



# Wildlife Survey & Photo Service

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## REPORT

2040c\_Design Channel

(amended)

October 16, 2006

To: Richard Marovich  
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**Subject: Putah Creek - Design Channel**

### Synopsis

The invasion of New Zealand Mudsnails (NZMS) into Putah Creek (discovered 2003) initiated the monitoring of the section of Putah Creek at the confluence of Dry Creek. The site has been monitored on a regular basis using various techniques in 2003 (December), 2004, 2005 and 2006. I have been unable to locate any record of invertebrate monitoring at the site prior to 2003. New Zealand Mudsnails have continued to increase in Putah Creek with exceptional numbers in certain areas. Slightly upstream from the Dry Creek confluence, mudsnails are from 97-100% of the invertebrate community. Mudsnails in other areas of the Design Channel - specifically riffles - are low, typically less than 1% of the macroinvertebrate population.

Unrelated to the mudsnail infestation, remarkable changes in the invertebrate community have occurred in the Design Channel partially documented by the discovery of eight (8) species that have not been previously collected in Lower Putah Creek or the Interdam reach. Possibly the most significant is the discovery of two distinct species of golden stoneflies (*Calineuria californica* and *Hesperperla pacifica*). These large stoneflies typically do not tolerate low oxygen conditions

### Species (except *Epeorus*) collected in 2006 in the Design Channel

			
<i>Hesperperla pacifica</i>	<i>Ameletus sp.</i>	<i>Leptophlebia sp.</i>	<i>Cinygmula sp.</i>
			
<i>Calineuria californica</i>	<i>Nixe criddlei</i>	<i>Leucrocuta sp.</i>	<i>Drunella coloradensis</i>



1. Part of the 1000- foot section of Putah Creek that was returned to its historical channel.



2. Closeup of the section of Putah Creek that was undermining Putah Creek Road.



3. Slow water section of Putah Creek at the confluence of Dry Creek prior to realignment.



4. Volunteers from fishing clubs assist with electroshocking fish. 9/4/05

or pollution. These stonefly species are rather common in certain areas of California, but they have not been recorded in Putah Creek until 6/27/06 when two were discovered during routine monitoring in the new Design Channel. Since that date, one species (*Calineuria californica*) is commonly found in the Design Channel.

## Background

Prior to 1997 a major bed of Giant Reed (*Arundo donax*) forced the low-flow channel to the south. The creek was rapidly eroding the bank near a walnut orchard and undermining Putah Creek Road. The Solano County Water Agency (SCWA) and the Lower Putah Creek Coordinating Committee (LPCCC) initiated a realignment project which was funded by the Urban Streams Program (DWR). The channel realignment was designed to reduce major erosion (picture #2), reduce the sediment load entering the creek, and restore the base of Putah Creek Road.

In August 2005 the historical creek bed was located, invasive plants (*Arundo*) cut, excess debris removed, and the new Design Channel re-watered. Volunteers assisted with the electroshocking and capture of fish trapped within the out-of-place channel after the creek was diverted. A group of volunteers also helped to remove and relocate riparian plants to the banks of the new Design Channel.

High water flows in early 2006 prevented additional work on the site until the spring when work continued on the flood plain. A significant number of willows were planted along the banks and in the flood plain in the summer of 2006. The plants were tended by the Putah Creek Streamkeeper, his staff and the California Conservation Corps.

Monitoring in the out-of-place channel (prior to dewatering) was conducted in multiple habitats. It included pools, runs, and riffles in open sun and shady conditions. Techniques included benthic gravel baskets, routine riffle assessments, and target surveys for New Zealand Mudsnaills and other invertebrates that might not be encountered with other techniques. Multi-habitat and multiple sampling techniques are supported by most investigators including Vincent Resh in "*Freshwater Biomonitoring and Benthic Macroinvertebrates.*" Dr. Resh states that: "*Riffle-only (or other limited habitat) sampling approaches are a problem because the subhabitat chosen may not be affected by an impact and the sensitivity of organisms*



5. Out-of-place channel after fill and initial grading.



6. The out-of-place channel after fill and slope applied toward Putah Creek Road. Seeding was completed after this image was recorded.



7. Design Channel after Putah Creek was returned to its historical channel. Image taken prior to high water events in early 2006.



8. CCC crew assist with planting willows on the flood plain adjacent to the Design Channel. Summer 2006.

in different subhabitats can vary.” (Resh, 1993)

I’m confident that the monitoring program designed for the Dry Creek Confluence (pre and -post realignment) was exhaustive and thorough. Samples of routine collections and unusual organisms were retained. Some mayfly samples were given to Dr. Pat Randolph (mayfly expert - UCD) for identification. Exclusive of SCWA and LPCCC funding, representatives of all aquatic invertebrates were photographed alive using high-definition digital processing and stored according to the collection numbers. Specimens are photographed alive to allow the normal configuration of appendages and other features that are necessary for basic identification. Those images are part of the core of the Putah Creek Biomonitoring Manual (in development).

### Physical Results as of October 2006

The project increased the gravel recruitment from Dry Creek which has improved salmonid spawning habitat, increased salmonid spawning areas and improved habitat necessary for a healthy invertebrate population. Effective riffle habitat has been increased by 60%. (Riffles in the out-of-place channel and the Design Channel were measured with a surveyor’s wheel.)

### Invertebrate Community

Prior to the realignment of the 1000-foot reach of Putah Creek at the Dry Creek Confluence the invertebrate community within the out-of-place channel was typical of some upstream sites. It appeared to serve as a “general transition zone” as the site was the downstream limit for a sensitive caddisfly (*Glossosoma sp.*) and the upstream limit for a moderately sensitive mayfly (*Nixe criddlei*).

One “possible effect” of the channel realignment on the composition of the invertebrate community surfaced on 2/17/06 when a casual NZMS survey of the flooded channel revealed five mayfly genera that were not previously collected in Putah Creek. The significant increase in species composition is remarkable. When all potential options for the increase in species at the Design Channel site are considered, the most reasonable source is invertebrate recruitment from Dry Creek. The fact that Dry Creek is an intermittent waterway and is dry most of the year actually supports my hypothesis that it is the source of the newly recorded mayflies. The new species composition closely



9. Design Channel on 7/12/06. Note willow growth on right bank.



10. Some members of the Putah Creek Biomonitoring Group during a "site visit" by Susan Oldland, Urban Streams Project (DWR).

mimics the invertebrate population that I have previously collected in Pope Creek which was a tributary of the historical Putah Creek drainage prior to the construction of Monticello Dam. Pope Creek like other intermittent waterways is typically dry by late spring and supports a significantly diverse invertebrate population.

Prior to the channel realignment, invertebrates possibly entering Putah Creek from Dry Creek were subject to marginal habitats that would not support their environmental requirements (Picture #3). Another species - *Nixe criddlei* - whose numbers have dramatically increased since the realignment was found rarely in the out-of-place channel and sporadically in some downstream habitats. On 6/8/06 a significant population was discovered at the Kilkenny Weir, 3.5 miles downstream from the Design Channel. Seventy percent of the cobble surveyed at the Kilkenny site held mature *Nixe criddlei* nymphs (Acceptable habitat did not exist at the Kilkenny site until the weir construction in the fall of 2006). The occurrence of *Nixe* is somewhat predictable as their environmental requirements in Putah Creek are well defined.

Select Invertebrate Occurance in Putah Creek					
Genus	Design Channel (2006)		Interdam (2004,05,06)	Lower Putah (Upstream from Dry Creek Confluence) (2004,05,06)	Lower Putah (Downstream from Dry Creek Confluence) (2004,05,06)
<i>Calineuria</i>	frequent	2006	0	0	0
<i>Hesperoperla</i>	rare	2006	0	0	0
<i>Ameletus</i>	common	March 2006	0	0	0
<i>Epeorus</i>	common	March 2006	1	0	0
<i>Leucrocuta</i>	rare	March 2006	0	0	2
<i>Drunella</i>	common	March 2006	0	0	0
<i>Cinygmula</i>	frequent	March 2006	0	0	0
<i>Leptophlebia</i>	common	2006	0	0	0
<i>Nixe</i>	common	2006	0	0	common
<i>Glossosoma</i>	common	2006	common	common	0

### Volunteers

Dawn Calciano (Putah Creek Council) and the Putah Creek Biomonitoring Group have assisted with routine surveys at several Putah Creek sites including several events in the Design Channel. Volunteers from the Northern California Council of the Federation of Fly Fishers assisted with the translocation of fish and riparian plants. That includes the **Fly Fishers of Davis**, **Granite Bay Flycasters**, and the **Golden Gate Angling and Casting Club**.



## Conclusions

1. The significance of the qualitative and quantitative increase in the invertebrate community in the Design Channel should not be underrated. Extensive upstream surveys to Monticello Dam have failed to locate the mayfly and stonefly species found at the Dry Creek confluence. In my surveys, the invertebrate community in the Design Channel is significantly more diverse than in the Interdam Reach.
2. ***Being that some mayflies (Ephemeroptera) migrate upstream to lay eggs, the establishment of functional populations in the Design Channel has impact for all upstream locations. This site could facilitate the reestablishment of invertebrate populations previously extirpated from the waterway by habitat alterations.***
3. The aquatic invertebrate community in the Design Channel has increased in diversity when compared to the rest of Putah Creek. The probable source is Dry Creek. I have made arrangements for initial sampling in the upper reaches of Dry Creek exclusive of funding for the Putah Creek Project.
4. New Zealand Mudsnails continue to increase in density throughout the Lower Putah Creek drainage. The Russell Ranch site is the lowest “known” downstream location for New Zealand Mudsnails. Their density appears to be negatively affected by riffle habitat in some areas.

## Recommendations

- A. New Zealand Mudsnails do not appear in most situations to flourish in riffles. Construction of additional riffle habitat, where possible is prudent.
- B. Invertebrate monitoring, in conjunction with New Zealand Mudsnail surveys should continue in Putah Creek. The invertebrate surveys have implications for the documentation of water quality, riparian health, fish resources, restoration projects, and additional funding. The U.S. Environmental Protection Agency recommends using at least two groups (fish, macroinvertebrate communities or periphyton) for water quality monitoring.
- C. Complete survey of Dry Creek in Spring 2007 in conjunction with the Putah Creek Biomonitoring Group.

## Sources

Resh, V.H. and J.K Jackson. 1993. Rapid Assessment Approaches to Biomonitoring Using Benthic Macroinvertebrates” In *Freshwater Biomonitoring and Benthic Macroinvertebrates*, eds. D.M. Roseberg and V.H. Resh, pp. 195-223. Chapman and Hall, New York, N.Y.

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