



# CALIFORNIA STATE SCIENCE FAIR 2002 PROJECT SUMMARY

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<b>Project Title</b> Metals Removal by Nature's Biofilter	
<b>Objectives/Goals</b> The objective was to determine if the wetland on the Penn Mine site reduces the amount of dissolved metals in the water from the creeks and seepages that flows into Camanche Reservoir from the Penn Mine site. <b>Abstract</b> <b>Methods/Materials</b> Water quality data was used from the Penn Mine water quality monitoring program that is performed by EBMUD. In addition, a new sample location was added just below the wetland. This new sample location was used to determine if there was a reduction of metals in the wetland. The wetland was measured for total area and for the most common plants in the wetland. Conditions and changes in the wetland were monitored during the study including: weather, rainfall, and water flow. Water samples were analyzed for the following parameters: dissolved metals, pH, temperature and turbidity. <b>Results</b> The wetland was more effective at reducing dissolved metals during periods of low flows and high detention times. Copper was reduced by 73% in September 2001. The flow was 0.5 gpm and the detention time was 20 days. The January and February 2002 sample data were much different than previous sample data. A seepage (PRSS-3) with very high levels of metals began flowing in January 2002. The only metal that was reduced in the wetland was iron. All other metals increased (except nickel in January) through the wetland. The previous months saw an increase in pH at wetland outlet. However, pH decreased from 5.5 to 4.7 in January; and 5.8 to 4.6 in February. <b>Conclusions/Discussion</b> The wetland was most effective at dissolved metals removal during the months of September, October, and November 2001. The flows through the wetland were low (2 gpm or lower) during sample collection. Flow did not exceed 63 gpm through the wetland during this time. The average flow through the wetland was 8 gpm or less for these three months. The wetland continued to remove dissolved metals in December 2001 except for manganese and nickel with a flow of 32 gpm. The overall removal was not as good as the previous three months. Rain in December increased flows through the wetland, however the high flows occurred later in the month and in January 2002. Loading on the wetland increased with high flows from the rain and most significantly from seepage PRSS-3. The high flows which peaked at 1,706 gpm on January 2, 2002 also dumped sediment in the wetland.	
<b>Summary Statement</b> This project examined dissolved metals reduction in the water flow through the Penn Mine wetland for a period of six months.	
<b>Help Received</b> Mom and Dad drove me to the site. EBMUD provided lab data including my new sample site. Friends helped with plant identification and construction of sample display. Mom and Dad also helped with typing and graphs.	