

# Polycyclic Aromatic Hydrocarbon Contamination History of Van Cortlandt Park Lake

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## Abstract:

Polycyclic aromatic hydrocarbons (PAHs) are chemical compounds that contain multiple fused aromatic rings. This class of organic contaminants has garnered significant attention since its discovery due to its toxic, carcinogenic, and mutagenic nature. PAHs are known to occur both naturally and anthropogenically. However, in highly urbanized areas like New York City, natural sources are minor contributors and are considered negligible. Anthropogenic sources include pyrogenic (combustion related) and petrogenic (direct release of fossil fuels) sources. Typical anthropogenic inputs include motor vehicle emissions, residential heating and power generation. Given the large number of motor vehicles and residential homes in urban areas, PAHs are abundant in the New York City. Sediments are excellent repositories for PAHs and Van Cortlandt Park (VCP) Lake is one of the few lakes in New York City that still contains sediments dating back to the early 1900s. Furthermore, VCP Lake is located in close proximity with two major roadways, both of which contribute runoff to the lake. Analyzing and dating these sediments provides insight into the pollution history of New York City as well as current pollution trends. Cores were collected from VCP Lake in 2000 and most were cut into 2 cm intervals. Dating was done by measuring the activity of  $^{137}\text{Cs}$  by gamma spectrometry using either a lithium-drifted germanium or intrinsic germanium detector and relating that to known dates of peak  $^{137}\text{Cs}$  levels due to past atmospheric nuclear weapon testing. Analysis was done using a Varian 1200L GC/MS/MS after sample extraction, purification and fractionation. This allows for PAH quantification. Furthermore, each combustion-related source is related to specific compounds and compound ratios. 1,7-dimethylphenanthrene (DMP) is produced at a far higher rate than its isomer 2,6-DMP in softwood combustion while they are at almost equal levels in motor vehicle exhaust. This ratio of 1,7-DMP to 2,6-DMP is just one example of how specific PAHs are associated with specific pyrogenic sources. With this data, a PAH contamination history of VCP Lake can be reconstructed and specific inputs can be predicted.