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March 19, 2013

State Water Resources Control Board Members
c/o Jeanine Townsend, Clerk to the Board
California State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95812-2000

Re: Water Quality Control Plan for the San Francisco Bay - Sacramento/San Joaquin Delta Estuary

Dear Members of the State Water Resource Control Board,

This winter's low precipitation rates and the resulting minimal snowpack in the Sierras has been a stark reminder of the preciousness of water resources in California. I am therefore writing to you as a concerned resident to urge you to use your authority at the upcoming March 20-22 meeting to set strong flow standards on the Lower San Joaquin River and its tributaries to restore their native fish populations, and thus aid the wildlife, fisheries and other industries dependent on them, as well as enhance their recreational uses.

While many arguments can be made for and against regulation of the apportionment of water to various constituents, interest groups and ecosystem needs, I would like to point out a practical and environmentally sound solution that would increase the overall amount of water available and thus take pressure off the fish populations and the entire ecosystem: "Eco-Machines" designed by Dr. John Todd (professor of ecology, Univ. of Vermont) are biological water purification systems that have been used over the last two decades to purify waste water from municipalities (e.g. the City of Burlington, VT) and corporations (e.g. New England Biolabs, MA) to drinking water quality (!) - without the use of expensive chemicals (such as hypochloric acid used for bleaching) and high energy-demanding machinery.

Eco-Machines are aquatic biological systems housed within tanks in a greenhouse or constructed in exterior wetlands, or a combination thereof. Each Eco-Machine functions similarly to a facultative pond with both aerobic and anoxic treatment zones, however, the process occurs instead of in a single body of water within a consecutive series of individual tanks acting as independent treatment zones. Together, these distinct treatment zones encompass all major groups of life, including microscopic algae, fungi, bacteria, protozoa, and zooplankton, on upward to snails, clams, and different species of fish. Higher plants, including shrubs and trees, are grown on adjustable industrial strength fiberglass racks suspended within the system. The result is a highly efficient wastewater treatment system capable of achieving high quality water without the need for hazardous chemicals.

My suggestion to the Board would be to, over the next decade, make Eco-Machines, or equivalent biological water purification systems, mandatory for the clean-up of all municipal, agricultural or industrial waste waters that are generated from all water taken out of the San Joaquin and Sacramento Rivers and their tributaries. This would achieve two mutually reinforcing objectives: first, increase the overall amount and quality of water available, and second, reduce the stress from pollutants on the fish populations, which is greatly aggravated in times of water shortage. Furthermore, once established these systems would save substantial amounts of energy and reduce the pollution from chemicals in the wastewater as well as those currently employed by conventional treatment systems.

Thank you very much for your attention and diligent efforts to improve California's water situation.

Sincerely,

Michael Bachmann

Addendum: See reverse side

Addendum:
Further Information on Eco-Machines can be found at:
1. Ocean Arks International (http://www.oceanarksint.org)
2. John Todd Ecological Design (http://www.toddecological.com)
This company founded by Dr. Todd has constructed dozens of Eco-Machine wastewater treatment systems based on his visionary ecological philosophy and award-winning practical designs in eleven countries on five continents around the world.

John **Todd Ecological** Design

About Eco-Machines

An Eco-Machine™ , can be a tank based system traditionally housed within a greenhouse or a combination of exterior constructed wetlands with Aquatic Cells inside of a greenhouse . The system often includes an anaerobic pre-treatment component, flow equalization, aerobic tanks as the primary treatment approach followed by a final polishing step, either utilizing Ecological Fluidized Beds or a small constructed wetland. The size requirements are entirely dependent on the waste flow, usually determined during our preliminary engineering phase and site visit. The Eco-Machine™ is a beautiful water garden that can be designed to provide advanced treatment. The Eco-Machine functions similarly to a facultative pond with both aerobic and anoxic treatment zones, only instead of a body of water, the process occurs within individual tanks, creating independent treatment zones.

A robust ecosystem is created in the Eco-Machine between the plants, microbial species and distinct treatment zones. Within the Eco-Machine, all the major groups of life are represented, including microscopic algae, fungi, bacteria, protozoa, and zooplankton, on upward to snails, clams, and fishes. Higher plants, including shrubs and trees, are grown on adjustable industrial strength fiberglass racks suspended within the system. The result is an efficient and refined wastewater treatment system that is capable of achieving high quality water without the need for hazardous chemicals. The Eco-Machine can be designed to function, and resemble, a baffled "river" through the creation of eddies, countercurrents, and contact zones in which a diversity of life will arise.

The outlet from the last tank may be equipped with an effluent filter, similar to the ones installed in septic tanks. This will prevent the discharge of unwanted solids, most likely plant detritus, to the polishing component. Nitrogen will be removed in anoxic zone of the Eco-Machine through a process called de-nitrification. If the rate of de-nitrification in the Eco-Machine is insufficient, a portion of the effluent may be recycled back to the anaerobic reactor with an ample supply of carbon. Additional removal of nitrogen and phosphorous nutrients may be achieved through plant assimilation and other microorganisms.

click to enlarge

Sustainable Water Management

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