

DETROIT RIVER HABITATS VERSUS SEWAGE ADDITIONS: ORGANIC MATTER QUALITY AND QUANTITY FOR BENTHIC PRODUCTION

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The Detroit River is the origin of nearly all (93%) of the water and much of the contaminants entering Lake Erie (Edwards et al. 1989; EC and EPA 1988; Table IX-14). Particulate organic matter in the Detroit River originates from three main sources: aquatic plants produced upstream in Lake St. Clair (151,650 metric tonnes AFDW/yr), additions of sewage effluent from 8 municipalities (25,655 metric tonnes AFDW/yr) and aquatic plants produced in the river (28,480 metric tonnes AFDW/yr; Edwards et al. 1989; Table 3). The difference between the three sources is that effluent from the three sewage treatment plant discharges in Michigan is enriched with contaminants from the more than 700 industries that are permitted to discharge toxic substances, such as zinc, mercury, and polychlorinated biphenyls (PCBs) from their manufacturing processes into sanitary sewers, provided it is diluted adequately, as part of Michigan's Industrial Pretreatment Program (EC and EPA 1988). In the 1980s, the Detroit Wastewater Treatment Plant (DWWTP) was the largest point source of sewage and 20 troublesome, toxic contaminants in the Great Lakes basin and was the largest source of PCBs (1.0 kg/da) to the total load of total PCBs (1.63 kg/da) added to western Lake Erie by the Detroit River (EC and EPA 1988; Fig. IX-21). Often since then and currently, the DWWTP has been and is being operated under court order because it failed to comply with effluent quality and plant operation standards. The 25,655 metric tonnes ash-free dry weight of organic matter, in the form of suspended solids, that is discharged per year by the DWWTP, is therefore laced with an unknown amount of toxic contaminants.

Scientists have documented the recovery of burrowing mayflies (*Hexagenia* spp.) in western Lake Erie from virtual extinction in the 1980s to present populations of approximately 350 nymphs/square meter (Schloesser & Nalepa 2001; Schloesser et al. 2001.). The main energy source (food) for such aquatic insect larvae is particulate organic matter. Because mayfly nymphs are sensitive to water pollution, including exposure to toxic contaminants, one could ask: What are the nymphs eating and what's in the food that they eat? Is the carrying capacity of western Lake Erie for mayflies influenced by the supply (loading) of detrital organic matter (food)? and, Will contaminants added by the Michigan Industrial Pretreatment Program to the sewage treated by the DWWTP reduce the abundance and vitality of the burrowing mayfly population or poison the food chain in Lake Erie?

Contaminant loadings added to western Lake Erie by aquatic macrophytic plants drifting in the Detroit River have been estimated by Manny et al. (1991; Table 7). A comparison of contaminant loadings from these drifting plants and from suspended solids discharged by the DWWTP (Table 1) reveals that sewage, at least potentially, adds 99% of the total, annual, contaminant load to western Lake Erie in the form of 17,877 metric tonnes of 12 toxic substances.

Table 1. Annual contaminant loadings to the Detroit River and western Lake Erie by the Detroit Wastewater Treatment Plant (DWWTP) and macrophytes drifting in the Detroit River (in metric tonnes per year).