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aquatic research

Eawag Seminar Invitation

One fish, two fish, boy fish, girl fish?
The recovery of adverse effects in fish in response to major wastewater infrastructure upgrades in Canada

Speaker **Prof. Mark Servos**
Canada Research Chair in Water Quality Protection, Department of Biology, University of Waterloo, Waterloo, Ontario

When **February 22, 11.00 – 12.00 a.m.**

Where **Forum Chriesbach, room C20, Eawag Dübendorf**

Abstract Municipal wastewater represents one of the largest sources of effluent impacting Canadian aquatic ecosystems. These effluents contain a diversity of contaminants, including those than can alter endocrine function and reduce reproductive performance of fish. Recent studies in the Grand River, Ontario, have demonstrated that a wide variety of endocrine active compounds (e.g. natural estrogens, ethinylestradiol) are released into the environment from numerous municipal wastewater outfalls. Fish populations, including rainbow darter (Etheostoma caeruleum), associated with these outfalls have shown a variety of biological changes including altered gene expression, physiology, energy storage, reproductive success and altered assemblages. Of particular note has been the extremely high incidence and severity of intersex (including visible eggs in developing testes) below the outfalls. The local municipality is currently investing hundreds of millions of dollars to upgrade two major treatment plants in the watershed to address new environmental regulations targeted at traditional effluent quality. This created a unique opportunity to follow the co-benefits of these investments. More efficient aeration and increased solids retention time in the Kitchener treatment plant introduced in 2013 led to an increase in nitrification and decreased estrogenicity of the effluent. In the years since these changes there has been a recovery of several biological endpoints in fish, including steroid production and intersex. A mechanistic fate and effects model was developed that predicts the exposure of estrogens to fish in the river spatially and temporally. The low incidence of intersex that remains evident is possibly due to residual chemicals (i.e. estrogens) in the effluent, the influence of other wastewater effluent outfalls and/or runoff from urban and agricultural landscapes upstream. The second treatment plant that is upstream (Waterloo), implemented similar upgrades in late 2017/18 and our research group is continuing to following the recovery. Although many residual effects on fish related to wastewater are difficult to separate from natural variability and other environmental stressors they need to be considered in the context of cumulative effects across the watershed.