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Mercury Cycle Studies Associated With the Hamilton Wetland Restoration Project

Description

Restoration of wetland habitat around San Francisco Bay must be evaluated in the context of the potential impact of export of Hg-species to the Bay-Delta ecosystem. We are currently providing San Francisco Bay Long Term Management Strategy team with information on linkages between Hg biogeochemistry and wetland restoration in San Pablo Bay in the context of the San Francisco Bay fishery and endemic threatened and endangered species. This information provides environmental managers and policy makers the best science available for planning and decision support.

Technical Background

While over 90% of the total mercury (THg) in sediment and soil samples is inorganic, over 95% of THg in top predators is methyl mercury (MeHg). MeHg biomagnifies up food webs and is a neurotoxin. Standing MeHg pools are the product of primarily anaerobic (sulfate-reducing) bacteria that methylate Hg^{2+} and aerobic bacteria that demethylate MeHg. Factors that affect these competing reactions regulate, in part, the incorporation of MeHg into food webs. Little quantitative data are available on the factors that control net MeHg production wetlands and on the processes and rates at which MeHg bioaccumulates at different trophic levels.

Accomplishments

Pre-construction data were collected at the Hamilton Wetland Restoration Project (HWRP) in a nearby, established, reference wetland, China Camp. The following work was completed:

- The temporal and spatial variability in the concentrations of Hg species were measured in bare and vegetated sediments. On-site methylation and demethylation rates were determined.
- A new Diffusive Gradient Thinfilm (DGT) device was developed to rapidly measure Hg species in water and sediment pore-water. DGT is a device that enables the collection of high-resolution information on sediment biogeochemistry needed to better understand physico-chemical processes that influence net MeHg production. DGT data enable the calculation of the net diffusive flux of Hg species from sediment into the water column.
- An advanced understanding of the fate and effects of Hg species into salt marsh food webs was attained by determining the Hg species fluxes through the live and standing dead mass, and litter of two predominant marsh plants.
- Biomagnification of Hg species was quantified, and the existence of two food webs was postulated, i.e., (1) A *Spartina*-deteritus-based semi-aquatic and near-shore aquatic, and (2) A *Salicornia*-associated lower-high tidal marsh.

Ultimately, mass balances will be calculated, food web structure quantified, and management options formulated, with data integration using a screening-level model approach. The mass balance will provide the understanding of fate of Hg species in wetlands.

Points of Contact

Herbert Fredrickson (CEERD-EP-P), Environmental Laboratory (EL);
Ph (601) 634-3716, FAX: 4002; *Herbert.L.Fredrickson@erdc.usace.army.mil*
Elly Best (CEERD-EP-R), EL; Ph (601) 634-4246, FAX: 4002;
Elly.P.Best@erdc.usace.army.mil.