

Toxic Contaminants and Their Effects on Resident Fish and Salmonids

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Toxic contaminants are present in the Columbia River Basin. One byproduct of advances in modern chemistry is the accumulation of synthetic chemicals in the natural environment. These compounds include contaminants that have been around for years—DDT and other agricultural pesticides, PCBs, and PAHs—as well as contaminants that are “new” on the scene—PBDE flame retardants, industrial byproducts, and pharmaceuticals and personal care products. Some of these “emerging” contaminants are endocrine disrupting compounds that can have detrimental reproductive effects in wildlife and humans. Results from several studies will detail which compounds have been detected in water and bed sediments of the lower Columbia River and estuary.

Resident and anadromous fish utilizing these ecosystems are exposed to toxic contaminants and their health is being compromised. Recent studies showed that levels of PCBs, DDTs, and PAHs in bodies and stomach contents of outmigrant juvenile salmon from the Lower Columbia were often above thresholds for effects on salmon health, such as delayed mortality, poor growth, and reduced disease resistance. Moreover, concentrations of copper and pesticides in the water column were at levels that could interfere with olfaction in salmon at some sites. Population models suggest that these toxicant-related impacts on juvenile salmon fitness and survival could impact stock recovery. Wastewater compounds and other contaminants of emerging concern may be a problem as well. In a study of resident largescale suckers, fish tissues are being analyzed to identify where and to what extent these classes of compounds are bioaccumulating in resident fish of the Columbia River. These results will contribute to understanding whether bioaccumulation of selected compounds is occurring in resident fish of the Columbia River. Information on the biological impacts of these emerging classes of contaminants is vitally necessary to ensure proper management of important resources.

Urban and industrialized areas in the lower Columbia River are source areas for toxic contaminants for multiple fish stocks. Genetic analyses show that juvenile fall Chinook salmon from upper, middle, and lower Columbia stocks are feeding and rearing in the estuary, and are exposed to PCBs, DDTs, PBDEs and PAHs at this time. The Portland/Vancouver area is an especially important major source of exposure for all fall Chinook stocks. Salmon from the Portland sites also showed signs of exposure to estrogenic compounds. Water-column data collected using passive samplers support these findings as well.

A better understanding of the sources and pathways of toxic contaminants is needed to develop reduction efforts and restore fish and ecosystem health. Information is especially needed about toxic loadings coming from wastewater-treatment plant effluents and stormwater runoff, which may be sources of “emerging contaminants” such as pharmaceuticals and PBDEs, as well as other chemicals of concern. A recent study sampled these sources and pathways throughout the basin from Wenatchee to Longview, and analyzed for wastewater-indicator compounds, pharmaceuticals, PCBs, PBDEs, and estrogenicity. This fall, stormwater runoff from the same sites will be analyzed for a slightly different set of contaminants—PCBs, PBDEs, PAHs, metals, currently used pesticides, and oil and grease. These two pathways are poorly understood in terms of their toxic contribution to the system and offer an area where changes could be made to lessen human impact on the environment.