

COLORADO RIVER BENTHIC FOODBASE STUDIES IN GLEN AND GRAND CANYONS

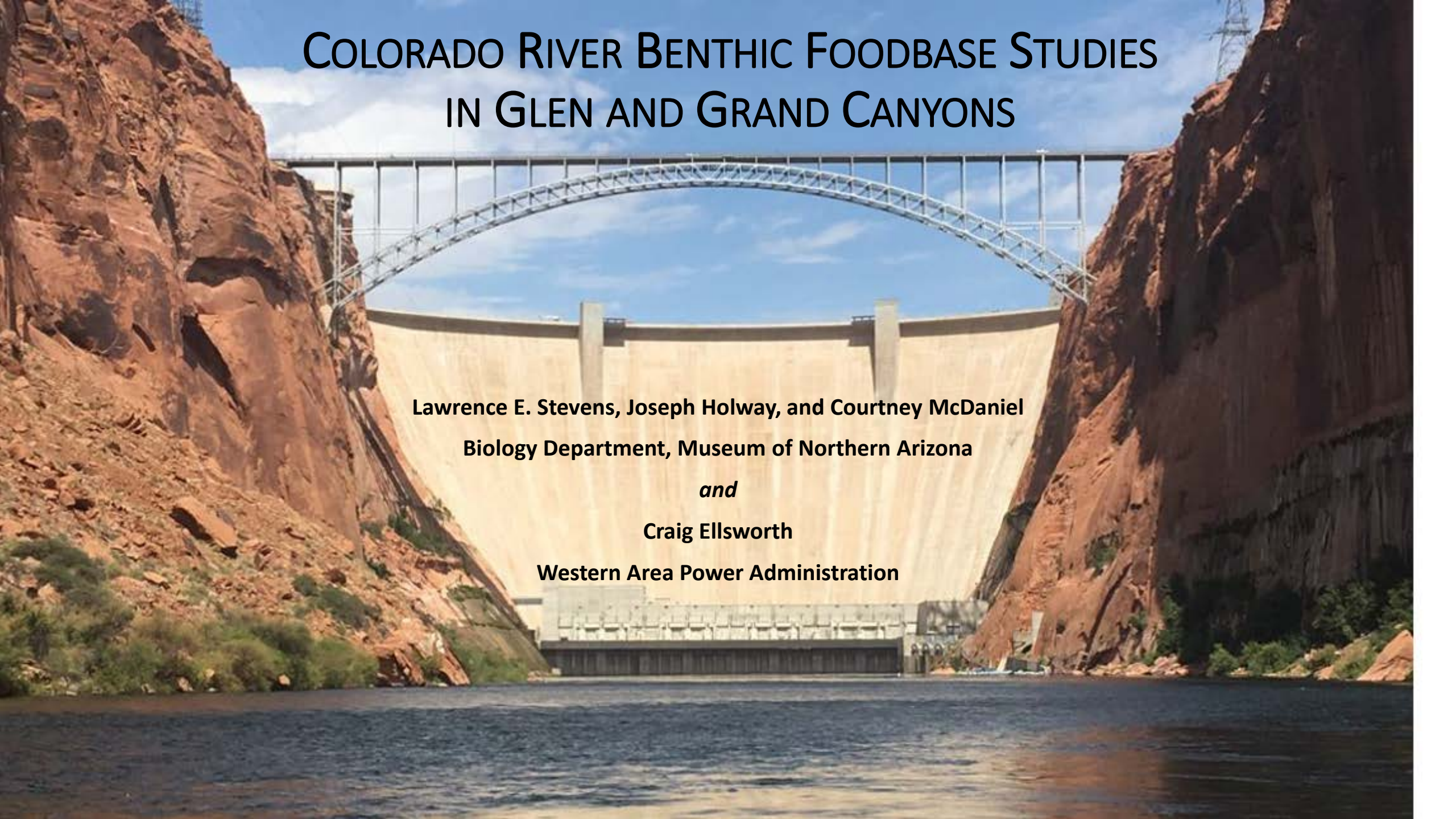
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and

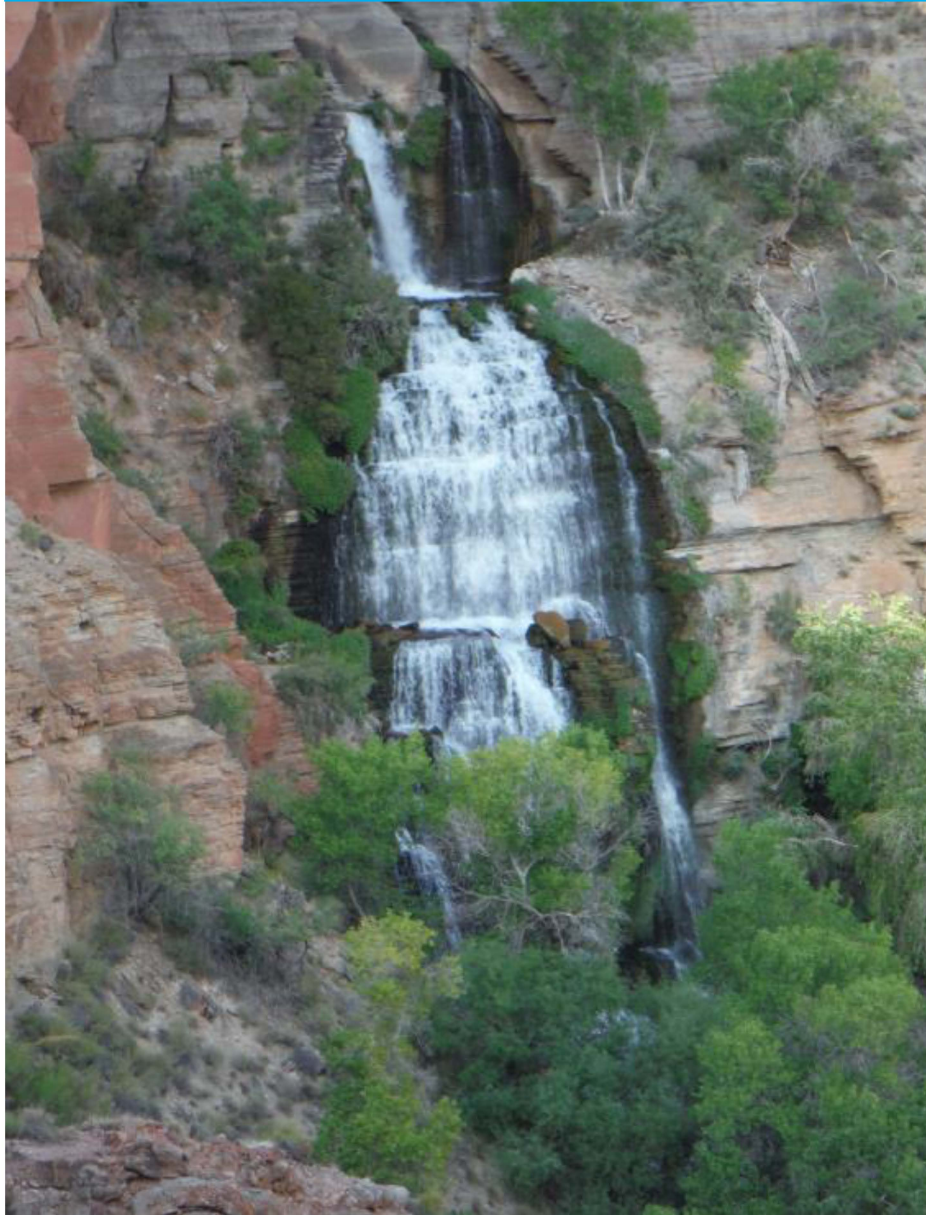
Craig Ellsworth

Western Area Power Administration



Colorado River Aquatic Foodbase at the Mouth of Tapeats Creek, Grand Canyon National Park, Arizona

L.E. Stevens, J.H. Holway, and C. Ellsworth



WHY TAPEATS CREEK?

Hofgnecht Transition (1981):

- Difference in BMI diversity between tributary and mainstream (esp. EPT)
- Marked riverward decline in species richness at stream confluences in Grand Canyon

Tapeats Creek is a water quality analog to Glen and Grand Canyons

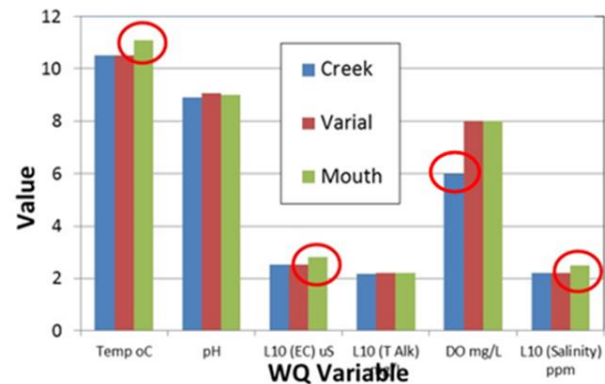
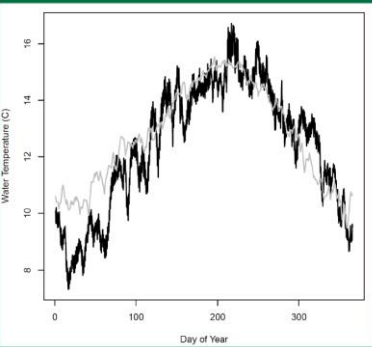
Question:

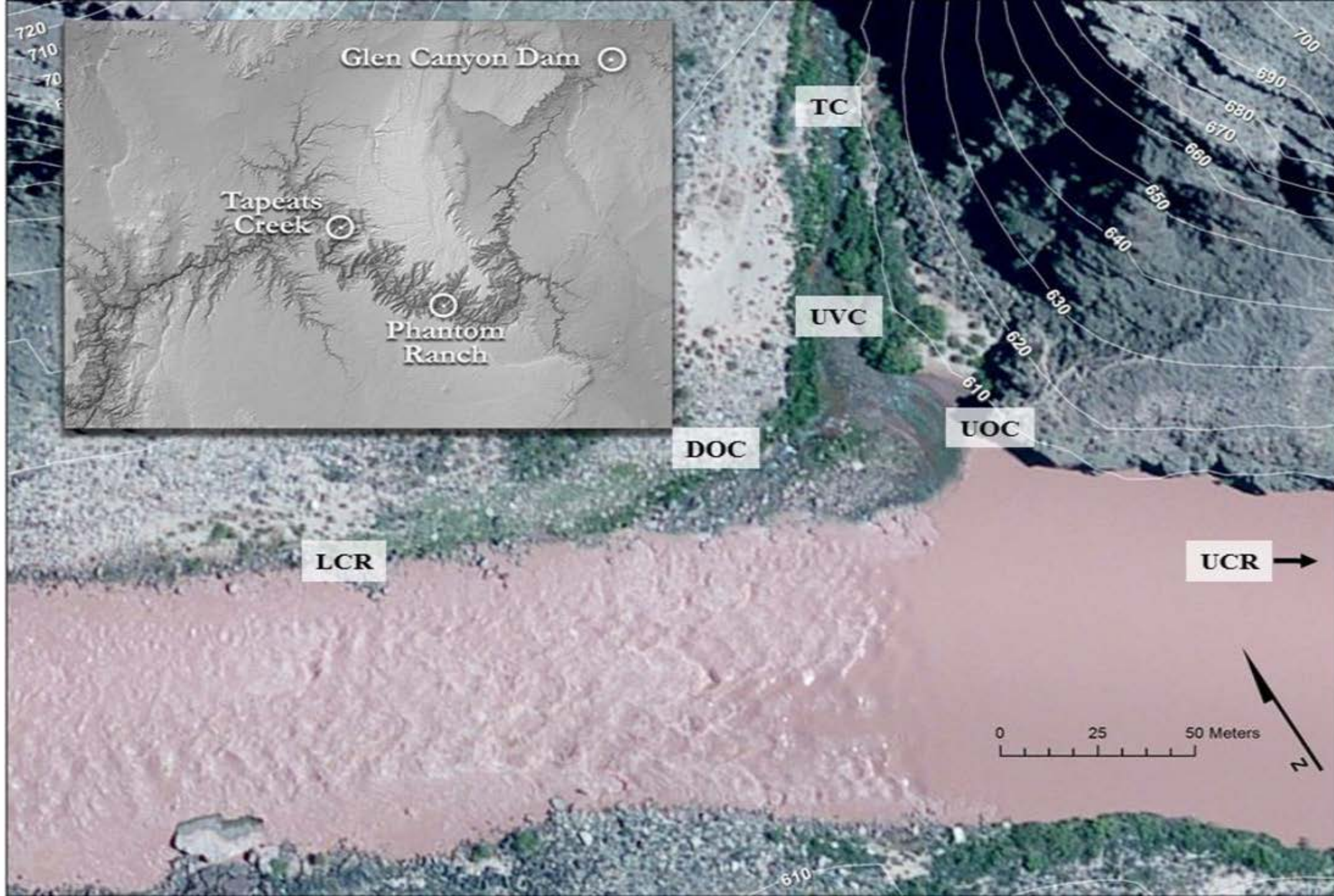
Can the rich BMI assemblage of Tapeats Creek be recreated in the regulated Colorado River tailwaters below Glen Canyon Dam?

■ Tapeats Creek:
7 genera caddisfly
3 genera mayfly
1 genera stonefly

Why haven't these species colonized the mainstream??

Temperature can't be the only bottleneck







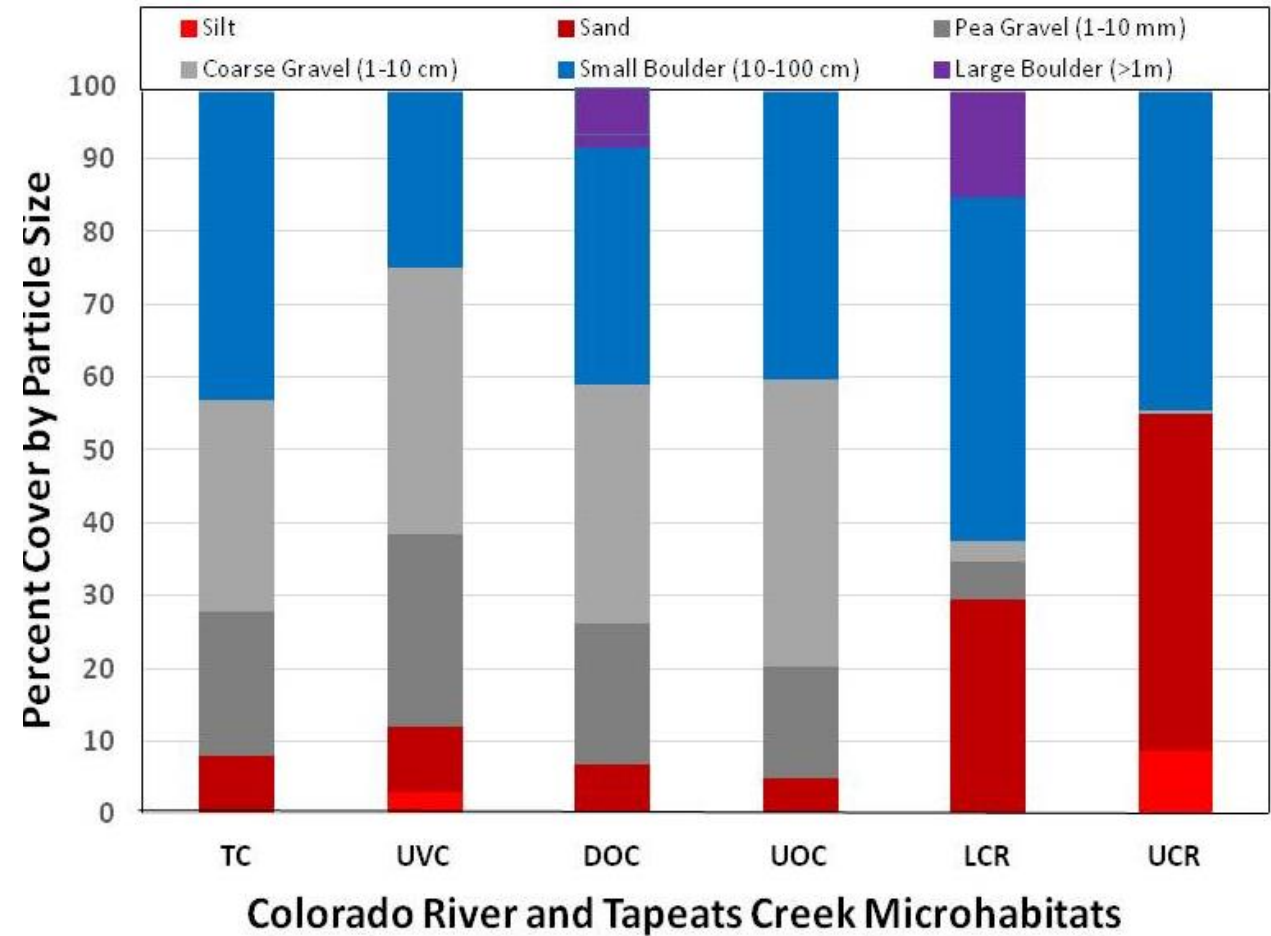
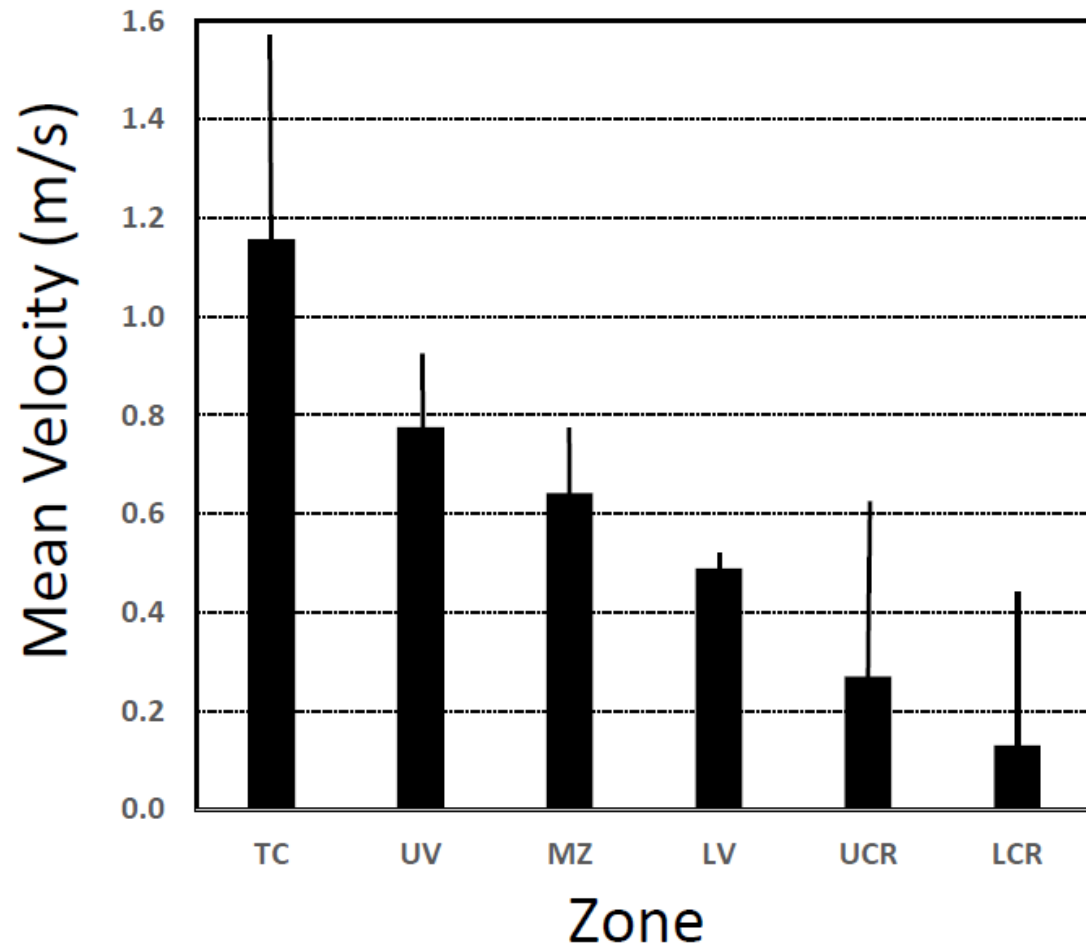
Hess, drift, and experimental basket sampling to evaluate seasonality, water quality, flow variation, sedimentation, and habitat on benthic macroinvertebrates (BMI)

June-July transition Upper Outflow Channel (2017)

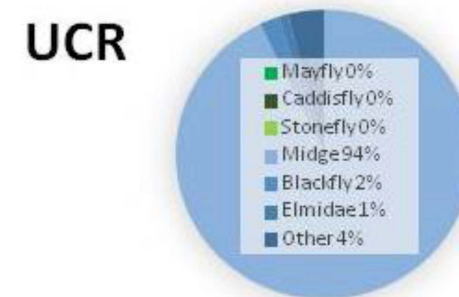
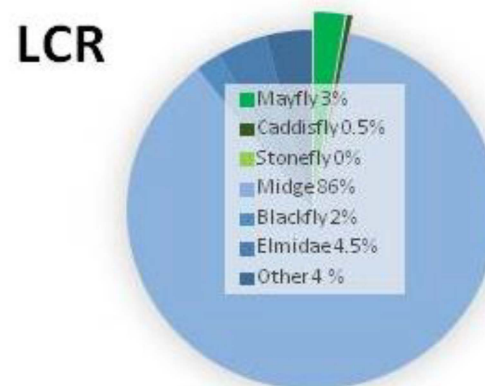
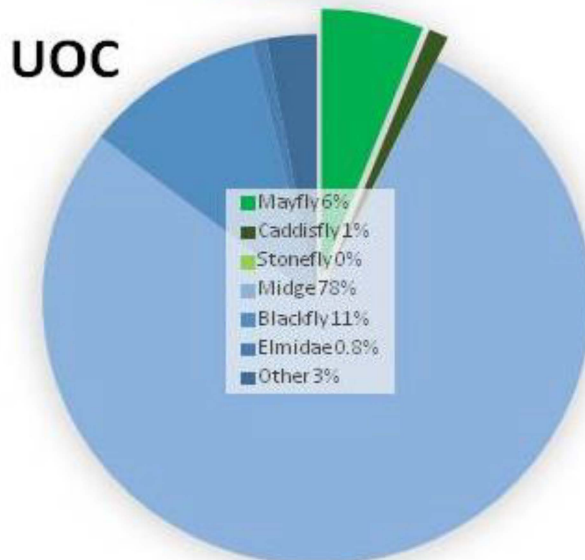
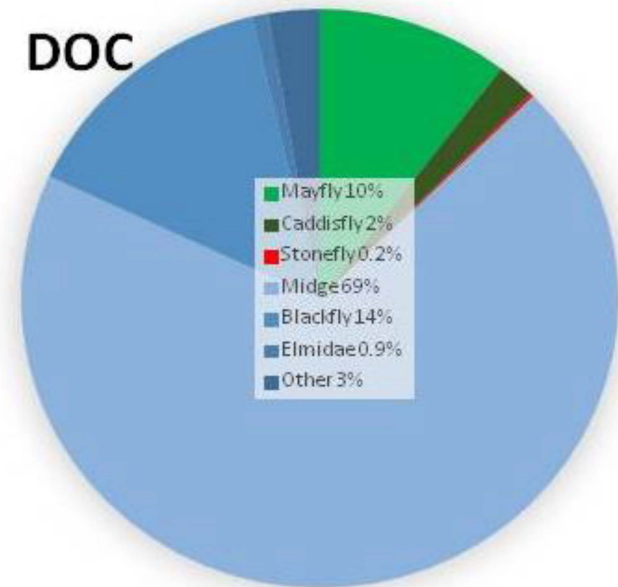
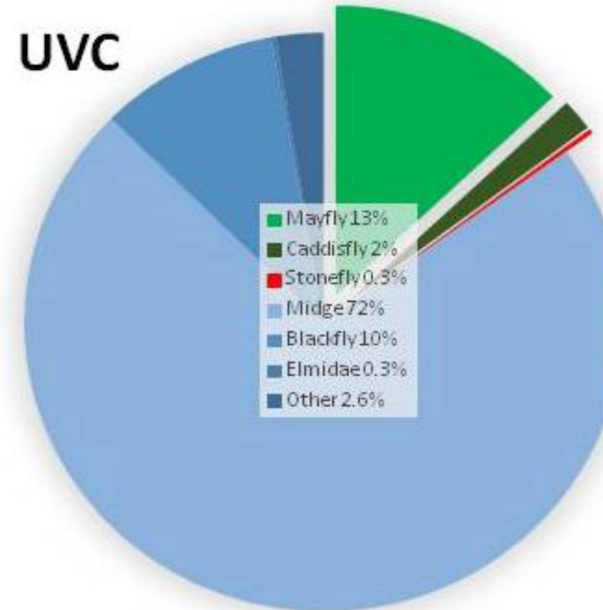
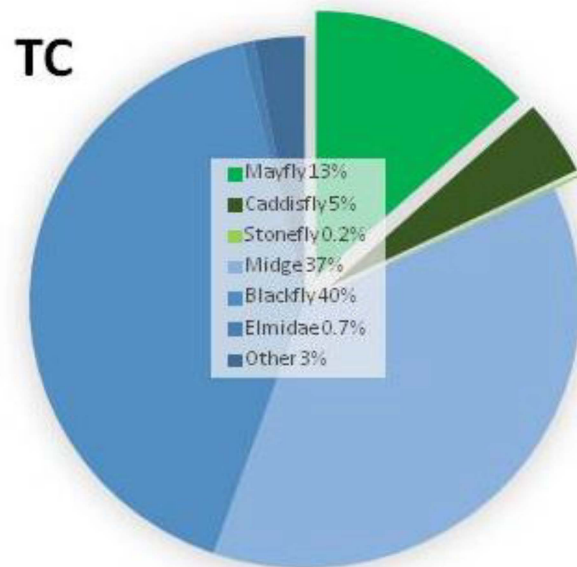
Low (~8,000 cfs) vs High (~17,000 cfs)



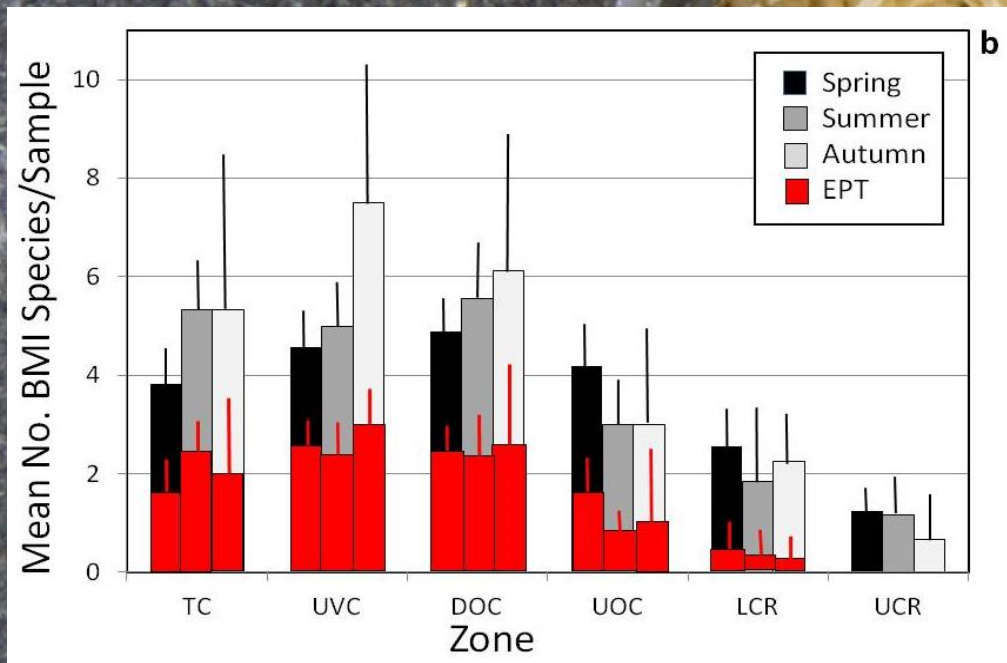
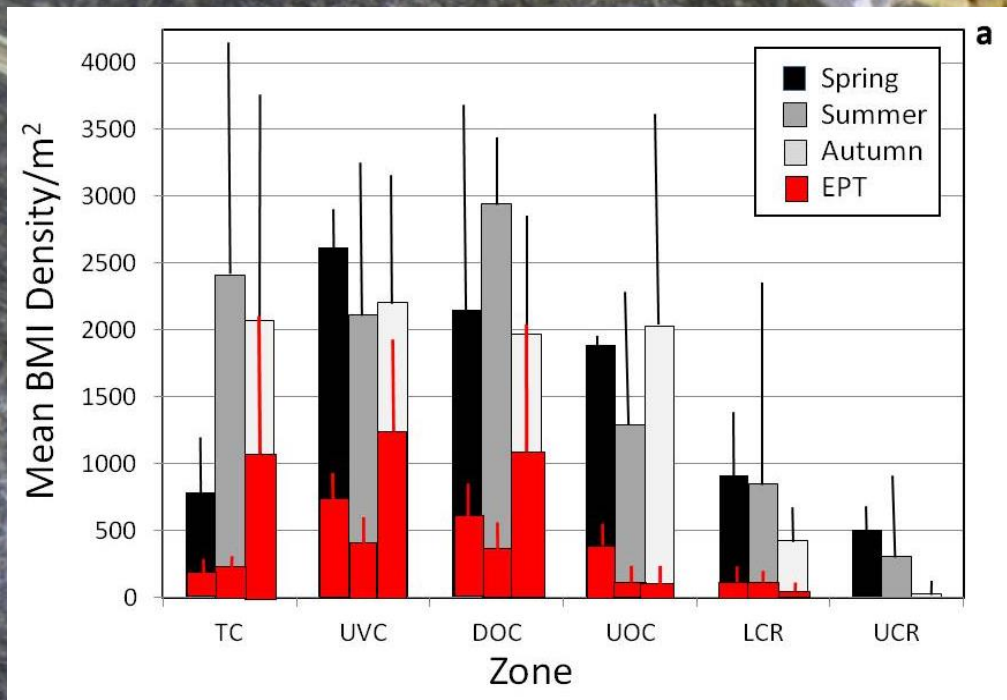
Mean Velocity and Substrate Among Zones



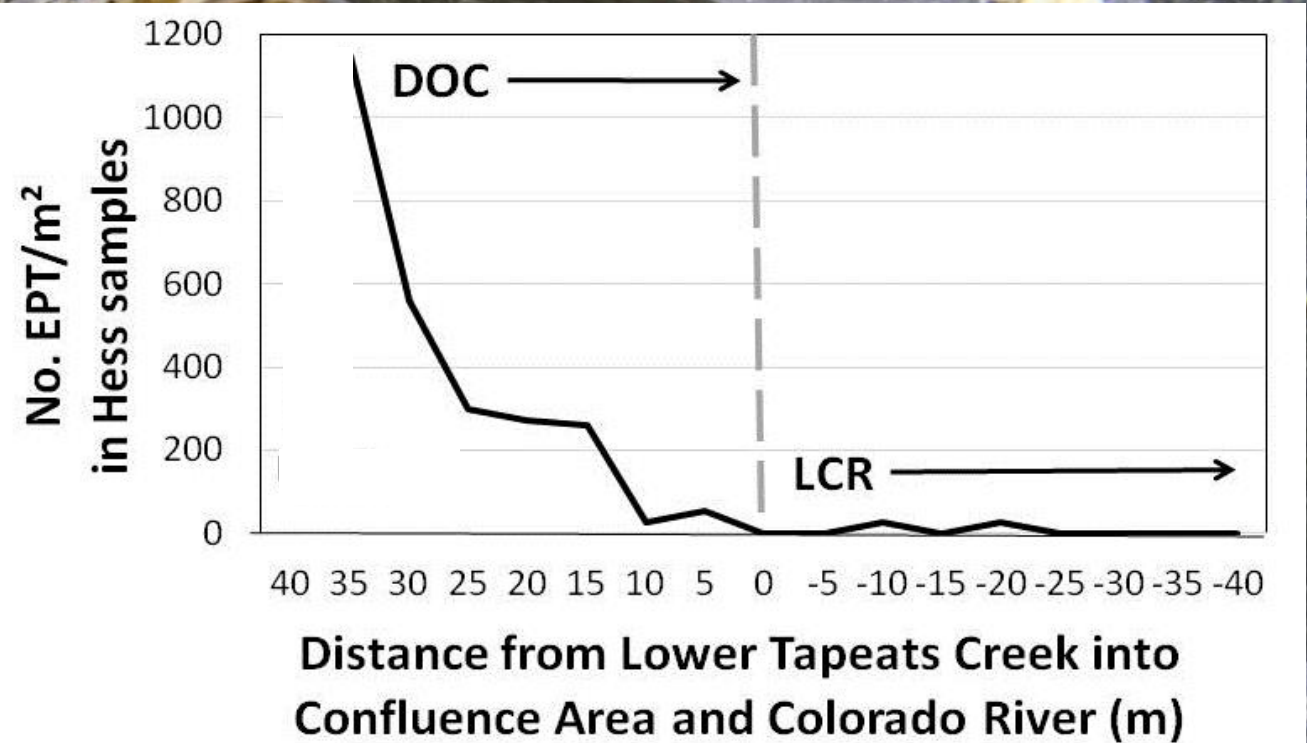
BMI Composition and Abundance Decreases Strongly from Tapeats Creek to the Mainstream



Circle size reflects density/m²



Spatial Variation of BMI Among Zones



Tapeats Creek benthos (TC/UVC/DOC): Little embeddedness



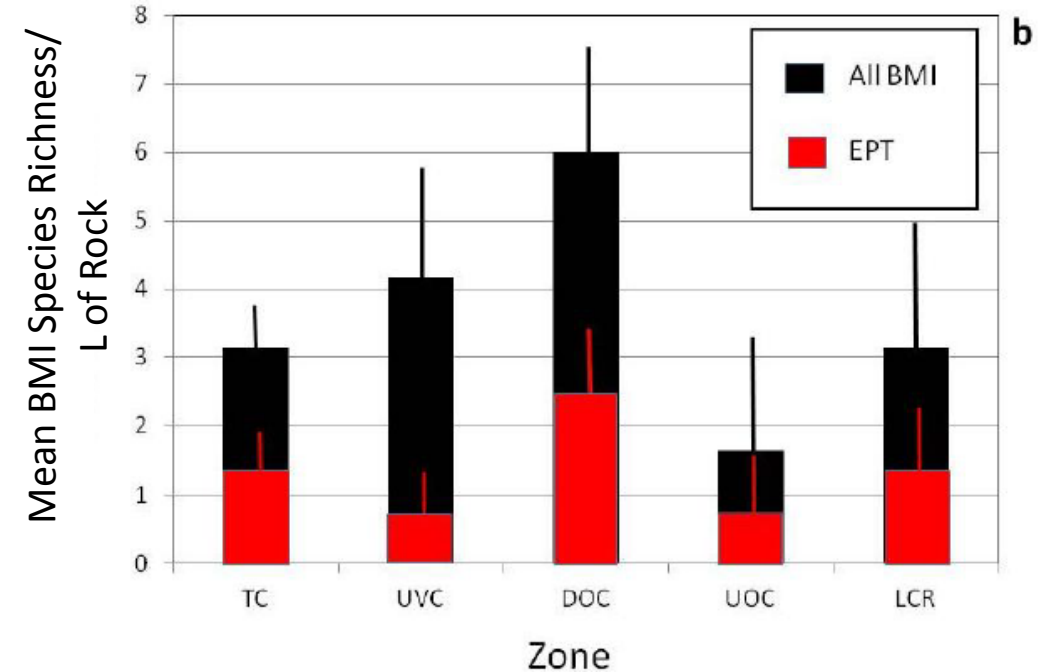
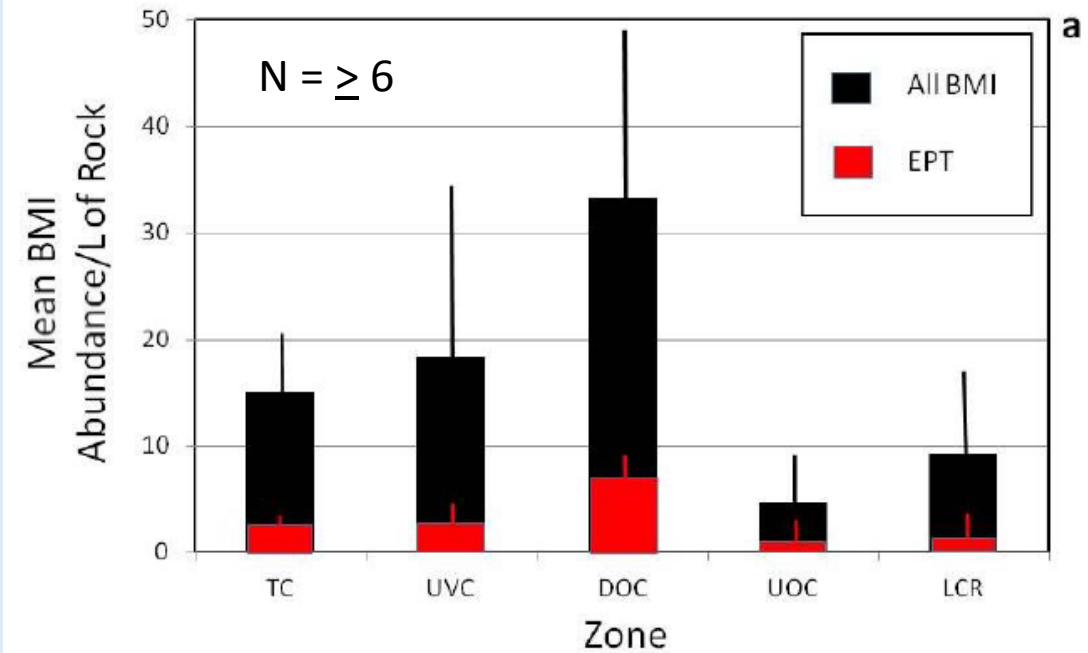
Colorado River benthos (UCR/LCR): High embeddedness, swash zone



EXPERIMENTAL BASKET

SAMPLER RESULTS

- BMI and EPT abundance/L in the LCR was essentially equivalent to those in TC
- The proportional number of EPT species/L of substrate were slightly higher (17%) in the LCR than in TC (14%).



CONCLUSIONS

- Tapeats Creek: High densities of EPT and other BMI
- Water quality conditions similar to mainstream in Glen & Grand Canyons
- Larval BMI (esp. EPT) strongly decrease in abundance and richness from Tapeats Creek into the mainstream
- Decrease occurs independent of daily fluctuations
- Adding suitable LCR habitat ds from confluence → EPT colonization ~equal to TC
- Absence of EPT in the mainstream due to limitations in habitat (sedimentation, embeddedness, flow direction and velocity), rather than egg desiccation
- Model for lack of mainstream EPT in mainstream:
 - = Larval habitat limitation (embeddedness, anoxic substrata)
 - > Egg desiccation (flow fluctuation)
 - > Water quality (temp, DO, pH, SC, other geochemistry)

Acknowledgments

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