

Contamination of Surface Ponds on Cape Cod, MA, by EDCs and Pharmaceuticals from Septic-contaminated Groundwater

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Retreating glaciers deposited the sandy surficial aquifer and sculpted almost 1000 freshwater ponds now dotting the landscape of Cape Cod, MA. Shallow groundwater, rather than rivers and streams, is the primary source of water to these ponds and thus their vulnerability to contamination parallels that of the aquifers that supply them. In prior research, we determined that endogenous hormones and other estrogenic organic wastewater contaminants (OWCs) migrated more than 5 meters down gradient of a septic leach pit in a shallow freshwater aquifer on Cape Cod. We hypothesized that ponds surrounded by residential development serviced by septic systems might be contaminated by OWCs, possibly impacting their ecological and recreational quality. To test this hypothesis, we collected water seasonally from several ponds surrounded by high-density residential development and two ponds with minimal residential development for analysis of hormones (e.g. 17 β -estradiol, estrone, progesterone), alkylphenol ethoxylates and breakdown products (e.g. nonylphenol), pharmaceuticals (e.g. caffeine, dilantin, fluoxetine, sulfamethoxazole), and personal care products (e.g. DEET, triclosan). We measured detectable levels (e.g. ng/L) of some pharmaceuticals and endogenous hormones in ponds surrounded by a high density of homes with septic systems whereas ponds with few adjacent homes were found to contain lower or undetectable levels of these compounds, suggesting differential impact based on residential density.