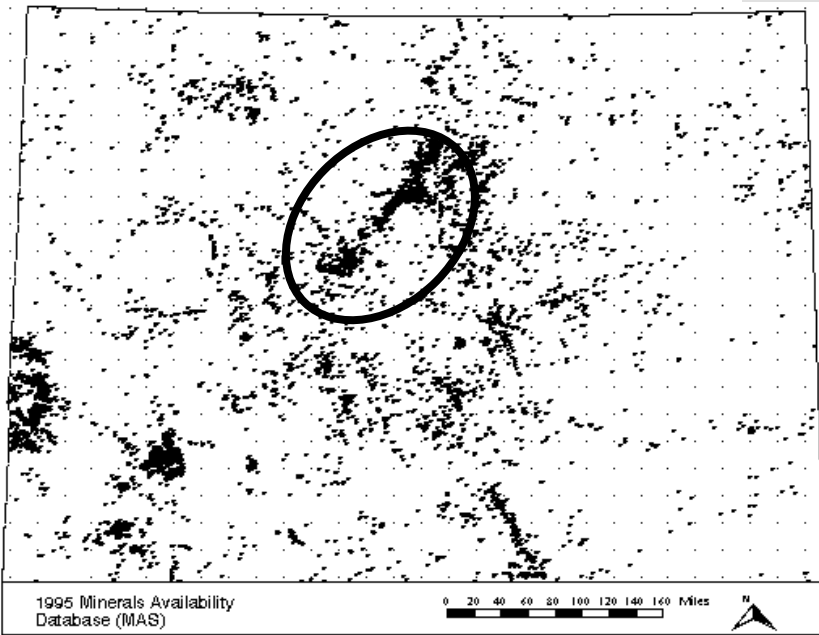
General Hypothesis

Climate-induced changes in biogeochemical processes and stream hydrology will alter quality and quantity of DOM, thereby increasing exposure of benthic communities to UV-B radiation and heavy metals

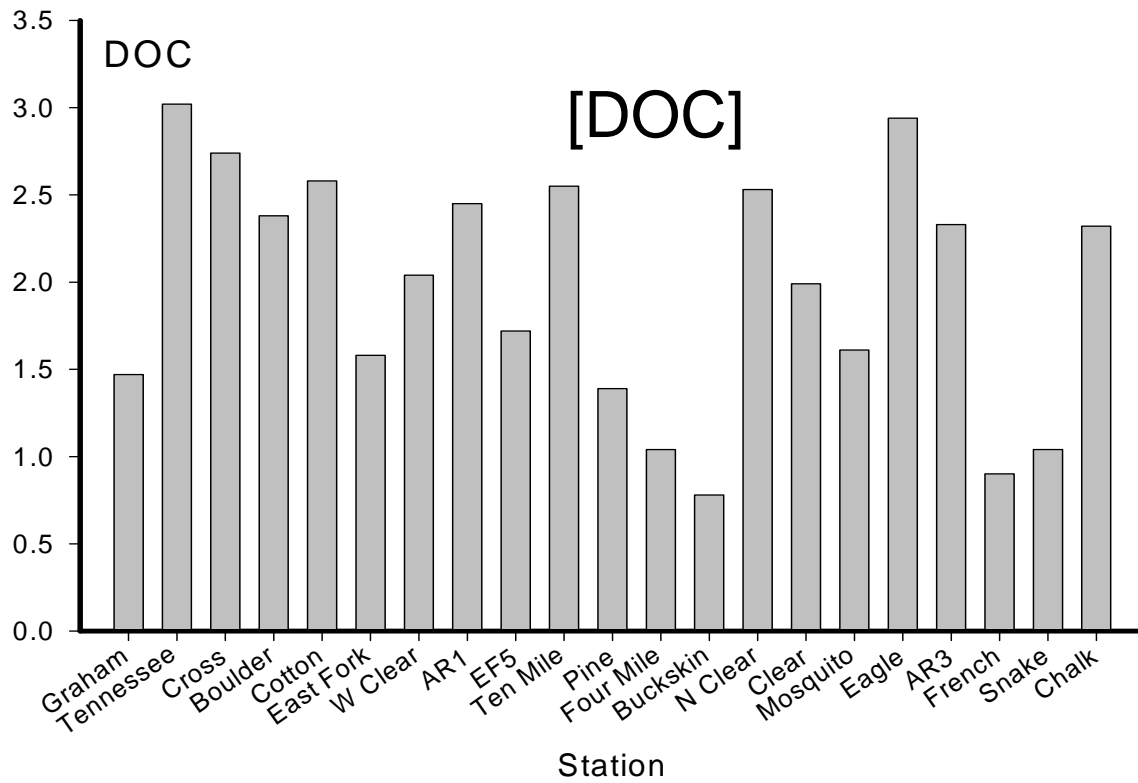
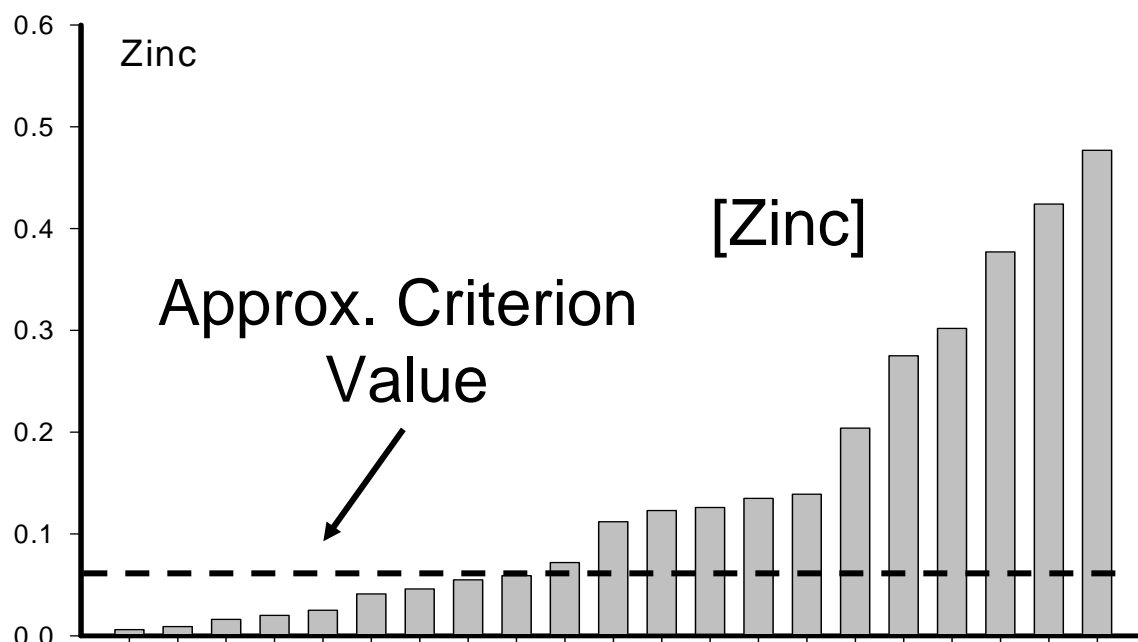
Conceptual Model



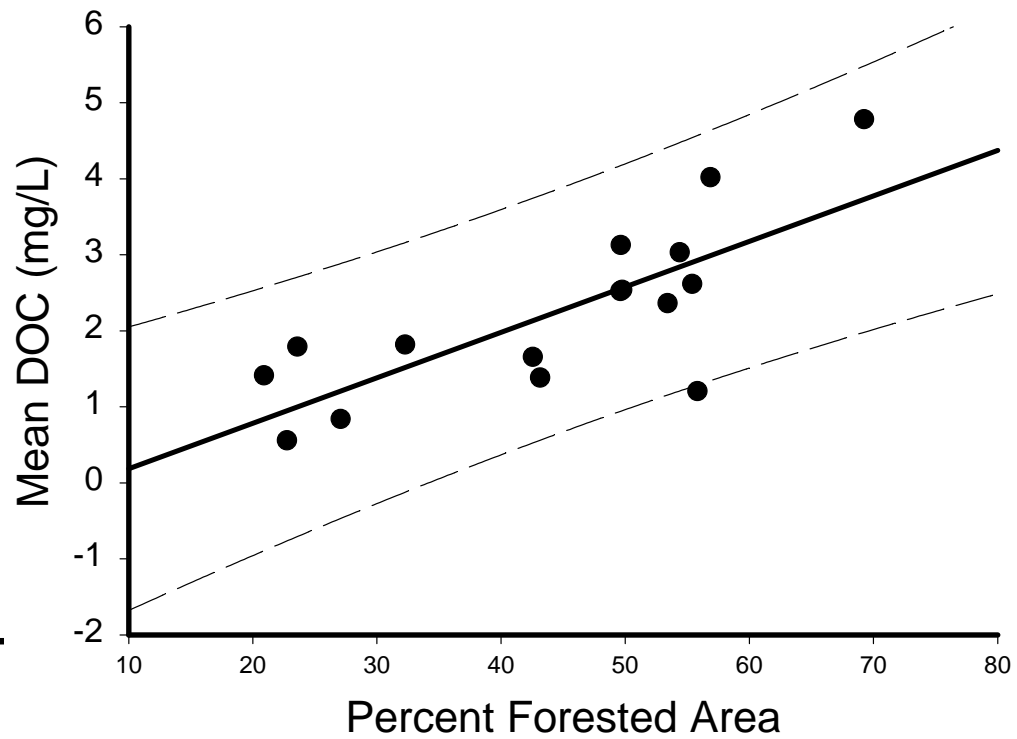
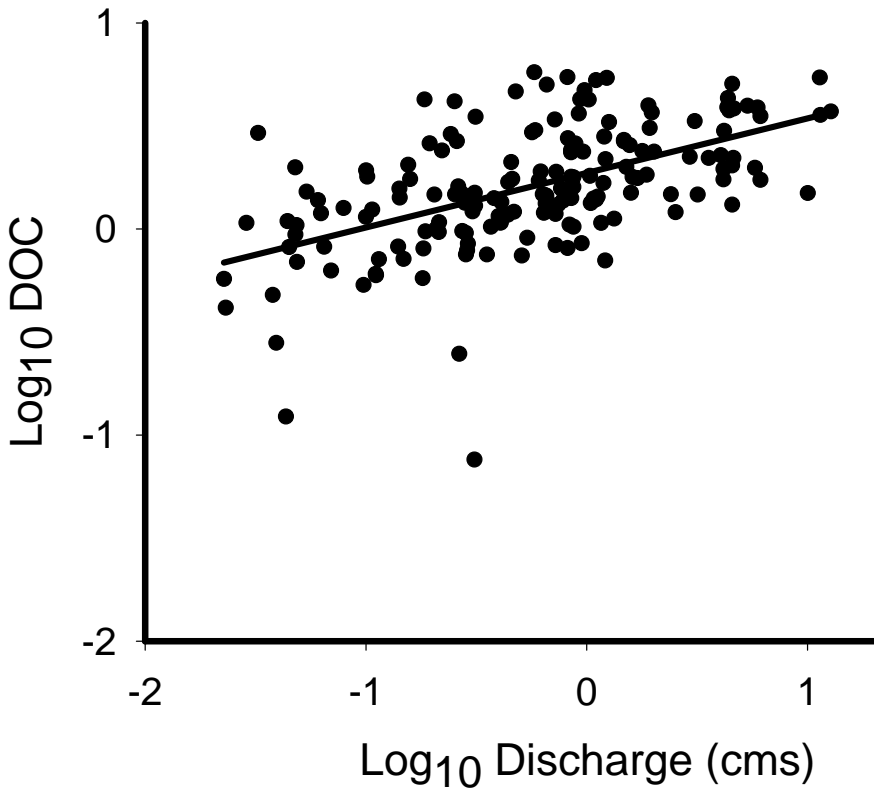
Field Monitoring

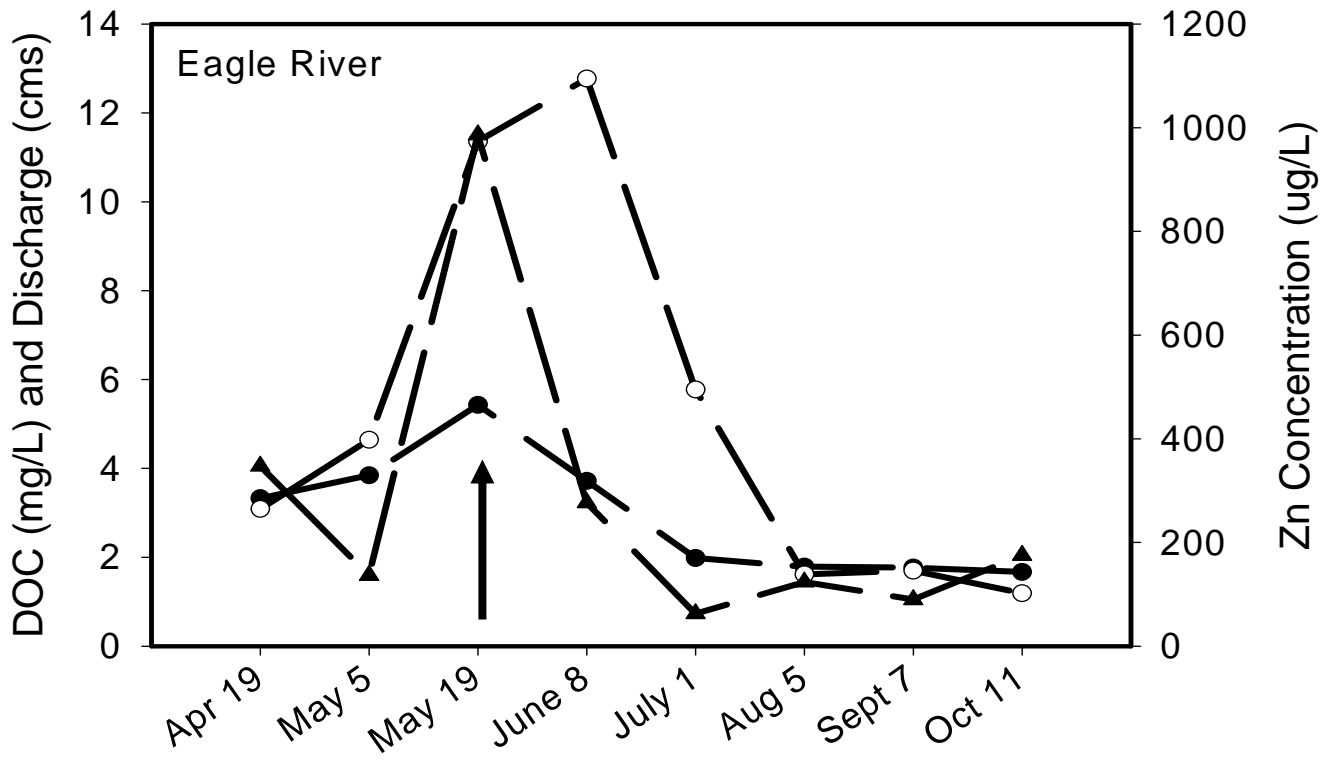
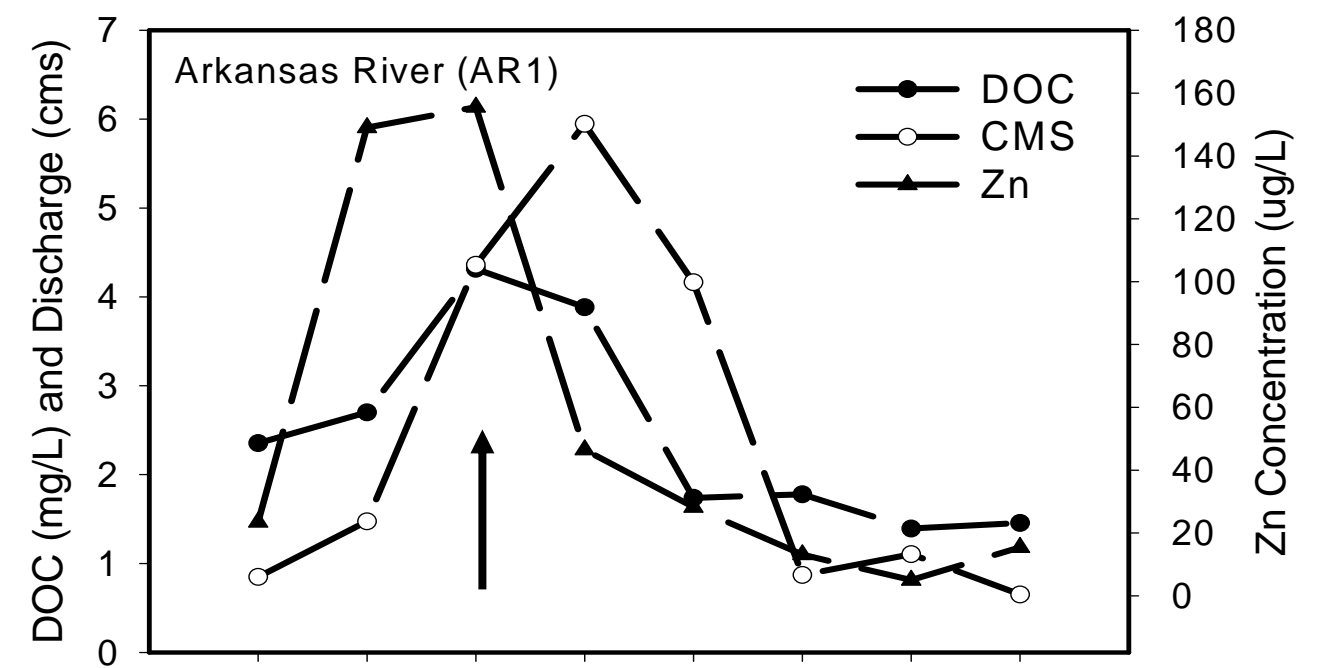


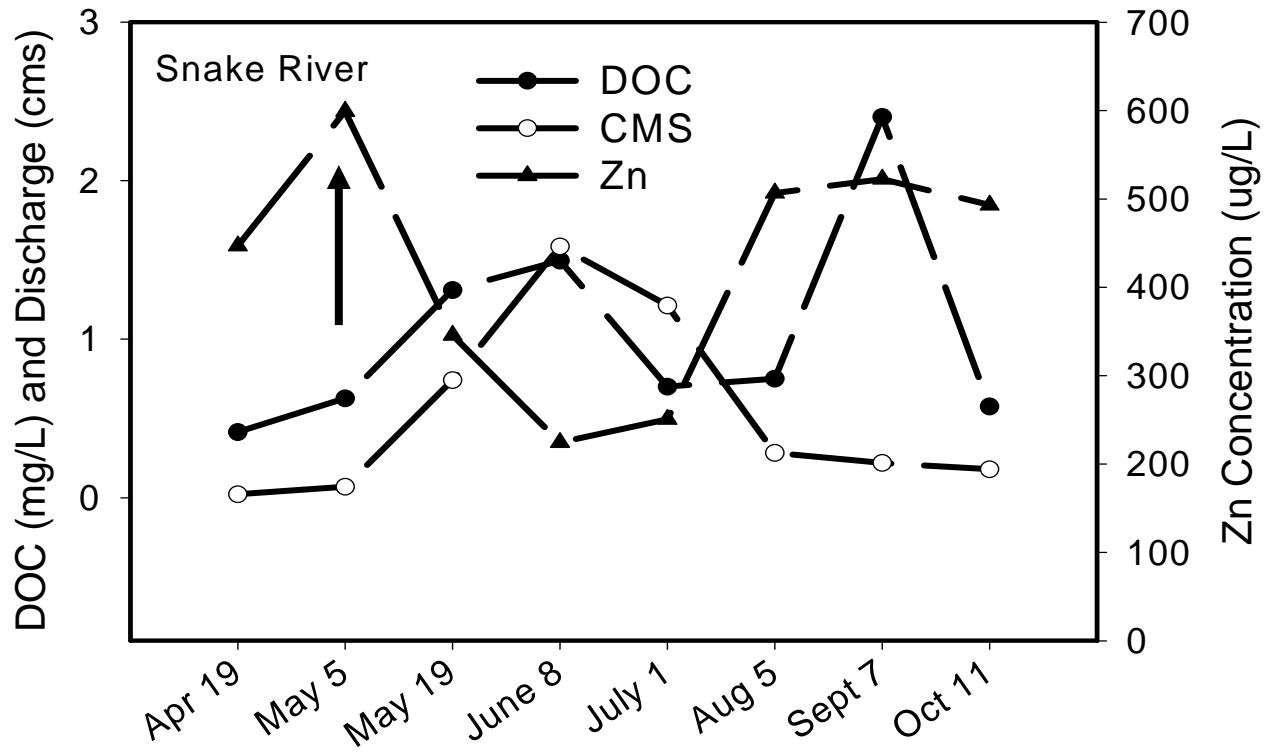
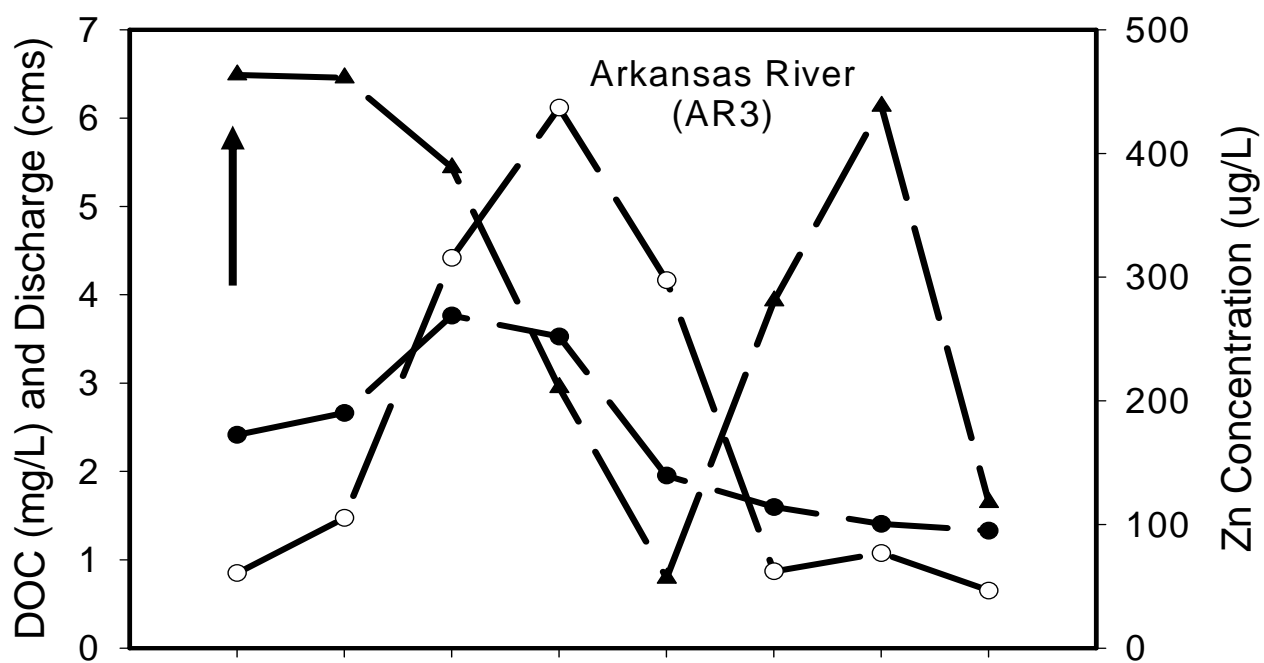
Mean Annual Concentration (mg/L)



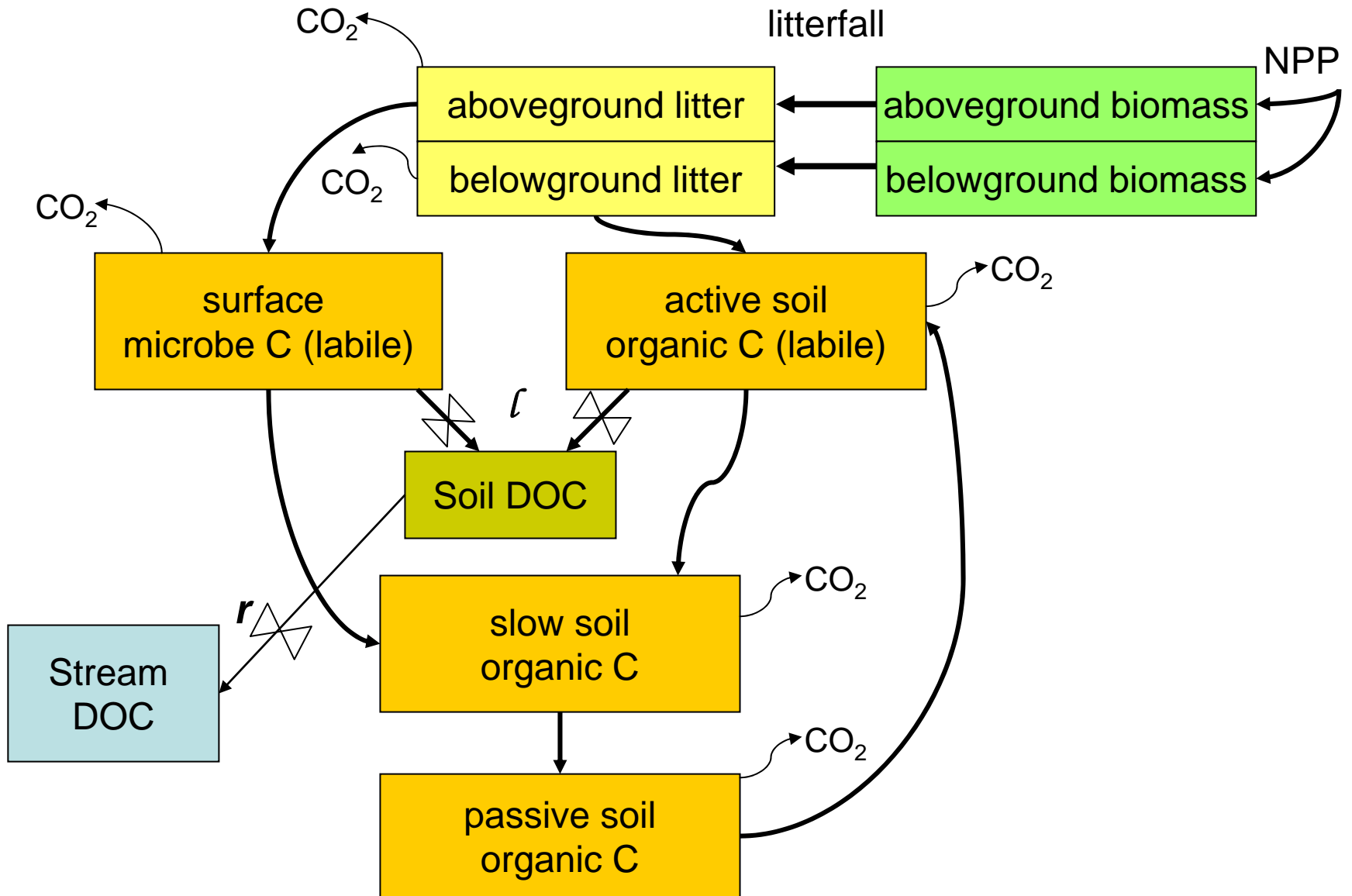
Influence of Stream Discharge and Vegetation on DOC



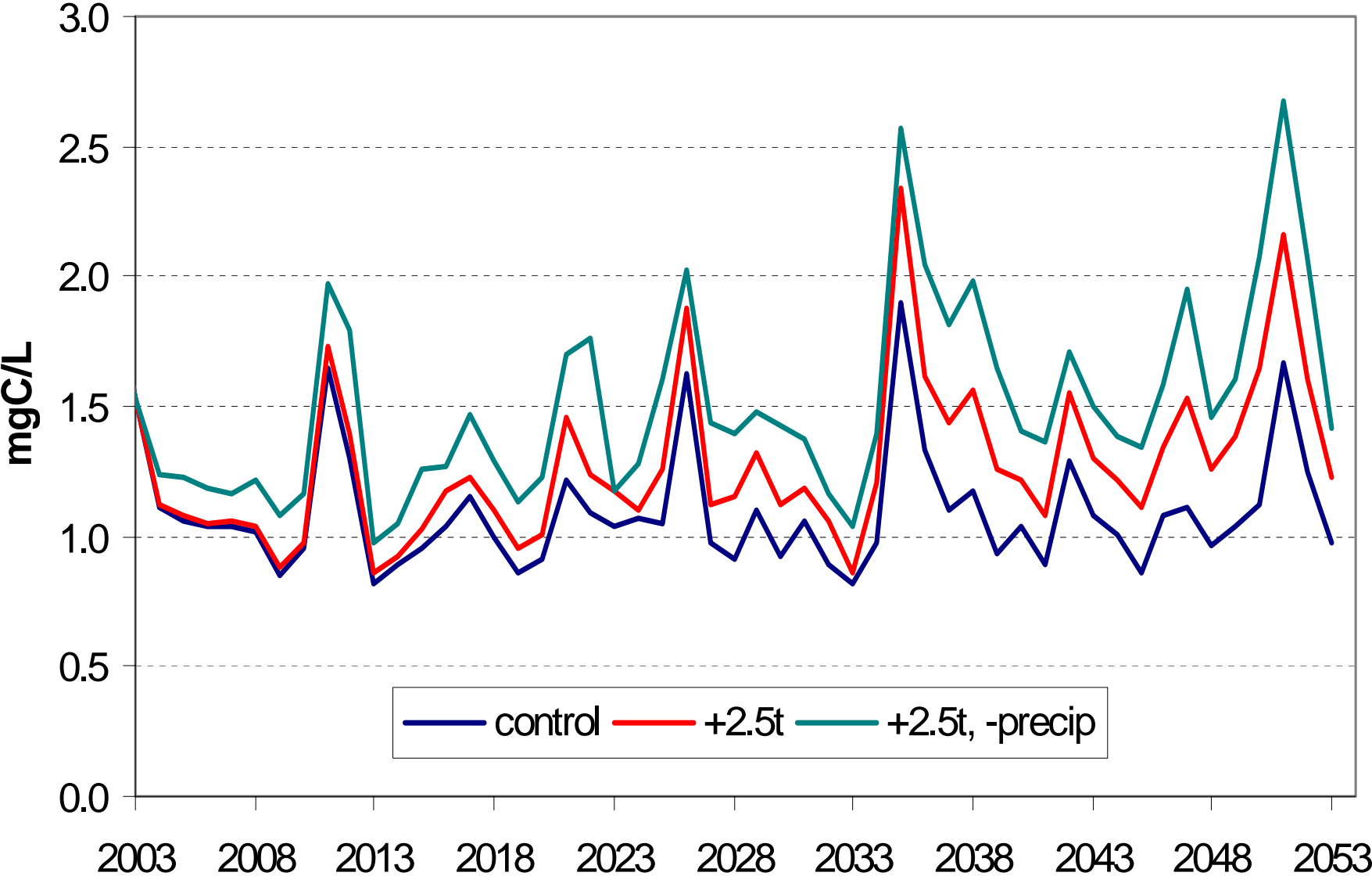




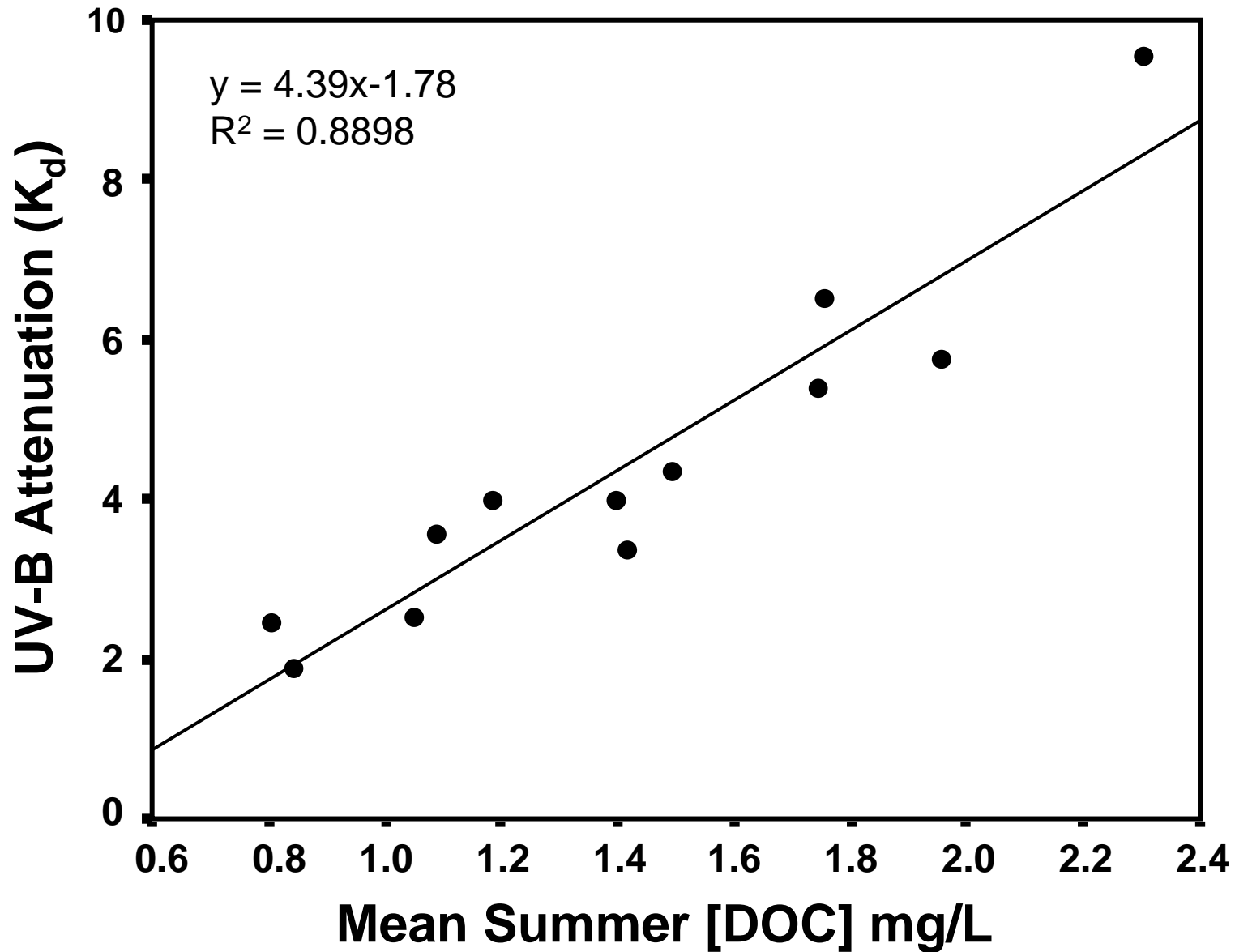
Daily CENTURY Organic C Pools



Predicted Changes in DOC based on Daily CENTURY Model for the Snake River Basin, CO

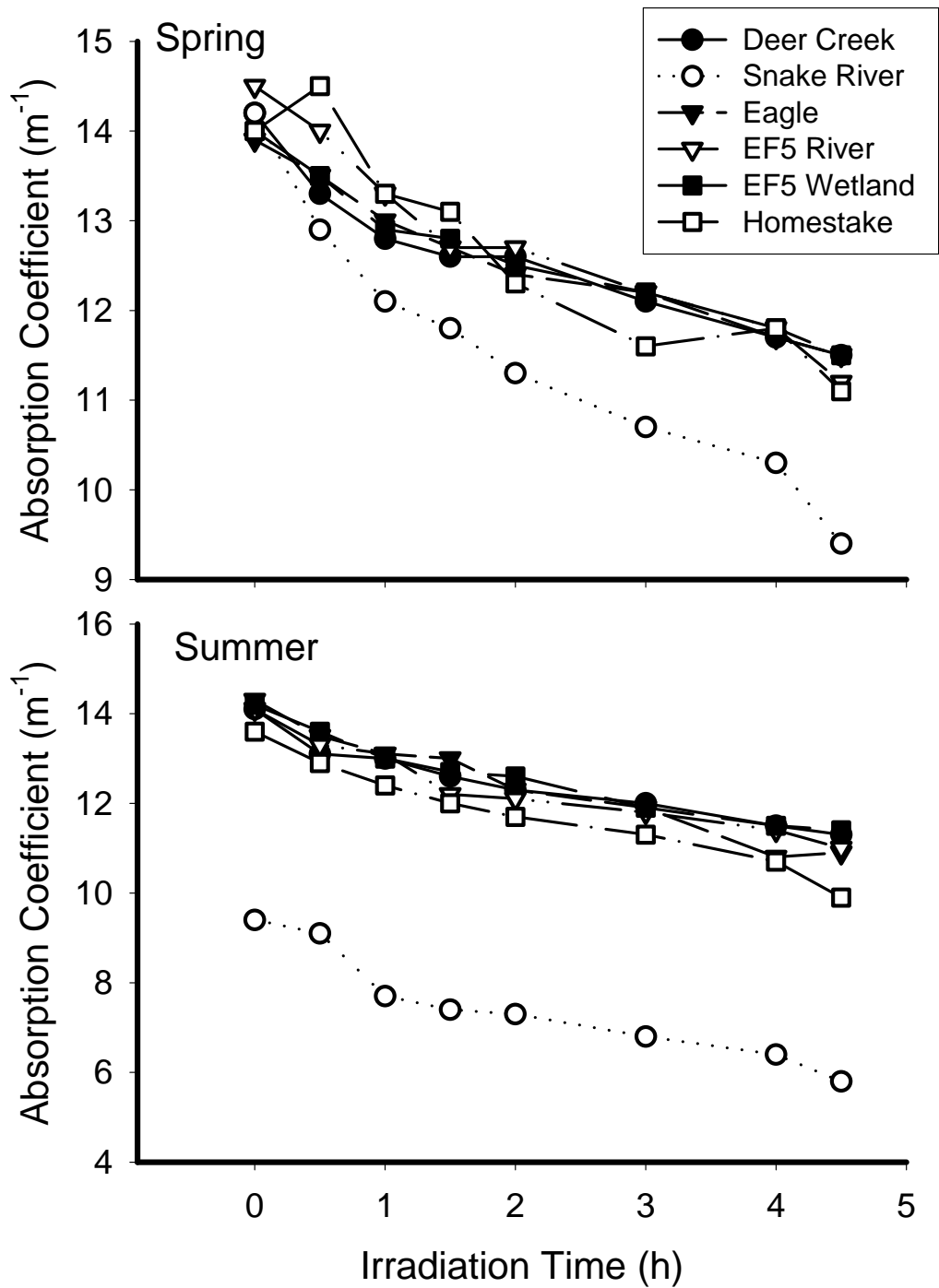


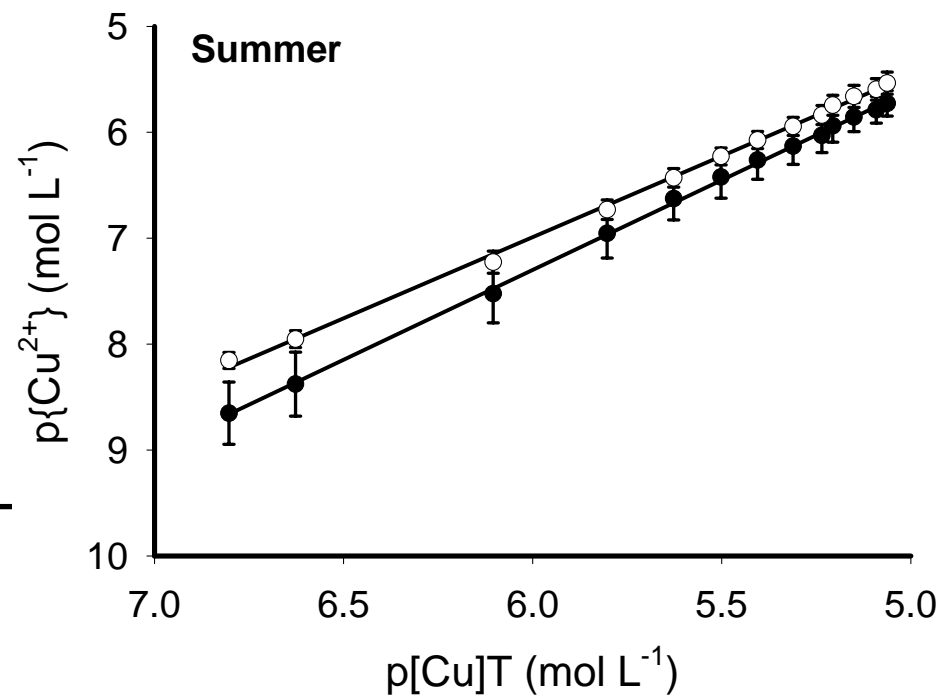
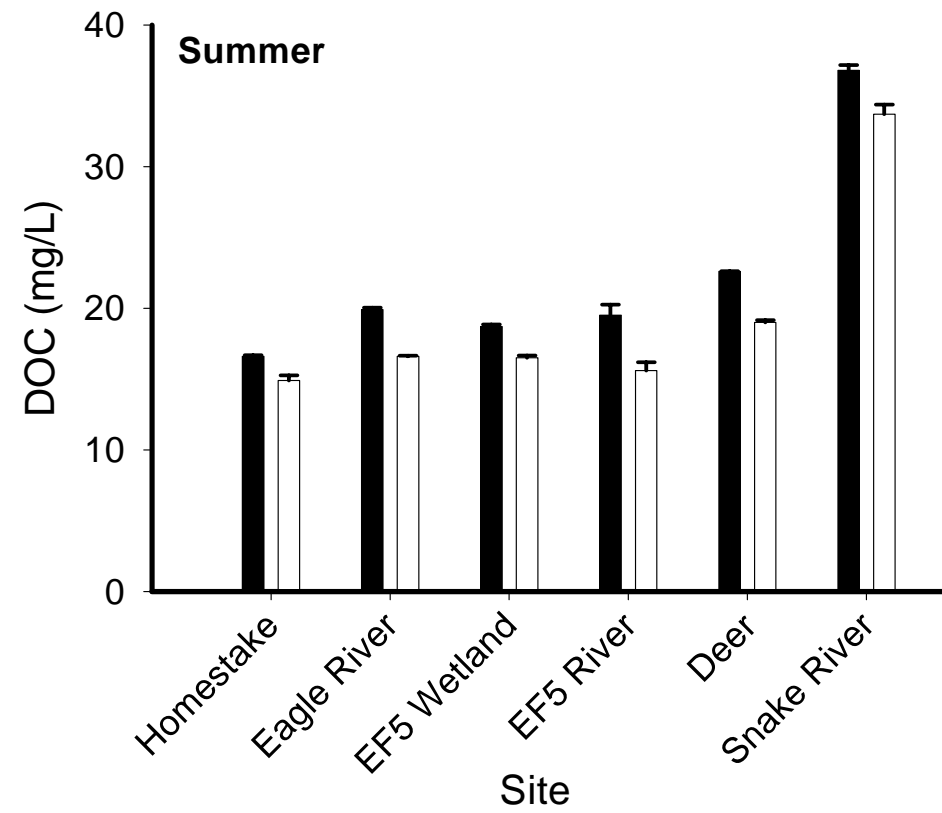
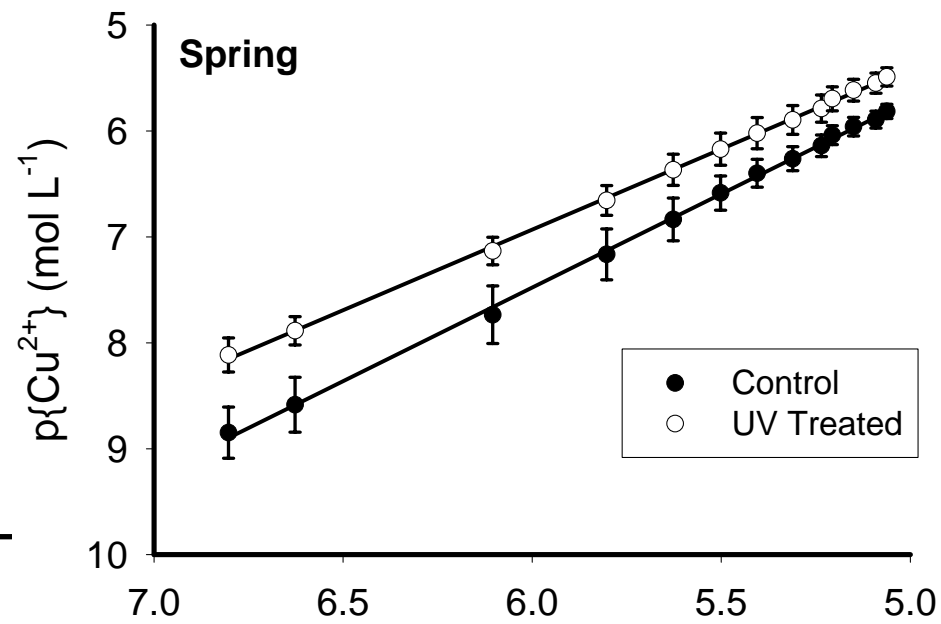
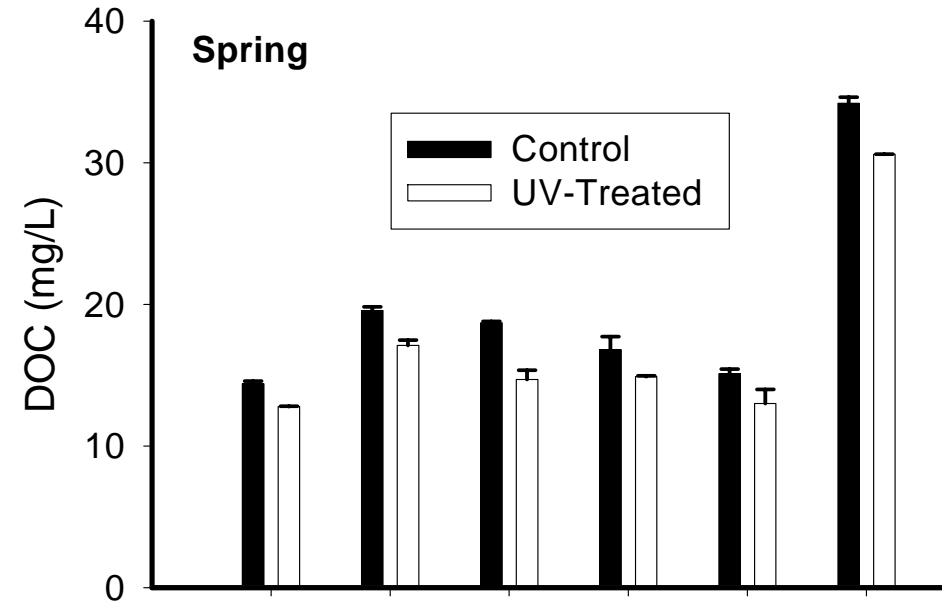
DOC and UV-b Attenuation



Relationship Between Measured and BLM-Predicted Metals in Caddisflies

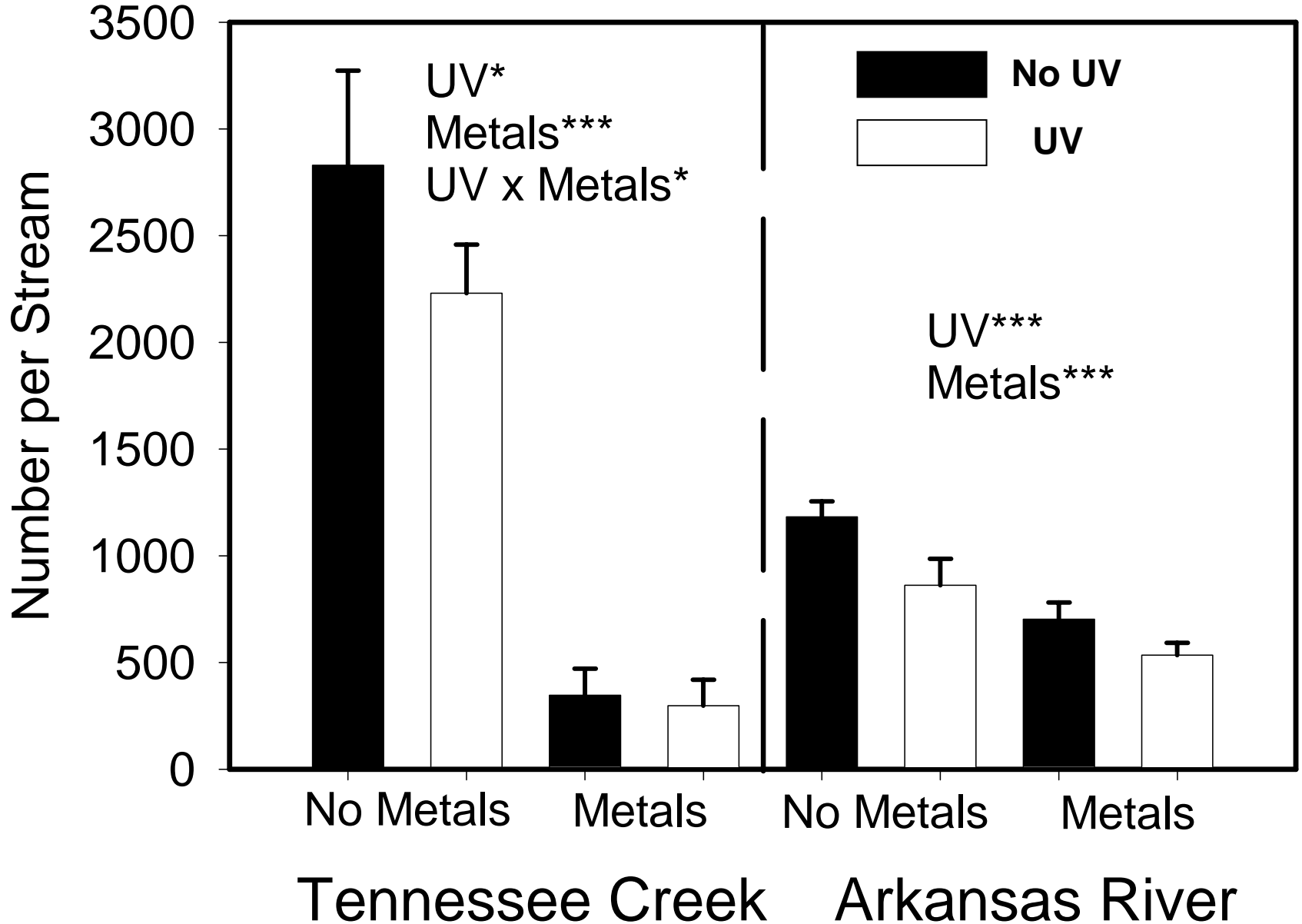
	Metal	F-value	r²
Spring	Zn	51.5***	0.77
	Cd	3.6	0.21
	Cu	4.9*	0.27
Fall	Zn	10.1**	0.50
	Cd	15.0**	0.60
	Cu	1.4	0.12

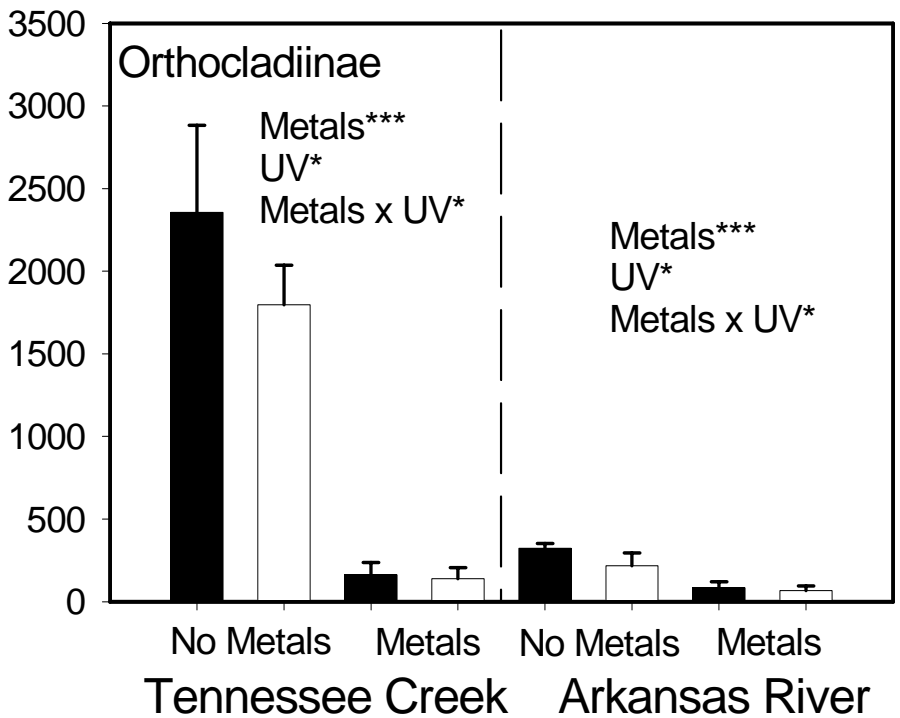
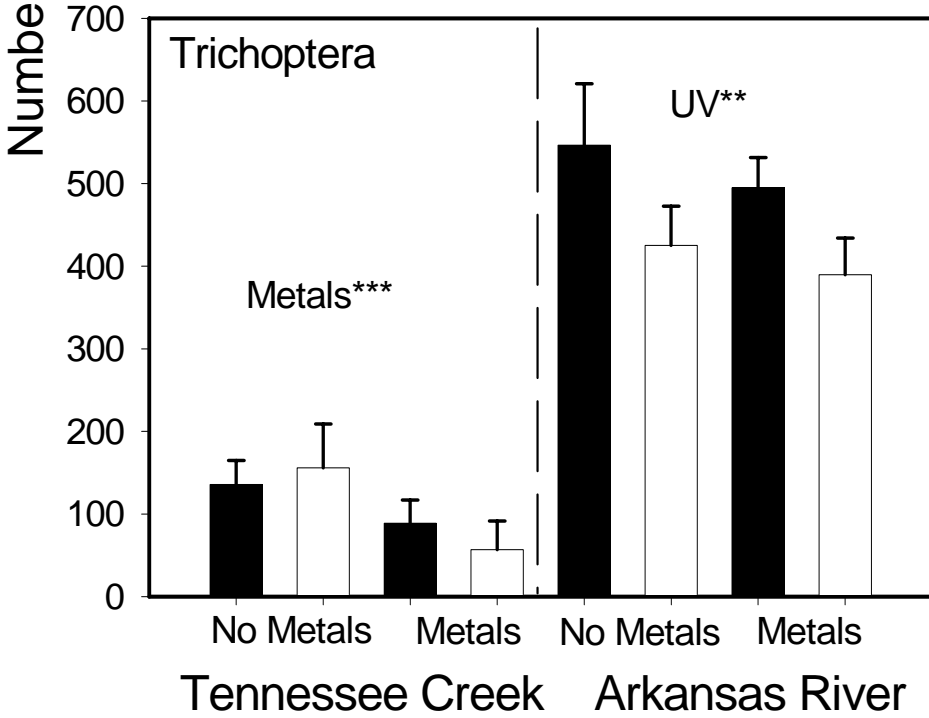
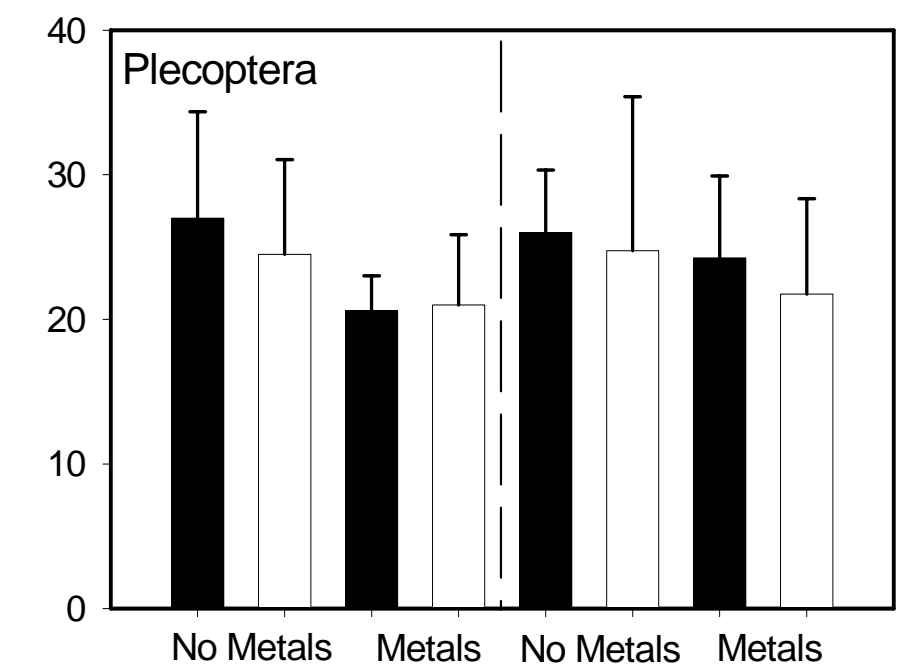
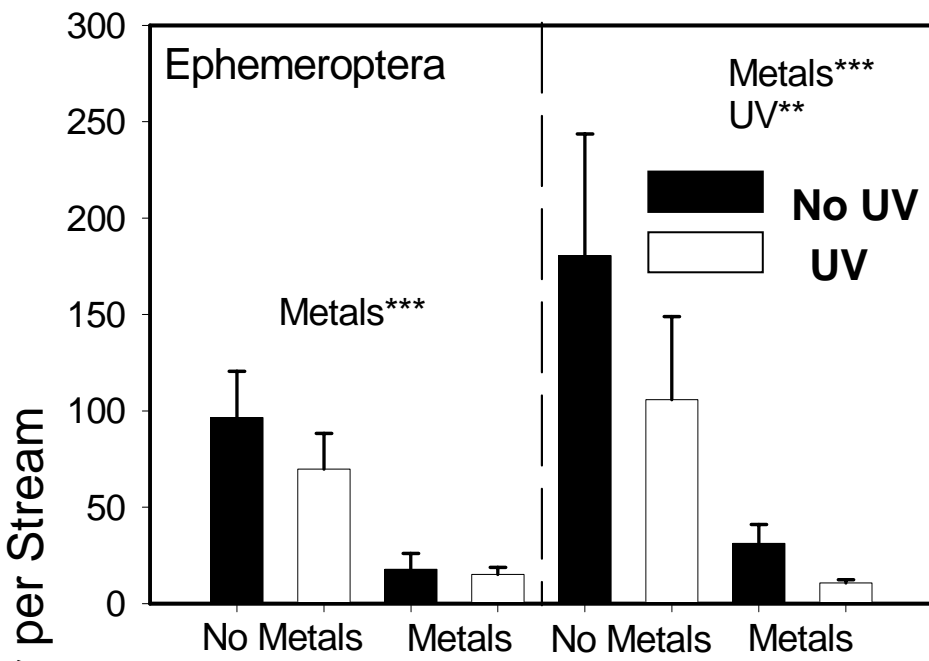


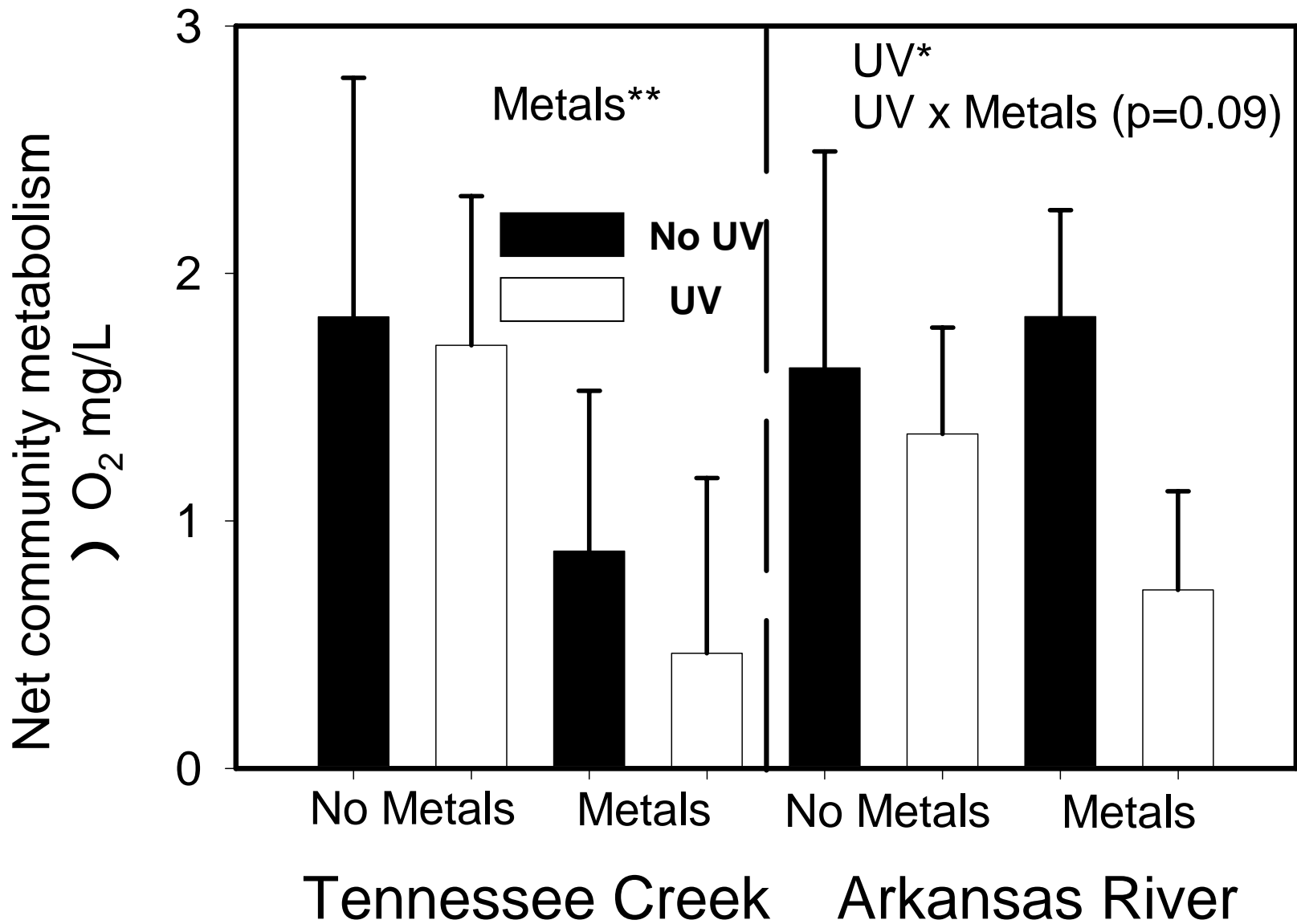


2003 Microcosm Experiments

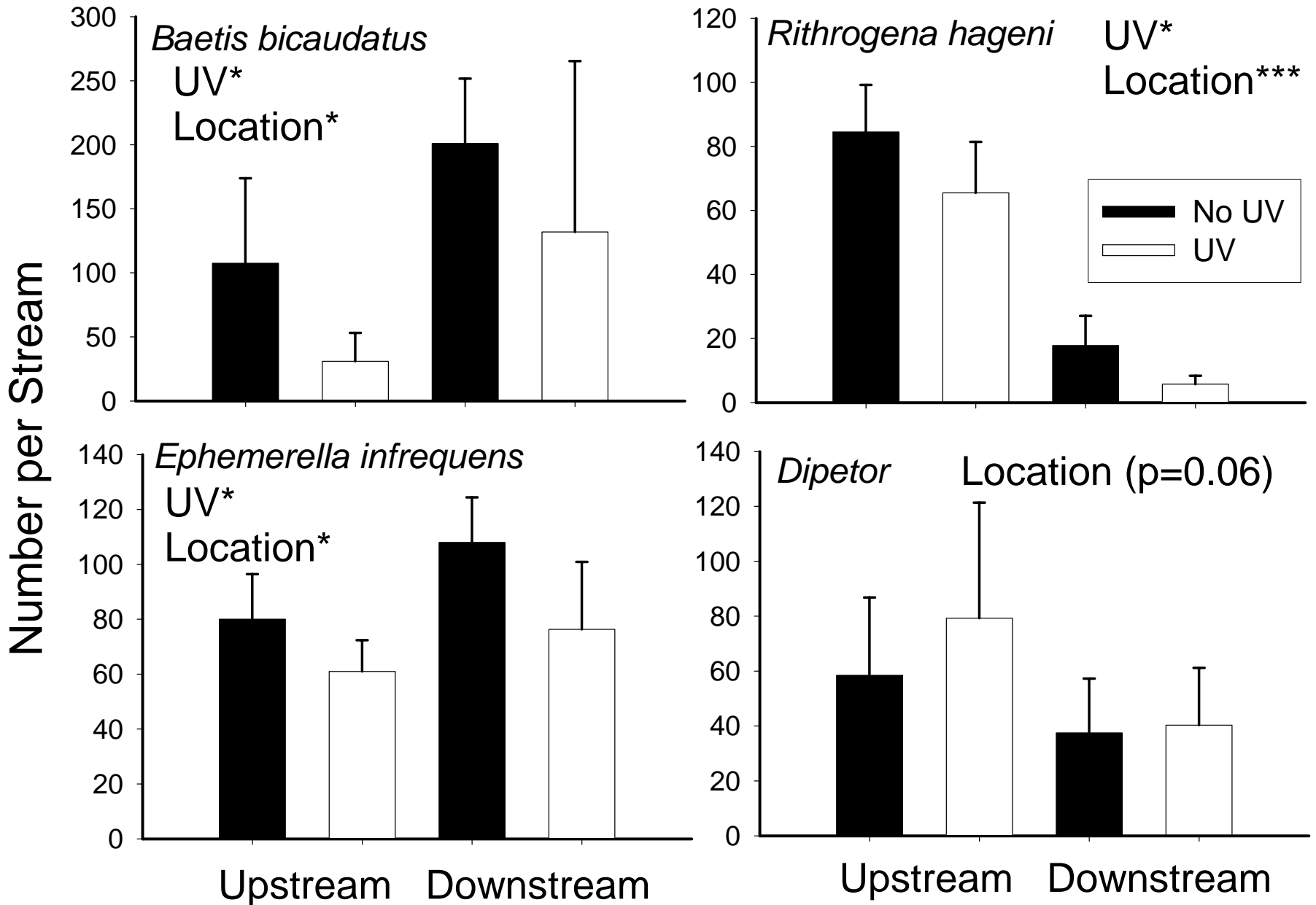
Total individuals



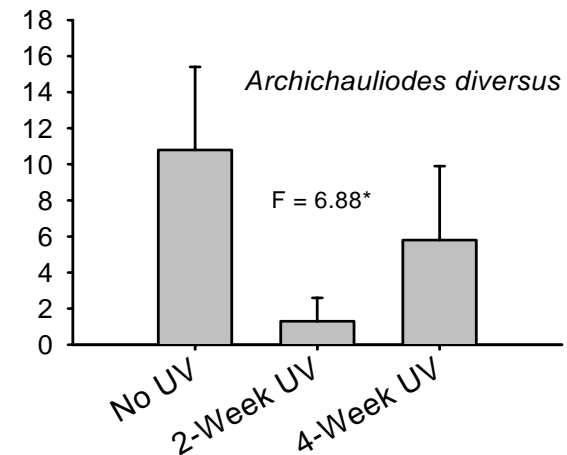
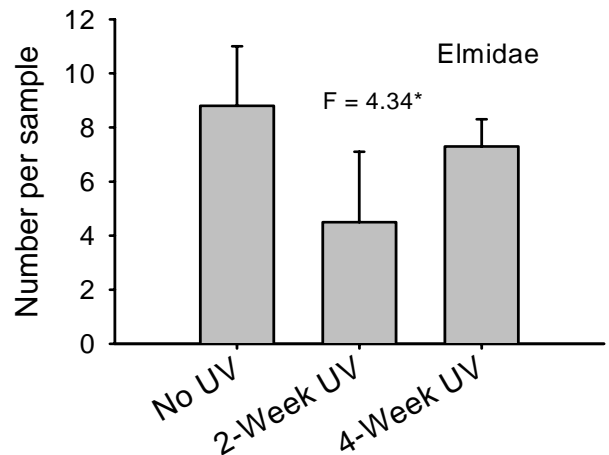
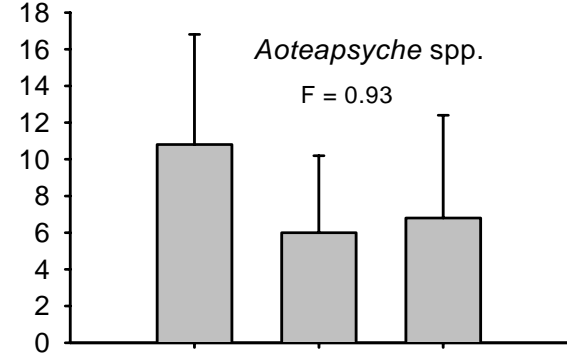
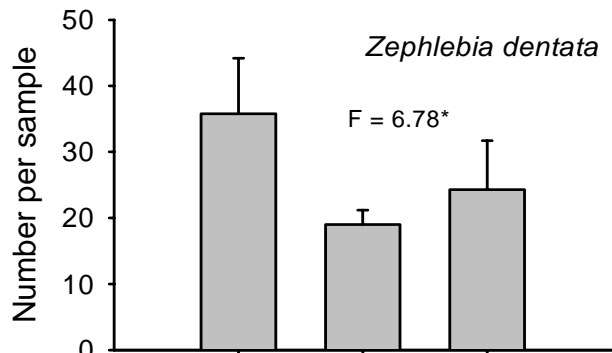
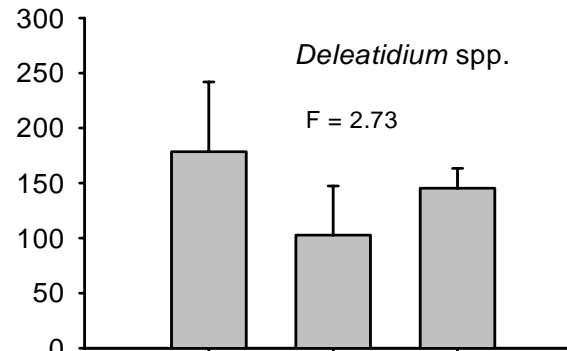
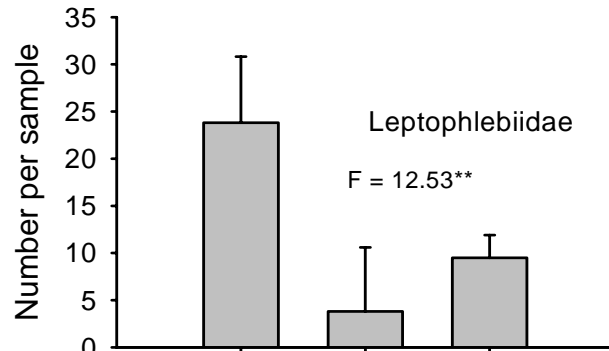




2004 Microcosm Experiment



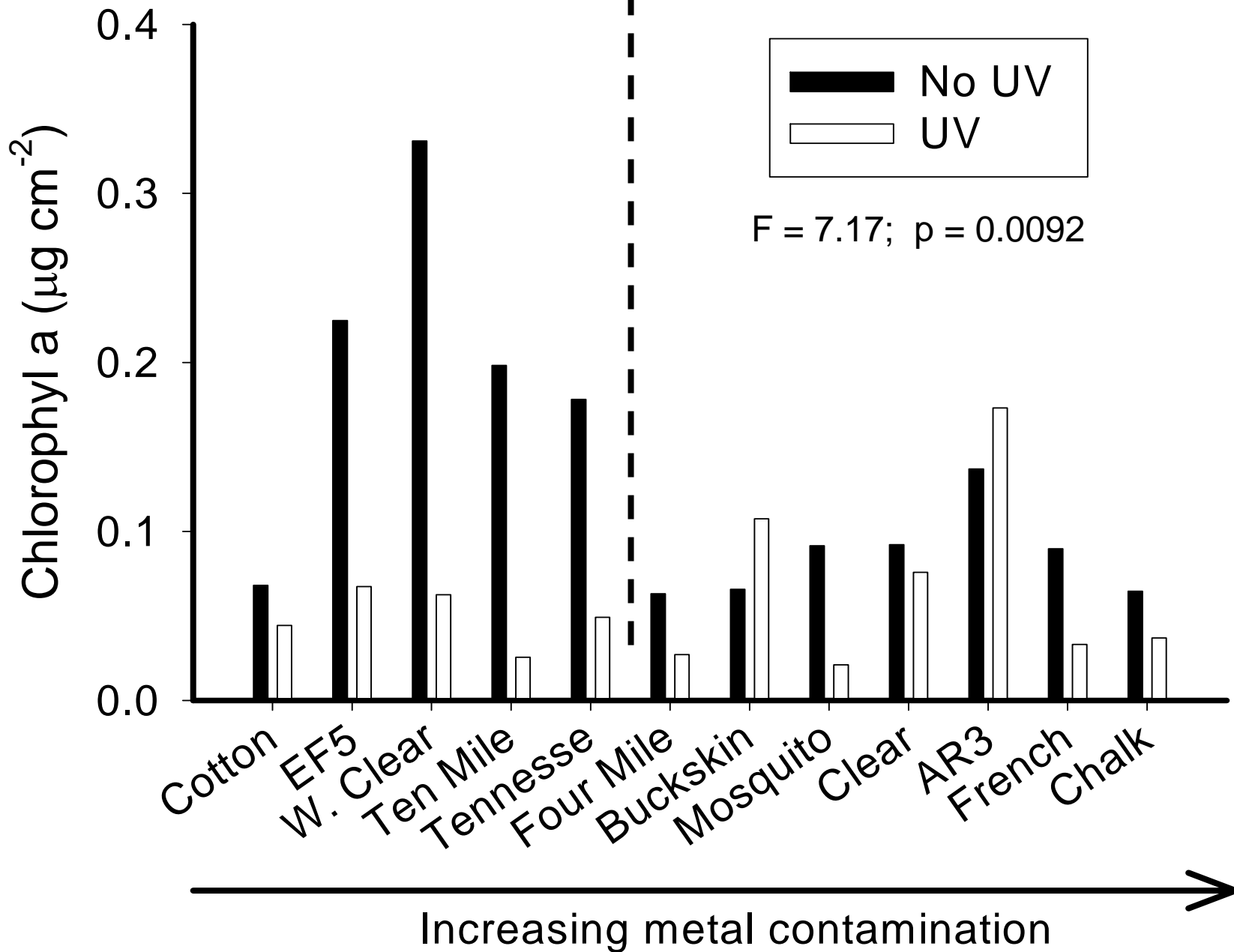
2005 New Zealand Experiments

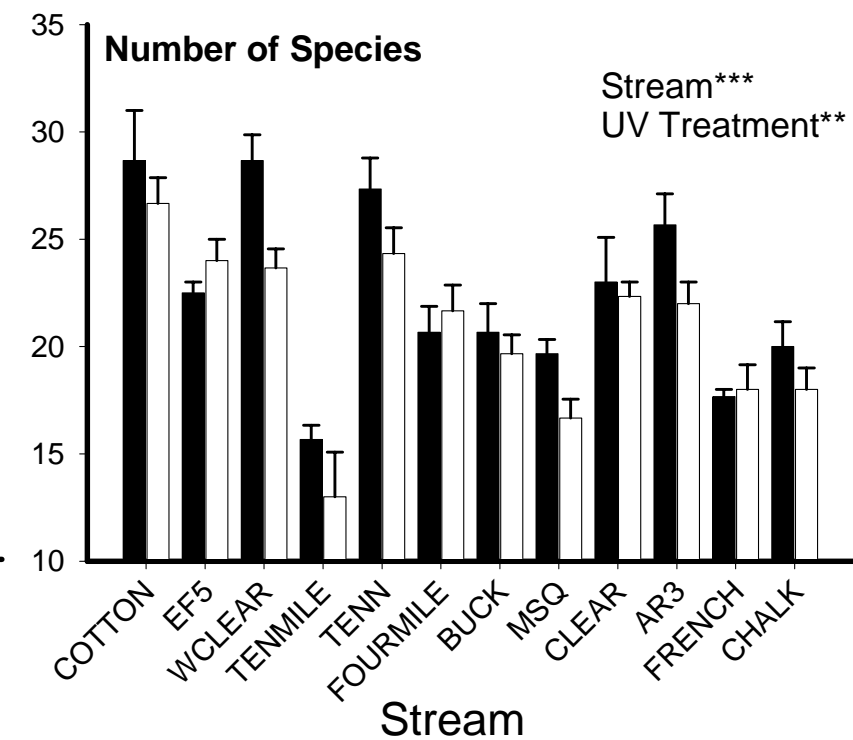
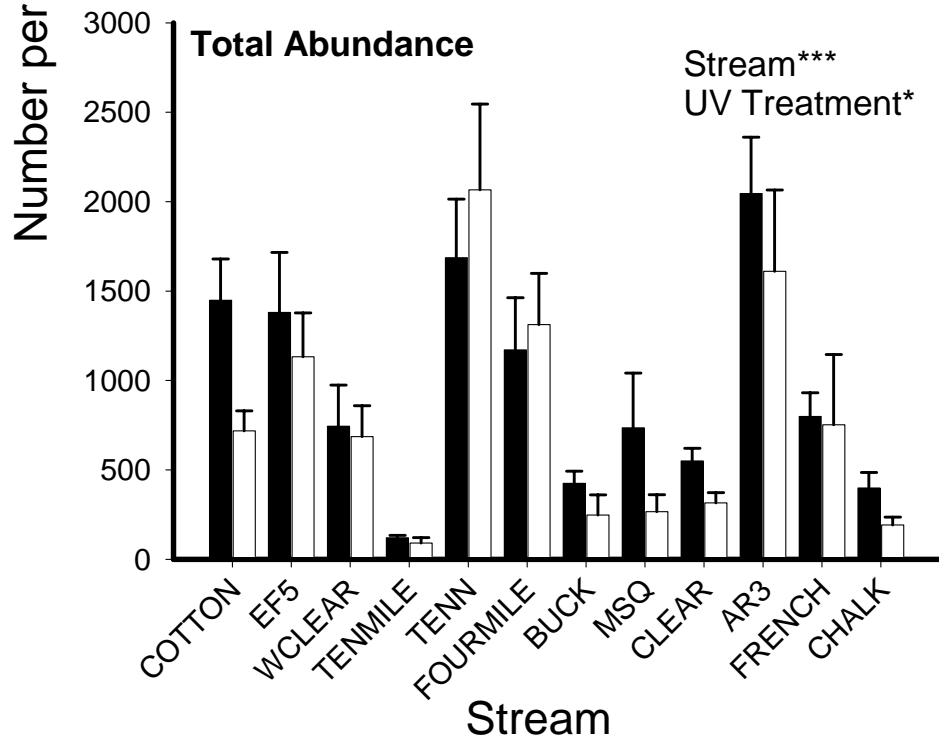
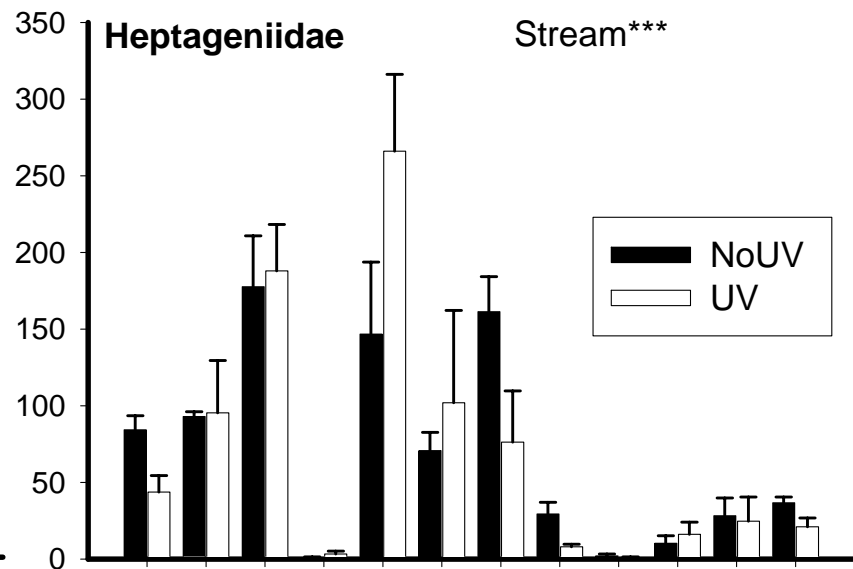
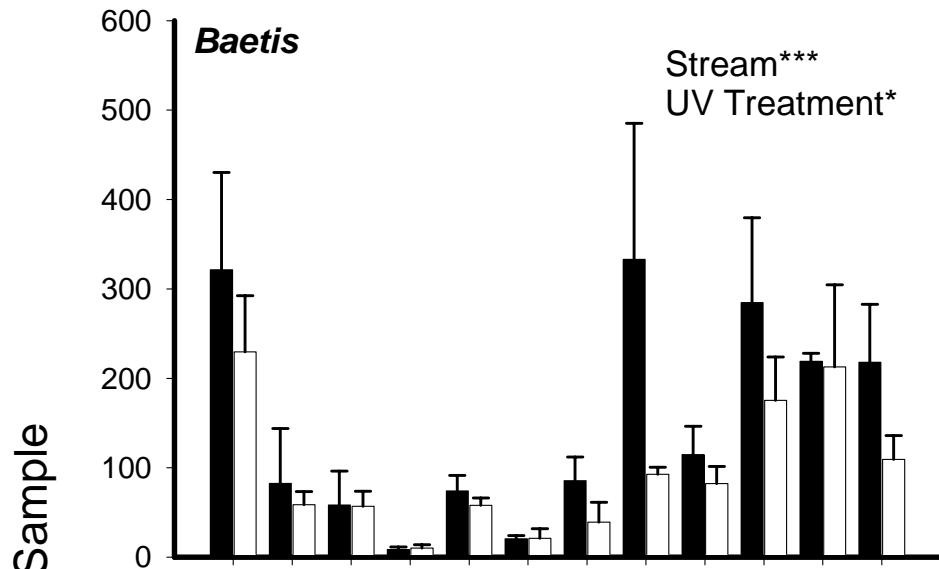


Conclusions from Microcosm Experiments

- Exposure to UV-B in stream microcosms reduced abundance of most organisms
→ consistent effects on grazing mayflies
- Combined effects of metals + UV-B were greater than either stressor alone
- Some evidence of greater UV effects on communities collected from metal-impacted sites

Field Experiments





Summary and Implications

- Benthic communities in shallow, alpine streams are exposed to intense UV-B
- Photodegradation of DOC increased UV-B exposure & metal bioavailability
- Removal of UV-B increased total abundance, number of species, and mayfly abundance
- Little evidence of differences in UV-B effects along the gradient of metal contamination

Future Plans

Continue to refine Daily-Century model to predict potential impacts of climate change and hydrology on DOC

Evaluate effects of changes in timing of snowmelt on DOC, light attenuation, and metal bioavailability



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