Sea Grant Maritime

The Bight of the Big Apple

by Donald F. Squires

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The New York Sea Grant Institute
of the State University of New York and Cornell University

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Illustrations

Cover. A view north along South Street in 1878. This street was the bulkhead line and the East River was the heart of the port of New York's commercial district. From original illustration in Harper's Weekly, 20 April 1878.

Frontispiece. Views of the Bight seen from the height of the deck of a sailing ship in 1777.
From the top: the Highlands near Navesink; the lighthouse at Sandy Hook (built in 1762, it is the oldest US lighthouse in continuous use);
The Narrows between Staten Island and Long Island (now spanned by the Verrazano Bridge);
Manhattan, East River to the right, North River (Hudson) to the left;
the south shore of Long Island. Originally printed in The Atlantic Neptune by Joseph F. W. des Barres in 1777.

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Acknowledgments

John Dana, research associate, New York Sea Grant Institute, was responsible for insights resulting from months of delving into the dusty archives of the New York State Library and others. His abilities to relentlessly pursue a trail, no matter how faint or inaccurately portrayed are gratefully recognized. Selection and acquisition of the illustrations were also his contributions.

Marjory Scarlet Simmons, editor, made the manuscript readable by her unfailing insistence on clarity. As importantly, with her enthusiasm she provided support for the project during the darker days of its compilation. Her perceptiveness on purpose, goal, and the grander gestalt resulted in the coherency that appears.

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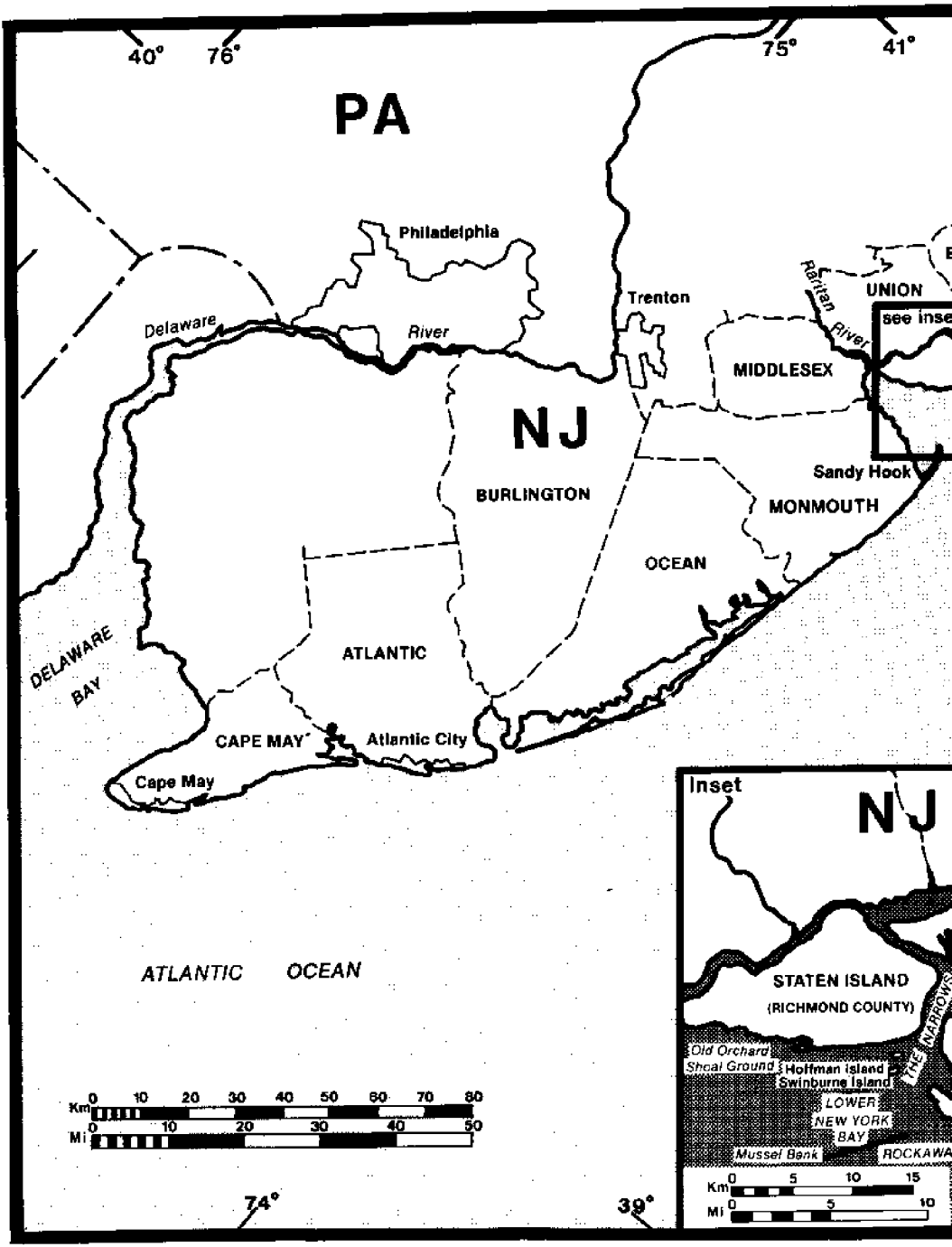
Without the active participation of my Northstar word processor, this book could not have been written.



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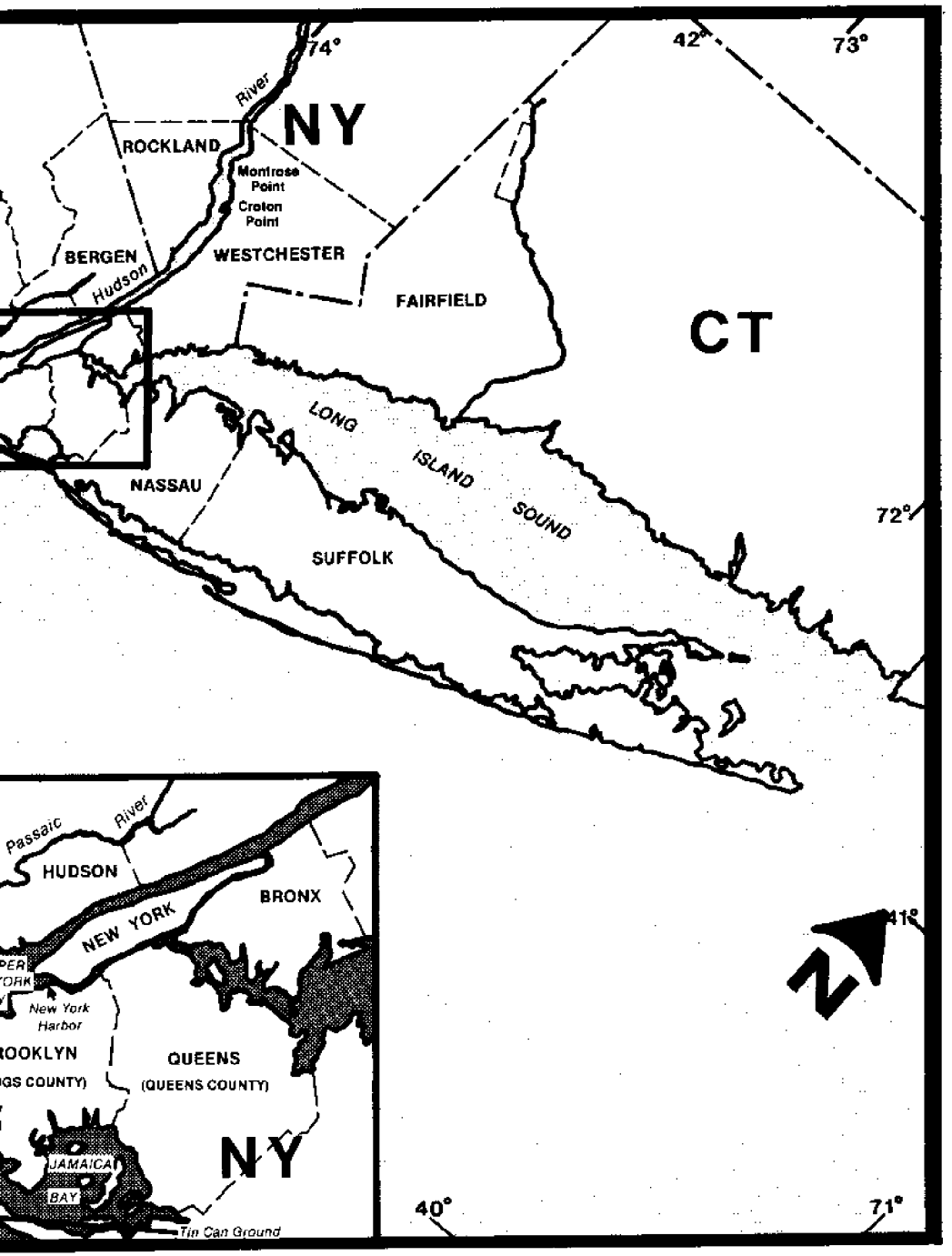

74°
42°
73°
River
NY
ROCKLAND
Montrose Point
Croton Point
BERGEN
Hudson
WESTCHESTER
FAIRFIELD
CT
LONG
ISLAND
SOUND
NASSAU
SUFFOLK
72°
Passaic
River
HUDSON
BRONX
NEW YORK
New York Harbor
QUEENS
(QUEENS COUNTY)
NY
JAMAICA
BAY
Tin Can Ground
41°
40°
71°

Figure 1 Harlem in 1765 was hardly a "suburb" for the Manhattan of its time. Source: Museum of the City of New York.

Introduction

The New York Bight harbors a rich story of the relationship between man and the ocean. The growth and development of the region has revolved around ocean resources and waterborne transport for nearly four centuries; a consequential segment of the economy is still based upon the resources of the ocean and the transport the ocean makes possible. As residents of the Bight region, we have often neglected the Bight, resulting in enormous negative impacts upon the coastal ocean. Because there are opportunities to rebuild our heritage, to once again enjoy those aspects of the coastal ocean that shaped the development of the region, to undo some damage that has been done, this book is written. As other coastal communities grow and develop, they may learn from the experiences of the New York Bight and may choose to follow a different evolutionary path.

The New York Bight region developed as a result of its natural geography and physiography coupled with advantageous political situations. Proximity to rich coastal resources; a fine, huge, natural harbor sited conveniently to trade routes; and an internal riverine transport system were among the most important of the region's attributes. Metropolitan New York and New Jersey might never have become a business and cultural center without the presence of one of the world's finest harbors and broad rivers to foster commerce with much of the eastern United States.

Once, this area was a wonderful habitat for wildlife, waterfowl, fish, and shellfish. There were the means of good living: food was plentiful; the waterways of the bays, lagoons, and rivers made transport easy; and trade opportunities abounded.

Figure 2 Indian life on Manhattan Island in the 1600s. Source: Museum of the City of New York.

"A Very Good Land To Fall With, And A Pleasant Land To See"

First Inhabitants

Generally accorded the distinction of being the first European explorer to reach New York's coast, Florentine Giovanni da Verrazano described the New York Harbor as it appeared on 17 April 1524:

> After a hundred leagues we found a very agreeable place between two small but prominent hills; between them a very wide river, deep at its mouth, flowed out into the sea; and with the help of the tide, which rises eight feet, any laden ship could have passed from the sea into the river estuary. Since we were anchored off the coast and well sheltered, we did not want to run any risks without knowing anything about the river mouth. So we took the small boat up this river to land which we found densely populated. The people were almost the same as the others, dressed in birds' feathers of various colors, and they came toward us joyfully, uttering loud cries of wonderment, and showing us the safest place to beach the boat. We went up this river for about half a league, where we saw that it formed a beautiful lake with innumerable people aboard who were crossing from one side to the other to see us. Suddenly, as often happens in sailing, a violent unfavorable wind blew in from the sea, and we were forced to return to the ship, leaving the land with much regret on account of its favorable conditions and beauty; we think it was not without some properties of value, since all the hills showed signs of minerals.
>
> (Tarrow, 1970, p. 137)

Verrazano noted the numbers of Indians who greeted him and his men. Indians were numerous in the coastal regions, far more so than inland. Populations built up first on the fish and shellfish that abounded and on the game that was available inland; later, agricultural crops supplemented these sources. Salwen (1975) suggested that as many as 20,000 Indians may have been present on Long Island at the time of Verrazano's call.

Indians first appeared in eastern North America about 11,000 years ago. Little is known of them for they appear to have been mobile hunters. Traces of their presence are evidenced by fluted points of arrows and spears and an occasional fireplace. These Paleo-Indians apparently hunted the large Pleistocene mammals, particularly the Mastodon, which roamed post-glacial New York and New Jersey. Sea level was lower, the climate more rigorous, and the forests dominated by spruce and pine. For about 2,000 years these shadowy folk roamed the coast and inland regions and then seem to have disappeared. Some suggest that they hunted the Pleistocene mammals to extinction (Martin 1958, 1967, 1973), others attribute their disappearance to the changing flora (Ritchie and Funk, 1971, p. 46).

Amelioration of the post-glacial conditions led to a dense, or "closed" white and red pine forest that replaced the spruce pine of earlier times. The white or red pine forest, because it is denser, has a lesser carrying capacity for game, hence, a lesser carrying capacity for Indian hunting tribes. Indians were absent from the scene until about 7,000 BC. Hardwoods, particularly oak, were beginning to appear and an oak hickory, open forest became prevalent, lasting for nearly 6,000 years. It was this environment that fostered abundance of game and a return of the Indian populations (Deevey, 1958; Newman, et al, 1969).

Reoccupation of the Bight region by the Indians centered around the coastal fringe; their economy was based on hunting. Evidence of earliest settlements have been found on Staten Island (Salwen, 1975, p. 50). Middens of oyster shells of enormous size have been found along the Hudson at Croton Point and Montrose Point dating back 5,500 years (Salwen, 1965, p. 513; Brennan, 1972).

Agriculture did not appear in the Bight region until almost 1,000 years ago. With the appearance of maize, squash, and beans, for example, major changes in the culture of the Indian populations are found: villages increased in size, with up to 1,000 inhabitants (Ritchie, 1969); patches of forest up to nearly 200 acres were cleared (De Rasieres, 1909, p. 104).

Indian population in the area was the most extensive at the time of contact with the first European voyagers. Salwen (1975, p. 61) estimated that the Hudson Basin had an Indian population of 62,000 to 69,000 in 1600 AD. Population density of different tribes varied, but was apparently highest among the coastal Indians where marine life enriched the agriculture (See Figure 3).

Because voyagers crossing the Atlantic by the northern routes seldom reached as far south as New York Bight and those using the southern routes landed in Florida and the Carolinas and seldom ventured far north, the next recorded account of the region is almost a century after Verrazano. John Juet, aboard Henry Hudson's Half Moon wrote of the Bight as it appeared in 1609, "For to the Northward off us we saw High Hils. This is a very good Land to fall with, and a pleasant Land to see." He recorded "many salmons, mullets, of a foot and a half long a peece, and a Ray as great as foure men could hale into the ship" (Juet, 1959, p. 28).

Most explorers sailing along the coast to New York Harbor commented upon the abundance of fish and birds, the sand beaches lying low and glistening in the sun, backed by lush green forests, suggesting richness of resources and wealth for those who could exploit them.

The twentieth century sights of the Bight area are different. To be sure, the land still shows as a low white rim of sand beaches crowned by the green of forests, indistinct through the salt haze lying low on the horizon. But it is now often tinged brown with the atmospheric pollutants of industry, automobiles, and dwellings. On a calm day, the sea water appears brownish, its surface dotted with plastic castoffs of civilization. On the right course, great offshore drilling rigs can be seen in the southern Bight. The Bight is busy with vessels ranging from great tankers to small fishing boats. Nearer the mouth of the harbor, congestion of shipping increases and the low skyline is punctuated by communications towers and high-rise dwellings. At about the

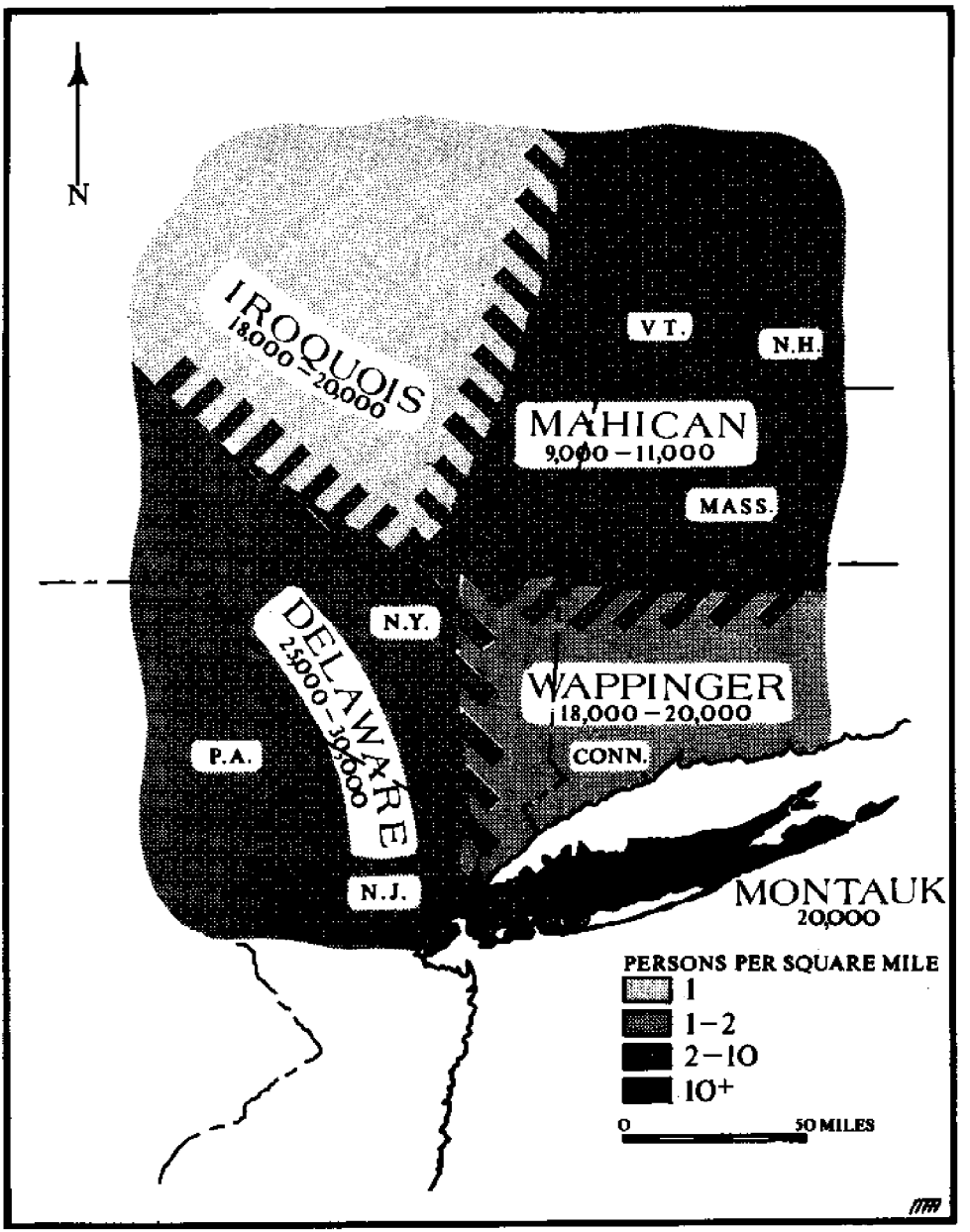
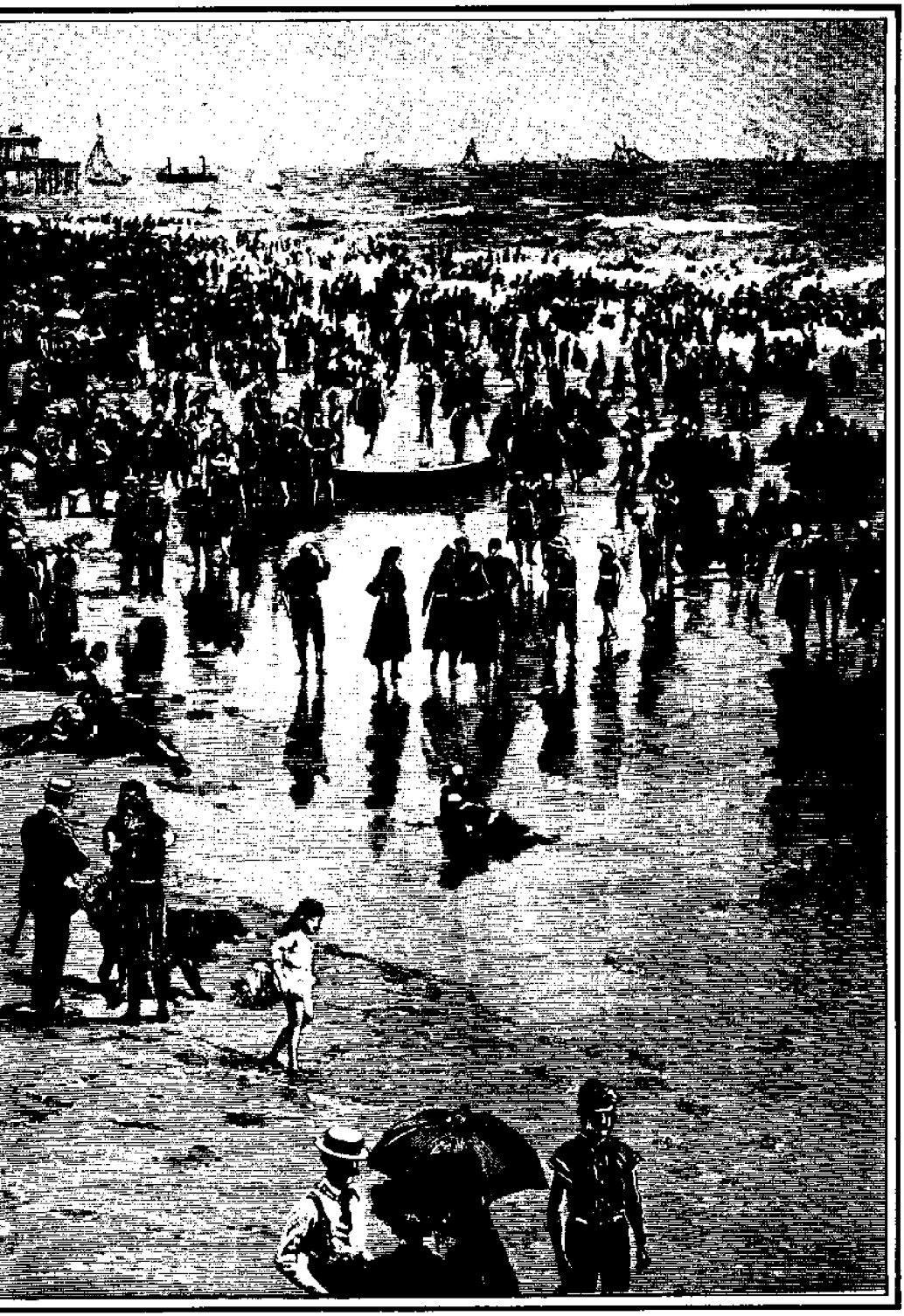


Figure 3 Population densities of Indian tribes at the time of the arrival of Henry Hudson. Based on data from Salwen, 1965.

Figure 4 The bathing hour at Atlantic City 1890. New Jersey's beaches were easier to reach than Long Island's in the pre-auto era.



From original illustration in Harper's Weekly, 30 August 1890.

point where spectacular views of lower Manhattan become visible, one may steam through clusters of hundreds of fishing boats--private and charter or party boats--fishing favored grounds called Mussel Bank, Old Orchard Shoal Ground, Tin Can Ground.

Today's Inhabitants

Today, more than 18 million people depend upon the Bight; sports fishermen of New Jersey and Long Island spend over $250 million annually; 15,000 commercial fishermen harvest about $50 million in seafood every year (US National Marine Fisheries Service, 1978, p. 120). Its beaches are lined with public and private recreation areas. More than 60 million visits are made to the south shore beaches on Long Island alone each year (NYS Department of Environmental Conservation, 1977, p. 15). In 1979, 7,620 ocean-going ships arrived and departed the Port of New York and New Jersey (Hammon, personal communication, 1979). Approximately 22,125 megawatts of electricity are generated and 154.4 million barrels of oil refined annually (Jones, Bronheim, and Palmedo, 1975, p. 10-19).

The Bight is also the repository of wastes from people who live on its margins and from the waterways that drain into it. More than 85% of all municipal sewage sludges dumped in the United States via vessels, more than 65% of all industrial wastes, and more than 90% of all acid wastes dumped in the United States were introduced into the Bight in 1974 (US Environmental Research Laboratories, 1978, p. 12-13). All of the great conurbation and industrial complex around the Bight is dependent upon the resources of the Bight to some extent, be it cooling waters for electrical generation, ocean transport of energy and goods, food, or open space. Mankind has inhabited the Bight region and made use of the Bight's resources for about 11,000 years. However, it is only since the onset of European influence in the area--356 years--that there have been notable signs of environmental pollution and abuse.

> The human populations of the Hudson River region, since 9,000 BC, have never, until very recently, rated "conservation" of resources high among their culturally shared values. Rather, each society, like any other biological population, has tended to live up to the carrying capacity of its habitat, using the technologies at its command. Until relatively recently, the limits of these technologies limited, in turn, the rate of population growth and the rate and extent of modification of the habitat. After the introduction of efficient large-scale water transport in the 17th century, and particularly after the fossil-fuel revolution of the 19th century, it became possible for the human population of the region to expand explosively through the importation of ever larger amounts of energy.
>
> (Salwen, 1975, p. 65)

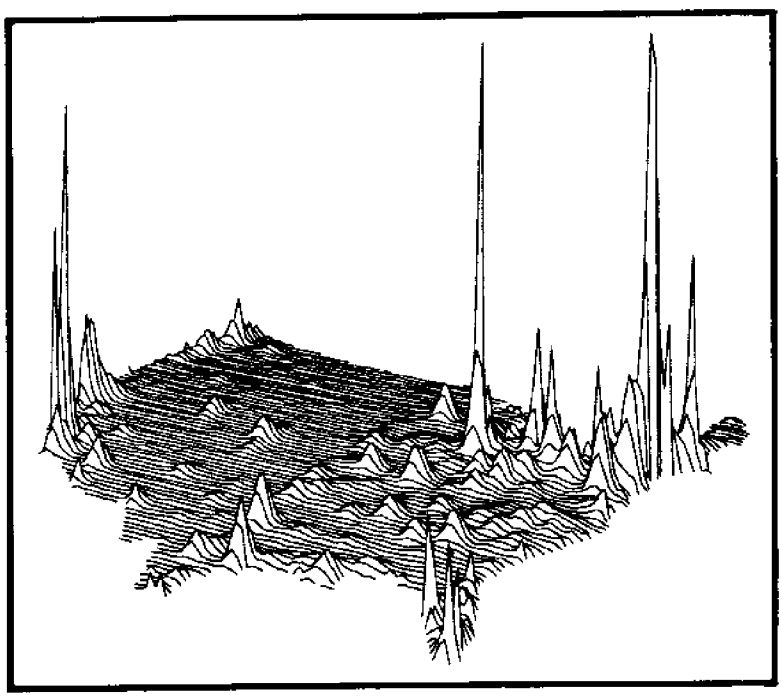


Figure 5 1979 US population density displayed on a computer generated 3-dimensional contour map of the United States. Credit: ASPEX map reproduced by permission of the Laboratory for Computer Graphics and Spatial Analysis, Harvard Graduate School of Design, Cambridge, MA.

The City on the Sea

The Beginnings

The metropolitan area of the New York Bight is a part of the megalopolis that stretches from Boston, MA, to Hampton Roads, VA. Within this megalopolis, population and development are heavily concentrated in New York City and the surrounding counties of New York, New Jersey, and western Connecticut. It is the home of the cultural and financial center of the country, the world's busiest port, the largest concentration of people in the nation, the site of a giant industrial complex. It is this metropolitan region that I call the "City on the Sea." It didn't begin importantly, for the region was overshadowed for almost two centuries by Boston and Philadelphia. At first, growth came slowly; later, in torrents as waves of immigrants arriving in the "Land of Opportunity" disembarked and began their lives in Manhattan and surrounding areas.

There is considerable confusion over the acquisition of Manhattan by Europeans. According to popular wisdom it was sold for some beads; contemporary accounts suggest a price of 60 guilders. Perhaps the Indians knew a good deal when they saw one. The island reportedly got its name because it was a wet and swampy place, but its name may actually have derived from the fact that the island was where Henry Hudson introduced the locals to European liquor (Skinner, 1915). Mannahachtaninu, a Delaware word, means "island or place of general intoxication" (Heckewelder, 1876).

In 1626, the Dutch bought Mannahachtaninu for the equivalent of 60 guilders. In its unimproved condition, Manhattan was worth about $24.12; in 1978, the full value of land and buildings reached $26,327,965,179 (NYS Board of Equalization and Assessment, 1979).

European settlement of Manhattan began in 1624 with eight men. Prior to 1624 there were only temporary outposts. By 1628 New Amsterdam had a population of 270, but the Dutch were not settlers, they were traders. It wasn't until the English arrived that population growth commenced. "On a summer day in 1664, four British frigates swooped down to change New Amsterdam into New York" (Albion, 1939, p. 2). By 1770 New York's population exceeded that of Boston and by 1810, with a population of 96,373, the city became the largest in the nation (Koebel and Krueckeberg, 1975, p. 9).

The end of the War of 1812 marked the turning point for the City on the Sea. Once the port reopened from British closure, population leaped 77%, from 93,634 in 1816 to 166,086 in 1825 (Rosenwaike, 1972, p. 18). Most of this growth was concentrated in the metropolitan region as we know it today: Manhattan Island and the surrounding shores. New York's growth was fueled by industrialization and driven by waves of immigration from overseas: Germany, Ireland, Italy, Austria, Hungary, Russia. About 1900, 84% of the white population of the city was foreign-born or born of immigrants (Koebel and Krueckeberg, 1975, p. 12).

Growth in the surrounding regions was slower. In 1700, the population of what is now New Jersey was about 8,000 (Greene and Harrington, 1966, p. 106). Long Island had a population of about 8,500 compared with 5,000 in New York County (Greene and Harrington, 1966, p. 92). Development in New Jersey was severely hampered after the American Revolution by commercial restrictions imposed by New York, through which most of the state's goods had to pass. But by the end of the War of 1812, the basis of New Jersey's industrial system was established.

Commerce Commences

Establishment of commerce between the growing urban centers of Philadelphia on the southwest and New York on the northeast was critical and a road system through New Jersey linking them was developed by 1791. As a result, New Jersey is sometimes called the corridor state or the "two-faced" state. Because of its development as the link between New York City and Philadelphia and urbanization adjacent to these centers, "the 150 mile strip between New York and Philadelphia is the most heavily travelled section of land in the United States" (Life, Pictoral Atlas 1961). Without a harbor between Cape May and Sandy Hook, New Jersey was unable to compete with the great ports of New York and Philadelphia.

Both highway and rail followed the Delaware River to Trenton and then turned east for New York, a route inland of the coast. This route tended to isolate the beaches:

> The Jersey shore was famous before 1890. Atlantic City and Long Branch has become the nation's greatest resorts, attracting presidents and tycoons, bishops and racing touts, steel makers and strumpets.
>
> (Bebout and Grele, 1964, p. 33)

Until the construction of the Garden State Parkway in 1955 the Jersey shore beaches were inaccessible to all but the privileged. If one did reach the beaches, it was difficult to get onto them as most were privately owned or held by local municipalities. In the last decade the fine beaches of New Jersey have been rediscovered as the recreational asset they were at the turn of the century.

Today, New Jersey, our fifth smallest state (8,204.34 square miles of land and water), is the ninth most populous (7,332,000--1979) and the most densely settled with 893.7 persons per square mile (US Bureau of the Census 1980, p.2). It is the largest producer of chemicals; part of its coastal region is packed with refineries with about 4% of the nation's capacity (Jones et al, 1975, p. 17). Textiles, electrical equipment, machinery, and paper products are other important industrial components. Most of the industrial development occurred in the northern part of the state where the commuting population coupled with the industrial sector caused an enormous concentration of population. New Jersey is called the Garden State, for much of its land still is in truck gardening; it produces many of the fruits and vegetables consumed in the megalopolis.

East of the Hudson things progressed somewhat differently. On 7 November 1626, the "High and mighty Lords, my Lords the States General, of the Hague" received this communication:

Yesterday, arrived here the Ship the Arms of Amsterdam, which sailed from New Netherland [New York] out of the River Mauritius [Hudson], on the 23rd September. They report that our people are in good heart and live in peace there; the Women also have borne some children there. They have purchased the Island Manhattes from the Indians for the value of 60 guilders; 'tis 11,000 morgens in size. They had all their grain sowed by the middle of May, and reaped by the middle of August. They send thence samples of summer grain; such as wheat, rye, barley, oats, buckwheat, canary seed, beans and flax.

The cargo of the aforesaid ship is:--	7246	Beaver skins.
	178 1/2	Otter skins.
	675	Otter skins.
	48	Minck skins.
	36	Wild cat skins.
	33	Mincks.
	34	Rat skins.

Considerable Oak timber and Hickory.
Herewith, High and Mighty Lords, be commended to the mercy of the Almighty.

In Amsterdam, the 5th November, AD 1626. Your High Mightinesses' obedient, Received 7th November, 1626.

(Signed) P. Schagen
(O'Callaghan, 1853, v.1, p. 37-38)

This understated message contrasted sharply with the experience of the Plymouth colony, established five years before, and still struggling for subsistence. By the end of the colonial period the basic pattern of growth in New York had been established. A major axis of commerce existed on the Hudson River from Albany to New York City. The Port of New York clearly demonstrated its ability to draw trade from Europe and its neighboring ports on the east coast of America. New York was establishing itself as a manufacturing, trading, and service center. Today, New York has only slightly over 1% of the nation's area--49,576 square miles of land and water, about 8% of the nation's population--17,648,000 (US Bureau of the Census, 1980, p. 2), 10% of the nation's manufacturing (US Bureau of the Census, 1979, p. 3), and 9% of its personal income (Eldridge, 1979, p. 20).

Downtown Megalopolis

The urban center that makes up the New York Bight area--Manhattan (New York County), Brooklyn (Kings County), Queens, the Bronx, Staten Island (Richmond County), plus New Jersey's Bergen, Hudson, Essex, and Union counties--includes nine counties with a combined population of nearly 11 million people (Koebel and Krueckeberg, 1975, p. 36), ranking sixth after California, New York, Illinois, Pennsylvania, and Texas. Defined in superlatives, this region is the cultural center of the country; the seat of the book publishing industry; a financial center of the world; the home of national newspapers; the center of the television industry; the location of some of the most awesome slums, the nation's dirtiest streets, and the largest traffic jams. In 1907 horsedrawn vehicles averaged 11.5 miles per hour in New York City; in the 1960s motor vehicles averaged only 8.5 miles per hour in the central business district.

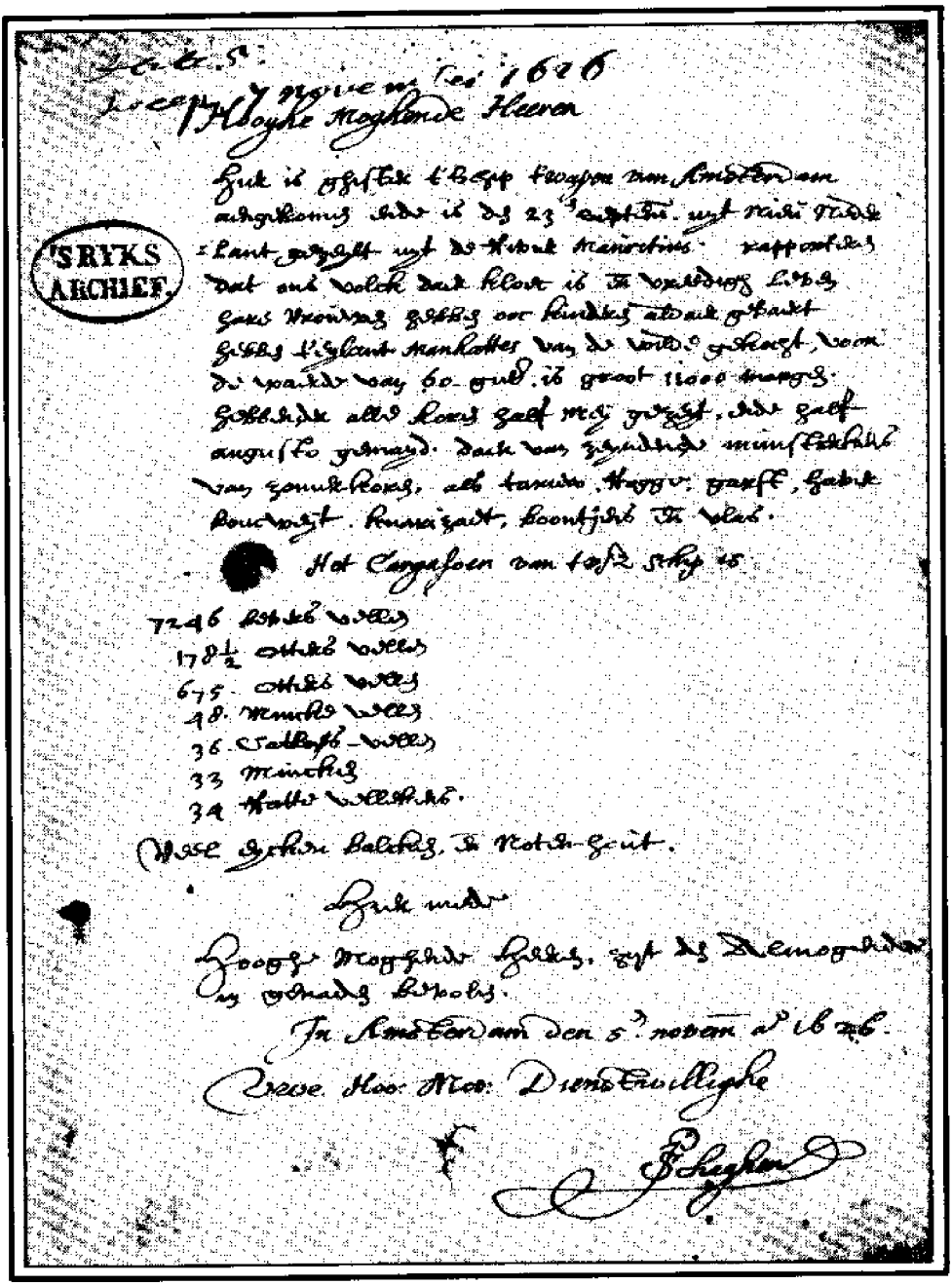


Figure 6. A reproduction of the original 1626 Schagen letter; the translation appears in the text. This amounts to a "bill of sale" for Manhattan Island. Source: Algemeen Rijksarchief tee's-Gravenhage, Staten-Generaal no. 5781II.

Most authors concur that the period between the War of 1812 and the first world war was the golden era for New York City. With the economic and political stability that followed the Congress of Vienna, prospering Europe poured investment capital, goods, and technology into the developing areas of the world, particularly North America. As a rapidly expanding focus for development in the United States, New York prospered most. The American concepts of limited government and of laissez faire fostered a climate in which entrepreneurship flourished. The relocation of the nation's capital from Philadelphia to Washington, DC, in 1800 eliminated New York City's only serious competition. This move divorced the centers of political power and economic strength that were formerly joined in Philadelphia. These factors, singly and collectively, unleashed powerful economic forces that resulted in enormous growth for the New York area.

Much of New York's early development resulted from its location. From colonial times New York was the important apex of the European/North American/West Indian trade triangle; it later became a centrally located node on two trade axes: the east-west axis from the coast to the midwest, and the north-south axis along the Atlantic seaboard. As the Ohio Valley and Great Lakes regions developed in the middle 1800s, so did the transport routes to the Port of New York. First, canals appeared, later railroads and highways, and eventually airline routes, all following the Hudson River Valley and westward along the Mohawk River to the Great Lakes.

For a century, industrial centers sprang up along the rivers and canals, providing access to energy, raw materials, and outlets for finished products. The railroads, built to connect existing industries with the ports, followed the major trade routes originally defined by the waterways. Examining the percentage (by weight) of all US foreign trade handled by the Port of New York shows the port's growth during this period: 1800--9%; 1830--37%; 1870--57%; 1915--50% (McNee, 1966, p. 428). The nation's total foreign trade grew during this period as well. Between 1800 and 1830, total US tonnage of foreign trade increased fourfold. The result of a concentration of commerce in New York City was enormous prosperity for the region.

New York originally developed as a wholesaling center and early acquired a near monopoly on textiles which, by the mid-1800s comprised nearly one third of total US imports. Other high value commodities were characteristic of early trade in the port: jewelry, chinaware, furniture, and delicacies. Immigration fueled industrial growth by providing enormous numbers of skilled and cheap workers. In the late 1800s immigration of large numbers of Jewish tailors and the concurrent invention of the sewing machine nourished the development of the garment industry—dominated by New York City from 1870 to 1910.

The area's development as a wholesaling center led naturally to its growth as a leading manufacturing and service industry center. Even today, New York State leads the nation in value added to raw materials or products by manufacture, and New York City accounts for over one-half that amount.

As ships grew in size and trade increased, the Port of New York was in a favorable position; it had room for expansion. Its hard rock shoreline, so intractable for early settlers, provided a firm foundation on which to build. Other ports, bounded by swampy lands, were critically limited in hard, dry ground on which to build and expand.

Emphasis on high value products led to the location of related industries in the metropolitan area. Printing is an example. Even today, the metropolitan area is a major printing and publishing center. Although New York City led the nation's banking by 1836, it wasn't until the twentieth century that its role as a financial center became preeminent. Establishment of the headquarters of the Federal Reserve System in New York City at the turn of the century cemented this position.

New York City was undergoing yet another change, particularly after the second world war. The decentralization of the American economy, the growth of the District of Columbia as the political and administrative seat of the nation, and the continuing decline of foreign trade, begun in 1871, caused further shifts in the city's economy. Newer waves of immigrants, now Puerto Rican and American blacks, were less skilled than the earlier Europeans. Also, New Yorkers were adopting a social consciousness that was to become very expensive. By the twentieth century, the budget for the City of New York was larger than any government budget except the federal government. New York City's police force is larger than Australia's army: but then, there are more people in New York City than in Australia, or in over 40 of the United States.

The Port of New York was the busiest in the nation. However, as late nineteenth and early twentieth century internal US commerce grew, foreign trade was overshadowed. With this change, New York was less fortunate for, no longer centrally located with respect to the nation, transportation costs became higher than at other ports.

The metropolitan area has evolved from a colonial outpost whose success rested in the value of its natural resources to an international commercial city and industrial complex. Today New York's economy is no longer linked to its port. The city leads in insurance, banking, securities, and corporate administration, activities that had their roots in foreign commerce, but are no longer directly linked to the marine sector. The metropolitan area retains its importance as a manufacturing area largely because of the complex of chemical industries in northern New Jersey. While this complex accounts for 9% of the nation's industrial capacity, it is an aging complex and decreasing in importance nationally as other regions of the country develop.

The Bedroom Communities and Beyond

Most urban development follows a concentric pattern: the core of the city consisting of major economic activities, with concentric rings of suburbs surrounding it. As the metropolitan area developed, the five boroughs of New York City and the four adjacent counties of northern New Jersey came to form the core. Less industrialized counties surrounding these became the bedroom communities for the middle class and wealthy: Nassau, Westchester, Rockland, and western Suffolk counties of New York; Fairfield County of Connecticut; and Middlesex and Monmouth counties of New Jersey. Beyond these are developing areas, distant enough from the center so that they are not commuter centers. Included are eastern Suffolk, on Long Island; Ocean, Burlington, Atlantic, and Cape May counties in New Jersey.

The term "suburb" was first used by the US Bureau of the Census in 1880; it was initially applied only in connection with New York City (Singleton,

Figure 7 Broadway north from 34th Street in 1909. The combination of horse drawn carts, omnibuses, trolleys (newly electrified), and early automobiles provided a level of congestion almost as intense as today's. Source: Museum of the City of New York.

1973, p. 29-30). Development of suburbs is dependent upon transportation: the streetcar, railroads, and the automobile were the major factors.

It wasn't until after the second world war that the great boom in suburban development began and the suburbs began to take on the identity of middle-class communities. This resulted in part from the available housing following the war, stimulated by federal loan programs, and soldiers returning from overseas. The widespread availability of the automobile gave the population the mobility to disperse. The Great American Dream of the single family dwelling on a plot of land became the reality. The middle class suburb had arrived.

Easternmost Long Island established its separate traditions early. Settled primarily by New Englanders who did not wish to fall under the economic control of New York City, trade was often carried out through Boston rather than New York City. Long Island Sound and Block Island Sound provided relatively sheltered passage to the north, as well as to the west. Despite petitions from Long Island's towns to shift to the jurisdiction of Connecticut, the King of England remained firm. Agriculture, fishing, and whaling were principal occupations. Development of communities was largely coastal, for the center of the island was considered "barren."

Long Island was first opened to urban residents by construction of the Long Island Railroad in 1844. One line extended all the way to Montauk Point along the south shore, while the second ran along the north shore. Long Island's north shore rapidly became a "Gold Coast" of summer and country estates for New York's wealthiest barons, while the south shore's east end beaches became the playground of the social set.

At the end of the second world war, production of automobiles resumed, gasoline rationing ended, and ordinary people flocked to the areas outside the city.

As the suburbs developed, jobs followed. Building roads and highways fostered the movement of people and provided access for commerce. But Robert Moses, then City Construction Coordinator, responsible for the construction of all the highways from New York City, had his own plans. (Caro 1974, p. 940+). Moses' genius lay in his ability to apply technology: roads for the automobiles to traverse. Creation of parkways had a profound effect on the future character of Long Island. Believing that commercial vehicles would disfigure their natural beauty, Moses was able to restrict the kinds of traffic that parkways carried. Not until the 1950s, were closed vans permitted on the parkways. Even carrying skis outside an automobile was sufficient to gain a citation from parkway police. The parkways, built before 1942, thus opened the suburbs of Long Island for residential development, but not for industry. It wasn't until after World War II that Moses began the construction of the expressways that carried all sorts of traffic. Rail connections between Long Island and New York City were limited and connections from the city to New Jersey were absent. So, industry shied away from Long Island, with neither rail nor road access, and stayed in New York City. Long Island became the nation's first bedroom community.

Thus, although the population of Nassau County increased 93% from 1950 to 1960, few new jobs were created. In the same period, the population of Suffolk County increased 142% and in the decade between 1960 and 1970, increased again

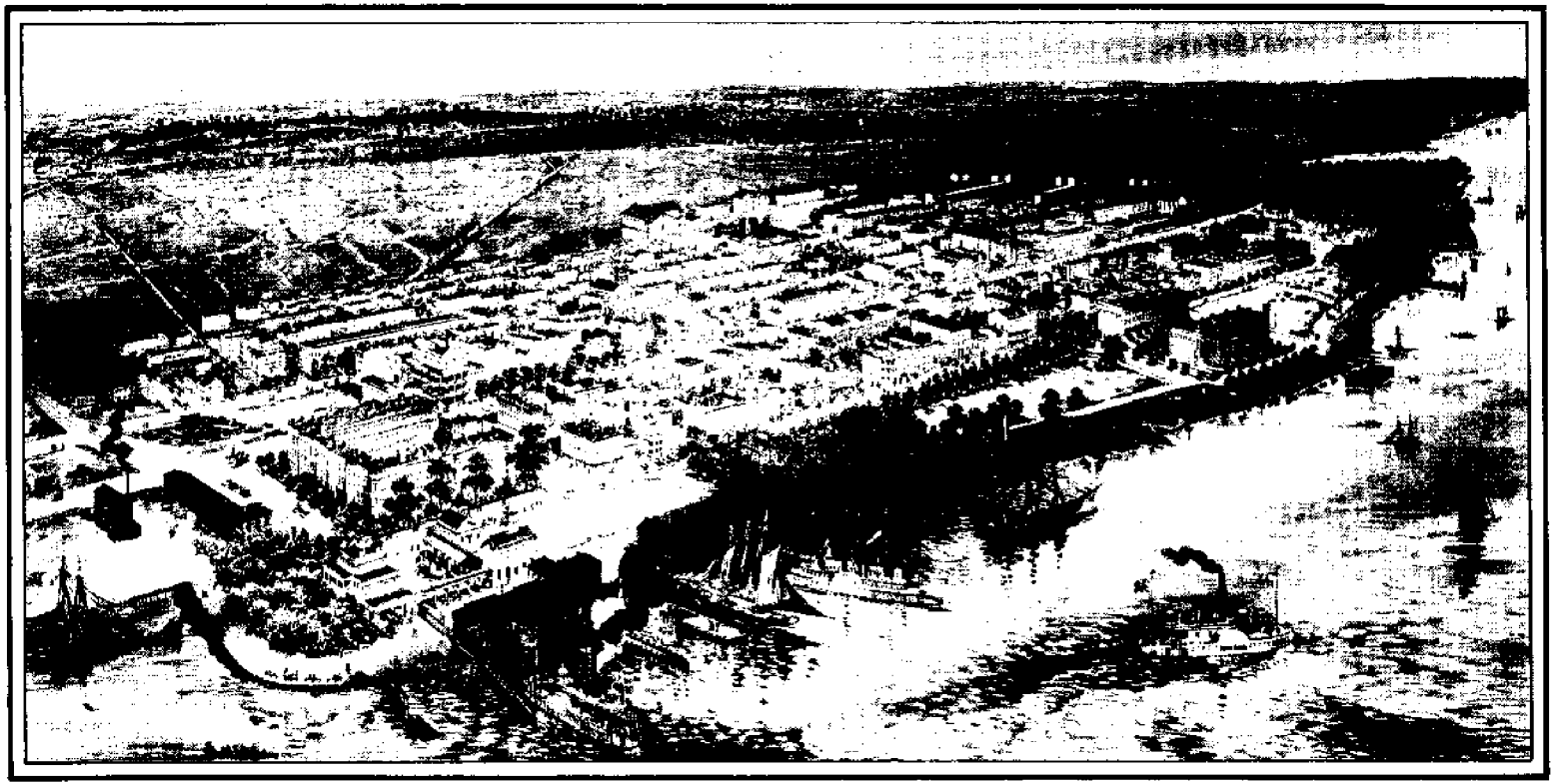


Figure 8 The ferry between Manhattan and New Jersey established early, flourished as the only transportation between island and mainland. This view of Hoboken, NJ, in 1856 shows early steam ferries and larger vessels centered at the port. Source: The I.N. Phelps Stokes Collection of American Historical Prints, The New York Public Library.

by 69%. Nassau's growth slowed: land simply wasn't available for further development. Today, Long Island is still largely a bedroom community, except for its eastern, water-limited portion. The easternmost portion of Suffolk County is agricultural and houses most of New York's fishing fleet. Water recreation is a major industry throughout the island. Over $60 million are spent annually on boat upkeep and marina charges alone for the island's fleet of over 200,000 recreational boats.

Although ferry service between New York and New Jersey was established very early, bridging the Hudson River had an impact on the pattern of development of New Jersey similar to that of opening highways to Long Island. For many decades travel to and from the city and New Jersey was multi-modal. Trains and trolleys carried passengers to ferry debarkation points for the trip across the Hudson. With tunnels and bridges, however, the Jersey shore was opened to commuter traffic and rapid development followed.

Most of New Jersey's development has followed the Philadelphia-New York City corridor. Long overshadowed by those cities, New Jersey's greatest economic and demographic development occurred after 1920; but since the second world war industrial decentralization and suburbanization have been the pattern. Greatest growth has been in the "spillover" areas from its terminal neighbors, Philadelphia and New York, a factor that led Edmund Wilson to write his bitter essay, "The Slave of Two Cities" (Wilson, 1922, p. 712-714).

Union, Middlesex, and Monmouth counties experienced major growth in the decade immediately after the second world war and then slowed dramatically. Beyond these are the relatively rural counties of Ocean, Burlington (which has only a tiny coast but is New Jersey's largest county in area), Atlantic, and Cape May.

Figure 9 Immigrants to the New World landed at Ellis Island. From the harbor they had a good view of lower Manhattan where most would take the first steps of their new lives. Source: Edwin Levick Collection, Library of Congress.

The Commercial Emporium of America — The Rise of the Great Port

The relative importance of political events and natural setting in determining the development of the port is a subject disputed by scholars. The fact remains: the Hudson/Raritan Estuary is one of the finest natural ports of the world. James Morris described it:

> New York's qualifications are evident, too, when you see it from the air. It might have been man-made as a port, so neatly functional is its shape and situation. On the northeastern coast of the United States, between latitudes 40° and 41° North, two large chunks of land stand out from the coastline like breakwaters. One is the flank of New Jersey, with its long line of reefs; the other is Long Island in the State of New York, a splendid boulevard, a hundred miles long, of sand, marsh, and grassland. These two land masses approach each other at an angle, and very nearly meet: they are separated by the entrance to New York Bay.
>
> It is a wonderfully sheltered, secretive opening. Long Island protects it from the northern gales, the arm of sand called Sandy Hook reaches out from New Jersey to embrace its channel from the south, and the bulk of Staten Island stands like a cork in the middle. The mariner enters it sailing almost due west, but a few miles from the open sea he turns abruptly north, passes through the bottleneck of the Narrows, leaves Staten Island on his port side, and finds himself in the glorious security of the upper bay--gales and high seas left behind, even the sea birds domesticated, as he steams snugly between Brooklyn and Bayonne towards the comforts of the metropolis.
>
> This is the lordly front door of New York--the carriage sweep. There is a kitchen entrance too, for between Long Island and the mainland there lies Long Island Sound, sixty miles of sheltered water linking the port with the Atlantic by a back route. This will also take a seafarer into the upper bay, via the tidal strait called the East River, while from the American interior the noble Hudson River flows into the Bay out of the north, mingling its icy fresh waters with the salt tide of the Atlantic. Diverse other creeks and rivers debouch into New York Bay, and all around are little islands, inlets, and spits, forming a watery sort of filigree upon the large-scale charts.
>
> (Morris, 1969, p. 11-12)

It took two centuries for the port to achieve national prominence and most of a third before it surpassed London, Liverpool, and Hamburg in volume and value of traffic (Albion, 1939, p. 1). Southern cotton and tobacco, shipped through the port to Europe and New England, was matched by a return flow of manufactured goods. By the Civil War, the Port of New York handled 70%

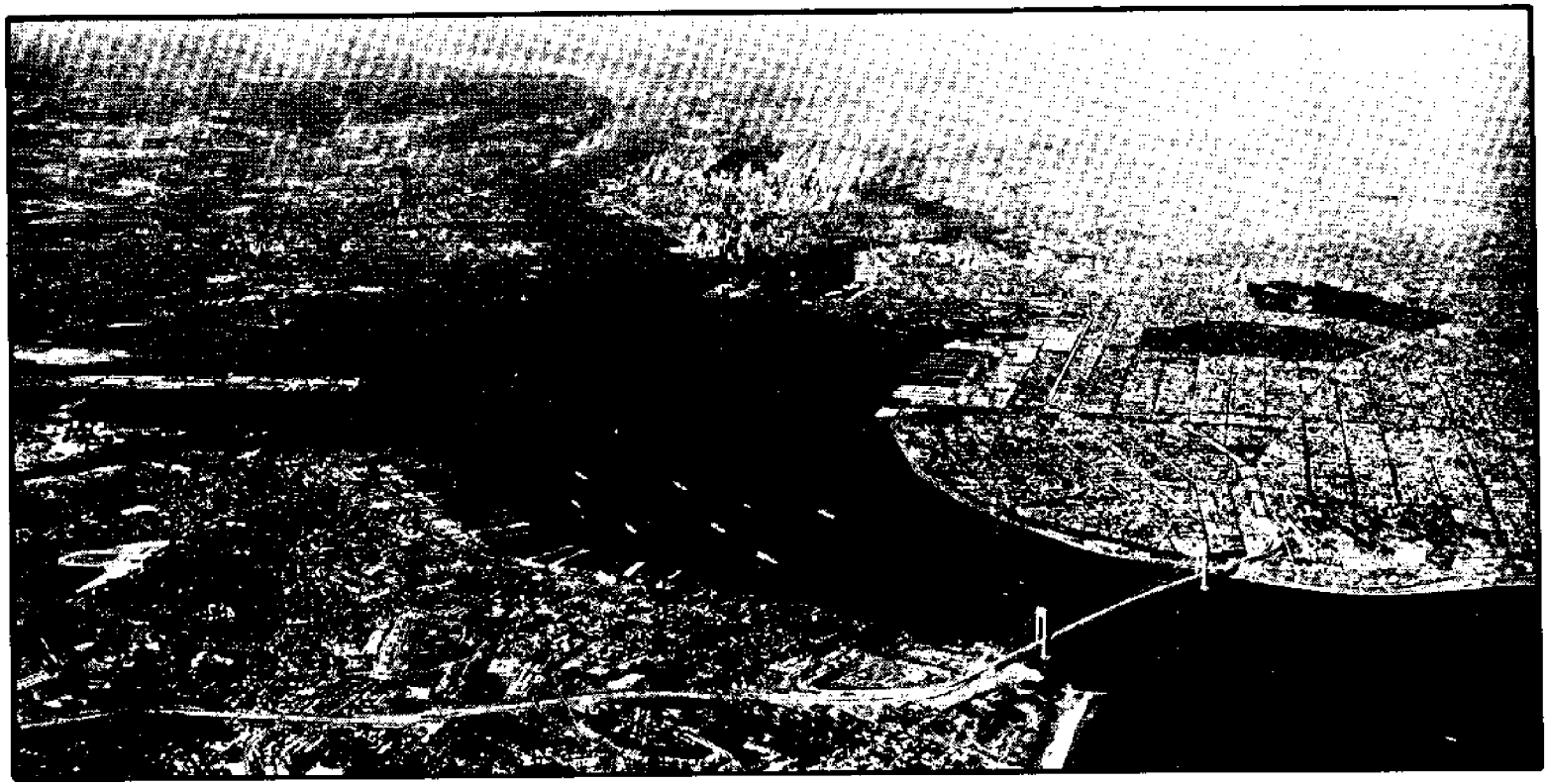


Figure 10 The Port of New York today. The Verrazano Bridge (lower right) spans The Narrows from Staten Island (lower left) to Brooklyn (middle right); Manhattan (center background) is separated from Brooklyn by the East River. Courtesy of the Port of New York and New Jersey Authority.

of the nation's imports and over 30% of its exports, a balance characteristic of today's port acitivites. Between 1820 and 1860, the East River shipyards were the nation's largest, measured by tonnage of vessels constructed. The port reached its zenith in 1871 when it handled about 71% of the combined value of imports and exports for the nation. From that time on, its importance declined and other commercial and industrial activities of the region outstripped port functions in importance to the city and its economy.

The role of the port has not been limited solely to commerce. Between 1897 and 1954 16 million immigrants came to the United States through the port, most visiting first at Ellis Island. The reception of foreign born was not new to the port; from the earliest days, Manhattan had a cosmopolitan population. An early governor saw it as:

> another great argument of the necessity of adding to this Goverm̃t the neighboring English Colonys, that a more equal ballance may be kept between his Matys [majesties] naturall born subjects and foreigners which latter are the most prevailing part of this Government.
>
> (O'Callaghan, 1850, v. 1, p. 103)

The port was also a source of conflict between New York and New Jersey. In 1664, James, the Duke of York and Albany granted the area between the Hudson and Delaware Rivers to be known as Nova Caesarea or New Jersey to John, Lord Berkeley, and Sir George Carteret. Meanwhile, unaware of this grant, New York's Governor Nicolls was encouraging settlements on the western side of the Hudson at sites now known as Elizabeth, Shrewsbury, and Middletown. Disputes arising from these settlements and other matters finally led to the division of the colony into East and West Jersey in 1676, when William Penn persuaded Carteret to split the colony, with Penn taking the southern half. When Carteret died in 1682, Penn bought the northern half. New Jersey thus came close to being the Quaker Commonwealth of Pennsylvania, but squabbles over land titles led Penn to lay out Philadelphia instead of New Jersey.

A Bi-State Port — Early Problems

By breaking the commonality of jurisdiction at the mouth of the Hudson the mischief was done. It was inevitable that two separate colonies situated adjacent to a port should squabble over customs and their circumvention and compete for trade, as well as argue unresolved questions such as the ownership of Staten Island. Because East Jersey had no customs regulations, New Yorkers feared that it would capture significant parts of emerging trade at a cost to New York. Indeed, the rise of Perth Amboy as a port began at this time. New York City was also plagued by the continuing disinterest of eastern Long Islanders in abiding by regulations proclaimed by the city. A healthy trade between eastern Long Island and Boston continued well into the nineteenth century.

New York granted a monopoly to the steamboat operations of Robert Fulton and Robert Livingston (Gibbons vs. Ogden, 1824, p. 105). When New Jersey contested the grant in Gibbons vs. Ogden, the US Supreme Court removed navigation control from the jurisdiction of either state. The boundary dispute between New York and New Jersey remained unresolved until 1834 when a middle line was drawn. However, New York asserted jurisdiction over all the waters of

the Hudson River to the high tide mark on the Jersey shore, exclusive of docks and wharfs. New Jersey, believing that Perth Amboy could become a significant port, accepted this assertion with the quid pro quo that it would have jurisdiction over the waters between New Jersey and Staten Island to the high tide mark on Staten Island (Bard, 1968, p. 5-6).

Prior to the War of 1812 growth of the port was uneven. New Jersey was unable to capture significant shipping traffic until the railroads came in about 1850. The railroad builders, concluding that bridging the Hudson would be prohibitively expensive, brought their rights-of-way through New Jersey, terminating as close to the port as possible. From these, freight and passengers were transferred to barges and transported to New York. In the period before the first world war, most railroad companies established terminals along the waterfront opposite Manhattan. The carfloat and lighterage system created to transport railroad cars was unequaled.

A series of port commissions established by New York and New Jersey through the early 1900s spurred rather than resolved inequality in the relative rates of port development. Matters came to a head in what has become known as the "New York Harbor Case" (1917). On 27 May 1916, an association of New Jersey interests filed a complaint with the Interstate Commerce Commission charging that railroad rates applicable to New Jersey were discriminatory because they did not provide for the costly services of lighterage, the term used to describe the barging of railroad cars about the harbor. Eugenius H. Outerbridge, president of the New York Chamber of Commerce, recognized the significance of the complaint and caused the State and City of New York to intervene, arguing discrimination against city interests. The Interstate Commerce Commission denied the application by New Jersey interests, and, in its report, presented the first judicial statement of the unity of the port region. In the late stages of arguing the case, New Jersey leaders recognized the importance of mechanisms to end the long disputes between New York and New Jersey and proposed a joint approach to harbor development. This new found spirit of cooperation blossomed and by the end of 1917 both states initiated legislation to implement the concept. Finally, on 30 April 1921, with the blessings of the US Congress, representatives of New York and New Jersey signed compacts to form the Port of New York Authority which was to have broad powers within a port district defined by boundaries roughly 20 miles from the lower point of Manhattan Island (Bard, 1968, p. 4).

Ship traffic in and out of the port has been sufficiently heavy that in July 1977 the United States and the Intergovernmental Maritime Consultative Orgnization felt the need to form a "Traffic Separation Scheme" establishing six sea lanes, three each way, for port traffic control (Marr, 1979). In February 1978 collisions between fishing boats and commercial traffic within these lanes led to action by the Coast Guard to ban fishing. Within one month, however, Congressional pressure forced a reversal of the rule (Armstrong and Ryner, 1980, p. 68). Conflicts between users abound in the Bight -- few are satisfactorily resolved.

From Sails to Steam

During the two-and-a-half centuries of development before the Port of New York achieved its preeminence, the technologies of waterborne trade evolved from sailing ships hardly larger than today's yachts, to the brilliantly

Figure 11 Ships awaiting berths anchor in Upper Bay. View out into the Bight across the Verrazano Bridge. Courtesy of the Port of New York and New Jersey Authority.

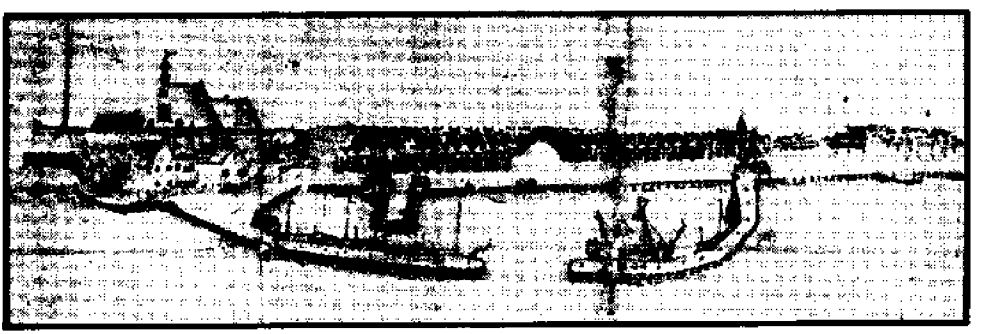


Figure 12 The Great Dock on the East River (1679-80), 30 years after its construction. This was the port's first and longtime major docking facility. Source: The Long Island Historical Society.

beautiful clipper ships, to steamboats, to ocean liners, to today's supertankers and giant cargo ships. It was an often difficult transition for the port, however, its commercial heritage and geographic setting combined to serve the port well through the transition.

The commercial heritage of the port began in 1678 when a monopoly was granted to a few leading citizens for the bolting of flour and baking of bread for export, often referred to as the "Bolting and Baking Act" (Wilson, 1892, v. 4, p. 495). The port's evolutionary development from a colonial trade in furs and other products of the wild to an economy stimulated by the region's developing agriculture can be traced from this point. There were reported to be 3 ships, 8 sloops, and 7 boats in the harbor in 1678; the number rose to 60 ships, 62 sloops, and 40 boats by 1694. In 1978, calling at the port were 7,620 ships, nearly 20% of all ships calling at the 11 leading US ports (A. Hammon, personal communication, 1979).

Early port development was concentrated along the East River where the Great Dock, Manhattan's first, was built in 1649. Because New York did not have to contend with the high tidal ranges so often encountered in European ports, its docks were simple affairs. A Glaswegian visitor of 1823 wrote:

> The slips run up a considerable way in the center of the buildings, as it were in the middle of streets; and being built or faced up with logs of trees cut to the requisite length, allow free ingress and egress to the water, and being completely out of the current of the stream or tide, are little else than stagnant receptacles of city filth; while the top of the wharves exhibits one continuous mass of clotted nuisance, composed of dust, tea, oil, molasses, &c., where revel countless swarms of offensive flies.
>
> (Albion, 1939, p. 221)

By 1840 the East River had 60 wharves; the Hudson had 53. Each was numbered consecutively moving north, starting at The Battery with #1. The East River remained the principal commercial area until the steamboat and Hudson River traffic became important.

New York City, under state legislation (1807) that gave title to lands 400 feet offshore, permitted construction of piers up to 400 feet long. Garbage, spoils, sewer waste, ballast cinders, and other materials quickly filled in the spaces between piers. Dockowners then extended the piers farther. Had this extension continued, by 1900 the East River would have been spanned and the Hudson would have been a quarter mile wide (Klawonn, 1977, p. 66).

A New York Harbor Commission, formed by the state legislature in 1855, coped with the expansion of the city. An advisory council, led by General Totten, hero of the Battle of Plattsburgh, surveyed the harbor and delineated the bulkhead line. Anti-dumping laws, harbor delineation laws, and the Office of Supervisor of the Harbor all date to the time of the commission formation (Klawonn, 1977, p. 67).

The first wharves on the New Jersey side were constructed in 1847 and by the 1900s there was extensive port development in both Brooklyn and New Jersey. For most of its early years, the port was visited by the usual run of sailing vessels common to the day. The 1848 discovery of gold in California

Figure 13 Fulton's Clermont on the Hudson River circa 1810 opened the steamship era and ended the age of the Hudson River sloops. Source: The I.N. Phelps Stokes Collection of American Historical Prints, The New York Public Library.

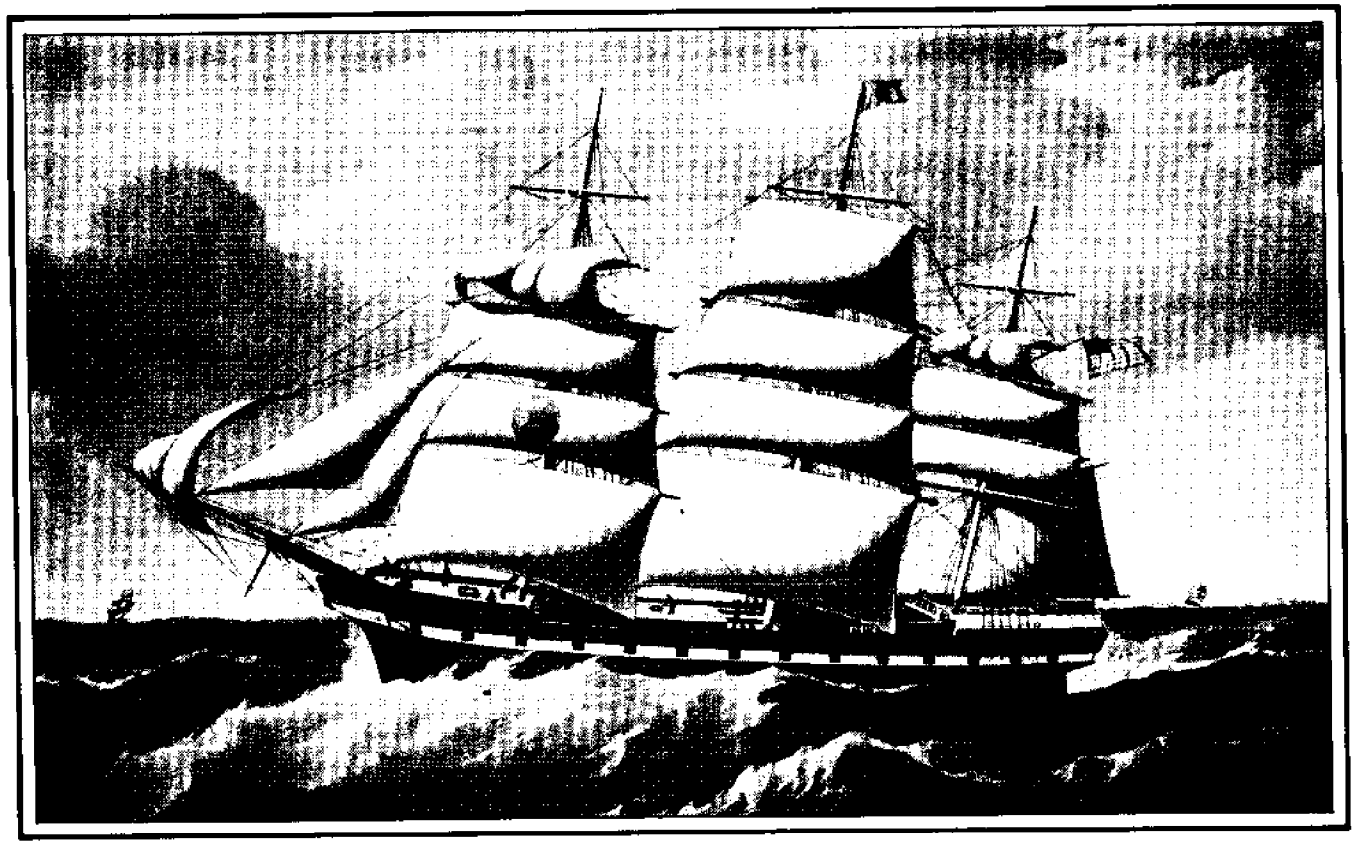


Figure 14 The James Foster, Jr. a vessel of the Black Ball Packet Line. This company was the first to establish regular packet service between New York and England. Source: The Fine Arts Collection of the Seaman's Bank for Savings.

changed that. New York sent 214 ships to the west coast in 1849; Boston sent 151; no other eastern port sent more than 42.

New York was the established leader in developing the China clippers. The 360 ton Empress of China built in Boston in 1783 was the first vessel to sail from America to China, leaving New York on 22 February 1784 (Chapelle, 1935, p. 140). Another, the sloop Experiment, built in Albany for the Hudson trade, was single masted and had a capacity for only 80 tons of cargo, but carried out a profitable China trade (Spears, 1919, p. 107). New York was now ready to capitalize on building clippers for the Cape Horn route to fuel the appetites of California. New York, with Boston, was to overshadow all other ports in construction and ownership of clipper ships (New York built 30%; Boston 45%). New York was clearly the headquarters for the greyhounds of the sea.

The Hudson River, Long Island Sound, and other portions of the estuarine complex that house the port were also the starting points for other kinds of ventures: Robert Fulton's Clermont first sailed from New York's 10th Street Wharf on her maiden voyage to Albany. The Clermont and her successors were triumphant, largely because of the complex of sheltered waters in which they could sail. The Hudson River, without great tides or the strong current of the Mississippi or Missouri rivers, was an excellent trial ground.

Most early trade was conducted by tramper. Ships arrived and departed without schedule and headed for destinations based upon the cargo their captains could acquire at any given port. A great innovation was the development of scheduled trade or the "liners." In October 1817 New York papers carried the startling announcement that regular monthly service was to be established between New York and Liverpool. The first such liner service from the New World was by the Black Ball Packets which made the trip to Europe in 22 days. By the 1900s the great steamships were making the same voyage on tightly scheduled runs in five days.

The history of the Port of New York is distinguished by other events as well. Around 1700 Captain Kidd and other West Indian pirates made the port their rendezvous, doing considerable trade with local merchants. The Governor of New York was finally compelled to plead with the Admiralty to send help "which would discourage and destroye these vermine who have hitherto made New York their nest of safety" (Albion, 1939, p. 4). Although Captain Kidd reportedly buried treasure in the port vicinity, by now New Yorkers have given up the search. The port also had the dubious honor of being the site of the first military attack by a submarine. In 1776, Sargeant Ezra Lee pedalled David Bushnell's submarine, the Turtle, to attack the British blockade fleet, but he was thwarted by tides and copper-sheathing on the British vessels (Klawonn, 1977, p. 8).

The Bars of the Port

The geographical setting of the Port of New York, the second factor leading to its preeminence, resulted from it being the only port of consequence in the 100-mile plus stretches of coast from Cape May to Sandy Hook and from Montauk to Coney Island. Other great ports, such as Baltimore and Philadelphia, lie at the head of a long river stretch, but New York Harbor is 17 miles from the ocean, well protected from storms, relatively ice free, and less subject to fogs or other atmospheric conditions that would hinder traffic. The Port of New York lacked local competition.

Figure 15 Clearing of the East River Channel, now called Hell's Gate was one of the US Army Corps of Engineers' first major operations. Tunnels were dug from land out under the reefs and then filled with explosives. The resulting explosions, which destroyed Flood Rock and Hallett's Point Reef, were among the largest man-made explosions to that time, 1885. Source: Museum of the City of New York.

The sandy, shoal shores of those stretches were hazardous for sailing ships, however. The bottom of New York Bight is littered with the wreckage of countless vessels driven upon them by storm winds (Rattray, 1973). The apex of the triangle formed by these long sandy legs terminates beneath the surface in a great complex of bars lying between Sandy Hook and the Rockaways. Wave action and currents carrying sand from Highland Beach, NJ, north along the coast, created Sandy Hook over thousands of years. Similarly, waves and currents carry sand from Montauk Point to the Rockaways. In both instances, more sand is transported below the surface and continually contributes to the shifting bars that cut off the harbor from the sea. The flow of the Hudson River is sufficiently great to maintain a relatively deep channel, and for the first several centuries these channels were used by the sailing ships to gain access to the harbor.

It wasn't until the arrival of the Great Eastern on 28 June 1860, that these bars became important in the future of the harbor. By far the largest vessel of her time, the Great Eastern drew 30 feet. There was considerable concern about her ability to call at New York. After awaiting high tide, she was taken across the bar, and by most accounts, is reckoned to have touched bottom, drawing 27 feet aft. Other entrances to the port were even worse, however. Hell Gate, the entrance from Long Island Sound through the East River, had rocky reefs that caused violent and uncertain currents. The British frigate Hussar struck a rock there and went to the bottom carrying several million dollars in gold, still at the bottom of the East River.

Federal programs to improve rivers and harbors commenced in 1834 with the first US Corps of Engineers civil works project, navigation improvement in the upper Hudson River (Klawonn, 1977, p. 60). In 1851, a combination of business capital and a municipal appropriation of $13,861 helped to remove some of the rocks of Hell Gate (Albion, 1939, p. 28). Two years later, it was matched by a federal appropriation of $20,000 (Klawonn, 1977, p. 75). The removal of Hallet's Point Reef and Flood Rock, both in the East River, were among the engineering achievements of the age. Tunnelled and mined, these obstructions were blown up. It took the largest quantity of explosives assembled for a single operation to demolish Flood Rock in 1885 (Engineering News and American Contract Journal, Sept. 12, 1885).

The main channel entrance was not dredged until 1884, however, and it was not until the turn of the century that the East Channel with its 16-foot natural depth was considered inadequate. Once deepened to 40 feet it was renamed Ambrose Channel. Because there is continual movement of sand into the channel region, maintaining it and the system of deep draft channels throughout the port has become a full-time job.

The magnitude of sand movement along the coast of the harbor mouth is indicated by the growth of the spits that forms the shores. At the western end of Fire Island, a lighthouse originally located 425 feet from the end of the spit is now over 5 miles from the end (US Geological Survey, 1979 a, b). The Sandy Hook lighthouse, built in 1762, is now 7,000 feet from the tip (US Geological Survey, 1954). Lighted in 1764, it is the oldest lighthouse in continuous service in the Western Hemisphere.

Today, the Port of New York has over 180 miles of dredged channels. Maintaining these in the face of over 300 million cubic yards of sand moved to the harbor mouth has become a major enterprise of its own. Sediments dredged

from the harbor are taken out and dumped at the Mud Grounds about 12 miles off the harbor. Since 1890 1.9 billion cubic yards of waste solids have been dumped by man (Gross, 1976, p. 10), of which dredged spoils constitute the largest part. These dumped wastes constitute the largest single source of sediment to the Bight (Freeland, 1976). Between 1964 and 1968, an average of about 5.7 million cubic yards of dredged spoil have been dumped there each year (Gross, 1976). In addition, earth fill and fly ash from fossil fueled power stations have been dumped at the site. In the more than 35 years the Mud Grounds have been used, enough material has accumulated to form underwater hills over 30 feet high on the continental shelf. These manmade hills have now become navigational hazards (Williams and Duane, 1974, p. 38-41).

Via Erie to the West

"Clinton's Ditch" is often credited with contributing much to the rise of the great port. Originally, the port's hinterland was the Hudson River Valley and adjacent Long Island, New Jersey, and Connecticut. Commercial enterprise encountered competition as it spread into the hinterland: East Jersey traded with New York via Raritan and New Brunswick; West Jersey with Philadelphia; Connecticut and eastern Long Island were held in Boston's sphere.

Governor Tryon's "Report on the State of the Province of New York" in 1774 gives interesting insights into the trade at this time:

> The Natural produce & Staple Commodities of this Province are Wheat, Indian Corn, Oats, Rye, Pease, Barley and Buck Wheat, Live Stock, Masts & Spars, Timber & Lumber of all sorts, Furrs, Skins, Beeswax, Iron Ore, Pork, Beef, Flour, Pot & Pearl Ashes.--And its Manufactures are, the making of Pig and Bar Iron, Distilling of Rum and Spirits, Refining of Sugar, and making Chocolate; from Molasses, brown Sugar and Cocoa imported.--The Making of Soap and Candles, Hats, Shoes, Cordage and Cabinet Ware, Tanning, Malting, Brewing & Ship Building.
>
> (O'Callaghan, 1850, v. 1, p. 515)

By the mid-1800s the metropolitan region had great textile mills, garment factories, ironworks, metal and woodworking shops of every kind, shipyards turning out clipper ships and river craft, breweries and distilleries, flour mills, and meat packing plants. The area produced the greatest variety of consumer goods in America. These items moved through the port.

Linking the port with the westward pioneer movement played a key role in expansion. Here, New York clearly had the edge. As early as 1724 surveyors commented on the possibility of a water level route westward from Albany to Lake Erie, avoiding the Appalachians. In 1810, the New York State Legislature appointed a commission to investigate the possibility of such a connection, and in 1818 passed the legislation necessary for its construction. Pushed tirelessly by DeWitt Clinton, the Erie Canal became a reality when in October 1825 its 353 mile route was opened to commerce.

The canal was an immediate success. In 1825, 185,000 tons of eastbound cargo consisting of flour, wheat, whiskey, and lumber were shipped through it. The 33,000 tons of westbound shipments weighed less, but were more highly valued imported goods and domestic manufactures. By 1840, Chicago shipped

goods destined for the Port of New York, Great Lakes, and the canal. By 1850, the Erie Canal, which had already paid for itself several times in the tolls collected, carried 3,076,617 tons. The significance of the canal may have been not so much in the volume of export materials brought from the hinterland, but in the development of a commercial network to sell the imported goods arriving at New York's docks from overseas. New York's prime position to receive overseas goods also made it more attractive than other ports as an export point.

In creating the Cotton Triangle, New York's port was to cement its competitive position with all other Atlantic ports. To accomplish this, New York finances developed coastal packet lines that linked the cotton ports of Charleston, Savannah, Mobile, and New Orleans with the European ports of Liverpool and Havre. It is claimed that during the early 1800s, the period of the Cotton Triangle, New Yorkers were getting 40 cents--in interest, commissions, freight, insurance, and other profits--of every dollar paid for southern cotton. This "irrational" trade, which required hazardous coastal shipments in lieu of direct business with Europeans, seemed to prosper because New York had access to desired foreign imports and New England manufactures. These goods, concentrated in the Port of New York, were the basis for both the coastal trade in cotton to the port, and the Cotton Triangle (Albion, 1939, p. 95-121).

By 1822, the port was exporting $9,228,000 in goods. Over 40% of this represented cotton, followed distantly by flour from primarily northern sources. Tobacco, pot and pearl ashes, undressed skins and furs, flaxseed, saltbeef and pork, naval stores, and rice were the remaining major exports. By 1860, the flow of exports through the port had increased to $120,600,000 or about 32% of the nation's total. Cotton, gold boullion, flour, cotton goods, tobacco, iron and iron manufactures, lard, wheat, and naval stores accounted for the majority of this value. Imports through New York City were valued at over $233,600,000 or about 65% of the nation's total. Woolen, silk, and cotton goods led the list (in value) followed by sugar, iron manufactures, linen and other flax manufactures, coffee, tea, hides and skins, and other manufactured goods.

Today, neither the Erie Canal nor the Cotton Triangle are important port activities. The port's hinterland has shrunk as rail and road transport eased movement of goods from cities to other ports and as the nation's population dispersed. As with other ports, bulk movement of oil and petroleum products dominates the lists of importations. Bulk cargoes account for much of the volume handled by the port (81%) and most of that (77%) is oil based (Hammon, 1976, p. 9). However, port commerce is still marked by the high value of the imports received and by the very large amount of local traffic generated--more than half the local traffic of all ports in the nation.

Of Containers, Planes, and Ports

Technology has profoundly affected the face of the Port of New York. Gone are the tall ships and the gala departures of the trans-Atlantic liners. In their place is a new generation of vessels and means of transport.

For most of man's history, goods were moved in ships in what came to be called break-bulk cargo. Materials were crated, bagged, or bundled into the

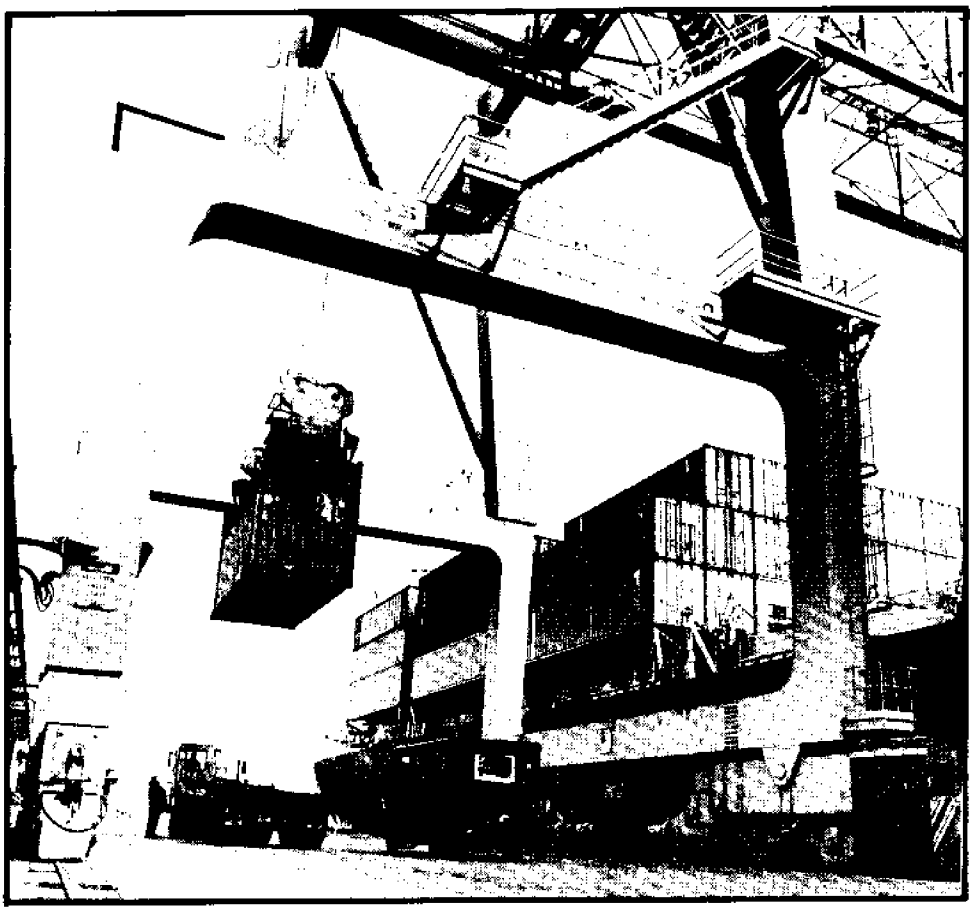


Figure 16 To load a containership requires lifting the equivalent of a tractor-trailer rig load onto a ship every three minutes. This method of packaging goods for overwater freight shipment changed the character of ports within a decade; it was the most profound change in ocean shipping since the steamship. Courtesy of The Port of New York and New Jersey Authority.

capacious holds of ships, shored up to keep them from shifting in transit, and off-loaded at appropriate ports of call. There was often not enough cargo from a single shipper to fill a vessel. These trampers, so called because they wandered without fixed itinerary, were early displaced by liners that had regular routes and scheduled callings. Both types of vessels were characterized by masts, booms, and rigging or derricks by which slings or pellets of cargo were loaded. Today, such vessels are becoming scarce as they are replaced by ungainly container ships loaded with aluminum or steel boxes that measure 8 x 8 x 10 to 40 feet piled to startling heights. This, the container revolution, pioneered in the port, has had enormous impacts on shipping and on port configuration.

After World War II movement of land freight by truck was clearly increasing. It was necessary to link large trailer trucks with ships: transferring the box of the truck to the ship was the answer. In 1967, the Port Authority published a study entitled "Container Shipping: Full Speed Ahead" (Port of New York Authority, 1967). Few authorities would disagree that containerization of cargoes was the right idea at the right time. The greatest change in port development was about to occur.

Containerization has removed the major activity of loading and unloading cargo from dockside to the place of manufacture. Large numbers of stevedores previously required to work the ships became unnecessary. Because the cargo arrived ready to load, and because large cranes were able to lift and place the containers on the ships in seconds, turn around time in ports could be measured in hours instead of days. Container ships now routinely take on cargoes in 8 to 12 hours that would have taken up to four months by old means. Because ships spend so little time in port, it has become necessary to backlog containers to be shipped, and move empty containers to the point of loading. Containerization requires spaces instead of warehouses adequate for breakbulk cargoes transferred by truck to rail. Between 30 and 50 acres of back-up space are required per container crane.

Anticipating and actively participating in the development of containerization, the Port Authority made plans in the mid-1950s to develop containerport facilities. New York's coastline was already studded with piers and warehouses, many new, but never used. The city's waterfront was congested and truck traffic moved very slowly. But New Jersey's coast, slow to develop, had acres of low marshy land available for development. By 1962, the Port Authority, using sands dredged from the Lower Harbor, filled 1,165 acres of marshlands for the Elizabeth Container Facility. There are now 19 container cranes servicing 22 container berths.

Shortly after the creation of the Elizabeth Container Facility, Port Newark was redeveloped to handle containers. These two facilities handle 75% of the port's container traffic; Howland Hook and Northeast Terminals on the New York Side handle the remainder. New York's docks still handle most of the break-bulk traffic, over 80% landing or departing from New York piers.

Containerization developed rapidly: in 1968, 18% of the port's cargoes was containerized; in 1978, 60% was containerized (A. Hammon, personal communication, 1979). New York City clearly lost in this growth. Of 42 city-owned piers on the Hudson River, many built just prior to the container revolution, 3 are used for shipping, 17 are vacant or demolished. Only two active piers remain on the East River. Five percent of the city-owned piers are now used for freight consolidation, storage, or parking.

The container revolution has had a human side also. The locus of port-related employment shifted drastically. Much of the packing and making up of shipments was no longer done dockside, but was accomplished at the site of manufacture. This resulted in a net decrease in employment of stevedores and related occupations. Union jurisdictions were such that many of the stevedores from the New York side were unable to move to the New Jersey side without loss of seniority. Many stevedores, unable to find work in the lesser used facilities of the city side, still draw a union negotiated wage until they retire, funded by a surcharge placed on all shipments into and out of the port.

Patterns of transport on the land were also changing: trucks were replacing the train. Ideally located adjacent to the New Jersey Turnpike, the new containerport facilities at Elizabeth and Newark were highly favored over the old docks approachable only from Manhattan's congested streets. Even though New Jersey has excellent rail facilities right to the port, the trend has been steadily away from rail freight to truck.

Further changes were to severely affect the port. Just as containerization revolutionized ocean freight, so the airplane caused the demise of the ocean liner. By the 1940s, Juan Trippe's great Flying Clippers operating from the marine terminal of LaGuardia Airport, carried increasing numbers of European bound passengers. With the end of the war came new, large, long-range aircraft, making mass air travel and trans-Atlantic travel commonplace. In 1955, 700,000 trans-Atlantic passengers left from the Port of New York; 20 years later that number was down to 61,500, and most of those passengers were on cruise ships. But even in the cruise business, the Port of New York can't compete. It is more desirable to fly to southern ports and board a tropical or Caribbean cruise than to spend two or three precious days fighting stormy cold weather of the North Atlantic to get to the southerly climes.

While the City of New York with the Port Authority was developing the Consolidated Passenger Ship Terminal at piers 88, 90, and 92, the passenger ship business was dying. Traffic at the region's three major airports, all operated by the Port Authority, was booming. Newark, the first major airport in the Bight region, was opened by the City of Newark on 1 October 1929. New York City's LaGuardia Airport opened 10 years later. Both were turned over to the Port Authority in 1947. New York International Airport, formerly Idlewild, was opened in August 1948, and renamed John F. Kennedy International Airport in 1963. Among these three, 2,167 flights per day are handled, with a capacity for 114,726 passengers and 3,300 tons of airfreight daily (Port Authority of New York and New Jersey, 1979, p. 19).

A Blighted Port

Today, the port is seriously plagued with the remnants of obsolete and unused facilities and vessels along its shores and shoal waters. Aside from rotting sunken hulks, which regularly and often unnoticed release drift into navigable waters, their existence destroys the esthetics and prevents full use of the shore area. The US Army Corps of Engineers has been collecting and disposing of such material from harbor waters since 1915 (Klawonn, 1977, p. 256). But, this does not cure the problem, it merely copes with it. By 1960 the NY District of the Corps of Engineers had four specially rigged boats catching 600,000 cubic feet of materials annually (Klawonn, 1977, p. 256).

Figure 17 Containerization requires large layout areas where the full and empty containers can be stored, sorted and loaded. Cargoes, instead of being loaded at shipside, are now put into the containers at factories and brought full to the port. The speed of loading and unloading requires that the containers be accumulated at the port in advance of the ship's arrival. Even when stacked several high, existing finger pier docks could not provide the required area. Port Elizabeth (pictured here) and Port Newark were built as container ports on wetlands filled with sand dredged from the harbor. With their completion, major port activity shifted from the New York to the New Jersey side of the Hudson. Courtesy of the Port of New York and New Jersey Authority.

Figure 18 Debris accumulating from river-borne flotsam and jetsam, refuse and timbering tossed overboard from ships, and debris from decaying docks, piers, bulkheading, and vessels necessitates major clean-up campaigns. Pictured here are the "before" and "after" of a US Army Corps of Engineers activity. Courtesy of the Port of New York and New Jersey Authority.

There are about 3,100 drift damage incidents each year with annual losses estimated at $13 million. To get ahead of the problem, in 1976 the Corps commenced a project removing or repairing 2,230 derelict timber and steel vessels, 100 dilapidated piers, wharfs, and miscellaneous structures amounting to an estimated 23.6 million cubic feet of potential timber drift and debris (US Army Corps of Engineers, 1975).

The problem of drift and decaying docks and piers is not apt to lessen. Today, as water quality in the harbor is improved through construction of sewage treatment plants and other pollution abatement projects, a new specter emerges--the wood borers. These small molluscs play havoc with wooden pilings the world over. Today, there are probably over 2 million wooden pilings in the harbor, most of them unprotected from the borers. Some, such as those at Erie Basin, go back to 1860 and are still sound.

The Port of New York had been exempted for over a century because of the low oxygen levels in the harbor. Because the molluscs need oxygen to live and to bore, and because such oxygen has not been present in sufficient quantities for sufficient periods of time, the harbor had been free of them. In 1833, New York City's Board of Aldermen noted:

> And whereas it is a fact of great notoriety that piers and wharves, as now constructed of timber, are temporary, and generally endure only from fourteen to seventeen yaars (sic) before they are destroyed by worms.
>
> (New York [City]. Board of Aldermen, 1833)

But a Port Authority survey shows that the borers are moving into the harbor again and that corrosion, by oxidation of sheet steel piling is also increasing (Kennedy and Wilson, 1967, p. 54).

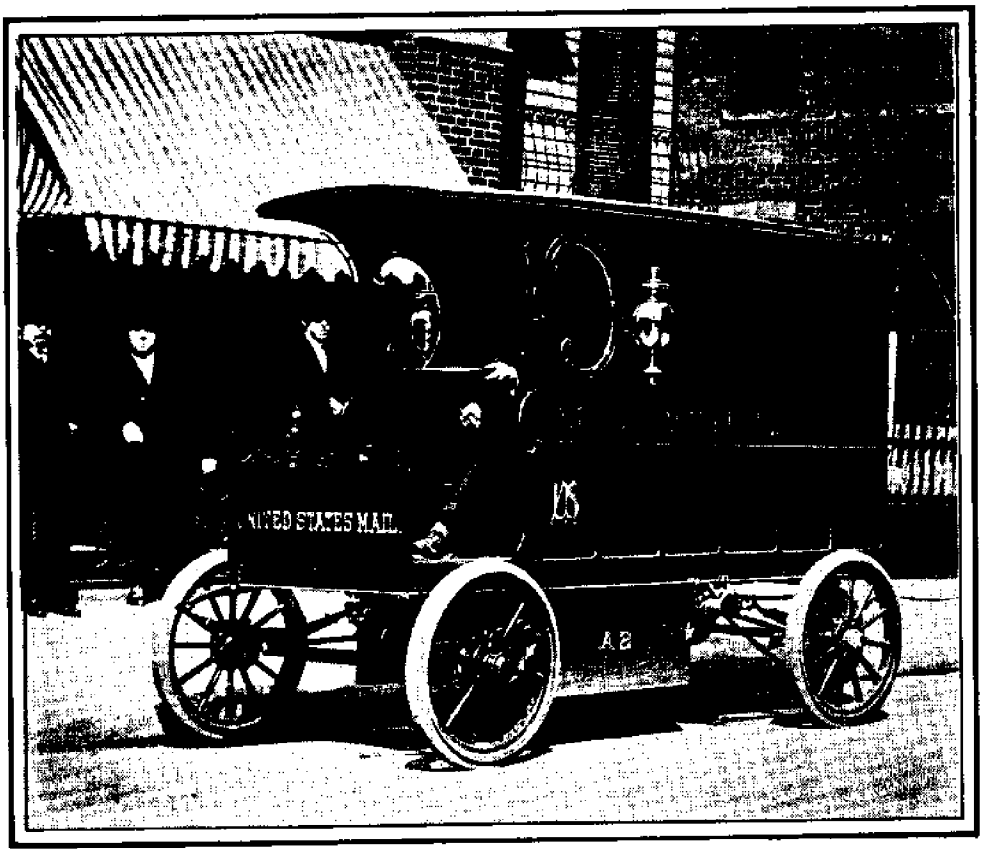


Figure 19 Pneumatic tires were the impetus for modern truck transport. Until their invention, the only alternatives to rail were chain-driven, electrically powered, solid-tire vehicles slightly better than the horsedrawn carts they replaced. Pictured here in 1909 is one of the first electric vehicles put into service in New York City. Source: Library of Congress.

65 Bridges to New York

Transportation in the Bight region developed along natural pathways. Early commerce was almost entirely waterborne. New York's geography was conducive to this with its four natural waterborne pathways: (1) east via the Mohawk to the Hudson, then to New York City; (2) north via Lake Ontario and the St. Lawrence to Montreal; (3) southeast via the Susquehanna to Baltimore; and (4) southwest via the Allegheny to Pittsburgh.

Through the early part of the 1800s almost 90% of the commerce of the region moved by water. All types of sailing ships were engaged in coastal or overseas trade. Steamboats became early fixtures on the inland waterway system of New York Harbor, the Hudson River, and Long Island Sound. Eighteen Years after Robert Fulton's Clermont voyaged to Albany in 1807, 43 steamboats called New York their home port (Ellis et al, 1967, p. 178).

As agrarian centers developed, the need to link them by a system of roads increased. Because of their dispersed nature and sparse populations, few roads were built other than between farming centers and local ports. It was passenger traffic between major centers that stimulated the development of highways. By 1784, Levi Pease established regular coach service between New York and Boston. Chartering of turnpikes for development by private entrepreneurs caused the first big boom in road construction. In New York, the first charter was granted in 1797, and by 1821, 4,000 miles of turnpikes had been constructed. New Jersey, lying between the two great metropolitan centers of Philadelphia and New York, experienced even earlier turnpike construction. Freight transport between South Amboy and Burlington was established by 1707 with regular passenger service advertised by 1723 (Rae, 1971, p. 12). New Jersey began chartering turnpikes about the same time as New York, and by 1828, granted over 54 charters. While the trip between New York City and Philadelphia took 30 to 40 hours of travelling time in the mid-1700s (few persons attempted the bone-jarring trip without several layovers at inns), it was the regularity and predictability of coach service that attracted passengers.

For freight, however, water transport remained the only economically feasible alternative. The boom in turnpike construction was checked by the development of canals. The costs were clear. The expense of shipping wheat from Genessee County, NY, to New York City by turnpike exceeded the sale price of the wheat. The Erie Canal changed that, albeit briefly. The glamorous canal period was short. Volume of commerce carried on canal boats peaked by mid-nineteenth century then fell off as the railroad took over. New York's extensive canal system was not alone in giving the state and its port a decided edge over Philadelphia and Baltimore for the Ohio trade. Pennsylvania almost bankrupted itself with canal building (Ellis et al, 1967, p. 246). New Jersey also had canal fever. The Morris Canal, linking the Delaware and Lehigh Rivers with Newark Bay, was acclaimed an "engineering wonder of America" for it climbed 914 feet to Lake Hopatcong. But it and the Delaware & Raritan Canal failed to survive the railroad.

The railroad era began with the 1850s. In New York most early rail development linked the west with Albany where freight was transshipped to the Hudson River traffic. Recognizing that it was losing ground to other ports as a result of railroad construction, New York's barons--Vanderbilt, Gould, Pullman, and Morgan--saw to it that the railroads were extended to New York City. By 1852 the canals were defeated.

Development of railways meant not only an increase in freight traffic but also passenger traffic. Construction costs precluded development of passenger service except for internal urban systems or intercity systems. Continued construction and improvement of roads increased competition between the automobile and intercity transit systems.

Automobility and the Bight

"With his characteristic flair for understating the spectacular, President Warren G. Harding said in his April 12, 1921 message to Congress that 'the motor car has become an indespensible instrument in our political, social, and industrial life'" (Flink, 1975, p. 140). Few would disagree with President Harding. No other technological innovation has had greater social and economic impacts on American life than the automobile. Making an automobile within economic reach of the average man changed the face of the country, for by the automobile, the traditional links between place of residence, place of work, and place of recreation were broken and the process of suburbanization and distant recreation commenced.

The pressures to connect Manhattan, Long Island, the mainland, and New Jersey grew. Once bridges and tunnels linked these areas of Manhattan with the mainland, torrents of humanity poured out to pioneer the pastoral regions surrounding the metropolitan nucleus. In 1920, passenger travel on intercity railway lines peaked and except for a brief period during the second world war was never to outstrip the passenger car again (Willey and Rice, 1933, p. 169-170).

With increasing dominance of the automobile and the development of highways, the metropolitan region opened up: suburbia was created. While the railroads provided some focal points for rural living, absence of convenient mechanisms for transportation beyond stations limited the growth to local clusters. Although street cars and railways initiated suburbanization, the full flower of the process was not reached until the automobile came fully of age.

> In 1925, only 2 percent of the Region's "closely developed" residential land [in the New York City metropolitan region] was more than a mile from a railroad station. But no less than 10 percent of the area brought into close residential development between 1925 and 1940 was more than a mile from a station.
>
> (Hoover and Vernon, 1959, p. 221).

Beaches, once the province of the local folk and the wealthy became accessible to the majority of city dwellers. Congestion and crowding of roads necessitated new highways; congestion and crowding of beaches required a new concept in development--public beaches providing amenities for the masses.

Along with easy, convenient, personal transport came a change of attitudes. Because one could afford to travel to more distant places, concern for the quality of the local environment lessened. The lure of the exotic and distant lands may well have spelled the downfall of the once highly fashionable urban watering places, now relegated to the less affluent.

The primary effects of the automobile on American society have been status, additional freedom of movement for seeking jobs and place of residence, and the development of service enterprises (the first gasoline station in the Bight region opened in New York City in 1901.) These effects are seen in a number of ways. Before the second world war, New York City and Hudson and Essex counties of New Jersey constituted the core of the metropolitan area: most employment was located there together with the port, rail, and air facilities. But in the last 20 years, the ring of Nassau, Suffolk, Bergen, Middlesex, Monmouth, and Union counties has been the region of population growth.

Not all of the impacts of automobility are social and economic dislocations. As automobile technology improved, it added new kinds of pollutants to our environment. The development of high compression engines and resulting requirements for leaded gasolines added a spectrum of chemicals to our atmosphere. Asbestos from brake lines and rubber shards from tires became part of the washout from the highway systems together with the complex obnoxious substance--crankcase drippings.

The need to carry bulk fuel to a wide variety of recharging points called gas stations, together with the need for cheap energy, resulted in increased amounts of petrochemicals in the atmosphere and the surface waters. Because there was no economic necessity to reclaim spent lubrication oil, it was disposed of by the easiest method, usually down the storm sewers or in the local creek.

There are estimates that 29.4% of the oil in the ocean comes from automobiles; industrial wastes contribute only 15.3%; refinery and chemical plants about 6%; and spills from tanker and tanker operations make up about 29.8% (Pornicelli, Keith, and Storch, 1971).

Not all of the traffic on highways is automobiles. Trucks have become an increasingly important means of moving goods. Development of effective pneumatic tires during first world war and their widespread adoption in the 1920s caused a boom in truck transportation (Litchfield, 1954, p. 142). Gone were most of the chain-driven, solid-tired vehicles that roamed city streets (although some of them persisted up to the 1940s) and gone was the railroads' dominance of freight traffic. By 1956, 75% of freight traveled by truck, a figure that has been more or less constant since (Rae, 1971, p. 109). Most truck traffic remains local; 50% of the giant, interstate semis travel less than 80 miles per day.

And Moses Descended from the Mount

More than any other individual, Robert Moses shaped the future of the shores of the New York Bight. In power for 44 years as City Park Commissioner, City Construction Coordinator, and as a member of the City Planning Commission, he was for New York City the ultimate politician and consummate

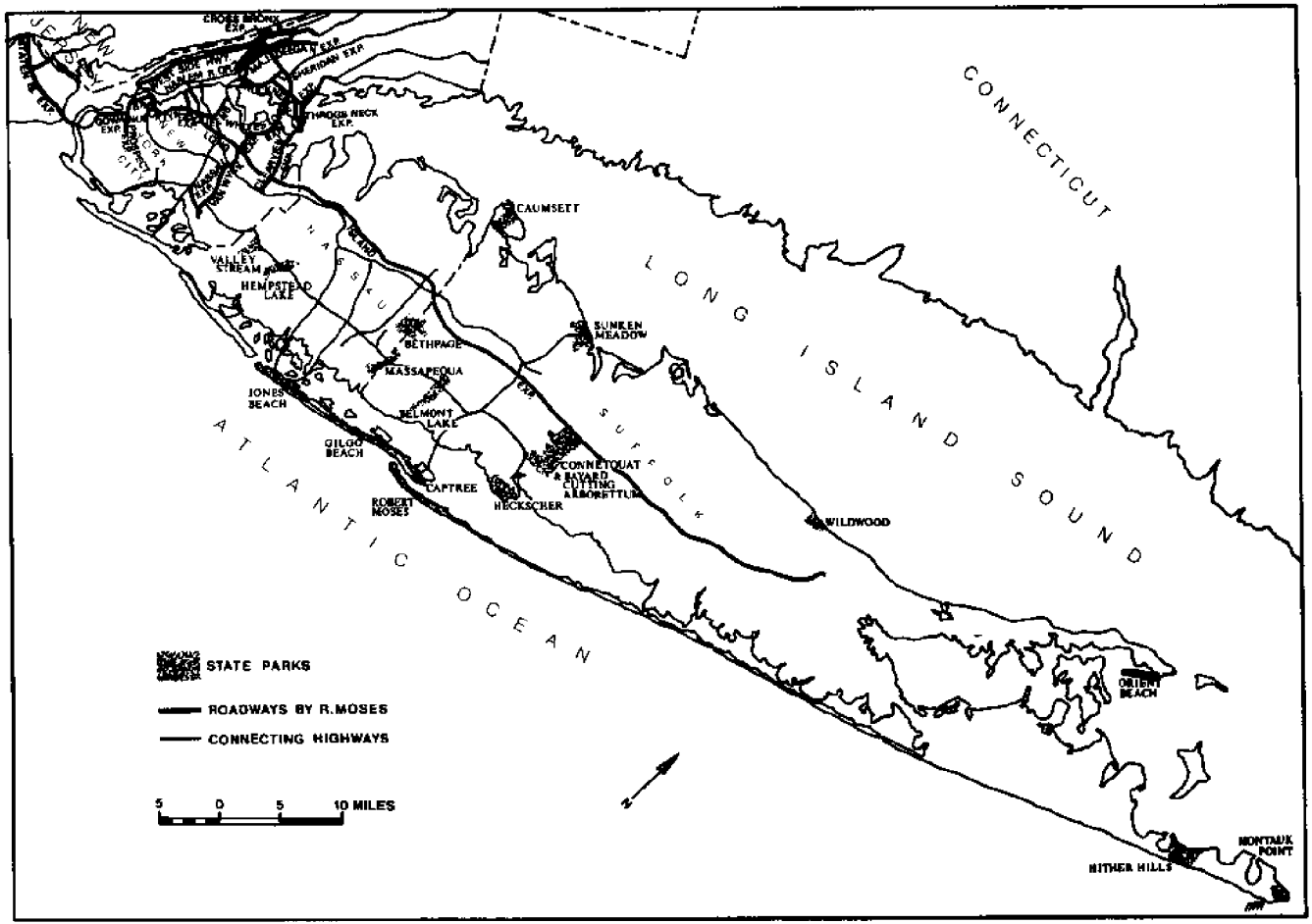


Figure 20 Long Island roads and parks, all Robert Moses' creations.

builder. From 1924 through 1968 Robert Moses created, almost singlehandedly, the network of parks and their connecting parkways that mark the coastal region of today's metropolitan New York City and Long Island.

During the summer of 1922, Robert Moses was working in New York City but spending his weekends at Babylon, an hour-long ride on the Long Island Railroad. While walking the sandy beaches of the south shore of the island, Moses dreamed of building a highway to bring people from the city to those beaches, particularly Jones Beach. By 1927, the dream became a reality when he initiated construction of the Southern State Parkway. In 1929 construction of the Wantagh Causeway began connecting the Southern State Parkway with the beach. But more than roads were needed and Moses saw to these requirements. Foundations for the Bathhouse at Jones Beach were laid in 1926. By 1929 full beach facilities were available and suddenly 325,000 people enjoyed the first major public ocean beach on Long Island since Coney Island.

> ...The very shoreline of metropolis was different before Robert Moses came to power. He rammed bulkheads of steel deep into the muck beneath rivers and harbors and crammed into the space beneath bulkheads and shore immensities of earth and stone, shale and cement, that hardened into fifteen thousand acres of new land and thus altered the physical boundaries of the city.
>
> Standing out from the map's delicate tracery of gridirons representing streets are heavy lines, lines girdling the city or slashing across its expanses. These lines denote the major roads on which automobiles and trucks move, roads whose very location, moreover, does as much as any single factor to determine where and how a city's people live and work. With a single exception, the East River Drive, Robert Moses built every one of those roads. He built the Major Deegan Expressway, the Van Wyck Expressway, the Sheridan Expressway and the Bruckner Expressway. He built the Gowanus Expressway, the Prospect Expressway, the Whitestone Expressway, the Clearview Expressway and the Throgs Neck Expressway. He built the Cross-Bronx Expressway, the Brooklyn-Queens Expressway, the Nassau Expressway, the Staten Island Expressway and the Long Island Expressway. He built the Harlem River Drive and the West Side Highway...
>
> Out from the heart of New York, reaching beyond the limits of the city into its vast suburbs and thereby shaping them as well as the city, stretch long ribbons of concrete, closed, unlike the expressways, to trucks and all commercial traffic, and unlike the expressways, bordered by lawns and trees. These are the parkways. There are 416 miles of them. Robert Moses built every mile. Still within the city limits, stretching northward toward Westchester County, he built the Mosholu Parkway and the Hutchinson River Parkway. In Westchester, he built the Saw Mill River Parkway, the Sprain Brook Parkway and the Cross County Parkway. Stretching eastward toward the counties of Long Island, he built the Grand Central Parkway, the Belt Parkway, the Laurelton Parkway, the Cross Island Parkway, the Interborough Parkway. On Long Island, he built the Northern State Parkway and the Southern State Parkway, the Wantagh Parkway and the Sagtikos, the Sunken Meadow and the Meadowbrook. Some of the Long Island parkways run down to the

Island's south shore and then, on causeways built by Robert Moses, across the Great South Bay to Jones Beach, which was a barren, deserted, windswept sand spit when he first happened upon it in 1921 while exploring the bay alone in a small motorboat and which he transformed into what may be the world's greatest oceanfront park and bathing beach. Other Long Island parkways lead to other huge parks and other great bathing beaches. Sunken Meadow. Hither Hills. Montauk. Orient Point. Fire Island. Captree. Bethpage. Wildwood. Belmont Lake. Hempstead Lake. Valley Stream. Heckscher. Robert Moses built these parks and beaches.

(Caro, 1974, p. 5-8)

Moses seems to be either revered or cursed by those who live in the world he created. The attitude depends on whether the individual gained or lost by Robert Moses' developments. To many suburban dwellers, opening their quiet refuge to the city's masses was a great wrong. Within a few weeks of its completion, one of his highways was jammed with traffic. There were plenty of automobiles in the city; roads hadn't been built to accommodate them. To the blacks living between Manhattan's 125th and 155th streets, Moses was no hero. Riverside Park, enlarged through landfill on the Hudson River, grew by 132 acres south of 125th street. But in the 30 blocks north of 125th street, Moses filled no park land, nor did he remove any commercial and industrial enterprises (Caro, 1974, p. 557-558).

Moses also had a major impact on the development of the rich recreational facilities of the Bight region. The contrast between Long Island and New Jersey is most apparent here for comparable development in New Jersey did not come for two decades. The automobile revolutionized the concept of recreation. Until its age arrived, only the wealthy could escape from the cities to the beaches and woodlands of surrounding regions. For those New Yorkers below the middle class, only the nearby beaches, such as Coney Island, had been accessible by public transport.

> Recreational travel has grown from an incidental type of endeavor into an activity generating many billions of dollars...
>
> The geographical influence of recreational travel is pervasive. Half of the States count travel among their three major sources of revenue, and altogether, 23 States and the District of Columbia consider travel among their three most important industries. Three States--Florida, Nevada, and New Jersey--and the District of Columbia rate tourism as their most important industry...
>
> In New York State also the tourist, recreation, and resort business is a leading industry. Over a billion dollars was spent in the State on these items in 1948, with almost 90 per cent of the vacation travel being accomplished via private automobile or bus. "
>
> (US Bureau of Public Roads, 1964, p. 154)

Moses clearly recognized the recreational potential of the offshore bar called Fire Island. Spending public funds, he quickly acquired land for many parks rather than a few grand facilities. Montauk, Hither Hills, Hecksher, Fire Island (now Robert Moses), and Jones Beach state parks are a result. Today 7,115 acres of New York State parks front directly on New York Bight (New York [State] Division of the Budget, 1979, p. 319). Annual attendence is

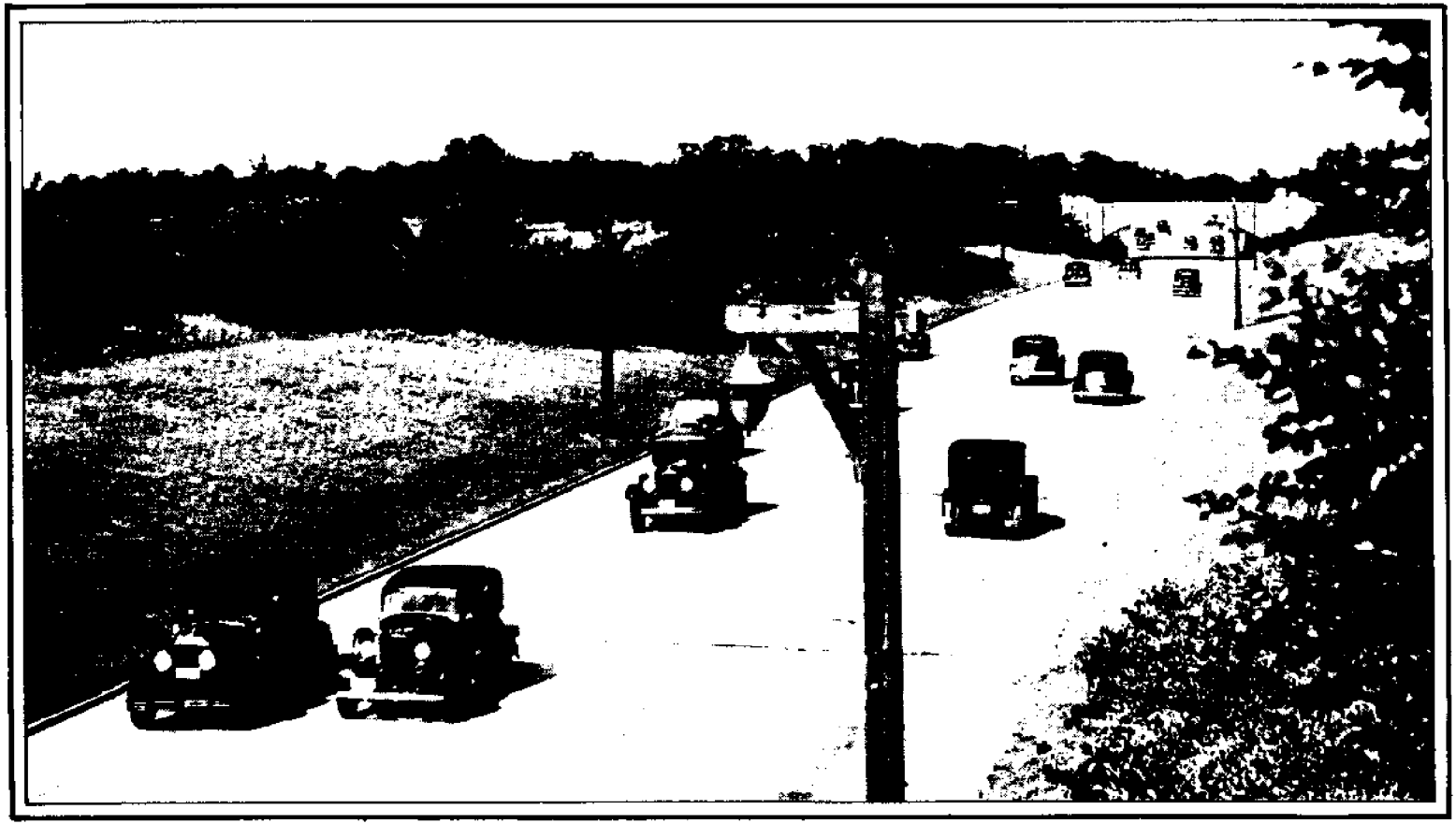


Figure 21 One of Robert Moses' major contributions was the Long Island parkways. In the 1930s these were lightly traveled; today, they can be long parking lots. Courtesy of the Long Island Park and Recreation Commission.

Figure 22 Jones Beach, already crowded in 1931, just a few years after opened to the public. Half a century later business is even better. Courtesy of the Long Island State Park and Recreation Commission.

in the hundreds of millions. In 1964, federal legislation (PL88-587) created the Fire Island National Seashore, the first of its kind. It doubled the amount of public lands for recreation with an additional 19,357 acres. Gateway National Park, which extends from Jamaica Bay, Long Island, to Sandy Hook, New Jersey, was created in 1972. Today, about 42% of the 118 miles of ocean beach on Long Island are publicly owned (US Army Corps of Engineers, 1973, p. 102).

The state park system in New York, virtually completed by 1930, was not matched by comparable development in New Jersey until 25 years later. Island Beach State Park, first opened in 1959 (The New York Times, 19 July 1959, II, p. 17) and Barnegat Light State Park (The New York Times, 12 July 1957, p. 23) are the only state parks on New Jersey's ocean beach (Carls, 1978, p. 20). Great areas are publicly held, however, in Manahawkin Wildlife Area (state), Barnegat National Wildlife Area, and Brigantine National Wildlife Refuge. These, together with the great Sandy Hook spit, now a part of the Gateway National Park, and other publically owned lands, comprise 34% of the 280 miles of beach front on the Bight. New Jersey's long underdeveloped recreational potential is now being exploited, not only by metropolitanites, but by people from as far away as Quebec who have established bilingual summer communities on the Jersey shore.

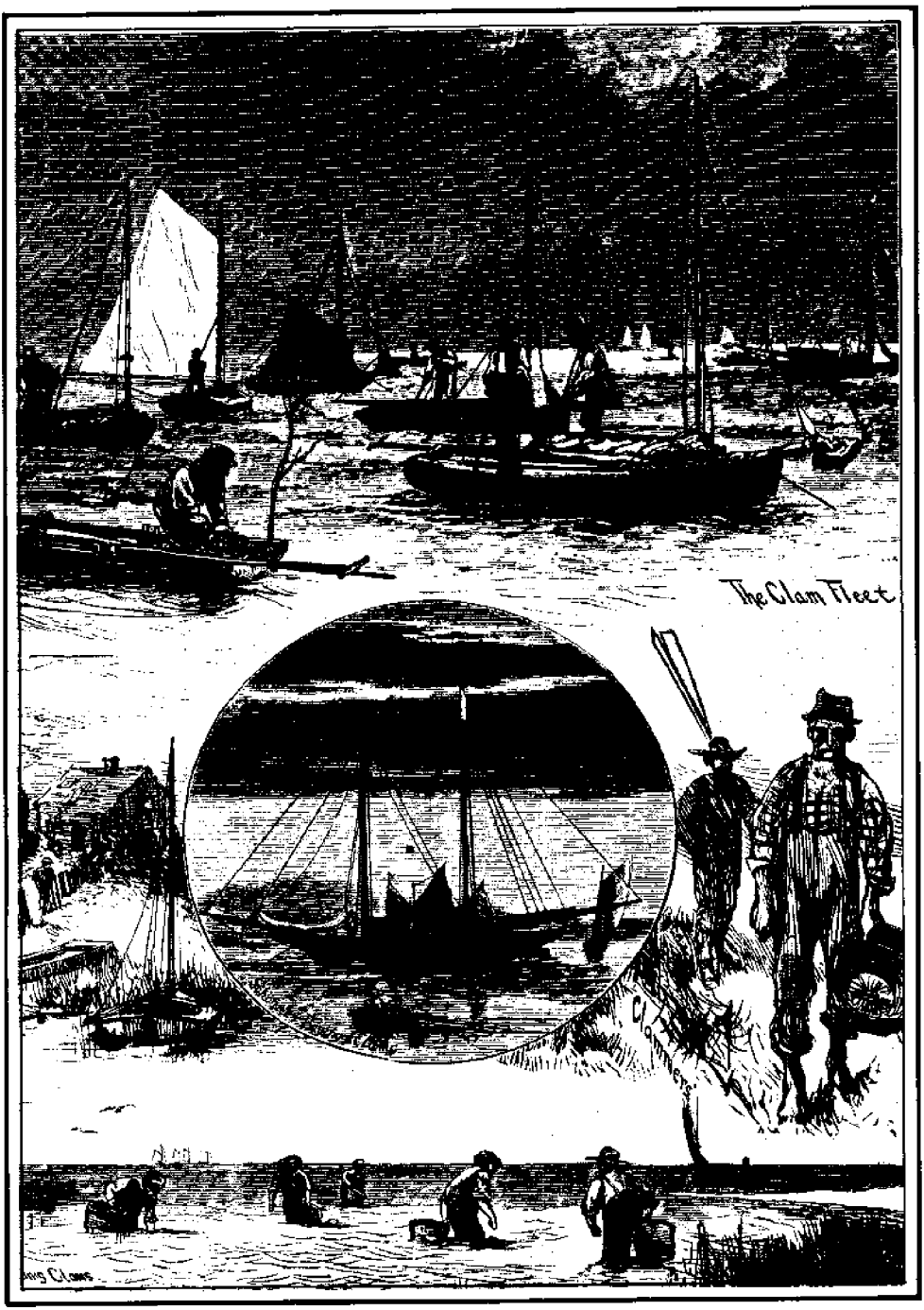


Figure 25 Clamming in 1877 in and around Great South Bay, Long Island. The area remains the United States' principal producer of the hard-shelled clam. From an original illustration in Harper's Weekly, 8 September 1877.

==A Bushel of Clams, A Load of Flounder, 500 Million Yards of Sand and Thou==

One of the most romantic but least understood uses of the ocean is as a source of natural resources. Fishing boats are high among coastal scenic attractions, the sheer size and complexity of the offshore drilling rigs rank among the greatest of man's engineering achievements. Yet, what actually goes on beneath the surface of the water remains a mystery, a mystery engaging the continual attention of the average fisherman attempting to lure one of those unseen, roaming, restless creatures to his hook with a bit of bait.

With unthinking ease, we muddle about with the environment that provides these very resources, often unaware of the contradictions inherent in our actions. While using the sea as a source of food, we also use it as a dumping ground for those toxic or noxious substances that disrupt the marine food chain.

New York Bight is the scene of immense contradictions. And, because we have put it to so many uses over the last three centuries, its productivity of natural resources may be suffering. Perhaps the record is clearest in the shellfishery of the New York Bight. Indians living around the Bight used the creatures of shallow inshore waters extensively for food and trade. Harvested by a variety of techniques including hooks, harpoons, spears, weirs, traps, seines, gill nets, and even shellfish tongs, fish served as a basis for wide trade. Even the purple lip of the quahog or hard clam shell became a medium of exchange--wampum.

Early colonists acclaimed the abundance of shellfish in the New York City area, using its quality and accessibility as a means of attracting other settlers.

> And at Amboy point and ſeveral other places there is abundance of brave oyſters.
>
> Oyſters, I think, would ſerve all England.
>
> We have one thing more particular to us, which the others want alſo, which is vaſt oyſter-banks, which is the conſtant freſh victuals, during the winter, to Engliſh, as well as Indians; of theſe there are many all along our coaſts, from the ſea as high as against New York, whence they come to fetch them.
>
> Oyſter ſhells upon the point, to make lime withal, which will wonderfully accommodate us in building good houſes [of stone] cheap, warm for winter, and cool for summer.
>
> We have ſtore of clams, eſteemed much better than oyſters; on feſtivals the Indians feaſt with them; there are ſhallops [scallops], but in no great plenty.
>
> (Smith, 1590, p. 167-189)

Oysters were a particular delicacy, found all over the Hudson/Raritan Estuary and up the Hudson as far as Ossining in considerable abundance. At the turn of the nineteenth century, New York City was famed for quality oysters when lower Manhattan was marked by oyster houses advertising "Rockaways," "Jamaicas," "Bluepoints," and others named for the various bays and inlets from which they were taken. Charles Dickens wrote:

> At other downward flights of steps, are other lamps, marking the whereabouts of oyster-cellars--pleasant retreats say I: not only by reason of their wonderful cookery of oysters, pretty nigh as large as cheese-plates...
>
> (Dickens, 1957, p. 87)

But the twin evils of the fisheries--greed and neglect--were to strike again and again. As early as 1715 the New York Colony found it necessary to introduce regulations to protect the diminishing stocks of oysters in certain localities.

> Be it Enacted by the Governour Council & General Assembly & by the Authority of the same, That from & after the first day of May, until the first day of September Annually to gather, Rake, take up, or bring to the Market, any Oysters whatsoever, under the penalty of Twenty shillings for every Offence, ...
>
> (Colonial Laws of New York, 1894, p. 845)

By 1887 authorities declared that "unless the pollution of the waters of the State is stopped, the planting of oysters in the neighborhood of large cities must entirely cease" (New York [State] Commissioners of Fisheries, 1887, p. 8). Not only were industrial and sewage pollutants affecting the oyster and other shellfish beds, but the physical disruption of the harbor bottom by dredging and dumping was causing changes inimicable to shellfish. By the first world war, the shellfish industry in the metropolitan area effectively ceased to exist. Those shellfish beds that remained were so contaminated by sewage that they could not be harvested.

As natural stocks began to weaken through overharvesting, seed transplant programs were instituted. As early as 1875 seed oysters were brought from Virginia and other distant points to fatten in the productive waters of New York and New Jersey (Ingersoll, 1881, p. 112). At first this rejuvenated the heavily worked beds and resulted in a resurgent development of "oyster villages." But even these replenishment methods could not overcome the deteriorating water quality and low oxygen levels resulting from overstressing by organic materials in the coastal waters.

Today, immense resources of the hard clam (cherrystone, little neck, and chowders) are being harvested, some would say overharvested, from the Great South Bay which alone produces over half the nation's supply of this species. This fishery faces an uncertain future, threatened by declining water quality as Long Island housing developments add more cesspools whose modified contents flow to the bay. There is speculation on the possibility of reopening Raritan Bay hard clam resources. These beds, closed in 1925 as a result of contamination, reopened in New Jersey by 1934; a portion of the New York beds reopened in 1941. But, in 1961, an outbreak of hepatitis, traced to the consumption of raw shellfish from Raritan Bay, caused their reclosure.

The Finfishery

Despite the fact that many of the early settlers of the Bight region came from fishing communities in Europe, fishing was of relatively minor economic importance in the Bight region--often serving as a sideline for farming. Exceptions were the whalers based in ports like Sag Harbor and Cape May. When the whales were overfished, however, Bight whalers tended to take up shellfishing rather than distant-water whaling as did the New Englanders (Ingersoll, 1881, p. 111-112).

Commercial fishing in the Bight has gone through a series of evolutionary phases (McHugh and Ginter, 1978, p. 10-12). The first phase was harvesting nearshore resources such as the oyster, alewife, bluefish, American shad, and weakfish. Shad, sturgeon, alewives, striped bass, and turtles were in abundance in the Hudson. Sturgeon was so important as a fishery that it was called Albany Beef (McDonald, 1887, p. 658-659). The shad fishery had once been one of the important industries of New York with over 2 million pounds taken in 1880. By 1908, the catch decreased to 16% of that level, largely as a result of pollution that caused "off flavors." The problem was not new; on 28 September 1879, the Spirit of the Times reported:

> Like rumbling sounds of distant thunder, an occasional report came to the office of the Spirit, to inform us that the gas factories were ruining the quality of eels and bottom-biting fish throughout the East River. But as the great body of anglers made no complaint, we made no note of the subject. But within the past year a more serious injury to the fishery around Manhattan has presented itself, the waters having become impregnated by the refuse from the kerosene refining factories to such an offensive degree, as to have not only deteriorated all bottom feeding fishes, but the striped bass as well have become so permeated by the offensive refuse as to be unfit for the table. This is a great damage, for there are many who made bass fishing near New York their only recreation.
>
> (Sports Illustrated, 18 Sept. 1978, p. 13)

Now, with severe restrictions on fishing in the Hudson, many species are rebounding--some sturgeon are again common, but all are contaminated by the PCBs dumped into the Hudson by the General Electric plant at the headwaters. When these fisheries will again be available to man is not known.

The second evolutionary phase began in the 1920s when these species were almost all in a state of decline. Offshore trawl fishing introduced, then put emphasis on haddock, silver hake, Atlantic cod, winter flounder, butterfish, and yellowtail flounder. A third phase emerged during the second world war when meat rationing enhanced the value of new species: Atlantic herring, red hake, and Atlantic mackerel. That stage continues to the present. McHugh characterizes it as concentrated fishing of temporarily abundant resources (McHugh and Ginter, 1978, p. 10-12). Included are fish such as the black sea bass, menhaden (a fish taken largely for its oil, used in industry), summer flounder, scup, lobster, and striped bass.

In each phase, the target species were taken in increasing abundance until the catch declined. The picture is of a series of peaks in the tonnage of fish captured, followed by a decline, a shift to new resources, a peak, a decline, and so on.

These phases create a picture of the New York Bight fishery: it reached a maximum of about 314,800 metric tons in 1956, of which 87% by weight was menhaden; the greatest landing of food fishes occurred in 1939; since then, the picture has been of decreasing catches. McHugh interpreted this by saying:

> The major domestic problems of commercial fisheries in the New York Bight area are sociopolitical and economic, aggravated by wide fluctuations in abundance of individual resources from natural causes. To a degree, the industry has been able to cope with resource fluctuations by shifting from one species to another and by using different methods of fishing. An outstanding example of changes in fishing strategy in both states was the virtual replacement of fixed pound nets in the shore zone by more flexible otter trawls... in the past 40 yr. This development not only allowed fishermen to follow the major species during their seasonal migrations, but also lengthened the fishing season from about 5 mo to a full year. This improvement in efficiency may have contributed to declining catches of some species by overfishing those resources. Development of a domestic trawl fishery proved to be an evolutionary trend in fishing strategy which eventually was adopted by much more efficient and massive foreign fleets in the 1960s, to the detriment of some domestic fisheries in the New York Bight area, including some recreational fisheries.
>
> Domestic fishermen in the area have been handicapped by restrictive state laws, usually justified as conservation measures, but in reality serving only to perpetuate inefficiency and increase the cost of locating and catching fishes and shellfishes. Some of this legislation has been passed at the insistence of recreational fishermen, who want improved access to certain living resources and a greater share of the catch.
>
> (McHugh, 1977, p. 47)

The story of our management of fish and shellfish is not characterized by success. Natural fluctuations in both species abundance and migratory patterns, the unnatural impact of man on the Bight ecosystem, our own shortsightedness, greed, and a compelling readiness to blame the omnipresent "they," all contribute to an inability to manage. The fishermen claim governmental interference inhibits their use of a "public" resource; the rapacity of the commercial fleet incites the sport fisherman to exaggerated claims; and we all contribute our wastes to the waters in which the fishes live.

Mineral Wealth

By way of contrast, the mineral resources of the New York Bight seemed to be on a threshold of new importance as the energy crunch of the 1970s appeared. Oil and gas from offshore sources had long been a phenomenon of "foreign" lands such as the Middle East, California, the Gulf Coast states, the North Sea, and the East Indies. It was with some amusement that other Americans noted the palpitations of the New York Stock Market when Texaco announced a show of gas in the southern reaches of the New York Bight. The East Coast was experiencing the excitement of becoming an energy producing region. For many years the Baltimore Trough was considered a potential oil and

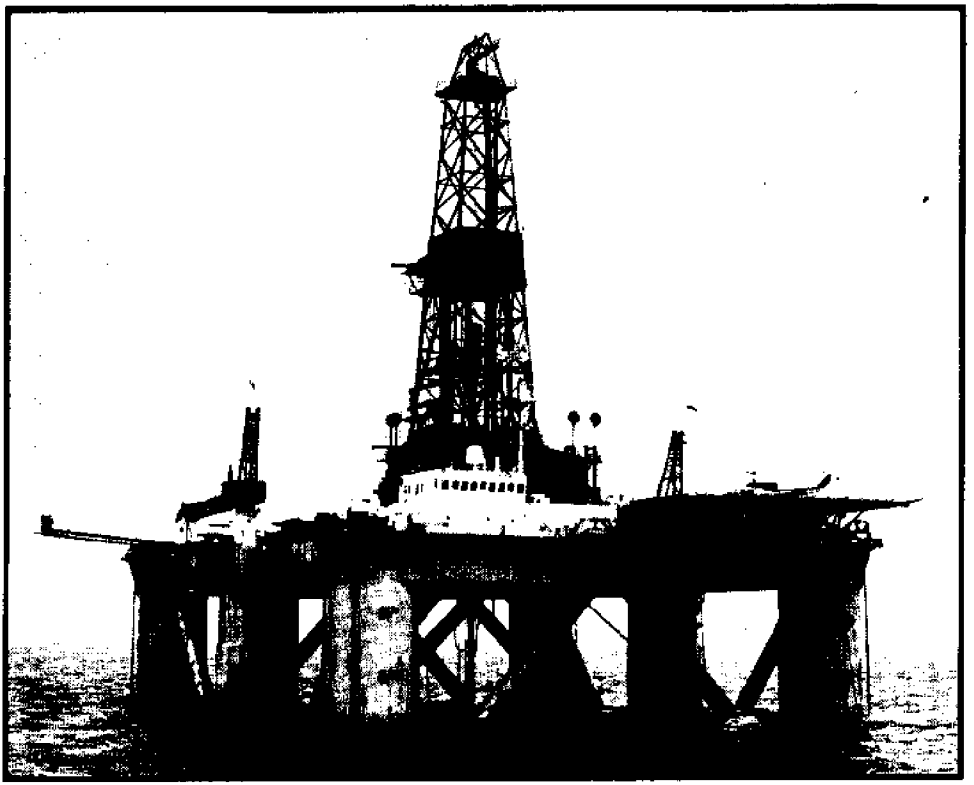


Figure 24 The Zapata Ugland, a semisubmersible drilling rig located over the Baltimore Canyon in the southern part of New York Bight in 1978. The enormous legs of the drilling platform when emptied serve as flotation devices to lift it free from the ocean bottom so that it may be towed from one location to another. When on site, these chambers are flooded and the structure sinks until it rests firmly on the bottom. Courtesy of the Zapata Off-Shore Company, Houston, TX.

gas producing region, but not in sufficient quantities to really entice producers faced with the enormous costs of finding, developing, and extracting a field. New York State responded to the potential leasing of its offshore regions with outrage: Suffolk County brought suit against the US Department of Interior to halt the sale of leases, basing its case on potential loss to the recreational industry if oil spills occurred.

But while the excitement of potential oil fields stirs our imaginations there are other minerals as important, if more prosaic, being extracted from the Bight: sand and gravel. These minerals are the very substance of an urban society built of concrete on lands reclaimed from the coastal ocean and its estuaries. It is a fact that the Lower Harbor of New York is the world's largest sand mine. From 1950 to 1975 over 116 million cubic yards of sand were mined, an average of 4.66 million cubic yards each year (Schlee and Sanko, 1975, p. 23). This is the equivalent of a hole 1 mile square mined to a depth of a five-story building each year.

Much of the sand mined from the harbor is used for filling marsh and marginal lands. The great building complex in the Hackensack Meadows of New Jersey, the New Jersey Turnpike's northern extent, Port Elizabeth, Newark Airport, and Battery Park City are all built on sand mined from beneath the harbor. Today, tracts are being marked for mining more than 10 million cubic yards, required if the construction of Westway, the replacement for the collapsed West Side Drive in Manhattan, moves ahead.

Fifty years ago, Long Island appeared to be a never-ending source of sand and gravel for concrete aggregate. Great mines levelled terminal moraines hundreds of feet high; barges carried the aggregate materials to local ports all over Connecticut, metropolitan New York, and New Jersey. But as Long Island suburbanized, houses were built on the very lands that had once been potential sand pits; supply for the future became critical. A prescient report prepared nearly a decade ago correctly stated that terrestrial sources would be very limited in 10 years; that 10 years is now (New York [State] Office of Planning Coordination, 1970, p. 23).

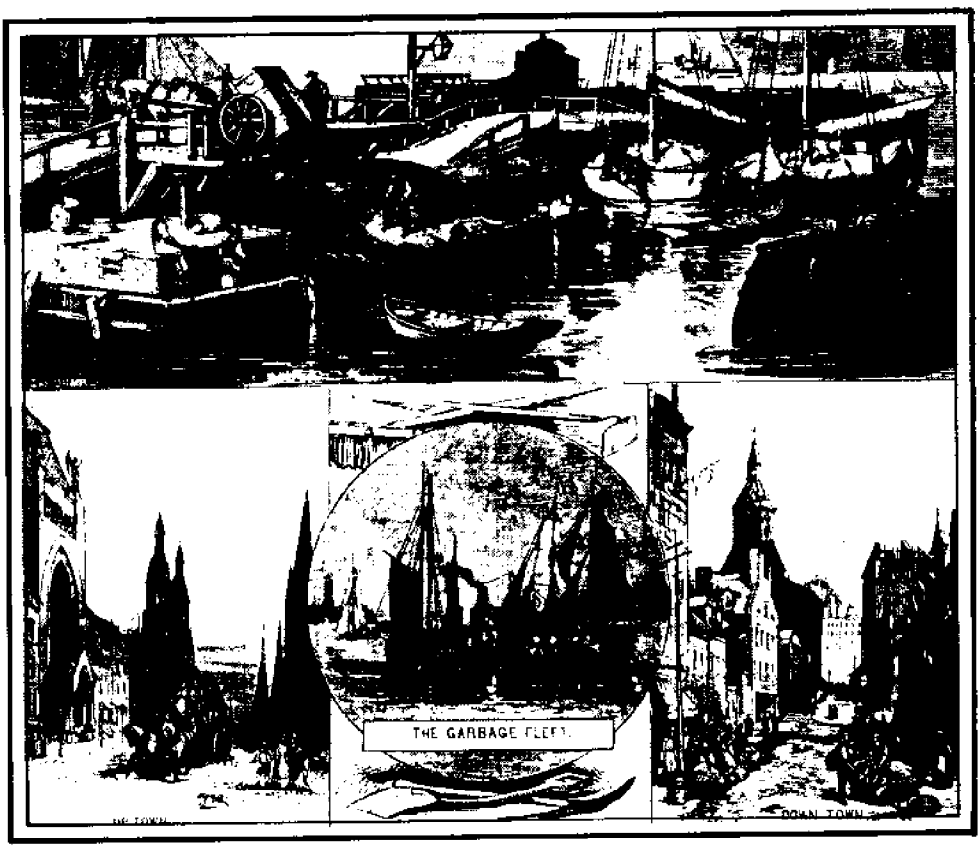


Figure 25 Urban garbage disposal in 1877 was not significantly different from today's methods. Refuse piled in the center of the street by householders each day, was collected by horse drawn carts and either taken to the pierhead or some wetland and dumped or taken by garbage scow to a landfill. From original illustration in Harper's Weekly, 24 November 1877.

The Bight as a Dump

In the New York Bight region, we have faced the problem of waste disposal since 1500 or 1600 AD, when the Woodland Indians created the long house. As population density grew after initial European settlement, the problems increased.

> As early as May 2, 1658 the burgomasters resolved to renew an ordinance of December 20, 1657 in regard to disposal of filth in New Amsterdam and added to it an order for the removal of privies on the street "having their outlet level with the ground"; also proposed to the whole city court the advisability of prohibiting the burghers from keeping hogs in the city. The ordinance was published on August 19th and ordered the removal of all such privies within eight days after publication, and required them to be rebuilt in such places as would prevent their becoming a public nuisance.
>
> (Loop, 1964, p. 4)

Within 50 years of settlement on Manhattan Island, the dumping of waste materials in the harbor waters became a problem. Governor Edmund Andros of the Colony of New York forbade any person "to Cast any dung, dirt, refuse of ye City or anything to fill up Ye harbor or among ye neighbors under penalty of 40 shillings" (Rush, 1920, p. 27). But strictures such as these had little impact. Our propensity for seeking short-term solutions to longer-term problems was applied to the problem of waste disposal. Disposal of solid waste, sewage, and storm runoff from city streets continued.

Testimony offered in 1856 to the New York City Harbor Commission yielded the following from S.A. Frost, 60 South Street, New York City:

> Q. How often is it necessary to dredge at the pier?
> A. Every second year.
> Q. What is the annual deposit of mud?
> A. Probably two feet.
> Q. What is the cause of deposit?
> A. Principally from the sewers and the wash of the streets. Another cause is from dumping rubbish from houses and factories into the slips at night. Rubbish is also thrown in from vessels...
> Q. Where is it deposited?
> A. In the stream [refers to main flow of the East River]
> Q. Does it not wash into the adjacent slips or be deposited in the lower parts of the harbor?
> A. Probably.
>
> (Klawonn, 1977, p. 124)

Gross (1976, p. 10) calculated that between 1890, when reasonable records began, and 1971, 1.4 billion cubic meters of waste solids from the metropolitan region were dumped in coastal waters. This is about 50 times the volume of material removed during the construction of the Panama Canal. Put another way, this volume of waste alone exceeded the volume of suspended

sediment carried into the coastal ocean by all the rivers on the Atlantic coast of the United States (Gross, 1970).

At first, disposal of nonsewage waste was taken care of by dumping off the piers. By 1856 the Corporation of New York required that material be disposed of 300 feet from the end of the piers where it might be carried off by the stream of water. The US Army Corps of Engineers was assigned the responsibility for navigability of waters in the New York area in the 1880s. Colonel Walter McFarland testified in 1887:

> There is one matter affecting the harbor of New York which demands the most earnest attention of those who are concerned in its welfare, and that is the damage which is being done to it by dumping into it the dredgings of docks and slips... All the contracts with the United States Government for dredging in New York Harbor are so drawn as to require that the dredged material shall be dumped. It is certain that none of the material dredged from the neighboring waters along the New Jersey shore is taken out to sea. It is dumped in Newark Bay, the Kills, and Raritan Bay, chiefly. New Jersey has, I believe, no law relating to the subject. New York has such a law establishing a dumping ground off Coney Island... The River and Harbor Bill of August 6, 1886, declared it to be unlawful to dump dredgings and other materials into the water of New York Harbor, but as no penalty was attached to the offense, the law is without effect.
>
> (Klawonn, 1977, p. 129-131)

In 1888, the Congress approved "An Act to prevent the obstructive and injurious deposits within the harbor and adjacent waters of New York City, by dumping and otherwise, and to punish and prevent such offenses" (US Statutes at Large, 1887-1889, v. 25, p. 209-210). With this legislation, dumping of dredge spoils moved from the harbor to a series of dump sites progressively farther and farther offshore.

Today, dredge spoils are still the subject of great controversy. After decades of dumping at the Mud Grounds, resulting in the creation of a small mountain of sand (Williams and Duane, 1974, p. 38-41), researchers have found that these spoils are the major source of heavy metals, and possibly of chlorinated hydrocarbons such as PCBs.

Dredge spoils, construction rubble, and sand mined from the harbor do, however, have their uses, particularly in the creation of new lands. While accretion to Manhattan Island was apparent from the extension of piers into the East and Hudson rivers, as material accumulated in and around them, there was also deliberate building. By 1966, 20 percent of Manhattan, Brooklyn, the Bronx, and Queens was built on filled lands; about half were former garbage dumps or other waste disposal sites (Gross, 1976). The construction of nearly 380 miles of subways in New York City created about 25 million cubic yards of rock debris, most used to create nearly 100 acres of new land for the city.

Building islands became a means of disposing of unwanted materials. In 1866, Hoffman and Swinburne islands in Lower New York Bay were built as quarantine islands. Hoffman Island is 11.5 acres, Swinburne, 2.5 acres. By 1956, New York City started considering joining the islands with a rock dike enclosing an area of about 350 acres which would then be used as a gigantic landfill for garbage. But, to date, the islands remain separate.

Figure 26 Looking west along 116th Street at Madison Avenue about 1895. This rural scene shows Manhattan's rock substrate, never far from the surface. Source: Museum of the City of New York.

In 1917, dumpsites were established at various locations in the Bight and Coney Island Sound to handle New York's street sweepings, garbage, and refuse. Quantities of floatables washing up on Long Island and New Jersey beaches soon became a problem and a complex system of seasonally varied sites was designated. In 1931, after long litigation, the US Supreme Court caused dumping of garbage to be discontinued and on 28 June 1934, the last barge of garbage went to sea (US Army Corps of Engineers, 1935, pt. 1, p. 1726).

Yesterday's Dinners

The subject of sewage is seldom table talk to Americans. Yet it should be talked about for sewage disposal is one of society's more pressing problems.

> Owing to the natural repugnance which is attached to it, the public has, until recently, failed to give attention to this question and inasmuch as the data are contained only in reports which are voluminous and difficult to obtain, there are but a few, even in the engineering profession, who have had an opportunity to get at the facts.
>
> (Soper, 1930, p. 147)

The sewage problem is directly linked to the number of persons inhabiting a small area. In low density populations, cesspools or drainage fields can handle what the backyard privy once did. But when the population increases to urban proportions, none of these remedies for human waste disposal are acceptable or functional; sewers must be constructed. Sewers are a necessary counterpart to a water supply: water coming into a house must go out. The impetus to construct a sewer is usually for convenience so it is not surprising that the wealthy were the first to install indoor facilities.

The rocks called the Manhattan Schist and the Fordham Gneiss, while fostering construction of the skyscrapers of New York presented almost insurmountable problems to early settlers. Well digging was difficult and water supplies were uncertain; droughts caused ponds and streams to dry up quickly. The British siege of Fort Amsterdam in 1664 seems to have been settled quickly because the Dutch had no water supply within the fort. It wasn't until the British drilled the first well in 1667 that a water supply in the fort was assured.

Aaron Burr gained a charter from the State Legislature in 1799 for a water company to be known as the Manhattan Company. A clause in the legislation provided that surplus capital could be used in any manner "not inconsistent with the constitution and laws of this State or of the United States... The Manhattan Company quit the water business a long time back. It is now called the Chase Manhattan Bank, one of the world's richest banks (Daley, 1959, p. 27-28).

Disease resulting from foul water plagued the city and lack of a water distribution system resulted in fires devastating major areas. It wasn't until 16 April 1835 that the people of New York City ratified the Croton project to tap the Croton River 40 miles north of the city and deliver water by means of tunnels and aquaducts. Thus, began New York City's incredibly engineered water supply system, which today continues to deliver fresh waters from the Adirondack and Catskill mountains through aqueducts unentered and unrepaired since their construction.

By 1827 four short stone sewers were constructed in New York City, mostly intended to carry off storm drainage. Cesspools were the primary means of eliminating domestic wastes, although "tubbs of odour and nastiness" were dumped on the city streets. As cesspools filled up, enterprising citizens drained them into the nearest stream. In a short time, most of the streams became sewers. The Dutch converted such a stream to the Heregraft--the common sewer--which was covered by a roadway in 1680 to form Broad Street in today's financial district (Loop, 1964, p. 4).

Sanitary conditions in New York City were deplorable by the mid-1800s. The population rose dramatically to almost 800,000; water was available, but no real sewer system existed. Obstructed sewers, manure heaps, and overflowing privies contributed to the high mortality rate of 54.63 per 1,000 population. A Citizen's Association, established in 1865, succeeded in gaining passage of an act to create a Metropolitan Sanitation District and a Board of Health (Loop, 1964, p. 13). Until this time, street sewers were discharging into the slips where the contents were washed back and forth by the tides, "poisoning the water and contaminating the air" (Loop, 1964, p. 14).

The first public urinal, constructed at Astor Place at the junction of 8th and 9th streets in 1868, received considerable public approbation. But no comprehensive plan was established for city sewerage or the treatment of sewage. As late as 1877 needs for collection and disposal were being pressed on the public.

> The very general opinion entertained by our citizens, that in consequence of the vicinage of the rivers bordering the city, and of the ocean at Sandy Hook, that it is only necessary to discharge the sewage into the rivers for it to be borne away to the ocean; is wholly fallacious, except as to a portion of the matter held in solution; that in suspension subsides a long time before it reaches the bar at Sandy Hook...
>
> (Haswell, 1875, p. 6)

Haswell later complained:

> We are practically saturating ourselves and everything about us, with deadly miasmatic emanation; that the made and undrained land on which so many thousands of our homes are built, is packed with miasm; that it comes to us on every breeze; that we drink malarious water, cooled with malarious ice, and live and sleep in an atmosphere stifling with sewer gas.
>
> (Haswell, 1877, p. 4)

In 1906, New York's legislature created a city-appointed Metropolitan Sewerage Commission of New York which, among its many acts, carried out a tidal survey of New York Harbor. It concluded that the East River, not being a true river at all, was very unsatisfactory for sewage disposal. In retrospect, among the most important recommendations in its 1914 final report was for establishment of a supervisory commission by New York and New Jersey to see that a proper system of sewage disposal be built (New York [City] Metropolitan Sewerage Commission, 1914).

More money was being spent on bringing water in than on sewerage to take it out.

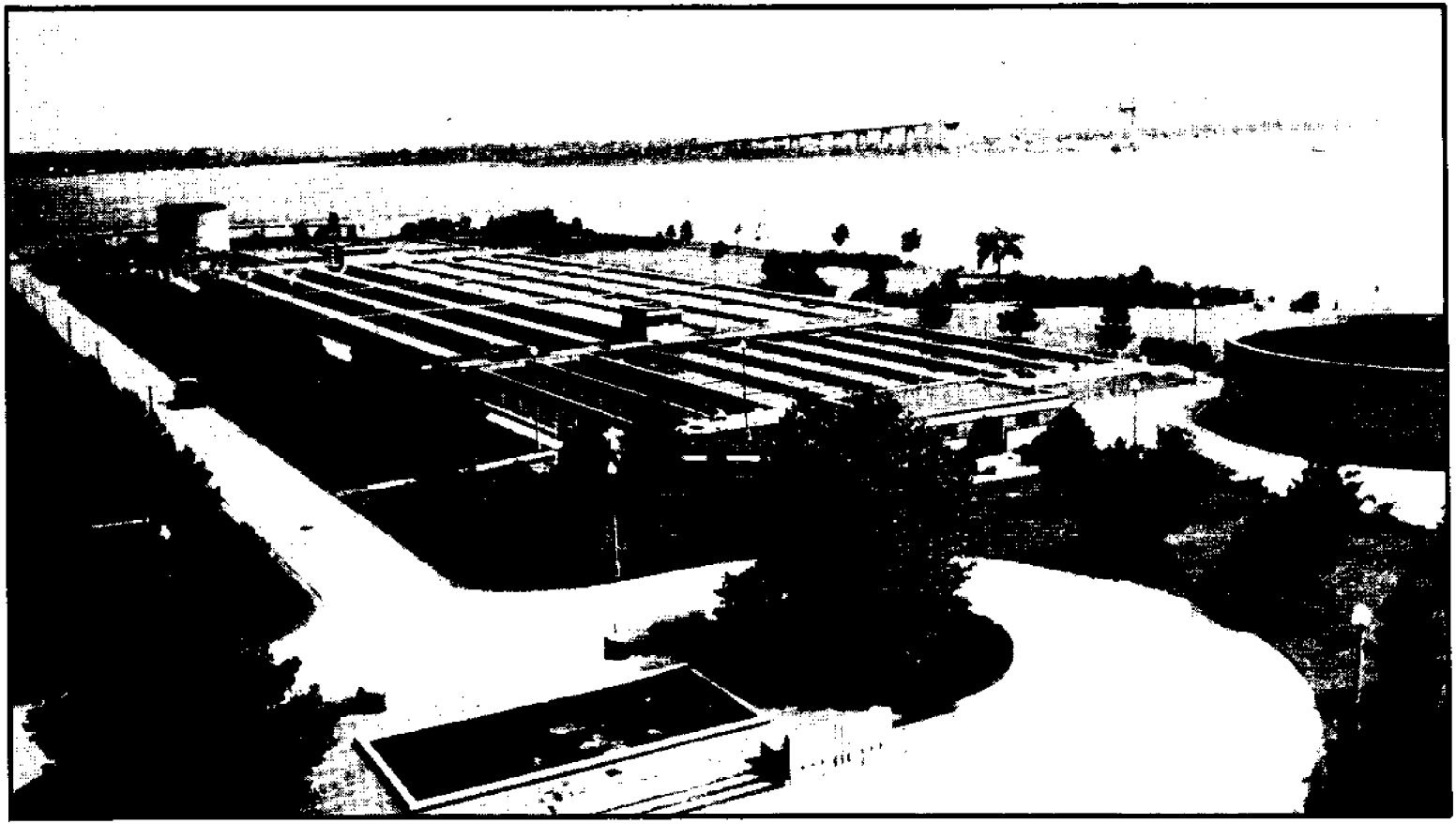


Figure 27 The Tallman's Island sewage treatment plant, one of New York City's modern plants. Courtesy of the New York City Department of Environmental Protection, Bureau of Water Pollution Control, Plant Operations.

> The City has spent nearly $200,000,000 in the last few years for an immense increase to its water supply, but has spent practically nothing to carry off this water in a sanitary way after it has been used and polluted in every possible way and from every possible source.
>
> (Hufeland, 1925, p. 58)

Treating Sewage

The first sewage treatment plant in New York City dates back to 1884. Construction moved rapidly and by 1927 the largest treatment plant of its kind was operating near Jamaica Bay, incorporating many fine screens and chlorination (Loop, 1964, p. 49). Today, New York still discharges 140,000 metric tons of untreated sewage into its neighboring waters (Gross, 1974, p. 119).

While sewage disposal conditions in New York were beginning to receive attention, the situation was intolerable in parts of New Jersey. The lower part of the Passaic River was so offensive that in 1893 the Passaic Valley Sewerage Commission recommended that the sewage from an area of 83 square miles, populated by 500,000 people, be collected and discharged into the inner New York Bay (Hufeland, 1925, p. 52). This proposal greatly alarmed New York State. A New York Bay Pollution Commission, appointed in 1903, subsequently advised against discharge of sewage into the bay, noted its existing state of pollution, and called for development of a regional sewage system. In 1908 the Secretary of State of New York invited the Governor of New Jersey to cooperate in the work of the Metropolitan Sewerage Commission, but New Jersey rejected the idea.

Both the commission and the city's engineers agreed that the "digestive capacity of the harbor for sewage disposal should be utilized as far as was consistent with due regard to public health and welfare" (New York Academy of Medicine, 1918, p. 503). But, the engineers and the commission disagreed on the standards of water quality to be applied, particularly the following:

> The quality of the water at points suitable for bathing and oyster culture should conform substantially as to bacterial purity to a drinking water standard.
>
> (New York [City] Metropolitan Sewerage Commission, 1914, p. 155)

> It was the engineers' opinion that it was unnecessary to maintain the waters of the harbor in a condition suitable for shellfish life. They contended that it was not feasible and economically too costly to maintain the water at such a high level of purity.
>
> (Loop, 1964, p. 44)

One of the perplexing problems of the metropolitan region is the difficulty in bringing together governments of different levels to search for a common solution to a common problem. As early as 1903, the New York Bay Pollution Commission made the first of many efforts to unite New York and New Jersey in some joint administrative arrangement to control sewage disposal. Failure of these states to cooperate led to a 1921 decision by the US Supreme Court (New York vs. New Jersey and the Passaic Valley Sewerage Commissioners, 1920). The court suggested:

'Dead Sea' in Harbor Linked to Pollution

Representative Richard L. Ottinger at his news conference yesterday. Two darkened circles on map behind him indicate areas south of Ambrose Light where dumping occurs.

Figure 28 The 8 February 1970 New York Times contained Congressman Ottinger's announcement of the "Dead Sea" in the New York Bight.

> ...that the problem involved in this case is one more likely to be wisely solved by cooperative study and by conference and mutual concession on the part of the States interested than by proceedings in any court...
>
> (United States Reports, 1921, p. 297)

As a result of the decision, New York, New Jersey, and Connecticut signed the "Tri-State Compact Establishing the Interstate Sanitation District and the Interstate Sanitation Commission" on 24 January 1936. It is not at all clear from the record of achievement since that time that this solution was effective in reducing sewage pollution or increasing the development of sewage treatment.

The Dead Sea

The congressional campaign of 1970 was waged largely on a false issue, but it served to bring public attention to a smoldering problem. On 8 February 1970, Representative Richard L. Ottinger, a Democrat from Westchester County, issued a statement (The New York Times, 8 Feb. 1970, p. 1+) accusing the US Army Corps of Engineers of creating a "Dead Sea" of over 20 square miles. The Corps had, at this time, a report prepared by the US Fish and Wildlife Service's Sandy Hook Laboratory indicating that the dumping of sewage sludge in the New York Bight was having an effect on the local environment. The US Food and Drug Administration had already taken the unprecedented action of closing a circle of 6 nautical miles around the dumpsite to shellfishing, apparently the first instance of shellfish closure on any open US continental shelf (O'Connor, 1976).

The scientific community was undecided on the effects of sewage sludge dumping. Few denied the impact at the dump site itself, an area devoid of the normal fauna that might be expected. But to designate as large an area as Congressman Ottinger portrayed as a "Dead Sea" strained the credulity of many. (Buzas et al, 1972, p. xxv; Pararas-Carayannis, 1973).

Continued newspaper coverage portrayed the "dead sea" as "growing rapidly" and suggested the necessity of closing New York City beaches; this fanned public indignation (Madden, 1970). In hindsight, while these newspaper accounts were seriously misleading, they did reveal some serious degradation of the environment. But this condition was hardly new (O'Connor, 1976). The disposal of raw or treated sewage in waters around Manhattan Island had been reducing oxygen levels for almost 70 years. The high amounts of organic material in sewage remove oxygen from the water as they are oxidized. This process occurs both as the sewage is passing though the water and later continues as a deposit of sludge accumulates on the bottom. City agencies began testing dissolved oxygen in the harbor waters in 1909, recognizing then the effects of sewage in the water and in the accumulation of sludge on the bottom of many of the creeks and bays. By the turn of the century "gases were given off which were most offensive and a bubbling effervescence could be observed" (Loop, 1964, p. 48).

A report by the Public Health Committee, New York Academy of Medicine, issued in September 1918, noted that excessive pollution of the Harlem and East rivers caused the available supply of free oxygen in those waters to

become exhausted in summer months (New York Academy of Medicine, 1918, p. 506). The odors that arose from these waters resulted in the abandonment of the "play piers" created by Jacob Riis; these piers provided open space and fresh air to thousands of immigrants in New York's teeming East Side tenements (O'Brien, 1897; Silver, 1967).

New York is one of two areas in the country that dumps sewage sludge at sea; the other is the Philadelphia, Pennsylvania, and Camden, New Jersey, area. The first sludge dump site was designated in 1924. Since then a regular navy of sludge vessels steams out and releases its watery cargo and returns. The sludge is derived from a growing number of sewage treatment plants from New York City up the Hudson River, New Jersey, and Long Island. Because the sludge is largely water, there is no mountain of sludge at the dumpsite, rather there is an extensive area of carbonaceous materials.

As the sludge dump site was being studied and reports issued, public concern was further ignited by press releases suggesting that the sludge was moving toward the Long Island beaches. This "sludge monster" was the creation of over 100 press releases carried nationally, as well as TV and radio messages. Citing "an authoritative EPA source," one article predicted that the sludge would wash up on the beaches (Pearson, 1974).

Today, the results of considerable research have shown that the "dead sea" is not so dead and that the "sludge monster" is not moving. Public concern has moved on to other matters. But sludge dumping must cease by 1981, under the Marine Protection, Research, and Santuaries Act of 1972 (PL92-532). New York City has tried some alternatives. In 1959, a total of 41 shiploads of sludge were taken to Marine Park, Brooklyn, to create artificial soil for a landfill (O'Leary, 1959).

The Bight has been a dump. We have put 1.91 billion cubic yards of wastes into it since 1890 (Gross, 1976, p. 10). This quantity loaded into dump trucks would make a parade almost 71.6 million miles long--a distance equivalent to three round trips to the moon. The New York Bight stands out as the major recipient of our largesse, for over 90% of the wastes dumped at sea in the United States are dumped here.

A Surfeit of Governments

Fronting on the waters of the New York Bight and its connecting waterways are 134 minor civil divisions gathered together into two state governments and one federal government: a total of 137 governments in all. It is estimated that the 134 minor civil divisions--counties, townships, cities, and villages--contribute 402 separate agencies. State and federal governments form an estimated additional 30. The rim of the New York Bight, therefore, is regulated by over 432 governmental units, omitting special purpose districts such as school, fire, water, and sanitation districts that may or may not coincide with the civil government boundaries (Marr 1979, p. 26).

The land on which we live is segmented into many governments. So, too, is the ocean. To examine the various jurisdictions over the waters of the Bight, we must think in three dimensions, starting at the shoreline where the tides of the sea rise and fall. Most shoreline property owners know that their land extends to the mean high tide mark. This interpretation of ownership is highly complex.

In most instances, the state owns the ocean bottom from mean high tide outward. Owners of waterfront property, however, may have riparian rights to the waters over the bottom and, in some cases, the bottom lands may belong to other than the state by reason of grants such as colonial patents.

From the benchmark of mean low water to a distance of 3 miles offshore is the territorial sea. Probably promulgated as the "cannon shot boundary"--the distance old ball cannons could fire--the territorial sea was for many centuries the area in which a nation could exercise its sovereignty. In general, the territorial sea is the province of the states (that is, the bottom of the territorial sea and its minerals); the waters above are under federal government jurisdiction).

Beyond the territorial sea are a series of parallel belts of influence known as the contiguous zones. These have special purposes and differ in their definition and limits according to their needs. They include such things as anti-smuggling zones (12 miles offshore), defense zones of varying widths (up to 300 miles offshore), and most recently, the Exclusive Economic Zone for Fishery Management, commonly known as the 200-mile limit.

Beyond the tidal region, the territorial sea, and the contiguous zones is a fourth zone--the outer continental shelf. After the second world war, the potential for the development of oil and gas resources was so great that the United States proclaimed rights to the natural resources of the seabed and its subsoil. The outer margin of this zone is generally thought to extend to lands about 100 fathoms deep. This proclamation of territoriality applied only to the seabed, not to the waters above. Beyond the outer continental shelf are the high seas where the classic freedom of the seas is thought to remain. But even the high seas are rapidly being divided into governmental jurisdictions as nations seek international agreements to manage fisheries, regulate pollution, and otherwise control the last domain not yet overgoverned by man.

The New York Bight is not a single entity; it's a conurbation of myriads of local governments, with its waters divided horizontally, vertically, and otherwise into yet another set of jurisdictions over which agencies can clamor and fight for power, authority, and funds. While the City on the Sea has been a focus of attention, and the fringe communities of southern New Jersey and eastern Long Island may feel little or no kinship for the metropolitan area, the futures of all are linked. The problems facing the Bight are not ones that local governments or single agencies will be able to solve or affect; they are regional problems to which all contribute to some degree and for which all must contribute solutions.

Metropolitan New York has experienced similar problems before. The cities of New York and Brooklyn had to agree to cooperate for the Brooklyn Bridge to be built in 1883. An agglomeration of 40 cities, towns, and villages, as well as the five parent counties, merged into the City of New York in 1898, providing their pooled resources for massive new projects none could undertake independently. The results were more bridges and tunnels across the rivers, expansion of the subway system to the Bronx and Long Island, and establishment of regular ferry services. Northern New Jersey municipalities, however, did not join the movement for regionalism. There, separate governmental units unable to muster development funds left coastal matters, such as port facilities, railheads, and the like, to private developers.

But it was clear to those whose projects required cooperation of even larger areas that the now broadened limits of New York City would provide insufficient funds for development of the region. Such cooperation was not made easy by the plethora of individual entities that had to be brought together.

Prior to the first world war congestion in the metropolitan area also called for joint New York and New Jersey solutions. Lack of common interests and outright antagonism led to the 1916 "New York Harbor Case" in which the Interstate Commerce Commission wrote:

> If we could overlook the fact that historically, geographically, and commercially New York and the industrial district in the northern part of the state of New Jersey constitute a single community; ...and if we were not persuaded that cooperation and initiative must eventually bring about the improvements and benefits which the complainants hope to attain through a change in the rate adjustment; then we might conclude that the present rates result in undue prejudice to the people and communities on whose behalf this complaint was filed. On the evidence now before us that conclusion cannot be reached.
>
> ("The New York Harbor Case," 1917, p. 739)

In 1921, this decision led to the formation of the Port of New York Authority (officially renamed in 1972 the Port of New York and New Jersey Authority). But even as consent of the Congress, under Article I, Section 10, of the Constitution, was being sought for the Port Authority, New York City was contending in a blocking suit, "that the legislature of the state of New York had surrendered its sovereignty, or some part of it, to the State of New Jersey..." ("City of New York vs. Willcox," 1921, p. 35).

Thus, while the problems of the Bight region and the future of the Bight itself depend on bringing together the resources of the entire region, there seems little likelihood of full cooperation. Each of us--unwilling to give up that little piece of treasured selfness, that last vestige of our claim to self government--carries on, content to blame the faceless and nameless "them" for our miseries.

A New Chapter

A new chapter is about to be written: a hopeful one. The 200-mile extended jurisdiction has stirred the Bight's fishery. Increased numbers of fishing vessels and processors suggest that this portion of our maritime heritage is rejuvenating. New York's Mayor Koch has announced plans to revitalize the city's waterfront; new uses for new times focus on marinas, parks, and people-oriented recreation. Resort and recreational development is revitalizing the Jersey shore. But the fishery and recreation are only two of the many uses of the Bight. Navigation, energy transport, possible oil or gas production are other resource utilizations; the bottom of the Bight is crisscrossed with pipelines and cables. Proposals abound for floating power plants and airports, for artificial islands and deepwater ports, and for ocean farms of seaweed, fish, or shellfish. But there is no mechanism beyond creaky international law adequate for management of the Bight or for allocation of its surface, waters, or substrate among and between competing uses (Armstrong and Ryner, 1980, p. 85).

To make the Bight what we want it to be will require us to start doing some things in new ways. The principal lesson we have to learn is that the Bight is a mighty, natural system over which we have little power. We must realize that to build a house on the margin of sand along the Bight, we would have to stop the waves and tides; this we cannot do. We must also learn to treat the Bight with foresight, we can't dump things into it without expecting to have those things cast back at us in one form or another.

We are not alone in abusing the coastal ocean. We must learn from others and we must apply those lessons to our own resources. The story of the New York Bight is a great story. We can make it even greater.

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