

TABLE 3-1
BRIEF HUMAN AND ENVIRONMENTAL HISTORY OF THE DELAWARE ESTUARY

circa 11000 BC	Paleo Indians begin inhabiting the Delaware Estuary region
circa 600 AD	Lenape Indians settle in the Delaware Estuary area; clearing of land for extensive maize farming
1609	Henry Hudson anchors in the Bay for a short time, giving the Dutch first claim upon the Estuary
1610	The Bay is named after Thomas West, Lord De La Warr—the governor of the Virginia colony
1620	English colonists begin arriving to hunt whales
1623	Establishment of 1 st known permanent European settlement on banks of the Delaware—the Dutch trading post at Fort Nassau, near present-day Gloucester, NJ
1631	Drawn by whale-hunting, Dutch settlers establish first permanent settlement in Delaware, on Cape Henlopen (destroyed in Winter 1631-1632 by Indians)
1638	First Swedish settlers establish Fort Christina on banks of the Christina River near present-day Wilmington
1641	English settlers arrive and settle on Varckens Kill, present-day Salem River
Mid-1600s	Clearing of land by settlers for agriculture
1651	Dutch headquarters moved from Fort Nassau to Fort Casimir at present-day New Castle
1654	Fort Casimir conquered by Swedes
1655	Dutch re-conquer Fort Casimir and take Fort Christina
1659	First reliable chart of Delaware Estuary region published by Augustine Herrman
1661	Canal connecting the Chesapeake and Delaware bays first suggested by Augustine Herrman
1670	Upstream landing on the Appoquinimink River is abandoned as unusable due to heavy siltation from agricultural runoff
1673	England gains control of all Dutch holdings in North America at end of Anglo-Dutch War
1675	Greenwich established along the Cohansey River
1675	Dutch begin dike and sluice construction for a highway crossing of tidal marsh in northern New Castle (Broad Dike Marsh)
1682	William Penn granted land now known as Pennsylvania
1690	First paper mill in North America is built along the Wissahickon Creek near Germantown in Philadelphia
1700s	Forests are cleared and plowed by European settlers for wheat farming
1700s 1800s	Delaware Estuary region is ruled by wheat farming
1700s 1800s	Mill-building boom in response to increase in wheat farming
1700s 1800s	Streams are dammed, sometimes several times, for wheat mills
1700s 1800s	International trade begins
1739	Benjamin Franklin petitions the Pennsylvania Assembly to stop waste dumping and to remove tanneries due to foul smells, low property values, and disease
1740	Lenape Indians leave homelands for resettlement
1756	First stagecoach line from Philadelphia to New York
1762	St. George's Marsh Company formed to manage the impoundment meadows of St. Georges, Marsh, and Cripple Creeks in northern Delaware (1000 Acre Marsh)
Late 1700s	Large mills are established on the Brandywine at Wilmington
Late 1700s	Development of anthracite coal industry at headwaters of the Schuylkill
Late 1700s	Marsh reclaimed near settlement on Burlington Island
1769	Pollution first noted in the Estuary
1775 - 1783	American Revolution
1779	U.S. Army Corps of Engineers is formed
1786	First vessel ever moved by steam sails on the Delaware
1788	New Jersey passes law to promote marsh reclamation through formation of meadow management companies
1789	Benjamin Franklin leaves money in his will to build a fresh water pipeline to Philadelphia because of his concern for the link between polluted water and disease

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1791	First public canal company in the country is chartered in Philadelphia—the Schuylkill and Susquehanna Canal Company
1792	Philadelphia and Lancaster Turnpike Co. chartered; builds and operates the first turnpike-road built in Pennsylvania, which stretches from Lancaster to Philadelphia by 1818
1792	First coal company in the region is formed
1793	Yellow fever epidemic in Philadelphia
1797	Philadelphia Watering Commission established to provide safe drinking water
1799	Work starts on Schuylkill Water Works in Philadelphia, the first water plant of its kind in the U.S.
1799	First pollution study conducted in the Estuary
1800 - 1930	Extensive clearing of forested lands for agriculture
1800 - 1930	Intense turbidity develops in estuary
Early 1800s	Sturgeon reported as abundant throughout the Estuary
Early 1800s	Industrial Revolution begins
Early 1800s	Great population increases during Industrial Revolution
1802	Yellow fever epidemic in Philadelphia
1802	DuPont site established on the Brandywine to produce gunpowder for westward expansion and defense against the British
1804	Work on canal connecting the Chesapeake and Delaware bays begins
1806	Work on canal connecting the Chesapeake and Delaware bays comes to a standstill
1806	First recorded bridge built across the Delaware at Trenton, the Lower Trenton Bridge
1809	First experimental railroad track is built in Philadelphia
1812 - 1813	Bay closed to trade by British ships during War of 1812
1819	Construction begins on Fairmont Waterworks in Philadelphia to bring freshwater into the city
1820 - 1940	Coal silt pollution problems in Estuary due to coal mining operations
1820	Yellow fever epidemic in Philadelphia
1820	Dam constructed on the Schuylkill blocks shad runs
1822 - 1835	Canal construction reaches its height
1824	Work on canal connecting the Chesapeake and Delaware bays resumes
1825 - 1828	Lackawaxen Dam built in northern PA blocks shad runs (only true dam ever built on the Delaware; lasted through early 20th century)
1825	Shad decline starts
Oct. 1829	The Chesapeake and Delaware Canal first opens
1832	Cholera epidemic in Philadelphia
1832	Philadelphia law prohibits discharge of any "putrid or noxious matter" to the River
1840	Manufacturing in Wilmington includes railroad cars, heavy machinery, gunpowder, textiles, flour, and iron ships
1850	First Philadelphia water intake on the Delaware
1850	Philadelphia leads the nation in production of cloth, iron, leather, and wood
1852	Delaware passes law making it unlawful to harvest oysters in any pond or creek from May through August
1860	Pennsylvania produces 50% of iron in the U.S. and has over 2,598 miles of railroad
1861	A whale is caught in the Delaware River at Philadelphia
1861 - 1865	American Civil War; causes increases in manufacturing
1866	Pennsylvania Fish and Boat Commission is formed, with the primary focus of shad restoration
1877 - 1882	Rock excavations at Schooner Ledge, fill placed behind Chester Island. Dredging of shoals at Petty Island and Fort Mifflin, fill placed at Fort Mifflin and League Island
1880	Many of Philadelphia's streams are converted into sewers as part of the city plan
1880s	Railroads outcompete canals
1885	Federal government enacts legislation authorizing permanent improvement of the Delaware River and Bay (through construction of anchorages, dikes, revetments, and harbors)
1886	Pennsylvania State Board of Health is established to improve sanitary conditions

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1888	Serious decline in sturgeon catches reported
1890	Shad increase due to construction of a fishway on the Lackawaxen Dam and artificial propagation efforts
1890	Bluefish fishery reaches its peak
1894 - 1898	Dredging of Smiths and Windmill Island near Philadelphia, fill placed on League Island to improve new Navy Yard.
1896	Thirty-foot channel authorized from Bombay Hook to Philadelphia
1900	New York shipbuilding company established at Camden
1900	Shad fishery reaches its peak
Early 1900s	Menhaden fishery thrives for use in lamp fuel, paint, and fertilizer
Early 1900s	Height of steamboat industry
1905	Pennsylvania legislature authorizes the Commonwealth Department of Health to control sewage discharges by permit
1906	Mosquito control measures start in Delaware and New Jersey with parallel-grid ditching
1910	Weakfish fishery reaches its peak
1910	Main shipping channel project adopted
1913	Pennsylvania passes Act 375, prohibiting discharge of anthracite coal, culm, or refuse into streams
1915	World's largest shipyard built on Hog Island mudflat
1917 - 1918	U.S. involvement in World War I
1918	Height of Philadelphia's shipbuilding industry
1919	Federal government takes over the Chesapeake and Delaware Canal, widens and deepens the canal, and removes locks
1920 - 1950	Shipbuilding dies out
1920	Shad fishery is almost eliminated due to pollution, habitat loss, and overfishing
1920	Oyster harvest rates begin to decline
1923	The Chesapeake and Delaware Canal re-opens
1923	Philadelphia's first major water treatment plant begins operating
1930 - 1934	First Comprehensive Water Resources Plan for the Delaware - includes proposal for Tocks Island Dam
1930 - 1934	Aerial spraying of salt marshes with persistent pesticides (e.g., DDT) begins
1930 - 1934	Salt marshes are drained or diked
1930 - 1958	Main channel dredged to 35 feet and then to 40 feet
1930	White perch fishery reaches its peak
1930	Ninety percent of salt marshes from Maine to Virginia are parallel-grid ditched for mosquito control by this time
1930	Citizens petition Roosevelt about the effects of the Estuary's pollution on health of women and children
1931	U.S. Supreme Court Decree grants New York City right to withdraw 400 mgd from tributaries feeding the Delaware
1932 - 1938	Extensive parallel-grid ditching
1936	New York, New Jersey, and Pennsylvania create the Interstate Commission on the Delaware River Basin (INCodel) to establish water quality standards and take measures to meet them
1937	Bombay Hook National Wildlife Refuge established in Delaware
1937	Anti-stream pollution law authorizes \$5 million to remove coal silt from the Schuylkill River
1937	Pennsylvania first exerts controls on industrial water pollution
1938	State of Delaware Joins INCodel
1940 - 1942	First major deepening project removes 42 million cubic yards of dredge material from the channel, deepening it by 40 feet
1940 - 1950	Dissolved oxygen levels reach catastrophic lows, with anoxic conditions stretching for 20 miles around Philadelphia
1940 - 1950	Widespread use of DDT kills mosquitoes but also has detrimental effects on nontarget species

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1940 - 1960	Widespread creation of impoundments for control of salt marsh mosquitoes
1941 - 1945	World War II increases industry in the Estuary
1941	President Roosevelt orders investigation to determine if pollution is hampering war build-up efforts on the Delaware
1941	Only 8% of industrial waste is treated before discharge
1942 - 1943	Channel maintenance dredging removes 29 million cubic yards of dredge material
1946	Philadelphia launches \$80 million sewer improvement and treatment program
1949	New law allows oyster dredging under power, which damages beds and spreads silt over seed oysters, which then fail to reproduce
Mid-1900s	Estuary suffers from gross pollution
Mid-1900s	Waste-water treatment facilities are built
1951	Philadelphia Northeast sewage treatment plant rebuilt to upgrade level of treatment
1954	Philadelphia Southeast sewage treatment plant opens, with only primary treatment
1954	Amended Supreme Court Decree permits New York City to increase its withdrawal to 800 mgd and permits another diversion to central and northeastern New Jersey through the Delaware and Raritan Canal
1954	Record flooding in basin
1955	Gulf Oil donates 145-acre non-tidal wetland to City of Philadelphia for the Tinicum Wildlife Refuge (now John Heinz National Wildlife Refuge)
1955	Philadelphia Southwest sewage treatment plant opens, with only primary treatment
1956 - 1960	Corps of Engineers Comprehensive Study of the Delaware River Basin
1957	Oysters begin to die from MSX parasite (90% of New Jersey oysters die by 1959)
Late 1950s	Menhaden fishery drastically declines
Late 1950s	Disease seriously depletes oyster populations
1959	Menhaden fishery starts to decline
1959	Bluefish fishery reaches its low
1960 - 1970	Weakfish fishery reaches its low
1960s 1970s	Wetland filling for highway projects in Camden, Philadelphia, and Wilmington
1960 - 1983	Motorized trawling outlawed in the Bay
1960 - 1983	Large scale cooling-water entrainment and impingement of organisms begins
1960 - 1983	Many cities above Philadelphia have secondary water treatment; only primary treatment is required below Philadelphia
1960	Corps report calls for 58 water control projects to be built over a 50 year period - Includes Tocks Island Dam
1960	Horseshoe crabs discovered as having a substance in their blood capable of detecting harmful toxins in biological testing
Early 1960s	Construction of Interstate 95 through Churchmans marsh and Christina River Corridor, affecting over 1000 acres of tidal marsh and non-tidal wetlands
1961	Peregrine Falcons no longer found in Pennsylvania
1961 - 1967	Record drought in basin
1961	Value of oyster resource is decreased from \$27 million in 1954 to only \$18,000
1961	U.S. Public Health Service initiates its Delaware Estuary Comprehensive Study (DECS)
1961	Delaware River Basin Compact is signed, creating the Delaware River Basin Commission (DRBC); marks first time federal government and states joined together in a river basin planning, development, and regulatory agency.
1962	Forty foot channel completed between the Navy Base and Alleghany Avenue
1965	Pennsylvania passes Anthracite Coal Mine Act establishing a program to prevent pollution from anthracite mining operations
1965	DRBC declares a state of water supply emergency in the Delaware River Basin
1966	Menhaden fishery stops due to lack of fish

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1967	DRBC adopts higher water quality standards, requiring 88% reduction in biological oxygen demand for all municipal and industrial waste discharges
1968	DRBC issues waste-load allocations to more than 90 discharges
1968	Construction of Salem nuclear power station begins
1969 - 1970	Three fish ladders are installed on the Brandywine
1969 - 1974	Establishment of U.S. EPA, federal water programs for expanded water quality protection, state departments of environmental protection and conservation, and legislation requiring environmental impact statements
1969	National Environmental Policy Act (NEPA) is enacted
1972	Use of DDT is outlawed in the U.S.
1972	Passage of the Coastal Zone Management Act (CZMA)
1972	Federal Water Pollution Control Act is amended (Clean Water Act)
1972	Schuylkill Oil Spill, Schuylkill River, PA - 8,000,000 gallons of waste crankcase oil and sludge
1973	Congress enacts the Endangered Species Act (ESA)
1974	Congress enacts the Safe Drinking Water Act (SDWA)
1975	Shad populations increase again
1975	Corinthos Oil Spill, Marcus Hook, PA - 11,000,000 gallons of Algerian crude oil
1976	Congress enacts the Resource Conservation and Recovery Act (RCRA)
1976	Congress enacts the Toxic Substances Control Act
1976	DRBC begins Level B Study to identify and resolve water resources issues
1977	Salem nuclear power station Unit 1 becomes operational
1980	Southeastern Pennsylvania Ground Water Protected Area established
1981 - 1986	Philadelphia Northeast, Southeast, and Southwest sewage treatment plants upgraded to secondary treatment with disinfection
1981	Salem nuclear power station Unit II becomes operational
1981	Congress enacts the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund
1981	DRBC releases Level B Study; identifies a preferred plan of action for water resources management through the year 2000
1981	Record shad catch above Trenton since 1896
1983	60% reduction in BOD waste discharge loading compared to 1958
1983	Large scale chlorination of municipal and industrial waste begins
1983	Widespread use of organotin antifouling paints begins
1985	White perch fishery lowest since 1940
1985	Creation of the Western Hemisphere Shorebird Reserve Network, linking the Estuary to a hemisphere-wide chain of shorebird protection sites
1985	Grand Eagle Oil Spill, Marcus Hook, PA - 435,000 gallons of Ninian crude oil
1986 - 1992	Water conservation program established by DRBC for Pennsylvania's portion of the Basin
1986	Hope Creek nuclear power station becomes operational
1986	DRBC with state & federal agencies begins Delaware Estuary Use Attainability Project
1988	Delaware Estuary awarded status in USEPA's National Estuary Program
1989	Presidente Rivera Oil Spill, Marcus Hook, PA - 306,000 gallons of #6 oil, heavy industrial grade
1989	Merrill Creek reservoir dedicated to replace consumptive losses from power generation
1990	Peregrine Falcons return to Pennsylvania
1993	Nutrient Management Act passed by Pennsylvania, requiring farms to develop a nutrient management program
1993	M/V Ellen Knutsen Spill, Philadelphia, PA - 40 barrels of cumene
1993	T/B New Jersey Oil Spill, C&D Canal - 4,915 gallons of #6 fuel oil
1994 - 2006	PSEG Estuary Enhancement Program restores more than 20,000 acres of salt marsh and adjacent uplands
1994	T/V Kentucky Oil Spill, Paulsboro, NJ - 13,000 gallons of Arabian light crude oil

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1996	T/V Anitra Oil spill, Big Stone Anchorage, Delaware Bay - 42,000 gallons of Angolan crude oils
1996	Comprehensive Conservation Management Plan (CCMP) adopted for the Delaware Estuary
1996	DRBC adopts regulations governing discharge of toxic pollutants from wastewater treatment plants to the Estuary
1997	T/V Mystra Oil spill, Delaware Bay - 10,000 gallons crude oil
1998	Fish populations show sharp increases due to water quality improvements
1998	Withdrawal limits set for Southeastern Pennsylvania Ground Water Protected Area
1999	Governors of the four basin states sign the "Resolution on the Protection of the Delaware River Basin" and call for development of a new comprehensive water resources plan for the Basin.
2000	Pipeline Oil Spill, Tributary near Tinicum, PA - 175,000 gallons of oil
2001	DRBC declares a state of water supply emergency in the Delaware River Basin
2003	TMDLs established for PCBs in tidal portions of the River
2004	Partnership for the Delaware Estuary merges with the Delaware Estuary Program (DELEP) and becomes the administrator for USEPA's Delaware Estuary Program
2004	Athos I Oil Spill, Delaware River near Philadelphia - 265,000 gallons of Venezuelan Heavy Crude Oil
2005	DRBC adopts rule establishing pollutant minimization plan requirements for point and non-point source discharges of PCBs to the Estuary

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