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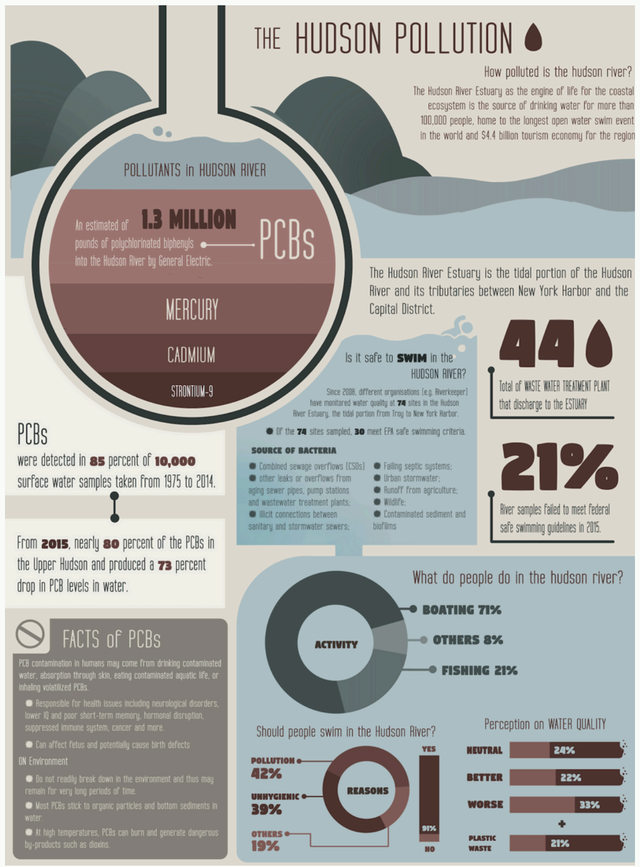
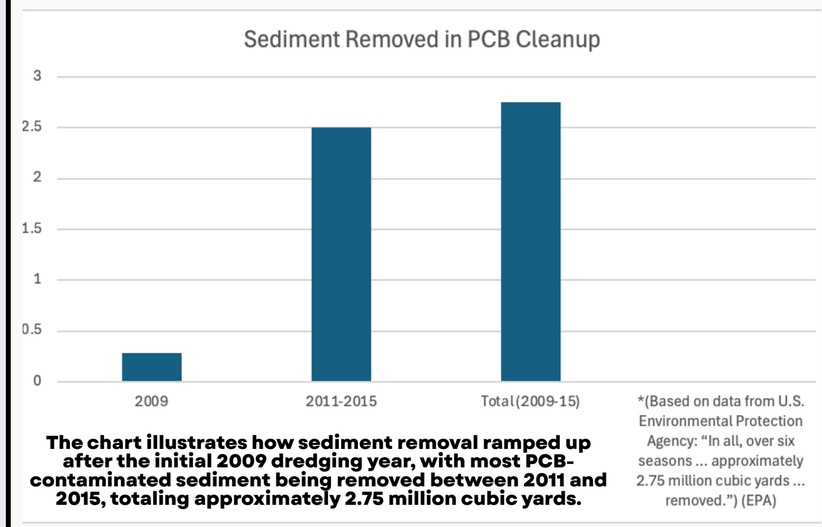
Hudson Currents: Bacteria on the Rise?

Introduction & Abstract

The Hudson River, a river that spans from north to south New York for over 300 miles, is a symbol of industrialization and environmental recovery. The Hudson has been altered through the introduction of factory waste in a rapidly industrializing society, sewage waste, and natural runoff processes. The EPA recognized this as destructive and marked several areas of the river as hazardous, which pushed the need for long-term cleanup efforts. Even though the river has gone through major restoration, the effects of pollution are still visible in its water quality today, especially when looking at bacterial levels that shift with weather, tides, and nearby human activity. Studying these changes helps show how the river is still shaped by both natural processes and the impact of living in such a densely populated region.

This project looks at how bacteria levels in the Hudson River change over time and what environmental factors might influence those changes. The goal is to understand how things like PCB contamination , industrialization, and natural factors affect the presence of bacteria in the Hudson. By comparing these variables, the project highlights patterns that show the river is still heavily impacted by human activity, even after cleanup efforts have passed. The results emphasize that while the Hudson has improved, monitoring bacterial levels is still important to understand the river's quality and the intersection of how industrialized environments and natural waterways interact.





The chart illustrates how sediment removal ramped up after the initial 2009 dredging year, with most PCB-contaminated sediment being removed between 2011 and 2015, totaling approximately 2.75 million cubic yards.

*(Based on data from U.S. Environmental Protection Agency: "In all, over six seasons ... approximately 2.75 million cubic yards ... removed.") (EPA)

Research Methods

Learning the History of the Hudson:
This historical overview provided a contextual foundation for our contaminant analysis, by simply tracing how the Hudson River's water quality has changed over time, especially since the 1960s. It helped frame our research by showing long-term trends in pollution and treatment efforts.

Analyzing the Environment Monitoring Plan Map:
The interactive map and inventory from the Hudson River Estuary Program allowed us to identify and study existing monitoring stations, geographic distribution of sampling sites, and relevant parameters, which then supported our live-data collection strategy and helped us make claims backed by evidence

The State of the Hudson 2020:
We drew on this report to get up-to-date scientific findings and trend summaries about the river's health, ecosystem, and pollutant levels. It provided baseline values and helped us interpret what "good" vs "poor" water quality looked like in our context

Hudson River Cleanup:
This U.S. The Environmental Protection Agency page gave detailed background on how PCBs were deposited, how cleanup was carried out, and how monitoring is ongoing in the Hudson. We used this to support the contaminant-level part of our research by linking legacy pollutant sources with present-day water treatment and contaminant presence.

Significance

This research demonstrates how historical pollution, modern infrastructure, and ongoing restoration efforts collectively shape the Hudson River's water quality. While decades of investment have led to major improvements, persistent contaminants like PCBs and storm-driven pollution from CSOs continue to pose challenges. Understanding these patterns highlights the importance of long-term monitoring, upgraded wastewater systems, and sustained environmental management. By identifying both progress and remaining risks, our findings emphasize the need for continued investment in resilient infrastructure and science-based policy to ensure cleaner, safer, and more accessible water for the communities that depend on the Hudson River.

Figure 1. Hudson River Photo from Upstate New York Retrieved November 13, 2025, from Tony Beaver

Findings

- PCB contamination remains a major issue in the Hudson River, even after the removal of 2.75 million cubic yards of contaminated sediment(1). Elevated PCB levels in surface sediment and fish persist, showing that legacy industrial pollution still affects water quality today(2).
- Water quality has significantly improved since the 1960s due to modern sewage treatment, the Clean Water Act, and long-term infrastructure upgrades(3). Bacteria levels and dissolved oxygen have recovered enough to make many areas swimmable on dry-weather days(2).
- Combined sewer overflows (CSOs) still release massive volumes of untreated water–approximately 1.2 billion gallons annually near Albany and 27 billion gallons in NYC–causing contamination spikes after rainfall and impacting recreation and ecological health(2,3).
- Habitat loss and altered river morphology limit full recovery, as nearly 300,000 acres of estuary wetlands have been destroyed over centuries(3). Restoration and monitoring efforts help stabilize habitats, but only partial recovery is possible due to irreversible historical changes(2).

Sources

1. . *Hudson River Cleanup. Environmental Protection Agency* EPA; 2025, Jan 22. https://www.epa.gov/hudson-river-pcb

2. *The State of the H*udson, Hudson River Foundation 2020. https://www.hudsonriver.org/wp-content/uploads/2021/03/HREP_SOH_Final_12-2020.pdf

3. The Hudson River Then and Now: A Brief History of Water Quality, Hudson Maritime Museum, 7/1/2020. https://www.hrmm.org/history-blog/the-hudson-river-then-and-now-a-brief-history-of-water-quality