

CIRCULATING COPY
Sea Grant Depository

LOAN COPY ONLY



Beach Use and Water Quality in New York City

By Charles Heatwole and Niels West



New York Sea Grant Report Series



Also in this series:

Gran, Warren. 1980. *The Urban Waterfront and the Low Income Community: Potential for Local Recreational Usage*. New York Sea Grant Report Series NYSG-RS-80-05. *Not yet published*.

Heatwole, Charles and Niels West. 1979. *Beach Use and User Constraints in the New York City Coastal Region*. New York Sea Grant Report Series NYSG-RS-80-01. Data report. \$1.50

Hoffman, Deborah. 1979. *The Revitalization of Fulton Ferry: A Prototype for Waterfront Redevelopment in New York City*. New York Sea Grant Report Series NYSG-RS-79-08. \$1.50

Kret, Ellen H. 1979. *Waterfront Redevelopment: A Partnership Between Public Resources and Private Ingenuity*. New York Sea Grant Report Series NYSG-RS-80-06. *Not yet published*

Moss, Mitchell. 1979. *New Prospects for the New York City Waterfront*. New York Sea Grant Report Series NYSG-RS-80-03. \$1.50

Moss, Mitchell and Matthew Drennan. 1979. *The New York City Waterfront: An Analysis of Municipal Ownership and Leasing of Public Land*. New York Sea Grant Report Series NYSG-RS-80-04. Data report. \$1.50

BEACH USE AND WATER QUALITY IN NEW YORK CITY

Charles Heatwole
Department of Geology and Geography
Hunter College
New York, NY 10021

Niels West
Department of Geography and Marine Affairs
University of Rhode Island
Kingston, RI 02881

February 1980

NYSG-RS-80-02

This research was sponsored by the New York Sea Grant Institute under a grant from the Office of Sea Grant, National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce.

ACKNOWLEDGMENTS

The authors thank Mr. Barry Crisciullo for preparing the maps used in this report.

TABLE OF CONTENTS

	Page
PREFACE--DEFINING SOME TERMS	v
What Is 208?	v
What Is a Beach?	vi
ABSTRACT	1
BEACHES AND BEACH USE	3
Diversity	3
Estimated Use	4
Variability	5
WATER QUALITY	7
Simple Runoff	7
The Municipal Wastewater System	7
Untreated Sewage	9
Ocean Dumping	9
IMPACT	10
USER ASSESSMENT OF BEACHES	13
Water Quality	13
Accessibility	13
WATER IMPROVEMENT AND FUTURE IMPACTS	15
Development of New Beaches	15
Improved Access	15
PUBLIC TRANSPORT	16
PRIVATE TRANSPORT	17
Increased Public Awareness	17
CONCLUSIONS	19

PREFACE--DEFINING SOME TERMS

What Is 208?

In 1972, the ninety-second Congress passed the Federal Water Pollution Control Act Amendments (PL92-500). The amendment was written to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Section 303(e) of the legislation requires each state to establish a continuing planning process for developing water quality management plans on a water basin-wide basis. There are, I believe, about 17 designated water basins in New York: one encompasses the marine district in its entirety.

Another section of the legislation (208) mandates the development of area-wide waste treatment management plans. While the basin-wide plans are the responsibility of the state, the area-wide plans can be "farmed out" to local governments if they can do an acceptable job.

Area-wide 208 plans involve the assessment of non-point sources of pollution in areas experiencing substantial water quality problems and the development of plans to cut down this pollution in ways that make cost and institutional sense. Non-point sources of pollution are, for example: storm-water run-off into Great South Bay.

Governor Malcolm Wilson reviewed the capabilities of a variety of governmental and planning organizations in the spring of 1974 and found them insufficient to warrant designating any of them 208 planning agencies. In December of 1974, the Nassau-Suffolk Regional Planning Board (now the Long Island Regional Planning Board) convinced Wilson that it could do the job and were designated as the planning agency for the Nassau-Suffolk 208 Planning area. Since then, New York City and Westchester County have also been designated as 208 Planning entities for the waters under their jurisdiction.

One hundred percent funding for 208 studies is available from the Regional EPA office.

What Is a Beach?

There are more than twenty stretches of coastline within the study area which are referred to as "beaches" on maps or by the user population. These range from large public city, state, and federal beaches, to relatively small "private" beaches of coastal municipalities; and from beaches readily accessible to millions of potential users to some in relatively remote locales, albeit within the New York City coastal region.

Problems of number and kind were augmented by problems of definition. For example, Brooklyn's Coney Island Beach and its contiguous neighbor to the east, Brighton Beach, appear as distinct entities on maps as well as in the minds of local residents and users. Yet the City of New York administers both under the single heading of Coney Island. How many beaches, then, is Coney Island? One or two? A similar situation exists on Staten Island where both South and Midland Beaches are administered by the City as South Beach. On a different tack, Brooklyn's Canarsie Beach, located along the northwestern shores of Jamaica Bay, is not a beach at all--at least not in the sense of a facility which permits people to use waterfront for bathing.

Realities like the above made it necessary to address the question of beach definition. Accordingly, a beach was interpreted to mean a stretch of sand fronting the ocean or inlet thereof, and available for bathing. Moreover, administrative definitions regarding the existence and extent of particular beaches (reference again the Coney Island - Brighton Beach situation) were credited at the expense of cartographic or popular definitions.

ABSTRACT

New York City's 16.9 miles of public beach are heavily used now and will attract even more users in the years ahead. Crowding occurs despite safe, but generally unsatisfactory, water quality. The major goal of Project 208 is to eliminate the sources of pollution and open new beach areas. If, by the early to mid-1980s, the contamination levels decrease, the water quality at the beaches will improve, and additional areas will be suitable for swimming. While these changes are desirable, they also will encourage greater use of city beaches--possibly causing overuse of the beaches. To prevent crowding requires that public officials plan now. For the moment, two broad strategies offer promise: improved accessibility to underused beaches and increased public awareness of underused beaches.

This paper focuses on the implication Project 208 might have for swimming and beach use in the New York City area. Specifically it addresses the following questions:

- . What is the current condition of city beaches and how are they used?
- . How does water quality affect beach conditions and use?
- . How will improving local water quality affect beaches and beach use?
- . What changes should beach managers prepare for after estuarine conditions improve?

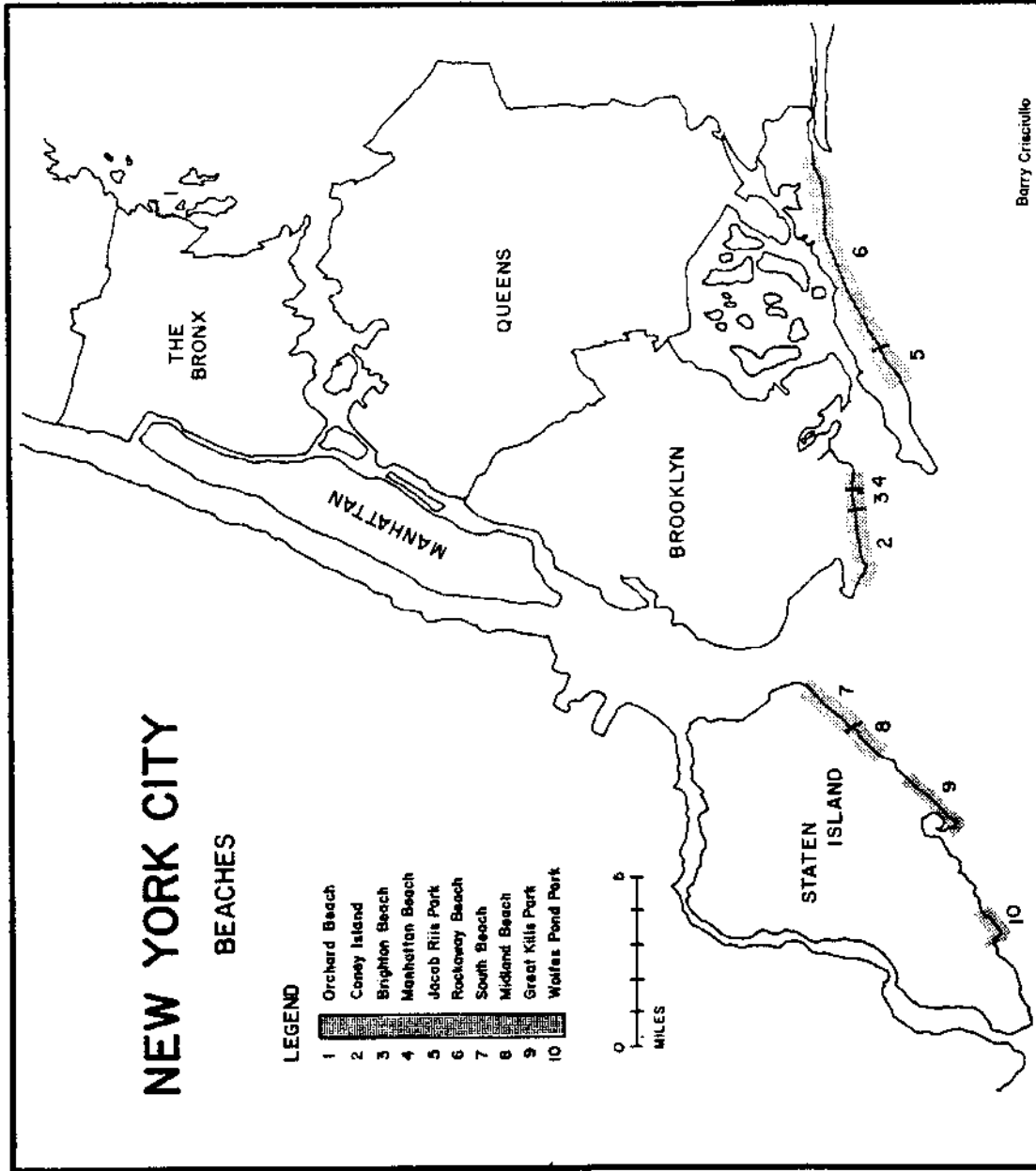


Figure 1 New York City beaches

BEACHES AND BEACH USE

Although the goal of suitable swimming water is but one part of the comprehensive 208 package, it is fitting to examine it more closely. For the average citizen, swimming is the most important recreational use of water.

A 1960s report by the Department of the Interior indicates that Americans spend a significant portion of their leisure time at the beach (Outdoor Recreational Resources Review Commission 1962). Apparently, the recreational behavior of New Yorkers follows the national trend. According to New York's Department of City Planning, city beaches had 55 million visitors per year (Department of City Planning 1969). According to data provided by beach managers, the figure is closer to 60 million. Officials predict that increased disposable income and leisure time will increase beach use until the year 2000, even if urban populations stabilize or decline.

Diversity

The individual beaches in New York City's expansive beach system vary in both physical size and use. As seen in Figure 1, every borough except Manhattan has at least one beach. Two of the sites, Riis Park and Great Kills Park, are former municipal beaches recently incorporated into the federally controlled Gateway National Recreational Area. Of the 16.9 miles of city waterfront devoted to beaches, only 2 miles are under federal jurisdiction and 14.9 miles are under municipal jurisdiction (Table 1).

TABLE 1 Length of beachfront

Beach	Length(miles)
Coney Island (includes Brighton Beach)	3.2
Great Kills	1.0
Jacob Riis	1.0
Manhattan	0.3
Orchard	1.0
Rockaway	7.5
South (includes Midland Beach)	2.5
Wolfes Pond	<u>0.4</u>
TOTAL	16.9

Source: Beach managers

Estimated Use

Although there never has been a formal census of beach use in the metropolitan area, beach managers make rough estimates of beach use. The estimates summarized in Table 2 suggest significant, though not unexpected, variations. Coney Island and Rockaway Beach each host about 1.5 million people during the peak summer holidays, such as Fourth of July. For the same periods, Wolfe's Pond Park and South Beach each host only about 10,000 visitors.

What other disparities are there? There is a big difference in beach attendance on weekdays and weekends. For example, 850,000 people visit Rockaway Beach during an average weekend day and 600,000 during the average weekday. In contrast, a mere 250 people visit Staten Island's Wolfes Pond on an average weekday.

TABLE 2 Beach user estimates

Beach	User estimates *		
	Weekday	Weekend	Holiday
Coney Island (including Brighton Beach)	400,000	650,000	1,500,000
Great Kills	3,000	12,000	20,000
Jacob Riis	40,000	45,000	90,000
Manhattan	20,000	45,000	60,000
Orchard	17,000	50,000	60,000
Rockaway	600,000	850,000	1,500,000
South (including Midland Beach)	1,800	2,500	4,000
Wolfes Pond	250	1,300	9,000
TOTAL	1,082,050	1,655,800	3,243,000

Source: Beach managers

Variability

The variability in beach use is determined partly by the size of the local population and relative ease of access. A trip to Coney Island or Rockaway Beach means a five- or ten-minute walk for thousands of nearby residents, or a short subway ride for millions more. Other beaches are not so convenient to so many.

WATER QUALITY

As noted, Project 208 is partly concerned with achieving suitable swimming water by 1983. To some this suggests that present waters are unsuitable for swimming and that millions of beach users have been swimming in unhealthy water. Generally speaking, the city's beaches, all of which have water safe for swimming, are well removed from the major sources of water pollution. Project 208 attempts to make the water near some of the sources of water pollution safe for swimming.

Still, there is some evidence that even distant sources of pollution contribute to the dirty appearance of beach water, whether it is safe or unsafe. Therefore, it is essential to examine the four basic sources of pollution that Project 208 seeks to eliminate:

- . simple runoff;
- . the present municipal wastewater system;
- . untreated sewage; and
- . ocean dumping.

Simple Runoff

Local topography and lack of sewers affect simple runoff. Because the water level is lower than the local land level, rain water carries debris from the land into the estuary. It is difficult to collect precise data on runoff pollution. Although runoff has a negative effect on water quality, and may never be halted completely, its impact seems less severe than the other pollution sources.

The Municipal Wastewater System

Figure 2 shows the major components of the municipal wastewater system. The keystones are the twelve treatment plants spread throughout the five boroughs. Fed by a combined sanitary and storm sewer system, these plants are designed to handle about twice the flow of sewage and contaminated water normal during dry weather conditions. The system poses two problems.

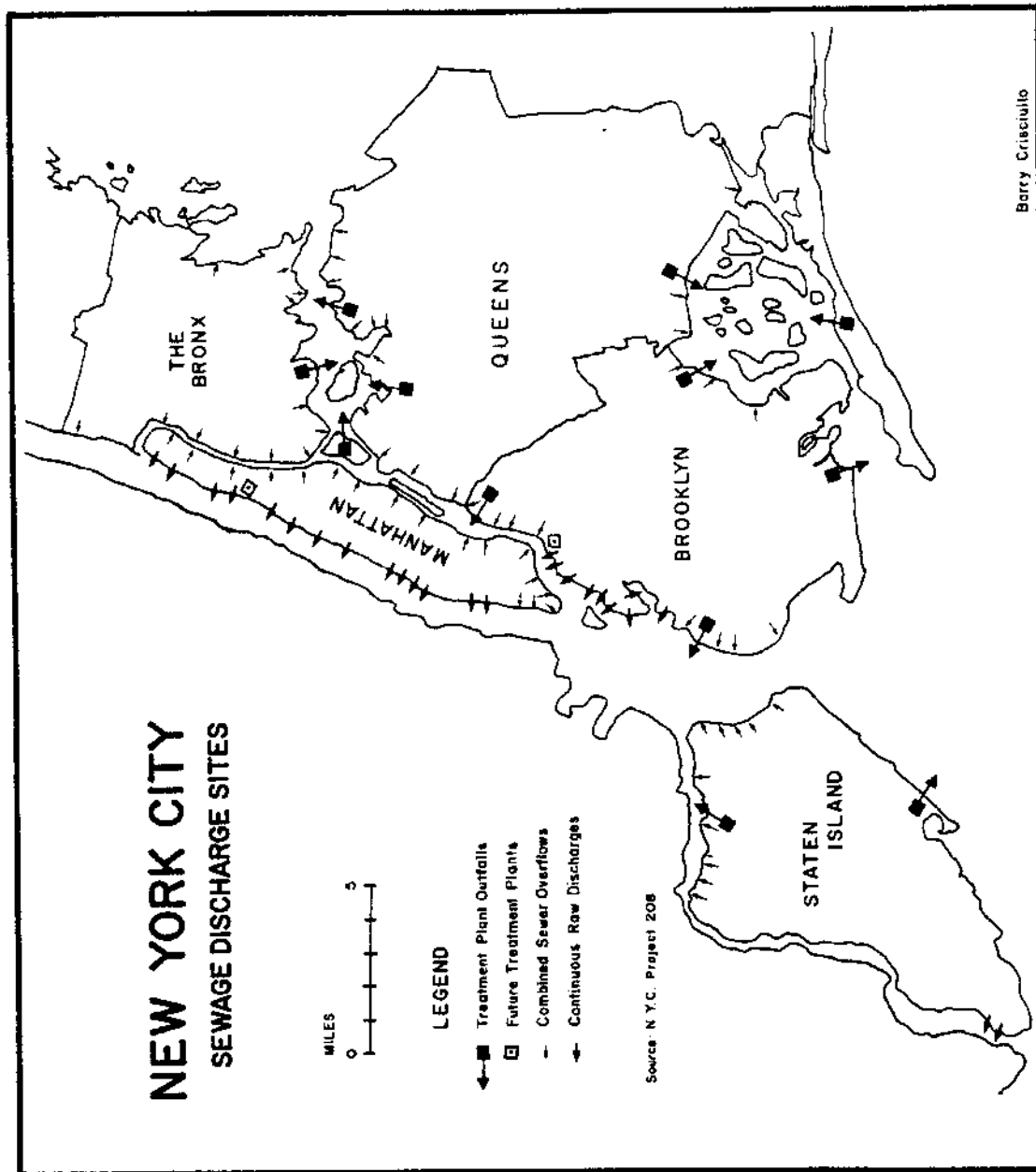


Figure 2 New York City sewage discharge sites

Treatment plants can remove the bacteria from the waste or by treatment they render the organisms harmless. They accomplish this sometimes by chemical treatment, by filtration, and by aeration.

Treatment plants handle water from two sources: domestic wastes--water from pipes, from the toilets, and sinks throughout the metropolitan area--and also storm sewers. But these treatment plants have a limited capacity. When more sewage flows through the system than can be treated properly the overflow bypasses the system and is dumped untreated into the estuary.

. During heavy rainfall, the combined sewer overflow (CSO) pours more water into the system than it can process. Thus untreated wastes from residences and city streets are dumped untreated into the estuary. Figure 2 shows locations of major CSO outlets.

. During rare electrical power failures, sewage treatment ceases, but sewage continues to flow through the system. As a result the treatment plant discharges raw sewage as long as the power fails.

Untreated Sewage

The West Side of Manhattan and the extreme northwest part of Brooklyn, two areas without treatment facilities, discharge significant amounts of raw sewage into the harbor. The North River treatment plant under construction should eliminate West Side pollution and the scheduled Red Hook plant should eliminate Brooklyn pollution. The days of raw sewage discharge should end by the early 1980s, when both facilities will be completed.

Ocean Dumping

No matter how well the sewage is treated and reduced, a certain amount of post-processing residue, called sludge, still requires disposal. The present disposal policy, effective since the mid-1930s, is to dump all sludge in the ocean. The city retains four ships that collect and dump sludge at a site approximately twelve miles seaward of the Verrazano Narrows Bridge.

According to the New York City Environmental Protection Agency, New York City dumped 3,230,000 cubic yards into the Harbor in 1973. At this rate, in a little over 7 months, New York City dumps enough sludge to fill one of the towers of the World Trade Center. Over many years a large area of pollution has grown around the dump site. If this marine dump remains stationary, it should pose no threat to swimmers or the waterfront environment. However, on several occasions sludge-like debris has forced temporary closings of city beaches. Summers of 1975 and 1976 were especially bad.

The source of the pollution has been the subject of controversy. Sludge does not appear to be a source now, but the more sludge we dump, the more likely it is to be a pollution problem for beaches in the future. The Environmental Protection Agency has mandated that ocean dumping end by 1981, but many doubt the city can comply. Changing to a new sludge disposal system would be extremely expensive.

IMPACT

Although water quality is marginal at South and Midland Beaches on Staten Island, city and state officials consider all city beaches suitable for bathing. Comparing Figures 1 and 2 shows the locations of beaches relative to the locations of sewage discharge sites. Only two treatment plant outfalls are near public beaches. The Coney Island plant in Brooklyn discharges in the area of Manhattan and Brighton Beaches; the Oakwood Beach plant on Staten Island discharges Great Kills and Midland Beaches. However, the treated discharge from these and other plants is relatively harmless.

Of greater concern are the combined sewer overflow and continuous raw sewage discharge. There is a CSO point in eastern Bronx close to Orchard Beach, and several others originate from Staten Island and Brooklyn near the Staten Island beaches.

Most CSOs empty into the Hudson River, the East River, or Upper New York Bay several miles from the public beaches. But

proximity is only part of the problem. CSO and raw discharge, like the sludge dumped at sea, do not remain stationary indefinitely. The Hudson River flows seaward, and tidal currents agitate the water particles in all parts of the estuary. Much of the discharged sewage settles to the bottom, but significant portions are moved by the current. The fouling of public beaches is always a possibility--and sometimes a reality. However, New York City and state officials are not necessarily wrong or irresponsible when they assess that beach water quality is safe. There is no such thing as pure water, except in the laboratory. But, water need not be pure or pollution-free to be safe for swimming. The Department of Environmental Protection monitors swimming waters and warns the public whenever harmful conditions prevail.

USER ASSESSMENT OF BEACHES

The diversity of public opinion makes beach user assessment of water quality difficult to evaluate. Still, it is possible to generalize from data taken by beach managers and from 1977 summer survey of 2900 beach users at Coney Island, Orchard Park, Riis Park, Great Kills Park, and Jones Beach State Park.

Water Quality

At first, one might conclude that the average New York beach user is content with existing water quality. An average of 60 million people annually visit New York City beaches, hardly an indication of dissatisfaction. But the 1977 survey data led to a different conclusion. Beach users at each beach were randomly asked what they disliked about that beach. On the city beaches, 41.3 percent of participants mentioned poor water quality; an additional 57.3 percent cited dirty beach environment without mentioning water. Respondent percentages varied for each beach, but Great Kills and Coney Island were criticized most severely. Nonetheless, we found no significant differences between the four city beaches sampled (excluding Jones Beach).

Thus, at each interview site, a dirty beach environment and dirty water ranked first and second, respectively, as the most undesirable characteristics. This study suggests a substantial number of New York City beach users are dissatisfied with the quality of the waters where they swim.

Accessibility

Despite all the user dissatisfaction with beach waters, New York City beaches draw big crowds because they are relatively easy to reach and offer inexpensive recreation. When asked what they liked most about the municipal beaches, 66.8 percent of those surveyed mentioned easy access. Table 3 shows that the average travel distance to each city beach surveyed was

TABLE 3 Access to sampled city beaches

Beach	Getting there and back (An average trip to the beach)		
	Distance (miles)	Time (minutes)	Cost (\$)
Coney Island (including Brighton Beach)	12.2	65.2	1.22
Great Kills	7.8	42.4	.50
Jacob Riis	18.0	67.8	2.69
Orchard	9.6	54.0	2.30

Source: 1977 beach survey

less than 10 miles. Average transit time between home and sea-shore was fairly consistent and ranged from 21 minutes for Great Kills to 33 minutes for Coney Island. Average round-trip travel cost reflected the greatest range--from \$.50 for Great Kills to \$2.69 for Riis Park. The cost range is expected because transportation, tolls, and fees differ for each beach. Some also spend more than \$10 to get there and, in bad traffic, spend an hour or two enroute.

Overall, the average New York City beach user is dissatisfied with estuarine water quality and would like it improved. For the present, however, convenience and low cost encourage heavy use of city beaches.

WATER IMPROVEMENT AND FUTURE IMPACTS

Project 208 is bound to affect beaches and beach users. Obviously, it is difficult to forecast all the impacts clean water would have on recreational use, but two things are immediately apparent. First, improved water quality would make the beach visit a more pleasant experience. Second, the elimination of pollution, a major source of user discontent, would most likely increase beach use. Thus, solving the problem of dirty water would probably aggravate the problem of crowded beaches.

Public officials must deal now with the likelihood of increased crowding with appropriate foresight and planning. For a start we consider several strategies.

Development of New Beaches

The first strategy develops new beaches and, in effect, spreads the number of users over a greater number of facilities. This option already has attracted serious consideration. Portions of the Jamaica Bay waterfront are prime contenders for new beaches. Areas in Queens and the Bronx that front the western end of Long Island Sound are also under consideration. The most exciting prospect is a Manhattan beach. The most likely site, suggested by the New York City 208 Citizens Advisory Committee, is the extreme Upper West Side (Dept. of City Planning 1977). An Upper West Side beach would open the Hudson River for swimming and serve nearby neighborhoods where many of the city's poor live.

Improved Access

A second strategy improves the access to New York City's underused beaches. There is no statistical definition of underused or overused beach, but Table 4 provides a framework for comparing beach use within the New York City region. Density equals user estimates (Table 2) divided by beach length (Table 1). The result is a series of averages of users per mile of beachfront. The widths of beaches--the distance from mean shoreline

to the landward periphery of the sand--were not available or included in these calculations. Thus, the data reported are not "true" density figures in terms of people per unit area. Differences in beach width do not appear to be significant.

The table shows, for example, that on a weekday, Coney Island averages 125,000 people per mile of beachfront versus 3,000 at Great Kills. The figures suggest that Coney Island, Rockaway Beach, and perhaps, Manhattan Beach, are all overused relative to the other beaches.

TABLE 4 User densities by beach

Beach	User densities*		
	Weekday	Weekend	Holiday
Coney Island (including Brighton Beach)	125,000	203,125	468,750
Great Kills	3,000	12,000	20,000
Jacob Riis	40,000	45,000	90,000
Manhattan	66,600	148,500	198,000
Orchard	17,000	50,000	60,000
Rockaway	80,000	113,333	200,000
South (including Midland Beach)	720	1,000	1,600
Wolfe Pond	625	3,250	22,500

*Computed by dividing user estimates in Table 2 by beach size in Table 1.
Source: Beach managers

PUBLIC TRANSPORT

None of the underused beaches are served by the city's subway system, but all are served by its public bus system. Survey data indicate people take the bus to the beach only on a limited basis. For example, 28 percent of the people surveyed on Orchard Beach arrived by bus. The percentages for other beaches lag far behind. Increased service, express routes, and fare incentives to the underused beaches may encourage use of these facilities. Whether these services will pay for themselves is a question best answered by a trial period.

PRIVATE TRANSPORT

Improving access for private automobiles looks more promising than improving public transportation, at least for the short run. The automobile is the major means of transportation to New York City's underused beaches. Indeed, it is the leading means of transportation to every beach except Coney Island, where the subway predominates. For a group of four or more people, it is usually cheaper to go to the beach by car than by public transit. Feedback from motorists suggests that parking facilities and costs influence their choice of beach. It follows that attractive parking facilities may increase attendance at underused beaches.

Increased Public Awareness

Public awareness may be another strategy to prevent overcrowding. If, for instance, more people knew that on a weekend there would be more than 200,000 people per mile of beachfront at Coney Island, but only 45,000 at Riis Park, perhaps many would choose the less crowded beach. Radio and television advertisements and subway posters could inexpensively increase public awareness.

CONCLUSIONS

Within the next decade substantial water quality improvements will occur within the New York City estuary. Cleaner water will mean that the city's beaches, many of which are already overused, will attract even larger crowds. To adequately and safely accommodate these future visitors, planners should focus their efforts on crowd reduction at the most heavily used beaches. Four strategies to be considered are:

- . Increase the number of beaches so the user burden can be spread over more facilities.
- . Inaugurate new public bus routes and fare incentives to underused beaches.
- . Establish favorable fee structures and parking facilities to attract more automobile users to the underused beaches.
- . Institute an advertising campaign designed to show the public where the least crowded beaches are and how to get there.

REFERENCES

Department of City Planning, City of New York. 1969. Plan for New York City, Vol. 1: Critical Issues, New York, NY.

Department of City Planning, City of New York. 1977. New York City 208 Water Quality Management Program Water Report, Issue 8 (September-December).

Outdoor Recreational Resources Review Commission. 1962. Water for Recreation: Values and Opportunities, Report #10, Bureau of Recreation, US Department of the Interior, Washington, DC.