but not after the exposure to Aqual-P. These results establish a threshold alum dose of 73 g m^{-2}, or 200 g m^{-2} Aqual-P for effects on these non-target species. These application rates will be put into context with factors such as the proposed application to the deep, anoxic zone of the lake where few benthic macroorganisms are present, and product characteristics such as different P-binding rates, metal- or ammonia-binding, or metal loss rates, and effects on the sediment microbial community resulting in ammonia release.

241 Evaluation of a Vegetated Treatment System and Landguard A900 Enzyme: Reduction of Water Toxicity Caused by Organophosphate and Pyrethroid Pesticides B.M Phillips, University of California – Davis / Environmental Toxicology, University of California-Davis / Granite Canyon; B. Anderson, UC Davis / Environmental Toxicology; K. Siegler, J. Voorhees, University of California Davis / Environmental Toxicology; R. Tjeerdema, UC Davis / Environmental Toxicology; R. Shihadeh, P. Robins, Monterey County Resource Conservation District; R. Budd, California Department of Pesticide Regulation. Runoff from irrigated agriculture in Monterey County contributes a significant amount of water to local stream flow, and several studies have measured toxic pesticide concentrations and biological impacts in receiving systems. On-farm practices such as vegetated treatment systems (VTS) and enzyme application can reduce concentrations of pesticides in runoff. A redesigned integrated VTS was evaluated with a series of field experiments. The VTS was constructed in a ditch that included a 40m section for sedimentation, a 170m section of vegetation, and included a flashboard riser to control the volume of water in the vegetated section. Laboratory experiments were conducted to determine the optimal dose and mixing time of Landguard A900 enzyme to reduce concentrations of organophosphate pesticides. A series of trials were conducted on a larger, unvegetated drainage ditch to determine the efficacy of the enzyme in a setting with up to twenty times the discharge volume. Field trials included measurements of water toxicity and chemistry at the input and output of each system. These trials were conducted during actual irrigation events that varied in runoff magnitude. The VTS reduced concentrations of pyrethroids, organochlorines and total suspended solids by 97-100%. Landguard application in the larger drainage completely removed chlorpyrifos and diazinon.

242 Overview of Urban and Agricultural Stormwater Treatment Projects N. David, D. Yee, San Francisco Estuary Institute; L.J. McKee, San Francisco Estuary Institute / Watershed Program. Detrimental impacts of stormwater runoff from transportation infrastructure and intensive agricultural land use have been well documented. The performance of a variety of Best Management Practices (BMPs) and Low Impact Development practices (LID) for reducing pollutant loads from stormwater is being monitored in northern California. In urban settings, reductions can be achieved through the construction of rain gardens, vegetated swales, infiltration and flow-through planters, curbside extensions, or a combination of these techniques, and structural BMPs in drainages (e.g., filters), coupled with monitoring to evaluate their effectiveness. Additionally, walnut and stone fruit orchard runoff was monitored in the Central Valley of California to examine growing practices such as integrated pest management, and certified organic practices. The agricultural BMPs implemented included the use of organic pesticides and pheromone disruption, cover crops, filter strips, beneficial insects, and monitoring of insects and insect fertility. The results from these studies suggest that rain gardens and swales are effective in reducing pollutant loads from urban stormwater runoff. They also suggest that pesticide and nutrient loads can be reduced in agricultural runoff during irrigation and storms. Pollutants that bind strongly to sediment particles (e.g., most metals, PCBs, PAH, pyrethroids) are especially amenable to removal relative to dissolved phase pollutants when flow is reduced and stormwater is filtered. Despite these differences in treatment efficiency, depending on the physical characteristics of the pollutant and the treatment method, the data indicate reductions in pollutant concentrations and loads between 40 and 90% even in larger storm events.

243 Phytoremediation of atrazine-contaminated water by expression of anti-atrazine antibody fragment (scFv) in duckweed (Lemna minor) S. Leelachao, University of Guelph / School of Environmental Sciences; A. Ziauddin, K.R. Solomon, University of Guelph; J.M. Hall, Arkansas State University / Department of Mathematics and Statistics. Atrazine is widely used as the main active ingredient for broadleaf weed control in corn, sugarcane and sorghum crops. Atrazine is an environmental concern since water resources may be contaminated with atrazine from runoff emanating from corn and sorghum fields. An anti-atrazine single chain variable fragment (scFv) gene was randomly inserted into the genome of common duckweed (*L. minor*), an aquatic macrophyte, to sequester atrazine in the transformed plant. Transgenic *L. minor* was produced via *Agrobacterium*-mediated transformation. The molecular weight and expression of the poly-histidine tagged scFv with was confirmed by Western blot. It was determined using dose-response analysis (EC_{50}) that the wild-type versus transgenic *L. minor* was more sensitive to atrazine 7 days after exposure. EC_{50} values for wild-type and transgenic *L. minor* were significantly different. The results of this proof of concept study suggest that antibody expression in plants can potentially be used for phytoremediation of waters contaminated with atrazine.

244 Potential remediation of nitrate-contaminated water in space-limited areas using microbial-based bioreactors P. Wilson, University of Florida / IFAS / IRREC- Soil & Water Science; J. Albano, USDA/ARS-Horticulture Research Laboratory. Nitrate is one of the most common contaminants is surface water throughout the world. Losses in surface runoff and drainage water from nursery and agricultural production areas, as well as from the managed landscapes can be significant. This study evaluated the potential use of microbial-based (denitrification), flow-through bioreactors for their nitrate-remediation ability. Duplicate bioreactor systems were constructed at a local foliage plant nursery. Each bioreactor system consisted of four 242 L tanks with connections alternating between bottom and top. Each tank was filled with approximately 113 L of Kaldness media to provide surface area for attachment of native microflora. Molasses was supplied as a carbon source for denitrification and water flow rates through the systems ranged from 5 to 18 $L{\cdot}min.^{-1}$ during tests. Automatic water samplers were used to collect composite samples every 15 minutes from both the inflow and the exit flow water. Results indicate consistent removal of 80-100% of the nitrate flowing into the systems. Accumulation of ammoniacal and nitrite nitrogen did not occur, indicating that the nitrate-nitrogen was removed from the water, and not simply transformed into another water-soluble species. Occasions where removal rates were less than 80% were usually traced to faulty delivery of the carbon source. Results indicate that modular microbial-based bioremediation systems may be a useful tool for helping water managers meet stringent nitrogen water quality regulations, especially in areas with limited space for construction or expansion of water retention facilities.

245 The potential of using rice (Oryza sativa) to mitigate agricultural runoff M.T Moore, USDA-ARS, National Sedimentation Laboratory, USDA-ARS National Sedimentation Laboratory / National Sedimentation Laboratory; M.A. Locke, USDA-ARS National Sedimentation Laboratory / National Sedimentation Laboratory. Agriculture is faced with providing food and fiber for a growing global population. With little new land availability, farmers must maximize production on limited acreage. Often these challenges are intersected by precipitation events which lead to non-point source runoff discharges. Innovative, cost-effective conservation practices are needed to address issues of agricultural runoff mitigation. A current approach being examined is the management of existing rice (*Oryza sativa*) fields for phytoremediation and mitigation of pesticides and nutrients. Scaled experiments studied the efficiency of rice at mitigating concentrations and loads of various pesticides. Initial results are promising, with rice mitigating 71-92% of applied pesticide mass, while non-vegetated systems removed only 42-51% of pesticide mass. Additional studies are examining possible pesticide transfer from plant to seed to determine if rice can also serve as a food source for developing countries' efforts at water quality improvement.

246 Using Groundwater Protectiveness Demonstration Tools to incorporate more UICs into Stormwater Management Plans H.H Blischke, M. Kohlbecker, GSI Water Solutions, Inc.; B. Adkins, City of Portland / Bureau of Environmental Services. Stormwater is widely viewed as a source of contamination to surface water. Concentrations of copper, biological oxygen demand (BOD), and temperature that are highly detrimental to ecological receptors in surface water are readily attenuated in the natural treatment capabilities of the subsurface environment. Underground Injection Control Devices (UICs) are included in the City of Portland's comprehensive watershed plan to use stormwater as a resource by infiltrating it back into the ground. UICs preclude the need to install or increase the capacity of piped stormwater infrastructure that eventually discharges into local surface water bodies. In 2005, the City of Portland was issued the first