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**THE ECONOMIC BENEFITS
OF PARKS IN**

New York City

Trust for Public Land (TPL) creates parks and protects land for people, ensuring healthy, livable communities for generations to come.

TPL's Conservation Economics team consists of resource economists, an award-winning geographic information systems (GIS) team, and partners from research institutions, including the University of Maryland Environmental Finance Center, Colorado State University, Dartmouth College, Georgia Institute of Technology, Michigan State University, University of California-Davis, University of Georgia, Texas A&M, University of Minnesota, University of New Hampshire, University of Vermont, University of Wyoming, and the U.S. Forest Service.

The Conservation Economics team has extensive experience measuring the benefits and fiscal impacts of parks and conservation in over 60 economic analyses across the country, including reports for cities, states, or both in Alabama, Arkansas, California, Colorado, Florida, Georgia, Illinois, Kansas, Kentucky, Maine, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Vermont, Virginia, Washington, and Wyoming.

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Executive Summary

Parks are vital infrastructure for healthy, flourishing communities, and are essential to improving quality of life for city residents. In this report, Trust for Public Land (TPL) quantified benefits of the network of city, state, and federal parks in New York City (NYC). NYC has an extensive park system that residents visit 527 million times per year, with 99 percent of residents living within a 10-minute walk to a park.¹ Parks in NYC create billions of dollars of benefits and savings every year to residents, businesses, and visitors in all five boroughs. Additional investments in parks would have the potential to lead the economic and social recovery of the city.

Results from the economic benefits analysis show that the system of parks in NYC provide the following benefits:

Human Health

- **\$9.1 billion in recreational value** for residents, an average of \$17 per visit for the 527 million visits by residents alone, who use the parks for playing in playgrounds, walking, picnicking, running, relaxing, observing wildlife, biking, visiting beaches, and participating in fitness classes;
- **\$1.14 billion in health care savings** for over one million residents who report using parks to meet CDC guidelines for physical activity, worth approximately \$1,330 annually for those who exercise for 150 minutes per week;
- **Reduced cost of heat stress illnesses** due to parks' shrubs and tree canopies providing shade and lowering nearby ground temperatures, and avoiding the costs for associated emergency department visits or hospitalizations;

Nature's Services

- **Up to \$2.43 billion in avoided stormwater treatment costs** through runoff absorbed rather than discharged to sewers, streets, and waterways;
- **Avoided treatment costs for nitrogen in runoff**, due to infiltration in parks rather than degrading water quality;
- **\$20.3 million through reduced fine particulate matter and \$6.2 million through reduced ground ozone**, two air pollutants known to impact human health;

Economic Impact

- **Over \$15.2 billion in increased property value** and **\$101 million in annual property tax revenues** for homes within 500 feet of parks;
- **\$17.9 billion in tourism spending**, including local and non-local domestic visits related to outdoor activity; and
- **\$680 million annually spent on sports, recreation, and exercise equipment** by residents attributed to the outdoor recreation economy, supporting at least 479 stores and 4,336 employees in NYC.



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Trust for Public Land conducted a broad literature review and analyzed geospatial data to calculate estimates of these benefits, with methodologies detailed in each section of the report. Findings are grounded in a survey of city residents' park usage and publicly available information and models, including open-source i-Tree models to estimate certain benefits of nature's services. Additionally, TPL integrated data from Longwoods International Travel USA® to estimate visitation to NYC for parks and help illustrate the economic benefits. At numerous key decision points TPL chose conservative estimates or methodologies such that the overall findings should be considered a lower bound on the value of economic benefits.

These benefit estimates must be considered independently, as different methodologies are used to estimate each category. Outputs may represent different types of values (e.g., the economic impacts of tourism compared to the value of benefits provided by nature), although they are both expressed as monetary values.

While previous studies have investigated the economic impact of individual parks in NYC or of special events held in parks, this is the first study of the entire park system, inclusive of city, state, and federal parks. This

study intentionally includes both environmentally and economically-driven values, as parks and natural spaces are not typically valued in traditional economic reports.

However, this analysis does not assess the benefits of street trees and private yards or other lands that may provide significant benefits. Nor does this report consider all the potential benefits of parks that could be quantified; for example, the direct, indirect, and induced economic activity from the wages of park workers and contractors or of capital investments are not assessed here. Therefore, this report should not be directly compared with earlier studies of individual parks' benefits, nor does it represent the total economic value of parks in NYC.

By any measure, however, parks in NYC provide significant benefits to residents and the city as a whole. NYC's identity is intertwined with the park system, and the vitality of one affects the other. By offering a fuller picture of economic benefits, this report equips local decision-makers with quantifiable support to help fund, protect, create, and maintain the city's parks for the use of current and future residents and visitors. Moreover, the benefits of parks go far beyond dollars and cents, as the peaceful green oases enrich life in NYC immeasurably.



Introduction

Parks are vital and essential components of healthy, flourishing communities. When well designed, maintained, and programmed, parks can provide a range of recreational, health, nature, tourism, and economic benefits that make a city and its residents more prosperous and resilient. These tangible benefits can be measured and quantified through economic analysis to help residents, businesses, and governmental leaders gain a fuller understanding of the value of the existing park system and the potential benefits of maintaining and increasing investments in parks.

Parks in New York City (NYC) provide residents and visitors with immense benefits: the joy of a summer picnic with friends and family, the excitement of a pickup basketball game, a relaxing lunch break, or being immersed in nature and observing plants and wildlife. In NYC, parks are a critical component of the “public realm” where a significant portion of urban life takes place.² They are a significant contributor to improving quality of life for residents.

“Aside from public health, parks can be integrated into city-wide infrastructure systems that provide other critical services such as transportation, flood and heat wave protection, support for local and regional economic activity, and education. Parks have the added benefit of being multi-functional infrastructure systems in that a single park, and parks linked through other green and grey infrastructure elements, can provide many functions at the same time.”

Zef Egan et al, “Urban Parks as Critical Infrastructure: Equity and Access During COVID-19,” Resilience Quarterly, June 2020, <https://medium.com/resilience/urban-parks-as-critical-infrastructure-equity-and-access-during-covid-19-4a86f9776e5e>.

Approximately 99 percent of residents in NYC have park space within a 10-minute walk of where they live.³ These open space resources are public goods owned and maintained by federal, state, and local governments and nonprofit organizations for residents and visitors to access and enjoy.⁴ And NYC recognizes the value of its parks: in the OneNYC 2050 report, one of the strategies to “building a strong and fair city” is to improve open space and increase opportunities for recreation in under-resourced and growing neighborhoods, ensuring that all New Yorkers have access to neighborhood open spaces and cultural resources.⁵ Quality of life is tied to safety and equity in access to neighborhood parks, and investments in open space are often integrated into long-term economic development projects.⁶

Although many park benefits may be hard to quantify, environmental economics research can be used to estimate the value (in dollars) that nature provides to humans, both individually and on a larger scale. For example, spending on outdoor recreation can help estimate the value people place on the experiences of sightseeing, hiking, fishing, visiting beaches, and more. Parks provide benefits to people’s health and wellbeing when they are used for exercise, reducing long-term health care costs. The natural services parks provide, such as filtering air pollutants, managing stormwater, absorbing and storing carbon, mitigating urban heat islands, and increasing resiliency from rising sea levels also has economic value. Parks strengthen the local economy by attracting visitors from outside of the city, supporting local jobs, boosting spending at local businesses, and generating local tax revenue. Some of these beneficial elements are estimated in this report to describe the economic value parks in NYC provide.

While previous studies have investigated the economic impact of individual parks, park activities, or organizations, this is the first comprehensive study of the entire system of parks in NYC and their economic value. This report prepared by Trust for Public Land (TPL) analyzes all parks in NYC and estimates some of the significant economic benefits they provide to the community.

Each section of this report addresses a benefit category in detail, provides summaries from a literature review,

briefly describes the methodology adopted, and presents a lower-bound, conservative value for the benefit.⁷ By introducing a picture of the economic benefit value for parks in NYC, this report equips local decision-makers with quantifiable support to help fund, protect, and maintain urban parks and greenspace.

Parks in NYC Analyzed in This Report

The New York City Department of Parks and Recreation (NYC Parks) manages and maintains approximately 30,000 acres of land, covering 14 percent of the city. This public open space encompasses a wide range of outdoor recreational facilities such as athletic fields, courts, playgrounds, paved multi-purpose pathways, pools and splash pads, as well as natural features such as forests, wetlands, beaches, and walking trails. Other publicly owned areas within the analysis include New York City Department of Education (DOE) Schoolyard to Playground sites that are open to the public after school hours, New York City Housing Authority open space (generally open to residents), waterfront public access areas and walkways created under New York City Department of City Planning zoning rules, state parks and forests, and federal parks.

For this report, TPL assessed publicly accessible parks and natural areas, and recreational activities that typically take place in them. The owner and manager of the largest amount of parkland is NYC Parks. Lands owned by the New York State Office of Parks, Recreation and Historic Preservation (NYS Parks); New York State Department of Environmental Conservation (NYS DEC); National Park Service (NPS) (only Gateway National Recreation Area in New York), New York City DOE lands under the “Schoolyards to Playgrounds” program; other state and city open space; and waterfront public access areas and walkways created under Department of City Planning zoning rules account for the remaining acres of publicly accessible parks.

This report does not encompass all natural areas in NYC, as the research focuses on publicly accessible parks and natural areas, and recreational activities that typically take place in them. For example, this study excluded

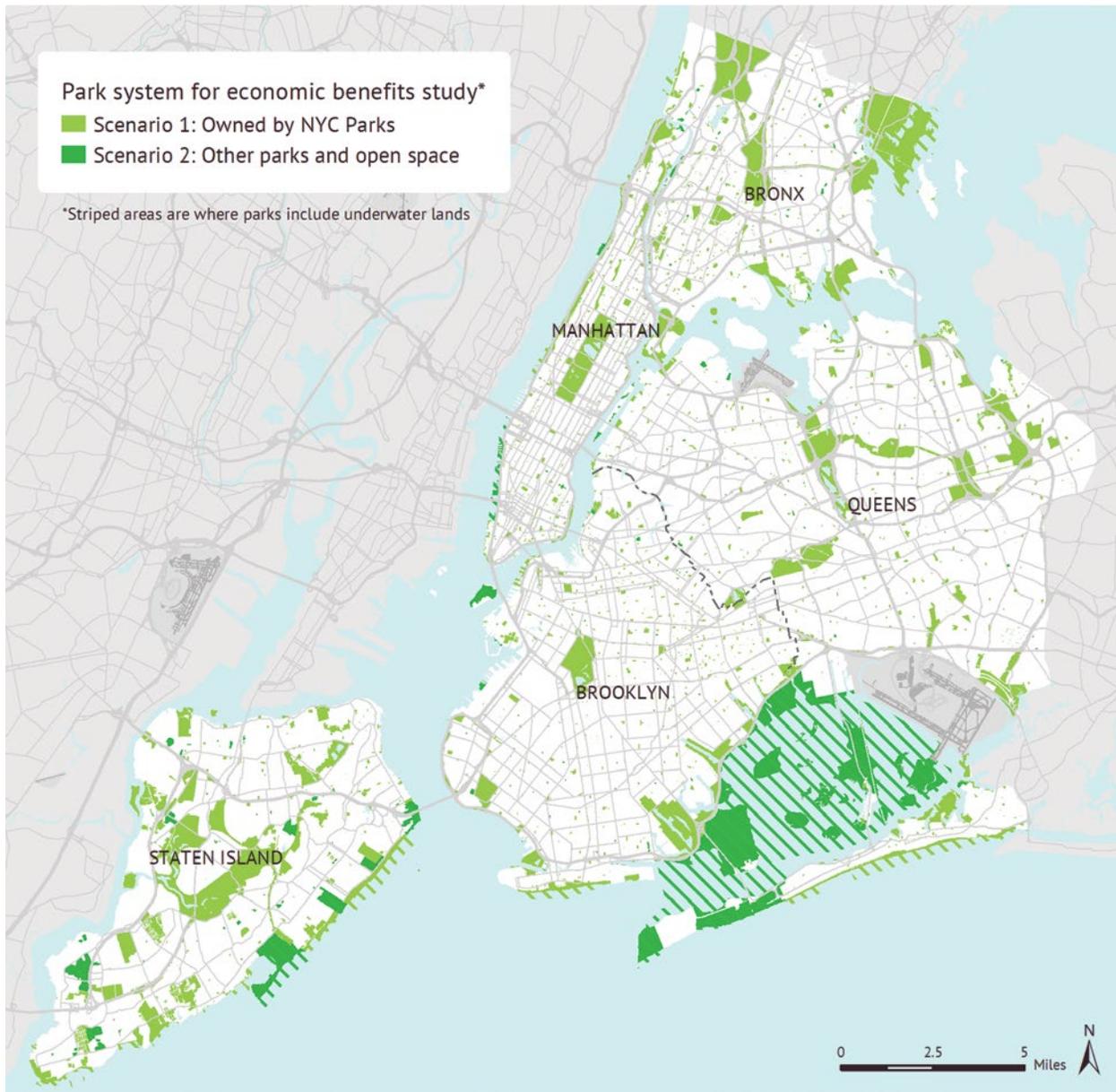


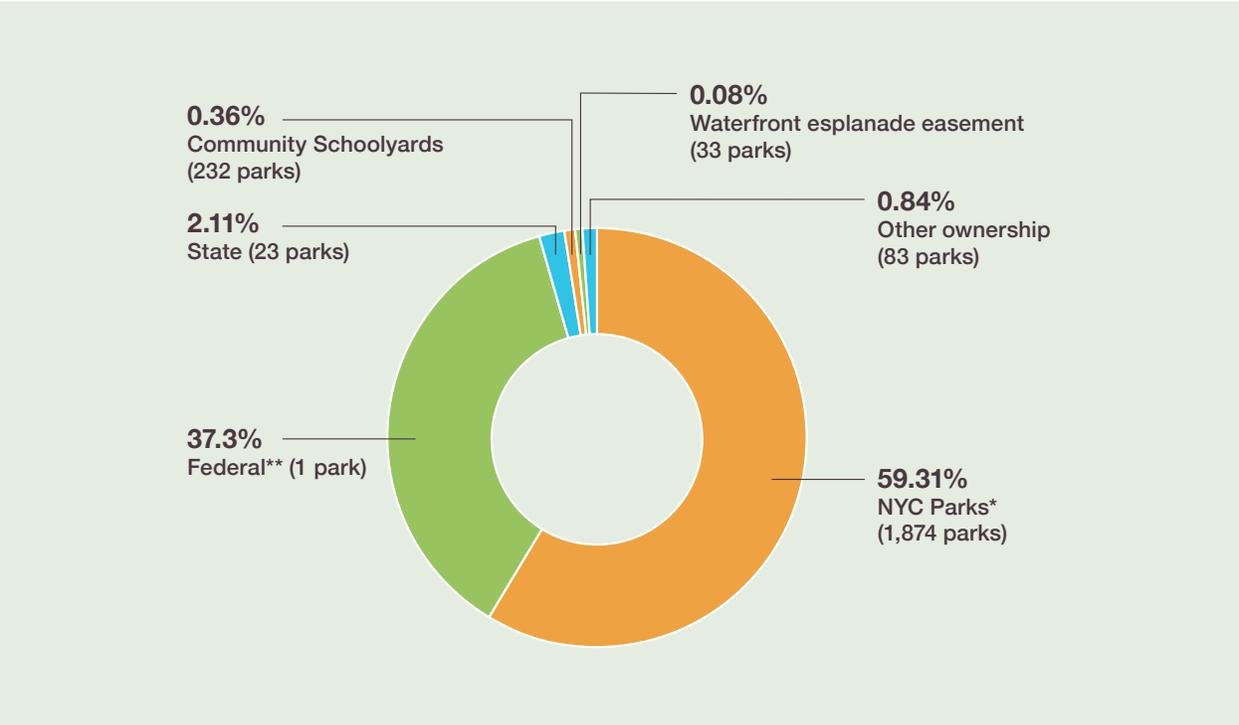
FIGURE 1. Parks in NYC. Green areas indicate publicly accessible parks included in this analysis; dark green represents federally-owned parks. Copyright © Trust for Public Land. Trust for Public Land and Trust for Public Land logo are federally registered marks of Trust for Public Land. Information on this map is provided for purposes of discussion and visualization only.

National Park Service facilities in NYC that are buildings or monuments, Bluebelts managed by NYC Department of Environmental Protection (DEP) (see [Water Quality Protection](#) section for additional information), and the city’s nearly 700,000 street trees and private yards and natural areas (other than required waterfront

esplanades.)⁸ These areas provide significant air quality, heat island mitigation, stormwater, and health benefits, even if they are not recreational.

The parks considered in this analysis consist of the units and acres as shown in Figures 1 and 2 ([page 10](#)).

FIGURE 2. Acreage of parks in NYC by ownership assessed in this report



Source: NYC Open Data and TPL ParkServe database. TPL acknowledges that these databases may not include all park acres reported elsewhere, and will work with our public agency partners to update public records and ensure data consistency.

* Acreage includes Greenstreets.

** Acreage includes the portion of Gateway National Recreation Area in NYC.

The COVID-19 Pandemic and Parks

This report was completed in the winter of 2022 amid the COVID-19 pandemic. At the time, the pandemic had already proven the critical role parks play in enhancing physical and mental health and providing essential spaces for people to connect with nature and each other. It also highlighted the challenges of operating parks under such complicated circumstances, especially given stay-at-home orders and recommendations that limited movements and upended funding models. While it is unknown how the pandemic and the resulting economic fallout will impact park systems in the short and long term, this analysis sought to provide a baseline understanding of the economic benefits of parks in NYC before the pandemic.

Nevertheless, the global pandemic has underscored that close-to-home parks are crucial to a community’s quality of life. During this crisis, people have turned to their

parks like never before—for fresh air, exercise, meditation, a sense of peace. Nationally, 72 percent of adults increased or maintained their use of public parks and trails during the pandemic.⁹

As movie theaters, restaurants, bars, and stores closed across the country, parks emerged as one of the few safe spaces people could go. Fortunately, most stay-at-home advisories made exceptions for forays into nature—whether for a walk, a run, or a bike ride. And the vast majority of states and cities kept parks open, even while shutting certain amenities like playgrounds, nature centers, and tennis courts. The result, in many places, was a surge in park visitation. State and city parks officials noted increases from Pennsylvania to Ohio to Texas.

The COVID-19 pandemic disproportionately affected low-income neighborhoods and communities of color



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in NYC, including access to quality parks and outdoor spaces. Many neighborhoods in Central Brooklyn, the East Bronx, and Queens suffered the most during the height of the pandemic, with many dependent on a single park facility.¹⁰ Parks serving low-income communities of color are generally smaller, serve more people per acre, and do not receive private funding.¹¹ In addition, urban parks in low-income areas are more likely to be a resident's only accessible green space due to lack of safe public transportation or access to a personal vehicle for visiting more distant green spaces.¹²

A survey conducted during the early months of the pandemic in NYC found that residents continued to use urban greenspaces and considered them more important for mental and physical health than before the pandemic began.¹³ However, the results also highlighted concerns about the accessibility and safety of greenspaces and

the varying needs of different populations. Even as park visitation increased, NYC Parks had to contend with significant budget reductions. Decreased private donations compounded these budget reductions during the pandemic, which primarily affected parks in higher-income neighborhoods where private conservancies play a larger role. As a result, park maintenance has been impacted, and some programs have been severely reduced in scope, such as NYC's Urban Park Rangers.¹⁴

Because the pandemic affected tourism so heavily, values analyzed in the [Economic Impact](#) section of the report leverage 2019 data to illustrate a more typical year. The pandemic has underscored the importance of parks' availability and access, their ability to support residents' health and well-being, and their contributions to the local and regional economy as NYC continues to recover.



Human Health Benefits

There are many ways in which nature is empirically tied to specific physical and mental health outcomes.¹⁵ Parks have tremendous potential to improve overall wellness, providing opportunities for recreation and exercise, reducing health care costs, and increasing the quality of our natural environment in a way that mitigates extreme heat events.

This section estimates some of the benefits parks in NYC have on residents' health, through recreational use and reduced health care costs associated with use of the parks.

Recreational Use Value

Parks in NYC provide substantial economic benefits to residents who use the space for recreation and relaxation activities, including picnicking, visiting playgrounds, participating in fitness programs, walking or hiking, swimming at a beach or pool, cooling off at a splash pad, or participating in team sports. This section estimates the recreational benefit value for residents who use parks in NYC.

Parks' amenities provide value to people, whether or not they pay for access to trails, parks, and other urban

green space (such as through entry or parking fees). When people pay for access, the value of recreation in parks can be estimated based on the price of entry or participation. However, many forms of outdoor recreation are available at low or no cost. People then benefit by either saving money by not traveling further for comparable outdoor recreation, or not paying to participate when they would have been willing to pay for access to park amenities.

One research study using social media data in NYC-owned parks indicates that park visitation increases with proximity to public transportation and bike routes, water bodies, athletic fields, and impervious (or non-porous) surfaces.¹⁶ For the purposes of this report, TPL analyzed frequency of park visitation for adults and children, and what activities they engaged in while visiting parks in NYC.

ESTIMATING ANNUAL BENEFITS OF NYC RESIDENTS' DAILY PARK USE

TPL surveyed NYC residents to determine the number of recreational users, their use patterns, and the recreational value they gained by having access to the parks. The survey did not include non-residents, millions of whom use parks in NYC every year, and consequently, the recreational valuation here should be considered a conservative, lower-bound estimate. Results from the survey were used in calculating both the recreational benefits and health care cost savings analyses.

To calculate the recreational use value to NYC residents, TPL first estimated the total annual number of visits that residents made to parks for various activities. Through a telephone survey, residents were asked questions about their park use and activities, as well as demographic information.¹⁷ Respondents provided information about the frequency of their visits to parks in NYC, whether they had children that used parks, and detailed information about the types of activities in which they and their children participated. The survey results indicated that about 80 percent of adults visit parks in NYC annually.

The self-reported participation data were calculated for each individual respondent for ten activities: visiting a beach; biking; participating in a fitness program; picnicking and relaxing; taking photographs; visiting playgrounds; walking; running; participating in team sports; and swimming or visiting a splash pad. The survey provided the number of visits per week for each activity for each respondent. Self-reported participation data were adjusted to account for participation in multiple activities during a single visit, and for the over-reporting of park use by respondents.¹⁸

Data on weekly participation in park and recreation activities were also adjusted to account for seasonality, assuming that most activity happens in good weather. The main season for beach visits and swimming was conservatively assumed to be approximately from Memorial Day to Labor Day, or 15 weeks. The remaining activities were assumed to extend into the shoulder season for 31 weeks of the year, including walking, running, and biking.¹⁹ The self-reported weekly

participation data was then multiplied by the number of weeks in that activity's season and scaled to the NYC population to estimate a total number of visits.

Survey data shows that NYC residents visit parks **527 million times annually**, with most visiting multiple times per week. The most popular activities reported for adults were walking or hiking, followed by running or jogging; picnicking, visiting with family and friends, or relaxing; viewing or taking photographs of birds and wildlife; and biking. Similarly, the most popular activities reported for children were walking or hiking; followed by picnicking, visiting with family and friends, or relaxing; visiting playgrounds; running or jogging; and biking (Table 1).

TABLE 1. Top five activities in parks in NYC for adults and children by percent of total visits by age group (self-reported)

	Park Use	Percent
Adults	Walk or hike	35%
	Run or jog	16%
	Picnic, visit with family and friends, relax	14%
	View of take photos of birds and wildlife	13%
	Biking	9%
Children	Walk or hike	20%
	Picnic, visit with family and friends, relax	19%
	Visit playgrounds	14%
	Run or jog	13%
	Biking	10%

Source: Telephone survey conducted for TPL of NYC residents by Luce Research from August 19 to 23, 2021.

These findings are consistent with NYS Parks' surveys that inform the 5-Year Statewide Comprehensive Outdoor Recreation Plan. Results from these surveys indicated that the most popular outdoor recreation activities statewide were:

- Walking for enjoyment, including jogging, running, and day hiking;
- Relaxing in the park, including picnicking, playground use, visiting nature centers, dog parks, and croquet;
- Swimming in an ocean, lake, river, or a public or private pool;
- Bicycling on and off road, including mountain biking; and
- Field sports such as baseball, soccer, football, and disc golf.²⁰

New Yorkers for Parks also found that playgrounds were essential neighborhood resources, with 79 percent of children using a playground at least once per week. These resources are particularly critical for lower-income neighborhoods. Adults from households earning more than \$80,000 per year report half the number of playground visits with their children compared to adults from households earning \$20,000 or less per year. Compared to the lowest-income adult caretakers, those earning more than \$60,000 per year have lower odds of stating that the playground is the main place their children play outdoors.²¹

Each visit made to a park has an associated economic value, regardless of the cost to participate. (The activities are generally free, except certain activities that require membership fees such as fees for recreational centers, greens fees for golfing, tennis memberships, equipment rentals, or parking fees at Gateway National Recreation Area.) Once the number of visits was determined from the survey results, TPL assigned dollar values to each visit for each activity. This methodology was developed using the framework of the “Unit Day Value method”, which the U.S. Army Corps of Engineers employs to count park visits by specific activity, assigning each activity a dollar value.²² TPL used values of recreation activities or estimates of outdoor recreation value from Oregon State University’s (OSU) Recreation Use Values Database. OSU’s database contains values for more than 20 activities, citing over 420 economic studies that estimated the “use-value” of recreation activities in the United States and Canada from 1958 to 2015.²³

TPL leveraged the dollar values in Table 2 for the ten activities in the survey.

TABLE 2. Consumer surplus values for recreational activities in NYC

Activity	Consumer Surplus Value (2021\$)
Picnic, visit with family or friends, or relax	\$ 5.73
Visit playgrounds	\$ 35.40
Participate in a fitness program (for example yoga, Zumba, hip-hop dance)	\$ 1.40
Walk or hike	\$ 21.81
View or take photos or view wildlife	\$ 25.26
Run or jog	\$ 5.72
Bike	\$ 13.43
Visit a beach	\$ 35.53
Swim or cool off in water	\$ 15.34
Participate in team sports	\$ 15.77

Source: OSU Recreation Use Values Database. Selected values are from the Mid-Atlantic where available or are otherwise national.

In selecting which dollar values to use for each of the activities, TPL applied the most conservative and relevant values to parks in NYC.

Applying these recreation values to the 527 million visits calculated from the survey, this analysis finds the total recreational use value of parks in NYC is **\$9.1 billion annually** in 2021 dollars (2021\$).²⁴ The average value per visit is \$17, representing the value to users above and beyond any cost to participate (the “consumer surplus value”) and is a unique calculation for NYC residents who visit parks regardless of activity. The total value considers the different types of activities available to residents, park use seasonality, and different values per park.



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Health Care Cost Savings Through Increased Physical Activity

Parks have tremendous potential to improve overall wellness, and investment in public open space supports behavioral changes that reduce chronic diseases and health care costs and improve quality of life.²⁵

Obesity in particular is a significant health problem, both in NYC and across the U.S. generally. In 2018, the Behavioral Risk Factor Surveillance System indicated that between 19.2 percent and 30.5 percent of adult residents in four of NYC's boroughs were obese.²⁶ The costs of these challenges are significant. Severe obesity alone costs individuals \$3,000 in excess health care costs each year.²⁷ Studies also show that physical inactivity and related health problems are a leading cause of death in the U.S.²⁸

Physical exercise can reduce the likelihood of illnesses including obesity and cardiovascular disease, and consequently it can also reduce the associated medical costs.²⁹ The Centers for Disease Control and Prevention (CDC) promotes physical activity guidelines to help

improve the overall health of Americans and reduce chronic diseases. The CDC defines sufficient activity as at least 150 minutes of moderate-intensity activity per week or at least 75 minutes of vigorous-intensity activity per week, along with muscle-strengthening activities at least two days per week.³⁰ Data from the U.S. Census Bureau's American Community Survey show that 48.5 percent of Americans are not meeting the CDC's minimum aerobic physical activity guidelines, but having access to places to walk can help people meet these recommendations.³¹ Studies of health care economics and policy have established that increased access to public outdoor spaces and more biking and walking infrastructure encourages people to exercise.³²

Parks are some of the most commonly reported convenient places for improved physical and mental health, especially if the space is well maintained, safe, and accessible, as parks provide low-cost, high-yield wellness opportunities from a public health perspective.³³ A study of Central Park found that physical activity in that park alone reduces health care costs and associated losses of labor productivity by \$53 million each year.³⁴

Access to parks is fairly uniform across the five boroughs, according to data from TPL's ParkServe database, with 99 percent of residents living within a 10-minute walk to parks in NYC. However, communities of color have less overall park acreage nearby, indicating that the distribution of park acres and benefits is not uniform according to race. Recent research on park visitation and equitable park access in NYC leveraging social media data has shown that "parks in high-minority neighborhoods are not as accessible, do not accommodate as many visitors, and/or are of lower quality than those in low-minority neighborhoods."³⁵ ParkServe's equity score similarly indicates that low-income areas in New York City have less access to park space than higher-income areas.³⁶

In 2016, the Robert Wood Johnson Foundation funded the Regional Plan Association to study how the New York Metropolitan Region's urban systems influence health. The study indicated that residents were likely to have a longer life span but a lesser quality of health compared

to the U.S. as a whole.³⁷ Comparing the five boroughs in NYC shows that the Bronx is particularly challenged; residents there suffer from higher rates of premature death, poor health, and lower physical activity than the four other counties in NYC, despite having parks nearby for exercise opportunities.³⁸

The following section analyzes the cost savings realized annually by residents who use parks in NYC specifically to exercise at a frequency, duration, and intensity that results in health care cost savings.³⁹

ESTIMATING BENEFITS THROUGH HEALTH CARE SAVINGS DUE TO EXERCISE IN PARKS

Over one million adult NYC residents use parks in a typical year to improve their health with physical activities that meet the CDC’s guidelines, according to TPL’s survey.⁴⁰ TPL used a conservative approach to interpreting activity levels; for example, if a respondent reported bicycling, TPL assumed they did so at a leisurely pace on level terrain, which qualifies as moderate activity, rather than bicycling at a brisk pace or on steep uphill terrain, a vigorous activity. Vigorous-intensity activity was limited to responses indicating running or jogging, while moderate-intensity activities included

walking, hiking, and biking. The health care savings analysis does not include sedentary or low-heart-rate activities, such as picnicking, wildlife watching, or fishing.

To be included in the analysis, NYC residents had to use the parks to a sufficient extent to meet the CDC’s physical activity guidelines.⁴¹ This analysis excluded individuals who use private facilities (i.e., gyms) to meet some or all of the CDC threshold.

Previous work in health care economics indicates that health care savings are more significant for individuals who exercise than those who do not. The difference in health care costs for active and non-active 18-to-64-year-olds is approximately \$1,330 per year (2021\$); for adults 65 and older, the health care savings is double that, or approximately \$2,660.⁴² To estimate health care cost savings for NYC residents over 65, TPL doubled the value assigned to 18-to-64-year-olds because seniors typically incur two or more times the medical care costs of younger adults.⁴³ TPL adjusted the medical care cost savings for inflation and converted the value to 2021\$.⁴⁴

Health savings by residents who used parks in NYC for physical activity is shown in Table 3.

TABLE 3. Estimated residents’ health benefits for those who use parks in NYC for physical activity (2021\$)

Adults 18–64	Value
Number of adults (18-64) that use parks in NYC for physical activity at CDC levels*	688,000
Average annual medical care cost difference between active and inactive persons between 18-64 years old (2021\$)	\$ 1,330
Subtotal of health care benefits (2021\$)	\$ 915 million
Adults 65+	Value
Number of adults (65+) that use parks in NYC for physical activity at CDC levels*	82,900
Average annual medical care cost difference between active and inactive persons over 65 years old (2021\$)	\$ 2,660
Subtotal of health care benefits (2021\$)	\$ 221 million
Total adults that use parks in NYC for physical activity at CDC recommendations	771,000
Total annual value of health benefits from parks in NYC for physical activity	\$ 1.14 billion

* This only includes outdoor activities, not NYC recreation center activities.

Parks in NYC provide significant annual health benefits to city residents through opportunities for outdoor recreation and avoided health care costs. This study does not quantify the additional health values likely provided by parks, including:

- Physical health benefits resulting when adults use parks for only a portion of weekly CDC activity levels. While many residents use parks to engage in physical activity within park spaces exclusively at a frequency, duration, and intensity that meet CDC guidelines, others use parks below those levels but that, when combined with other public or private amenities such as gyms, do reach CDC levels for improving physical health.
- Mental health benefits that adults receive from using these spaces.
- Health care cost savings result when children (<18 years old) use these resources to make themselves healthier, both physically and mentally.
- Non-residents who use parks for exercise.

Health Care Cost Savings Through Reduced Temperature

Climate change is altering fundamental processes and conditions that sustain the lives and health of communities in NYC.⁴⁵ One of the primary public health concerns regarding climate change is the increased intensity and frequency of heat waves. The Sixth Assessment Report from the Intergovernmental Panel on Climate Change anticipates an increase in severe extreme temperatures in cities throughout the rest of the century, including increases in the length, frequency, and intensity of heat waves, as urban areas “intensify human-induced warming locally.”⁴⁶

In the New York Metro area, the average number of days above 100°F is estimated to increase from 2 to 18 by mid-century and up to 40 days by late century.⁴⁷ By 2050, New Yorkers could see seven heat waves per year, up from two per year now, and by 2090 deaths from the heat in NYC could exceed 3,330 people per year.⁴⁸ NYC already sees on average 450 heat-related emergency

department (ED) visits, 150 heat-related hospital admissions and 13 heatstroke deaths annually.⁴⁹

Higher temperatures are associated with higher rates of both heat stroke and hyperthermia, and extreme heat events are the leading cause of weather-related death in the U.S.⁵⁰ Days of extreme heat are associated with a 66.3 percent increase in relative risk for heat-related illness (HRI) nationally.⁵¹ Mortality rates may be even greater than reported because heat events trigger serious complications from pre-existing health conditions, such as asthma and heart disease. People at higher risk of HRI include the elderly, very young, disabled, poor, those with existing cardiovascular medical conditions, and those living in urban areas with high air pollution or in buildings without air conditioning.⁵²

The increasing frequency, intensity, and length of heat waves affect historically underserved populations the most, particularly within urban areas in the U.S. In NYC, Blacks and Hispanics accounted for 60 percent of the heat-related deaths from 2000 to 2012.⁵³ Recent data published by the NYC Department of Health and Mental Hygiene show that Black NYC residents had twice as high a death-rate due to heat stress compared to white New Yorkers from 2010-2019, stating that “structural racism and an inequitable distribution of resources needed for wellness... are causes of racial inequalities in heat-related mortality.”⁵⁴

Thermal comfort—people’s subjective perception of heat and humidity in their environment—is improved when people spend time in tree-covered spaces. Research indicates urban greenspace has cooling effects on urban heat, and trees specifically may reduce the risk of heat stroke and heat-related ambulance calls during extreme heat events.⁵⁵

Parks with vegetation play an essential role in lowering temperatures, and the cooling effect can reduce temperatures up to a half-mile away.⁵⁶ TPL’s analysis of 14,000 cities and towns shows that nationwide, areas within a 10-minute walk of a park are as much as 6°F cooler than areas beyond that range.⁵⁷ Groups of trees mitigate urban heat islands, and the cooling extends to adjacent areas if certain conditions are present.⁵⁸



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Research to determine the total cooling effect shows cooling may be linear at all times of day and is dependent on surrounding surfaces: for example, a recent study showed that in the afternoon, soft canopy cover (i.e., trees with pervious surface under the canopy) contributed to cooling better, and larger parks cool surrounding areas more consistently compared to other parks.⁵⁹

In summer 2021, the National Integrated Heat Health Information System, in partnership with Climate Adaptation Planning and Analytics Strategies and the Columbia Climate School, collaborated with local organizers and volunteers in the Bronx and Manhattan to track thousands of temperature and humidity data points on hot summer days. Key findings from this research include heat was concentrated in “asphalt-dense intersections with low canopy cover,” while shade from large parks and open space kept adjacent residential blocks relatively cool.⁶⁰ NYC’s strategy to help city residents stay safe during hot weather, “Cool Neighborhoods NYC,” recognizes the impact that the physical environment plays in mitigating extreme heat events. The 2017 report describes investments NYC has made to increase “shade, greenery, and canopy cover... to help lower surface and indoor temperatures in NYC neighborhoods with high vulnerability to heat-related illnesses and mortality.”⁶¹

Recognizing the impact heatwaves have on the elderly in particular, in 2020 NYC announced a \$55 million program to provide 74,000 air conditioners to low-income residents who were at least 60 years old.⁶² In heat-vulnerable areas of the South Bronx, Northern Manhattan, and Central Brooklyn, NYC also committed \$82 million to plant trees to mitigate higher temperatures

in these areas.⁶³ Data collection is underway city-wide to improve understanding of heat and health, including how different green interventions may impact NYC resident’s heat exposure.⁶⁴

This section proposes two areas of future study to better articulate the linkages between parks, HRI, and health care costs.

HEALTH CARE COSTS AND HEAT ILLNESS

Rising temperatures have severe implications for our environment and human health. Public health agencies track the number of ED visits and in-patient hospitalizations due to heat-related causes. Research shows that heat illness impacts some communities disproportionately and compounds inequities stemming from socioeconomic status, race, and geographic location.

Although HRI is more likely to result in an ED visit than hospitalization, HRI can escalate into more severe conditions requiring an overnight stay.⁶⁵ In 2005, the national Healthcare Cost and Utilizations Project (HCUP) estimated extreme heat exposure caused 6,200 hospitalizations in U.S. community hospitals, with 81.6 percent of those patients being admitted from the ED. The average cost of a hospital stay related to heat exposure is \$6,200, with a per-day mean of \$1,900 (the mean length of a heat-related hospital stay is 3.2 days). The hospital costs may be in addition to an individual’s potential loss of income from missed work. Nationally, the aggregated costs for all reported heat-related hospitalizations in 2005 was \$38.7 million, which did not include any added costs associated with ambulance dispatches, ED services, or health professional fees.⁶⁶

Findings from HCUP also indicate that income levels likely play a role in HRI, as “the rate of hospital stays resulting from excessive exposure to heat and cold due to weather was inversely related to wealth: as community-level income increased, the rate of hospitalizations decreased.”⁶⁷ Research by Schmeltz et al. (2016) indicates that people in the lowest-income quartile are the most likely to be hospitalized for HRI, amounting to over a third of total HRI hospitalizations (Table 4). The HCUP data shows that lower-income patients bear the burden for HRI hospitalizations in the U.S.

TABLE 4. Hospitalizations of heat-related illness patients in the U.S. by zip code income quartile (2001–2010)

Zip-Code Income Quartile	Percent HRI Hospitalizations
0 to 25th	36.1
26th to 50th	25.9
51st to 75th	18.8
76th to 100th	13.8
No Income Data	5.3

Source: Michael T. Schmeltz, Elisaveta P. Petkova, and Janet L. Gamble, “Economic Burden of Hospitalizations for Heat-Related Illnesses in the United States, 2001–2010,” *International Journal of Environmental Research and Public Health*, vol. 13, no. 9. (2016)

There is also a compounding effect between income and race. Blacks, Hispanics, and Asian/Pacific Islanders living in the lowest zip-code income quartile face higher HRI hospitalization costs, totaling an additional \$733, \$703, and \$1,238, respectively, compared to their white counterparts.⁶⁸

The New York State Department of Health tracks HRI ED visits by place of exposure, or where the incident occurred (Table 5). From 2005 to 2019, there were 31,583 ED visits statewide for HRI, with 10,224 ED visits in NYC alone during that timeframe.

TABLE 5. Heat-stress related emergency department visits by place of exposure in NYC (all ages, 2005–2019)

Place of Exposure	Count
Home	1,344
Public Place	1,303
Recreational Setting	3,755
Work Setting	354
Unknown	3,468
Total (14 years)	10,224

Source: NYS Department of Health.⁶⁹

Additional research is needed to estimate the economic impact of these HRI incidences on residents, including more refined data on place of exposure, and the estimated economic costs of ED visits due to HRI. More specific information about incident locations will help identify the type and scale of intervention that should be prioritized, including addressing inequitable access to air conditioning or expanding green space in areas with limited park access.⁷⁰

POTENTIAL FOR BENEFITS ESTIMATION—HEAT-RELATED STRESS AND HEALTH CARE VALUES

Although published research demonstrates that trees, tree canopy, and park space reduce ambient temperatures, there is limited documentation on the direct effects of park space characteristics and temperature reduction on heat-stress-related illnesses. One recent study showed that the relationship between the urban tree canopy, temperature, and health is estimated to reduce heat mortality and valued tree canopy heat reduction services between \$5.3 billion and \$12.1 billion annually across the entire country, estimating that the urban tree canopy helped avoid 19 percent to 27 percent of heat-related deaths annually.⁷¹

Another study by Georgia Tech’s Urban Climate Lab developed a model that couples heat data with health impact data. The research does not include the link to reduced ED visits due to green space specifically, but does model reduced mortality with other interventions, such as air conditioning prevalence.⁷²

In 2019, TPL developed and released a first-of-its-kind nationwide Urban Heat Island (UHI) dataset.⁷³ This unique dataset is more accurate and at a finer resolution than any other national UHI dataset created to date. The interactive map visualizes urban heat island severity around the country, providing both a national overview and local data as specific as a street address. In the spring of 2020, TPL integrated the UHI data into its ParkServe platform, helping park planners, city officials, or residents in 14,000 communities nationwide identify new park locations that can help protect people living with extreme heat.

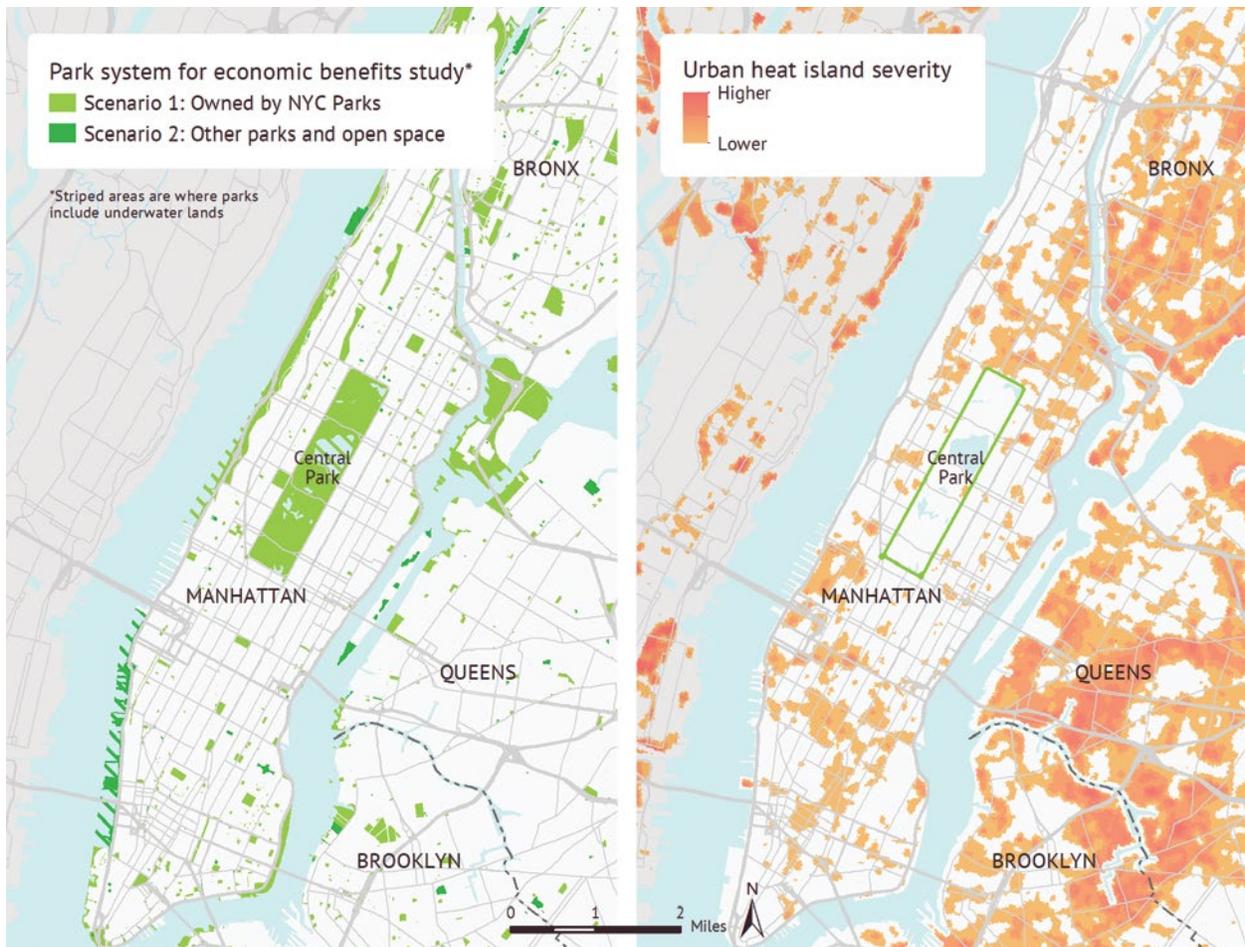


FIGURE 3A AND 3B. Figure 3A (left) shows Central Park in Manhattan, and Figure 3B (right) shows TPL's Urban Heat Island map of Central Park and surrounding areas.

Figures 3A and 3B show Manhattan with Central Park located in the center; Figure 3B shows the data from the UHI dataset map. The darker pink areas indicate more severe instances of the urban heat island effect, demonstrating how Central Park and proximate areas experience lower than average land surface temperatures compared to Manhattan overall.

This study does not quantify the benefits of parks to NYC residents for heat mitigation due to limitations in available data. The specific characteristics of the places of exposure in NYC health data are unknown, including the type of setting, amount of vegetation, amount of canopy cover, and types of surfaces (pervious or impervious), which would help analyze the impact of the setting on the incidence of heat.

Future research could integrate public health data and/or other microclimate models such as EnviMET (<https://www.envi-met.com/>) with the UHI dataset to better understand how environmental conditions (or specifically urban park design) may influence HRI occurrence or severity. Better understanding the influence of heat-reducing surfaces like splash pads and trees on ED visits is another key research area, as is researching whether and how people leverage parks as relief from extreme heat. (For example, research from Georgia Tech's Urban Climate Lab indicates that greenspaces combined with residential green roofs and cooling surfaces might reduce mortality from extreme heat by 20 percent.)⁷⁴ With additional research, improved park designs could be leveraged to reduce incidences of HRI and ED costs, and bolster the health benefits of parks nationwide.



Nature's Services

Parks in NYC provide valuable natural goods and services by infiltrating stormwater, protecting water quality, removing air pollution, absorbing and storing carbon, increasing resiliency from sea-level rise and storm surges, and mitigating urban heat islands. Previous work in NYC has measured the natural goods and services provided by particular city park types and street trees. However, no work has measured the benefits of park system as a whole.

Water Quality Protection

Stormwater management is an essential issue for NYC. Rainwater that flows off impervious surfaces in the built environment—such as rooftops, roads and sidewalks—can cause flooding, erosion, and declines in water quality by carrying pollutants into surrounding waterbodies. Rainwater flows that exceed the carrying capacity of sewers that also carry sanitary wastewater from buildings will cause combined sewer overflows (CSOs), releasing raw sewage into waterbodies. Agreements with New York State Department of Environmental Conservation or the U.S. Environmental Protection Agency (EPA), known as consent degrees, require that NYC reduce CSOs and implement long-term control plans to improve water quality by investing tens of billions of dollars.⁷⁵

Street trees are outside of the scope of this study, but NYC Parks calculated some of their benefits in NYC:

- 1.05 billion gallons of stormwater intercepted each year, worth \$10.43 million annually
- 649.26 million kWh of energy conserved each year, worth \$81.97 million annually
- 1.23 million pounds of air pollutants removed each year, worth \$6.44 million annually
- 1.18 billion tons of carbon dioxide reduced each year, worth \$3.93 million annually

The total value of annual benefits from street trees in NYC is over \$102.77 million.

Source: NYC Street Tree Map, <https://tree-map.nycgovparks.org/tree-map/>

NYC implements stormwater management, in part, by capturing precipitation and slowing its runoff and filtering out pollutants. Increasingly, green infrastructure such as parks and urban forests plays an essential role in solving stormwater problems and has been a critical part of NYC's strategy since at least 2010.⁷⁶ Parks with natural porous surfaces such as grass and trees allow rainwater to filter into the ground, reducing peak flows of runoff and CSOs during storms. The parks also reduce pollutant discharge into waterbodies by decreasing runoff into storm sewer systems, improving water quality, enhancing fish and aquatic life habitat, and lowering wastewater treatment costs for municipalities.

The city has implemented significant hybrid green-gray infrastructure to reduce CSOs, and several agencies in

NYC have programs and partnerships dedicated to reducing stormwater. The NYC DEP implements green infrastructure projects to prevent stormwater from entering the city's sewer system, including rain gardens, infiltration basins, green streets, green roofs, and permeable pavement.⁷⁷ Greenstreets, a collaboration of several departments, including the NYC Department of Transportation, NYC DEP, and NYC Parks, designs, installs, and maintains over 2,500 Greenstreets to capture stormwater runoff.⁷⁸

NYC DEP also protects nearly 75 Bluebelts throughout the city, areas that mitigate runoff in NYC naturally, preserving and enhancing natural drainage corridors (streams, ponds, and wetlands) to ensure they can convey, store, and filter runoff and stormwater. Currently, DEP is working on three Bluebelt projects on Staten Island, representing over \$100 million in investment in the borough's infrastructure. Then-DEP Commissioner Vincent Sapienza stated that Bluebelts "have proven to be an integral tool for managing stormwater and reducing flooding, while also improving nearby property values."

NYC DEP, "Stormwater: The Bluebelt Program," <https://www1.nyc.gov/site/dep/water/the-bluebelt-program.page>; "City and Borough President Oddo Tour Progress of \$121 Million Expansion of Mid-Island's New Creek Bluebelt," July 2021, <https://www1.nyc.gov/site/dep/news/21-024/city-borough-president-oddo-tour-progress-121-million-expansion-mid-island-s-new-creek#/0>

In NYC, TPL partners with DEP to fund stormwater improvements in the Schoolyards to Playgrounds Initiative and has constructed 21 projects with more than 30 in development.⁷⁹ One such project at Elmhurst Educational Campus in Queens captures 1.7 million gallons of stormwater per year while providing publicly accessible park space. The Mayor's Office recently committed to investing in another 20 sites as part of its Hurricane Ida response plan.



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Another project, MillionTreesNYC, planted a million trees over eight years in NYC, helping absorb stormwater runoff and providing many benefits beyond runoff reduction.⁸⁰ Since a portion of stormwater runoff comes from private properties, the city also provides financial incentives to certain private property owners to cover green infrastructure design and installation costs or stormwater source controls.⁸¹

A recent study in NYC looked at five natural goods and services including stormwater absorption, carbon storage, air pollution removal, local climate regulation, and recreation and found stormwater absorption is one of the benefits that can be most readily quantified due to current environmental policies and mandates.⁸²

This section analyzes the value of rainwater infiltration by parks in NYC, explicitly considering the avoided treatment costs because of these parks' pervious surfaces.⁸³ This study does not assess other natural areas (other than parks) that manage stormwater, such as Bluebelts (see sidebar) or street trees.

ESTIMATING BENEFITS OF REDUCED STORMWATER RUNOFF

The purpose of this analysis is to isolate the volume of stormwater retained by parks in NYC compared to an alternative scenario where such parklands did not exist, but were instead developed to the same extent

as the surrounding lands. The alternative scenario ("No Parks") models the same number of park acres but with impervious surface percentages comparable to the adjacent developed areas. An open-access hydrologic model (i-Tree Hydro) was used to estimate the difference in stormwater runoff from greener (parks) and less green (urban) land uses. Table 6 describes the difference in land cover changes used in the analysis.

The first step of this analysis was to collect data on the relevant characteristics of parkland and surrounding urban areas. TPL added files for park property boundaries to a database in ArcGIS (Geographic Information System). Land cover data was added from the 2016 Percent Developed Imperviousness data from the National Land Cover Database (NLCD) created by the U.S. Geological Survey (USGS).⁸⁴ Impervious surfaces within parks typically consist of paved trails, roadways, parking areas, and buildings, and the porous surfaces contain trees, shrubs, herbaceous cover, open soil, and even trails and turf fields that are designed to infiltrate water. The NLCD shows that parks in NYC have more porous surfaces than impervious surfaces (Table 6).

The second step was to use the U.S. Forest Service's i-Tree Hydro model to calculate the incremental amount of stormwater runoff and pollutant loading (nitrogen, phosphorous, and sediment) generated by different land uses in the two scenarios ("Existing Parks in NYC" and "No Parks").⁸⁵ i-Tree Hydro models tree canopy and

TABLE 6. Land cover categories and percent of each type in two alternative scenarios analyzed in i-Tree Hydro

Land cover	Percent in Existing Parks in NYC	Percent in Alternative Scenario (increased urban cover)
Tree	42.5	20.6
Shrub	7	2.2
Herbaceous	15.6	12
Water	16.8	1.2
Impervious	12.2	62
Soil	6	2

Source: TPL analysis of land cover data from USGS NLCD.

impervious cover and estimates the stormwater entering waterbodies that may impact the water quality of an area. Several factors contribute to estimated stormwater volume, including the geographic location and climate region, annual precipitation, hydrologic soil composition, land, and vegetation types. The model relies on several inputs, including a map of the two alternative scenarios, hourly weather data, land cover types, and elevation.⁸⁶ i-Tree Hydro simulates precipitation and volumes of water either absorbed by land-use surface or runoff from a surface. The model combines surface volume runoff data with the concentration of pollutants associated with land use to estimate pollutant loading to waterways for the scenarios, presenting the differences in pollution generation or reduction in each.

The No Parks alternative scenario had 53 percent more impervious surfaces and 20.2 percent less pervious surfaces compared to the Existing Parks in NYC scenario (Table 7). The model estimates that parks in NYC reduce runoff by approximately 4.49 billion gallons (or 600 million cubic feet) per year (Table 8). This stormwater runoff volume includes what is passively infiltrated by pervious parkland and does not include any intentional stormwater capture.

The final step in determining the economic value of stormwater reduction by parks in NYC was to estimate the management costs using existing wastewater treatment facilities or other “engineered” forms such as green stormwater infrastructure to treat (or temporarily store for later treatment) the same amount of runoff. This can be considered the “avoided filtration” costs of treating water and wastewater. TPL estimated a lower and upper bound cost of stormwater reduction: the first using existing wastewater infrastructure, the second capturing the cost of new green stormwater infrastructure.

Assuming rainwater flows are constant and can be treated along with sanitary flows, estimated ranges to treat wastewater in NYC are \$0.0019–\$0.0021, which is higher than the national average treatment cost of \$0.0009/gallon.⁸⁷ Using an average of \$0.0020 in NYC, it would cost approximately **\$8.98 million annually** to

remove the pollutants in runoff using costs from existing wastewater treatment technology (Table 8).

However, NYC cannot treat all wastewater during storms, especially during extreme rainfall events.⁸⁸ As a result, systems must be put in place to store, detain, or retain water to minimize peak flows. These challenges can drive significant costs of regulatory compliance, including massive facilities to temporarily store runoff until it can be treated.⁸⁹ Managing peak flow rather than steady-state flows will significantly improve the longevity and resiliency of stormwater management in NYC, and one potential strategy is to build parks that include green stormwater infrastructure that absorbs runoff.

Green stormwater infrastructure is constructed to infiltrate runoff in features such as rain gardens, bioswales, and permeable pavers, rather than grey or more engineered stormwater infrastructure. TPL used a study that determined the average unit construction costs for green stormwater infrastructure by the Allegheny County Sanitary Authority (ALCOSAN) in Pittsburgh, Pennsylvania. The ALCOSAN study obtained average construction cost estimates from 13 different green stormwater practices in Onondaga County, New York that ranged between \$0.39 and \$1.49 for each gallon reduced to the combined sewer.⁹⁰ Based on that range, this report leverages a conservative mid-point value of \$0.54/gallon/year for construction costs alone (i.e., not the present value of overall lifecycle costs that would also include operations and maintenance costs). These estimates are well within the range of costs found in national studies⁹¹ and NYC costs of green infrastructure was around \$1/gallon. Traditional or “gray” infrastructure storage of peak stormwater flows can be up to \$7 per gallon in NYC,⁹² and such methods to store the 4.49 billion gallons of runoff mitigated by parks would otherwise cost tens of billions of dollars.

Applying this cost to the volume of reduced stormwater runoff, TPL estimates that parks in NYC provide an annual value of **\$2.43 billion** in avoided green stormwater infrastructure construction costs (Table 7).

TABLE 7. Annual amount and estimated value of stormwater runoff reduction from parks in NYC (2021\$)

Stormwater Runoff Reduction Per Year	Value
Alternative stormwater runoff (billion gallons)	35.90
Parks in NYC stormwater runoff (billion gallons)	31.40
Estimated runoff reduction attributed to parks (billion gallons)	4.49
Avoided NYC DEP wastewater treatment cost estimates in steady-state scenario*	\$8.98 million
Avoided green stormwater infrastructure cost estimates in peak-flow scenario**	\$2.43 billion

* \$0.0020 average cost per gallon range of NYC wastewater treatment.

** \$0.54 cost per gallon/year green stormwater infrastructure treatment in parks and open space.

POTENTIAL FOR BENEFITS ESTIMATION— VALUE OF REDUCTION IN EXCESS NITROGEN

In addition to avoided stormwater treatment costs, parks and green spaces also provide benefits by reducing pollutants in runoff. Excess nutrients such as nitrogen and phosphorus that end up in waterbodies degrade water quality and decrease dissolved oxygen, leading to algal blooms that harm fish and wildlife and limit people’s ability to recreate safely on the water, including boating and fishing. Suspended solids or sediment can also cause water quality problems, increasing treatment costs for drinking water or “covering fish spawning grounds and reducing fish populations. These nutrients and sediment are produced naturally by forest, shrub and herbaceous land cover, but the rate at which the enter water bodies is exacerbated by increased stormwater runoff over impervious and developed land uses.

TPL used the i-Tree Hydro model to determine how parks in NYC influence runoff and subsequently pollutants in the runoff, leveraging the same two scenarios as before (Existing Parks in NYC and No Parks).⁹³ Results from the model indicate that parks in NYC reduce approximately 1.48 million tons of solids (sediment), 5,930 tons of phosphorus, and 32,600 tons of nitrogen per year from waterways surrounding NYC.

Excess sediment and nutrients cause many adverse economic impacts. Many studies nationwide document the negative impact that poor water quality (for example, algal blooms caused by excess nitrogen) has on tourism, recreation, commercial fishing, property values, and

human health.⁹⁴ In NYC, algae grow in freshwater lakes and ponds during summer months driven by excess nitrogen entering the water. Harmful algal blooms may be toxic to humans and pets; therefore, the New York State Department of Environmental Conservation tracks the occurrence of the algal blooms to help address public health concerns.⁹⁵

Many harmful pollutants are required to be reduced by law. The cost of removing a pound of nitrogen and phosphorus varies widely and depends on the removal technique.⁹⁶ Technological interventions may be especially expensive: for instance, the NYC DEP recently made a \$1 billion investment to upgrade four wastewater treatment plants to mitigate the amount of nitrogen being discharged into the Upper East River.⁹⁷ However, treatment costs can be attributed to particular pollutants through regulations such as water quality permits. Total Maximum Daily Loads, for example, focus on reducing one type of pollutant so the cost of permit compliance can be ascribed to that pollutant. For example, New York Harbor has a Total Maximum Daily Load for dissolved oxygen that requires the reduction of nitrogen entering the waterbody.⁹⁸ While reduction in nitrogen may largely come from treatment at wastewater plants, these efforts are supported by infiltration of stormwater in urban areas through pervious surfaces such as parks and open space.

Although parks in NYC provide natural pollution reduction, this study does not quantify the benefits of reducing excess nutrients due to limitations in available data. The cost per pound of nutrient removal by parks

is highly location-specific, but future research could integrate data on site conditions (such as soil type) to help analyze the impact of parks on water quality, or can estimate any avoided expenditures on technology-based pollution reduction due to the presence of parks.

Parks in NYC likely make a significant economic contribution to the community in water treatment cost savings. Without pervious surfaces that reduce stormwater runoff, communities would have to invest in new or expanded systems like green stormwater infrastructure or wastewater treatment facilities to capture and treat more stormwater to keep pollution out of waterways. These parks provide a tremendous natural service to the city and the waterways surrounding the city.

Air Pollution Reduction

The efforts of NYC to improve and expand green stormwater infrastructure also often improve air quality. Air pollution is an expensive problem that injures human

health, and small particles in the air affect human cardiovascular and respiratory systems with broad consequences for health care costs and productivity.⁹⁹ According to the NYC Department of Health and Mental Hygiene, harmful effects of air pollution include increased infant mortality, asthma, and even death.¹⁰⁰ In addition, acid rain, smog, and ozone increase the need to clean and repair buildings and other infrastructure.¹⁰¹ Because air pollution is a significant issue in densely-populated cities, NYC and the state have monitored and improved the air quality over the last several decades.¹⁰² Data is collected on ozone in four of the five boroughs in NYC, and all four received “F” grades from the American Lung Association in 2019, for days when ozone exceeded healthy limits.¹⁰³ Data is collected on particulates (Particulate Matter (PM) < 2.5 microns or PM 2.5) in all five boroughs and all received passing grades for annual particulate levels, although it should continue to be monitored going forward.¹⁰⁴ Due to recent measures to control PM 2.5, NYC has the lowest PM 2.5 levels in 50 years.

Parks’ vegetation, especially trees, play a role in improving air quality, helping nearby areas avoid the costs associated with pollution.¹⁰⁵ Trees and shrubs can remove pollutants from the air, and leaves absorb gases such as nitrogen dioxide, sulfur dioxide, carbon monoxide, and ozone. By adhering to plant surfaces, fine particulate matter, which includes small particles of dust, metals, chemicals, and acids, can also be removed. The pollution-reducing benefits of trees in parks in NYC enhance the city-wide efforts made in the last decade; although NYC has numerous trees on private property and streets, this study measures only the economic value of tree canopy located in park acres throughout the city.¹⁰⁶

In this section, TPL calculates the cost savings that parks in NYC provide by reducing the concentration of pollutants in the air.

ESTIMATING BENEFITS OF AIR POLLUTION REMOVAL WITH I-TREE CANOPY

TPL used a model designed at the Northeast Research Station of the U.S. Forest Service (USFS) to estimate the value of air pollution reduced by parks in NYC. This



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program utilizes the USFS i-Tree Canopy model, which incorporates factors such as local tree canopy, pollution, weather, and demographic data to measure change in pollutants due to the presence of tree canopy, including carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, and fine particles.¹⁰⁷

A 2018 U.S. Forest Service report has shown that there are about 7 million trees in NYC, and that tree canopy covers 21 percent of the city. (The 2018 study includes all trees in NYC, including street trees and trees on private properties, which were outside the scope of the current report.) These trees currently store about 1.2 million tons of carbon worth \$153 million, and remove 51,000 tons of carbon and about 1,100 tons of air pollution annually. The trees' removal of carbon is worth about \$6.8 million annually, and the air pollution removal is worth about \$78 million per year. The report found that the compensatory value of the trees in NYC is estimated at \$5.7 billion overall.

U.S. Forest Service, "The Urban Forest of New York City," Resource Bulletin NRS-117, September 2018, https://www.fs.fed.us/nrs/pubs/rb/rb_nrs117.pdf

TPL used the NLCD to determine the amount of park space canopy cover in NYC, and classify canopy cover type. i-Tree Canopy uses the tree canopy cover data to estimate annual air pollution removal due to vegetation, and estimates the value of these changes for each pollutant. The values are based on a literature review by i-Tree researchers and the EPA's Environmental Benefits Mapping and Analysis (BenMap) Program, which

leverages this data on air quality changes, population, and baseline incidence rates to estimate health impacts.¹⁰⁸

BenMap estimates the economic value of health impacts specifically due to changes in ground-level ozone and fine particles. According to the EPA, ground-level ozone is created "when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight." Fine particles form in the atmosphere because of chemical reactions between pollutants, and can be made up of hundreds of different chemicals emitted from power plants, industries, and automobiles.¹⁰⁹ Both pollutants cause health impacts including aggravated asthma, and potentially premature death. The value of the health impacts are determined primarily from health care cost savings and research on willingness to pay for reduction of exposure to harmful pollutants.¹⁰

Table 8 describes the tons of these two pollutants reduced each year due to the trees and shrubs in NYC parks, and the health care value associated with this annual reduction in ozone and PM 2.5.

Values of air pollution removal estimated for the parks in NYC annually demonstrate that the health benefits of trees in parks are significant, including reducing instances of asthma and cardiac ED visits that can be alleviated by better air quality. Because it is difficult to determine exactly which pollutant causes each incidence of the emergency visit, these values should not be considered additive, but instead illustrate the relative impact of each pollutant on health costs. For example, fine particles are perhaps the most dangerous and cause the most cardiovascular and lung-related illnesses and deaths in any given year.

TABLE 8. Amount and value of air pollution reduced by parks in NYC (2021\$)

Pollutant	Tons Reduced Annually in Parks in NYC	Annual Health Care Value Associated with Air Pollutant Reduction (2021\$)
Ozone	278	\$ 6.20 million
Fine particles (PM 2.5)	15.2	\$ 20.30 million

Source: i-Tree Canopy. Values were adjusted to 2021\$ using the Producer Price Index (PPI) (www.bls.gov/ppi/)



Economic Impacts

Parks and greenspace in NYC also contribute to critical components of the economy, including benefits to property values and associated tax revenue, tourism, and outdoor recreation. Past reports have looked at the economic impacts of individual parks or major events that take place in them; this report instead focuses on the economic impact of the park system in NYC as a whole. This report does not quantify the direct, indirect, or induced effects of park-related employment, wages, or capital investments, or of special events in parks.

Enhancing Property Values

Well-maintained parks can have a positive impact on nearby residential property values.¹¹¹ All other things being equal, people are willing to pay more for a home close to natural space and park amenities, and economic analysis can isolate parks' impact on home values. Because a home's value typically determines the property tax amount, the increased value of homes near park spaces also leads to increased annual property taxes. This section estimates the potential increase in property value attributed to parks in NYC and the associated tax revenue generated on an annual basis.

The effect of parks and natural spaces on local property value is significant, especially in NYC. The results of a recent review of U.S. studies found that passive parks can boost home sales by 8 percent to 10 percent, with more significant premiums for larger parks.¹¹²

A study focused on Central Park found that proximity to that park added more than \$26 billion to the market value of properties located on the blocks closest to the Park. The study estimated that it creates over \$1 billion in additional property taxes (for properties within 1,500 feet of the park) that are used to support city services. Sales data from 2014 cited in the report showed 41 of

the 50 highest-value apartment sales in New York City were located either directly across the street or within a few blocks of the Park.¹¹³

A 2011 study by NYC Economic Development Corporation found three parks studied, Central Park in Manhattan, Prospect Park in Brooklyn, and High Line Park in Manhattan, also influenced proximate property values. Properties in a five-minute walk of a well-maintained park were 11 percent higher than those beyond a five-minute walk from the park.¹¹⁴ Another study from 2008 looked at the property value impact of the Hudson River Park specifically. About 20 percent of the property value in the two adjacent blocks of the Greenwich Village section could be attributed to the Park, worth approximately \$200 million.¹¹⁵ A survey of NYC residential property sales from 1992 to 2001 reported sales “immediately surrounding” an improved park were 8 to 30 percent higher than homes further from the park.¹¹⁶ Single-family homes near improved parks also had lower rates of turnover, suggesting that quality parks stabilize local communities and are a catalyst for redevelopment of adjacent real estate.¹¹⁷

The property value added by parks is separate from the value that residents gain from the recreational use of these amenities. Property value for residents living near parks increases even if they never visit or use a given park. Rather than benefits from recreational use, property value is affected by two factors: quality of and distance from the park.

Residences near high-quality natural areas with public access, scenic vistas, and bodies of water are markedly more valuable. Less attractive or outdated parks may provide only marginal value, and in some cases, they may reduce nearby property values. The economic research literature considers the subjective nature of a park’s quality and the variation in quality across time when looking at the park’s impact. TPL relies on a methodology that accounts for the effect of a community’s entire park system to account for such variations and effects on the premiums generated by individual parks. The “park premium” applied in this analysis is a minimum average value added by the system of parks in NYC collectively, and is isolated from other factors that affect a home’s

value, such as proximity to public transportation. The result is a conservative estimate of the total impact of parks in NYC on property values based on established values from comparable studies.

Distance from parks and open space is the second factor influencing property values. Nationwide, research shows that the premium for proximity to these spaces could extend up to 2,000 feet and can also affect market values by as much as 20 percent.¹¹⁸ In NYC, the Central Park Conservancy study used a distance of approximately 1,500 feet to estimate impacts of the Park on property value.¹¹⁹ To maintain a conservative approach to benefit estimation, TPL collected data on the residential properties within 500 feet of parks, consistent with TPL’s past research.

Parks within this analysis ranged from small neighborhood parks to large parks like Pelham Bay and Van Cortlandt. Research suggests that the size of a park does not necessarily impact benefits, and the quality and proximal access are most important characteristics.¹²⁰

ESTIMATING BENEFITS OF PROPERTY VALUE AND TAX REVENUE ATTRIBUTED TO PARKS

TPL first collected data on property and tax assessment information (market value, assessed value, and tax class) for homes in NYC using parcel and tax data from the NYC Department of Finance (via NYC OpenData).¹²¹

Next, TPL used spatial analysis to estimate the total value and taxes assessed on the residences near parks.¹²² To remain well within the bounds of reported values and to reflect the significant difference between large destination parks and small neighborhood parks, this study uses a midpoint value of five percent of the total market value to estimate the premium for residences proximate to parks. Similarly, five percent of the total assessed tax value is calculated as the increased revenue from the park’s proximity. The application of a five percent premium is consistent with TPL’s conservative approach to measuring property value in over a dozen studies of other communities across the country.

Table 9 shows the results of this analysis for all parks. In 2020, over 1 million residences were within 500 feet of a

park in NYC. However, only 403,000 of these residences had sufficient property records with the data necessary for inclusion in this analysis. These residences have a total market value of \$303 billion, with an estimate of at least **\$15.2 billion in property value** due to proximity to parks. Accordingly, each year, at least **\$101 million in tax revenue** generated from these properties is related to park proximity.

TABLE 9. Increased property value due to proximity to parks in NYC (2021\$)

Property Data	Values (2021\$)
Number of homes 500 feet from parks with property data	403,000
The market value of homes 500 feet from parks	\$303,000,000,000
Property tax of homes 500 feet from parks	\$2,010,000,000
Estimated market value attributed to parks	\$15,200,000,000
Estimated property tax revenue captured from parks	\$101,000,000

Source: NYC Department of Finance property and tax values.

This is a conservative estimate of the enhanced property value provided by parks in NYC. Sufficient property value data was only available for less than half of the million properties within 500 feet of parks in NYC, suggesting that the impacts on property taxes and market value are underestimated. Second, the analysis was limited to increased property value and tax revenues for homes within 500 feet of parks, and the impact may extend to a greater distance.¹²³ (The total value of residential real estate in NYC is \$29.2 trillion).¹²⁴ Third, this analysis looked at residential properties only. Other properties, including a significant commercial base, are also likely to experience improved property values due to proximity to parks. One study found that asking rents for commercial properties near parks were generally higher than those in other markets.¹²⁵ The economic benefits calculated in



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this section represent a lower-bound estimate of total enhanced property value and exclude commercial, business, and industrial properties. Finally, this analysis does not consider the additional state and local transfer taxes that are triggered by the sale of expensive property, such as the state and city “mansion taxes,” which can be quite significant.¹²⁶

DISPLACEMENT

TPL recognizes that increased property values have the potential to displace current residents due to rising, unaffordable housing costs. Research in NYC suggests that dramatic increases in home prices have occurred around certain major parks such as Central Park and the High Line in Manhattan, creating the potential for displacement.¹²⁷ This is particularly a concern for renters who do not capture the potential wealth created by increased home values. Whether smaller parks create the same displacement effects is less clear or documented.

Displacement is a complicated issue with many root causes beyond parks. However, thoughtful community engagement, planning, and specific policies can help ensure park projects are enjoyed by existing residents, as well as newcomers, for years to come. Indeed, creating new parks and improving existing parks in all neighborhoods can be an important tool to improve equity by broad measures (see boxes on the following page).

Research specifically focused on parks and displacement suggests cities have been successful in combating displacement by using parks-related anti-displacement strategies.¹²⁸ In addition, governing or funding agencies can institute proactive policies for increasing income, affordable housing, and legal requirements for displacement avoidance to determine park projects' successes (and failures).¹²⁹

Using strategies early can lead to park improvements that advance equity. Recent research found successful implementation of strategies in 12 cities that limited “green gentrification” (a process of “greening” a city that also leads to higher property values and elevated rents).¹³⁰ An example from Los Angeles County is a parcel-tax funding source for parks that scores competitive grants higher if they include displacement-avoidance strategies. This particular strategy encourages and incentivizes collaboration between housing advocates and developers to develop and implement anti-displacement strategies as part of receiving public funding for parks.¹³¹

The American Planning Association awarded NYC Parks the 2020 National Planning Excellence Award for Advancing Diversity and Social Change in Honor of Paul Davidoff for its equity-based Community Parks Initiative. The initiative began in 2014 and has resulted in \$318 million spent to “reimagine” 67 parks in areas data showed a history of underinvestment. NYC Parks work with Partnerships for Parks to help hire outreach coordinators and encourage volunteer efforts to steward the new parks.

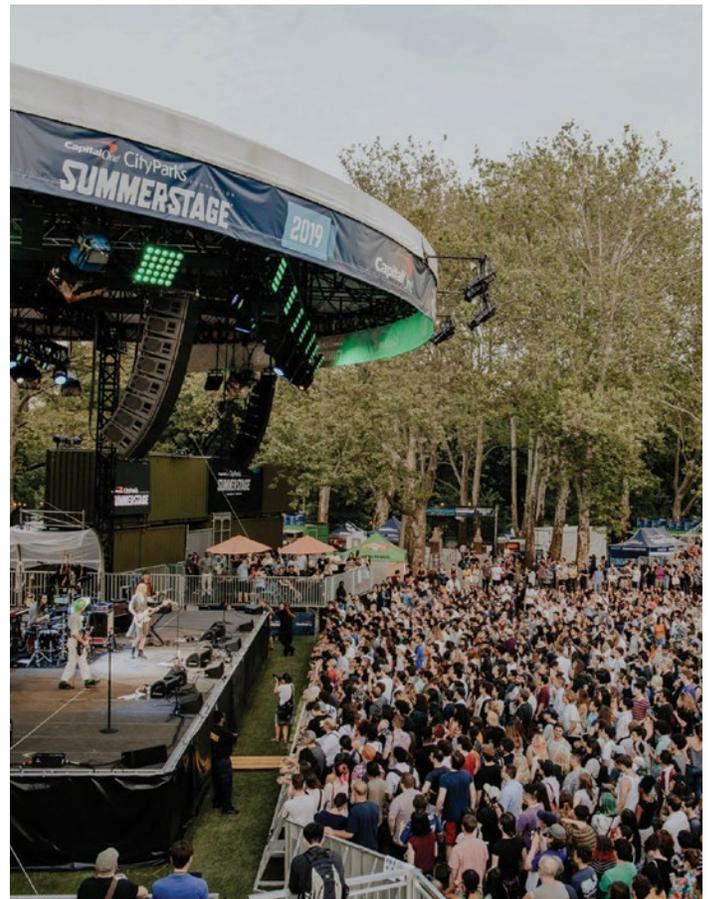
American Planning Association, “Community Parks Initiative – NYC Parks: Advancing Diversity and Social Change in Honor of Paul Davidoff”, 2020, <https://www.planning.org/awards/2020/excellence/community-parks-initiative/>

Tourism Spending and Outdoor Activity

Travel and tourism represent a significant component of NYC’s economy. According to Economic Impact of Visitors in New York City, 66.6 million tourists visited

NYC in 2019 and created \$51.7 billion in economic impact.¹³² In 2020, the value of the industry’s economic impact dropped significantly by 75 percent, due to the COVID-19 pandemic, and visitation fell by 67%.¹³³ The estimates in this section rely on 2019 data to describe a “non-pandemic” usage of parks in order to estimate the benefits of parks in a typical year.

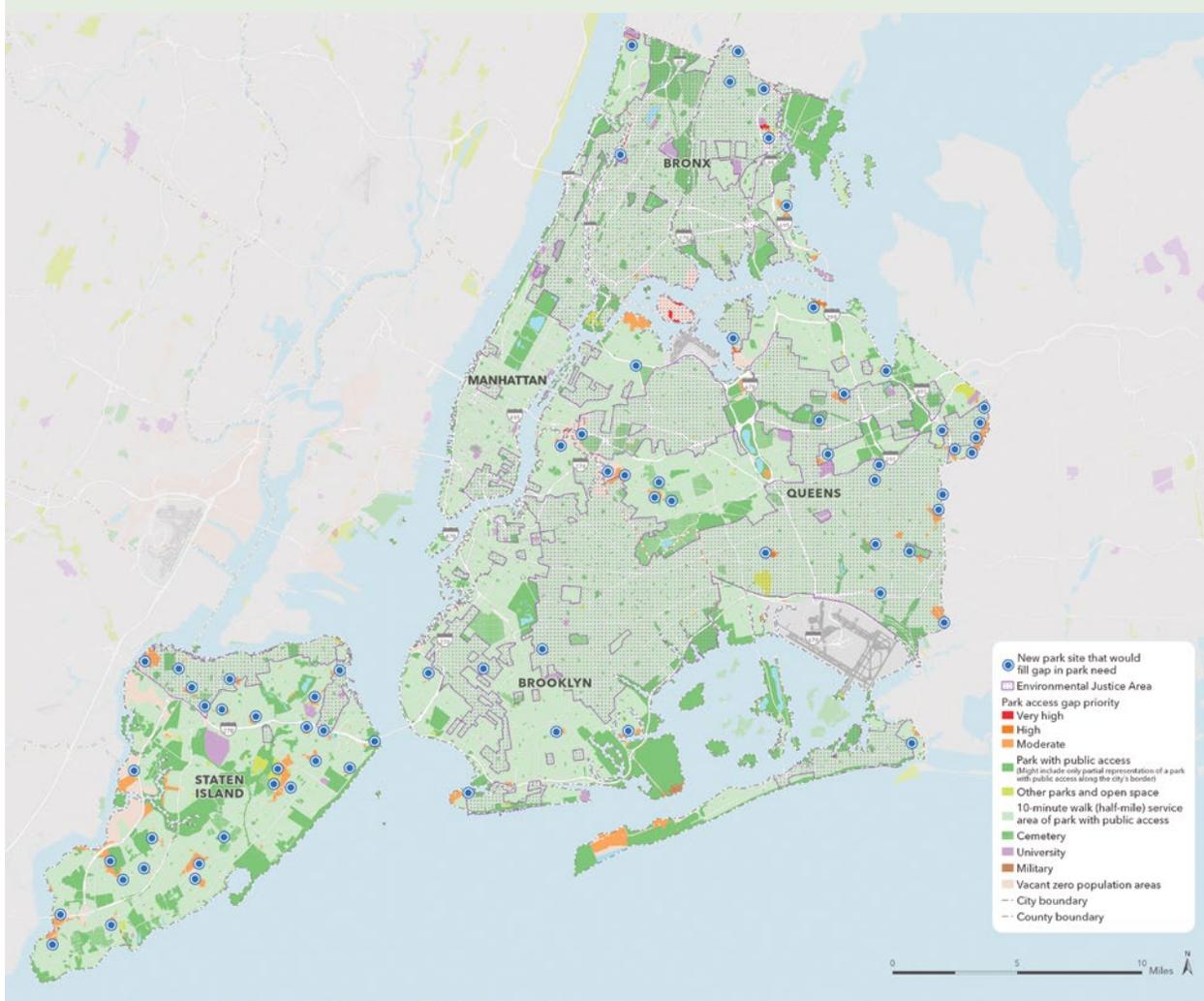
Before the pandemic, tourism-related spending had increased approximately 2.5 percent per year in the past decade and visitation to NYC tripled during that time.¹³⁴ Tourism spending increased 17 percent over the last five years, indicating significant growth in NYC’s tourism economy. Before the COVID-19 pandemic, the city generated \$5.3 billion annually, or 8.3 percent of its revenue, from tourism.¹³⁵ In 2020, almost two-thirds of domestic visitors to the City came from the rest of New York State, and (in order of visitor share) New Jersey, Pennsylvania, Connecticut and Massachusetts.¹³⁶



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TPL created the New York City Park Equity Plan, and has detailed steps to close the gap in NYC. Currently 99 percent of NYC residents have access to parks within a 10-minute walk from where they live. But there are still 75,000 residents who do not enjoy the benefits of a park within a 10-minute walk. By creating 70 new parks in the Bronx, Queens, South Brooklyn, and Staten Island, NYC can achieve 100 percent access for all New Yorkers and close the gaps in park area per person for many communities of color and low-income communities. The map on the left shows where new parks are proposed to close the park equity gap in high-need, underserved neighborhoods as well as gaps in park amenities like playgrounds, empty lots, and other public lands.

Trust for Public Land, “New York City Park Equity Now, <https://www.tpl.org/nyc-park-equity-now/>





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Parks in NYC are the venue for a number of events that attract residents and tourists alike, adding to the cultural richness of the city and also generating economic activity through direct wages, concessions, hotel, and transportation, which is then multiplied through indirect and induced channels. Some of the major events in parks include:

- The Governors Ball, a multi-day music festival that has been held at Randall’s Island Park every year since 2011, with 150,000 people attending in 2021;
- The NYC Marathon, which ends in Central Park, has been run for 50 years, and with 54,205 starters in 2019 was the largest marathon ever, in addition to attracting more than one million spectators and 10,000 volunteers line the city’s streets in support of the runners and millions more who watch the globally televised broadcast;
- The Celebrate Brooklyn! Festival, New York’s longest-running, free outdoor performing arts festival held each summer since 1979 in Prospect Park at the Lena Horne Bandshell, attracting upwards of 185,000 people during a 10-week, 30-event summer season; and
- Numerous art exhibitions, concerts, festivals, from Coney Island’s Mermaid Parade to the Dance Parade, and other events that are free or low-cost.

People visit NYC for business or leisure, and either type of visitor may include visits to parks as part of their stay. Citing NYC & Company, the Office of the New York State Comptroller notes that activities related to the “arts, entertainment and recreation” sector account for 11 percent of tourism expenditures. This sector was fast-growing and employed 93,500 people in 6,250 establishments. The museums, parks, and historical sites subsector makes up 15 percent of the arts, entertainment, and recreation sector, with approximately 14,000 employees.¹³⁷ This entire sector was hard hit by COVID-19. However, parks also encouraged visitation due to the relative safety of outdoor gatherings: nationally, 7 in 10 people increased or maintained their use of public parks and trails during the pandemic.¹³⁸ Forecasts for leisure tourism predict a rebound to pre-pandemic levels by 2023, although tourism for business may not recover as quickly.¹³⁹

Several studies estimate the number of visits and economic impacts of tourism to specific parks in NYC. Some of the most popular parks for tourists include Central Park, Coney Island and Rockaway Beaches, Statue of Liberty, Riverbank State Park, Prospect Park, Brooklyn Bridge, Riverside Park, the Highline, and Battery Park. Central Park is a significant contributor to tourism and the economy in NYC. The “Central Park Effect” describes the park’s draw for business, visitors, and residents that add value to the entire city. In 2015, Central Park was estimated to have received 41.8 million

Gateway National Recreation Area (NRA) is another significant contributor to the NYC economy, managed by the U.S. National Park Service (NPS). Gateway NRA is the fourth-most-visited NPS site nation-wide. The NPS report, “2020 National Park Visitor Spending Effect,” highlights some of the annual economic impacts of the park:

- 8,404,728 total recreation visits,
- \$229,246,000 in total visitor spending (2020\$ for all), with 65.2 percent of visitor considered ‘non-local’ (Figure 3),
- 2,708 jobs generating \$90,973 in labor income,
- \$161,107,000 in value added (contribution of NPS visitor spending to the regional Gross Domestic Product), and
- \$259,051,000 in economic output

The report attributes 83 percent of visitor spending at Gateway to visits in New York, and 17 percent to New Jersey.

National Park Service, “2020 National Park Visitor Spending Effects Economic Contributions to Local Communities, States, and the Nation,” Natural Resource Report NPS/NRSS/EQD/NRR – 2021/2259. https://www.nps.gov/nature/customcf/NPS_Data_Visualization/docs/NPS_2020_Visitor_Spending_Effects.pdf; National Park Service, “Visitation Numbers: 2020 by the Numbers,” <https://www.nps.gov/aboutus/visitation-numbers.htm>

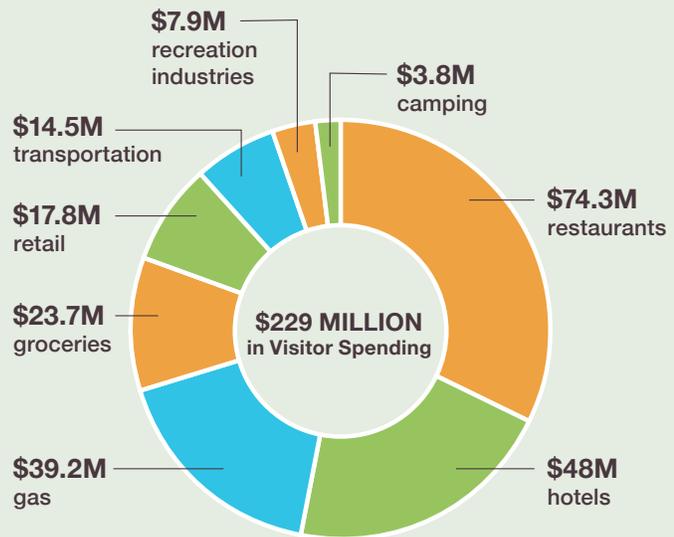


FIGURE 4. Contributions of 2020 visitor spending to Gateway National Recreation Area in NY and NJ. Source: NPS

visits a year, or an average of 115,000 visits per day. This total is estimated to have included 13.7 million people from outside the New York Metropolitan area and 8.3 million people from outside the U.S. Visitor spending, directly and indirectly, accounts for over 1,870 jobs and \$87.5 million in wages.¹⁴⁰

Special events in parks are another significant contributor to the tourism sector in NYC, including concerts, theatre shows, and the NYC Marathon, although a valuation of events in all parks in NYC was outside the scope of this report. A 2016 economic impact analysis of the Governors Ball Music Festival, which was held on Randalls Island prior to the COVID-19 pandemic, had a cumulative economic impact of over \$125 million from 2014–2016, in addition to the value of festival volunteer hours.¹⁴¹

Central Park Conservancy valued the total spending by visitors from outside the NYC metropolitan area that attended or participated in special events at the Park (excluding the Marathon) directly or indirectly accounted for 1,871 jobs, \$87.5 million in earnings, and \$203.8 million in economic output.¹⁴²

The City’s tourism agency, NYC & Company, does not track intended or planned park visits by tourists. Accurate estimates of visitation numbers, primary trip purpose (inclusive of parks visitation), and length of stay are all data necessary to estimate the total tourism impact of parks in NYC. Travelers who visit parks are usually also visiting NYC for other purposes, so it is difficult to separate out the specific effect of parks on what tourists spend for food, travel, and lodging during a stay.¹⁴³

As an alternative approach to estimate the impacts of parks on NYC’s tourism industry, TPL obtained proprietary data from Longwoods International Travel USA® (Longwoods).¹⁴⁴ The dataset, 2019 New York City Outdoor Activity Volume, provided day and overnight domestic visitor numbers, which was used to estimate travel costs (gas mileage, hotel, and food expenditure) for day and overnight visitors in 2019 (Table 10).

The Longwoods data identified that out of the total visitors to NYC in 2019, approximately 16 million day trippers and 18 million overnight domestic visitors came to NYC with the intent to engage in outdoor activity, or about 95,000 per day. The data did not further specify the types of outdoor recreation; all visitors who identified participation in outdoor activities were included in this analysis. However, this visitation data was more specific than the “arts, entertainment, and recreation” data previously available from NYC & Company, and therefore is a better measurement of tourism for parks.

The NY Office of the State Comptroller (OSC) estimates that the average spending for domestic visitors is \$492 (2021\$) per person per trip (adjusted to 2019 dollar value of \$465, to align with the year of the visitation data).¹⁴⁵ The U.S. General Services Administration (GSA) rates were used to estimate the local and non-local trip cost for one overnight stay.¹⁴⁶ Based on the OSC report, two-thirds of the overnight visitors were assumed to come from an average of 400 miles round trip and one-third were assumed to travel an average of 200 miles round trip leading to a per-trip cost of \$603 and \$493 respectively. The total estimated travel cost of **\$17.9 billion** provides an estimated visitor spending for tourism in NYC related to outdoor activity (Table 10).

This is a conservative estimate of the tourism value provided by parks in NYC. Longwoods data was available for domestic tourism, but not international visitors. The OSC report notes that while there are fewer international visitors to NYC compared to domestic, “the economic value (i.e., the spending) of one international visitor is equivalent to that of four tourists.”¹⁴⁷

TABLE 10. Tourism expenditures for trips where people engaged in outdoor activity in NYC, 2019\$

	2019 Day Person Trips Inclusive of Outdoor Activity [^]	Cost of Travel (local, 200 miles round trip) ⁺	Cost of Travel (non-local, 400 miles round trip)	Estimated Total Travel Cost Day and Overnight (billions)
Day trip @ \$465 (2019)*	16.10 billion	—	—	\$ 7.49
Overnight trip (assume 1 night)	18.40 billion	\$493	\$603	\$ 10.40
Total	34.50 billion			\$ 17.90

[^] Proprietary data received under contract from Longwoods International Travel USA 2019 New York City Outdoor Activity Volume L.

* \$492 (2021\$) average per person per trip adjusted to 465 (2019\$). See endnote 146.

** \$0.55 is U.S. GSA 2019 mileage rate.

+ While it is very likely visitors take the train or bus into the city, there are not estimates of the various modes of transportation of visitors.

Recreation Economy

Parks also provide substantial economic benefits through their use by local residents. Parks greatly contribute to improving quality of life, as highlighted by the COVID-19 pandemic. In today's economy, employees consider more than salary when choosing where to work.¹⁴⁸ Research on local economic development has focused on quality of life broadly (including transportation, housing, and health care) and concerns about the natural, social, and cultural environment and lifestyle affordability. Parks contribute to local economic development by making communities more attractive to new residents and also by providing low-cost opportunities for recreation and health that increase the quality of life for residents.¹⁴⁹

New York City has many opportunities for cycling throughout the city. There are at least 52 miles of “Self-Guided Bike Rides” in NYC which connect points of interest like DOT Art projects or cycling from park to park like St. Mary’s Park to Central Park. Mountain biking trails are available in four parks throughout the Boroughs of Queens, Staten Island and Manhattan. Private companies offer rentals for visitors and residents to enjoy NYC on two wheels. Having high-quality biking amenities supports the local economy, especially when considering the extent to which residents spend on bicycles. In 2020, total household spending on bicycles was predicted under this method to be \$113 million or \$34.80 per person on average.

Recreational opportunities increase quality of life for residents, helping attract NYC’s labor force and therefore bolstering the city’s business community. This section estimates the contributions of the parks system in NYC to its recreation economy to approximate their contribution to economic development.

ESTIMATING ECONOMIC VALUE OF THE RECREATION ECONOMY

Recreation-driven economic activity in NYC is important to the economic health of the city. Sales and expenditures by residents in NYC indicate significant market potential



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for recreation-based goods and services. TPL utilized the ESRI Business Analyst tool, which contains data on consumer behavior, leisure activities, and business activity for a defined geography, to estimate how much recreation spending contributes to the local economy.¹⁵⁰

ESRI Business Analyst data calculates a market potential index (MPI) for various categories of spending that measures the relative likelihood of individuals and households in an area participating in certain activities compared to the U.S. average.¹⁵¹ Results for the MPIs in NYC range from 87 to 129, meaning that the household budget expenditures potentially range from 13 percent less than the national average to 29 percent more than the national average.

Table 12 shows the average amount spent on household budget expenditures and the market potential index in NYC and includes median and average household incomes for 2020. The high spending potential index

(SPI) suggests that NYC has a larger proportion of higher income households compared to the national average. However, 2020 data does not reflect a typical year. The U.S. Bureau of Labor Statistics published an Economic News Release on Consumer Expenditures in 2020, describing how the COVID-19 pandemic impacted spending behavior: “Stay-at-home orders affected expenditures for retail outlets, entertainment venues, and even transportation providers... nine of the fourteen major components of household spending decreased during 2020.”¹⁵²

THE NYC RECREATION ECONOMY

The recreational use survey discussed earlier in this report looked at park use by residents in NYC. ESRI Business Analyst data reports spending for outdoor recreation activities across the entire population instead, including both municipal parks and private facilities.

The Business Analyst data for 2020 indicates that participation in recreation activities is prevalent among residents of NYC. The top outdoor activity was walking for exercise, with 24.1 percent of households doing so in the last 12 months (Table 12). Other popular activities, with over 10 percent of residents participating, include swimming (14.4 percent), jogging or running (13.7 percent), hiking (12.2 percent), yoga (10.3 percent), and basketball (10 percent), all recreation activities provided by parks in NYC.

Based on the MPI data from Business Analyst, households in NYC are more likely than other households across the country to participate in yoga (MPI 125, or 25 percent above national average) or Zumba fitness (MPI 169) and play basketball (MPI 127). (An MPI of 100 represents the national average.)

TABLE 11. Household income and budget expenditures for NYC residents (2020)

Location	Median Household Income	Average Household Income	Average Amount Spent on Household Budget Expenditures	Spending Potential Index for Total Household Budget
New York City	\$65,000	\$102,000	\$86,800	113

Source: ESRI Business Analyst.

TABLE 12. Estimated participation of NYC households in sports and leisure market (2020)

Activity	Percent of Households Participating	Market Potential Index (MPI)
Walking for exercise	24.1	102
Swimming	14.4	94
Jogging or running	13.7	112
Hiking	12.2	100
Road biking	8.3	90
Fitness programs (e.g., yoga, aerobics)	3 – 10.3	117 – 169
Team sports (e.g., volleyball, basketball)	3.2 – 10	96 – 127

Source: ESRI Business Analyst.

Understanding the types of households living in the region further highlights residents' preferences for and spending on recreation-related activities. By extension, this gives insight into the value residents place on outdoor resources.

RECREATION EXPENDITURES AND SPENDING POTENTIAL

Individuals who participate in recreation activities often purchase products to enhance their experiences, such as exercise clothing, footwear, bicycles, and sports equipment. Data from ESRI's Business Analysis indicates that 964,002 households, or 14.3 percent of adults in NYC, spent money on sports and recreation equipment in 2020.

ESRI Business Analyst compiles estimates of expenditures and calculates an SPI that represents the amount spent for a set of products and services, relative to the national average.¹⁵³ As with the MPI, the SPI can be useful for comparing the NYC consumer behavior to U.S. averages.

Residents of NYC spend an estimated \$681 million annually on sports, recreation, and exercise equipment, with households spending an average of \$210 a year (Table 13). Among other recreation equipment expenditures, this spending includes \$61.60 on exercise equipment, \$34.80 on bicycles, and \$20.70 on camping equipment.

Outdoor recreation-related expenditures also contribute to broader economic development in NYC. The sector is a major economic driver nationally: recent U.S. Bureau of Economic Analysis data show that the outdoor recreation economy accounted for \$274.3 billion of the 2020 gross domestic product.¹⁵⁵ At the state level, the total outdoor recreation value added was just over \$21 billion in 2020, employing over 241,000 people.¹⁵⁶ In just sporting goods retail and wholesalers alone, NYC had 4,366 employees in 479 businesses, according to 2019 Business Analyst data.¹⁵⁷

TABLE 13. Annual NYC household spending on sports, recreation, and exercise equipment (2020)

Spending Category	Average Amount Spent per Household	Spending by Category	Spending Potential Index
Total Sports, recreation, and exercise equipment	\$ 210.00	\$ 681,000,000	104
Exercise equipment and gear, game tables	\$ 61.60	\$ 200,000,000	94
Bicycles	\$ 34.80	\$ 113,000,000	112
Camping equipment	\$ 20.70	\$ 66,900,000	93
Fishing and hunting equipment ¹⁵⁴	\$ 73.70	\$ 236,000,000	117
Winter sports equipment	\$ 6.28	\$ 20,400,000	125
Water sports equipment	\$ 5.63	\$ 18,200,000	87
Other sports equipment	\$ 5.75	\$ 18,600,000	81
Rental and repair of sports, recreation, and exercise equipment	\$ 2.64	\$ 8,570,000	95

Source: ESRI Business Analyst.



Conclusion

The results of this study illustrate that parks in NYC contribute billions of dollars annually in economic benefits. These values are conservative, lower-bound estimates, and are just a selection of the robust benefits these parks provide residents of NYC.

Parks have a tremendous potential to improve overall wellness. The phone survey led by TPL shows that parks in NYC provide significant recreational value to resident adults and children, worth \$9.1 billion annually. Over a million residents in NYC use parks for sufficient exercise to meet the CDC's recommendations to improve their well-being, worth \$1.14 billion in avoided health care cost savings. Parks also reduce costs of heat-related illnesses in the city, although additional information is needed to quantify this benefit.

Parks in NYC also provide natural goods and services, protecting water quality through stormwater runoff (worth up to \$2.43 billion a year) and improving air quality as trees and shrubs reduce ground-level ozone and PM 2.5 in the atmosphere (avoiding \$26.5 million in health care costs each year).

People are willing to pay more to live near parks and open space. The presence of parks in NYC annually increases the property value for residences within 500 feet of parks by at least \$15 billion, and increases property tax revenue by \$101 million. However, the property value benefits due to parks likely extend beyond the adjacent 500 feet, and this estimate includes a segment of residential properties only.

Tourism is a significant economic industry for NYC, and parks contribute to this value by enabling outdoor experiences in a heavily-urbanized setting and providing outdoor event and recreation space (especially important during the COVID-19 pandemic). Domestic travelers who visit NYC at least in part to participate in outdoor activities spend an estimated \$17.9 billion in a typical year, and NYC residents spend an estimated \$681 million annually on sports, recreation, and exercise equipment.

The summary of select economic benefits in the analysis for parks in NYC is in Table 15 below. These values reported in 2021 dollars (except tourism dollars, reported in 2019 dollars, to match the visitation year in the data from Longwoods).

While significant amounts of research have been carried out on the economics of housing, manufacturing, retail, the arts, and even specific parks, a comprehensive study on the economic value of parks in New York City had not been conducted prior to this report. TPL believes that answering, “How much value does a city park system bring?” can be profoundly helpful to the political leaders, non-profits, and individual residents of the city.

TPL also recognizes the need to identify how these economic benefits are distributed among communities. Because park quality and access are not evenly shared throughout the population, populations made vulnerable

by historic policies in NYC must be thoughtfully integrated into planning and policy development to support a more equitable distribution of these economic benefits of parks.

This report identified many areas for future research opportunities in NYC, including:

- Accurate park visitors counts and a consistent methodology to facilitate tracking trends over time and across parks;
- Conducting regular surveys of park visitors to better understand or forecast shifts in park activities and visitation;
- Expanding recreational use surveys to include more language options to better capture NYC residents’ park usage, especially for historically underserved communities;

TABLE 14. Summary of estimated annual economic benefits provided by parks in NYC

Benefit Category	Estimated Annual Total*
Human Health and Well-Being	
Recreational use values	\$ 9.10 billion
Health care cost savings	\$ 1.14 billion
Nature’s Services	
Avoided stormwater treatment costs	\$ 2.43 billion
Reduced air pollution: Fine particulate matter (PM 2.5)	\$ 20.30 million
Reduced air pollution: Ground Ozone	\$ 6.20 million
Economic Impact	
<i>Enhanced property values and tax revenue of homes within 500 feet of parks in NYC</i>	
Property value associated with parks	\$ 15.20 billion
Property tax revenue associated with parks	\$ 101 million
Tourism spending—outdoor activities (day and overnight trips)	\$ 17.90 billion
Recreation Economy	
Annual amount spent on sports, recreation, and exercise equipment in NYC	\$ 681 million

* These values should remain separate and discrete due to methodological differences in estimating individual literature values as well as potential overlap in values. For example, health care cost savings and air pollution removal may have instances where the benefit would be double counted. In addition, focusing on discreet values helps describe specific benefits of parks and identify specific beneficiaries.



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- Better integrating public health data and/or other microclimate models into urban heat island data to better understand how environmental conditions (or specifically urban park design) may affect heat-related illnesses;
- Evaluating the economic impact of heat-related illnesses in NYC, including analyzing places of exposure to better understand the impacts of access to air conditioning (indoor incidences) and benefits of shade and canopy cover in parks and green space (outdoor incidences);
- The energy savings from the cooling effects of parks;
- Calculating the avoided costs of storing the 4.49 billion gallons of stormwater that are instead absorbed by parks in NYC;
- Expanding the property values analysis to include more residences (pending data availability on value), or refining the economic approach to estimate NYC-specific impacts of parks on property values;
- Further researching the impacts of park qualities (including size and amenities) on displacement;
- Analyzing direct, indirect, and induced economic activity related to parks employment and wages; and
- Analyzing the economic impact of capital investments in city parks.

Through TPL's conservation economics research, parks in NYC can begin to be assigned the kind of numerical underpinning long associated with transportation, trade, housing, and other sectors. Urban analysts, park planners, economic development professionals, and regional decision-makers can communicate in dollar terms how parks benefit the city's residents. Health advocates, business leaders, policymakers, and other regional constituencies may strategically use the dollar values to acquire parkland, support and maintain existing parks, and find new allies in park advocates.



Endnotes

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143. For example, outdoor recreation activities may extend a visitor's length of a stay in the city. Visitors may have a varied itinerary, and might paddle along the Hudson River after attending a special event or visiting family, which was the driver of their visit.
144. Longwoods Travel USA® (<https://longwoods-intl.com/>) is a multi-client syndicated study visitor research program surveying Americans' domestic travel habits since 1990, and is the largest and longest on-going syndicated study of American domestic leisure and business overnight and day trips, with a with an average annual sample of over 250,000 trips. This ongoing study is conducted quarterly employing an online platform. A representative sample of respondents is selected and invited to participate in the research. The panel is geographically and demographically balanced to U.S. Census targets to provide an accurate picture of today's marketplace and to ensure projectability to the U.S. population.
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154. Hunting is not permitted within the state, federal or city parks within NYC; however, the parks in NYC are part of the larger tapestry of parks and conserved lands across the region that provide access for recreational activities including fishing. Data do not exist to isolate the portion of spending that is specifically hunting- or fishing-related. Thus, this document reports the spending for the category as a whole, to indicate the magnitude of spending on this type of recreation. The NY State Public Outdoor Recreation Survey (2018) indicated approximately 114,000 days of fishing and 101,000 days of hunting in the 5 counties. Source: personal communication/data obtained via email communication with NYS Parks, August 24, 2021).
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