



February 15, 2013

To: Richard Marovich  
Putah Creek Streamkeeper

**RE: Putah Creek Watershed Invertebrate / Cementation Study**

**BACKGROUND**

Fine organic sediment ( $\leq 2\text{mm}$ ) is a major source of pollution in streams. It can cause negative effects for microbes, aquatic invertebrates, fish, and riparian wildlife that use prey sources linked to the affected systems. The USEPA claims that excessive siltation from anthropogenic sources is the most important cause of lotic ecosystem degradation in the United States in terms of stream distance (USEPA 1990). Deposited sediment can cause severe cementation of the benthic structure closing off interstitial spaces thus eliminating

crucial habitat used by aquatic invertebrates for feeding and protection from fish. The result can greatly reduce diversity and density of mayflies, caddisflies and stoneflies and causes the ultimate demise of the invertebrate community. The ecosystem is further compromised as hatching aquatic invertebrates are a significant source of food for fish, birds, bats and other riparian wildlife.



**Sediment load from Thompson Creek entering Putah Creek.**



**Putah Creek cobble cemented by fine sediment particles.**

**PROPOSED SEDIMENT/ INVERTEBRATE SURVEYS**

Limited studies on the effects of sediment on aquatic invertebrates have shown that traditional metrics such as the ratio of Ephemeroptera (mayflies), Tricoptera (T) and Plecoptera (P) could not discriminate among streams with varying levels of fine sediment. Some ETP species appear to tolerate or possibly benefit from increased sediment deposition.

The proposed study will monitor aquatic invertebrates in several streams in the Putah Creek watershed that range from “no apparent impact from sediment” to areas in Putah Creek that show cementation levels of 80 - 95%. Obstacles include comparing streams of different orders, size, and anthropogenic impacts. Study streams include:

- Miller Creek
- Pleasant’s Creek
- Putah Creek (IDR)
- Putah Creek (Pickerel Riffles)
- Putah Creek (TBD)
- Putah Creek (River Parkway)



**PROTOCOL**

**Invertebrate collections:**

Aquatic invertebrates will be collected on a monthly basis from the six main sites using a modified SWAMP protocol. A University of California statistician is assisting with the study design, implementation, and analysis. Measures of cementation will be taken using depth penetrations and percent of cobble embeddedness.

**Taxonomy:**

Specimens will be identified to species when possible. As a member of the Southwest Aquatic Freshwater Invertebrate Taxonomists (SAFIT) I am regularly notified of taxonomic changes to invertebrate species and have access to the accepted taxonomic experts across the nation.

**Permits:**

I possess a current Scientific Collection Permit issued by California Department of Fish & Wildlife.

**References:**

Relyea, C.D., Minshall, G.W., Danehy, R.J. 2000. *Stream insects as biomonitors of fine sediment*. Watershed Management 2000 Conference. Boise, ID.

Newbold, J. D., D.C. Erman, and K.B. Roby. 1980. *Effects of logging on macro invertebrates in streams with and without buffer strips*. Canadian Journal of Fisheries and Aquatic Sciences 37: 1076-1085.

USEPA (U.S. Environmental Protection Agency). 1990. *The quality of our nation's water: a summary of the 1988 National Water Quality Inventory*. U.S. Environmental Protection Agency, EPA Report 440/4-90-005, Washington, D.C

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*Epeorus sp.* a mayfly that is sensitive to sediment disruption.



*Epeorus sp.* mayfly gills showing structures that are sensitive to pollution including sediment.



*Tricorythodes* mayfly nymph that is highly tolerant of sediment deposition.