

## NEW YORK CITY WATER BODIES

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The following are New York City water bodies:

- The Atlantic Ocean and the New York Bight south of Brooklyn, Queens and Staten Island.
- New York Harbor, which is a tidally influenced estuary, subject to the mixing of salt water from the ocean with fresh water primarily from the Hudson River. It is divided at the Verrazano Narrows into Upper and Lower New York Bays.
- Long Island Sound, which is a long and relatively narrow tidal water bordering Queens that is separated from the Atlantic Ocean by Long Island (which geographically includes Queens and Brooklyn).
- Bays, basins and coves, which are enclosed or partially enclosed tidal waterbodies that are generally fed by freshwater streams or rivers with limited outlets to larger bays or the ocean. The City's waterfront contains a number of bays, basins, and coves. Jamaica Bay is the largest and most important as a natural resource. It is an enclosed bay in Brooklyn and Queens, fed by a number of creeks and streams, with an outlet to the Atlantic Ocean. Other bays include Raritan Bay south of Staten Island; Little Neck Bay, Bowery Bay, and Powell's Cove in Queens; and Pelham Bay and Eastchester Bay in the Bronx.
- Tidal straits, including the East and Harlem Rivers, which connect Long Island Sound and the Hudson River with Upper New York Harbor; and the Kill Van Kull and Arthur Kill, which connect Upper and Lower New York Bays around the north and west sides of Staten Island.
- Rivers, the largest of which is the Hudson River, which originates in the Adirondacks and flows south to New York Harbor. From the City north to the Federal Dam at Troy, NY, the Hudson River is a tidal estuary. Other rivers include the Bronx River and Hutchinson River. Rivers draw their waters from streams, groundwater, and overland runoff from a large area referred to as a drainage basin, catchment area, or watershed.
- Streams and kills (the Dutch word for stream), which usually have their headwaters and outlets in a relatively small drainage area (a portion of a borough, for example). Examples of the City's streams and kills include Spring Creek in Brooklyn, and Fresh Kills, Richmond and Lemon Creeks in Staten Island. Most of the streams and kills that once regulated the flow of water, sediment and nutrients from the landscape have been channelized, filled, and piped in New York. Zero order streams, consisting of swales and hollows that lack natural stream banks, are typically ephemeral (they only flow during wet periods), and serve as important conduits of water, sediment, nutrients, and other materials during rainfall and snowmelt. They play a critical role in protecting downstream habitat by slowing flow, allowing infiltration through large soil surface area contact with water, and providing areas for water storage and biogeochemical processes such as denitrification. Small, first-order streams are the smallest distinct channels that may flow perennially (year-round) or ephemeraly. The friction of gravel, twigs, leaf litter, and woody debris reduces flow rates and erosion potential in small streams, and allows slower moving water to seep into streambeds and banks, providing soil and groundwater recharge. These streams also frequently exhibit intermittent flow, occurring several months per year, or intermittently along the stream channel, with surface flows disappearing underground and reappearing. Below ground in these saturated sediments (the hyporheic zone), water is cooled, further benefitting downstream aquatic habitat and allowing for infiltration and microbial and bacterial processes to occur that result in improved water quality. Small headwater streams and flow paths typically make up at least 80 percent of a stream network under natural conditions, and in terms of gross area, may provide more ecosystem services than any other water feature. They are critically important to the health of larger streams and coastal ecosystems, all of which originate in the smaller stream network.
- None of the few remaining zero-order streams are mapped in NYC and few are afforded any protection despite their important functions. Only fractions of many first-order streams are mapped. It should be noted that on the City GIS layer for hydrology, the more recent 2006 layer omits about 20% of the



stream length that was on the 2001 layer and the omitted stream lines are all 1st order. Small headwater streams and natural flow paths are often filled and replaced with storm and sewer pipes or damaged through dumping and receipt of increased stormwater volumes and flow frequency. The increased flow volume and velocity create erosive conditions, causing the channel to narrow and deepen and release sediment. As the channel deepens, shallow groundwater and soil moisture can begin to discharge to the channel, dropping the water table and ultimately reducing soil moisture conditions in the surrounding area. This affects the health of vegetation, especially woodlands. This is a common problem in urban parks where upstream storm sewers often discharge to parklands, creating dramatic incision, such as along Alley Creek in Queens. First Order streams can be protected through a well-vegetated riparian buffer, elimination of stormwater discharges and protection of their Zero Order tributaries. Zero order streams can be protected and their function retained by 1) providing them the same buffer protection afforded wetlands, 2) locating stormwater BMPs or bioretention systems immediately upstream of them, 3) or insuring that large upstream impervious areas are retrofitted and new developments are designed to retain and treat significant flows on site.

- Ponds and lakes, either built or naturally occurring, include all stationary and contained freshwater bodies. Lakes and ponds are found in all five boroughs. Prominent natural ponds include Kissena Lake in Queens, Van Cortlandt Lake in the Bronx, and Brooks and Clove Lakes in Staten Island. Built ponds include the Lake and other water bodies in Central Park and Prospect Lake in Prospect Park. The Jerome Park Reservoir is used to store the City's drinking water and regulate its flow to consumers.