



Middlesex County Cultural Landscape and Ecosystems Service Plan

Part I

Environmental Conditions Inventory

Prepared by: CUES Rutgers University

Prepared for: Middlesex County Office of Planning, full draft submitted June 30, 2022

PREFACE

The Middlesex County Department of Planning supported the development of a comprehensive Cultural Landscape and Ecosystems Service Plan as part of the Destination 2040 planning process, County's strategic vision.

Although the political and administrative process is still ongoing, we publish the underlying research to disseminate relevant information to the general public and interested members of the environmental community. Further we believe that the developed methodology is a contribution to the ongoing discussion on the role of environmental planning in a home rule state.

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INTRODUCTION

The landscape offers many opportunities to enhance human health, well-being, and overall comfort in a place. Landscape qualities directly result from human activities in land use, natural land quality, and habitats. Middlesex County, New Jersey's landscape follows the pattern, like all developed places, of environmental conditions directly resulting from human activity. This *Environmental Conditions Inventory* chapter examines the County's existing composition at the regional scale to understand the County's landscape through an integrated ecosystem and human lens. Environmental conditions encompass all County environments, meaning these conditions explore places in which people, plants, and wildlife reside or operate. The **Nature & Place** functional plan contains the landscape component of the County's Destination 2040 (D 2040) Master Plan, aligning with the overall D 2040 strategic initiatives.

The eight selected D 2040 Strategic Initiatives informing the following inventory elements include:

1. *Expand the use of green infrastructure approaches for water management.*
2. *Expand the use of green infrastructure to reduce the heat and stormwater impacts of transportation facilities.*
3. *Enhance the capacity of municipalities to advance sustainable and resilient land use and development.*
4. *Preserve wildlife habitats and natural resources.*
5. *Improve the stewardship of environmental resources.*
6. *Revitalize walkable town centers, downtowns, and commercial corridors.*
7. *Develop the Arts Institute of Middlesex County into a hub for all arts, cultural and historical programming.*
8. *Provide safe, innovative, inclusive, and sustainable parks and recreation services.*

The strategic initiatives focus on environmental, ecological, and cultural landscapes, guiding seven individual inventory sections. Each of the seven sections explores unique elements of the County's existing landscape conditions to examine potential opportunities for landscape enhancements (in the *Analysis (2)* and *Actions (3)* chapters) and the relationship of people in space to comprehend what encompasses Middlesex County's cultural landscapes.

The seven sections included in this *Environmental Conditions Inventory* include:

- *Land Use Land Cover (1.1):* The County's urban to natural composition, landforms, wetlands and waterbodies, watersheds, urbanization patterns, and impervious surface composition.
- *Natural Resources (1.2):* The County's ecological habitats, wildlife, native plant species, and groundwater recharge rates.

- *Environmental Issues* (1.3): The County's environmental threats include flood risk, sea-level rise, and urban heat island effects.
- *Open Space and Farmland* (1.4): The County's existing open space and preserved farmland extend from the ***Open Spaces***. functional plan inventory and analysis.
- *Demographics* (1.5): The human population and distribution through a population density, racial and ethnic minority, and income summary.
- *People and Space* (1.6): The relationship between people and space by studying landscapes with historic designations, commercial areas, place names, arts, and cultural centers, houses of worship, and public transportation.
- ***Nature & Place. Outreach*** (1.7): Establishes an understanding of Middlesex County's human interests and desires through a public outreach photo survey and municipal stakeholder outreach.

The seven sections together help understand the County's urban growth over time and the result of urban expansion. The existing conditions in Middlesex County show that the County's historical development patterns relate very closely to Middlesex County's natural landscape. Topography, wetlands, and adjacency to the County's rivers played a significant role in the locations of Middlesex County's settlement and demographic distribution.

The Inventory chapter's goal is to gain a well-rounded understanding of the County's existing environmental conditions for ecological and human environments by utilizing existing data from reliable online resources. The existing data study will help develop a comprehensive definition of the cultural landscape unique to Middlesex County, further explored in the following Analysis chapter.

The National Park Service's and Cultural Landscape Foundation's definitions of the cultural landscape informed the inventory components for *People and Space* (1.7). To paraphrase, the cultural landscape includes the experience of nature and natural environments impacted by people. ^(1,2) This inventory utilizes the NPS and CLF definitions to inform inventory components through existing data of existing conditions. Key findings reveal that extensive cultural landscape inventories do not exist; this inventory describes them as an accumulation of diverse environmental conditions resulting from human intervention. More importantly, cultural landscapes are places people want to be and where people comfortably interact with outdoor spaces. The inventory elements inform essential components to discuss in the following *Analysis* (2) chapter. The analysis of compared inventory components helps identify priority locations for intervention in the *Action* (3) chapter.

1.1 LAND USE AND LAND COVER

INTRODUCTION

Land use and land cover directly relate to human interactions with the landscape. The land use and land cover present today are the outcomes of urbanization trends in the County's historic land composition, such as topographic patterns, wetlands, and rivers. This section (1.1) explores the County's topography, historic urbanization, natural and urban land cover, and impervious surfaces. Studying the County's land use and land cover existing conditions through available data reveals how cultural preferences shaped the County's landscape since early European settlement in the seventeenth century.

The *Land Use and Land Cover* inventory reveals that urbanized landscapes dominate Middlesex County with pockets of preserved forests, farmland, and protected wetlands. The County's topography, with high points in the south and low points along major waterbodies, defined ideal places for settlement. As the County's industrial history progressed, settlements occurred in wetlands and other less suitable landscapes. This development resulted in altered hydrology and impervious surface conditions, which are still increasing to accommodate the growing demand for occupiable space for residential, commercial, and industrial activities.

Figure 1.1: The Raritan River at New Brunswick Landing



Source: CUES, Rutgers University. Photograph. 2020.

Topography

Middlesex County's topography, demonstrated in elevational contours, results from a complex geomorphological history shaping the entire foundation of Middlesex County's landscape shown in **Map 1.1**.⁽³⁾ Middlesex County's landforms began to take shape through land-forming, erosional, and depositional events nearly ten million years ago.⁽⁴⁾ Over 2 million years ago, the ancient Pennsauken River valley from today's Milltown to Plainsboro initially shaped the County's southern landforms. More recent occurrences of glaciation created the landforms seen today, such as the glacial outwash plains in the northern section of the County, which diverted the original watercourse of the Raritan River and is responsible for its current placement. These processes contributed to the County's soil types like the sandy, well-draining soils in the County's southern coastal plain or the red shale, sandstone, and sedimentary rock, resulting in a more refined clay in the northern piedmont.^(5,6)

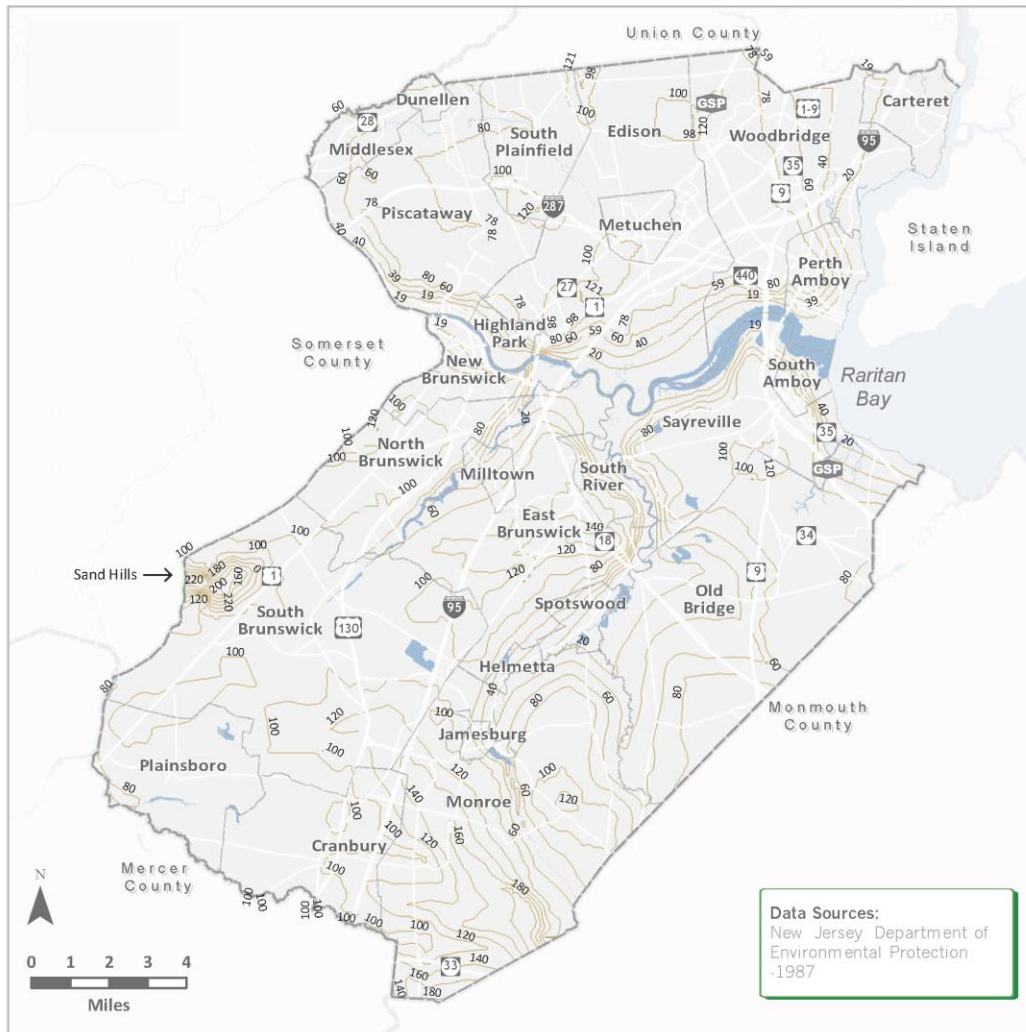
The Raritan River divides the County into northern and southern regions. The Raritan River's riparian corridors contain distinct elevation changes that provide inspiring viewsheds, especially at the steepest locations in Highland Park, New Brunswick, and the Amboys, **Figure 1.1**. North of the Raritan River, the high elevations plateau between 80 and 100 feet above sea level in South Plainfield, Edison, Metuchen, and Piscataway, **Map 1.1**.

In the county's southern portion, landforms include stream terraces deposited by the Millstone Brook, Lawrence Brook, Ambrose Brook, and the South River.⁽⁷⁾ These watercourses and their tributaries eroded the valleys. They formed slopes around notable high points like East Brunswick (140 feet above sea level) and Monroe Township near Gravel Hill (180 feet above sea level). The County's highest land elevation occurs at the Sand Hills of South Brunswick, reaching over 220 feet above sea level. The Sand Hills occupy the western border between Middlesex and Somerset Counties.⁽⁸⁾

Each landform provides a geological character that influences natural heritage composition as well as the cultural identity in Middlesex County. Places where topographic landforms affect everyday life occur at the many inspiring vistas. Topography lends character to various natural areas that offer passive recreational use. Topography supplies ideal landscapes for residential and commercial development and building structures. In addition, ***the topographic nature of Middlesex County shapes future environmental decisions regarding water management, watershed areas, wetlands, and ecological habitats.***

Map 1.1: Topography

Topography



Elevation Contours

— 20 Foot Intervals

Prepared: December 1, 2021
By: CUES, Rutgers University

Urbanization History

Middlesex County's landscape has rapidly developed and urbanized over the last two and a half centuries (**Figures 1.2-1.8**). The progression of the County's settlement shaped the current landscape and helps explain the development patterns throughout Middlesex County today. The pattern of rapid urbanization exemplifies the County's role in American history and the progressive settlement along the entire East Coast.

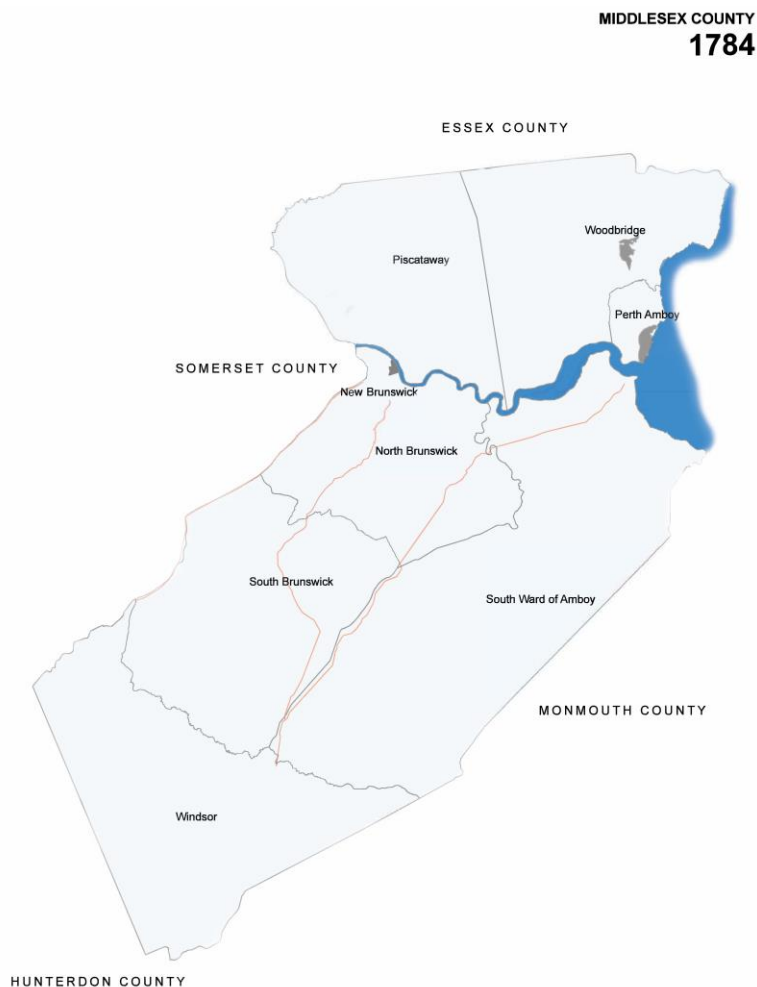
Early Settlement

Settlements along the Raritan River, dating to sometime before 6000 B.C, began with Lenape Indigenous tribes. ⁽⁹⁾ The Lenape lived off of the land, tended to the land, and gathered settlement cues from the evolving environmental patterns. ⁽¹⁰⁾ Two main Lenape tribes inhabited the area. One referred to themselves as the "Unami," meaning "people down the river," and the "Sacunk" tribe —meaning stream outlet. ⁽¹¹⁾ The Unami Tribe lived along the Raritan River near the Green and Ambrose Brooks. During the wet seasons, the Lenape took refuge on higher lands throughout the Green Brook Valley. As evidenced by archeological finds, differing floodplain areas prove that indigenous people moved with rising water. However, European settlers of the 1600s drove these indigenous tribes westward and permanently altered land along the Raritan River for permanent settlement. ⁽¹²⁾

The area, now called Middlesex County, became a permanent European settlement and New Jersey County in 1683. The English controlled the land after clashes occurred between the Swedish, Dutch, and English. ⁽¹³⁾ In the early settlement history of Middlesex County, the area of Ambo Point, now known as Perth Amboy, gathered an influx of English, Scottish, and French immigrants looking for mercantile opportunities and religious freedom. This influx of people resulted in the city's foundation, with settlers clearing 1,500 acres for homes, farmlands, and trading posts (**Figure 1.2**). ⁽¹⁴⁾ With the vast resources, prime location, and access to the waterways, these settlers believed that Ambo Point was the city to rival New York and could become the London of America. ⁽¹⁵⁾

By the early eighteenth century, the prime location established Middlesex County's prominent presence within New Jersey. The County's proximity to New York City, Philadelphia, and the Raritan River defined it as a critical area for road and waterway infrastructure development and trading. Merchants regularly utilized these trade routes; this helped shape the settlement along the Raritan River and formed present-day New Brunswick. By 1730, the city of New Brunswick became the second royally chartered city in Middlesex County after Perth Amboy (chartered in 1718). ⁽¹⁶⁾ New Brunswick's status began to pull traffic away from Perth Amboy. Merchant vessels continued upstream towards New Brunswick City rather than unloading at the coastal harbor. The movement and settlement inland also expanded the extent of the County's agricultural land. ⁽¹⁷⁾

Figure 1.2: Urbanization in Middlesex County, 1784



Source: Created by CUES, Rutgers University adaptation from I. Mills. A Map of Middlesex County [map]. 1784. "A Map of Middlesex County." <MiddlesexCounty1784.jpg (4320×3836) (rutgers.edu)> (July 19, 2021).

War Efforts, Economic Growth, and Planning

After the Revolutionary War, agriculture and trade remained the cornerstones of Middlesex County's economy. Much trading remained rooted in river travel along the Raritan River and later rail (**Figure 1.3**, green rail lines). In 1815, New Jersey adopted the first railroad act in the U.S., capitalizing on trade from the Raritan River. In 1820, the state established the New Jersey Delaware and Raritan Canal Company, with the resulting canal becoming one of the busiest canals in America.⁽¹⁸⁾ Near the Lawrence Brooke, a tributary to the Raritan River, farmers began to condense settlement around a gristmill used for processing grain, laying the groundwork for the Borough of Milltown (incorporated 1889). By 1843, one of the first rubber manufacturers in the U.S., the Meyer Rubber Company, established itself in Milltown, resulting in a sizeable economic boost.⁽¹⁹⁾ This economic boost laid the foundation of change for the coming decades as wars in the areas erupted, such as the Civil War, and later World War I, and World War II.

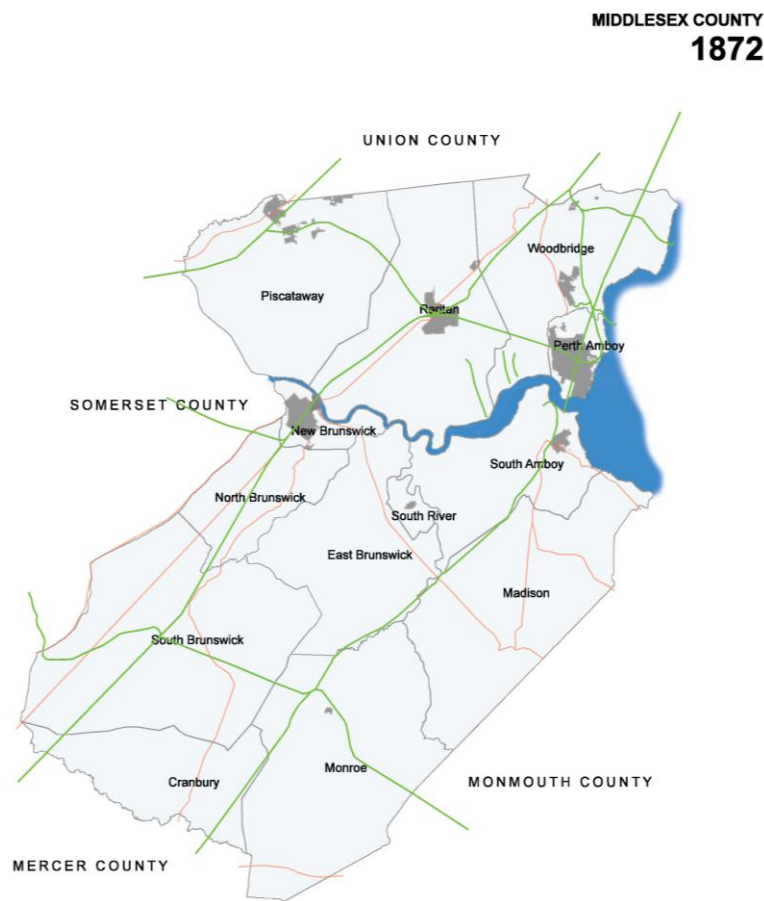
Figure 1.3: Urbanization in Middlesex County, 1861



Source: Created by CUES, Rutgers University adaptation from H. F. Walling. Map of the County of Middlesex, New Jersey [map]. 1861. "Map of the County of Middlesex New Jersey". <Middlesex County 1861 (rutgers.edu)> (July 19, 2021).

During the Civil War (1861-1865), Middlesex County rapidly shifted from agricultural production to the industrial sector, boosting New Jersey's economy. ⁽²⁰⁾ Industrial prevalence continued after the war's end, with company towns establishing along with the County's trade networks. The *General Incorporation by Election Act* (1878) allowed inhabitants of a city (embracing an area less than four square miles, a population not exceeding five thousand people, and property boundaries selected and signed by those owning at least one-tenth in value of the taxable real estate) to become a political body and incorporate into an official municipality through the election process. ⁽²¹⁾ One such town grew so large that it seceded from East Brunswick, becoming the incorporated Borough of Helmetta (1888). This burgeoning industrial center was attractive to immigrants. A similar scenario led to the creation of Dunellen (referendum 1886, incorporated 1914) and Sayreville (1876, incorporated 1920).

Figure 1.4: Urbanization in Middlesex County, 1872



Source: Created by CUES, Rutgers University adaptation from Topographical Map of Middlesex Co. New Jersey [map]. 1872. 1 inch to ½ mile. "Topographical Map of Middlesex Co. New Jersey." < MiddlesexCo_1872.jpg (3330×2208) (rutgers.edu)> (July 19, 2021).

Economic prosperity centered around industrial production and commercial services replaced agrarian landscapes. In 1886, Johnson and Johnson settled in New Brunswick. The company eventually became a leading force in the medical practice. In the same region, Bristol-Myers Squibb Company became the largest penicillin plant in the world.⁽²²⁾ These anchor companies brought economic opportunity and created desirable places for community settlement. Companies like Johnson and Johnson played a prominent role in New Brunswick and later aided in revitalizing its downtown area, further increasing its desirability.⁽²³⁾

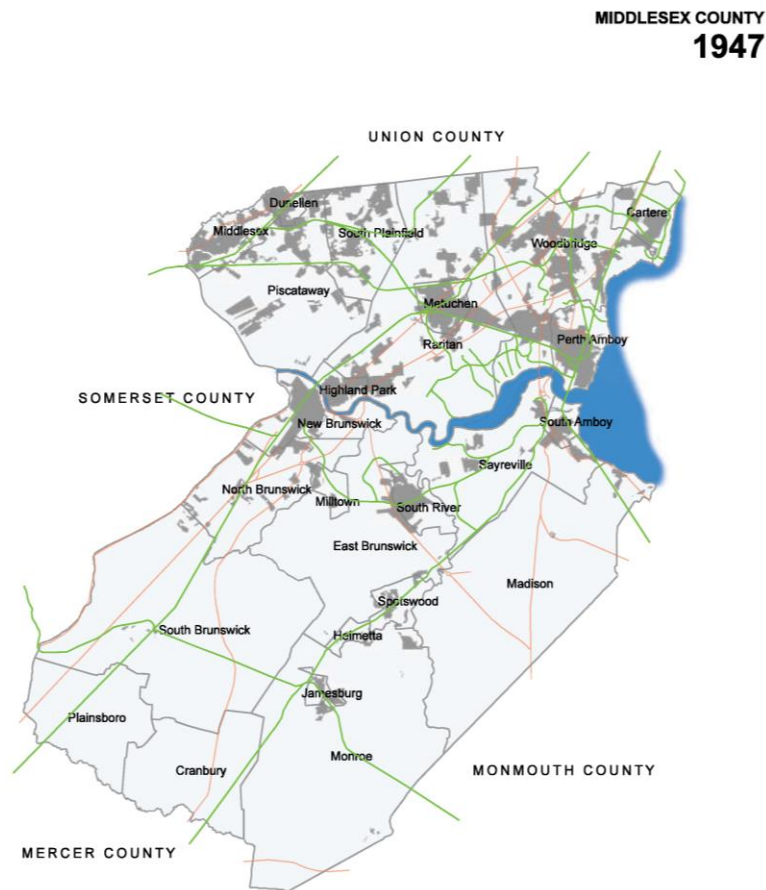
Prosperity and governance grew in other County Boroughs outside of the cities. In 1917, powered by the League of Municipalities, a newly established *Home Rule Act* aided municipal power growth beyond previous limitations.⁽²⁴⁾ This Act awarded municipalities broader governmental power to enact ordinances and regulations.⁽²⁵⁾ The *Home Rule Act* allowed municipalities to make even more pressing decisions independently from one another to endorse rules and regulations that shaped and continue to alter Middlesex County's landscape.

To combat regional-scale planning necessities, the Regional Planning Committee (RPA), created in 1922, planned to develop areas surrounding New York on a regional scale with a transportation and housing focus.⁽²⁶⁾ This was the first effort focused on regional-scale planning instead of individual cities, paving the way for future regional-scale planning.⁽²⁷⁾ Planning efforts continued with great force in all planning sectors.

In 1924, the U.S. Post Office leased out forty-seven acres from a local farmer, John Hadley, which drastically transformed the land. The acreage became Hadley Airfield, a transcontinental airfield.⁽²⁸⁾ Today, the airfield known as the Hadley Center and the surrounding area became the Borough of South Plainfield.⁽²⁹⁾

War efforts dramatically influenced Middlesex County's landscape and cultural heritage. As WWI erupted, the area's industry played a significant role in the war efforts, causing Middlesex County's economy to soar. The Gillespie Shell Loading Plant in Sayreville became the largest in the world at the time, providing artillery shells for the war. There was also the Raritan Arsenal, which served as a critical facility for the U.S. Army. Additionally, with the advent of WWII, Camp Kilmer became one of the most important administrative centers in the U.S. military effort, with over 2.5 million troops and later a multitude of Hungarian refugees.⁽³⁰⁾ These areas exist in Piscataway and Edison Townships, which remain prime settlement locations within the County.

Figure 1.5: Urbanization in Middlesex County, 1947



Source: Created by CUES, Rutgers University adaptation from H. R. Fleming. Map of Middlesex County New Jersey [map]. 1947. "Map of Middlesex County New Jersey". < MiddlesexCounty_1947.jpg (3000×3222) (rutgers.edu)> (July 19, 2021).

Suburbia

After WWII, suburbanization expanded throughout the United States. New Jersey became the suburban landscape surrounding New York City and Philadelphia. The South links to Mercer County and Philadelphia, while the North closely relates to New York City. Many factors contributed to suburbia's growth, including funding sources for residents and home development.

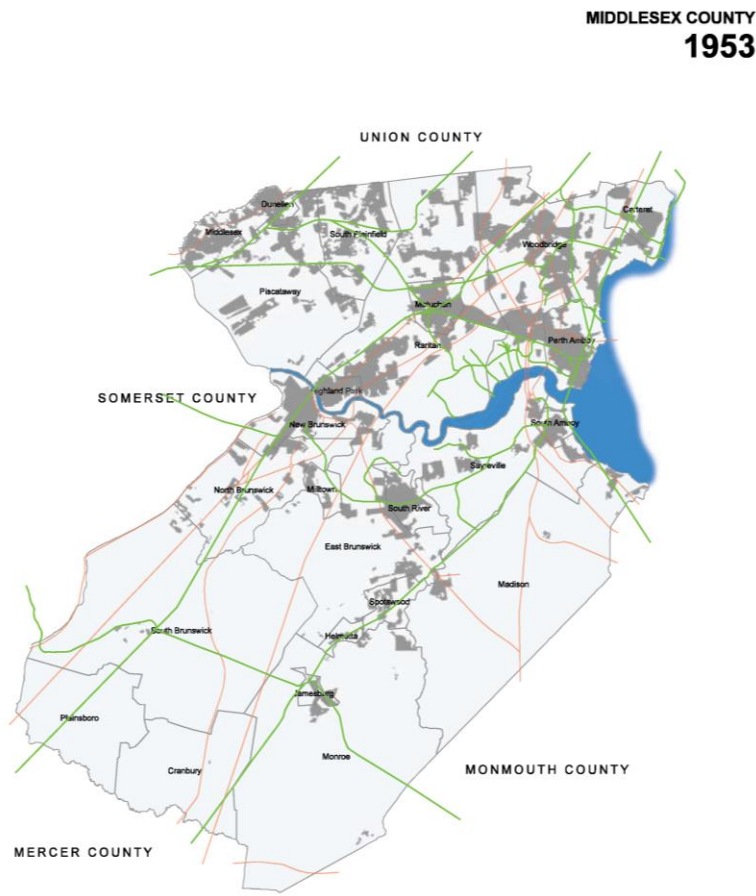
The G.I. Bill of Rights (1944) established an influential funding source for suburbanization by awarding loans to veterans who returned from the war. ⁽³¹⁾ The G.I. Bill helped shape the post-war era American landscapes, allowing veterans to enter the middle class, gain education, and buy homes. At the same time, redlining practices kept minority groups from buying suburban dwellings. Houses were in short supply in America during the suburbanization period, but New Jersey and the County's open lands provided ideal landscapes for suburban development. ⁽³²⁾

Highway infrastructure skyrocketed the thriving spread of suburban communities by allowing people to travel autonomously for work, shopping, and leisure activities. U.S. Route 1 and Route 22 became early arteries adorned with strip malls and served as an extension of the new suburbs. ⁽³³⁾ The advent of the Garden State Parkway (1946 beginning phase) created a scenic route for people to travel from New York to the New Jersey shore. ⁽³⁴⁾ The New Jersey Turnpike (1951) allowed people to travel throughout the entire state (and County) from northeast to southwest. ⁽³⁵⁾ Both highways intersected in Woodbridge and added to the County's growing development by providing further access than rail and river travel.

At this point, the east and west regions of the County were accessible by highway, with several significant roadways intersecting through Middlesex County. The Highway Act, signed into law in 1956, authorized 41,000 miles of highway construction in the U.S., creating even more highway connections throughout the state. ⁽³⁶⁾ **Figure 1.5**, compared with **Figure 1.6**, highlights the addition to the transportation network with added transportation networks crossing Middlesex County's landscapes (red) and associated settlement expansion (dark gray). Highways like U.S Route 1-9, the Garden State Parkway, U.S. Route 130, and U.S Route 18, and the unbound travel by autonomous vehicles allowed people to travel throughout the County and State rendering New York City and Philadelphia even more accessible from rural areas.

During the latter half of the twentieth century, manufacturing slowed in Middlesex County. Industrial production trends shifted towards research and development, financial districts, and pharmaceutical and service industries. Middlesex County industries continue to include hospitals, campuses, and research facilities. However, the markets shifted from heavy industry dominating the economic sector was not the only consumption trend changing. The cultural preference for shopping malls and convenience shopping increased as people moved further from the cities and into the suburbs.

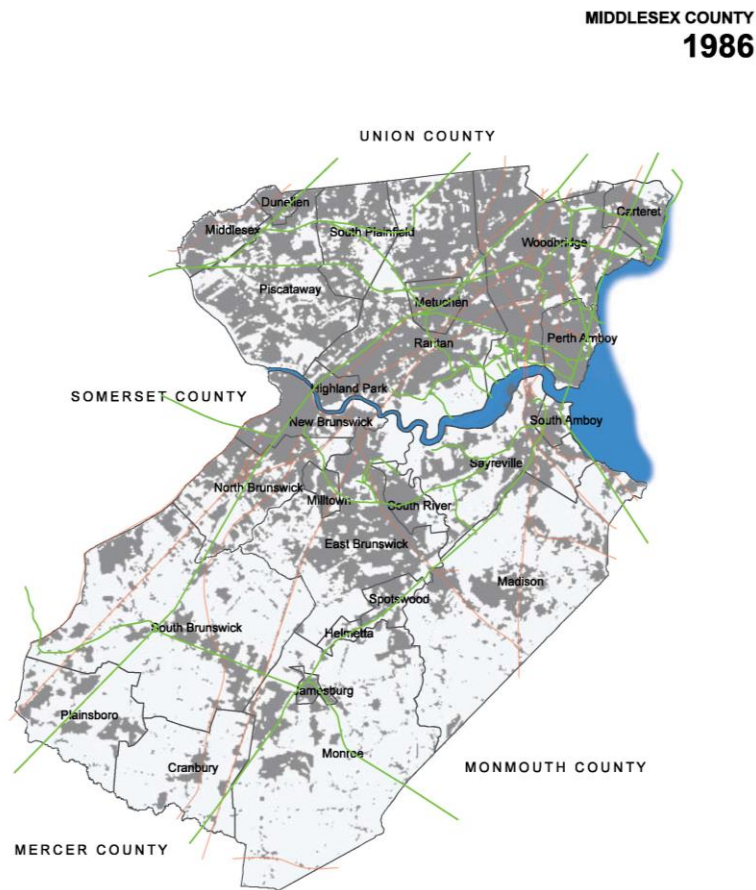
Figure 1.6: Urbanization in Middlesex County, 1953



Source: Created by CUES, Rutgers University adaptation from H. R. Fleming. Map of Middlesex County New Jersey [map]. 1953. "Map of Middlesex County New Jersey". < MiddlesexCo1954.gif (2435×2564) (rutgers.edu)> (July 19, 2021).

Shopping trends shifted to condensed shopping experiences in shopping malls. The Menlo Park Mall, Edison (1959) was one of the first malls in Middlesex County to replace downtown and city shopping.⁽³⁷⁾ The Brunswick Square Mall (1970) followed suit as a hub within what was once a rural landscape. The mall replaced the Ostroski Farm on Rues Lane through a sale to the Macy's Corporation for \$845,000 (\$5.7 million at today's cost).⁽³⁸⁾ The Woodbridge Center (1971) became the next big mall, the largest two-level enclosed shopping mall in the East with 1,500,000 square feet of retail space.⁽³⁹⁾ Malls such as these drew more people to Middlesex County, encouraging increased development and settlement in these areas. Today, the three malls remain staple shopping centers. These centers lie in some of the County's most car-centric and urbanized regions, rendering pedestrian accessibility difficult today.

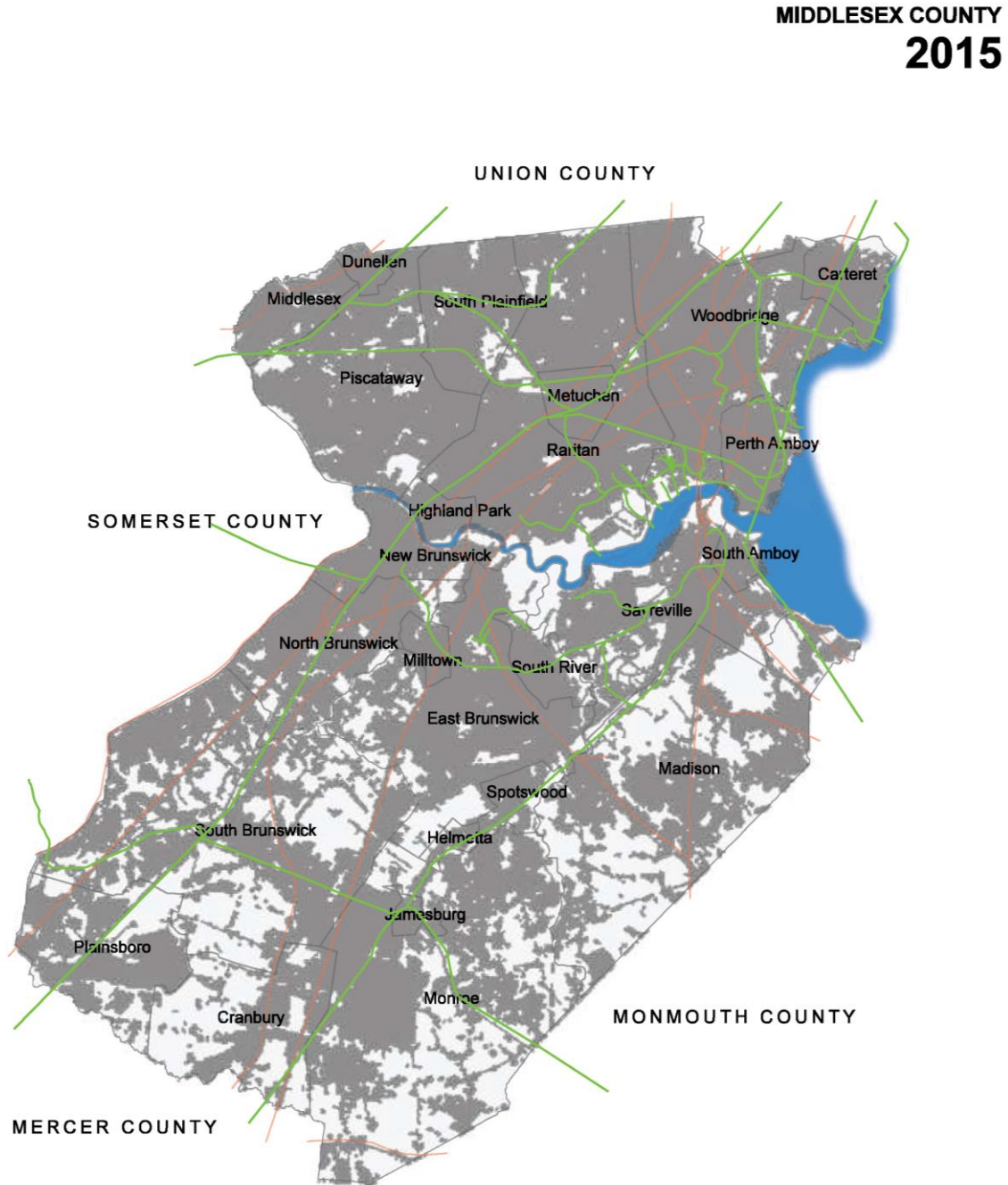
Figure 1.7: Urbanization in Middlesex County, 1986



Source: Created by CUES, Rutgers University adaptation from NJDEP Bureau of GIS. (1998). Land Use/Land Cover of New Jersey 1986 [Data Set]. NJ Dept. of Environmental Protection Bureau of GIS. Retrieved December 13, 2021 from, <https://njgis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-1986-download/about>

The twentieth century included many land-use changes from natural to urban land as the County experienced a shift from industrial production dominance to pharmaceuticals, research, and commercial services. Downtown center dominance shifted to strip mall shopping centers anchored by major highways. Middlesex County's landscape and commercial trends directly resulted from economic transformation throughout the County. The County's developmental history informs about the land uses currently occupying the County today, **Figure 1.8**. Cultural preferences and needs for developable land shaped the County's natural and agricultural lands, suburban development, downtown centers, highways, and more. The following inventory sections examine the County's landscape character as it stands today, shaped and transformed through the County's urbanization history by studying the land use and land covers in 1986 and 2015.

Figure 1.8: Urbanization in Middlesex County, 2015



Source: Created by CUES, Rutgers University adaptation from NJDEP Bureau of GIS. (2019, January 28). Land use/land cover of New Jersey 2015. NJGIN Open Data. Retrieved December 15, 2021, from <https://njgis-newjersey.opendata.arcgis.com/documents/njdep:land-use-land-cover-of-new-jersey-2015-download/about>

2015 Land Use Land Cover

The County's urbanization history illustrates the important role development and industrial progression played in the natural land loss of urban land. Middlesex County's land use and cover expose natural and urban or built land compositions. Land Use Land Cover (LULC) data allows the research team to compare urbanization trends and natural land cover losses over time through existing New Jersey Department of Environmental Protection (NJDEP) data. Land uses and covers classification level 1 information includes five primary types: urban, forest, wetland, agriculture, and barren land. This level 1 information (2015 most current data) locates and provides base acreage for further analysis through Geographic Information System (GIS) processing. **Table 1.1** lists the overall acreage of each level 1 category, **Map 1.2**, compared with 1986 LULC, **Map 1.3**, acreage expressing the percent gain or loss over time.

Table 1.1: 1986 and 2015 Land Use Land Cover Types and Acreage

Type (Level 1)	1986 Acres	Percent of Total Acres 1986	2015 Acres	Percent of Total Acres 2015	Total Acres Difference 1986-2015	Percent Change from 1986 to 2015
Urban	95,576	48%	123,534	60.4%	+27,958	+29%
Forest	28,895	15%	25,486	12.5%	-3,409	-12%
Wetland	39,994	20%	40,772	20.0%	+778**	+2%**
Agriculture	26,261	13%	10,907	5.3%	-15,354	-58%
Barren	6,829	3%	3,884	1.89%	-2,945	-43%
Total	197,555*	100%	204,533*	100%		

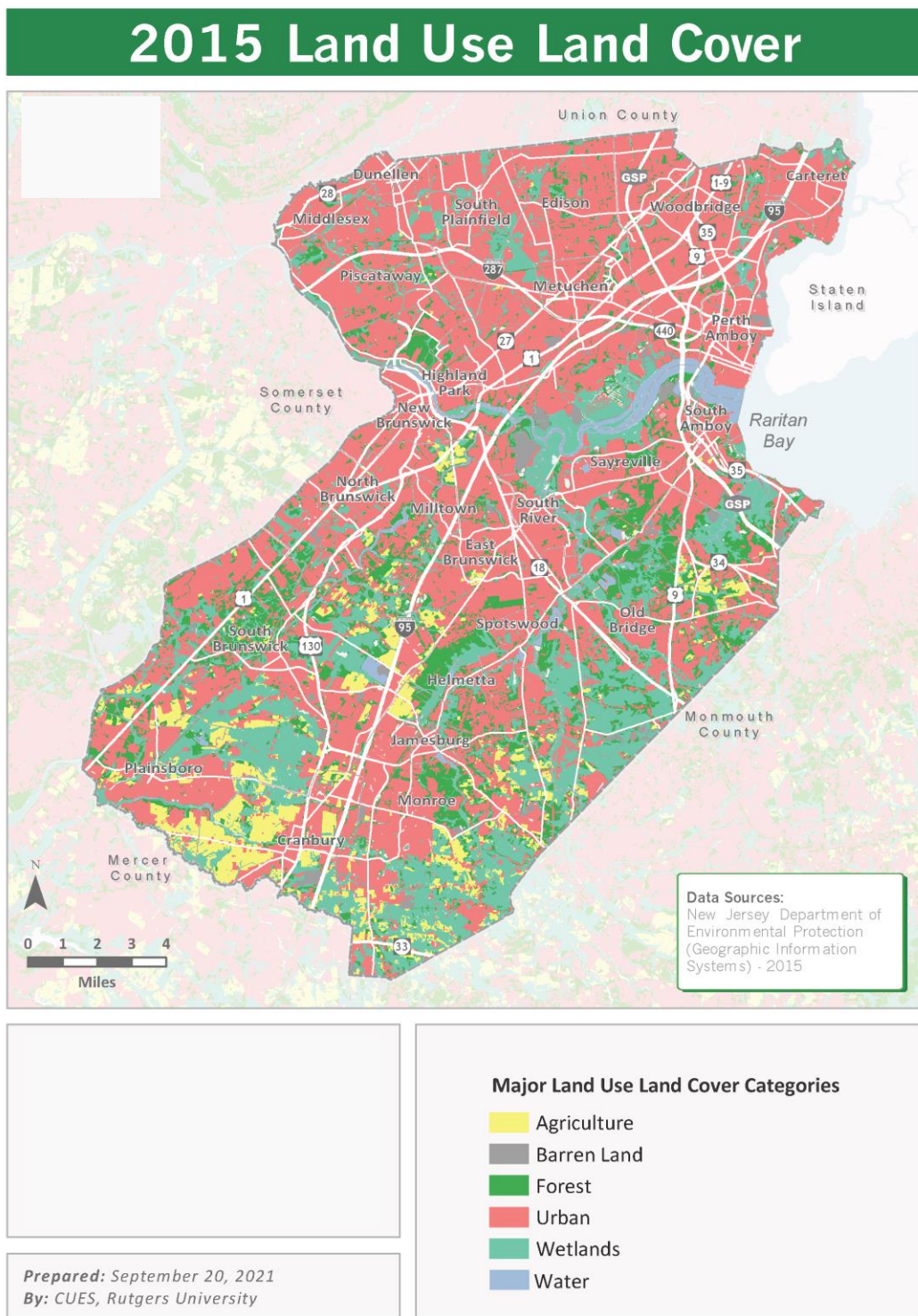
Source: NJDEP, Land Use Land Cover 2015 and 1986, ESRI GIS Field Calculator acres

PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet

* * Total acreage calculation derived from GIS data. Discrepancies in total acreage from 1986-2015 by **6,978** acres.

Compared with **Map 1.4, GIS processing shows wetland location loss to the urbanization of 9,594 acres since 1986.

Map 1.2: 2015 Land Use Land Cover



Urban land predominantly comprises Middlesex County's land uses and covers (60 percent), **Table 1.1**. The NJDEP classifies "urban (or built-up) land as an intensive landscape altered by humans." ⁽⁴⁰⁾ Urban land uses include all types of developed land, such as urban cities, suburban neighborhoods, recreational land, and roadways. ⁽⁴¹⁾ The greatest urban land area concentration occurs in the county's northern half, where there are smaller and fewer contiguous forests, wetlands, and agricultural parcels shown in **Map 1.2**.

NJDEP classifies agricultural land as farmland, orchards, vineyards, horticultural areas, pastures, and nurseries. ⁽⁴²⁾ Agricultural lands are essential to the County's cultural identity. Farmland either holds preservation status or has preservation potential. More extensive tracts and more acres of agricultural land exist in the county's southern half, likely due to the soils and the reach of urban land, **Figures 1.5-1.8**. Few agricultural parcels exist today north of the Raritan River.

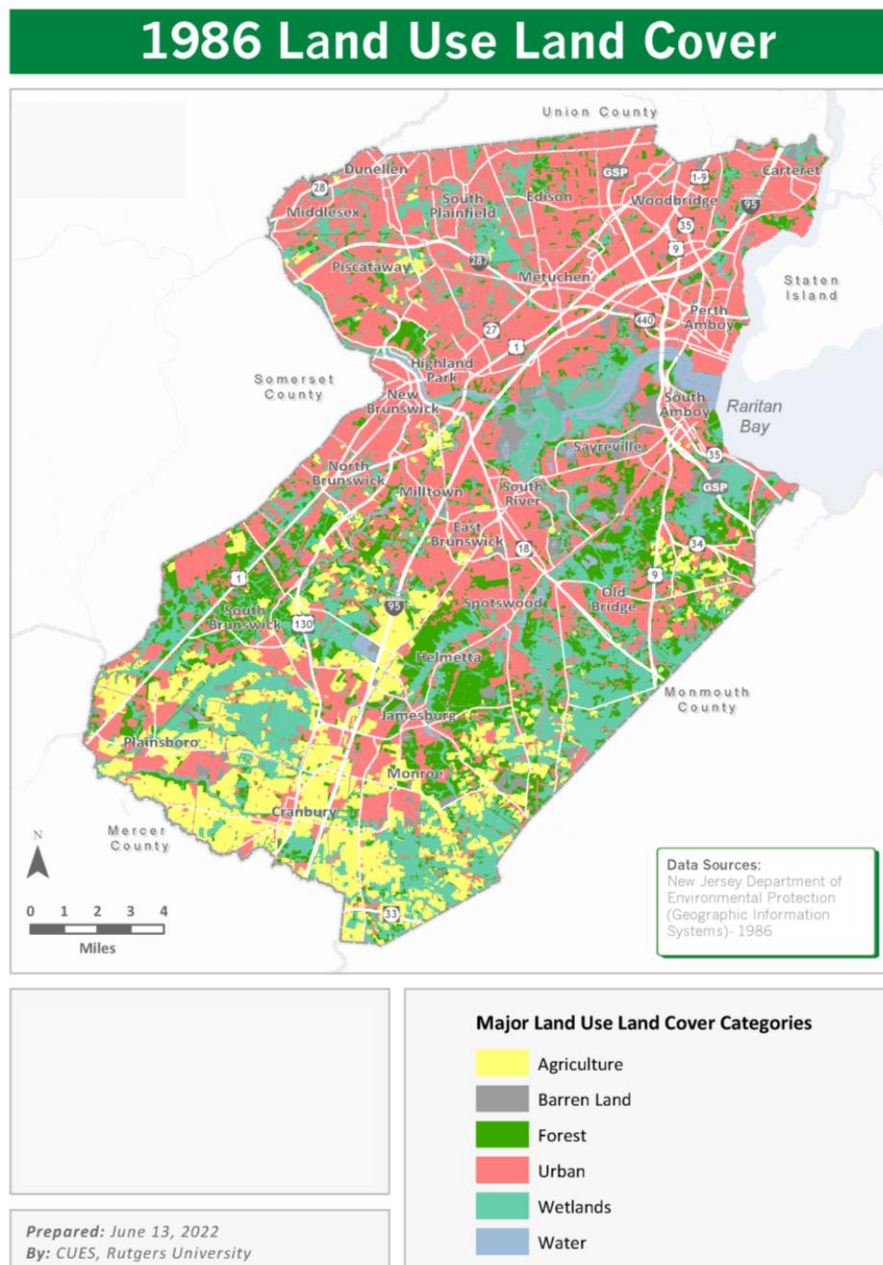
Barren land includes both natural land and results from human activity. Barren lands include lands "characterized by thin soil, sand or rocks and a lack of vegetative covers such as beaches and rock faces. Results of human activities include extraction mining operations, landfills, and other disposal sites." ⁽⁴³⁾ Various barren lands occupy the landscape County-wide. The largest parcels and concentrations occur along the Raritan River and Raritan Bay which lend to the historical practices of dumping and artificially filling wetlands. ⁽⁴⁴⁾ The County-owned landfill resides in East Brunswick near the Raritan River.

Forest land cover consists of non-developed upland forests. Forest land cover in this map does not include street trees or forested swamps that include designated wetlands. The southern County consists more widely of forest cover while only small, scattered forested areas occur in the North. The smaller northern forests lie adjacent to riparian corridors of the Bound Brook, Woodbridge Creek, the Ambrose Brook, wetlands within the Peter J. Barnes III Wildlife Preserve in Edison, and the Rutgers Ecological Preserve in Piscataway. Like farmland, upland forests exist in preserved open space or areas at risk of development throughout the northern and southern regions.

Wetland land cover extensively covers the non-urban southern half of the County. Wetlands include terrestrial wetlands such as tidal marshes, emergent freshwater wetlands, and swamps (forested wetlands). Wetland cover is greater than forest cover in the county's southern and northern parts. The south wetlands occupy large portions of Old Bridge, Monroe, and Plainsboro, while the Raritan River's southern edge contains vast wetland cover in Sayreville and South River. In the north, the land along the Raritan River in Edison and Woodbridge includes a significant stretch of wetlands. Preservation rules apply to delineated wetlands.

The *Land use Land Cover* inventory reveals potential areas of concern surrounding the higher concentrations of urban land and areas lacking sufficient natural land cover essential to providing valuable ecosystem services. Land Use and Land Cover provide the primary investigatory step to decipher the environmental impacts of land use distribution. These findings inform potential action locations across the County, such as green infrastructure implementations like rain gardens or restoration activities.

Map 1.3: 1986 Land Use Land Cover



Wetlands and Waterbodies

The legal definition of wetlands includes “areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.”⁽⁴⁵⁾ Wetlands allow for the continuance of invaluable ecosystem services such as water quality protection (like drinking water), floodwater storage, erosion control, and recreation. The *Land Use and Land Cover* inventory revealed that wetlands cover roughly 40,772 acres (20 percent) of Middlesex County’s landscape (variance of 39 acres compared to **Table 1.2** due to different dataset resources).

Wetlands’ adjacent land influences can harm their function by degrading or destroying them. Thus, wetlands and adjoining areas have specific protections placed on them through the Clean Water Act (Section 404, 1972) and state-level protections through the NJDEP Freshwater Wetland Protection Act (FWPA).

Between 1986 and 2015, mapped wetland loss, **Map 1.4**, reveals 9,594 acres (23 percent change) converted to urban land in Middlesex County due to developmental pressures (note that this number does not offset wetland construction projects likely responsible for the overall two percent gain in **Table 1.1**).⁽⁴⁶⁾ Wetland change trends most notably occurred along the county’s western half in the northwest region in Dunellen down to the southwest in South Brunswick. The loss happened along the wetland fringes at the Raritan River and in the wetland landscapes of the southeast in Old Bridge and Monroe.

Table 1.2: Wetland Type Acreage

Type	Acres	Percent of Total
Estuarine and Marine Deepwater	3,376	8.3%
Estuarine and Marine Wetland	4,438	10.9%
Freshwater Emergent Wetland	2,558	6.3%
Freshwater Forested/Shrub Wetland	25,892	63.6%
Freshwater Pond	1,242	3.0%
Freshwater Lake	1,223	3.0%
Freshwater Riverine	1,958	4.8%
Other	47	.1%
Total	40,733*	100%

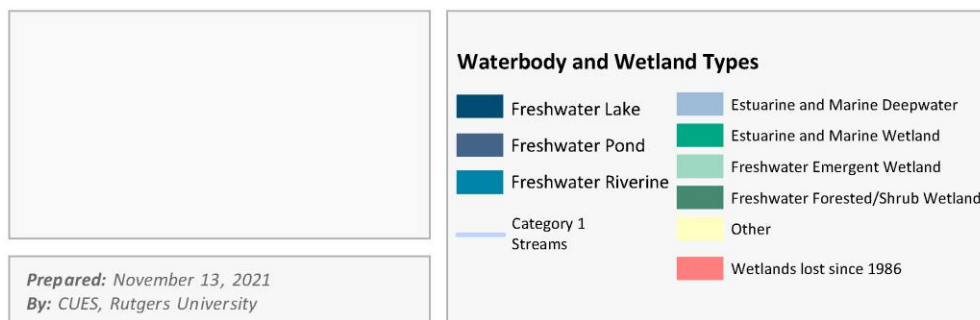
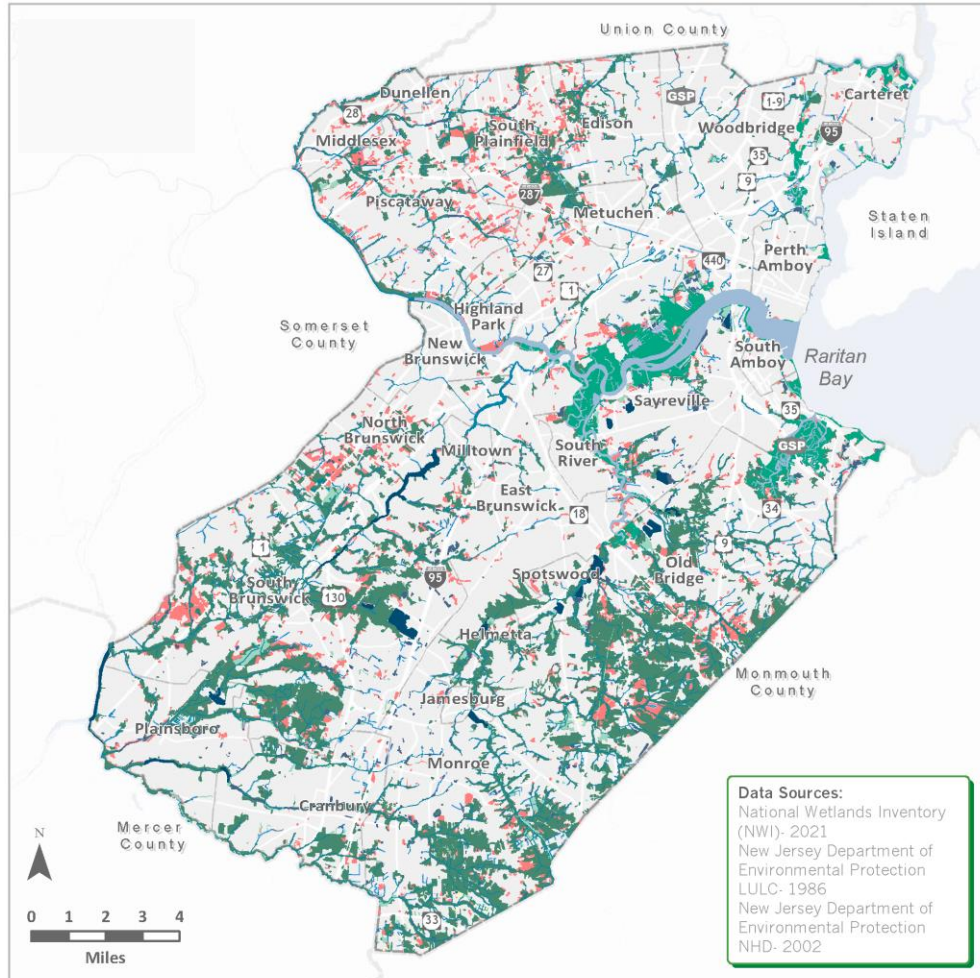
Source: National Wetland Inventory (NWI), ESRI GIS Field Calculator acres, 2021.

PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet

* * Total acreage calculation derived from GIS data shows a 39-acre variance from the NJDEP Land Use Land Cover data.

Map 1.4: Wetlands and Waterbodies

Wetlands and Waterbodies



The most prevalent wetland type throughout Middlesex County includes freshwater forested/shrub wetlands dominated by woody plants, **Map 1.4**. Freshwater forested/shrub wetlands encompass freshwater swamps and floodplain forests. These wetlands provide vital ecosystem services such as flood risk reduction, soil-water infiltration, water retention, carbon storage, filtration of pollutants that cause eutrophication (negative impacts of excessive nutrients) in adjacent waterbodies and provide valuable habitats for biodiverse flora and fauna. ⁽⁴⁷⁾ The southern portion of Middlesex County contains the highest concentrations of freshwater forested/shrub wetlands. ***Localized areas lacking freshwater forested/shrub wetlands hold a greater risk of flooding, drought, eutrophication, and biodiversity loss.***

Figure 1.9: Freshwater Forested/Shrub Wetland in South Brunswick



Source: CUES, Rutgers University. Photograph. 2021.

Estuarine and marine wetlands include the County's tidally influenced, coastal, and brackish wetlands. They provide coastal flood protection and invaluable habitat for aquatic, terrestrial, and avian wildlife. Wildlife requires estuarine and marine wetland locations for nesting, foraging, and migration.⁽⁴⁸⁾ In Middlesex County, estuarine and marine wetlands occur along the Raritan River, South River, Cheesequake Creek, tributaries of the Arthur Kill in Woodbridge, and along the Rahway River in Carteret, **Map 1.4**.⁽⁴⁹⁾ Projected sea-level rise (discussed in Section 1.3) and storm surges amplified by climate change threaten these areas.^(50, 51)

Wetlands include waterbodies with shared protection under the Clean Water Act.⁽⁵²⁾ Waterbody categories include estuarine and marine deep water, freshwater (riverine, ponds, and lakes), and category one (C1) streams. Brackish estuarine and marine saltwater bodies in Middlesex County occur mainly in the Raritan River and creeks that connect directly to the Arthur Kill and Raritan Bay, **Map 1.4**. They provide economic value through tourism, fisheries, and recreational activities. They are also irreplaceable natural habitats for migratory birds and critical bird spawning locations.⁽⁵³⁾

Figure 1.10: Freshwater Pond in Edison



Source: CUES, Rutgers University. Photograph. 2021.

Freshwater waterbodies such as ponds, lakes, and riverine systems are valuable habitats for aquatic and terrestrial wildlife and great recreational areas. These waterbodies provide ecosystem services such as water storage. Category one streams include “outstanding natural resource waters,” like habitat and drinking water, designated by the NJDEP. C1 streams have a monitored 300-foot buffer protected from development under the Flood Hazard Control Act. These wetlands and buffers operate as essential habitats for endangered and threatened species such as the wood turtle and shortnose sturgeon. ⁽⁵⁴⁾

Figure 1.11: Adult Wood Turtle in New Jersey



Source: U. S. Fish and Wildlife Service- Northeast Region. (2010). Adult Wood turtle in hand at Great Swamp National Wildlife Refuge. Wikimedia Commons. photograph, Wikimedia Commons.
[https://commons.wikimedia.org/wiki/File:Adult_Wood_turtle_in_hand_at_Great_Swamp_National_Wildlife_Refuge_\(6762041173\).jpg](https://commons.wikimedia.org/wiki/File:Adult_Wood_turtle_in_hand_at_Great_Swamp_National_Wildlife_Refuge_(6762041173).jpg)

The County’s wetland types provide invaluable water management ecosystem services. Wetland locations compared with development patterns or impervious surfaces can outline areas needing mitigation to reduce potential landscape threats of sea-level rise, climate change, and over-development resulting in flooding, habitat loss, and habitat degradation. The *Analysis* chapter explores the locations of impervious surfaces concerning the County’s wetlands.

Watershed Management Areas

“A watershed is the area of land that drains into a body of water such as a river, lake, stream or bay,” landforms define watershed boundaries. ⁽⁵⁵⁾ There are four Watershed Management Areas (WMA) that transect Middlesex County’s landscape: (1) Arthur Kill, (2) Lower Raritan, South River, and Lawrence (Lower Raritan), (3) Millstone, and (4) Monmouth, **Map 1.4**. All WMAs cross the County’s border into neighboring counties, exemplifying the necessity for regional environmental planning. WMAs do not follow political boundaries; therefore, management and stewardship of water quality and storage are a shared responsibility among neighboring municipalities and counties. ⁽⁵⁶⁾ Sub-watershed units break down the four watershed management areas into local-scale, smaller units known as HUC-14 or hydrologic unit code 14, shown in **Map 1.5**.

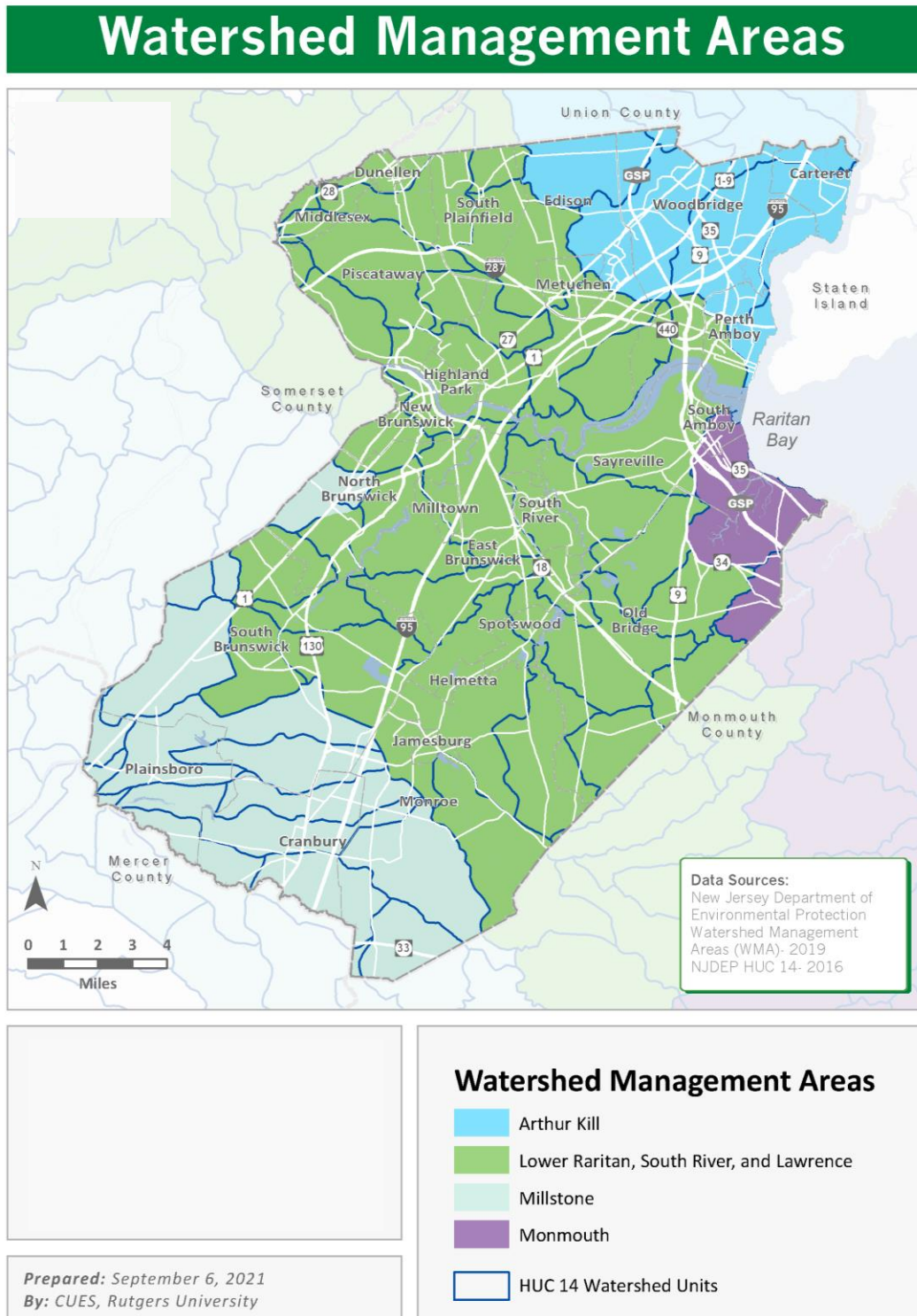
Table 1.3: Watershed Management Area acreage within Middlesex County

Watershed Management Area	Acres in Middlesex County	Percent of Total
Arthur Kill	23,020	11.3%
Lower Raritan, South River, and Lawrence	128,747	63.5%
Millstone	42,678	21.1%
Monmouth	8,415	4.1%
Total	202,860*	100%

Source: NJDEP, Watershed Management Areas (WMAs), 2019 ESRI GIS, Area (ac) Field Calculator,
PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet

* Total acreage calculation derived from GIS data.

Map 1.5: Watershed Management Areas



The Arthur Kill watershed encompasses the Northeast region of the County, feeding the Rahway River and the Woodbridge Creek ending at the Arthur Kill. Carteret and sections of Perth Amboy, Woodbridge, Edison, and Metuchen contribute to the Arthur Kill watershed. Parts of Union and Essex counties also contribute to the Arthur Kill watershed.

The Lower Raritan, South River, and Lawrence watershed management area (Lower Raritan) covers over 60 percent of the County's landscape (**Table 1.3**). The Lower Raritan encompasses 16 municipalities and the majority of secondary and tertiary watercourses in the County leading to the Raritan River. Parts of Union, Somerset, and Monmouth counties share the Lower Raritan. Solidifying the importance that water management tools through watershed management areas directly influence the water quality and water storage capabilities within Middlesex County. ⁽⁵⁷⁾

The Millstone watershed includes the Millstone River and its associated tributaries in the Southern portion of the County across Plainsboro, Cranbury, and parts of Monroe and North Brunswick Townships. The Millstone WMA collects water from Somerset, Mercer, Hunterdon, and Monmouth Counties portions.

The Monmouth WMA extends into a small portion of the County's coastal zone through the Cheesequake region flowing into the Raritan Bay. ⁽⁵⁸⁾ Parts of the City of South Amboy, Borough of Sayreville, and Old Bridge Township feed water into the Monmouth WMA. The Monmouth WMA is primarily in Monmouth County.

Development and urban land use changes within each watershed replace vegetation and permeable land with impervious surfaces. This replacement permanently alters water flow, infiltration rates, and water quality. ⁽⁵⁹⁾ Increased urbanization and impervious surfaces in conjunction with reduced naturalized lands can negatively impact the function of the watershed by increasing pollutants, volume, and velocity of water from the watershed entering local rivers and streams while reducing water storage capabilities. This subsequently creates more frequent flash flooding events, amplifies flooding intensity, increases water restrictions in summer months, and decreases water quality. ***It is essential to monitor and plan development in each WMA appropriately to reduce stormwater runoff entering waterways and increase water infiltration and storage potential.***

Major Urbanized Land Use

Middlesex County's location and proximity to significant waterways have created an ideal place for settlement and development. Widespread development and urbanization, which vary in type across the landscape, occurred from the County's perfect location. Urban land use, **Map 1.2**, further divides into detailed Urban categories as defined by NJDEP, **Map 1.6**. Level 1 Urban land (also known as Urban or Built-Up Land) "is characterized by intensive land use where human activities have altered the landscape."⁽⁶⁰⁾ Level 2 Urban land includes commercial/services, industrial, and high, medium, and low-density residential.⁽⁶¹⁾

Urban areas include places where human activity occurs more widely, influencing the experiences, demographics, and structure of both communities and the landscapes they encompass. It is essential to understand the composition and locate urban land uses to know how various actions apply to different landscapes.

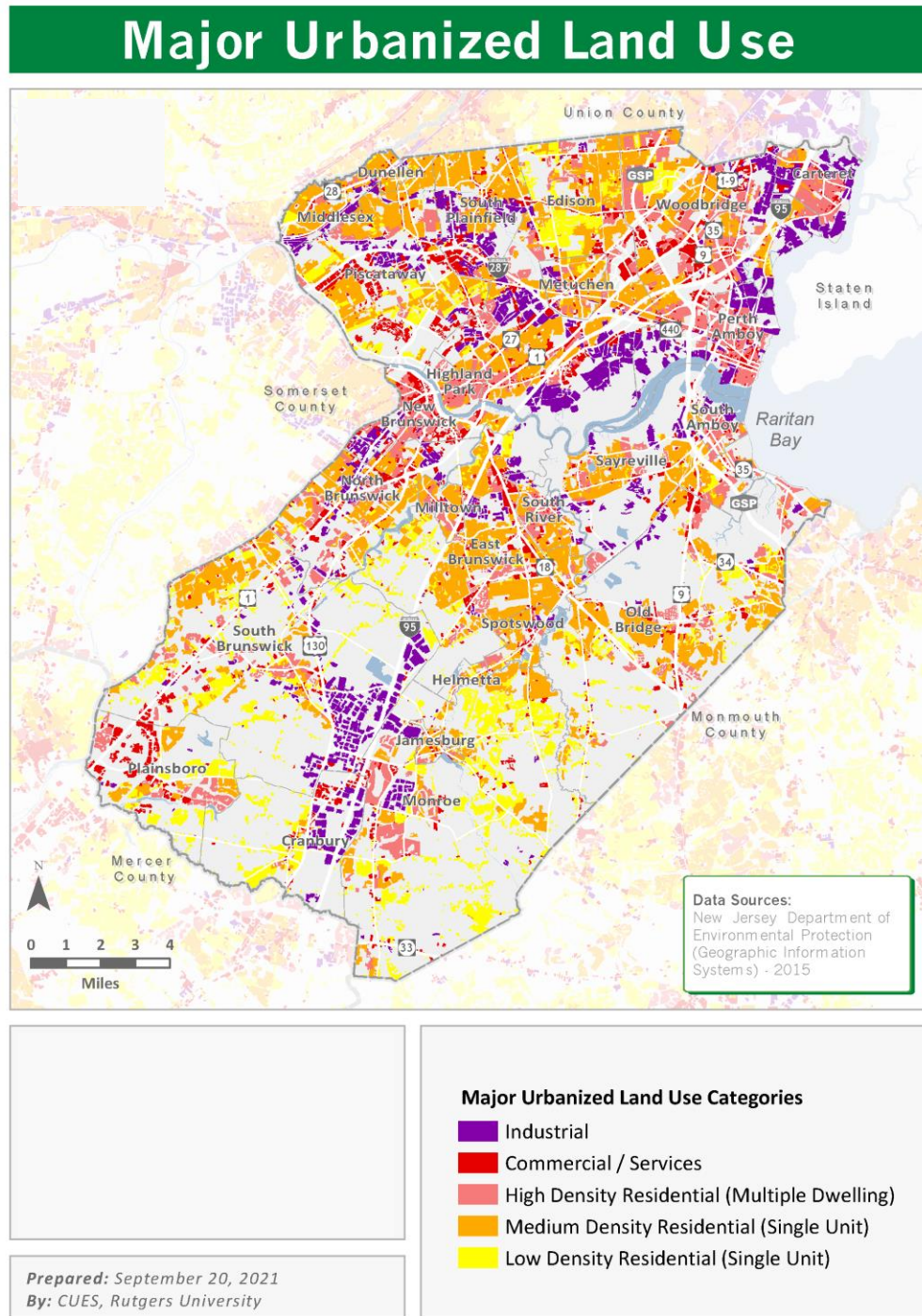
Table 1.4: Major Urbanized Land Use Types and Acreage

Type	Acres	Percent of Total
Industrial	12,722	14%
Commercial / Services	12,967	14%
High-Density Residential	15,466	17%
Medium-Density Residential	37,369	40%
Low-Density Residential	14,846	16%
Total	93,370	100%

Source: NJDEP, Land Use Land Cover 2015, ESRI GIS Field Calculator acres

PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet

Map 1.6: Major Urbanized Land Use



Commercial services (red) locate the retail centers within each municipality. Commercial services include a wide variety of uses such as Central Business Districts (CBD), commercial strip development, isolated goods and services, isolated office buildings, shopping centers, hotels, educational and health institutes, government centers, and more. The commercial centers often anchor the major roadways seen throughout the County.

The larger cities in Middlesex County, Perth Amboy and New Brunswick, are predominately commercial services-based, with high-density residential dwellings surrounded by industrial land. Industrial land use includes light and heavy industry, which are “comprised of land uses where manufacturing, assembly or processing of products takes place.”⁽⁶²⁾ This includes warehouses (light) and refineries (heavy).⁽⁶³⁾ Industrial land use surrounds the city’s residential areas, typically along the waterfront (seen in Perth Amboy and the more densely populated Borough of Carteret). Industrial areas are not only along the waterfront but also adjacent to the regional transit corridors along Route 287, Piscataway; along Interstate-95 and the waterfront, Carteret, and Perth Amboy; along U.S. Route 1 in New Brunswick, North Brunswick, and South Brunswick; in Dunellen and Middlesex along Route 28; and along Interstate-95 near Jamesburg and Cranbury.

Residential land use is the most widespread across the County (yellow-orange gradient). Low-density residential is comprised of “single-unit residential neighborhoods with areas greater than half-acre up to and including one-acre lots.”⁽⁶⁴⁾ Medium Density Residential (Single Unit) is “comprised of residential urban and suburban neighborhoods greater than an eighth-acre and up to and including half-acre lots,” and high-density residential is “single-unit residential areas of more than five dwellings per acre, often found in densely populated urban areas.”⁽⁶⁵⁾ In Middlesex County, medium and high-density residential land uses are clustered around major roadways.

Low-density residential is in more of the County’s southern regions and concentrated in the northern County in Edison, Woodbridge, Piscataway, and Middlesex. Southern areas have utilized cluster zoning techniques to focus on residential development, avoiding the destruction of rural and natural landscapes. Due to suburban sprawl, medium-density residential land most widely spreads throughout the County. High-density residential dwellings occur in cities adjacent to major roadways and transportation networks. ***It is essential to monitor the spread of residential development as it has replaced ecological habitats and former farmland.***

The differentiation of urban land uses by type defines the character of the built landscape and reveals opportunities for improvements and environmental mitigation. ***Intervention-based approaches, such as policies and initiatives, will vary based on landscape types.*** Examples include industrial buildings, commercial warehouses, large office parks, etc., which will require different interventions compared to low-density residential housing. Accordingly, the positive impact of a large building (ex, warehouse or high-density residential buildings) adopting a green infrastructure initiative (ex, green roof or solar array) will be much more significant than a small private home. Therefore, it is essential to consider the variation within urban land use, as each major type will require different considerations. Further analysis will inform actions that positively impact the community, such as enhancements to energy utilization, stormwater management, landscape connections, and other opportunities for ecosystem service improvements.

Change in Commercial Areas

The rapid growth of Middlesex County's commercially zoned land occurred in a short period (29 years). Between 1986 and 2015, commercially zoned land expansion reached an additional 1,192 acres (+10 percent).⁽⁶⁶⁾ From 1986 to 2015, commercial land expansion shows that the demand for more commercial commerce continues today since newly developing residential communities will need local commercial services.

Commercial growth between 1986 and 2015 predominately occurred along major roadways, including U.S. Route 287, U.S. Route 1, and U.S. Route 130. Expansion of commercial land use occurs throughout the County across all highways. Development happens on County and State roads. An example includes commercial growth on County Road 604 (Oak Tree Road, Edison). Commercial land use expansion patterns occur in larger clusters in the agricultural, wetland, and forested areas in the south (compared to 1986 LULC **Map 1.3**), likely due to residents' cultural preferences for suburban and rural residential landscapes creating a demand for more commercial areas. Expansion reveals how culture imprints itself on the landscape through land use changes expressing desired trends.

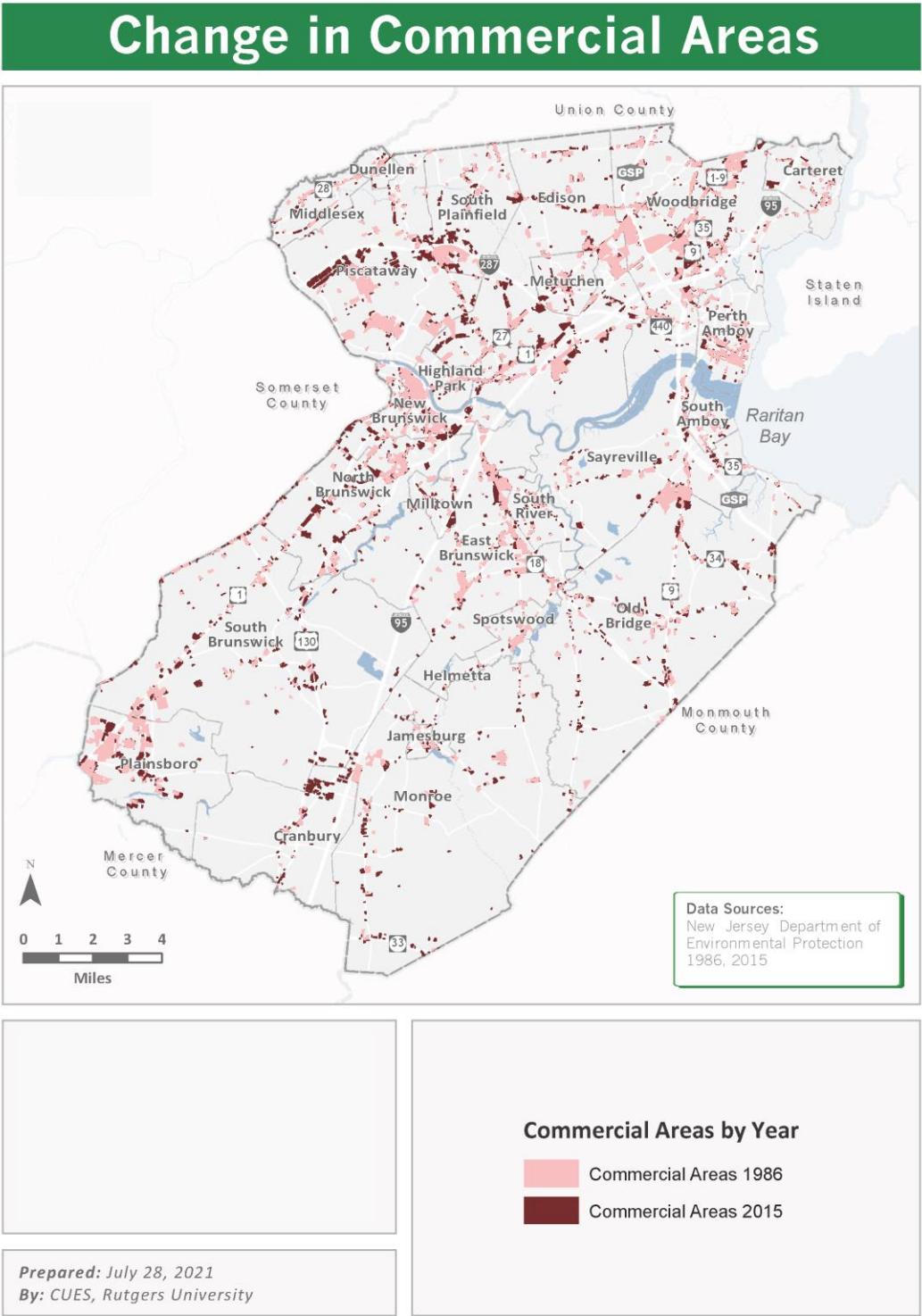
The land use comparison raises questions about commercial land's visual character, design and maintenance standards, and environmental impacts. The retail growth trend helps identify an expansion trend which highlights potential uses for underutilized and abandoned commercial properties. This information confirms commercial property growth, expressing the importance of incorporating ecological best management practices and culturally relevant design in planned development and redevelopment projects.

Table 1.5: Commercial/Services Acreage by Year

Type	Year	Acres
Commercial/Services	1986	11,500
Commercial/Services	2015	12,692
Total Change	29 Years	1,192

Source: NJDEP, Land Use Land Cover 2015, ESRI GIS Area (ac) Field Calculator,
PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet

Map 1.7: Change in Commercial Areas



Impervious Surfaces

Impervious surfaces accompany urbanization in the form of building structures, paved parking lots, sidewalks, and more. The *Land Use Land Cover* inventory revealed that Middlesex County's landscape is 60 percent urban. At the same time, this section explores the extent of impervious surfaces covering the County's landscape based on NJDEP's 2015 land use land cover impervious surface inventory.

Impervious surfaces prevent surface water from infiltrating into the ground, reducing groundwater recharge and water storage capabilities. Water's inability to permeate the soil increases water runoff volumes, causing intensified flooding.⁽⁶⁷⁾ In addition to the life-threatening dangers of floods, impervious surfaces jeopardize water quality by facilitating the movement of harmful nonpoint source pollution (from a non-discernible source). Non-point source pollution enters local streams through surface runoff.⁽⁶⁸⁾ Stormwater runoff may contain nitrogen and phosphorus pollutants from fertilizers, pet, and yard waste.⁽⁶⁹⁾ Intensified floods can lead to non-point source pollution into low-lying areas such as floodplain forests and wetlands, harming these environments.

Map 1.8 outlines the impervious surfaces across Middlesex County's landscape, detailing the various types of impervious cover. The types include building footprints, roads, parking lots, and "other" impervious surfaces such as sidewalks, driveways, patios, and other surfaces of similar material (asphalt and concrete).^(70, 71) ***Understanding the composition and type of impervious surfaces across Middlesex County informs the implications of urban development's spread leading to priority areas for impervious surface replacement and removal through action implementation.***

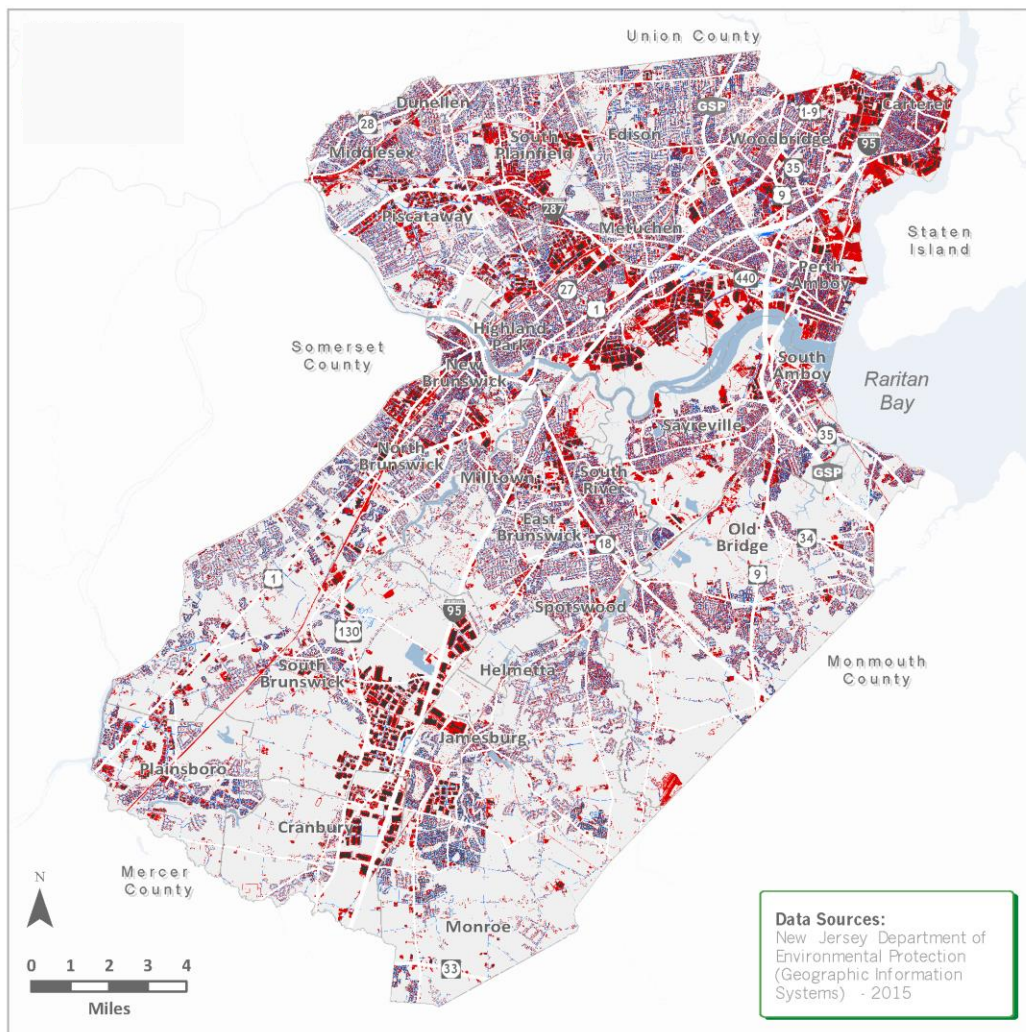
Table 1.6: Impervious Surfaces (2015) Classes and Acreage

Class	Acres	Percent of Total	Percent of Total County
Building	16,533	26%	8%
Road	17,346	27%	9%
Other: Parking lots and paved surfaces	29,890	48%	15%
Total	63,768	100%	32%

Source: NJDEP, Land Use Land Cover 2015 Impervious Surface, ESRI GIS Area (ac) Field Calculator,
PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet

Map 1.8: Impervious Surfaces

Impervious Surfaces



Prepared: July 28, 2021
By: CUES, Rutgers University

The impervious surface types correlate closely with the *Major Urban Land Cover* shown in **Map 1.6**. Smaller building footprints spread across the entirety of the County in residential and commercial areas, while large building footprints occupy industrial and commercial land uses. Interstate-95, U.S. Route 130, U.S. Route 1, and U.S. Route 287 corridors house many of the County's larger building footprints, **Map 1.8**. Warehouse footprints and parking lots contribute to more prominent contiguous impervious surface coverage, **Map 1.8**.

Large warehouses, residential dwellings, commercial structures, etc., increase water runoff rates. Dense, impervious surface cover contributes to rising temperatures and the urban heat island effect (see **Map 1.16 Urban Heat Islands**). ***Naturalized land management and preservation, along with porous materials throughout the landscape, will increase water infiltration rates, filter nonpoint source pollution before entering waterways, and help reduce rising temperatures to benefit human health and ecological communities.***

Figure 1.12: Commercial Parking Lot in East Brunswick



Source: CUES, Rutgers University. Photograph. 2021.

Middlesex County's landscape contains 32 percent (63,768 acres) impervious surface cover across the entire landscape (2015), **Table 1.6**. Nearly half (48 percent) of the total impervious surfaces in the County include the type "other" surfaces. Parking lots, sidewalks, and patios form pieces of the County's landscape and offer ideal locations for impervious surface improvements.

Parking Lots by Size

Parking lots are a significant contributor (48 percent of total impervious surfaces) to the excessive amount of impervious surface coverage across the County. Impervious materials such as asphalt or concrete typically comprise parking lot materials that range in size and color. Often darker in color, they cause higher surface temperatures. Parking lot size reduction and surface replacement with permeable materials can significantly reduce runoff and urban heat islands. Tactics to lessen the negative impacts of impervious surfaces include replacement with permeable materials and green infrastructure, overall size reduction, lighter coloring, or shade tree additions. Parking lots can even act as gathering places for events with added cultural benefits such as shaded environments and aesthetically pleasing outdoor spaces from the mentioned solutions.

Categorizing parking lots by size helps visualize possible opportunities to reduce the negative impacts of impervious surfaces across the landscape. ***Large parking lots pose several challenges to stormwater management, wetland health, and urban heat islands with more surface area replacing permeable materials.*** Parking lots greater than one acre in size contribute 61 percent of the County’s “other” impervious surface class category. The larger parking lots exceeding one acre in size align with the larger building footprints along major roadways mentioned in the previous section, ***Map 1.6***, Perth Amboy, Carteret, Piscataway, Woodbridge, Edison, South Plainfield, Middlesex, New Brunswick, South Amboy, South River, and Cranbury contain sections of parking lots greater than one-acre in size shown in ***Map 1.9***.

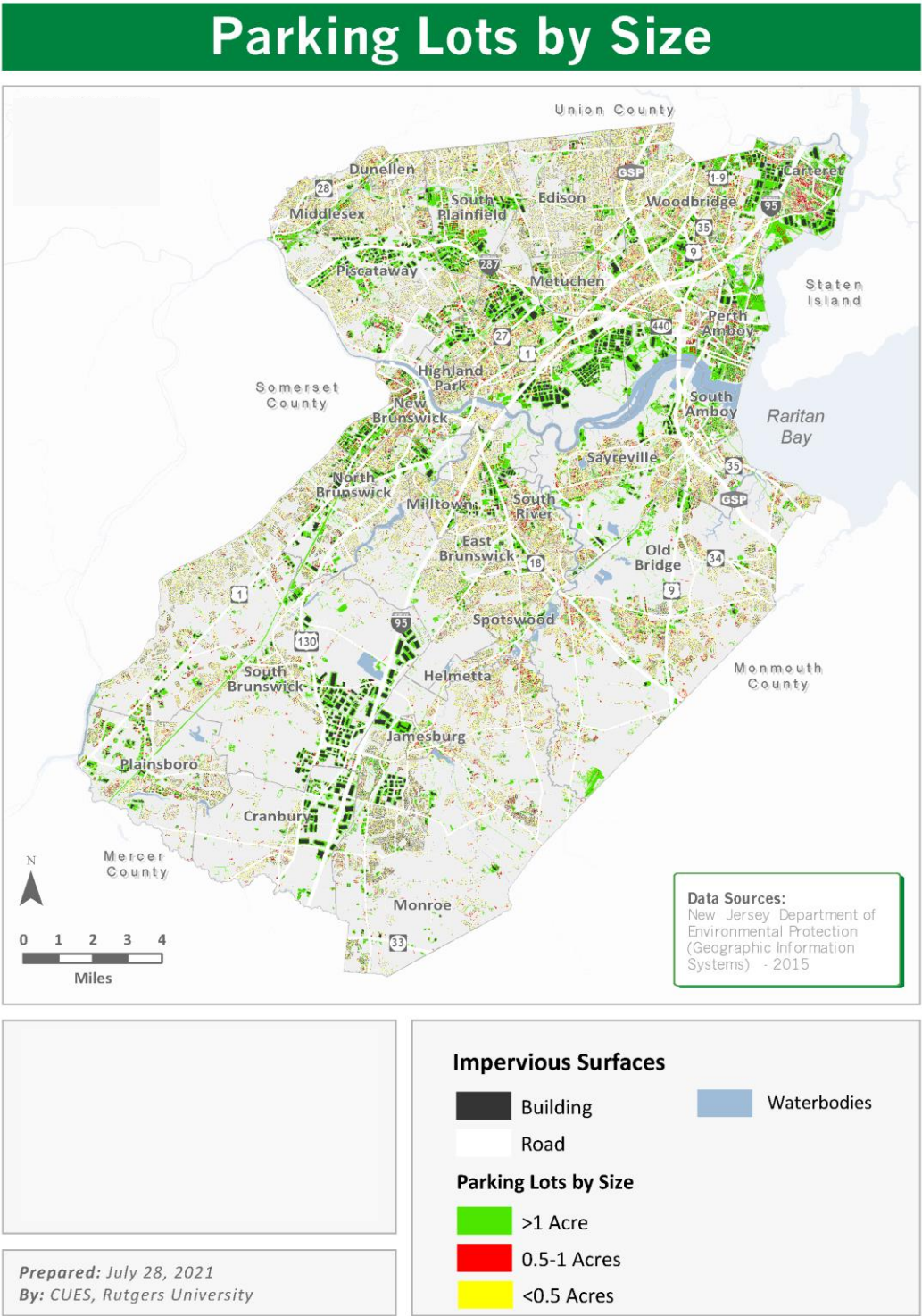
Table 1.7: Parking lots by size greater than 1 acre - 0.5 acres and total acreage

Parking lot by size	Acres	Percent of All Other
Greater than 1 acre	18,165	61%
Between .5 and 1 acre	2,521	8.5%
Less than .5 acres	9,204	30%
All Other*	29,890	100%

Source: NJDEP, Land Use Land Cover 2015 Impervious Surface, ESRI GIS Area (ac) Field Calculator,
PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet

*Total area calculated in GIS of entire “other” impervious surfaces land use category.

Map 1.9: Parking Lots by Size



LAND USE AND LAND COVER SUMMARY

Middlesex County's land use and land cover encompass multiple landscape features that explain the County's development patterns seen today. The inventory of the County's topography revealed that the Raritan River divides the County into northern and southern halves. Naturally, riparian corridors sit at the lowest elevations like the Raritan River or South River Edge below 20 feet above sea level. The Sand Hills of South Brunswick occupy the highest peak at over 220 feet above sea level. Urbanization typically favored the County's low points along the major rivers and tributaries, evidenced by the County's extensive industrial progression anchored in New Brunswick, on the Raritan River, and Perth Amboy on the Arthur Kill, Raritan River, and Raritan Bay.

As a result of industrialization and development pressures from the surrounding cities, the landscape is roughly 60 percent urban with pockets of forest (approximately 13 percent), wetland (approximately 20 percent), and agricultural (approximately 5 percent) land uses. The coastal plain and northern piedmont physiographic regions split the County northeast to the southwest. Agricultural land, forests, and wetlands occupy the southern half of the County in the coastal plain, while urbanization more widely occurs in the northern piedmont with pockets of forests and wetlands. Barren land, including landfills and vacant land, occurs across the County, with the largest parcels adjacent to the Raritan River and Raritan Bay.

As noted, wetlands occupy approximately 20 percent of the County's landscape. More than half of the County's wetlands include freshwater forested/shrub wetlands. Wetland loss in a comparison of mapped areas between 1986-2015 reveals 9,594 acres (23 percent) of natural wetland change likely due to developmental pressure (not accounting for wetland construction likely responsible for the overall two percent gain). The federal and state governments protect wetlands and waterbodies by providing valuable habitats for ecological life and invaluable ecosystem services. Wetlands offer valuable landscapes serving the entire watershed by storing, cleaning, and regulating groundwater stores, holding and filtering stormwater, and buffering coastal communities from storm surges.

Nearly 60 percent of the County's area contributes water to the Lower Raritan Watershed Management Area. The remaining three watersheds (Arthur Kill, Millstone, and Monmouth) encompass smaller portions of the southwest, southeast, and northeast. ***Land management practices and land use monitoring within watersheds significantly impact flood risk and water quality.***

The County's urban landscapes include industrial, commercial/services, and residential land uses. Industrial patterns closely align with the major road corridors and waterfronts. Between 1986 and 2015, commercial land includes an additional 1,192 acres (10 percent gain). Residential land uses inhabit nearly half of the County at 46 percent of the County's total acreage.

Impervious surface cover directly correlates to urban land use. Smaller building footprints sprawl across the County, while large building footprints exist in industrial and commercial areas. Parking lots also encompass many acres of the County's landscape. These parking lots often accompany industrial land uses.

Land Use and Land Cover represent humans' historical impacts on the landscape. Car-centric suburban lifestyles favor large parking lots, single-unit residential homes, and even materials like asphalt that impact natural resources. Human impacts affect the ability of landscapes to capture stormwater, stabilize temperatures, and combat the adverse effects of climate change, providing essential ecosystem services to support a high quality of life. Best Management Practices (BMP) in the developed landscape become crucial to protect the surrounding natural environment and associated resources.

1.2 NATURAL RESOURCES

INTRODUCTION

Natural resources include land, air, wildlife, water, biota, groundwater, and more. Natural resources and their environments offer beneficial ecosystem services for the surrounding human population. ⁽⁷²⁾ This section inventories the County's natural resources; the analysis will include the benefits those resources provide to people, defined as ecosystem services. The broad definition of ecosystem services consists of the benefits people obtain from the ecosystem. ⁽⁷³⁾ These benefits include provisioning services (provisions of food, fresh water, fuel, fiber, and other goods); regulating services (climate, water, and disease regulation); supporting services (soil formation, nutrient cycling, and support pollinators); and cultural services (education, aesthetic, cultural heritage, recreation, and tourism). ⁽⁷⁴⁾ Natural resources support ecosystem services as their potential directly relates to the quality of natural resources.

The quality and quantity of local ecosystems benefit human health and wellbeing through the County's natural resources and offer essential functions for the survival of wildlife and plant species. This section (1.2) discusses the components that compose Middlesex County's natural ecosystems, including tree canopy cover, terrestrial habitats, rare plants, wildlife habitats, and groundwater recharge locations and rates to locate and understand the County's natural resources.

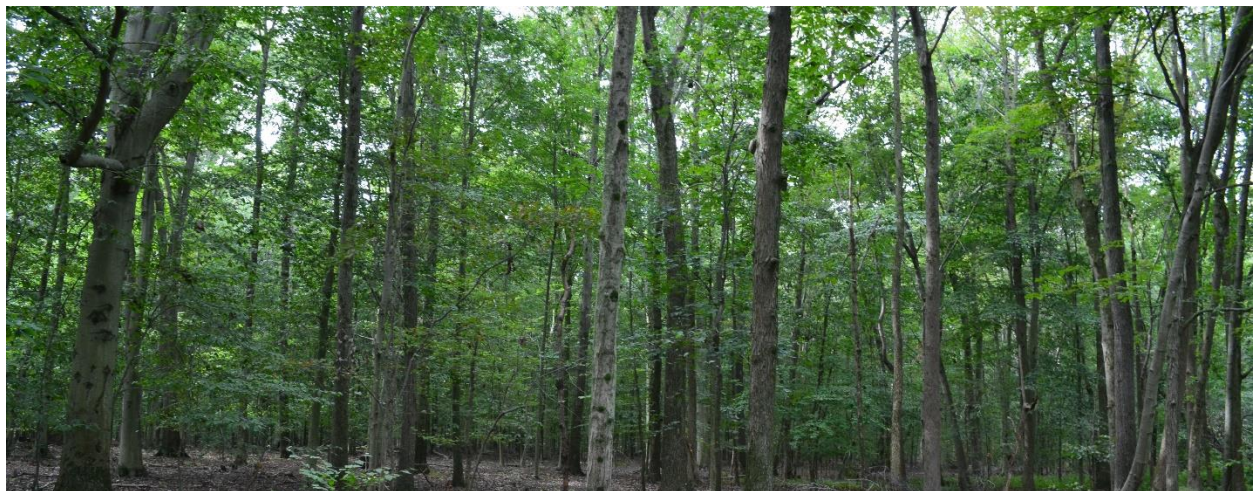
Tree Canopy Cover

Tree canopy cover from shade trees is an essential ecosystem service. Tree canopies cool and regulate temperatures through shade and evapotranspiration, while shade trees absorb stormwater. ⁽⁷⁵⁾ The tree canopy function helps mitigate urban heat island effects. The tree canopy from one shade tree can reduce surface temperatures by 20–45 degrees Fahrenheit in peak temperatures compared to unshaded surfaces. ⁽⁷⁶⁾ Tree canopies have many benefits and help filter air pollutants such as carbon emissions, providing clean oxygen for residents. On average, one acre of new forest can sequester about 2.5 tons of carbon per year. ⁽⁷⁷⁾ For perspective, on average, one person's activities in the U.S. release 16 tons of carbon annually. ⁽⁷⁸⁾ Carbon emissions from vehicles and building cooling or energy consumption amplify the heat index in urban heat islands by emitting carbon.

Cultural preference favors tree canopy cover as it improves aesthetics, increases privacy, and provides screening to non-scenic land uses. ⁽⁷⁹⁾ Increased property values often accompany parcels with greater tree canopy cover, while those with less can negatively impact property values. ⁽⁸⁰⁾ According to the NJDEP NJ Forest Service, residential lots with shade trees can sell for 20 percent more than an unshaded lot. ⁽⁸¹⁾ Moreover, tree canopies foster local fauna habitat, further elevating ecological value. Overall, tree canopy cover improves residents', visitor's, and wildlife's quality of life.

Tree canopy cover density measurement values range from 0-100 percent. The density value correlates to the percent coverage of a 30 x 30-meter area (cell size in ArcGIS) inventoried by the U.S. Forest Service through aerial imagery (2016). ⁽⁸²⁾

Figure 1.13: Scott's Corner Conservation Area Dense Tree Canopy Cover, Plainsboro

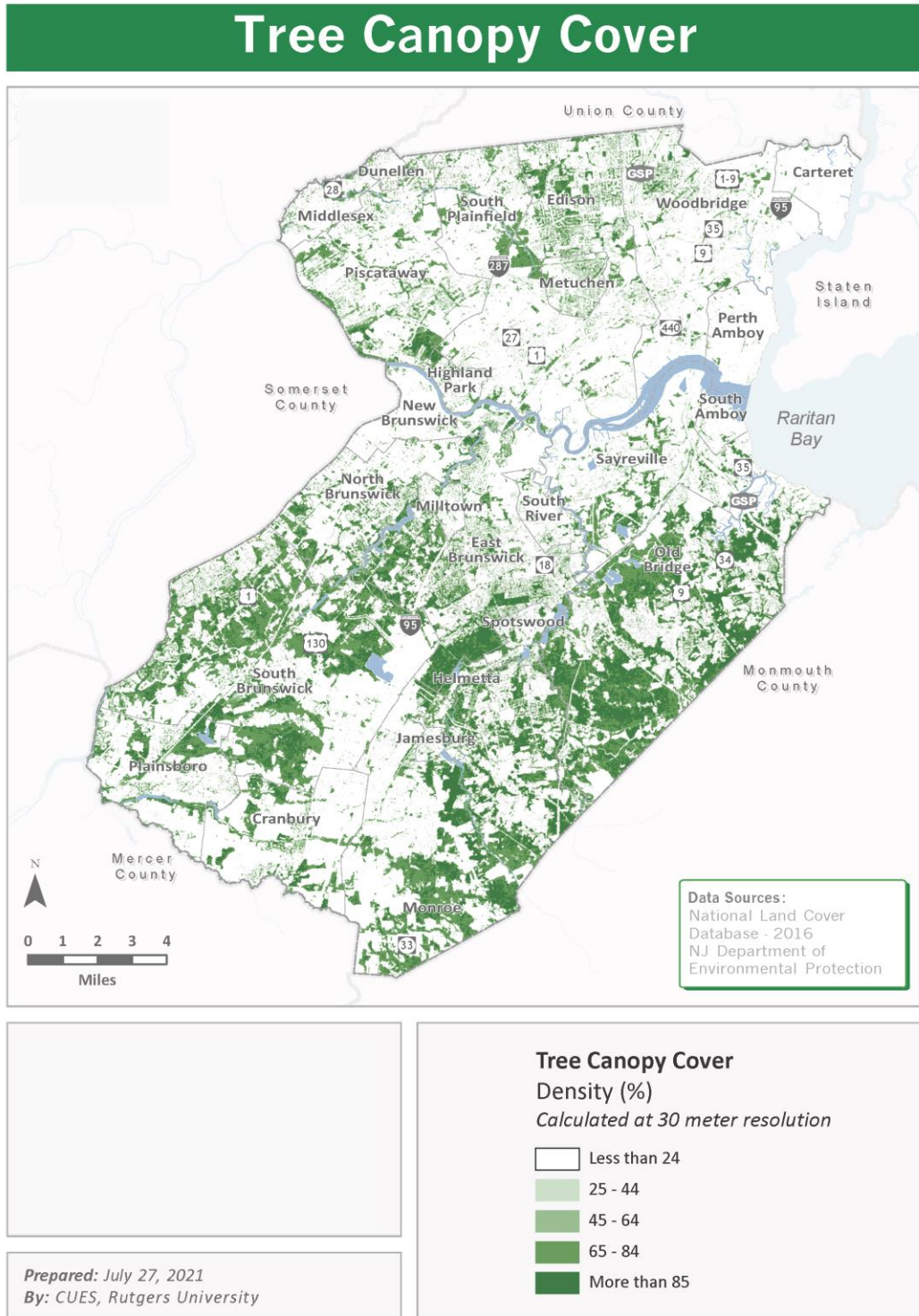


Source: CUES, Rutgers University. Photograph. 2020.

Middlesex County's tree canopy cover ranges from 0 percent density cover areas to over 85 percent, **Map 1.10**. The greatest densities, over 65 percent, exist most prevalently south of the Raritan River. These densely covered areas contain the largest parcels of preserved natural land containing forests and swamps (forested wetlands). However, most of the County has less than 24 percent tree canopy cover or the lowest density calculation category (exact percentage not available). This occurs in urbanized and developed lands even though they may contain small street trees or sparse spacing of remnant mature trees. ⁽⁸³⁾ Perth Amboy, Carteret, and New Brunswick average under 24 percent cover (essentially no tree canopy cover). ***On a regional scale, most county urbanized areas contain tree canopy covering less than 24 percent.***

Discouraging increased development in and around preserved forested locations is vital to ensure future canopy cover and invaluable ecosystem services. Places where tree canopy cover appears lacking in urban areas provide primary focus sites for canopy cover improvement. In these urban areas, street tree planting initiatives become paramount, and open space acquisitions where more tree plantings can occur. A comparison with impervious surfaces in the *Analysis* chapter examines locations where low canopy cover compares with high development.

Map 1.10: Tree Canopy Cover

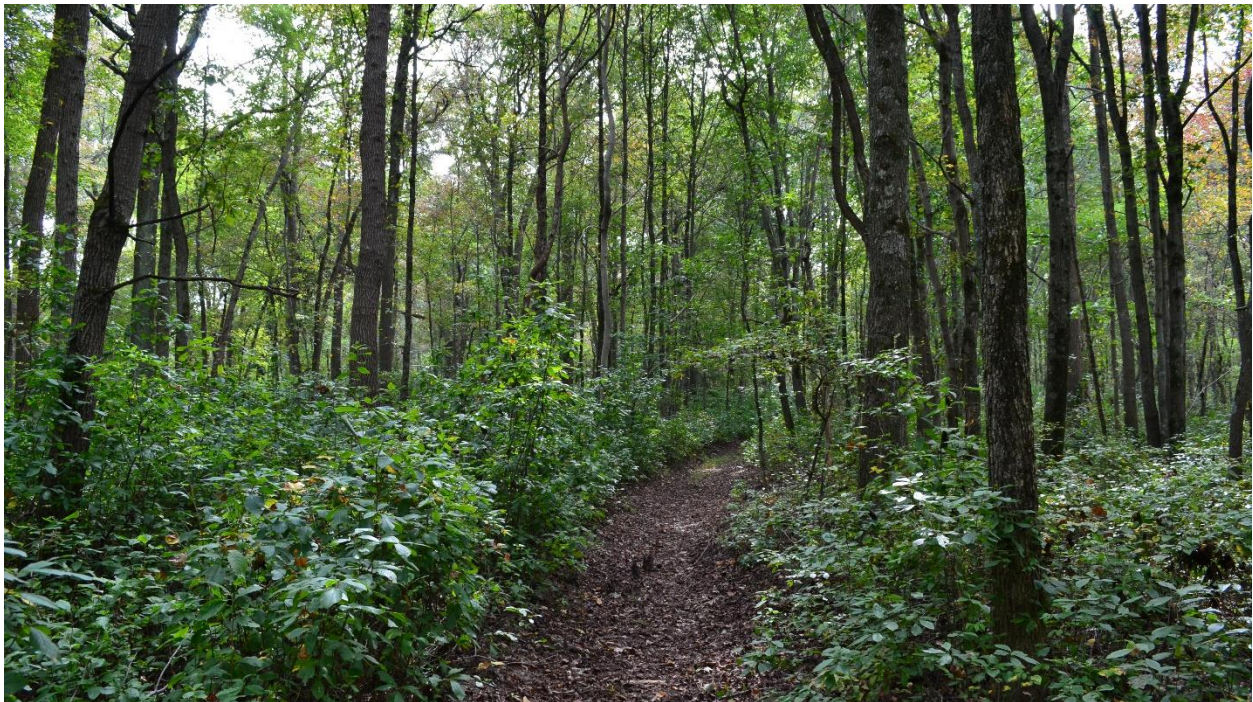


Terrestrial Macrohabitats and Physiographic Regions

Two physiographic regions in New Jersey divide Middlesex County's landscape. The piedmont to the north and the inner coastal plain to the south, **Map 1.11.**⁽⁸⁴⁾ Flatter, milder slopes encompass the inner coastal plain, while the piedmont contains rolling hills.⁽⁸⁵⁾ The key differences between the regions include geological and glacial histories. These histories influenced differing formations of soil types with agricultural favored soils in the south. Soil types support different plant communities, forest types, and wildlife. ***Each region contains unique, high-quality natural areas which support a locally exclusive natural and cultural identity.***

Vegetation communities define the County's terrestrial habitats. Middlesex County's terrestrial macrohabitat designations differ between physiographic regions, **Map 1.11.**⁽⁸⁶⁾ The most prominent macrohabitats within Middlesex County include central oak-pine forest, coastal plain swamp, northern swamp, and tidal marsh. ***The species assemblages in relatively pristine locations serve as reference ecosystems for more degraded areas to inform restoration and conservation actions.*** Furthermore, the terrestrial macrohabitats provide shelter, nesting areas, forage, and other resources that support native wildlife.

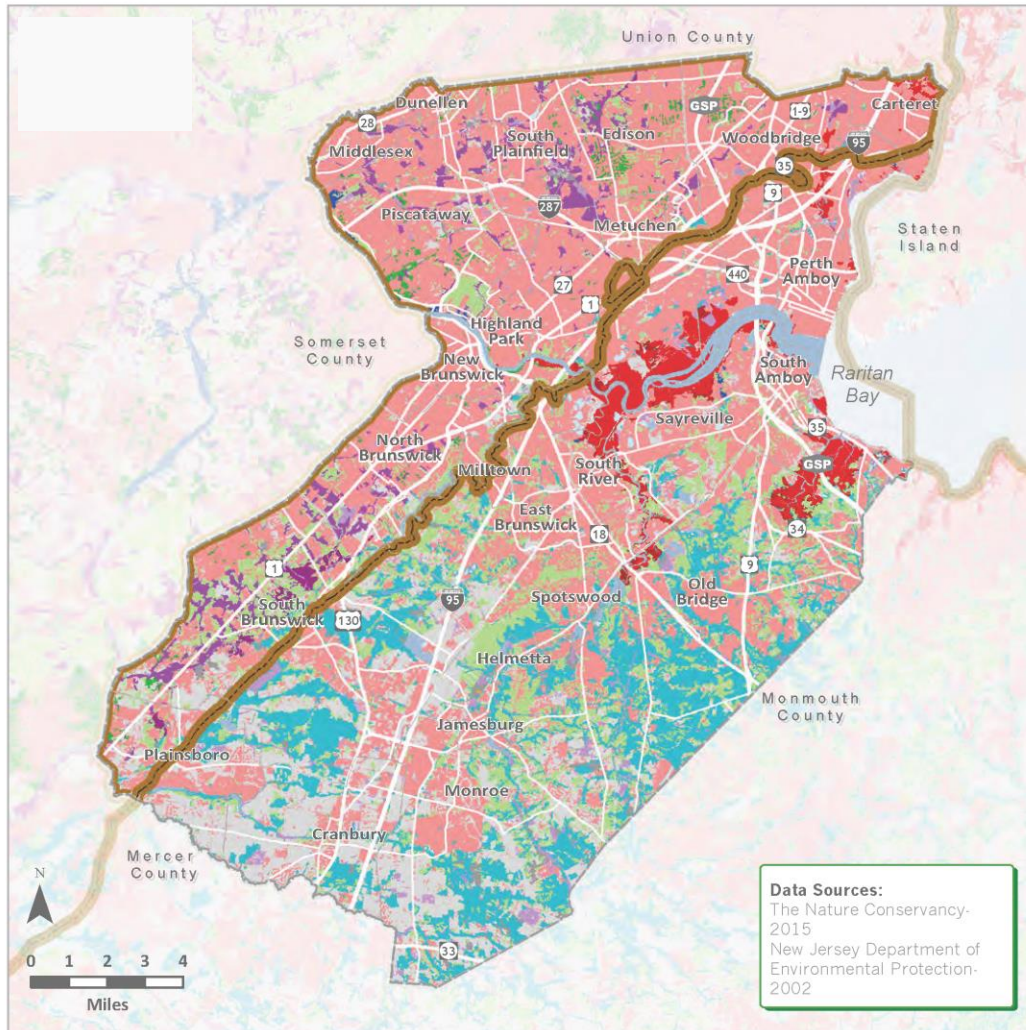
Figure 1.14: Central Oak-Pine Forest at John A. Phillips Preserve, Old Bridge



Source: CUES, Rutgers University. Photograph. 2020.

Map 1.11: Terrestrial Macrohabitats & Physiographic Regions

Terrestrial Macrohabitats & Physiographic Regions



Macrohabitats & Physiographic Region

- | | |
|--------------------------|-----------------------------------|
| □ Agricultural | ■ Northern Hardwood & Conifer |
| ■ Central Hardwood Swamp | ■ Northern Swamp |
| ■ Central Oak-Pine | ■ Tidal Marsh |
| ■ Cliff and Talus | ■ Tidal Swamp |
| ■ Coastal Plain Peatland | ■ Developed Land |
| ■ Coastal Plain Swamp | ■ Water |
| ■ Emergent Marsh | ■ Wet Meadow / Shrub Marsh |
| ■ Large River Floodplain | ■ Piedmont & Coastal Plain Border |

Prepared: August 17, 2021
By: CUES, Rutgers University

Mixed-upland oak species dominate Middlesex County's central oak-pine forests, which host thousands of faunal species critical to local food webs.⁽⁸⁷⁾ The central oak-pine forest is prevalent throughout the south, especially in the southeast. The central oak-pine vegetation in the inner coastal plain differs slightly from a similar forest type in the northern piedmont. In the piedmont, forest types within the central-oak pine encompass northeast interior dry-mesic oak forests, with several oak species. This forest contains shagbark and mockernut hickories, sugar and red maple, and black and yellow birch, **Figure 1.15**.⁽⁸⁸⁾ The Rutgers Ecological Preserve in Piscataway provides an example of the northeast interior dry-mesic oak forest type. Examples also include upland portions of Johnson Park in Piscataway and parts of Tingley Lane Park in Edison Township.

Northern Atlantic Coastal Plain Hardwood Forests occupy a similar forest type in the inner coastal plain dominated by oaks but also include black birch, sassafras, American holly, and pitch pine, with heath shrubs in the ground layer, **Figure 1.15**.⁽⁸⁹⁾ Jamesburg Park, Frost Woods in East Brunswick, and the upland forests of Cheesequake State Park in Old Bridge offer examples of this forest type.

Figure 1.15: Central Oak-Pine Forest Macrohabitats



Source: CUES, Rutgers University. Photograph. 2021.

(Left) Northeast Interior Dry-Mesic Oak Forest. (Right) Northern Atlantic Coastal Plain Hardwood Forest.

Coastal plain swamps predominantly occur in the southern region. The dominant tree species include red maple, sweet gum, black gum, and lowland oaks. The dense understories include ferns, greenbrier, and wetland shrubs like sweet pepperbush, **Figure 1.16**.⁽⁹⁰⁾ Examples of this natural plant community occur in County-owned parks like John A. Phillips Preserve in Old Bridge and Shallow Brook Conservation Area in South Brunswick.

Northern swamps occur only in the piedmont and include basins and seepage swamps. Historically, eastern hemlocks dominated these swamps. Currently, hardwoods such as red maple, American elm, pin oak, yellow birch, and understory vegetation like spicebush, ferns, and skunk cabbage dominate this landscape, **Figure 1.16**.⁽⁹¹⁾ County-owned preserves include Pin Oak Forest in Woodbridge, Peter J. Barnes III Wildlife Preserve (formerly known as Dismal Swamp), and Edith Stevens Memorial Wildlife Preserve in Edison house northern swamp ecosystems.

Figure 1.16: Coastal Plain and Northern Swamp



Source: CUES, Rutgers University. Photograph. 2021.
(Left) Coastal Plain Swamp; (Right) Northern Swamp.

Saltmarsh cordgrass (*Spartina* spp.) dominates tidal marsh habitats. These cordgrasses depend on tidal influences and marsh accretion for survival.⁽⁹²⁾ The tidal marsh habitats primarily occur in the inner coastal plain region. Still, they strictly associate with tidally influenced coastal locations such as Woodbridge River Park in Woodbridge and Cheesequake State Park in Old Bridge, **Figure 1.17**.

Figure 1.17: Tidal Marsh With Saltmarsh Cordgrass



Source: CUES, Rutgers University. Photograph. 2021.

Conservation priorities exist in the collection of Middlesex County's ecologically diverse habitats. These habitats provide vital resources to all native flora and fauna, maintain the landscape's natural heritage, and translate into cultural heritage. Each habitat functions to support thousands of native species while providing invaluable ecosystem services to local communities. Their presence, spatial distribution, and ecological attributes inform the focus on conservation and open space preservation. Habitat locations identify key transitional zones adjacent to developed land for future mitigation and restoration to prevent further ecological degradation through pollution and invasive species spread.

Rare Plants

Middlesex County's rare and endangered plant species depend on natural habitat conservation and restoration for survival. The New Jersey Natural Heritage Program identified 112 rare and endangered native plant species with remnant naturally occurring populations in Middlesex County. ⁽⁹³⁾ Limited to no mapping of rare plants exists for public use to protect the 112 rare species from the risk of exploitation.

Middlesex County contains a rare and threatened terrestrial plant community known as rice cutgrass-marsh pepper coastal plain intermittent pond herbaceous vegetation, **Figure 1.18**. This community occurs in emergent wetland areas with little woody vegetation. They often occur in regions lacking degradation and *Phragmites australis* inundations, the invasive, common reed. Ecologically intact areas such as preservations likely host most of the County's rare and endangered plant species. Due to management regimes, preservation protects the landscape from the most harmful human impacts and habitat degradation.

Figure 1.18: Rice Cutgrass-Marshpepper Coastal Plain Rare Plant Community



Source: CUES, Rutgers University. Photograph. 2021.

Rare plant community, rice cutgrass-marsh pepper coastal plain intermittent pond herbaceous vegetation, which naturally occurs in Middlesex County.

The rare plant species in Middlesex County provide valuable resources to their ecological communities, as each rare plant supports large complexes of food webs. For example, most rare flowering plants, such as yellow giant-hyssop and white milkweed, provide nectar for numerous pollinators, support species-specific larval hosting, and attract several predatory insects shown in **Figure 1.19**. Predatory insects benefit the ecosystem by stabilizing plant-feeding insect populations. ^(94, 95)

Figure 1.19: Rare Plant Examples Naturally Occurring In Middlesex County



Sources: (Left) (Yellow giant-hyssop) Category: *Agastache Foeniculum*. Wikimedia Commons. (n.d.). Retrieved December 15, 2021, from https://commons.wikimedia.org/wiki/Category:Agastache_foeniculum
(Right) (White Milkweed) Eleanor. (2010). *White or Red Ring Milkweed*. Flickr. Retrieved December 15, 2021, from <https://www.flickr.com/photos/wildflowersflorida/7149460925/>.

The state-threatened lowland loosestrife offers a unique example of habitat provisions as it provides floral oil for the mature melittid bees (*Macropis* spp.). ⁽⁹⁶⁾ The melittid bee collects floral oil for its larvae in solitary nests and is a strict specialist of native loosestrife species, **Figure 1.20**.

Figure 1.20: Rare plant lowland loosestrife (left) and a melittid bee extracting floral oil (right)



Sources: lowland loosestrife. CUES Rutgers University. Photograph. 2021.; (melittid bee) Hampshire, G. (2014). *Macropis species*. Flickr. Retrieved December 15, 2021, from https://www.flickr.com/photos/gails_pictures/16068029098/.

The critically endangered cuckoo bee (*Epeoloides pilosula*) acts as obligate kleptoparasites on the melittid bees. Meaning, that the cuckoo bee deliberately takes food (floral oil) from the melittid bee as it cannot collect loosestrife floral oil on its own but requires it for survival. ⁽⁹⁷⁾ The endangered cuckoo bee's population survival depends on the native loosestrifes and the melittid bee populations. **Proper protection of rare plants prevents the local food web and biodiversity from dwindling. Protection can help rare and threatened populations grow and become more stable.**

Rare plants depend on the health of their surrounding ecosystems, as wildlife species depend on rare plants. Rare, threatened, or endangered species listing directly results from habitat degradation and loss. Essential tactics to conserve these habitats include strict habitat protection and zoning changes, further discussed in the *Actions* chapter. **Landscape planting of rare species like the Eastern Redbud (*Cercis canadensis*) or Northern Blazing-star (*Liatris scariosa* var. *novae-angliae*) may help conserve rare plants. Still, the most effective method to support endangered species includes conserving their natural habitats.** Endangered plants and wildlife species depend on human action for protection to support prolonged survival.

Wildlife Habitats of Concern

Middlesex County's forests, meadows, wetlands, and waterbodies provide vital habitats for hundreds of native wildlife species. Several declining species populations occur in the County as threatened or endangered, **Table 1.8a**. Habitat destruction and environmental pollution resulting from land-use changes and development, in turn, cause wildlife endangerment. ⁽⁹⁸⁾

The Division of Fish and Wildlife's research program Connecting Habitats Across New Jersey (CHANJ) ranked natural habitats by wildlife species endangerment status, **Map 1.12, Tables 8a and 8b**. The County's waterways and designated wetlands house the most critical wildlife habitats shown in **Map 1.12**. Wetlands and waterways function for protected species, while protection status reveals development pressure.

Many of these habitats contain vernal pools, **Map 1.12**. Vernal pools have "ephemeral, shallow pools of water that occur in moist depressions in spring, often in undisturbed forested areas, and provide breeding locations for amphibians that they return to every year to host their offspring." ⁽⁹⁹⁾ Described by the Freshwater Wetlands Protection Act (N.J.A.C. 7:7A-1.4), vernal pools and their surrounding land provide vitally essential habitats for the survival of several wildlife species. ⁽¹⁰⁰⁾

Figure 1.21: Little Blue Heron, Species of Special Concern



Source: Knight, R. (2010). *Little Blue Heron (Egretta caerulea) (8079371905).jpg*. Flickr. Photograph, Flickr. Retrieved May 24, 2022, from <https://www.flickr.com/photos/sussexbirder/8079371905/>.

Map 1.12: Wildlife Habitats of Concern

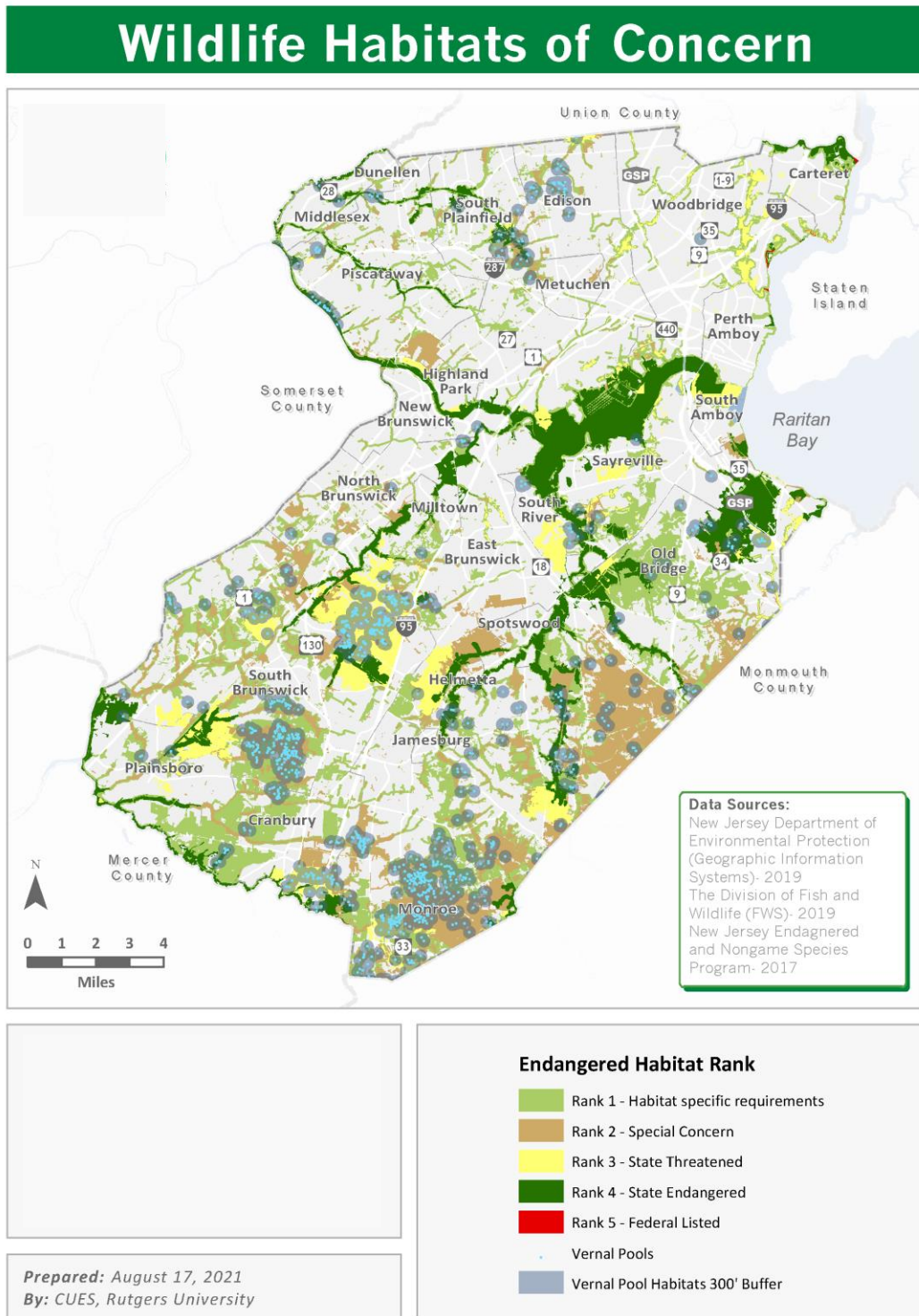


Table 1.8a: Endangered Habitat and Wildlife Species Rank Definitions

Rank	Status	Definition
1	Specific Habitat Requirements	Species-specific habitat patches that meet habitat-specific suitability requirements such as minimum size or core area criteria for endangered, threatened, or special concern wildlife species do not intersect with any confirmed occurrences of such species. Rank 1 habitat patches without documented occurrences are not necessarily absent of imperiled or special concern species. Patches with a lack of documented occurrences may not have been systematically surveyed. <i>The Rank 1 designation provides a planning purpose, such as targeting areas for future wildlife surveys.</i>
2	Special Concern In NJ	Species of special concern contain species-specific habitat patches containing one or more species occurrences.
3	State Threatened NJ	Species-specific patches containing one or more occurrences of State threatened species.
4	State Endangered NJ	Species-specific habitat patches with one or more occurrences of State endangered species.
5	Federally-Listed as Threatened or Endangered	Species-specific habitat patches containing one or more occurrences of wildlife listed as endangered and threatened under the Federal Endangered Species Act of 1973.

Source: New Jersey Department of Environmental Protection, Division of Fish and Wildlife, (n.d). New Jersey Landscape Project Version 3.3: Wildlife Habitat mapping for community land-use planning and species conservation. Page 21.
https://www.state.nj.us/dep/fgw/ensp/landscape/lp_report_3_3.pdf

Figure 1.22: Endangered Pine Barrens Tree Frog



Source: Gallagher, J. (2017). Pine Barrens Tree Frog - *Hyla andersonii*, Carolina Sandhills National Wildlife Refuge, McBee, South Carolina (37037472291).jpg. Flickr. Photograph, Flickr. Retrieved May 24, 2022, from <https://www.flickr.com/photos/52450054@N04/37037472291/>.

Tidal creek and large river aquatic habitats support federally-listed (*Rank 5*) and state-endangered (*Rank 4*) species shown in **Map 1.12**. The few remaining degraded tidal creeks in Woodbridge and Carteret—surrounded by development—provide habitats for the federally endangered shortnose sturgeon.⁽¹⁰¹⁾ Only a few *Rank 5* habitats occur in the County.⁽¹⁰²⁾ The federally protected Osprey inhabit coastal shores in the same municipalities and in proximity to abundant fish populations.⁽¹⁰³⁾ Surrounding urban land use and projected sea-level rise add stressors to these habitats. ***The management and future planning in these urban coastal zones hold the survival of these federally-listed species.***

Many New Jersey state-listed endangered species, such as the northern harrier, pied-billed grebe, and bald eagle, inhabit critical *Rank 4* habitats in and along most of the County's rivers, tributaries, and several wetland areas, **Map 1.12, Table 8b**. The endangered species classifications reveal immediate danger for species survival due to factors including habitat degradation and destruction.⁽¹⁰⁴⁾ Often, areas with the most endangered habitats occur in or near water, wetlands, and historically filled, polluted, modified, or degraded wetlands.⁽¹⁰⁵⁾ ***Losses or further degradation of these habitats will result in further population decline or species extinction. Paramount actions include conservation and restoration of these habitats.***

Much of the lower-ranking (3-1) habitat areas occur adjacent to the *Ranks 4 and 5* habitats in marshes, swamps, and forests which often encompass vernal pools, **Map 1.12**. Vernal pools are vitally important locations for amphibians to reproduce and spawn, such as the threatened pine barren tree frog and the Fowler's toad, **Table 8b**.⁽¹⁰⁶⁾ Reptiles, like the threatened wood turtle, and other terrestrial and avian species seasonally inhabit vernal pools. The ranked habitats and vernal pools support the natural wildlife diversity of Middlesex County.⁽¹⁰⁷⁾ ***Modifications to or losses of habitat near or in these areas will result in a further population decline of sensitive wildlife species of concern in New Jersey.***⁽¹⁰⁸⁾

Table 1.8b: Wildlife Species of Concern within Middlesex County

Common Name	Scientific Name	Status
American kestrel	<i>Falco sparverius</i>	State Threatened
Bald eagle	<i>Haliaeetus leucocephalus</i>	State Endangered
Black-crowned night heron	<i>Nycticorax nycticorax</i>	State Threatened
Black-throated green warbler	<i>Dendroica virens</i>	Special Concern
Bobolink	<i>Dolichonyx oryzivorus</i>	State Threatened
Brown thrasher	<i>Toxostoma rufum</i>	Special Concern
Cattle egret	<i>Bubulcus ibis</i>	State Threatened
Cliff swallow	<i>Petrochelidon pyrrhonota</i>	Special Concern
Cooper's hawk	<i>Accipiter cooperii</i>	Special Concern
Eastern box turtle	<i>Terrapene carolina carolina</i>	Special Concern
Fowler's toad	<i>Anaxyrus fowleri</i>	Special Concern
Glossy ibis	<i>Plegadis falcinellus</i>	Special Concern
Great blue heron	<i>Ardea herodias</i>	Special Concern
Hooded warbler	<i>Wilsonia citrina</i>	State Threatened
Kentucky warbler	<i>Oporomis formosus</i>	Special Concern
Least bittern	<i>Ixobrychus exilis</i>	Special Concern
Little blue heron	<i>Egretta caerulea</i>	Special Concern
Loggerhead shrike	<i>Lanius ludovicianus migrans</i>	State Endangered
Long-eared owl	<i>Asio otus</i>	Special Concern
Northern harrier	<i>Circus cyaneus</i>	State Endangered
Northern parula	<i>Parula americana</i>	Special Concern
Peregrine falcon	<i>Falco peregrinus</i>	State Endangered
Pied-billed grebe	<i>Podilymbus podiceps</i>	State Endangered
Pine barrens treefrog	<i>Hyla andersonii</i>	State Threatened
Osprey	<i>Pandion haliaetus</i>	State Threatened & Federally-Listed
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	State Threatened
Saltmarsh sparrow	<i>Ammodramus caudacutus</i>	Special Concern
Savannah sparrow	<i>Passerculus sandwichensis</i>	State Threatened
Scarlet bluet	<i>Enallagma pictum</i>	Special Concern
Silver-bordered fritillary	<i>Boloria selens myrina</i>	State Threatened
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	Federally Endangered & State Endangered
Snowy Egret	<i>Egretta thula</i>	Special Concern
Worm-eating warbler	<i>Helmitheros vermivorum</i>	Special Concern
Wood thrush	<i>Hylocichla mustelina</i>	Special Concern
Wood turtle	<i>Glyptemys insculpta</i>	State Threatened
Veery	<i>Catharus fuscescens</i>	Special Concern
Yellow-crowned night heron	<i>Nyctanassa violacea</i>	State Threatened

Source: NJDEP. (2019). Terrestrial Wildlife Habitat Cores and Corridors in New Jersey, Connecting Habitat Across New Jersey (CHANJ) [Data set]. Retrieved from, <https://gisdata-njdep.opendata.arcgis.com/datasets/njdep::terrestrial-wildlife-habitat-cores-and-corridors-in-new-jersey-connecting-habitat-across-new-jersey-chanj/about>

PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet

Groundwater Recharge

Groundwater recharge (GWR) occurs when water replenishes groundwater stores through natural hydrologic processes such as precipitation and infiltration reaching the groundwater table. GWR rates, expressed in inches per year, include climate, soil, and land-use data.

Different rates represent GWR determined by site-specific conditions, **Map 1.13, Table 1.9.** ⁽¹⁰⁹⁾

Rates vary based on wetland or upland soils. When precipitation reaches waterbodies and hydric soils (wetlands) rather than upland soils, water directly enters the groundwater table without infiltrating an unsaturated soil or rock substrate. Therefore, calculations for wetlands and waterbodies do not exist. ⁽¹¹⁰⁾

Middlesex County's lowest GWR rates occur in the high impervious surface-covered urban areas in **Map 1.13**. Roughly 10 percent of the County's soils do not recharge groundwater, **Table 9**. Impervious surfaces impede groundwater infiltration and recharge, causing surface runoff, flooding, and soil erosion. **Minimal to moderate recharge rates from one to ten inches per year occur in 25 percent of the County.** These GWR areas surround dense urban development, like older suburbs in the northern half of the County or town centers in the southern half, and they contain a substantial amount of impervious surface, **Map 1.8**.

Higher GWR rates occur in developed areas with more pervious surface and protected natural lands. This scenario occurs throughout the southern and northwest portions of the County. **These recharge locations of eleven to fifteen inches per year constitute about one-third of the County land area, Table 1.9.**

Map 1.13: Groundwater Recharge

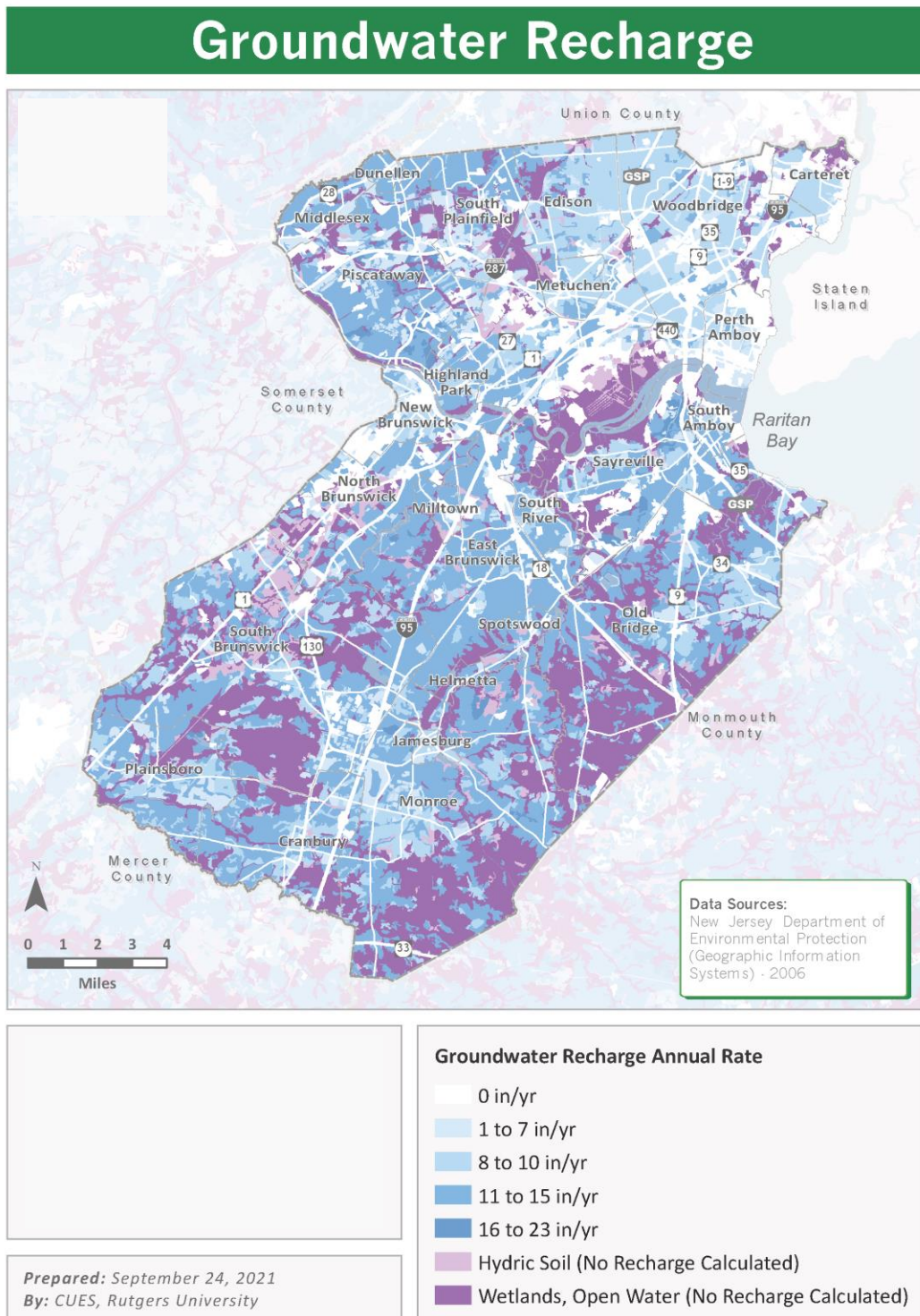


Table 1.9: Groundwater Recharge Rates Acreages and Percent Cover In Middlesex County

Recharge Value	Acres	Percent of Total
0 in/yr	20,962	10.46
1 to 7 in/yr	19,787	9.88
8 to 10 in/yr	31,212	15.57
11 to 15 in/yr	69,525	34.68
16 to 23 in/yr	2,084	1.04
hydric soil-no recharge calculated	7,738	3.85
no recharge calculated	47	0.02
wetlands, open water-no recharge calculated	49,110	24.50
Total	200,466*	100%

Source: New Jersey Department of Environmental Protection (NJDEP), New Jersey Ground-Water Recharge, Series DGS02-3, Edition 200605 (Geol_gw_recharge) (Web Mercator ArcGIS Online Service), 2006.

PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet

* Total acreage calculation derived from GIS data.

GWR rates differ across the County's varied landscapes because development and land use heavily impact recharge rates. GWR is a vital ecosystem service. These services help maintain ground-water stores, reduce drought intensity, and decrease the negative impacts of stormwater runoff. Groundwater provides an essential resource for the County's water supplies and drinking water. ***Natural land conservation and limiting impervious surfaces are imperative tactics to enhance groundwater recharge capabilities to maintain and improve GWR function for the County's stormwater management and water resources.***

NATURAL RESOURCES SUMMARY

Natural resources and the associated ecosystem services heavily rely on human activity for protection. Often, waterbodies and contiguous natural land provide the greatest ecological value benefits for the County.

Waterbodies and wetlands intake and store groundwater and provide habitat for the County's most endangered wildlife species. Various wetlands provide the County with many services. Tidal swamps buffer coastal storms and surges. The adjacent wetlands buffer flooding, store, and filter groundwater, sustain high biodiversity, and maintain vegetative cover, including tree canopy cover. Conserved forest lands and swamps (forested wetlands) capture the greatest groundwater recharge amount, maintain the densest tree canopy cover, and serve as critical habitats for native and rare flora and the state's wildlife species concern.

The conserved natural areas in the southern inner coastal plain contain most of the County's terrestrial natural resources, providing significant ecological value. Urban land dominates the county's northern half, limiting ecological value to smaller areas. Urban areas often contain lower tree canopy cover, potentially exacerbating urban heat island effects. In comparison, developed areas and impervious surfaces contribute to lower GWR rates.

The most productive natural resources in urban areas occur in marginal parcels that support small habitat fragments. The County-owned Ernest L. Oros Wildlife Preserve in Woodbridge provides an example landscape hosting *Ranks 3 and 2* state-listed species. However, development surrounding conserved areas poses potential degradation threats as the landscape may be subject to human stressors like non-point source pollution from surface runoff. The most critical wildlife habitats of concern (*Rank 5*) occur in tidal creeks and shores of Woodbridge and Carteret's highly urbanized coasts. Sparse distribution of other habitats of concern occurs in urban areas concentrated around waterways and remnant wetlands.

Promoting ecological quality through the protection of natural resources on conserved land, restoration of ecosystem functioning in developed areas, and mitigation of urban land-use stressors to ecologically productive parcels will be very important. The *Analysis* chapter will identify priority locations to focus on ecosystem services enhancements, further outlined in the *Actions* chapter. These natural resource improvements will enhance air, water, and aesthetic quality, supporting the ecosystem and cultural value. Safeguarding natural resources and enhancing ecosystem services cohesively improve the quality of life for all residents.

1.3 ENVIRONMENTAL ISSUES

INTRODUCTION

Human imposition on the natural environment results in environmental issues. Environmental issues pose detrimental effects to both human and non-human life. ^(111, 112) Climate change results in sea-level rise, increased flooding, and a high number of high-heat days. Hotter surfaces and ambient air temperatures, air pollution, and drinking water contaminants pose environmental issues as direct results of human activity.

The three main environmental issues mapped in the *Environmental Issues* inventory include FEMA Flood Risk Zones, Projected Sea-Level Rise, and Urban Heat Islands. Development and impervious surfaces directly relate to each of these environmental issues. However, they affect the land in different ways. Understanding environmental issues' spatial distribution, intensity, and potential impacts will inform future analyses to identify focus areas for priority flood mitigation zones and urban heat island reduction paired with impervious surfaces in the *Analysis* chapter.

Figure 1.23: Route 18 Flooding in New Brunswick, 2021



Source: CUES, Rutgers University. Photograph. 2021.

FEMA Flood Risk Zones

Climate change expectations include increased annual precipitation totals, frequency, and storm intensity. Increased precipitation will amplify flooding threats in Middlesex County.⁽¹¹³⁾ To paraphrase, FEMA defines a flood as “a general and temporary water inundation of land that is usually dry.”^(114, 115) Areas with the highest risk of flooding (FEMA’s 100-year, 0.1% annual chance and 500-year, .2% annual chance flood risk zones) lie within floodplains and land in lower elevations adjacent to waterbodies and wetlands, **Map 1.14**.⁽¹¹⁶⁾ *This inventory utilizes the 2020 National Flood Hazard Layer available at the time of inventory mapping (2020-2021).*

Waterbodies spread throughout Middlesex County’s landscape, posing widespread potential flood risks. The County’s southern half illustrates potential flood risk along the South River, the coastal wetlands, and the Millstone River tributaries. In the North, flood risk occurs along the Raritan River, the Raritan River tributaries, the East Coast, and the Arthur Kill tributaries. Historically, communities associated with these flood zones experienced infrequent but repeated flooding. Land acquisitions occurred with *Blue Acres Program* funding, **Map 1.19**.

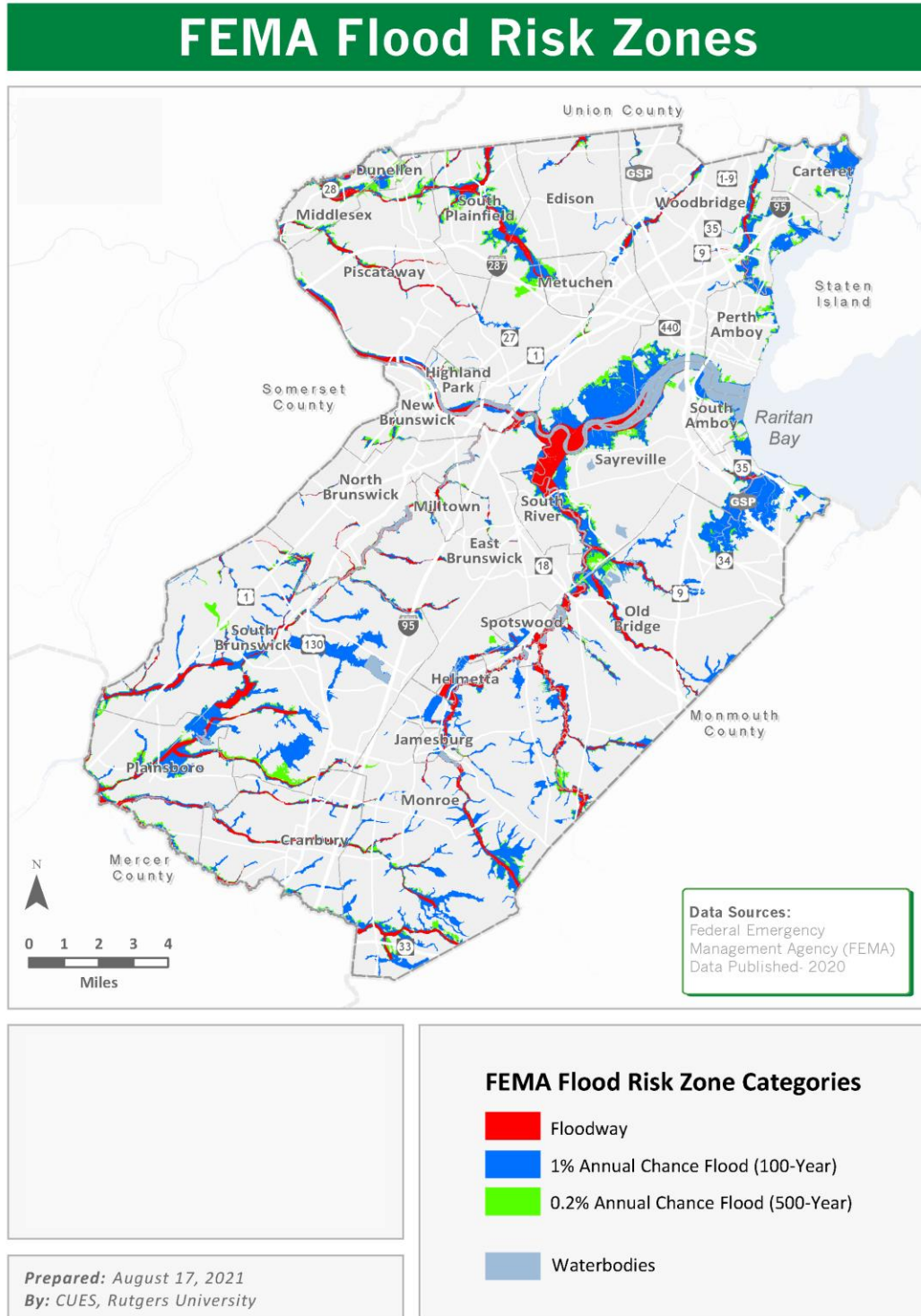
Impervious surfaces in the County’s urban areas, such as buildings and pavement, occur along many waterbodies (**Map 1.8 Impervious Surfaces**). Impervious surfaces within the low-lying 100- and 500-year floodplains leave these areas at the highest risk for increased damage or threat to human life. Urban land use growth majorly impacts flooding as impervious surfaces replace vegetation and soil, necessitate regraded land surfaces, replace floodplains, and require constructed drainage networks, which increase runoff from storm events. As a result, the peak discharge, volume, and frequency of floods increase in nearby streams.⁽¹¹⁷⁾ Streams become flashy, meaning they flood quickly and rapidly.

“An altered floodplain with a reduced floodplain size is more likely to have rapid peak flows, increase the chance of flooding, and intensify the velocity of water leaving the catchment area.”⁽¹¹⁸⁾

Increased storm intensity and the after-effects occur in Middlesex County. Hurricane Henri (August 2021) and Tropical Storm Ida (September 2021) provide two recent examples of flashy floods causing significant damage and loss of human life in Middlesex County. Three Middlesex County resident casualties occurred due to flashy floodwater in Woodbridge (1) and Piscataway (2).⁽¹¹⁹⁾ Current FEMA flood zones locate the areas most affected by floodwaters, leading to analysis components explored in the *Analysis* chapter, including impervious surfaces and flood risk comparisons. Identified areas will establish priority locations for open space preservation and green infrastructure (through Green or Blue Acres and other tactics).

This inventory utilizes 2020-2021 FEMA data; expected 2022 updates by FEMA and NJDEP will likely show an even more concerning situation.

Map 1.14: FEMA Flood Risk Zones



Projected Sea-Level Rise

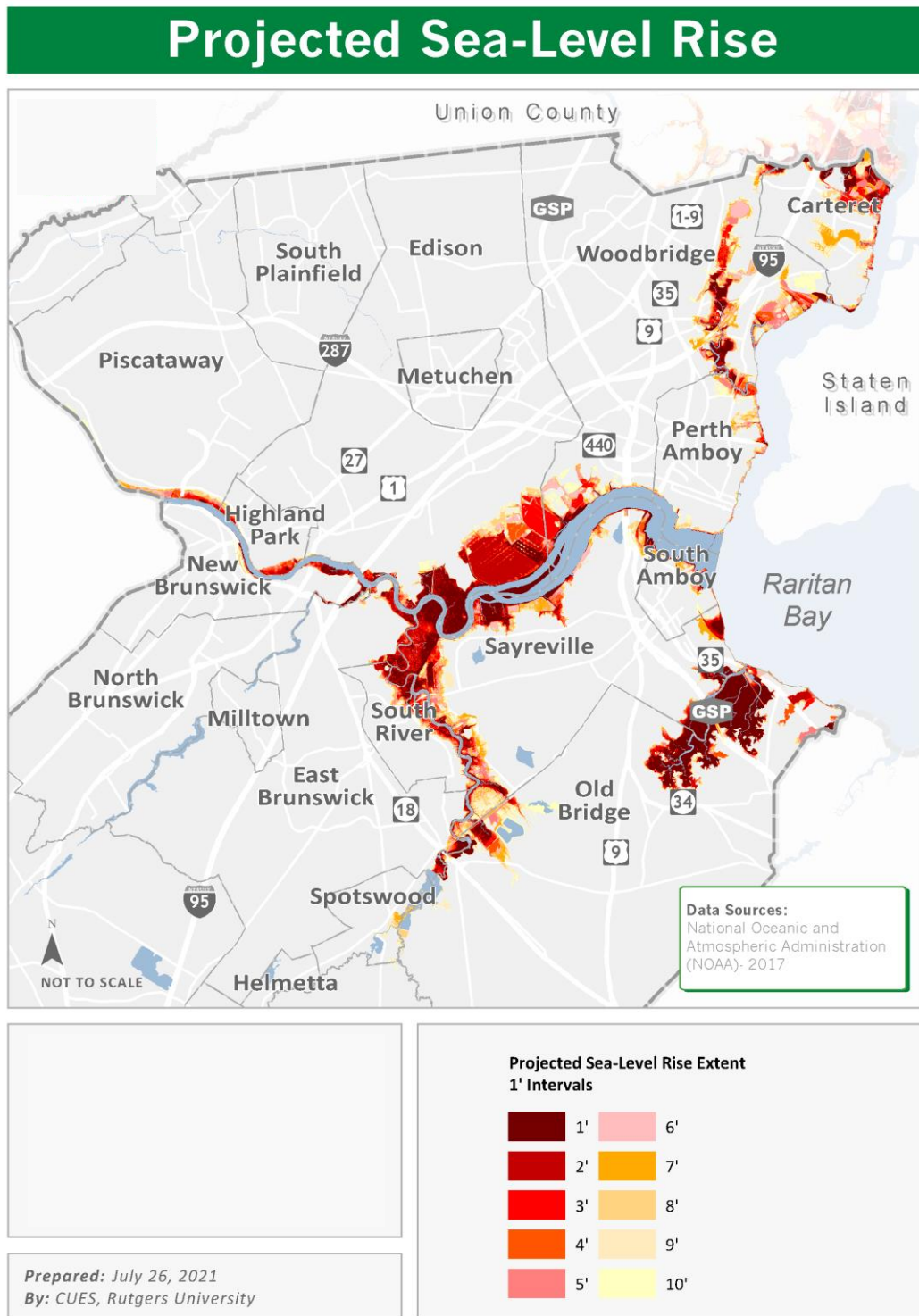
Sea-level rise (SLR) directly relates to climate change effects caused by human inflictions on the landscape, precisely the Earth's rising temperatures. The core causes of rising sea levels include melting ice sheets, melting glaciers, and expanding seawater. ⁽¹²⁰⁾ These climate-related alterations to the earth result in a global phenomenon affecting coastal communities worldwide, including the Raritan Bay coastal communities in Middlesex County.

Several sea-level rise prediction scenarios exist based on changing climate factors and probability. ^(121, 122) Based on estimates of projected SLR from the Middlesex County Climate Change Exposure Assessment, ***it is likely that Middlesex County's coastal communities will see approximately a 1.5-foot SLR by the year 2040.*** ⁽¹²³⁾

In Middlesex County, the projected SLR will affect coastal communities and development in floodplains along the Raritan River from Perth Amboy and South Amboy all the way westward to Piscataway and New Brunswick. SLR will also significantly impact the South River, Cheesequake Creek, Woodbridge Creek, and the Arthur Kill shown in ***Map 1.15.*** ⁽¹²⁴⁾ ***Map 1.15 illustrates the Sea-level rise extent that could impact all five tidally influenced waterbodies in the County and the development within these zones.***

Predictions suggest that hurricane and storm frequency and intensity will increase, creating heightened storm surges. ⁽¹²⁵⁾ The EPA describes "heavy precipitation" events as "instances during which the amount of rain or snow experienced in a location substantially exceeds normal amounts." ⁽¹²⁶⁾ These events drop heavy rain or snow in a short amount of time, contributing to both inland and coastal flooding. Severely detrimental effects can occur in low-lying coastal communities when increased heavy precipitation events, SLR, and storm surges occur simultaneously.

Map 1.15: Projected Sea-Level Rise



As stated by Rutgers University research, the 1-2' sea-level rise intervals represent the 1.5' SLR prediction by 2040. ⁽¹²⁷⁾

Urban Heat Island (8/26/21)

Middlesex County's diverse landscape conditions alter heat reflection and retention capabilities. The landscape's ability to retain or omit heat results in heat pockets or *Urban Heat Islands*. Urban Heat Islands occur in "urban areas with higher temperatures than the outlying area." ⁽¹²⁸⁾ Impervious surface covers often accompany urban areas, which absorb and re-emit the sun's heat more than natural landscapes such as forests and waterbodies. ⁽¹²⁹⁾ These urban areas include "clusters with a limited green cover," which become "islands" of higher temperatures. ⁽¹³⁰⁾ A characteristic of an urban heat island includes "daytime temperatures in urban areas about 1–7°F higher than temperatures in outlying areas and nighttime temperatures about 2–5°F higher." ⁽¹³¹⁾

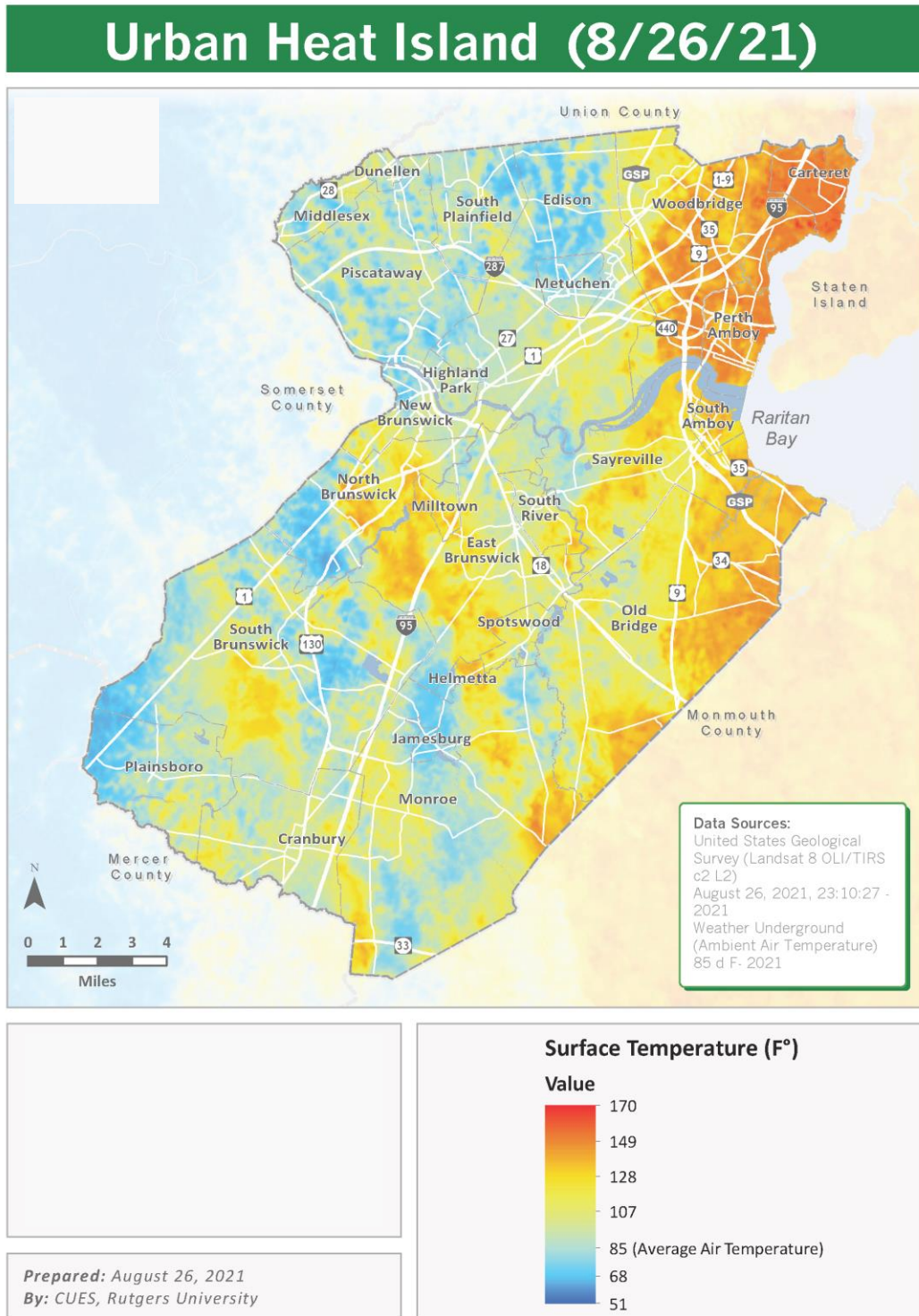
Mapping Process

The urban heat islands mapping method includes a conversion of the United States Geological Survey (USGS) satellite imagery from the LandSat8 satellite using Band 10 into surface temperature, **Map 1.16**. The satellite's Band 10 uses a Thermal Infrared Sensor (TIRS) and collects wavelengths between 10.6 - 11.19 μm at 100m cells. Surface temperatures in degrees Fahrenheit express the surface temperature for Middlesex County converted from the recorded TIRS energy through GIS processing. The USGS and LandSat8 data selection (August 26, 2021) reflects a hot summer day (85 degrees Fahrenheit) with relatively high visibility for best quality processing.

The surface temperatures calculated range between 51-170 Degrees Fahrenheit. The average ambient air temperature marks the higher-than-average surface temperatures shown in **Map 1.16**. Surface temperatures compared with the County's August 26, 2021 daily high temperature reveal the relative heat produced by the surface.

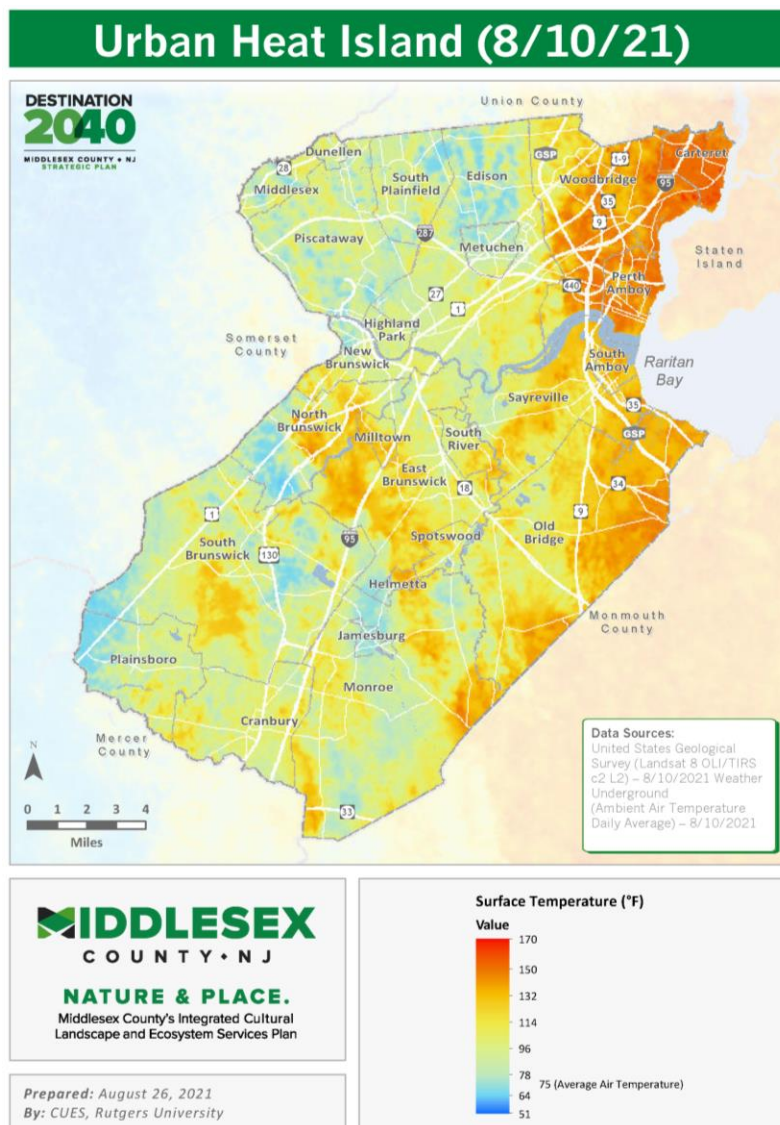
Areas with the highest surface temperatures, **Map 1.16** (red), occur in Carteret, Perth Amboy, Woodbridge, and the southern area of New Brunswick. In the South, urban heat impacts Sayreville, South Amboy, coastal regions, communities bordering Monmouth County, and the corridor between New Brunswick and Monroe. **Map 1.16** (yellow-orange) displays areas with moderately high temperatures occurring in pockets in the southwest, southeast, and surrounding the highest areas in the north. In the regions with lower surface temperatures, **Map 1.16** (blue) occurs throughout the northwest and southwest. Plainsboro, South Brunswick, North Brunswick, Helmetta, and Edison have larger lower-temperature pockets. Comparisons with tree canopy cover and impervious surfaces in the *Analysis* chapter will lend to urban heat island causes.

Map 1.16: Urban Heat Island (8/26/2021)



Urban heat decreases the quality of life for residents by amplifying health issues, increasing mortality rates, and cooling costs, and intensifying air pollution while harming ecological habitats. ⁽¹³²⁾ Urban heat islands concentrate almost all pollutants released in urban settings, particularly ozone, which harms air quality and impacts human and ecosystem health. ⁽¹³³⁾ Further analysis will display the contributing factors to urban heat islands, such as impervious surfaces and low tree canopy cover.

Map 1.17: Urban Heat Island (8/10/2021)



The UHI comparison with August 10, 2021, in **Map 1.17** reveals a similar pattern of hotter surface locations above the average ambient air temperature (75 degrees Fahrenheit). The August 8, 2021 date also includes high visibility (fewer clouds) on a hot summer day.

ENVIRONMENTAL ISSUES SUMMARY

Environmental issues, including climate change, pose a growing threat on a global scale. Understanding environmental threats at the local and regional level helps contribute to global-scale issues, which impact the County's residents' quality of life. Planning to combat the County's environmental issues supports Middlesex County's initiative for sustainability.

The County's waterbodies spread throughout the landscape, posing widespread potential flood risks. The County's southern half illustrates potential flood risk along the South River, the coastal wetlands, and the Millstone River tributaries. In the North, flood risk occurs along the Raritan River, the Raritan River tributaries, the east coast, and the Arthur Kill tributaries—in the lower-lying topographic areas.

The NJDEP *Blue Acres Program* presents a successful resource for land acquisitions in areas that experienced reoccurring flooding along the five tidally influenced waterbodies. The following section (1.4) identifies open space parcels in Middlesex County acquired with Blue Acres funding. The *Actions* chapter explores additional acquisition opportunities. Other opportunities exist to lessen the amount of water entering local waterways during rain events. In some County communities, green infrastructure provides examples of traditional approaches to reducing flood risk. Example communities include downtown Highland Park and Woodbridge's rain gardens. ***Flood management requires multi-level interventions to support resilient landscapes and water storage to reduce the water volume entering local waterways at rapid rates.***

Impervious surfaces in the County's urban areas, such as buildings and pavement, occur along many waterbodies (***Map 1.8 Impervious Surfaces***). Impervious surfaces within the County's floodplains leave these areas at the highest risk for increased damage or threat to human life because impervious surfaces replace vegetation and soil, require regraded land surfaces, replace floodplains, and require constructed drainage networks, which increase water runoff. The *Analysis* chapter examines the correlation between impervious surfaces, flood risk areas, and wetland buffers to assess priority locations for ecosystem service enhancements outlined in the *Actions* chapter.

In Middlesex County, the projected SLR will affect coastal communities and development in floodplains along the Raritan River, South River, Cheesequake Creek, Woodbridge Creek, and the Arthur Kill. SLR coupled with increased storm intensities and frequencies will negatively impact coastal communities and communities along these five tidally influenced waterways. A Rutgers' sea-level rise projection provided multiple scenarios for New Jersey. With the current climate impacts continuing, this inventory focused on a potential higher-end scenario (1.5 feet sea-level rise by 2040) affecting the County's coastal and tidally influenced areas. ***In unison with acquisitions along the waterfronts, clean energy and reduced energy consumption will help contribute to the global effort to curb climate change impacts. The Actions chapter explores clean energy tactics and ideal landscapes for intervention.***

An additional environmental issue includes urban heat islands, which significantly threaten human and ecosystem health through the elevated number of annual high-heat days. The County's UHI inventory revealed that urbanized areas experience the highest surface temperature patterns, including Carteret, Perth Amboy, Woodbridge, portions of New Brunswick, Sayreville, South Amboy, coastal areas, southeast communities, and the corridor between New Brunswick and Monroe. The areas with lower surface temperatures occur throughout the northwest and southwest near open space and forested areas. Urban heat island decreases the quality of life for residents by amplifying health issues, increasing mortality rates and cooling costs, and creating more air pollution while harming ecological habitats. ***The Analysis chapter compares impervious surfaces with UHI to identify causes and priority areas for improvement. Urban environmental improvements explored in the Actions chapter aim to curb urban heat islands through added shade and dark impervious surface replacement.***

The first line of defense for environmental issues like flooding, sea-level rise, and urban heat islands focuses on ecosystem services (*Analysis* chapter). High-performance landscapes include natural landscapes. Natural land protection through open space designation and conservation opportunities becomes essential for combating environmental issues exacerbated by increased impervious surfaces and climate change. The quality of open space and quantity will help create a safer environment for Middlesex County residents, support thriving ecological communities, and support sustainability initiatives.

1.4 OPEN SPACE AND FARMLAND

INTRODUCTION

This ***Nature & Place*** plan defines open space as land that is accessible to the public and designed for recreation, habitat preservation, or both. Open space includes parks, nature preserves, greenways, and other intentional land preservation efforts. Land ownership, usually but not always, belongs to a government or non-profit conservation organizations. ⁽¹³⁴⁾

Adequate open space provides the most efficient tool to address environmental issues and enhance ecosystem service potential. Open space serves the community through cultural, ecological, and ecosystem benefits from natural resources such as ecosystem services, ecological habitats, and cultural spaces for people to experience nature and gather.

This inventory expands on the in-depth assessment completed through the ***Open Spaces*** functional plan of the County's open space network and utilizes the County's *Comprehensive Farmland Preservation Plan* to relate agricultural landscapes with open space.

Middlesex County's land includes protected open spaces such as recreational parks, preserves, and conservation areas. The County also offers golf courses for recreational opportunities. Even though many preserved open spaces exist in Middlesex County, other types of protected and non-protected natural lands occur. Natural lands include wetlands and upland forested areas, which may fall outside protected open space boundaries. Agricultural land provides many services for the County's residents and bolsters cultural, economic, and ecological value. The County includes preserved farmland under the New Jersey Farmland Preservation Program (NJFPP) and non-preserved agricultural land.

Farmland preservation expanding across the County's southern landscape can ensure the County's agricultural production, reduce development pressure, and forever maintain culturally valued farmland. Although not strictly considered open space, the County's Farmers' Markets support the open space inventory because these programmed spaces connect people to the rural landscape and provide fresh food to local communities. This section maps Middlesex County's preserved open spaces, natural land, agricultural land outside protected parcel lines, preserved farmland, and USDA-mapped farmers' markets. The inventory component examines existing conditions and considers opportunities to protect and enhance the County's open space networks' cultural and ecological value, further discussed in the *Analysis* and *Actions* chapters.

Open Space and Natural Land

Middlesex County's open spaces offer ecological value and recreational opportunities connecting people to nature and the County's heritage. Open space in the County encompasses state, county, municipal, non-profit, and privately owned open spaces shown in **Map 1.18** and roughly 31,737.3 acres listed in **Table 1.10**. This inventory illustrates natural land not within park boundaries, such as forested and wetland landscapes, to consider the role and extent of natural land not protected. Preserved farmland's high cultural value adds to the surrounding landscape; therefore, it becomes essential to include farmland in open space inventories (although the land is often not publicly accessible). Original mapping occurred in the **Open Spaces** functional plan calculating the County's open space and preserved farmland acreage, **Table 1.10**.

Middlesex County is home to 5,459 acres of preserved farmland through the New Jersey Farmland Preservation Program (NJFPP) and approximately 40,773 acres of wetlands protected under the Clean Water Act.⁽¹³⁵⁾ Forested lands outside of park parcels pose the same potential threat of development, whether public or privately owned (discussed in detail in the *Analysis* chapter).

Table 1.10: Mapped Existing Open Space by Ownership from the Open Spaces Plan

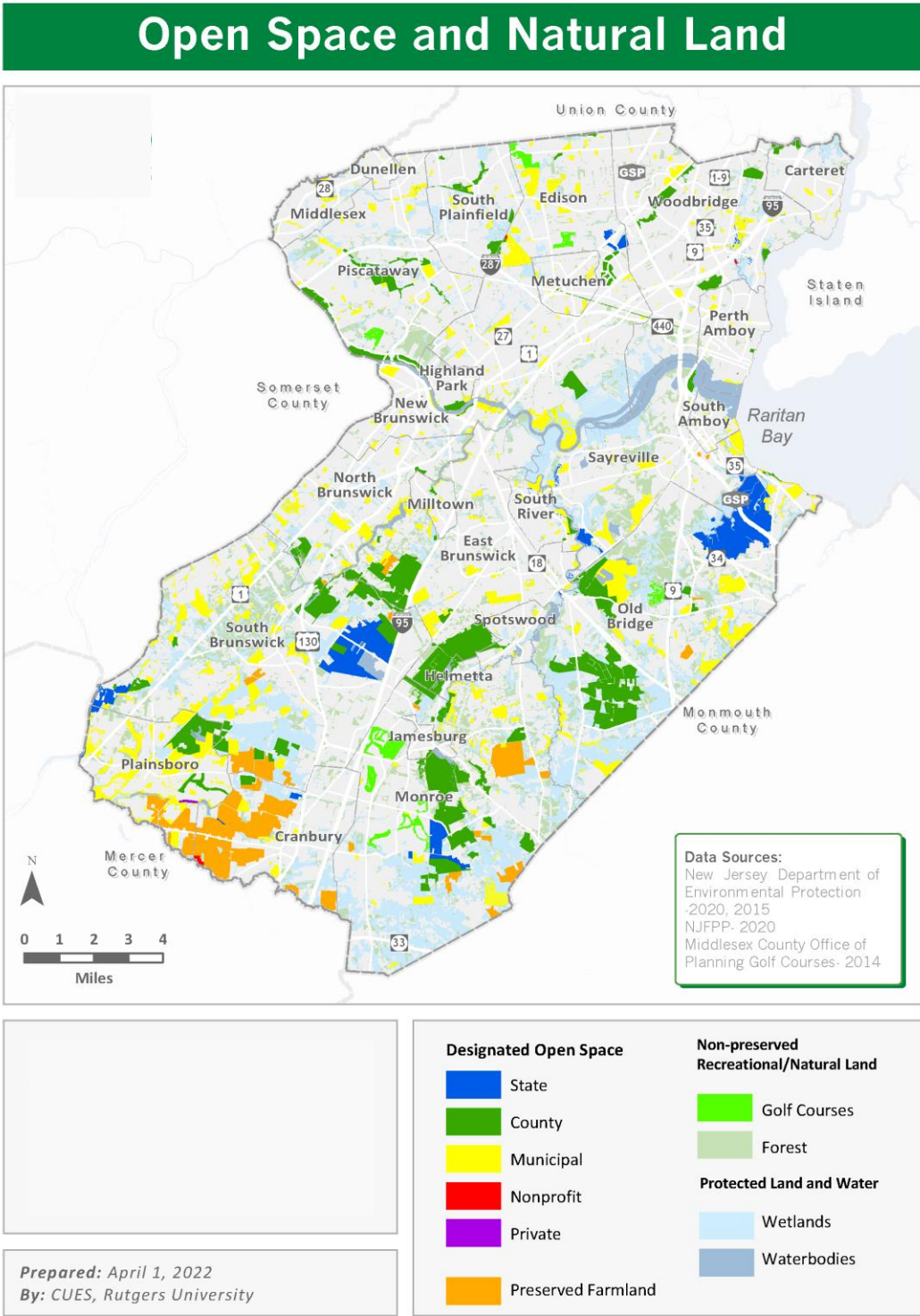
Owner	Total Acres	Percent of Open Space	Percent of County
State of New Jersey	3,673.15	11.57%	1.8%
Middlesex County	11,267.12	35.50%	5.8%
Municipal	11,788.51*	37.14%	5.5%
Non-Profit	47.88	0.15%	-
Privately Owned Open Space	25.5**	0.08%	-
Preserved Farmland	5,459.00	15.55%	2.4%
Total	31,737.30	100%	15.6%

Source: NJDEP Green acres database, Middlesex County Office of Parks and Recreation, and additional parks added by CUES park inventory assessment through the Open Space and Recreation Plan Update (Adopted 2022).

*759 Acres of mapped parcels have been added to the NJDEP Green Acres Open Space Inventory dataset since map completion in 2021.

**This number does not include the Princeton Forrestal Campus General Development Plan (258 +/- acres) and Princeton Nurseries General Development Plan (109 +/- acres).

Map 1.18: Open Space and Natural Land



Middlesex County owns 19 parks, 33 preservation properties, and three golf courses. The golf courses include the Tamarack Golf Course in East Brunswick, the Meadows at Middlesex in Plainsboro, and the Raritan Landing Golf Course in Piscataway. ⁽¹³⁶⁾ ⁽¹³⁷⁾ The ***Open Spaces*** functional plan inventoried, in detail, the 19 parks, 33 conservation areas, and three County-owned golf courses. The County contains 13 golf courses in total, both privately and publicly owned. ⁽¹³⁸⁾

Municipal parks include nature parks, conservations, preservations, sports fields, and neighborhood recreational parks. Each municipality contains its municipal parks owned and operated by the local government, while Three non-profit organizations own County land: the Delaware and Raritan Greenway Land Trust, Edison Wetlands Association, and the New Jersey Conservation Foundation. ⁽¹³⁹⁾

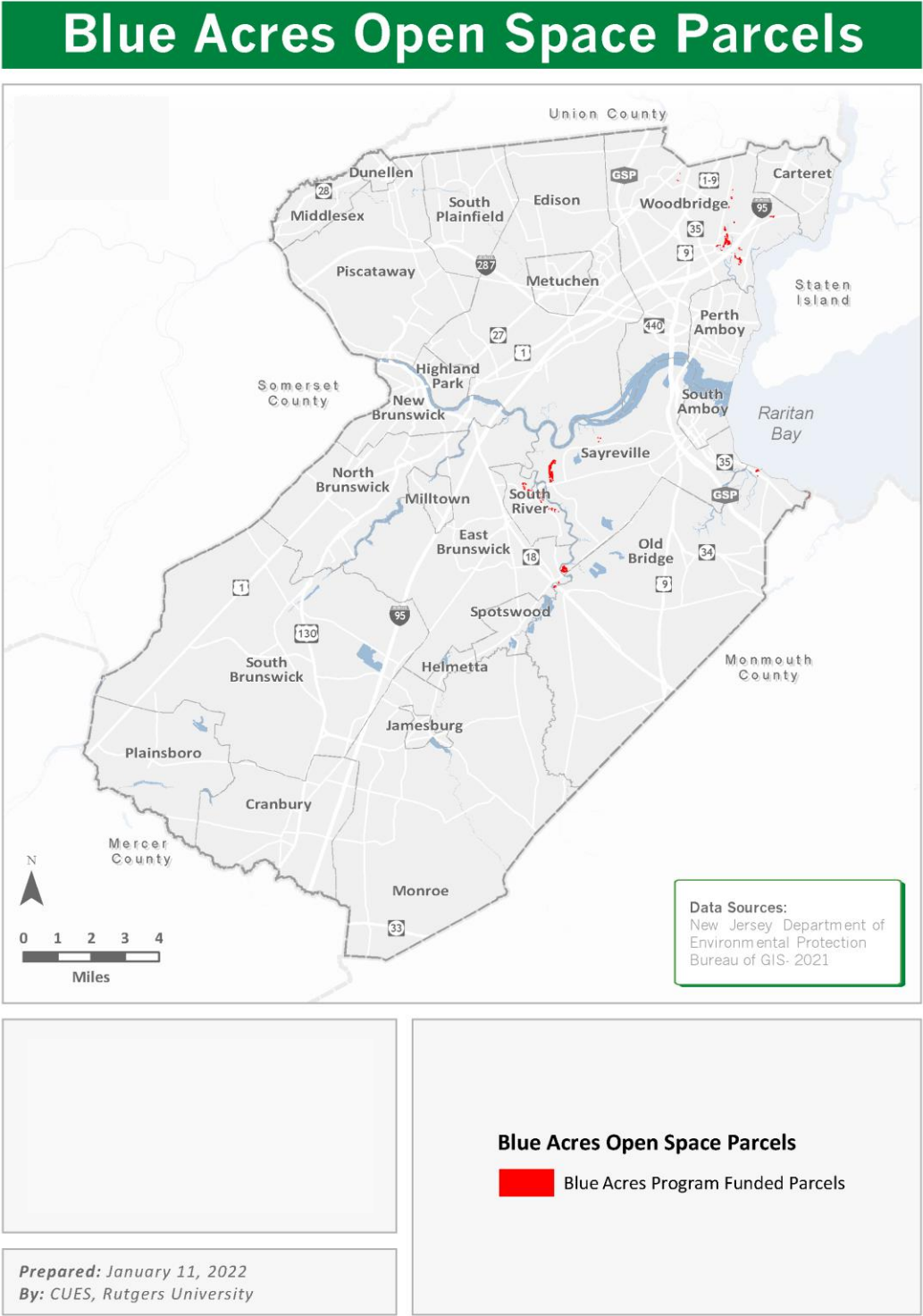
Nine state-owned open spaces occupy Middlesex County's landscape, including Cheesequake State Park, Old Bridge; Pigeon Swamp, South Brunswick; Monmouth Battlefield, Monroe; the Soldiers and Sailors Monument, Edison; Thomas Edison State Park, Edison; Joyce Kilmer House Historic Site, New Brunswick; and the Proprietary House Historic Site, Perth Amboy. The State owns The Delaware and Raritan Canal along the western border and several Blue Acres properties in Woodbridge, Sayreville, East Brunswick, South River, and Old Bridge, shown in ***Map 1.19, Figure 1.24.*** ⁽¹⁴⁰⁾

Figure 1.24: NJDEP Blue Acres Program Acquisition, Woodbridge



Source: CUES, Rutgers University. Photograph. 2021.

Map 1.19: Blue Acres Open Space Parcels



Multiple opportunities exist to expand the County's open space network, such as Green and Blue Acres funding for acquisition, easement tools, conservation zoning tactics, deed restrictions, and more. The County provided support for municipal acquisitions by supplying funding aid for over 1490 acres since 2003. ⁽¹⁴¹⁾ The *Actions* chapter will identify tactics and resources to conserve ecological and recreational resources.

Figure 1.25: Future Open Space, Middlesex



Source: CUES, Rutgers University. Photograph. 2022.

Historic Landscapes in Open Space and Preserved Farmland

Middlesex County's open spaces provide essential ecological value and recreational opportunities and offer places for people to experience the County's preserved historical heritage. NJDEP listed, eligible, and identified historic properties and districts that occupy 271 properties within park boundaries (section 1.7 further defines the state and national historic registrar designations). Historic properties in existing park boundaries support the area's heritage, character, and cultural significance. Signage opportunities through the County's *Historic Marker Program* can connect people with the County's historic landscapes.

NJDEP individual state-listed historic (17) property parcels occupy parkland (not including state-listed historic districts), **Table 1.11**. Many more historic landscapes exist throughout Middlesex County, as this list only includes state-listed individual properties within park boundaries. All listed and eligible historic properties within open spaces include 1290 acres, and historic properties in preserved farmlands encompass 478 acres, **Map 1.20**.

Historic properties and structures support the park's character and tie to the County's cultural heritage. These historic properties encompass all park ownership types, from state to municipal parks. These historic events in parks embody individual residents and local communities. A fraction of the County's history holds indefinite preservation in protected open spaces like Perth Amboy's Ferry Slip at Harborside Waterfront Park or the Edison Tower at Edison State Park, **Table 1.11**, **Figure 1.26**.

Figure 1.26: State-Listed Historic Properties in Open Space



Source: CUES, Rutgers University. Photograph. 2020.

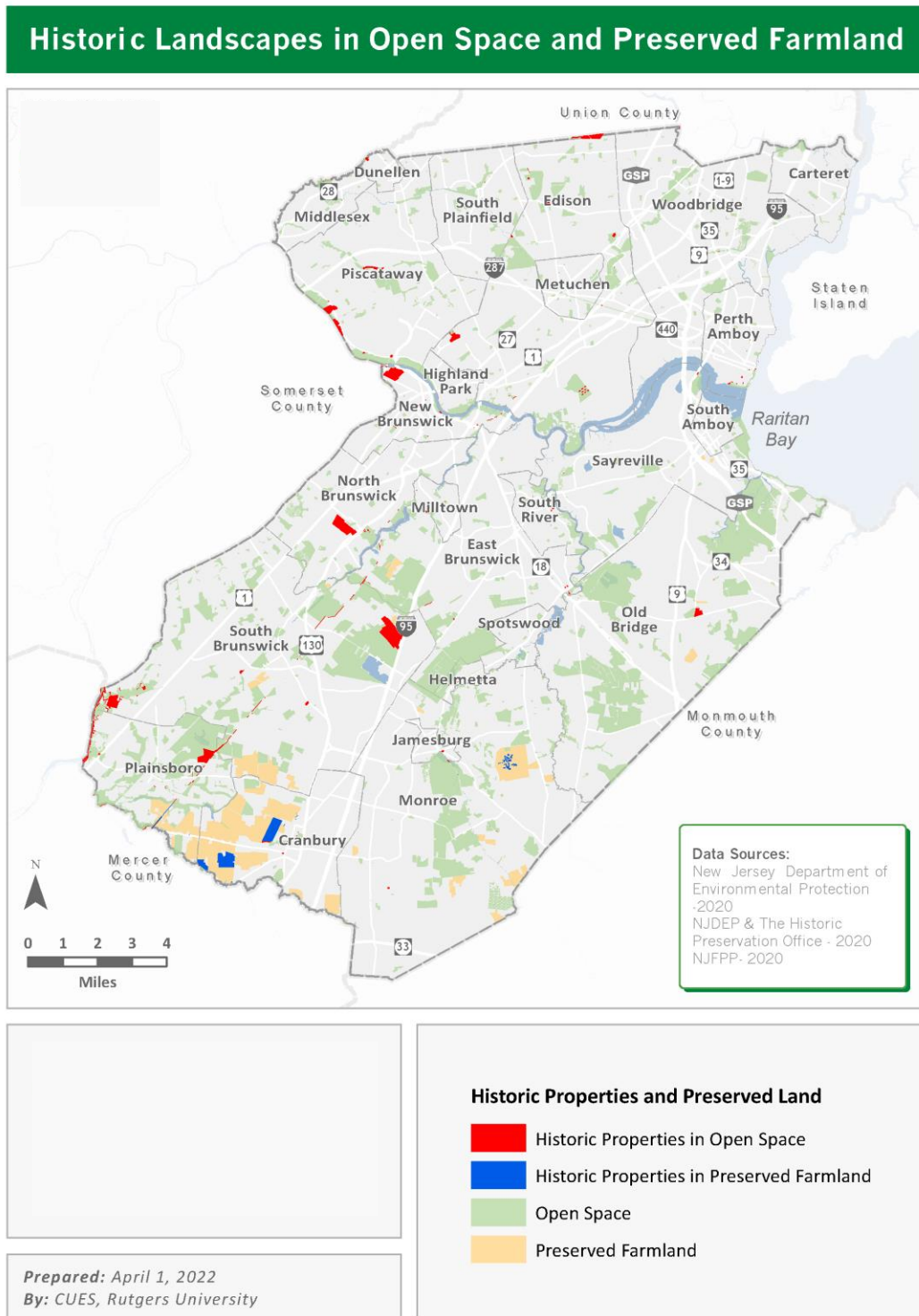
(Left) Edison Tower, Edison; (Right) Heathcote Meadows Preserve, South Brunswick

Table 1.11: State-Listed Historic Properties in Open Spaces

Name	Park Name	Municipality	Date	Demolished
Homestead Farm at Oak Ridge	Oak Ridge Park	Edison	1995-10-25	NO
Roosevelt Hospital	Middlesex Greenway	Edison	2002-03-05	NO
Thomas A. Edison Memorial Tower	Edison State Park	Edison	1979-11-30	NO
Ensley-Mount-Buckelew House	Buckelew Mansion	Jamesburg	1979-09-12	NO
Vail-Trust House	Mountain View Park	Middlesex	2008-10-07	NO
Buccleuch Mansion	Buccleuch Park	New Brunswick	1977-04-13	NO
Lawrence Kearny House	Sadowski Waterfront Park	Perth Amboy	1976-05-28	NO
McCormick Tenant House	Harborside Waterfront Park	Perth Amboy	1980-06-25	YES
Perth Amboy City Hall and Surveyor General's Office	City Hall Circle Park	Perth Amboy	1981-01-12	NO
Perth Amboy Ferry Slip	Harborside Waterfront Park	Perth Amboy	1978-11-28	NO
Proprietary House	Proprietary House	Perth Amboy	1971-02-24	NO
Cornelius Low House	Johnson Park	Piscataway	1971-05-27	NO
Ephraim Fitz-Randolph House	Ambrose and Dotys Park	Piscataway	1973-03-14	NO
Isaac Onderdonk House	Johnson Park	Piscataway	1973-10-30	NO
Randolphville Bridge (SI&A #122B129)	Ambrose and Dotys Park	Piscataway	1999-09-17	NO
John Van Buren Wicoff House	Wicoff House Museum	Plainsboro	1998-03-12	NO
Withington Estate	Heathcote Meadow Preserve	South Brunswick	1984-09-27	NO

Source: New Jersey Department of Environmental Protection (NJDEP). (June, 2020). Historic Property Features of New Jersey. NJDEP.

Map 1.20: Historic Properties in Open Space and Preserved Farmland



Farmland and Farmers' Markets

The open space inventory revealed that Middlesex County's landscape includes 5,459 acres of preserved farmland through the New Jersey Farmland Preservation Program (NJFPP). A comparison with *Land Use Land Cover* total agricultural land reveals that roughly 5,448 acres of farmlands lack preservation. Farmland preservation efforts continue through the **Strong Farming** functional plan, further offering an essential component to consider in enhancing and expanding Middlesex County's open space network. Farmland supports conservation opportunities and recreational spaces while connecting people to the County's agricultural heritage through farmers' markets, education, and agrarian tourism. Not only will farmland preserve natural land but also protect the County's agrarian viewsheds.

Farmers' markets link people to rural cultures and provide locally grown fresh food to surrounding communities. County farms produce corn, hay, apples, nursery stock, and more. Farmers' markets include temporary and seasonal outdoor markets where farmers sell agricultural goods throughout the spring-fall months. The Middlesex Farmers' Market in Middlesex lists one example of a year-round market included in the *Comprehensive Farmland Preservation Plan*.⁽¹⁴²⁾ Markets occupy designated outdoor locations such as the Highland Park Farmers' Market, the Metuchen Farmers' Market, Rutgers Gardens, and the New Brunswick Community Farmers' Market. **Table 1.12** lists all farmers' markets in Middlesex County located by the USDA, **Map 1.21**.⁽¹⁴³⁾

Farm stands or roadside markets (28) also occur across the County, not mapped in this inventory. Roadside markets include Pick Your Own farms and shops like Joan and Jacks in Piscataway or Diekers Farms in South Amboy.⁽¹⁴⁴⁾ Farmers Markets and Pick Your Own Farms to attract agricultural tourism, events for school-age children, and entertainment significantly supporting the County's cultural value through agrarian landscapes.⁽¹⁴⁵⁾ The *Middlesex County Comprehensive Farmland Preservation Plan* provides an extensive inventory and analysis of the County's farmland, markets, stands, cooperative ties, agrarian heritage, and preservation targets.⁽¹⁴⁶⁾

The County is home to agricultural resources for the community. The Middlesex County Rutgers Cooperative Extension Service at the E.A.R.T.H. Center, South Brunswick, educates the community about agriculture and conservation through programmed activities. The experimental station of Rutgers New Brunswick (NJAES) strongly links to the County's agrarian heritage. The Middlesex County 4-H Fair annually connects people with farming and similar activities. At the local level, houses of worship and NGOs connect with farmers to supply residents with fresh and local produce like food pantries in urban areas.

Map 1.21: Farmland and Farmers Markets

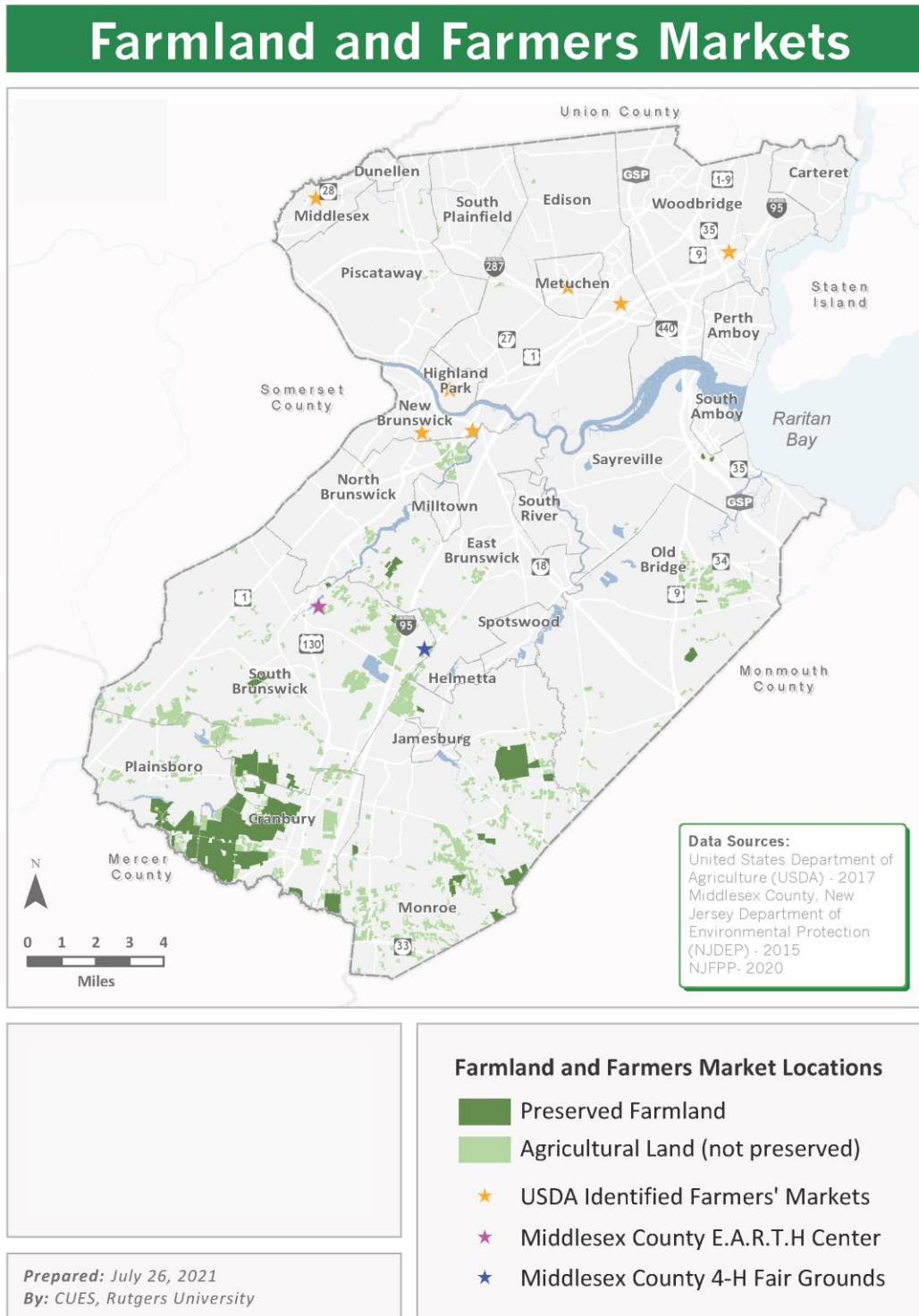


Table 1.12: Farmers Markets in Middlesex County

Farmers Market	Location	Indoor/Outdoor
Metuchen Farmers Market	Metuchen Town Plaza, Metuchen	Outdoor
Edison Farmers Market	980 Amboy Avenue, Edison	Outdoor
Woodbridge Farmers Market	1 Main Street, Woodbridge	Outdoor
New Brunswick Community Farmers Market	178 Jones Avenue, New Brunswick	Outdoor
Rutgers Gardens Farmers Market	Rutgers Gardens, New Brunswick	Outdoor
Middlesex Farmers Market	Union Avenue (Route 28), Middlesex	Indoor
Highland Park Farmer's Market	218 Raritan Avenue, Highland Park	Outdoor

Source: USDA. (2018). USDA Farmers Market Layer 2017 [Dataset]. Retrieved from, <https://www.arcgis.com/home/item.html?id=1e76414a681446f69f2295d7fc973230>

Middlesex County Planning Department. (2008). Middlesex County Comprehensive Farmland Preservation Plan 2008. Middlesex County Planning Department Division of Environment, Parks & Comprehensive Planning. Pg. H-3. <https://www.middlesexcountynj.gov/home/showpublisheddocument/2200/637686017743570000>

Middlesex County's southern half contains most of the preserved farmland. Farmland lends to the character of the southern communities and still exists in Cranbury, Plainsboro, Monroe, Old Bridge, North Brunswick, East Brunswick, and South Brunswick Townships. Minute parcels of unpreserved agricultural land occur in Edison and Piscataway. Active farms support the farmers' markets and farm stands throughout the County. Farms like Gasko's Family Farm and Greenhouses and Princeton Nurseries add to the farming and landscaping industry, as local suppliers support the County's landscapes through plant selection.

The *Land Use Land Cover* comparison from 1986 to 2015 revealed the County's agricultural landscape loss of 15,354 acres (-58 percent) to urban land. Development continues into the County's future with a pressing need for housing. It is essential to continue preserving the County's agricultural land. At the same time, it still exists to maintain the County's rural identity in the south, preserve the County's agricultural heritage, and support sustainable activities in farming culture. East Brunswick, Cranbury, Plainsboro, South Brunswick, Monroe, and Old Bridge utilize zoning and conservation tactics for preserving farmland and open space. It is essential to maintain the County's connection to these heritages where farmland losses occurred. Middlesex and Piscataway present prime examples of farm communities transformed into suburban landscapes. Historical signage, flags, agricultural museums, maintained viewsheds, and neighborhood names represent a connection to the County's agricultural past while supporting the cultural desire and need to transform the County's landscapes.

Figure 1.27: E.A.R.T.H Center Educational Signage



Source: CUES, Rutgers University. Photograph. 2020.
Davidsons Mill Pond Park, North Brunswick

OPEN SPACE AND FARMLAND SUMMARY

Middlesex County's open space and preserved farmland network encompass 31,737.3 acres (5,459 acres of preserved farmland) of the County's landscapes. Open space management and ownership include various types such as state, county, municipal, and non-profit owners. These agencies and private landowners may also manage and own preserved farms. Green and Blue Acres program funding supports open space acquisition with parcel acquisition opportunities presented in the County's **Open Spaces**. functional plan. The NJFPP funding preserves the farmland's function, viewsheds, and local character. The County offers irreplaceable support in preserving and acquiring open spaces and farmland through grant opportunities and priority location identification resources such as the **Open Spaces**. and **Strong Farming**. functional plans.

Land acquisitions play an essential role in maintaining quality open space and natural habitats. Wetlands occupy 47,773 acres, while unprotected agriculture exists on roughly 5,448 acres of the County's land. The County experienced a near 58 percent decrease in agricultural land from 1986 to 2015. Natural land and agricultural land preservation become even more pressing in a landscape rapidly transforming for urban uses.

Open spaces and preserved farmlands connect people to nature and agricultural practices, providing paramount ecosystem and provisioning services. These connections help maintain awareness of the County's agricultural heritage supported by the open space network through historic properties in parks and on preserved farmland. Open space preservation ensures quality ecosystem service potential through best land management practices. It expands the network's land cover to reach communities that may lack open space access (see **Open Spaces**. page 47 for *Areas of Greatest Open Space Needs*).

The best management strategies for the County's natural landscapes, farmlands, and surrounding communities will be essential to protect these natural habitats for human and non-human ecology. Agricultural and forested lands not protected show potential concern areas subject to future development. Support for acquisition, preservation, and awareness will ensure that each municipality holds the tools needed to maintain the County's cultural heritage through its open space and farmland network.

1.5 DEMOGRAPHICS

INTRODUCTION

Historic development patterns and land use changes lend to Middlesex County's population distribution. People inhabit the entire County with clustered urban centers, evidenced by higher population densities. The distribution of people highlights the County's urban centers and the ethnic diversity spread throughout the County. Racial and ethnicity statistics help understand the County's cultural needs and preferences. Income provides an additional indication of understanding population needs through landscape features. As seen in the Urban Heat Island inventory, the County's cities show patterns of higher urban heat island effects. A comparison of population distribution will show the generalized groups most affected by climate conditions, pointing to priority areas for landscape interventions.

Figure 1.28: People in Highland Park on the 4th of July



Source: CUES, Rutgers University. Photograph. 2019.

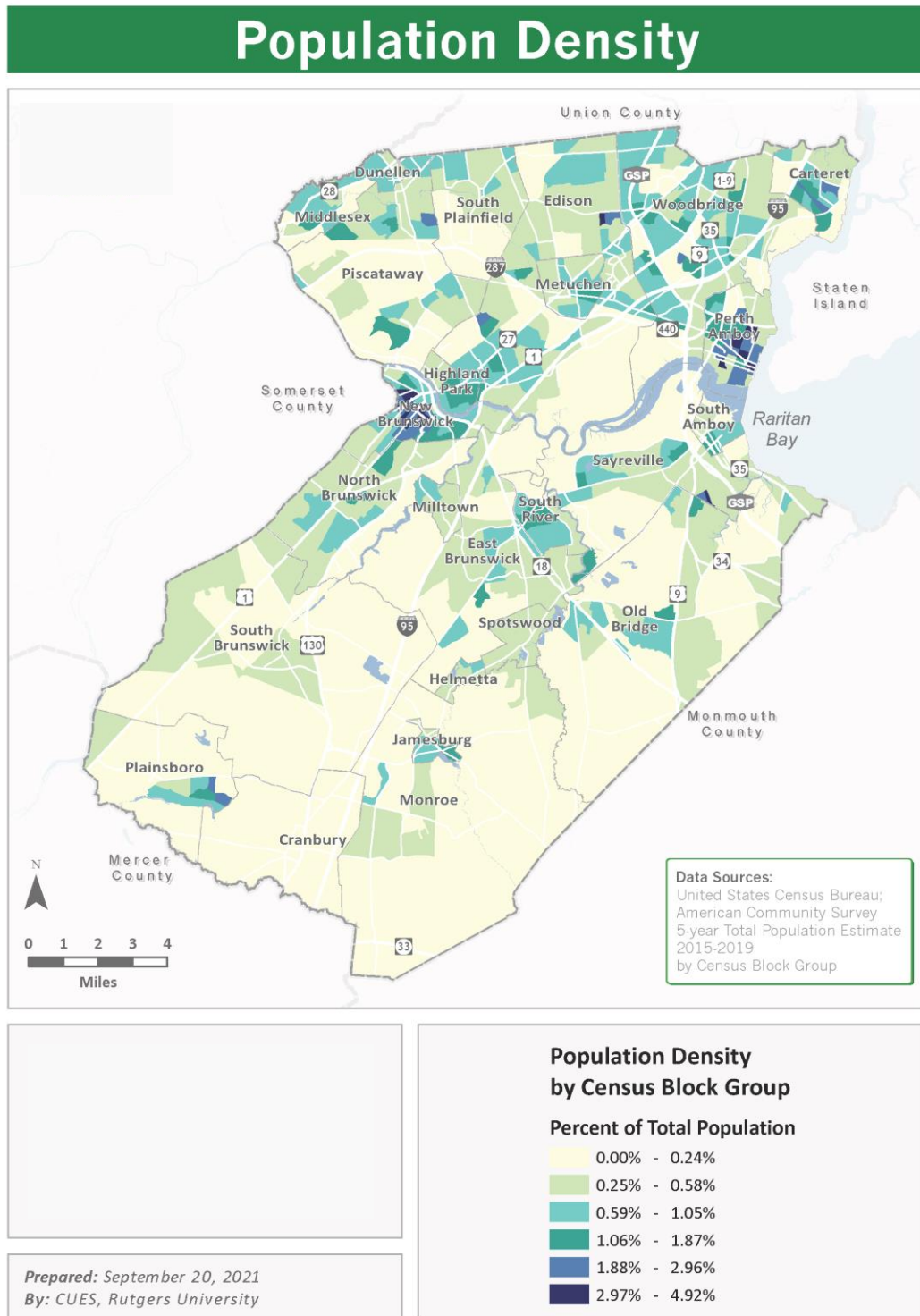
Population Density

The character of the County's people and population distribution similarly aligns with its landscape characteristics. The County's landscapes range from the urban city to rural landscapes with interspersed suburbs. The County's population density (persons per square mile represented as a percentage of Middlesex County's total population) follows these community patterns closely, **Map 1.22**. The highest percentage of Middlesex County's total population (2.97-4.92 percent of the total population) lives in the City of Perth Amboy and the City of New Brunswick and small portions of Sayreville (near U.S. Route 9) and Edison (Oak Tree Road). The population is denser in the county's northern half (where there is more urban land cover) and less dense in the South (where more farmlands and wetlands occupy the landscape).

Population densities reveal the County's suburban and rural centers. The percentage of the County's total population shows higher population densities at the center than in the surrounding suburban or rural landscapes. This occurs more obviously in the southern half of the County in Jamesburg, Helmetta, Plainsboro, and Old Bridge. Plainsboro practices planning techniques to conserve natural landscapes, actively planning denser development in favor of land conservation. Older suburbs contain moderately higher population densities in residential areas (0.59-1.87 percent of the total population). These patterns occur more widely in the north in Dunellen, Middlesex, Edison, Woodbridge, and Carteret. These areas include the denser suburbs across the County.

Population density helps examine the County's urban to rural gradient and landscape needs based on higher occupancy. City areas often contain higher population densities and lower access to natural resources and ecosystem services, such as a minimum percentage of tree canopy cover (section 1.2). More development, in the form of impervious surfaces, also accompanies urban areas. Landscape enhancements will require variation across the urban to rural gradient, supporting human health and well-being by increasing ecosystem service potential for all landscape types. The *Actions* chapter will identify landscape enhancements for urban, suburban, and rural areas.

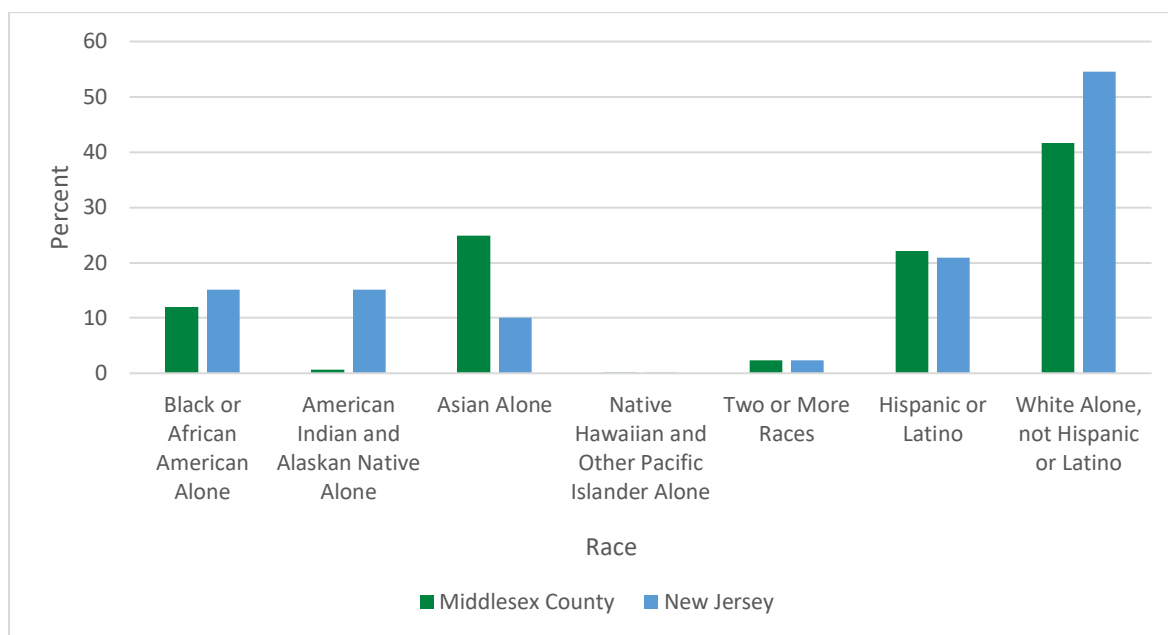
Map 1.22: Population Density



Racial and Ethnic Minority

Middlesex County is known throughout for its diverse ethnic and racial minorities. United States Census Bureau defines race “as a person’s self-identification with one or more social groups. An individual can report as White, Black or African American, Asian, American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, or some other race.”⁽¹⁴⁷⁾ Ethnicities represent people’s culture and impact the landscape through cultural preferences. Historic properties, programmed activities, art installations, and commercial establishments represent diverse ethnic groups across the County’s landscapes. Identifying as a *minority*, defined by the Oxford English Dictionary as a smaller group than the majority, marks an industry-standard indicator for qualifying as a potentially disadvantaged population and factors into this overall calculation (discussed in more detail in the **Open Spaces.** and **Invest Smart.** functional plans).⁽¹⁴⁸⁾ The **Nature & Place.** plan utilizes minority populations’ demographic information to locate culturally diverse areas which may require culturally different landscape interventions.

Figure 1.29: Race Percentage of Total Middlesex County population compared to New Jersey



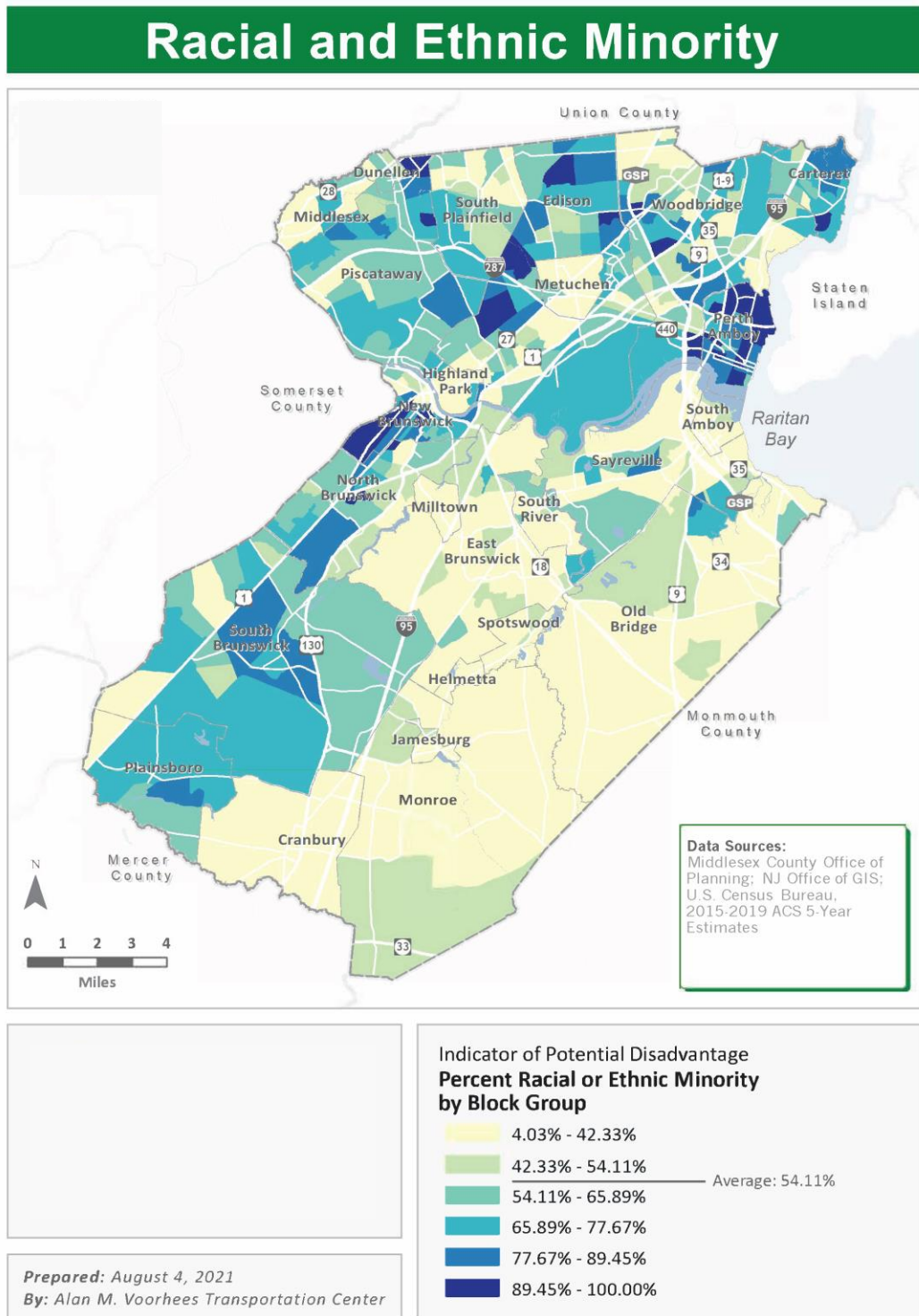
Source: U.S. Census Bureau quick facts: United States. Quick Facts Middlesex County 2019. (n.d.). Retrieved December 17, 2021, from <https://www.census.gov/quickfacts/US>

Middlesex County's racial population composition contains more diversity than New Jersey. The largest County group identifies as white (not Hispanic) with 41 percent. The Caucasian population no longer forms the County's majority, as this group represents under 50 percent of the total population. The Asian alone population follows the white, non-Hispanic identifiers; then the Hispanic and Latinx population, then the African American or Black population, followed by those identified by two or more races, American Indian and Alaskan Native, and lastly, Native Hawaiian and other Pacific Islander, **Figure 1.29**. In comparing the racial composition of Middlesex County with New Jersey, **Figure 1.29**, it is evident that Middlesex County has a higher Asian and Hispanic or Latinx population than the overall state.

Widespread diversity exists in the northern County, **Map 1.23**. The highest percentages of racial and ethnic minority populations (89.45-100 percent minority) occupy census blocks in Perth Amboy. Perth Amboy's total city population identifies as 78 percent Hispanic or Latino. Edison's total population identifies as 48.7 percent Asian alone. Piscataway's total population includes 37 percent Asian alone and 20 percent African American or Black. New Brunswick's total city population identifies 46 percent as Hispanic or Latinx, while Carteret's city population is 40 percent Hispanic or Latinx. ^(149,150,151,152,153)

The southern half of the County is less diverse. In the South, most racially and ethnically diverse populations occupy the western County along U.S. Routes 1 and 130 and Plainsboro Village. Comparatively, these areas are more rural and have a lower population density percentage, **Map 1.22**.

Map 1.23: Racial and Ethnic Minority



Poverty & Median Household Income

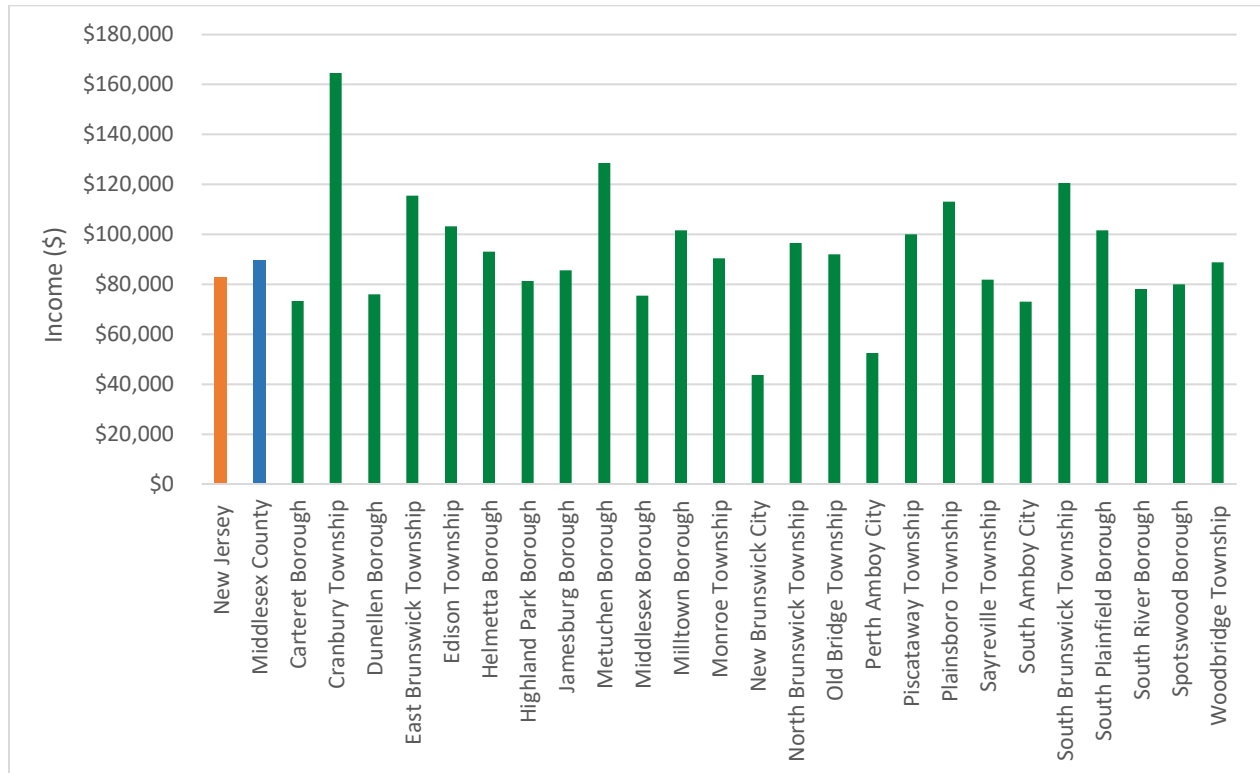
The United States Census Bureau defines poverty as the number of people (per capita) who live below the annual poverty threshold, which fluctuates based on inflation. ⁽¹⁵⁴⁾ Poverty measurements compare the percentage of the total population by geography.

The poverty rate in Middlesex County lies below the national average poverty line (12.3 percent). ⁽¹⁵⁵⁾ On average, the Middlesex County residential population poverty percentage, as a whole, lies lower than the total national population living below poverty. Although lower than the national average, poverty still exists throughout the County. According to the United States Census Bureau and the American Community 5-year estimate, “8.49 percent of the population with a determining poverty status in Middlesex County live below the poverty line (67,700 out of 797,000 people).” ⁽¹⁵⁶⁾

Geographically, a higher percentage of the impoverished population lives in areas (defined by census block groups) of New Brunswick, Piscataway, Highland Park, Dunellen, Middlesex, Sayreville, South River, Woodbridge, and Perth Amboy, **Map 1.24.** ⁽¹⁵⁷⁾ Less impoverished communities expanded the rest of the County. It is worth noting that Cranbury Township population accounts for the wealthiest municipality, with the entire County in the 0.00-2.68 percent of people living in poverty.

Understanding where higher concentrations of impoverished people reside can help identify factors that limit people’s access to open spaces and exemplify the need for improving open space access. Urban areas often align with the highest percentage of impoverished people in an area (26.84-78.27 percent). People with fewer resources and limited means to relocate, often live in areas with more susceptibility to environmental issues such as higher flood risks and urban heat islands compared with **Map 1.16, Urban Heat Islands.**

Figure 1.30: Median Household Income in Middlesex County 2019

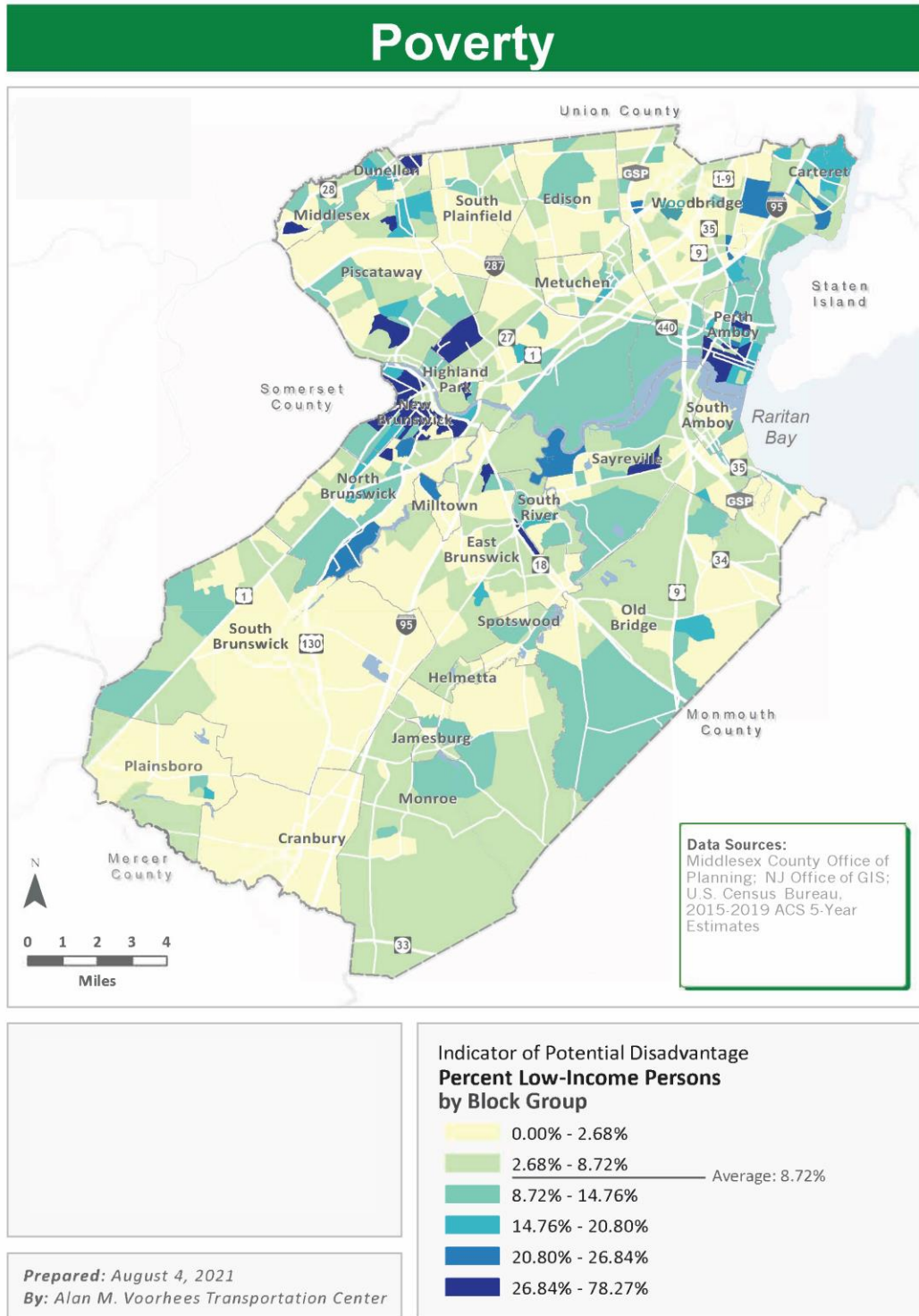


Source: United States Census Bureau QuickFacts. 2019. Median Household Income.

Comparing poverty with Middlesex County’s median household income by municipality reveals that poverty trends align with income levels, **Map 1.24, and Figure 1.30**. The average of all household members over 15 with reported income within designated geography encompasses the Median Household income calculation. ⁽¹⁵⁸⁾ Middlesex County’s median household income in 2019 was \$89,533, above New Jersey’s median household income of \$82,545, **Figure 1.30**. The highest poverty levels occur in New Brunswick and Perth Amboy Cities, with annual household incomes below the County average, **Table 1.13**. Interestingly, Piscataway Township’s median household income lies above the County average (\$99,925) with an isolated census block group with a higher percentage of residents living below the poverty threshold, **Map 1.24**.

The municipalities with the highest median household income (8 of 25 above \$100,000) occupy the County’s northern and southern areas. Cranbury Township has the highest median household income, followed by Metuchen, South Brunswick, East Brunswick, Plainsboro, Edison, South Plainfield, and Milltown **Table 1.13**. The southern half of the County holds nine out of the thirteen municipalities with a median household income above the County’s average **Table 1.13**.

Map 1.24: Poverty



Source: Destination 2040. Strategic Investment Framework. 2021

Table 1.13: Middlesex County 2019 median household income from high to low

Municipality	Median Household Income (\$)
Cranbury Township	\$164,722
Metuchen Borough	\$128,619
South Brunswick Township	\$120,546
East Brunswick Township	\$115,445
Plainsboro Township	\$113,131
Edison Township	\$103,076
South Plainfield Borough	\$101,565
Milltown Borough	\$101,563
Piscataway Township	\$99,925
North Brunswick Township	\$96,546
Helmetta Borough	\$93,056
Old Bridge Township	\$91,919
Monroe Township	\$90,451
Middlesex County	\$89,533
Woodbridge Township	\$88,900
Jamesburg Borough	\$85,560
Sayreville Township	\$81,883
Highland Park Borough	\$81,402
Spotswood Borough	\$80,074
South River Borough	\$78,162
Dunellen Borough	\$76,010
Middlesex Borough	\$75,460
Carteret Borough	\$73,347
South Amboy City	\$73,056
Perth Amboy City	\$52,563
New Brunswick City	\$43,783

Source: United States Census Bureau QuickFacts. 2019. Median Household Income.

DEMOGRAPHIC SUMMARY

The character of the County's people and population distribution similarly aligns with its landscape characteristics. The County's landscapes range from the urban city to rural landscapes through a suburban gradient. The County's population density (persons per square mile represented as a percentage of Middlesex County's total population) follows these community patterns closely, **Map 1.22**. The highest percentage of Middlesex County's total population (2.97-4.92% of the total population) lives in the City of Perth Amboy and New Brunswick, with the lowest population density percentages in the southern half of the County.

Racial diversity exists across Middlesex County's population composition. The largest section population identifies as white, alone not Hispanic (41 percent) but does not form the majority. The County's second-highest population identifies as Asian alone, followed by the Hispanic and Latinx, African American or Black, two or more races, American Indian and Alaskan Native, and lastly, Native Hawaiian and other Pacific Islander. In comparing the racial composition of Middlesex County with New Jersey, it is evident that Middlesex County's Asian and Hispanic or Latinx population statistics exceed the state's overall percentage.

Geographically, higher percentages of impoverished populations live in urban and denser suburban areas. These areas include New Brunswick, Piscataway, Highland Park, Dunellen, Middlesex, Sayreville, South River, Woodbridge, and Perth Amboy. Populations with lower impoverished population percentages expand the rest of the County. Cranbury Township contains every census block in the lowest poverty bracket (0.00-2.68 percent).

The highest median household incomes in the County occur in eight out of 25 northern and southern municipalities (above \$100,000). The highest median household income occurs in Cranbury, followed by Metuchen, South Brunswick, East Brunswick, Plainsboro, Edison, South Plainfield, and Milltown. The south contains nine of the thirteen municipalities with a median household income above the County's average (\$89,533).

Population density, median household income, racial minority, and poverty help understand which areas and populations may need different landscape resources. Demographic data alone only highlights the County's cultural and economic composition. Demographics paired with the ecosystem services inventory reveal landscape and population characteristics. The following section (1.6) examines people and space to understand how people directly impact and utilize the landscape through cultural preference, heritage, infrastructure, and more.

1.6 PEOPLE AND SPACE

INTRODUCTION

This section inventories human spaces to understand where people like to be and how areas or a physical location reveal the County's identity. Middlesex County's predominantly suburban landscape holds deep cultural diversity told through the County's people and how each group uses space. This section examines the human component of space through the exploration of culture.

The previous sections inventoried County elements that result from human activity. Human activity stems from cultural preferences preserved or discredited within the landscape. Land uses and covers, development patterns, topography, wetland loss, and commercial growth provide examples of cultural change inflicted on the landscape. The people and space section explores how humans utilize space for cultural activities. This utilization understanding helps identify if and how culturally significant places impact the County's landscape. Cultural landscape impacts inform a cultural landscape definition specific to the County, further discussed in the *Analysis* chapter, and landscape enhancements, discussed in the Actions chapter.

Understanding culture in the Middlesex County context is critical. What do people find important? The ***Nature and Place***. plan utilizes the following definition of culture: Culture represents human identity with a shared group. Culture includes shared values and shared dislikes. People belong to groups through beliefs, institutional understandings, and shared morals. ⁽¹⁵⁹⁾

Representation of culture in Middlesex County occurs in various contexts. Religious spaces, historic events, art centers, museums, commercial areas, transportation networks, and transmission infrastructure reveal where people want to be and how they use the landscape. Culture encompasses the things people value. In the ***Nature & Place***. context, the landscape, and cultural places can hide or reveal the County's cultural identities.

This inventory examines the County at the regional scale to identify different groups, cultural places, and identities. Understanding the County's historic and downtown programming, commercial centers, rail network, and more reveals desirable components which landscape features can enhance.

This section begins to outline how culture relates to the County's outdoor spaces. This inventory will be the baseline for developing a working definition of cultural landscapes associated with Middlesex County's suburban nature. The *Analysis* chapter will further discuss other definitions of cultural landscapes created by the National Park Service, Cultural Landscape Foundation, and European context based on the existing conditions inventories in this chapter and analytical components further observed in the *Analysis* chapter.

This inventory explores a new innovative approach demonstrating how cultural places can provide ecosystem services and cultural experiences in the suburban setting. This inventory intent encompasses a regional scale assessment of cultural elements representing the County's people and heritage, not an in-depth local level inventory. The inventory includes a demonstrative sampling of various factors contributing to the character and use of cultural places through data available for Middlesex County. Exploration of the following components considers the link between people and space, leading to *the Cultural Landscape Analysis* in chapter 2.

Rail Network, Transit Villages, and Bus Routes

The County's public transportation networks reveal connections between municipalities and larger cities like Philadelphia, Pennsylvania, and New York City, New York. These connections and assets offer resources for the population and become centers for desired community growth. Historically, the transportation networks closely align with settlement patterns through trade routes. Today, the same trend remains true, but with an increased focus on commuter needs and transit communities.

Middlesex County's location along the Northeast Corridor fosters the County's identity as a central hub. The rail line connections extend to New York City, New York, and Philadelphia, Pennsylvania, providing exceptional public transportation services compared to other suburban communities in the United States, **Map 1.25**.

Middlesex County encompasses 14 rail lines; seven lines cross County borders, including the Raritan Valley Line, Lehigh Line, Northeast Corridor Line, North Jersey Coast Line (North), Freehold Secondary, North Jersey Coast Line (South), and Chemical Coast Secondary.⁽¹⁶⁰⁾ These rail lines serve various purposes, such as shipping goods around the country and commuter lines.

Ten operational railroad stations service Middlesex County which include: South Amboy (South Amboy City), Perth Amboy (Perth Amboy City), Woodbridge (Woodbridge Township), Avenal (Woodbridge Township), Dunellen (Dunellen Borough), Metropark (Woodbridge Township), Metuchen (Metuchen Borough), Edison (Edison Township), New Brunswick (New Brunswick City), Jersey Avenue (New Brunswick City).⁽¹⁶¹⁾ South Amboy, Perth Amboy, Woodbridge, and Avenal Stations locations serve the North Jersey Coast Line. Metropark, Metuchen, Edison, New Brunswick, and Jersey Avenue Stations contain the Northeast Corridor.⁽¹⁶²⁾ The lone Raritan Valley Line station exists in Dunellen.⁽¹⁶³⁾ U.S. Route 1, North Brunswick, contains a future train station located in the New Main Street development. Development surrounds train stations supporting cultural hot spots, informing predictions for community growth due to transportation opportunities.

Transit Village designations accompany four of the County's transit communities. A Transit Village encompasses an "area around a transit facility that the municipality has demonstrated a commitment to revitalizing and redeveloping into a compact, mixed-use neighborhood with a strong residential component."⁽¹⁶⁴⁾ The New Jersey State government aids designated municipalities to gain grant funding for transit-oriented development.⁽¹⁶⁵⁾

The Transit Village Initiative, established in New Jersey in 1999, includes 34 municipalities.⁽¹⁶⁶⁾ Middlesex County contains four of the 34 Transit Village designations in Middlesex County: South Amboy (1999), Metuchen (2003), New Brunswick (2005), and Dunellen (2012).^(167, 168) Transit-oriented development (TOD) encourages Smart Growth initiatives to include housing development, job creation, and community engagement to support dense, high-activity areas with reduced car traffic.⁽¹⁶⁹⁾

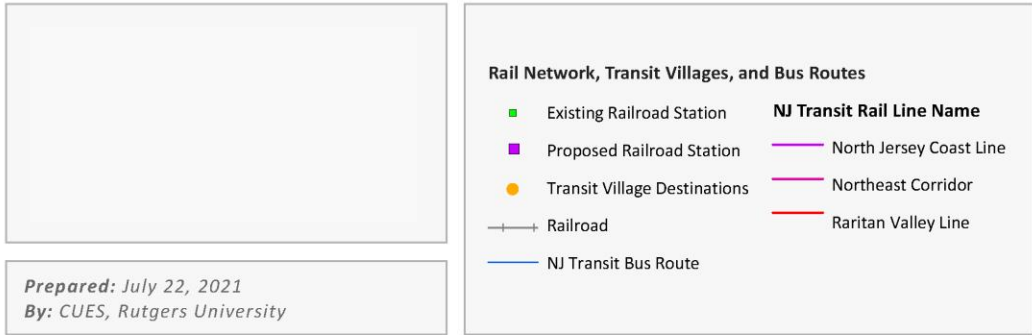
Buses provide an additional transportation network, adding to a municipality's potential for a transit village designation. New Jersey Transit lines run throughout Middlesex County in the north and south. One route runs from north to south along the New Jersey Turnpike. Bus routes connect New York City to the Jersey coast in the south, extending into Old Bridge. Bus networks also connect the east and west borders of the County.

Other bus networks serve the County's southern areas where NJ Transit bus lines do not reach. These lines include the County's MCAT line in the south, the Rutgers bus network, the Suburban Transit line in East Brunswick, the Tiger Bus line in Plainsboro and Mercer County, the Monroe Township shuttle, Somerset County shuttle, and the Greater Mercer TMA line.⁽¹⁷⁰⁾ Five *Park and Ride* lots connect travelers with public transportation networks, adding to the overall public network. These lots exist in East Brunswick, New Brunswick, Old Bridge, Sayreville, and South Plainfield.

Ferry travel also provides an additional transportation network connecting with New York City. The Perth Amboy Ferry Slip, planned South Amboy, and planned Carteret ferry terminals forge alternative connections for public transit supporting desirable places to live, community character, and likely future transit-oriented development opportunities.

By consolidating development, these areas become more unified as a community, reduce car usage through proximity to essentials, and free land for other types of land use and conservation. New economic development, facilitated by Transit Village designations and the County's transportation networks, provides an opportunity to incorporate green infrastructure and place-making opportunities into new plans. Public transportation locations and designations support character, function, and increased access to downtown areas. Communities with many transportation networks, such as New Brunswick, connect with surrounding municipalities and neighborhoods, supporting local and regional tourism. Transportation and tools to enhance development in these areas support efforts to establish sustainable outdoor spaces for people.

Rail Network, Transit Villages, and Bus Routes



Electrical Transmission Line Network

Electric power transmission lines and right-of-ways stretch across Middlesex County's landscape, forging ideal connections between various landscapes. These right-of-ways pose both potential opportunities and challenges for recreational opportunities and wildlife habitats. Public Service Electric and Gas (PSEG) transmission lines intersect the County's landscape from northeast to southwest. In contrast, Jersey Central Power & Light Company (JCP&L) bisects the County in the central-east region, **Map 1.26**.⁽¹⁷¹⁾

The transmission right-of-ways transect the landscape following highways, rail corridors, natural areas, and farmlands. Right-of-ways divide residential areas offering ideal public connections without infringing on residents' property, **Figure 1.31**. The power lines run alongside major highways like U.S. Route 130, Interstate-95, and U.S. Route 1. These lines cross farmland and open spaces in the county's southern half, such as the PSE&G line in South Brunswick and Plainsboro Townships.⁽¹⁷²⁾

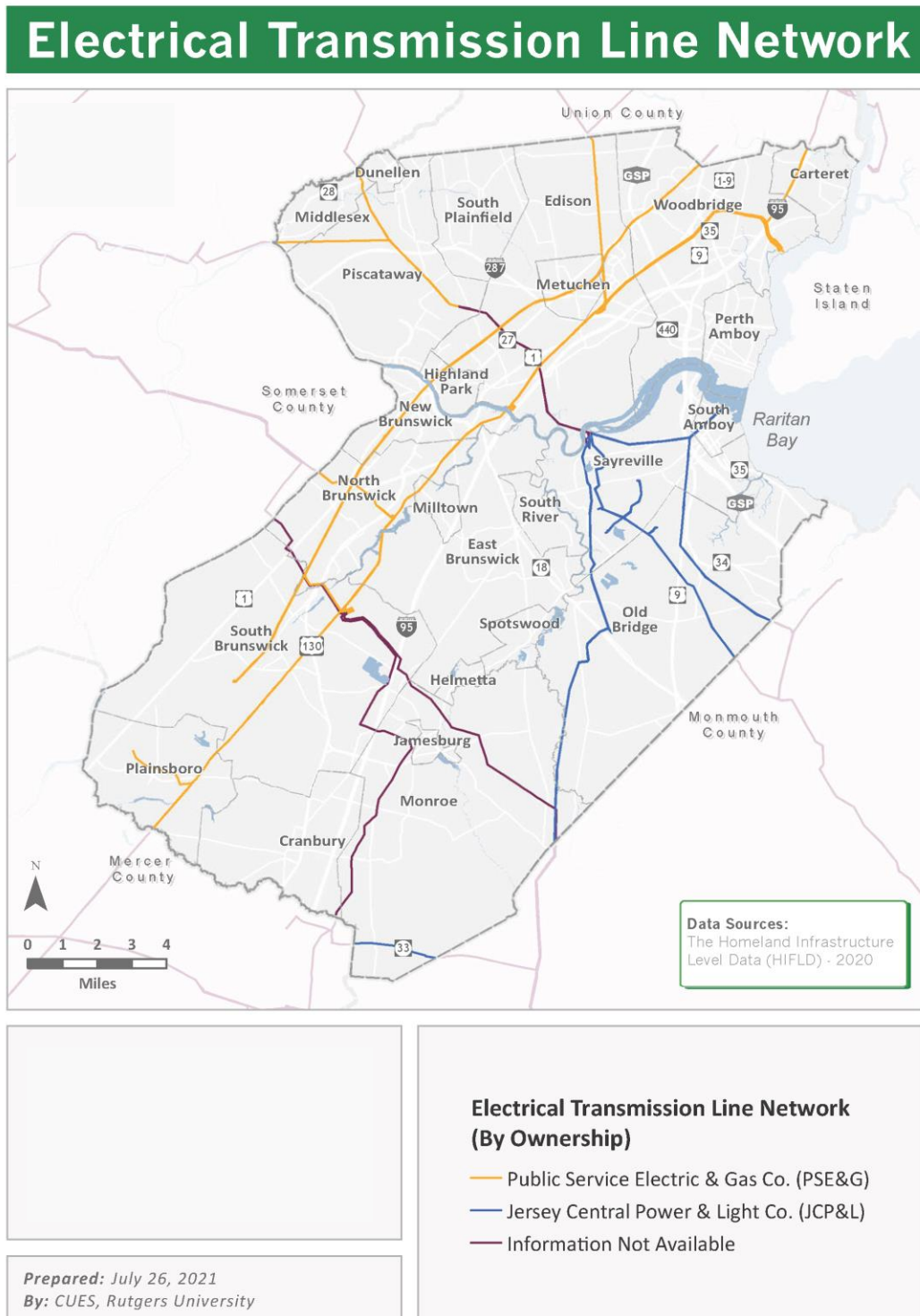
Mown lawn, maintained vegetation, meadows, gravel paths, and sometimes asphalt paving often occupies transmission right-of-way corridors. Regular management of these corridors offers an ideal location and opportunity for passive recreational activities such as a greenway or conservation through natural habitat support. Transmission right-of-way ownership identifies the stakeholders for targeted discussion to implement potential recreational or conservation tactics discussed in the *Actions* chapter.

Figure 1.31: Mown Lawn Transmission Line in a Residential Neighborhood, Milltown



Source: CUES, Rutgers University. Photograph. 2021.

Map 1.26: Electrical Transmission Line Network



Historic Properties and Districts

The National (NR) and State (SR) Historic Registers list historic properties and districts exemplifying historic significance to an era, event, or community. Historic properties and districts include structures, materials, design, setting, feeling, and association. Designations include the National Historic Landmark (NHL) and National and State Historic Registers. Each register contains multiple designation statuses. These include listed, eligible, identified, delisted, and local status. The State Historic Preservation Office lists and declares eligibility for historic sites. Eligible sites may not contain an official listing but can receive funding and resources through the New Jersey Historic Trust. ⁽¹⁷³⁾ The State Historic Preservation Office (SHPO) includes identified properties for consideration.

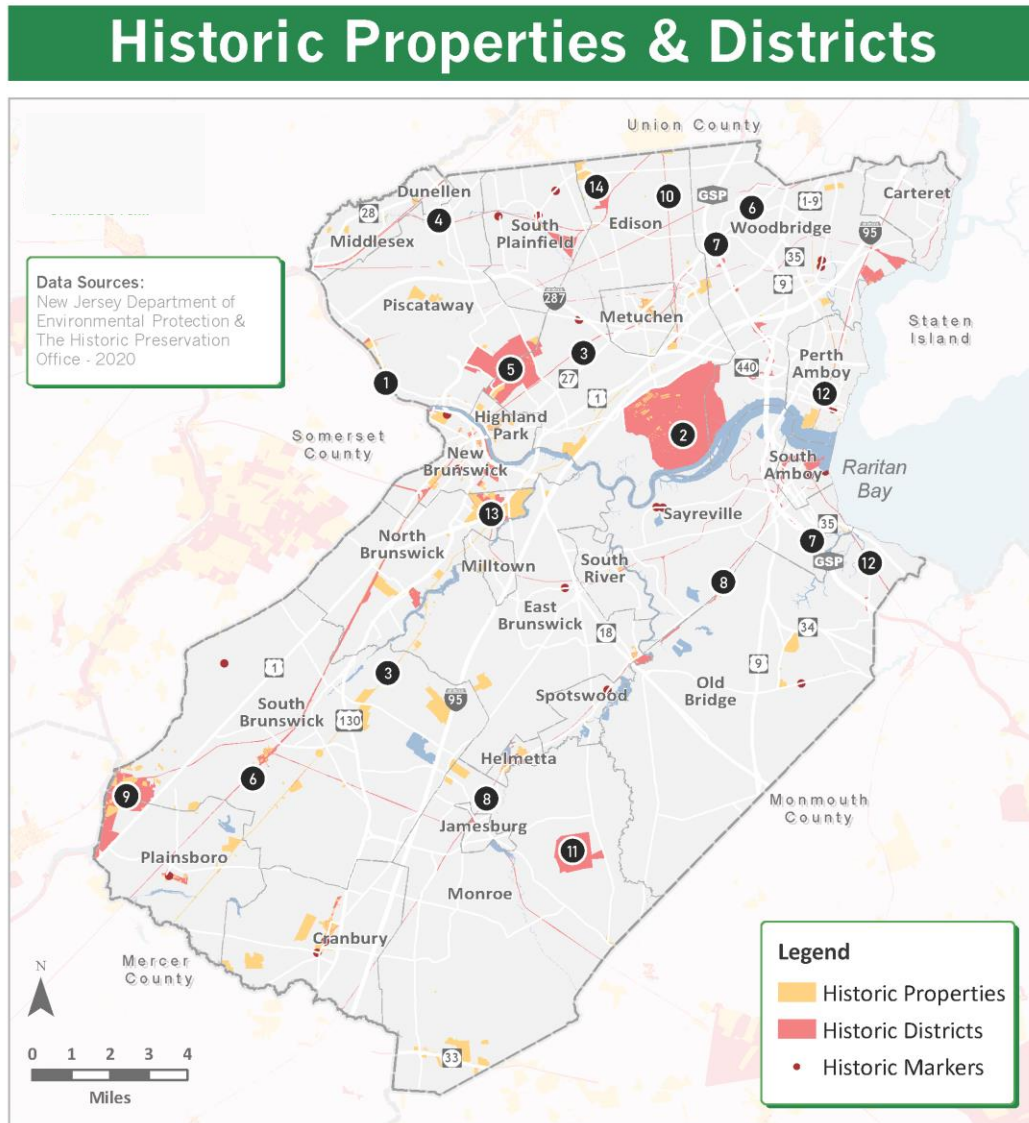
The NJDEP Historic Preservation Office (HPO) maps all historic properties listed, eligible, identified, delisted, and locally listed. Historic designations include both individual properties and districts. Districts occupy areas with continuous historic parcels contributing to the area's heritage. ⁽¹⁷⁴⁾ Examples include linear districts like rail and transmission corridors, historic neighborhoods, campuses, etc. Middlesex County's landscape encompasses 12,467 acres of historic districts. ⁽¹⁷⁵⁾

In Middlesex County, historic properties include 4,817 acres of land in both historic districts and standalone properties. ⁽¹⁷⁶⁾ These properties range from eligible to listed, with 64 properties on the National Register of Historic Places (NR). The earliest listing (1971) in Middlesex County occurs in Perth Amboy, known as the Proprietary House, representing the country's revolutionary heritage. ⁽¹⁷⁷⁾ One National Historic Landmark (NHL) designation exists in Middlesex County at Rutgers University. The National Park Service declares that Rutgers University automatically holds national historical significance, including it on the NR list. ⁽¹⁷⁸⁾

The Historic Landscapes in the *Open Space and Preserved Farmland* section (1.4) discussed the Middlesex County Division of History and Historic Preservations Historic Marker Program. In total, the County marked over 25 historic locations. ⁽¹⁷⁹⁾ Historic markers contain plaques honoring a property, structure, or landscape's historical significance, **Appendix 1.2**.

The **Open Spaces**. inventory identified priority historic property locations based on Municipal priorities and properties listed on the National Historic Register. This inventory expands the assessment beyond preservation priorities to examine historically significant locations, district opportunities, and community character represented through the landscape, whether enlisted status includes the highest priority for preservation or not. Please refer to the **Open Spaces**. report for parcels ranked by preservation priority.

Map 1.27: Historic Properties & Districts



		Top 14 Largest Historic Districts (By Area)	
		<ol style="list-style-type: none"> 1 Delaware and Raritan Canal Historic District 2 Edison Facility 3 Metuchen to Burlington Transmission Line 4 Lehigh Valley Railroad District 5 Camp Kilmer Military Reservation Historic District 6 Pennsylvania Railroad New York to Philadelphia Historic District 7 Garden State Parkway Historic District (Middlesex) 	<ol style="list-style-type: none"> 8 Camden and Amboy Railroad Main Line Historic District 9 Princeton Nurseries Historic District (SHPO Opinion) 10 PSE&G Company Northern Inner Ring Transmission Line 11 New Jersey Training School for Boys Historic District 12 New York and Long Branch Railroad Historic District 13 New Jersey Agricultural Experiment Station College Farm Historic District 14 Short Hills Battlefield Historic District

Prepared: December 6, 2021
By: CUES, Rutgers University

Historic districts, properties, and markers celebrate and immortalize Middlesex County's historic events. These events represent the many contributions Middlesex County residents added to the County's heritage, ranging from historic battles, epic innovations, industrial progress, military bases, pre-colonial settlement, and more.

For example, Cranbury's historic district (locally listed), home to Cranbury's downtown community, visibly represents Cranbury's historic character through architecture (in instances marked by signage).⁽¹⁸⁰⁾ Rutgers University, New Brunswick (not in the top 14 largest districts, **Map 1.27**, provides a notable historic district helping to define the character of the surrounding community. An apparent agriculture heritage reveals Rutgers' New Jersey Agricultural Experiment Station College Farm Historic District throughout the New Brunswick landscape in and around Cook Campus.⁽¹⁸¹⁾ The Edison Facility district (Raritan Arsenal), Edison, lays claim to the industrial and military history along Edison's waterfront. While Camp Kilmer, Edison, and Piscataway encompass the fifth largest historic district in Middlesex County, representing the County's military history, **Map 1.27**.

Figure 1.32: Perth Amboy City Hall – NR and SR Listed Place



Source: CUES, Rutgers University. Photograph. 2020.

Linear historic districts provide connections throughout the landscape. Multiple historic transmission lines, rail lines, and roadways traverse Middlesex County's landscape. The Middlesex Greenway touches a portion of the historic Lehigh Valley rail corridor, defining the Greenway's physical character. ⁽¹⁸²⁾ The Middlesex Greenway provides an ideal example of the potential to implement linear trails rooted in the County's history by utilizing other right-of-ways, depending on status and circumstances.

Municipal Historical Societies support Middlesex County's historic landscapes and structures through preservation and maintenance efforts. Each of the 25 municipalities has a historical society advocating for historic preservation and representation. The City of Perth Amboy and Woodbridge provide example opportunities with historic preservation commissions and ordinances declaring "all items of historic value must be preserved." Ordinances determine the competencies represented in a historical society, including members with historic knowledge of architecture and local history (refer to **Appendix 1.1** for a list of Middlesex County historical societies).

Locating Middlesex County's historic locations, whether individual properties, districts, listed, identified, or eligible, encompass all of the County's recognized historic landscapes. Historic landscapes such as farm fields, bridges, building frames, and more represent opportunities to connect the community with the County's cultural heritage, whether through historical signage in districts or restored structures on individual properties. These structures and markers exemplify the area's cultural heritage celebrated by the population today and hold opportunities to connect diverse groups to the County's landscapes.

Figure 1.33: Selman A. Waksman House at Rutgers University in Piscataway



Source: CUES, Rutgers University. Photograph. 2022.

Places

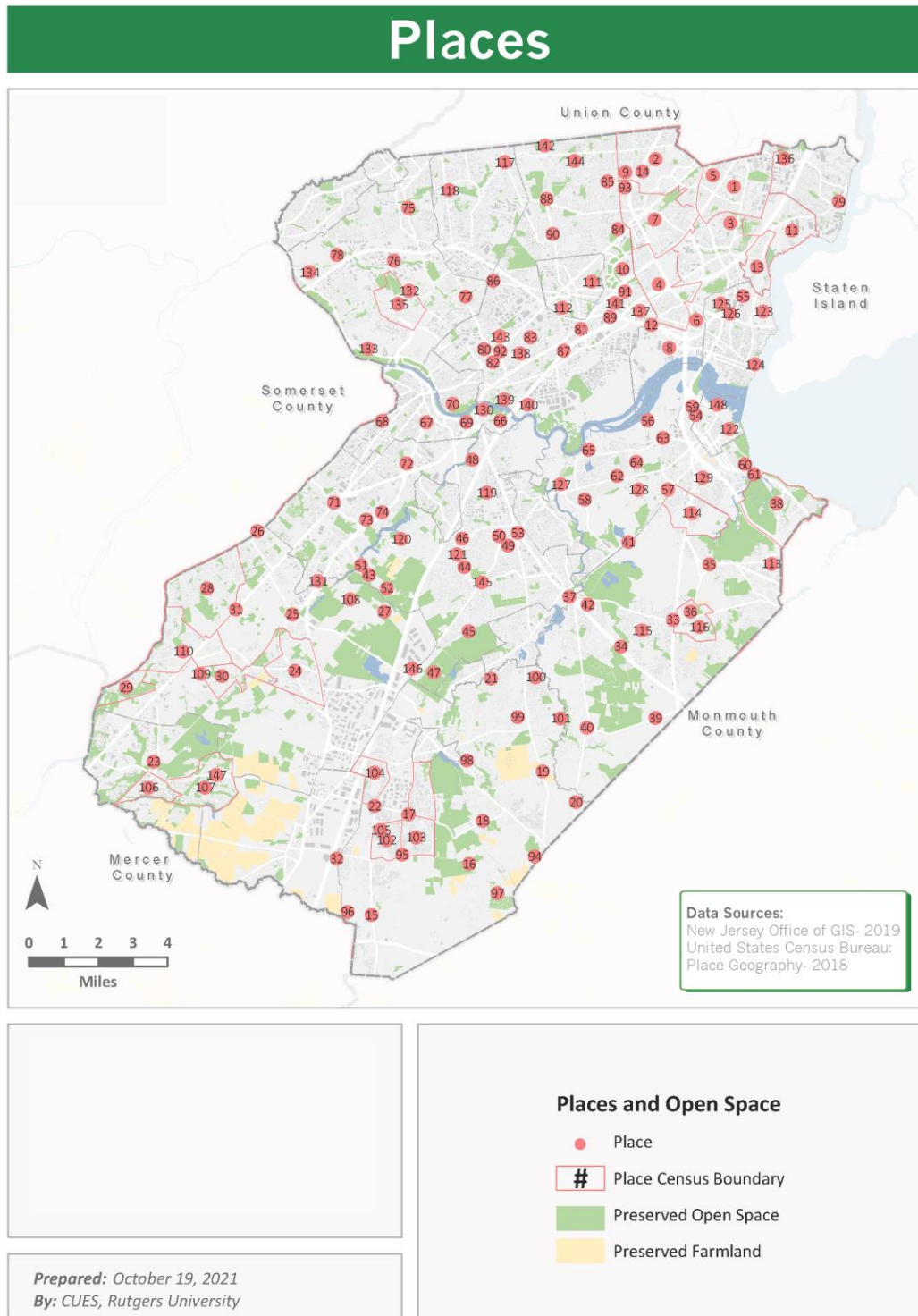
Many municipalities throughout the County encompass incorporated and unincorporated communities with official names other than the 25 incorporated municipalities in the County. Incorporated communities have their government (townships and boroughs), whereas unincorporated places do not have a government; they instead identify as neighborhoods and residential communities. This inventory refers to the collection of all unincorporated communities in Middlesex County, coined as places shown in **Map 1.28 and detailed in Table 1.14**. The term *place* acts as an interchangeable name for a neighborhood.

Places included represent only neighborhoods named other than the County's incorporated 25 municipalities since incorporated municipalities do not encompass all of the County's place or neighborhood identities. Middlesex County holds at least 148 place names or individual neighborhoods other than municipality names identified in the County, **Map 1.28, and Table 1.14**. The geography and place names include those found through the U.S. Census Bureau and NJDEP place names data.

Places reveal unique neighborhood identifiers separate from the municipality. For example, Woodbridge contains 15 neighborhoods or places identified by a unique name within one municipality, **Table 1.14**. The place name refers to a different identifiable feature separating one from the whole by geographic location, such as Keasbey along Woodbridge's waterfront or Colonia inland near the Union County border. A place's name reveals that occupants within each section identify differently, attend different schools, or potentially offer and require varied cultural needs and preferences within the same municipality. Place names reflect a community's history or cultural tie, providing opportunities to uniquely represent diversity through landscape elements like signage or amenity enhancements. For example, in Edison, the Clara Barton section (141) displays a more urban and historic character with a central business district than the suburban landscape of North Edison (142), **Table 1.14**.

Place name identification helps research the County's place characters. Some place names represent suburban developments and communities (Applegarth, Monroe), others reflect an entire community (Iselin, Woodbridge), and some reference the local geography (Sand Hills, South Brunswick). Place names locate communities, creating starting points to identify characters associated with outlines on the map and unique landscape needs within each town.

Map 1.28: Places



Refer to **Table 1.14** for the number key.

Table 1.14: Place names corresponding to Places Map (Map 1.28)

Number	Place Name	Municipality
1	Avenel	Woodbridge Township
2	Colonia	Woodbridge Township
3	Edgar	Woodbridge Township
4	Fords	Woodbridge Township
5	Hazelton	Woodbridge Township
6	Hopelawn	Woodbridge Township
7	Iselin	Woodbridge Township
8	Keasbey	Woodbridge Township
9	Lynn Woodoaks	Woodbridge Township
10	Menlo Park Terrace	Woodbridge Township
11	Port Reading	Woodbridge Township
12	Sand Hills	Woodbridge Township
13	Sewaren	Woodbridge Township
14	Shore View	Woodbridge Township
15	Applegarth	Monroe Township
16	Gravel Hill	Monroe Township
17	Half Acre	Monroe Township
18	Hoffman	Monroe Township
19	Matchaponix	Monroe Township
20	Mounts Mills	Monroe Township
21	Outcalt	Monroe Township
22	Prospect Plains	Monroe Township
23	Schalks	Plainsboro Township
24	Dayton	South Brunswick Township
25	Deans	South Brunswick Township
26	Franklin Park	South Brunswick Township
27	Fresh Ponds	South Brunswick Township
28	Kendall Park	South Brunswick Township
29	Kingston	South Brunswick Township
30	Monmouth Junction	South Brunswick Township
31	Sand Hills	South Brunswick Township
32	Cranbury Station	Cranbury Township
33	Browntown	Old Bridge Township
34	Brunswick Gardens	Old Bridge Township
35	Cheesequake	Old Bridge Township
36	Cottrell Corners	Old Bridge Township
37	East Spotswood	Old Bridge Township
38	Laurence Harbor	Old Bridge Township
39	Moerls Corner	Old Bridge Township
40	Redshaw Corner	Old Bridge Township
41	Runyon	Old Bridge Township
42	South Old Bridge	Old Bridge Township
43	Brookview	East Brunswick Township
44	Dunhams Corners	East Brunswick Township
45	Gillilandtown	East Brunswick Township
46	Herberts	East Brunswick Township
47	Jamesburg Park	East Brunswick Township
48	Lawrence Brook Manor	East Brunswick Township
49	Newton Heights	East Brunswick Township
50	Orchard Heights	East Brunswick Township
51	Patricks Corners	East Brunswick Township

52	Paulas Corners	East Brunswick Township
53	Tanners Corners	East Brunswick Township
54	Mechanicsville	South Amboy
55	Maurer	Perth Amboy
56	Crossmans	Sayreville Borough
57	Ernstson	Sayreville Borough
58	Gillespie	Sayreville Borough
59	Melrose	Sayreville Borough
60	Morgan	Sayreville Borough
61	Morgan Heights	Sayreville Borough
62	Parlin	Sayreville Borough
63	Phoenix	Sayreville Borough
64	Sayreville Junction	Sayreville Borough
65	Sayreville Station	Sayreville Borough
66	Edgebrook	New Brunswick
67	Feaster Park	New Brunswick
68	Lincoln Park	New Brunswick
69	Raritan Gardens	New Brunswick
70	Rutgers	New Brunswick
71	Adams	North Brunswick Township
72	Berdines Corners	North Brunswick Township
73	Maple Meade	North Brunswick Township
74	Red Lion	North Brunswick Township
75	New Market	Piscataway Township
76	Newtown	Piscataway Township
77	North Stelton	Piscataway Township
78	Possumtown	Piscataway Township
79	Chrome	Carteret Borough
80	Lindenau	Edison Township
81	Bonhamtown	Edison Township
82	Haven Homes	Edison Township
83	Lincoln Park	Edison Township
84	Menlo Park	Edison Township
85	New Dover	Edison Township
86	New Durham	Edison Township
87	Nixon	Edison Township
88	Oak Tree	Edison Township
89	Phoenix	Edison Township
90	Pumptown	Edison Township
91	Raritan Manor	Edison Township
92	Stelton	Edison Township
93	Woodbridge Oaks	Woodbridge Township
94	Tracy	Monroe Township
95	Union Valley	Monroe Township
96	Wyckoffs Mills	Monroe Township
97	Middlesex Downs	Monroe Township
98	Jamesburg Gardens	Monroe Township
99	Shore Road Estates	Monroe Township
100	Spotswood Manor	Monroe Township
101	Texas	Monroe Township
102	Clearbrook Park	Monroe Township
103	Concordia	Monroe Township
104	Rossmoor	Monroe Township
105	Clearbrook	Monroe Township
106	Plainsboro Center	Plainsboro Township

107	Princeton Meadows	Plainsboro Township
108	Cottageville	South Brunswick Township
109	South Brunswick Terrace	South Brunswick Township
110	Heathcote	South Brunswick Township
111	Robinvale	Metuchen Borough
112	Jefferson Park	Metuchen Borough
113	Morristown	Old Bridge Township
114	Madison Park	Old Bridge Township
115	Sayerwood South	Old Bridge Township
116	Brownville	Old Bridge Township
117	Avon Park	South Plainfield Borough
118	Samptown	South Plainfield Borough
119	Washington Heights	East Brunswick Township
120	Farrington Lake Heights	East Brunswick Township
121	Fairview Knolls	East Brunswick Township
122	Thomas J Dohany Homes	South Amboy
123	Barber	Perth Amboy
124	Harbor Terrace	Perth Amboy
125	John J Delaney Homes	Perth Amboy
126	William Dunlap Homes	Perth Amboy
127	MacArthur Manor	Sayreville Borough
128	Laurel Park	Sayreville Borough
129	Sayre Woods	Sayreville Borough
130	Westons Mills	New Brunswick
131	Black Horse	North Brunswick Township
132	Randolphville	Piscataway Township
133	Riverview Manor	Piscataway Township
134	Fieldville	Piscataway Township
135	Society Hill	Piscataway Township
136	West Carteret	Carteret Borough
137	Valentine	Edison Township
138	Washington Park	Edison Township
139	Martins Landing	Edison Township
140	Greensand	Edison Township
141	Clara Barton	Edison Township
142	North Edison	Edison Township
143	Lahiere	Edison Township
144	Potters	Edison Township
145	Halls Corners	East Brunswick Township
146	Rhode Hall	South Brunswick Township
147	Scotts Corners	Plainsboro Township
148	South Amboy Junction	South Amboy

Source: Census place geography and NJDEP Place Names (183, 184)

Arts and Culture Centers

Throughout Middlesex County, arts and culture centers provide opportunities for people to experience the diversity of the County's population through entertainment and educational outlets. The following inventory includes arts and cultural centers identified through the Middlesex County Economic and Business Development encompassing "galleries and theatres in Middlesex County where arts and cultural programming take place... including historical museums," **Map 1.29**.⁽¹⁸⁵⁾ Note that the available resource does not encompass all theaters and cultural centers but points to locations with dense cultural activities and representations of the local community for further study in the *Analysis* and *Actions* chapter.

The County contains a range of art and culture centers such as museums, theaters, cultural centers, and historic sites.⁽¹⁸⁶⁾ These locations serve local communities while also providing opportunities for local and regional tourism, attracting people to the County's municipalities. Theaters often occupy urban landscapes and commercial cores. While historic museums link to historic districts and properties (discussed in the *Analysis* chapter).

A cultural hub in Middlesex County centers in New Brunswick offers significant cultural opportunities from theaters, historic places, and outdoor spaces. New Brunswick's cultural representation portrays the County's history, Rutgers University, and the *State Theatre*, all accessed through public transportation supporting regional tourism, **Map 1.29**. The County Arts Institute office occupies Livingston Avenue next to the State Theater. The Arts Institute provides resources and connections to support Middlesex County's arts and history programming across the County utilizing County park properties for events. In Civic Square New Brunswick, Monument Square Park offers an outdoor space for programmed activities exemplifying New Brunswick's arts culture. The Art Institute, State Theater, and Rutgers Theaters support an arts identity in downtown New Brunswick celebrated through entertainment and outdoor space enhancements like street art.

Arts and cultural centers also occur outside New Brunswick's densely populated cultural center. Theaters exist in Edison (*Edison Valley Playhouse*, *Middlesex County Performing Arts Center*, and the County's *Plays-in-the-park* program at Roosevelt Park), Woodbridge (*Avenel Performing Arts Center*), Carteret (*Carteret Performing Arts and Events Center*, not mapped), and East Brunswick (*East Brunswick Community Arts Center/Playhouse 22*). Note that other theaters may exist throughout the County. School auditoriums also house theaters for programmed events. Several museums represent the local community history, such as the *Milltown Museum* in Milltown, the *Cranbury History Center* in Cranbury, and the *Menlo Park Museum* in Edison (to name a few).

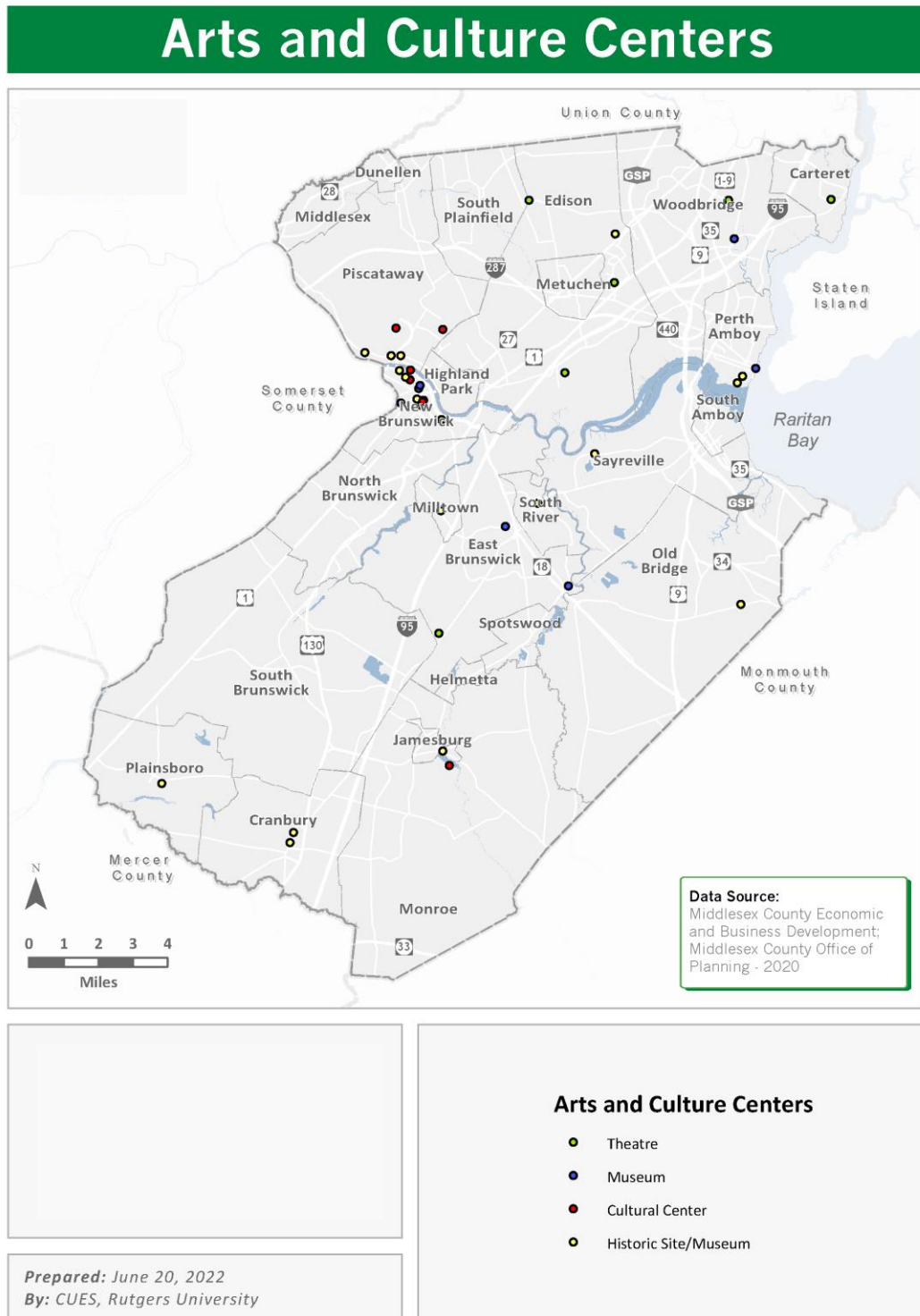
The *Open Space and Farmland* (1.4) inventory revealed historic landscapes in parks. Parks provide ideal outdoor spaces for people to experience Middlesex County's culture through activities and landscape experiences. Historic properties in parks lend to an outdoor space's overall cultural relevance and character. A prime example includes the County's East Jersey Old Town Village in Johnson Park, Piscataway. The village offers a clear colonial identity and connection to the County's heritage through a cultural center while enhancing its use through programming.

Middlesex County's Office of Arts and History and the Arts Institute lead the County's efforts to support arts and history. County Parks like Roosevelt Park in Edison offer cultural, outdoor spaces with a summer stage and County programmed events such as Plays-in-the-park made possible through County funding. Larger social parks provide prominent spaces for cultural activities, but it becomes essential to consider the role of neighborhood-scale parks in arts and history programming. Neighborhood parks with adequate amenities offer places for festivals, gatherings, arts, and historically relevant activities. Supporting smaller-scale landscapes will extend access to neighborhood-scale areas. Linking outdoor spaces with cultural centers can help activate outdoor spaces for accessible activities.

Cultural centers also include places for people to celebrate their cultural heritage. These places may represent communities that once occupied an area or currently do. Cultural centers include *The Lodge*, *American Indian Cultural Center at Thompson Park*, *the Hungarian American Athletic Club*, *the Asian American Cultural Center*, and *the Center for Latino Arts and Culture at Rutgers University*. Cultural centers support the County's diversity. Additional methods can expand the diverse representation of the landscape through monuments, markers, and place names dedicated to the County's diverse populations.

The various arts and cultural centers throughout the County provide entertainment, education, and places to celebrate the diverse cultural heritage and history throughout Middlesex County. Understanding where arts and cultural centers are and their activation sources help understand the County's cultural preference and avenues to extend entertainment to outdoor spaces like parks, town centers, and streets.

Map 1.29: Arts and Culture Centers



Houses of Worship

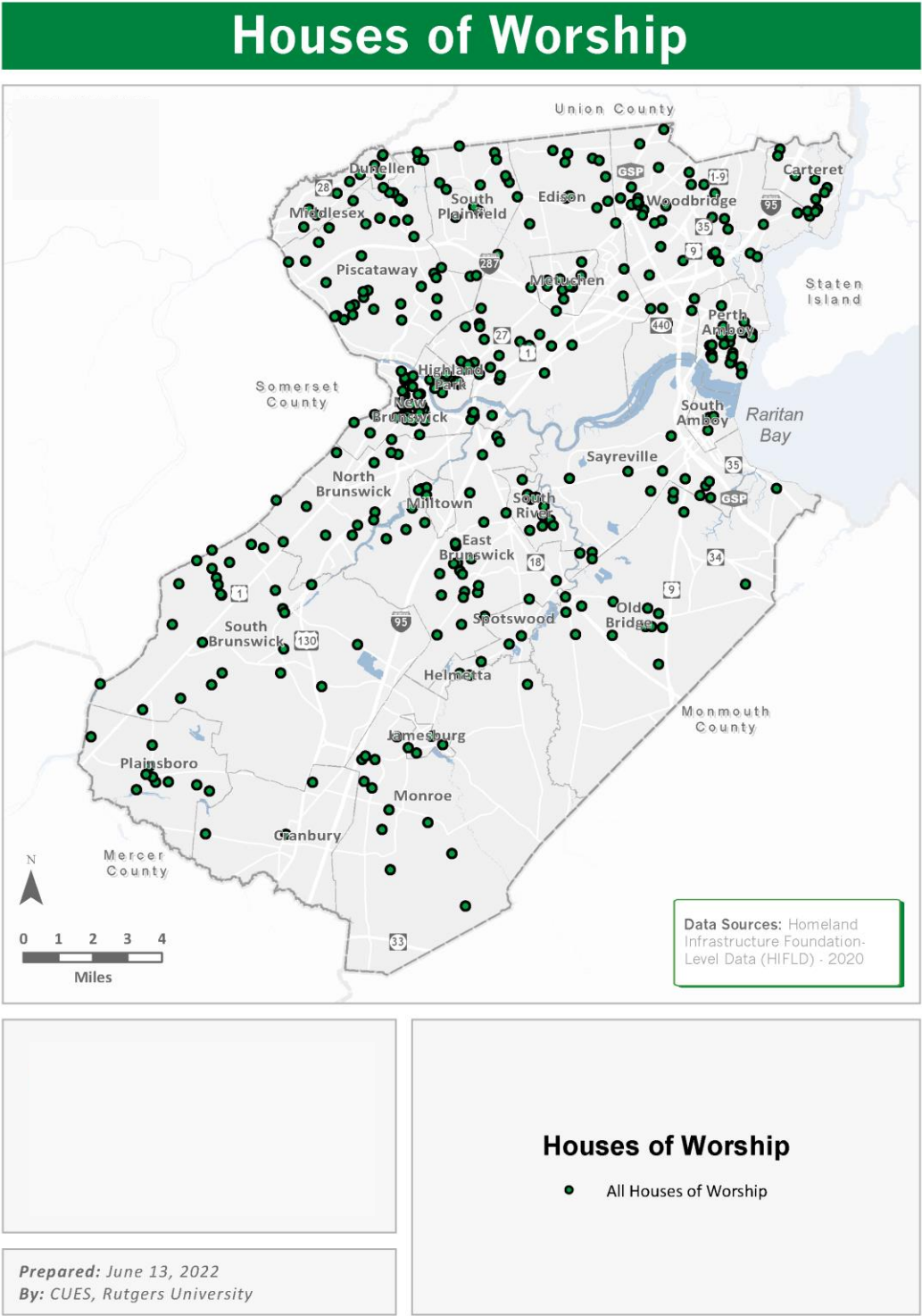
The demographic inventory revealed that Middlesex County encompasses an ethnically and racially diverse community celebrated across the County. Arts and cultural centers, events, and programming offer cultural experiences for the County's community. A sacred activity tied to cultural identity presents itself through religious ties. Religious denominations link people with groups celebrating similar morals, ideals, and beliefs. Religious communities represent the County's people and potential use of the landscape.

Demographic data typically refrains from mapping religious identification. This inventory considers the houses of worship throughout the County, examining the tie between religion and the use of space to comprehend the County's diverse population, **Map 1.30**. Some beliefs represent culture through lawn ornaments, others through building placement, and more. Over 480 individual houses of worship exist in Middlesex County. These houses range in the physical landscape character, architecture, and religious denomination. Houses of worship represent a wide range of religious groups such as Islamic, Muslim, Jewish, Catholic, Presbyterian, other Christian, and many more. Religious groups often represent ethnic ties such as Korean, Polish, Indian, and more. **Appendix 1.2** includes the full Houses of Worship list derived from the GIS data shown in **Map 1.30**.⁽¹⁸⁷⁾

People who identify with religious groups value places that have strong religious ties to their community. Not only is the extended community essential to Middlesex County's character, but also the cultural value of religious places adds to the landscape experience and even demographic pattern. Houses of worship offer connections through landscape elements, spreading awareness about diverse cultures and historical places. Four historic markers in Middlesex County celebrate religious establishments, **Appendix 1.2**. At the same time, other houses of worship include cultural centers like the Jewish Community Center in Highland Park. Building structures add to viewshed experiences like the Muslim Center of Middlesex County experienced while driving along U.S. Route 18. Lawn space on houses of worship offers essential private outdoor gathering space for community members and sometimes adorns lawn ornaments such as religious figures.

The many religious denominations throughout the County represent diverse people. For example, 48 houses of worship exist in Piscataway alone, exemplifying the mix of religious communities potentially sharing communal spaces like parks, downtown areas, and schoolyards. Ultimately, places of worship provide an additional layer to the County's diverse cultural identity and other significance to the community through shared identity, programming, and cultural representation through outdoor features.

Map 1.30: Houses of Worship



Commercial Centers and Designations

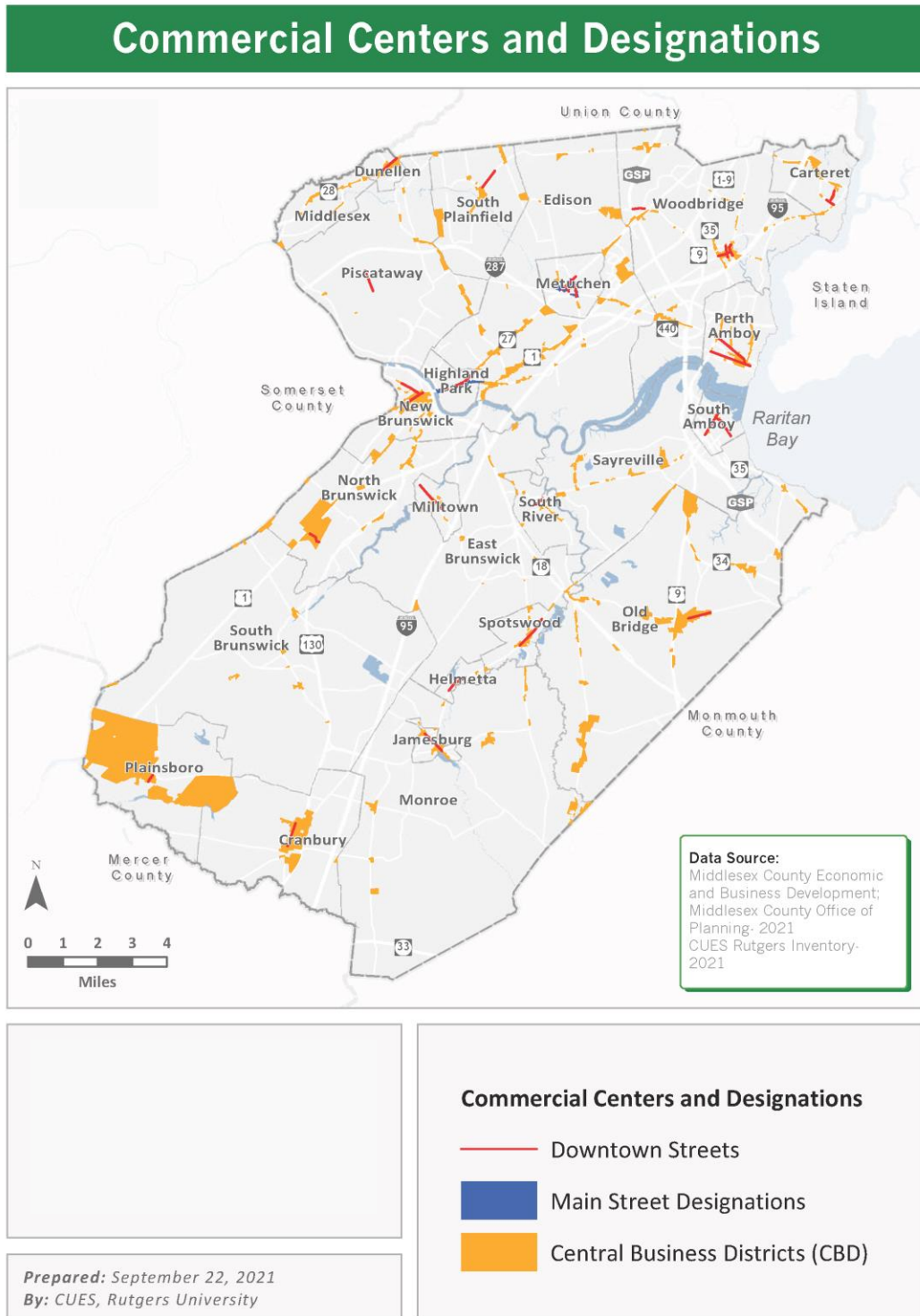
Middlesex County offers unique shopping, restaurant, employment, and entertainment opportunities. These establishments stand alone or occur in commercial hubs known as *Central Business Districts* (CBD). CBDs comprise areas where business concentration occurs, creating commercial and business centers.⁽¹⁸⁸⁾ CBDs often encompass areas along and near transportation networks like major roadways and train stations, including commercial properties, public buildings, and mixed-use development.⁽¹⁸⁹⁾

CBDs provide shopping, office centers, entertainment, hotels, and employment opportunities catering to the local community while occasionally supporting regional tourism like New Brunswick. CBDs tend to include higher desirability for space, prompting higher property taxes resulting in higher rent, but with the payoff of more consumer traffic.⁽¹⁹⁰⁾

The CBD areas throughout the County range in character. CBDs exist in downtown centers such as rural downtown Cranbury, suburban downtown Metuchen, or an urban downtown like Perth Amboy. They also occur along highway commercial/business corridors. The U.S. Route 1 corridor in Edison and North Brunswick and the Route 28 corridor in Dunellen and Middlesex provide transit corridor CBDs.

CBD association with a downtown environment does not always occur. To study the extent of downtown areas in Middlesex County, the research team identified potential downtown areas associated with the County's CBDs through aerial imagery and ground proofing exercises, **Map 1.31**. The specified locations, downtown streets, identify streets exemplifying potential downtown character such as commercial centers, sidewalks, transportation stops, and mixed land uses. Further investigation in the *Analysis* chapter reveals the character of each identified downtown area to inform landscape enhancements targeted for downtown areas.

Map 1.31: Commercial Centers and Designations



Two CBSs participate in the Main Street New Jersey Program: Highland Park and Metuchen.⁽¹⁹¹⁾ While five municipalities participate in the Downtown New Jersey Program (a prerequisite to the Main Street NJ Program): Metuchen, Highland Park, Dunellen, New Brunswick, and Perth Amboy.⁽¹⁹²⁾ This designation helps with downtown support through funding and human resources to enhance and sustain community downtown areas and allowed the research team to identify where downtown areas currently exist.

Non-profit organizations (NGOs) manage the Main Street NJ downtown areas, including the *Metuchen Downtown Alliance* in downtown Metuchen and *Main Street Highland Park* in Highland Park, **Map 1.31.**^(193, 194, 195) The Certified State Coordinating Program of the National Trust's National Main Street Center awards Main Street designation. This initiative provides funding to aid in NGO work to revitalize Main Streets throughout New Jersey, fostering human and place assets with a four-point approach, including design, promotion, economic vitality, and organization to enhance the value of downtown areas.^(196, 197) Other CBD locations not designated by the Main Street NJ Program may meet main street criteria.

CBDs occur in all 25 County municipalities catering to the regional and local community, **Map 1.31.** Locating CBDs assists in identifying potential downtown locations not participating in the New Jersey Downtown and Main Street NJ Programs. For example, Jamesburg's main street does not occur in any available downtown dataset. Still, the character of its CBD reveals that Jamesburg offers a downtown where people can walk to stores and explore the streetscape. Contrarily, CBDs encompassing strip malls and standalone stores, similar to the U.S. Route 1 corridor in Edison, do not express a downtown or main street character.

The research team identified 19 total downtown areas, Map 1.31, that serve as potential community downtowns based on physical characteristics such as CBD locations, building types, land uses, proximity to major roads, commercial areas, transit centers, and sidewalks. Sample identified downtown CBD areas include New Brunswick's Route 27, George Street, and Civic Square corridors; the Plainsboro Village Center; and the Helmetta Snuff Factory, **Map 1.31.**⁽¹⁹⁸⁾

Identifying downtown areas through CBD locations and Main Street designations helps reveal cultural landscape centers outside parks. Downtowns offer quality outdoor spaces for people, showing a community's character and potential gathering spaces. Highland Park and Metuchen's Main Streets provide examples of Main Street growth which benefits the community by boosting the local economy and desirable places to live and frequent. Further analysis of each community's downtown area will reveal opportunities for downtown enhancement tactics such as street amenity enhancements and trail connections.⁽¹⁹⁹⁾

The *Analysis* chapter assesses the available amenities, programs, and character of each identified downtown (based on the research team's assessment of physical character and programs). The evaluation examines which municipalities include Neighborhood Preservation Programs, downtown designations, Special Improvement Districts, and more to determine qualities that support thriving downtown areas.

Figure 1.34: Municipal Main Streets with Main Street NJ Designation



Source: CUES, Rutgers University. Photograph. 2021.

(Left) Highland Park Main Street; (Right) Metuchen Main Street.

PEOPLE AND SPACE SUMMARY

Middlesex County's *People and Space* inventory examined cultural preferences connected to physical landscape features. These cultural preferences imprint themselves on the landscape in the form of essential human services like public transportation and transmission infrastructure, consumer locations like commercial business districts and downtowns, preservation areas like historic properties, place names, and community spaces like arts and culture centers and houses of worship. This inventory examines existing culturally relevant assets which directly or indirectly impact outdoor spaces through the broad understanding of culture as a representation of human identity within a shared group. ⁽²⁰⁰⁾

This inventory examines the County at the regional scale to identify different groups, cultural places, and identities. Understanding the County's historic and downtown programming, commercial centers, rail network, and more reveals desirable components which landscape features can enhance. Culture represents people, and cultural landscapes reflect the human implications present in the landscape.

Examining accessibility through transportation is essential to investigate places people may frequent. Three commuter lines with ten operating train stations and eight different bus lines serve the Middlesex County community. Four of the State's 34 Transit Village Designations occur in Middlesex County, encouraging transit-oriented development (TOD). Train lines connect to New York City, Philadelphia, and down the Jersey Shore. Bus services expand the transportation network into the southern suburbs.

Transmission lines encourage opportunities for pedestrian and bicycle trails on already existing connections. The transmission network inventory revealed that PSE&G and JCP&L own two lines cutting across the County from northeast to southwest and central west to central east, forging uninterrupted landscape connections. Some transmission lines encompass historic district listings.

Historic places contribute to the cultural identity of the surrounding community. Middlesex County contains sites of pre-colonial settlement, historic battles, epic innovations, industrial progress, military bases, and more. Middlesex County's landscape encompasses 12,467 acres of historic districts with 25 plus historic markers through the Middlesex County Historic Marker program. Historic districts and properties portray a community's cultural heritage through landscape character, architecture, signage, and even place and neighborhood names.

Over 148 place or neighborhood names, in addition to the 25 municipality names, occur across Middlesex County. These unincorporated communities represent the County's heritage through groups and historical significance. Unincorporated places reveal cultural connections and show geographic areas within one municipality with a unique local identity. These places may require varied landscape needs or resources to foster that identity.

Throughout Middlesex County, arts and culture centers provide opportunities for people to experience the diversity of the County's population, entertainment, and educational outlets. County-wide, art and culture centers such as museums, theaters, heritage cultural centers, and historic sites with museums offer education and entertainment. New Brunswick presents the most arts and culture centers in the County, with six out of 11 theaters in the downtown area or central business district, attracting local and regional tourism.

Central Business Districts serve the County's commercial/services needs and link to various places. CBDs include suburban, rural, and urban centers and commercial corridors along roadways. CBDs range in character, revealing downtown qualities. ***The research team identified 19 total downtown areas, Map 1.31, that serve as potential community downtowns based on physical characteristics such as CBD locations, building types, land uses, proximity to major roads, commercial areas, transit centers, and sidewalks.*** Two Main Street NJ Designations exist in Middlesex County (Highland Park and Metuchen), with five municipalities participating in the Downtown New Jersey program.

People and Space reveal that culture not only exists in the distribution of people and character but also in the diverse uses of the County's spaces. Transportation networks move people throughout the County and connect people with commercial districts. Historic landscapes provide spaces for people to experience the County's heritage, while houses of worship bring people together. This inventory concludes that culture in Middlesex County presents itself in the landscape in a suburban context using everyday spaces.

The Analysis chapter will assess the traditional definitions of cultural landscapes prepared by the National Park Service, Cultural Landscape Foundation, and European Union and then compare these definitions with the suburban context to establish a cultural landscape understanding specific to Middlesex County's needs. The *People and Space Environmental Conditions Inventory* observed existing assets, providing a base for essential cultural elements to further assess in the *Analysis* chapter to inform cultural landscape improvements in the *Actions* chapter. The last component of this inventory examines the community's expressed needs through public and stakeholder outreach.

1.7 NATURE & PLACE. OUTREACH

The ***Nature & Place. Outreach*** inventory summarizes two outreach efforts completed during this project timeframe (2021-2022). The first summarizes the results of a crowd-sourced public engagement survey collecting demographic and place information to assess the public perception of the County's outdoor spaces. The second includes municipal engagement meeting findings to understand the County's needs during the early-mid project development phases. The following sections outline the process and critical findings for further assessment in the *Analysis* chapter and the overall D 2040 outreach.

Figure 1.35: Destination 2040 Public Outreach Event, 2018



Source: Destination 2040 Phase 1 Outreach, page 43.

D 2040 event at Woodbridge Center Mall, Sunday, December 2, 2018, obtaining 150 comments.

Nature & Place. Photo Survey

The **Nature & Place.** (L-Plan) Photo Survey asked people to identify their favorite outdoor place in Middlesex County by uploading a photograph and identifying a location on an interactive map through an online survey. The Rutgers Institutional Review Board (IRB) approved the survey for public use. The public could access the online survey through the online link below.

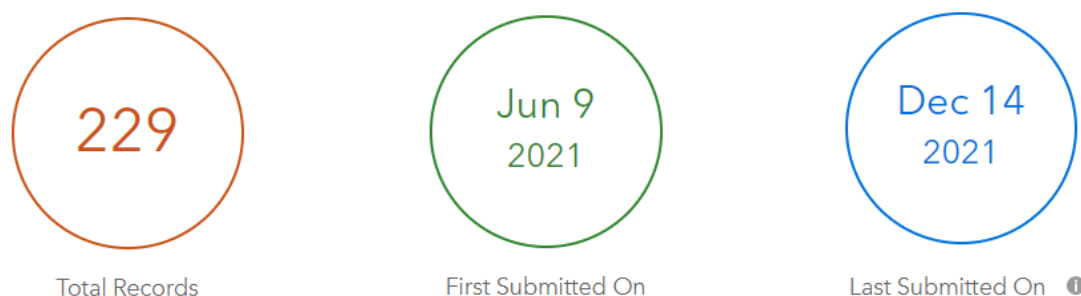
ArcGIS Survey123 link:

(<https://survey123.arcgis.com/share/97d0ecaf2a5f4edcaf7f5d0ab492e7dd>)

The online survey active dates included June 1, 2021, through December 30, 2021. 229 participants completed the survey. **Figure 1.36** shows the first and last dates of submitted responses. Participants consented to the terms and conditions of the Rutgers IRB and confirmed they were over 18 before entering the 15-question survey. Participants were free to skip any question(s) they wished.

This section includes highlights from the overall cleaned survey data relaying information related to favorite outdoor *places* and the *people* who identified these outdoor spaces. The following section breaks down each survey question (15) and responses into a Place and People section. *Place* includes summarized responses pertaining to the favorite outdoor place, while *People* refer to the summarized answers to demographic questions.

Figure 1.36: Survey Count and Dates



Source: ArcGIS Survey123. 2021.

Place

Identifying favorite outdoor places helps to understand where desirable outdoor places occur in Middlesex Community and determine what makes these places valuable to the individual. The survey helped understand activities people like to partake in and how these responses can better enhance Middlesex County's outdoor spaces. When asked to identify a favorite outdoor place, 217 participants named a place, while **99** participants listed an identifiable location within the County on the interactive map, **Map 1.32**, and **Table 1.15**. Photographs submitted to the survey highlighted park features, natural landscapes, and viewsheds (51 total photos) and helped further decipher an analysis of landscape features people enjoy. The findings show a linked narrative to space through human identification with landscapes (*Analysis* chapter).

Roosevelt Park, Edison, is counted as the most listed favorite outdoor place with an associated location on the map (16). The favorite outdoor places include County Parks, such as Davidson's Mill Pond Park, Thompson Park, and the Middlesex Greenway **Table 1.15**. This survey shows the critical role that County parks play in the outdoor experience for County community members. Multiple responses mentioned Rutgers University properties such as the Rutgers Ecological Preserve and Rutgers Gardens, **Figure 1.37**. Participants identified neighborhood-scale municipal parks as "closer to home" and accessible for daily use. Additional unmarked locations with high responses included "basketball courts" and "football fields" (not included in **Table 1.15** because these responses lacked locations), showing the high demand for quality outdoor recreational opportunities.

Figure 1.37: Survey Photograph Submission



Source: Nature & Place. (L-Plan) Photo Survey. Photograph Submission. 2021. Rutgers Gardens.

Map 1.32: Photo Survey Results

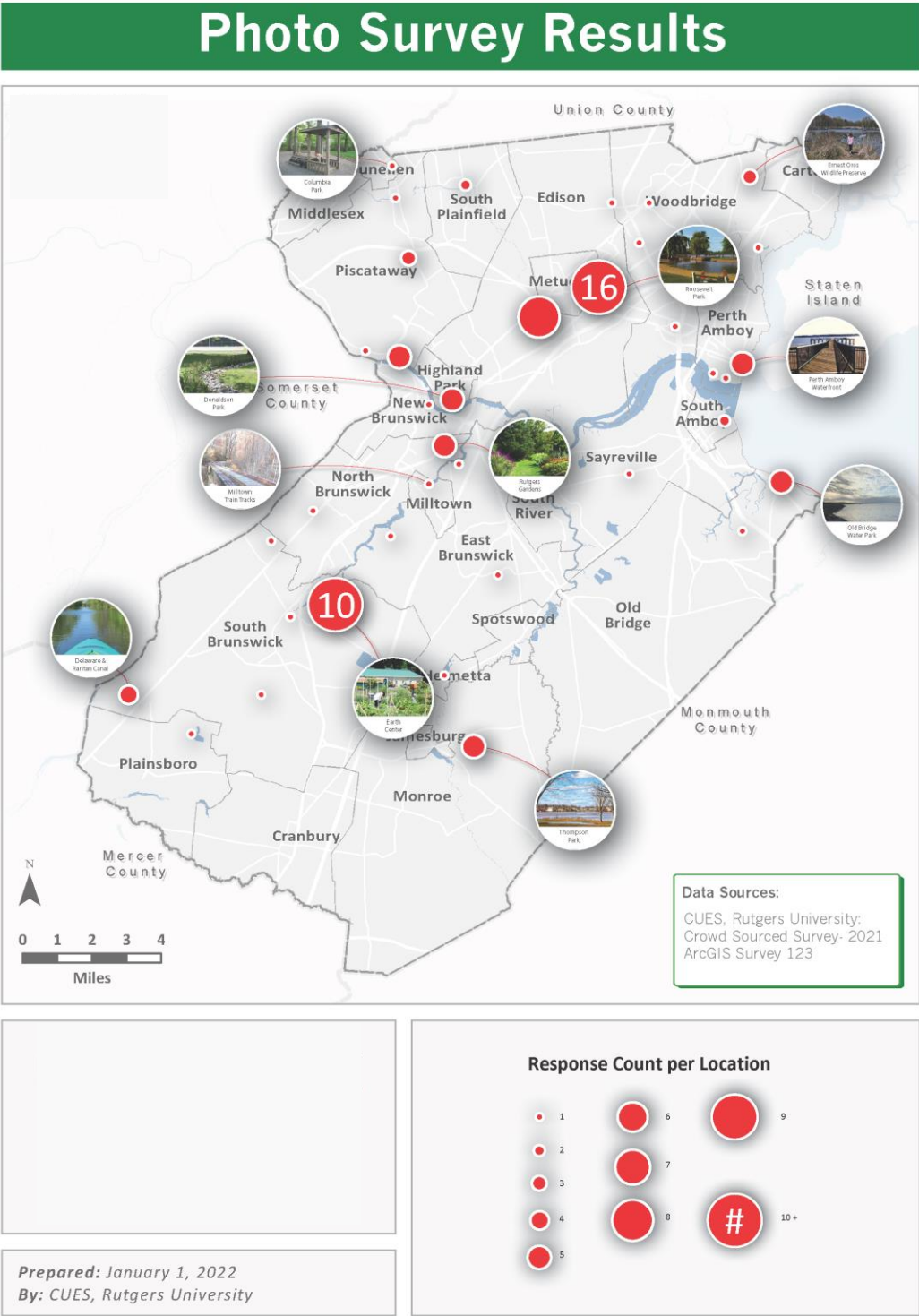


Table 1.15: Favorite Outdoor Place Identified by Survey Respondents

Place name	Municipality	Count
Alvin Williams Park	Woodbridge	1
Bicentennial Park	East Brunswick	1
Boyd Park	New Brunswick	1
Cheesequake State Park	Old Bridge	1
Columbia Park	Piscataway	1
Columbus Park	Dunellen	1
D&R Canal	(Multiple Locations)	4
Davidson's Mill Pond Park	South Brunswick	8
Davidson's Mill Pond Park (Earth Center)	South Brunswick	2
Donaldson Park	Highland Park	5
East Jersey Old Towne	Piscataway	1
Ernest Oros Wildlife Preserve	Woodbridge	3
Farrington Lake Trail	South Brunswick	1
Great Oak Park	East Brunswick	1
Harvest Woods Fields	South Brunswick	1
Helmetta Pond	East Brunswick	1
Johnson Park	Piscataway	5
Menlo Park Terrace	Woodbridge	1
Merrill Park	Woodbridge	1
Middlesex Greenway	Metuchen	7
Milltown Train Tracks	Milltown	1
Oak Tree Road	Edison	1
Old Bridge Waterfront Park	Old Bridge	5
Perth Amboy Waterfront	Perth Amboy	5
Plainsboro Preserve	Plainsboro	1
Port Reading Waterfront	Woodbridge	1
Raritan Bay Waterfront Park	South Amboy	2
Roosevelt Park	Edison	16
Rutgers Gardens	North Brunswick	5
Rutgers University Ecological Preserve	Piscataway	3
Sabella Park	North Brunswick	1
Sadowski Parkway Park	Perth Amboy	1
Sayreville Kennedy Park	Sayreville	1
Spring Lake Park	South Plainfield	2
Thompson Park	Jamesburg	5
Weston Mills Pond	East Brunswick	1
William Warren Park	Woodbridge	1
Total		99

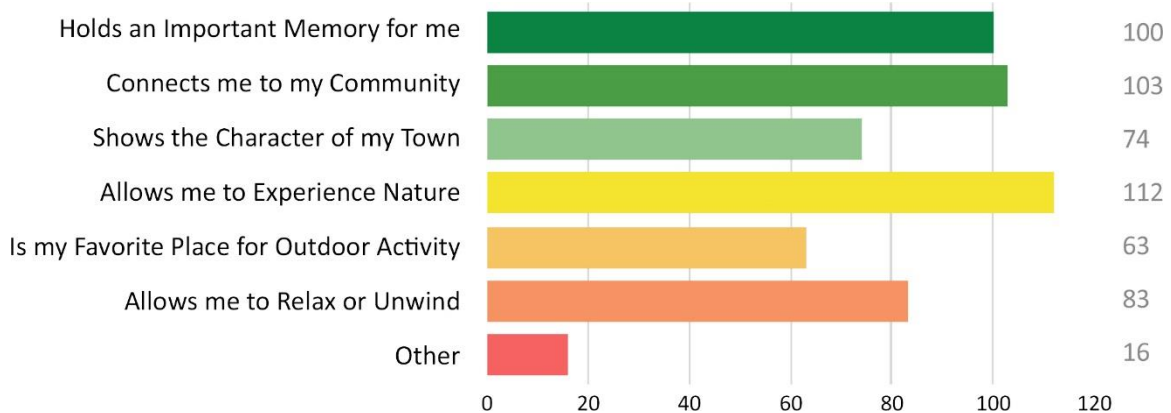
What is the name of your favorite outdoor place?

Responses with identifiable locations within the County.

The following question asked participants why this place is important to them and prompted six selections and an *Other* option. The choices included: *Allows me to experience nature, connects me to my community, holds an important memory for me, allows me to relax and unwind, shows the character of my town, is my favorite place for outdoor activities*. Respondents selected all answers that apply. Participants responded that the experience of nature was the top reason they identified this as their favorite outdoor place (112), **Figure 1.38**.

Other open-ended responses displayed people’s connection to a place through memory, family, and self-identity **Table 1.16**. The open-ended responses identify why people found this place important and unveiled the components that comprise the cultural landscape. **The components include diverse individual and collective experiences that link to an outdoor space, creating a shared narrative of a particular place.** People mentioned the “heart” of Iselin, experiences with their children, home identity, and access to the cultural and arts programming through their favorite outdoor places (Roosevelt Park), **Table 1.16**. Participants stated that this place is “my home away from home” and “is the place I watched my children grow up.” These comments lend to the significance of memory tied to a place’s identity for the individual and that individual’s formation and linkage to a space forming a valuable cultural landscape.

Figure 1.38: Favorite outdoor place reasons identified by survey respondents



Responses to: This place is important to me because...

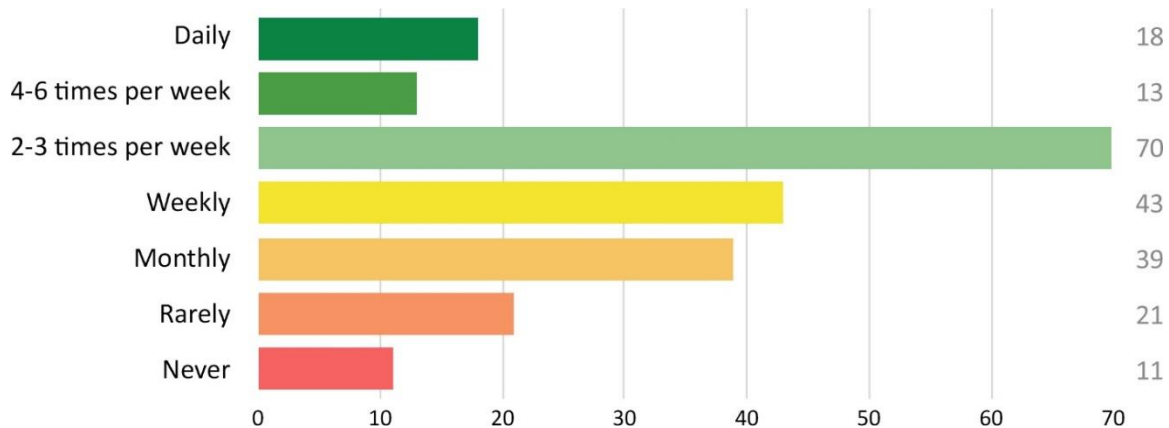
Table 1.16: Favorite outdoor place reasons identified by survey respondents

Place name	This place is important to me because...
Davidson's Mill Pond Park	My home away from home
Donaldson Park	Is a place where I watched my children grow up
East Jersey Old Towne	I love that this place offers cultural and historical programming in a beautiful setting. We have enjoyed the Halloween storytelling events and tours with historical reenactors.
Ernest Oros Wildlife Preserve	Is very near where I live.
Harvest Woods Fields	Means the world to me to have wooded, open spaces like this to enjoy. My aunt fell in love with the abundance of trees here when visiting from our home country. It is not to be taken for granted, I am grateful for the park.
Johnson Park	Johnson Park is my favorite park to run in. There are several trail and loop options. My children love to run with mommy and then play on the many playgrounds and visit the animals.
Oak Tree Road	It's the "heart" of Iselin yet looks very decrepit compared to the Main St. of Metuchen. Given the business that this area brings to the county, it is worth some effort to beautify it and make it more ecologically friendly.
Old Bridge Waterfront Park	I love the water
Old Bridge Waterfront Park	Taking early morning walks with my dogs.
Perth Amboy Waterfront	Shows the history of the city.
Roosevelt Park	It's where a walk around the Lake turned into a Friendship that turned into Marriage. We walked to Recover from his Dual Transplant and both of our Heart Surgeries. It's also named after my grandfather.
Roosevelt Park	Plays in park
Roosevelt Park	Has an exercise trail and spring with fresh water
Sayreville Kennedy Park	Best sunsets
Thompson Park	Memories of feeding the animals as a child.
William Warren Park	it's a safe place to ride bikes, and the free Movatic bikes are located there.

Responses to: This place is important to me because... *Other*

The highest percentage of participants visited their favorite outdoor place 2-3 times per week (30 percent), followed by weekly (18 percent), monthly, rarely, and daily **Figure 1.39**. Various activities bring people to their favorite outdoor places, such as exercise, sports, and programmed activities, as mentioned in **Table 1.16**.

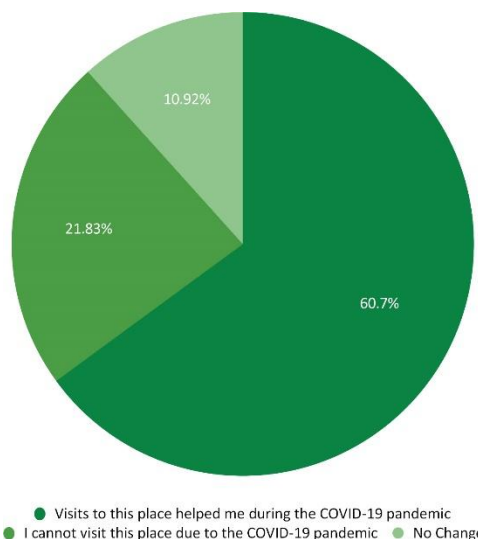
Figure 1.39: Visit frequency identified by survey respondents



Responses to the questions: How often do you normally experience this place?

More than half (60 percent) answered that “visits to this place helped me during the COVID-19 pandemic,” **Figure 1.40**. While 50 participants (21.8 percent) stated they “cannot visit this place” due to COVID-19 (2021). It is evident that outdoor usage during the pandemic has increased, supported by a Rails to Trails study stating that “in the early weeks of the pandemic, trail use surged by 200%.” ⁽²⁰¹⁾

Figure 1.40: COVID-19 Pandemic influence identified by survey respondents



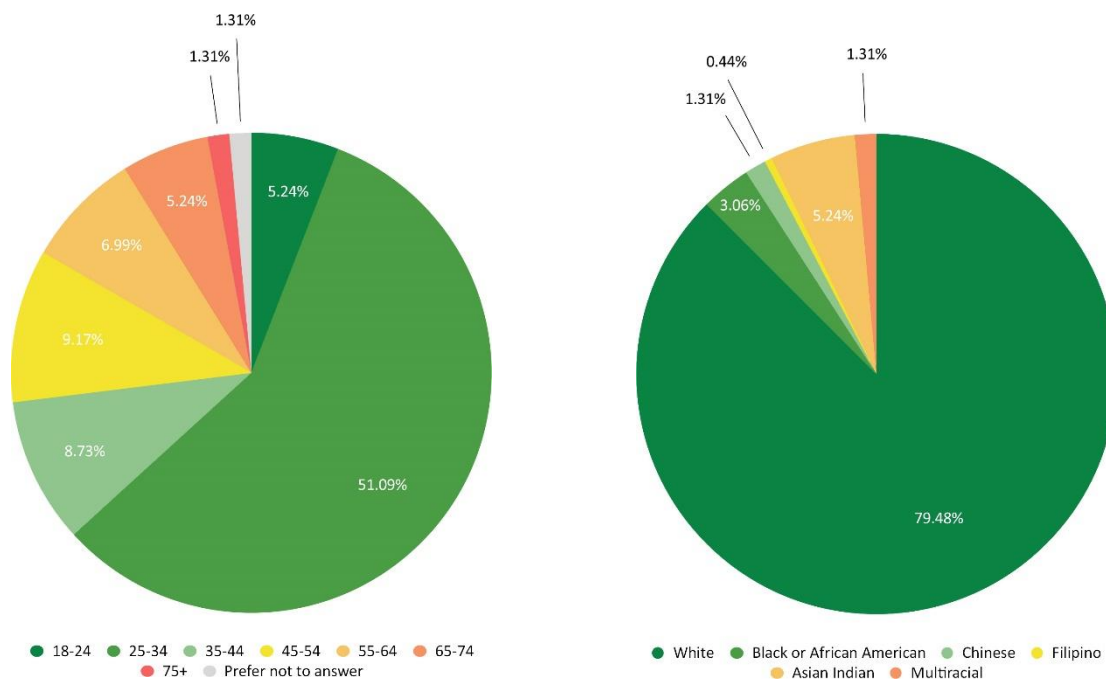
Responses to the question: How has the COVID-19 pandemic impacted your relationship to this place?

People

The people of Middlesex County establish the cultural landscape and its appreciation based on cultural preference. To understand Middlesex County's people, demographic questions asked people to identify their age, **Figure 1.41**, race and ethnicity, **Figures 1.41 and 1.42**, gender **Figure 1.43**, and annual household income **Figure 1.44**. Survey participants between the ages of 25 and 34 accounted for 51 percent of respondents, followed by 45-54 (nine percent).

Participants identified as white (182 responses, 79 percent), Asian Indian (12 responses, five percent), black or African American (seven responses, three percent), with under two percent identifying as Chinese (three responses, 1.3 percent), Filipino (one response, .8 percent), and multiracial (3 responses, 1.3 percent).

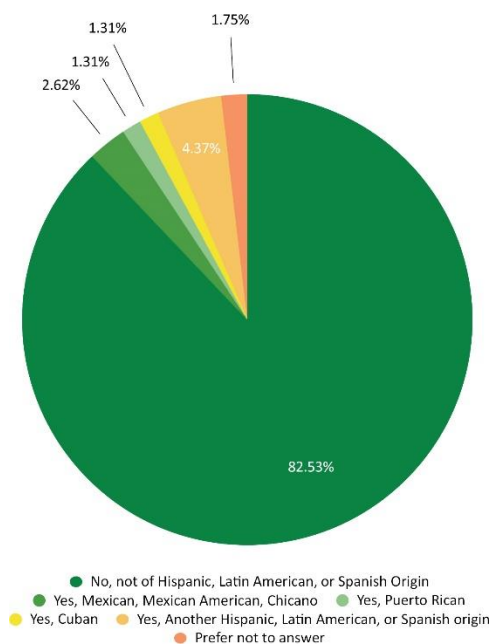
Figure 1.41: Age and race identified by survey respondents



Responses to the questions What is your age; What race best describes you?

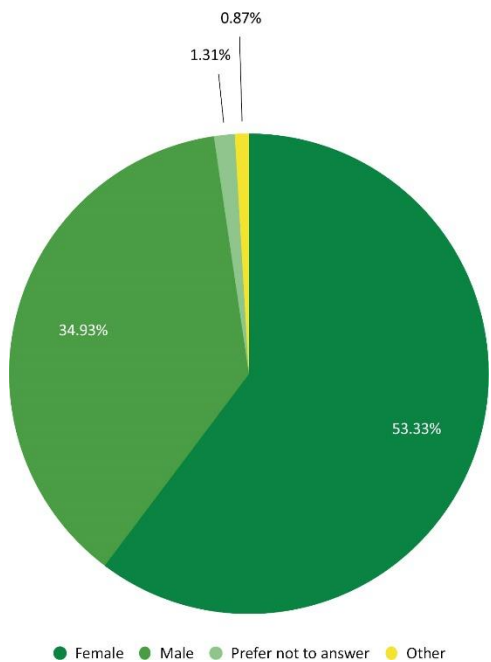
Participants identified as Hispanic, Latin American, or of Spanish origin (22 participants, 16 percent). Females accounted for the highest percentage (56 percent), followed by males (35 percent); three participants preferred not to answer the question related to gender, while two listed *Other*.

Figure 1.42: Hispanic, Latin American, or Spanish origin identified by survey respondents



Responses to the question: Are you of Hispanic, Latin American, or Spanish origin?

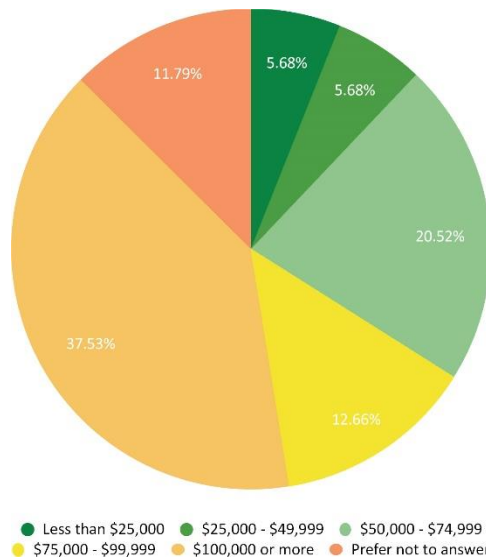
Figure 1.43: Gender identified by survey respondents



Responses to the question: What gender do you identify with?

The annual household income over \$100,000 accounted for 37.5 percent (86 responses) of survey respondents, followed by \$50,000-74,000 (47 responses, 20.5 percent). The online photo survey predominantly reached females between 25 and 34, identifying as white, with an annual household income above \$100,000.

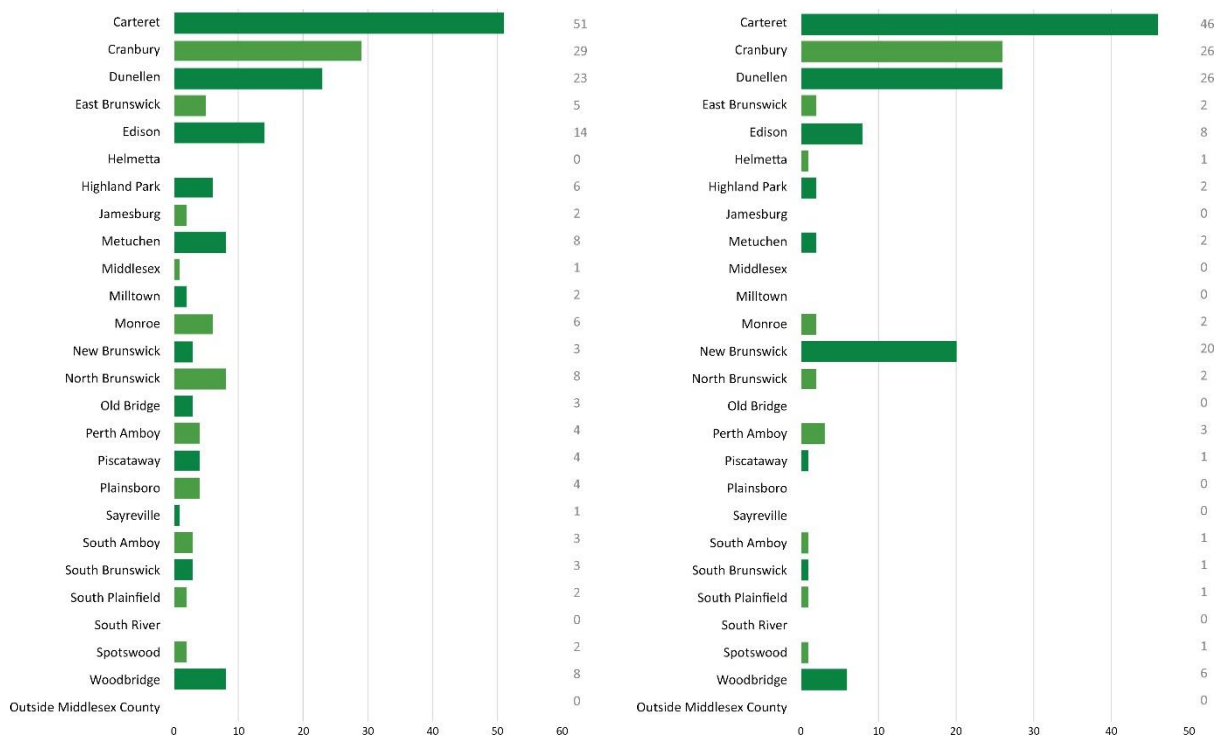
Figure 1.44: Annual household income identified by survey respondents



Responses to the question: What is your estimated annual household income?

To identify people’s connection to Middlesex County, participants answered if they lived in the County and identified which municipality. Almost all 25 Middlesex County municipalities had at least one survey respondent representing the municipality (less Helmetta and South River). Carteret accounted for 22 percent (51 responses), followed by Cranbury (29 responses, 12 percent), Dunellen (23, 10 percent), then Edison (14, 6 percent), shown in **Figure 1.45 (Left)**. Others lived in Union, Somerset, Bergen, Hunterdon, Mercer, Monmouth, and Morris Counties. Most participants (161, 70 percent) work or go to school in Middlesex County, with the top answers in Carteret, Cranbury, Dunellen, New Brunswick, Woodbridge, and Edison, **Figure 1.45 (Right)**.

Figure 1.45: Residence, work, and school townships identified by survey respondents



Responses to the questions: (Left) Which town do you live in; (Right) Which town do you work or go to school in?

When asked what activities people participate in most in Middlesex County, the top three responses included shopping (178), then dining (146), followed by parks and recreation (135), **Figure 1.46**. This information identifies the importance of linking commercial activities with outdoor opportunities to enhance the use of outdoor space.

Activity	Number of Respondents
Shopping	178
Dining	146
Parks and Recreation	135
Visit Friends and Family	103
Attend Arts and Cultural Events	86
Attend Religious Service	34
Other	6

Figure 1.47: Groups identified by survey respondents



The survey responses revealed that people connect with outdoor spaces through cultural and individual identity. People appreciate viewsheds, water, and highly valued County parks. Although the survey response count included 229 people, the information provides an essential resource to help define the cultural landscape through the lens of the Middlesex County community in the suburban context.

Municipal Engagement Meetings

Three municipal engagement meetings fostered interaction with municipal representatives. The engagement meetings helped gather information for the Destination 2040 process with a branched focus on ecosystem services and cultural landscapes at the local level. The first engagement meeting involved an in-person all-day workshop at Middlesex College on October 5, 2021. Two Zoom events followed the in-person meeting to reach communities not present at the in-person workshops. The virtual events took place on November 30 and December 1, 2021. In total, 12 out of 25 municipalities participated in the three meetings.

Municipalities in attendance included:

- East Brunswick Township
- Highland Park Borough
- Jamesburg Borough
- Metuchen Borough
- New Brunswick City
- North Brunswick Township
- Old Bridge Township
- Perth Amboy City
- Piscataway Township
- Plainsboro Township
- Spotswood Borough
- Woodbridge Township

Questions prompted participants to comment on the ecological and cultural landscapes and the early greenway opportunities identified in the ***Open Spaces.*** functional plan. Inventory and analysis maps, with the early ***Nature & Place.*** (L-Plan) Photo Survey results facilitated meeting conversation. These questions enabled interesting discussions shedding light on concerns and opportunities in the represented community about ecology and culture.

Cultural Landscape

Cultural landscape questions included:

- Why do people like living, working, or coming to your town?
- Are there aspects of your community that negatively impact the quality of life?
- Where are the locations your town is targeting for community enhancement and placemaking?

Municipal representatives identified opportunities and concerns for cultural representation in the landscape and identified qualities people love about their communities. Perth Amboy participants noted the pride of the Latinx culture, proximity to New York City, and beachfront access as top reasons people loved living in their municipality. Highland Park and Metuchen representatives noted their downtown offerings, including restaurants and walkability, and Woodbridge representatives commented that residents love calling Woodbridge “home” with multiple place identities such as Sewaren Marina, Keasbey, Metro Park, Oak Tree Road, Colonia, and the Estate Section (to name a few). A New Brunswick representative mentioned that people enjoyed identifying with Rutgers University, the downtown towers, restaurants, and theater offerings.

Each municipality commented on the importance of small-scale municipal parks that serve their local communities. Piscataway offers a new spray park. Plainsboro includes a wide array of publicly accessible preserved open spaces, and Old Bridge embraces preserved open spaces and transportation connections to New York City. Highly sought-after efforts include new development projects to enhance housing, access, aesthetics, outdoor space connections, and more. Representatives noted high traffic in their communities, such as Metuchen and Piscataway. Piscataway, North Brunswick, and East Brunswick commented on the new plans for developing community centers, Main Street areas, and cultural hubs; they expressed excitement about pedestrian and bicycle connection potential.

Ecological Landscape

Ecological landscape questions included:

- What are the most significant ecological challenges in your town?
- What are your town's ecological priorities?
- Please identify opportunities to enhance ecosystem services in the built environment within your town (office park lawns, parking lots, downtowns, etc.)?

Ecological opportunities and concerns centered around flooding and stormwater management, open space acquisition and preservation, ecological trails, and tree canopy cover. Spotswood, South River, Woodbridge, and Old Bridge representatives mentioned Blue Acres funding projects. Spotswood and South River representatives showed interest in the buy-out program, while Woodbridge and Old Bridge stated both positive and negative after-effects of buy-out projects. Woodbridge noted the trails added through the program, while Old Bridge pointed out the issue of resident maintenance on buy-out properties, such as mowing.

Many municipalities noted the desire for green infrastructure and reduced impervious surface cover to help with urban flooding. Highland Park representatives emphasized the need for not only green infrastructure but also maintenance methods and resources. Piscataway, Jamesburg, and Metuchen mentioned the need for green infrastructure, reduced pavement, and incorporated permeable materials. Highland Park said the desire for more street trees and increased tree canopy cover.

Generally, all representatives appreciated open spaces in their communities. Across the board, desires included more trail connections and greenway links, preserved open space, and preserved farmland. Plainsboro continues to successfully acquire more open space and preserve farmland, covering over 50 percent of its total acreage. Other communities aim to continue acquisition in their communities or enhance their greenways. Woodbridge and Highland Park are working to strengthen or develop a greenway connection along the Raritan River. Perth Amboy fosters pedestrian connections to the Raritan Bay Waterfront through trail and beachfront access, and Metuchen hopes for the Middlesex Greenway extension.

The municipal engagement meetings reveal municipal representatives' understanding and hopes for the ecological and cultural landscapes. From these outreach exercises, the research team learned about physical locations (such as community centers, etc.) and general applications (such as green infrastructure) that municipalities would greatly benefit from. A broader gained perspective illustrates the role of the influencers, such as individual residents to municipal leaders and how the County can forge connections to help support communities' ability to enhance their ecological and cultural landscapes.

***Nature & Place.* Outreach Summary**

The ***Nature & Place.*** photo survey and municipal engagement meetings provided valuable public insight into how people experience outdoor space and its role in planning. The photo survey provided the research team with information about residents' landscape preferences and indicated important components of a possible suburban definition of the term cultural landscape. Further, findings revealed that municipal representatives share environmentally focused values underlying the D 2040 process. Municipalities already strive for sustainability initiatives through stormwater management, open space acquisition, historic preservation, tree plantings, and more. This information guides the Analysis chapter outreach assessment to discover County-wide opportunities based on resident and municipal needs.

CONCLUSION

Existing environmental conditions comprehension provides an essential tool to develop informed enhancement tactics specific to Middlesex County's landscape needs. The *Environmental Conditions Inventory* revealed the many components encompassing Middlesex County's landscapes, such as ecological habitat composition, geology, historic significance, and more. Eight Destination 2040 strategic initiatives guided the inventoried elements in all seven sections relating to ecology, sustainability, and cultural support.

The seven inventory sections included:

- The Land Use Land Cover section (1.1)
- Natural Resources (1.2)
- Environmental Issues (1.3)
- Open Space and Farmland (1.4)
- Demographics (1.5)
- People and Space (1.6)
- ***Nature & Place***. Outreach (1.7)

The key topics from the seven listed sections include the County's geographical form, land use percentages, wildlife habitats, macrohabitats, environmental issues, tree canopy density, open space and farmland, historic landscapes, people, commercial centers, and more.

The *Land Use Land Cover*, *Natural Resources*, and *Environmental Issues* findings revealed that Middlesex County contains a majority of urban (60 percent) land cover with growing urban trends. Since 1986, the County's urbanized landscape grew by 29 percent. Wetlands, forested, barren, and agricultural land occupy 40 percent of the County's landscape. These natural landscapes increase or detract from each of the County's four watersheds' resiliency abilities. Quality habitats provide ecosystem services to support resiliency for all landscapes. High impervious surface coverage (32 percent of the total County land) contributes to habitat degradation, increased water volume in local waterways, and urban heat islands. ***The Analysis chapter will overlay environmental conditions such as wetlands, urban heat islands, flood risk areas, and impervious surfaces to establish priority areas for urban environmental and habitat improvements.***

The *Open Space and Farmland* inventory revealed the County's open space and farmland composition and how these spaces connect to people. Nearly 16 percent of the County's land falls under open space and preserved farmland designations. These spaces include social parks, natural preservations, neighborhood parks, active farmlands, and farm viewsheds. Farmstands, Farmers' Markets, the 4-H Fair, and the Rutgers Co-op Extension at the E.A.R.T.H Center offer agricultural connections to County residents through fresh food and recreational experiences.

Parks and farmland link people with outdoor spaces, historic events, and agricultural heritage. They also provide quality ecological habitats for the County's wildlife. Greenways offer opportunities to link open spaces and preserved farmland while securing ecological corridors for the County's wildlife. ***The Analysis chapter compares the County's protected open spaces and preserved farmland with ecological habitats of concern developed with Natural Resource inventory elements to determine priority areas for the County's open space network expansion or places to encourage conservation through private landowners.***

Middlesex County's people apply value to the landscape and directly impact landscape conditions through development patterns and cultural preferences. County demographic data revealed that Middlesex County's population is widely diverse, with under 50 percent of the population identifying as white alone. The County's population includes White, Asian, Hispanic, Black, African American, multi-racial, American Indian, Alaska Native, Native Hawaiian, and Other Pacific Islanders.

The County's population density highlights the urban centers in New Brunswick and Perth Amboy. With higher-density suburban areas in Carteret, Woodbridge, and Plainsboro. At the same time, lower-density areas correlate with lower-density residential areas and rural landscapes throughout the south. Middlesex County's municipalities range in annual household incomes, with urban areas below the County average and suburban landscapes often above.

Middlesex County's people can experience the County's heritage through arts and cultural centers and historic landscapes. People can experience their sense of belonging tied to houses of worship offered throughout the County. While shopping and entertainment link to every community. New Brunswick provides a cultural hub on a regional scale. Train stations, bus stops, and the Rutgers bus network connect people from New Brunswick's cultural theater center (six theaters) with the rest of the County. However, the rich cultural activities go well beyond New Brunswick. The County's parks, downtown areas, and commercial cores hold historic designations connecting people to educational opportunities and the County's historic landscapes like farms, colonial homes, battlefields, and more.

The *Environmental Conditions Inventory* revealed the character of the County's physical environment in terms of ecological habitats and people spaces. Outreach explored County residents' opinions of the County's existing conditions, revealing the County's perspective of a cultural landscape. The ***Nature & Place*** online photo survey displayed that people identify with everyday spaces instilling meaning in them. Meaning through identity adds an intangible cultural value to a space. The outreach finding provides an essential component, allowing the research team to explore a new understanding of the term *cultural landscape* in the suburban context. ***The Analysis chapter further examines the cultural landscape through the National Park Service, Cultural Landscape Foundation, and European context to assess the County's traditional cultural landscapes not available through existing inventory. The analytical study centers on the cultural landscape as it relates to the County-specific, American context of a culture in outdoor space.***

Middlesex County's *Environmental Conditions Inventory* revealed the County's widespread diversity. The land uses, people, places, cultural features, and history vary significantly across the County. The County's southern land contains widespread wetlands, farmland, and suburban landscapes. In the North, the County contains more urban landscapes mixed with wetlands along riparian corridors, forests in parkland, suburban areas, and industrial waterfronts. An evident finding concludes that Middlesex County's urbanization will continue to spread across the landscape.

This spread makes for a crucial moment to incorporate environmentally focused development and conservation into all future planning efforts to provide the County's community with quality outdoor space, resilient environments through ecosystem services, and desirable outdoor places expressing the current communities' cultural preferences. The following chapter, *Analysis (2)*, compares inventory elements to examine the County's landscape character, priority concern areas, and landscape threats while revealing opportunities to enhance the County's overall outdoor network. Opportunities inform efforts for a higher landscape performance expectation that all outdoor spaces will provide quality ecosystem services and spaces to celebrate the County's culture.

APPENDIX

Appendix 1.1: Municipal Historical Societies ⁽²⁰²⁾

- Carteret Historical Committee
- Cranbury Historical and Preservation Society
- Dunellen Historical Society
- East Brunswick Historical Society
- Highland Park Historical Society
- Jamesburg Historical Association
- Kingston Historical Society
- Metuchen Edison Historical Society
- Middlesex Borough Heritage Committee
- Milltown Historical Society
- Monroe Township Historic Preservation Commission
- New Brunswick Historical Association
- New Brunswick Historical Society
- North Brunswick Historical Society
- Madison-Old Bridge Township Historical Society
- Perth Amboy Historic Preservation Commission
- Sayreville Historical Society
- South Plainfield Historical Society
- South River Historical & Preservation Society, Inc.
- South Amboy Historical Society
- Spotswood Cultural & Heritage
- Historical Association of Woodbridge Township

Appendix 1.2: Middlesex County Historic Landmarks

Name	Municipality	Registry	Marker	Theme
South Main Street Firehouse			No	
Walker Gordon Farm			No	
9/11 Memorial	Carteret		No	
Parsonage Barn	Cranbury	County	Yes	Barn Architecture
Cranbury Mills	Cranbury	County	Yes	Industry
L.J. Smith House	East Brunswick	County	Yes	Farming
Danish Home	Edison	County	Yes	Home
William H. Johnson House	New Brunswick		No	
Buccleuch Mansion	New Brunswick	National	Yes	Patriot Era Farm House
Anshe Emeth Memorial Temple	New Brunswick	State	Yes	Religion
Signal Hill	Old Bridge	County	Yes	Patriot Era
Back Street and Burial Place	Perth Amboy		No	
Perth Amboy Barracks and Investors Institute	Perth Amboy	County	Yes	Education
Thomas Mundy Perterson Elementary School	Perth Amboy	County	Yes	Voting
Revolutionary War Sign	Piscataway		No	Recreation
John Van Burren Wicoff School	Plainsboro	National	Yes	Education
Sayre and Fisher Reading Room	Sayreville	National	Yes	Industrial, Architectural and Soical
Sayreville United Methodist Church	Sayreville	County	Yes	Religion
1950 South Amboy Explosion	South Amboy	County	Yes	Memorium
First Airmail Flight	South Amboy	State	Yes	Travel Expansion
Titus Farm	South Brunswick	State	Yes	Nursery/ Farm
Samptown Cemetery	South Plainfield	County	Yes	Cemetery
Conways Bridge	South Plainfield		No	Recreation
Quaker Meeting House	South Plainfield	County	Yes	Recreation
First Baptist Church of South Plainfield	South Plainfield	County	Yes	Religion
Camden and Amboy Railroad	Spotswood	National	Yes	Travel Expansion
Trinity Church	Woodbridge	National	Yes	Religion
Barron Arts Center	Woodbridge	National	Yes	School Architecture/ Education

Source: Middlesex County Historic Landmarks Dataset.

Appendix 1.3: Houses of Worship in Middlesex County

NAME	STREET	CITY	STATE	ZIP
LIVING WATER FAMILY BIBLE CENTER INC	1163 ST GEORGE AVE STE 162	AVENEL	NJ	7001
MISSION TORRE FUERTE	1902 COLONIAL GARDENS DR	AVENEL	NJ	7001
NEW LIFE CHURCH OF GOD	413 HYATT ST	AVENEL	NJ	7001
ST ANDREWS ST VINCENT DE PAUL SOCIE	244 AVENEL ST	AVENEL	NJ	7001
BIBLE CHURCH OF JESUS CHRIST	284 PERSHING AVE	CARTERET	NJ	7008
CATHOLIC DAUGHTERS OF THE AMERICAS	213 PERSHING AVE	CARTERET	NJ	7008
FAVOR MINISTRIES	132 BERNARD ST STE PH	CARTERET	NJ	7008
IGLESIA CRISTIANA SHALOMIR A NJ NONPROFIT CORPORATION	128 EDGAR ST	CARTERET	NJ	7008
IGLESIA MANANTIAL DE VIDA INC	59 WILLIAM ST	CARTERET	NJ	7008
IGLESIA PENTECOSTAL EL TABERNACULO	PO BOX 533	CARTERET	NJ	7008
IGLESIA PENTECOSTAL MANANTIAL DE VIDA INC	59 WILLIAM ST	CARTERET	NJ	7008
ISLAMIC ORGANIZATION OF CARTERET	68 ESSEX ST	CARTERET	NJ	7008
KHALSASPIRIT INC	26 VAN BUREN AVE	CARTERET	NJ	7008
NEW WINE CHURCH OF CHRIST INC	101 ROOSEVELT AVE APT 417	CARTERET	NJ	7008
RHEMA WORD MINISTRIES	41 EDWIN ST	CARTERET	NJ	7008
CALVARY TEMPLE CHURCH	1 RUNNYMEDE RD	COLONIA	NJ	7067
HOLY TRINITY ORTHODOX CHURCH	26 ACME PL	COLONIA	NJ	7067
ST JOHN VIANNEY CONFERENCE	420 INMAN AVE	COLONIA	NJ	7067
UNITED TELUGU CHRIST CHURCH NEW JERSEY	226 MCFARLANE RD	COLONIA	NJ	7067
CHILD EVANGELISM FELLOWSHIP INC	PO BOX 59	CRANBURY	NJ	8512
CHINMAYA MISSION TRI-STATE CENTER	95 CRANBURY NECK RD	CRANBURY	NJ	8512
CRANBURY KOLLEL INC	4A CEDARBROOK DR	CRANBURY	NJ	8512
GOOD NEWS FELLOWSHIP CHAPEL	RD 2 BOX 53 Y 2ACRE ROAD	CRANBURY	NJ	8512
NICHIREN SHOSHU ACADEMY NEW JERSEY CHAPTER	R D 1 BOX 146	CRANBURY	NJ	8512
STAFF OF LIFE	PO BOX 142	CRANBURY	NJ	8512
REDEEMED CHRISTIAN CHURCH OF GOD MIRACLE CENTER	15 QUINCY CIR	DAYTON	NJ	8810
TEMBO FOUNDATION INC	1 CHRIS CT	DAYTON	NJ	8810
TRUE LIGHT FELLOWSHIP A NEW JERSEY NON PROFIT CORPORATION	11 MOCKINGBIRD LN	DAYTON	NJ	8810
FIRST PRESBYTERIAN CHURCH OF DUNELLEN NJ	218 DUNELLEN AVE	DUNELLEN	NJ	8812
IGLESIA CRISTIANA CLINICA DEL ALMAINC	260 GERTRUDE TER	DUNELLEN	NJ	8812
MINISTERIO INTERNACIONAL PRESENCIA DE DIOS	432 FRONT ST	DUNELLEN	NJ	8812
PALABRA DE FUEGO MINISTRIES INC	214 DUNELLEN AVE	DUNELLEN	NJ	8812
PRESBYTERY OF THE NORTHEAST	208 DUNELLEN AVE	DUNELLEN	NJ	8812
316 CHAPEL C&MA INC	151 MILLTOWN RD	E BRUNSWICK	NJ	8816
ALDERSGATE UNITED METHODIST CHURCH	568 RYDERS LN	E BRUNSWICK	NJ	8816
ARABIC ASSEMBLY OF GOD CHURCH BAYONNE	PO BOX 904	E BRUNSWICK	NJ	8816
ARABIC ASSEMBLY OF GOD CHURCH ELIZABETH	PO BOX 904	E BRUNSWICK	NJ	8816
BAHAIS OF EAST BRUNSWICK TOWNSHIP	131 DUNHAMS CORNER RD	E BRUNSWICK	NJ	8816
BEACON OF HOPE ASSEMBLY OF GOD	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
CHABAD OF EAST BRUNSWICK INC	3 LEXINGTON AVE STE 8	E BRUNSWICK	NJ	8816
CHRIST ARABIC CHURCH	8 FRESH PONDS RD	E BRUNSWICK	NJ	8816
CHRIST ASSEMBLY OF GOD NJ	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
CHRIST MEMORIAL LUTHERAN CHURCH	114 OLD STAGE RD	E BRUNSWICK	NJ	8816
CHRISTIAN ARABIC CHURCH	572 RYDERS LN	E BRUNSWICK	NJ	8816
COMMUNITY SYNAGOGUE OF EAST BRUNSWICK INC	4 CORNWALL DR STE 100 # A	E BRUNSWICK	NJ	8816
CROSSROADS ASSEMBLY OF GOD	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
EAST BRUNSWICK BAPTIST CHURCH	456 RYDERS LN	E BRUNSWICK	NJ	8816
FIRST ASSEMBLY OF GOD	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
FIRST ASSEMBLY OF GOD	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
FIRST ASSEMBLY OF GOD	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
FIRST BIBLE BAPTIST CHURCH	285 BROMLEY PL	E BRUNSWICK	NJ	8816
GRACE MELODY MUSIC MINISTRIES US CORP	135 FERN RD	E BRUNSWICK	NJ	8816
IQRA COMMUNITY SERVICES INC	402 NEW BRUNSWICK AVE	E BRUNSWICK	NJ	8816
LIFE CHAPEL ASSEMBLY OF GOD CHURCH	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
LIGHTHOUSE FAMILY COMMUNITY CHURCH	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
LOVE GLOBAL VISION CHURCH INC	552 RYDERS LN	E BRUNSWICK	NJ	8816
MOUNTAIN TOP ASSEMBLY OF GOD CHURCH	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
NATIONAL COUNCIL OF YOUNG ISRAEL	195 DUNHAMS CORNER RD	E BRUNSWICK	NJ	8816
NATIVITY EVANGELICAL LUTHERAN CHURCH	552 RYDERS LN	E BRUNSWICK	NJ	8816
NEW JERSEY FULL GOSPEL KOREAN MISSION CHURCH	34 MITCHELL AVE	E BRUNSWICK	NJ	8816
OUR SAVIORS LUTHERAN CHURCH	151 MILLTOWN RD	E BRUNSWICK	NJ	8816
PRAISE ASSEMBLY	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
RARITAN VALLEY Y M C A	144 TICES LN	E BRUNSWICK	NJ	8816

SACRED HEART COPTIC CATHOLIC CHURCH INC	700 OLD BRIDGE TPKE	E BRUNSWICK	NJ	8816
SAINTS BASILIOS-GREGORIOS ORTHODOX CHURCH OF CENTRAL JERSEY INC	4 BERKSHIRE WAY	E BRUNSWICK	NJ	8816
SHEPHERD OF THE VALLEY ASSEMBLY OF GOD	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
ST BARTHOLOMEW CONFERENCE	460 RYDERS LN	E BRUNSWICK	NJ	8816
ST MARY COPTIC ORTHODOX CHURCH OF MIDDLESEX	433 RIVA AVE	E BRUNSWICK	NJ	8816
TEANECK ASSEMBLY OF GOD	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
TEMPLE BNAI SHALOM	15 FERN RD	E BRUNSWICK	NJ	8816
THE BRANCH CONGREGATION	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
THE LATVIAN EVANGELICAL LUTHERAN CHURCH OF NEW BRUNSWICK AND	12 GATES AVE	E BRUNSWICK	NJ	8816
TORAH LINKS OF MIDDLESEX COUNTY COMMUNITY SYNAGOGUE	271 DUNHAMS CORNER RD	E BRUNSWICK	NJ	8816
VICTORY ASSEMBLY OF GOD	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
WEST HUDSON CHRISTIAN CENTER	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
WORSHIP CHURCH	197 STATE ROUTE 18 STE 260	E BRUNSWICK	NJ	8816
ZARATHUSHTI CULTURAL CENTER OF DELAWARE VALLEY INC	3 VAN WICKLE RD	E BRUNSWICK	NJ	8816
LIGHTHOUSE CHRISTIAN FELLOWSHIP OF THE ASSEMBLIES OF GOD	MATTHEWS AND NULTY INC	EAST BRUNSWICK	NJ	8816
ROCKAWAY ASSEMBLY OF GOD	197 STATE ROUTE 18	EAST BRUNSWICK	NJ	8816
ST BARTHOLOMEWS RECTORY	480 RYDERS LANE	EAST BRUNSWICK	NJ	8816
BAPTIST FELLOWSHIP COMMUNITY CHURCH	249 HORIZON DR	EDISON	NJ	8817
BIBLE STUDENTS CONGREGATION OF NEW BRUNSWICK	PO BOX 144	EDISON	NJ	8818
BOCHASANWASI SWAMINARAYAN SANSTHA INC	18 INDEPENDENCE DR	EDISON	NJ	8820
CENTRAL NEW JERSEY PRESBYTERIAN CHURCH INC	445 OLD POST RD	EDISON	NJ	8817
CHRIST THE LIBERATOR MCC	PO BOX 157	EDISON	NJ	8818
COMMUNITY PRESBYTERIAN CHURCH OF EDISON NEW JERSEY	75 GLENVILLE RD	EDISON	NJ	8817
CONGREGATION AHAVATH ISRAEL OF EDISON NJ	1587 ROUTE 27	EDISON	NJ	8817
DDMBA NJ INC	56 VINEYARD RD	EDISON	NJ	8817
DESTINY CHAPEL INTERNATIONAL INC	71 WINTERGREEN AVE W STE 21-E	EDISON	NJ	8820
DREAMING FELLOWSHIP CHURCH A NJ NONPROFIT CORPORATION	26 RICHARD RD	EDISON	NJ	8820
EDISON FOURSQUARE CHURCH	334 PLAINFIELD AVE	EDISON	NJ	8817
EDISON KOREAN CATHOLIC COMMUNITY	37 PLAINFIELD AVE	EDISON	NJ	8817
FREEDOM IN CHRIST INC	702 VILLAGE DR	EDISON	NJ	8817
GOOD CHURCH INC	80 JEFFERSON BLVD	EDISON	NJ	8817
GOOD NEWS CHURCH INC	120 PLEASANT AVE	EDISON	NJ	8837
GRACE REFORMED CHURCH	2815 WOODBRIDGE AVE	EDISON	NJ	8817
HADASSAH THE WOMENS ZIONIST ORGANIZATION OF AMERICA	24 BROOKFALL RD	EDISON	NJ	8817
IGLESIA BAUTISTA DE EDISON	334 PLAINFIELD AVE	EDISON	NJ	8817
IGLESIA CRISTIANA VIDA INTEGRAL INC	36 HENRY ST	EDISON	NJ	8820
INDIA HERITAGE FOUNDATION NJ NY INC	7 KILMER CT	EDISON	NJ	8817
INTERNATIONAL BETHEL CHURCH BETHANY NEW JERSEY INC	20 CEDAR ST	EDISON	NJ	8820
JOSEPH PEZZELLO MINISTRIES INC	63 LAURA AVE	EDISON	NJ	8820
LIGHTHOUSE CHRISTIAN FELLOWSHIP INC	2 JANE PLACE	EDISON	NJ	8820
MT PLEASANT BAPTIST CHURCH	1087 GROVE AVE	EDISON	NJ	8820
N J FIRST CHINESE BAPTIST CHURCH OF EDISON INC	592 OLD POST RD	EDISON	NJ	8817
NEW BETHEL COMMUNITY BAPTIST CHURCH A NEW JERSEY NONPROFIT CORPORATION	274 HANA RD	EDISON	NJ	8817
NEW DOVER UNITED METHODIST CHURCH	687 NEW DOVER RD	EDISON	NJ	8820
NEW GOSPEL CHURCH OF CHRIST INC OF INDIA	211 MICHELLE CIR	EDISON	NJ	8820
NEW GOSPEL CHURCH OF CHRIST INC OF THE PHILIPPINES	211 MICHELLE CIR	EDISON	NJ	8820
NEW JERSEY FALUN DAFA BUDDHAS STUDY ASSOCIATION INC	5 WINNIE CT	EDISON	NJ	8820
NEW JERSEY HEALTHY CHURCH	2815 WOODBRIDGE AVE	EDISON	NJ	8817
NEW JERSEY TABERNACLE	24 LATONIA ST	EDISON	NJ	8817
NILGH INC	PO BOX 2576	EDISON	NJ	8818
OBRIE HAMILTON INC NEW GOSPEL CHURCH OF CHRIST INC	211 MICHELLE CIR	EDISON	NJ	8820
ONE HEART KOREAN CHURCH INC	334 PLAINFIELD AVE	EDISON	NJ	8817
ORCHOS CHAIM CHABURA - A NJ NONPROFIT CORPORATION	98 LESLIE ST	EDISON	NJ	8817
PENTECOSTAL CHURCH OF NEW JERSEY INC	PO BOX 2565	EDISON	NJ	8818
SHREE UMIYA PARIVAR OF USA INC	1697 OAK TREE RD	EDISON	NJ	8820
SHRI PUSHTI PARIVAR OF USA INC	883 BEATRICE PKWY	EDISON	NJ	8820
SRI SAI VENKAIAH A NJ NONPROFIT CORPORATION	18 JUDSON ST 12 A	EDISON	NJ	8837
ST MATTHEW THE APOSTLE	81 SEYMOUR AVE	EDISON	NJ	8817
ST PAULS LUTHERAN CHURCH	445 OLD POST RD	EDISON	NJ	8817
STELTON BAPTIST CHURCH	334 PLAINFIELD AVE	EDISON	NJ	8817
THE KOREAN CHURCH OF THE CROSS INC	120 PLEASANT AVE	EDISON	NJ	8837
VEERASAIVA SAMAJA	70 RIEDER RD	EDISON	NJ	8817
VICTORY IN JESUS OUTREACH MINISTRIES INC	904 BLUEBERRY CT	EDISON	NJ	8817

VISCEGLIA-SUMMIT ASSOCIATES FOUNDATION	RARITAN PLAZA I RARITAN CENTER	EDISON	NJ	8818
SHALEM INDIA PENTECOSTAL CHURCH NJINC	3 DE GRASSE ST	FORDS	NJ	8863
TOGETHER 4 KIDS INC	PO BOX 352	FORDS	NJ	8863
ZION CHURCH OF NEW JERSEY INC	28 S 4TH ST	FORDS	NJ	8863
ST GEORGES ANGLICAN CHURCH	56 MAIN ST	HELMETTA	NJ	8828
UNITED EVANGELICAL CHRISTIAN FELLOWSHIP	12 YORK DR	HELMETTA	NJ	8828
AGUDATH ISRAEL OF EDISON-HIGHLAND PARK	1131 RARITAN AVE	HIGHLAND PARK	NJ	8904
CONGREGATION AHAVAS ACHIM	PO BOX 4242	HIGHLAND PARK	NJ	8904
CONGREGATION ETZ AHAIM	230 DENISON ST	HIGHLAND PARK	NJ	8904
CONGREGATION OHAV EMETH	415 RARITAN AVE	HIGHLAND PARK	NJ	8904
ETHNOS NETWORK INC	301 N 4TH AVE	HIGHLAND PARK	NJ	8904
HIGHLAND PARK MINYAN INC	22 HARRISON AVE	HIGHLAND PARK	NJ	8904
JOEUNSORI PRESBYTERIAN CHURCH	417 MONTGOMERY ST	HIGHLAND PARK	NJ	8904
KHAL CHASSIDIM OF HIGHLAND PARK INC	1601 CENTRAL AVE	HIGHLAND PARK	NJ	8904
MAKHELAT HAMERCAZ	PO BOX 1256	HIGHLAND PARK	NJ	8904
MESORAH NEW JERSEY	116 LINCOLN AVE	HIGHLAND PARK	NJ	8904
OUR LADY OF KOREA	23 S 5TH AVE	HIGHLAND PARK	NJ	8904
REFORMED CHURCH OF HIGHLAND PARK	19 S 2ND AVE # 21	HIGHLAND PARK	NJ	8904
SUFI ORDER	123 JOHNSON ST	HIGHLAND PARK	NJ	8904
SUMMER TORAH EDUCATION PROGRAM INC	30 S ADELAIDE AVE APT 3K	HIGHLAND PARK	NJ	8904
TABERNACLE OF LOVE-PRAYER IS THE ANSWER MINISTRY INC	220 S 7TH AVE	HIGHLAND PARK	NJ	8904
THE REFORMED CHURCH IN WILLINGBORO NEW JERSEY	19 S 2ND AVE # 21	HIGHLAND PARK	NJ	8904
TRINITY UNITED METHODIST CHURCH	417 MONTGOMERY ST	HIGHLAND PARK	NJ	8904
TYRANNUS EVANGELICAL HOLINESS CHURCH	417 MONTGOMERY ST	HIGHLAND PARK	NJ	8904
FULL GOSPEL GAULLEE ASSEMBLY OF GOD	52 CLYDE AVE	HOPELAWN	NJ	8861
EVANGELICAL CHURCH OF THE LIVING GOD INC	232 BLOOMFIELD AVE	ISELIN	NJ	8830
AGAPE KOREAN PRESBYTERIAN CHURCH	90 COOPER AVE	ISELIN	NJ	8830
CHABAD TOKYO JAPAN	517 US HIGHWAY 1 SOUTH SUITE STE 41	ISELIN	NJ	8830
COUPLES FOR CHRIST FOUNDATION FOR FAMILY AND LIFE A NJ NONPROFIT COR	12 SEMEL AVE	ISELIN	NJ	8830
DAARUL REHMAT LEARNING CENTER INC	1391 OAK TREE RD APT 8	ISELIN	NJ	8830
HERALD OF TRUTH CHURCH INC	11 ABERDEEN AVE	ISELIN	NJ	8830
IGREJA EVANGELICA BOM SAMARITANO	263 E HENRY PL	ISELIN	NJ	8830
JAIN VISHWA BHARATI OF NORTH AMERICA INC	151 MIDDLESEX AVE	ISELIN	NJ	8830
MASIH MANDIR	PO BOX 165	ISELIN	NJ	8830
METRO PARK ASSEMBLY OF GOD	48 BERKLEY BLVD	ISELIN	NJ	8830
PAULETTE POLO MINISTRIES INC	4 JOEL PL	ISELIN	NJ	8830
SATSANG SOCIETY OF NEW JERSEY INC	PO BOX 478	ISELIN	NJ	8830
ST CECELIA CONFERENCE	45 WILUS WAY	ISELIN	NJ	8830
TAMIL ASSEMBLY OF GOD CHURCH	1295 OAK TREE RD	ISELIN	NJ	8830
ASSEMBLY OF GOD	75 STEVENS AVE	JAMESBURG	NJ	8831
CALVARY CHAPEL CROSSFIELDS INC	15 HALF ACRE RD	JAMESBURG	NJ	8831
HOPE FOR THE NATIONS WORSHIP CENTER INC	200 BUCKLOW AVE 2ND FL	JAMESBURG	NJ	8831
LION OF JUDAH FAITH CENTER INC	PO BOX 185	JAMESBURG	NJ	8831
MAHAMEVNAWA BHAVANA MONASTERY OF NEW JERSEY	241 DEANS RHODE HALL RD	JAMESBURG	NJ	8831
ROSMOOR JEWISH CONGREGATION	37 BRADFORD LN	JAMESBURG	NJ	8831
ST JOHNS BAPTIST CHURCH	24 LAKE ST	JAMESBURG	NJ	8831
ST MINA SOCIETY INC	28 SPRUCE ST	JAMESBURG	NJ	8831
JESUS PRINCE OF PEACE MINISTRIES	208 SUNNYVIEW OVAL	KEASBEY	NJ	8832
CHRIST THE KING LUTHERAN CHURCH	3330 STATE ROUTE 27	KENDALL PARK	NJ	8824
COMMUNITY CENTERS OF CHRIST TEMPLE OF PEACE DELIVERANCE INC	PO BOX 5114	KENDALL PARK	NJ	8824
COMMUNITY CHURCH INC	PO BOX 175	KENDALL PARK	NJ	8824
GRACE BIBLE CHURCH OF CENTRAL JERSEY	45 DONALD AVE	KENDALL PARK	NJ	8824
GRACE PC OF SOUTH BRUNSWICK	57 SAND HILLS RD	KENDALL PARK	NJ	8824
JAI DURGA VEDIC CENTER INC	91 SAND HILLS RD	KENDALL PARK	NJ	8824
KINGDOM INSIGHT CHURCH INC	14 BERWICK RD	KENDALL PARK	NJ	8824
LIBERTY MINISTRIES INC	PO BOX 175	KENDALL PARK	NJ	8824
NEW JERSEY INDIAN CHURCH	57 SAND HILLS RD	KENDALL PARK	NJ	8824
SIDDHAKALA BHAIJAN MANDAL-NEW JERSEY SHAKHA	24 JARED BLVD	KENDALL PARK	NJ	8824
SPRINGS OF LIVING WATER CHURCH	11 TALCOTT CT	KENDALL PARK	NJ	8824
TEMPLE BETH SHALOM OF SOUTH BRUNSWICK	9 STANWORTH RD	KENDALL PARK	NJ	8824
FEED TRUCK MINISTRIES INC	9 CHURCH ST	KINGSTON	NJ	8528
EVANGELICAL COVENANT CHURCH LAURENCE HARBOR NJ	22 LAURENCE PKWY	LAURENCE HBR	NJ	8879
MOST HOLY REDEEMER CONFERENCE	133 AMBOY RD	MATAWAN	NJ	7747

ALPHA MINISTRIES INTERNATIONAL INC	245 MIDDLESEX AVE	METUCHEN	NJ	8840
ALPHA OMEGA CHURCH INC	PO BOX 565	METUCHEN	NJ	8840
APOSTOLIC CHURCH OF TRUTH AND SPIRIT	PO BOX 530	METUCHEN	NJ	8840
CENTENARY UNITED METHODIST CHURCH	200 HILLSIDE AVE	METUCHEN	NJ	8840
CHINA PARTNERSHIP	351 MAIN ST STE E	METUCHEN	NJ	8840
CHURCH IN EDISON	212 DURHAM AVE BLDG 3	METUCHEN	NJ	8840
EASTERN KOREAN CHURCH INC	398 AMBOY AVE	METUCHEN	NJ	8840
METUCHEN ASSEMBLY OF GOD	130 WHITMAN AVE	METUCHEN	NJ	8840
NEW HOPE BAPTIST CHURCH	45 HAMPTON ST	METUCHEN	NJ	8840
RARITAN BAY CATHOLIC PREPARATORY SCHOOL	PO BOX 191	METUCHEN	NJ	8840
REFORMED CHURCH OF METUCHEN	150 LAKE AVE	METUCHEN	NJ	8840
SHREE RAM MANDIR INC	10 CARLTON RD	METUCHEN	NJ	8840
CENTRAL BIBLE CHURCH FORMERLY KNOWN AS CENTRAL EVANGELICAL FREE CHURCH	PO BOX 89	MIDDLESEX	NJ	8846
CHRISTIAN LIFE CHURCH	272 LINCOLN BLVD	MIDDLESEX	NJ	8846
CROSSROADS ASSEMBLY OF GOD	272 LINCOLN BLVD	MIDDLESEX	NJ	8846
FIRST LOVE MINISTRIES	426 VOORHEES AVE	MIDDLESEX	NJ	8846
FREEDOM IN CHRIST BAPTIST CHURCH	100 BOUND BROOK RD	MIDDLESEX	NJ	8846
IGLESIA MISIONERA DEL REINO DE LOS CIELOS	348 RUNYON AVE	MIDDLESEX	NJ	8846
MISSION NETWORK INTERNATIONAL	208 S LINCOLN AVE	MIDDLESEX	NJ	8846
VIVID LIFE CHURCH	PO BOX 444	MIDDLESEX	NJ	8846
CORNERSTONE CHAPEL	88 CHESTNUT ST	MILLTOWN	NJ	8850
JERSEY CHURCH	24 RIVA AVE	MILLTOWN	NJ	8850
OM SRI SAI BALAJI TEMPLE AND CULTURAL CENTER INC	6 BEL AIR CT	MILLTOWN	NJ	8850
RIVER OF LIFE CHURCH OF THE ASSEMBLIES OF GOD	PO BOX 16	MILLTOWN	NJ	8850
UNITED METHODIST CHURCH AT MILLTOWN N J	47 N MAIN ST	MILLTOWN	NJ	8850
VED MANDIR INC	1 VED MANDIR DR	MILLTOWN	NJ	8850
AMERICAN ASSOCIATION OF BUDDHIST EDUCATION INC	834 GEORGES RD	MONMOUTH JCT	NJ	8852
GURUJI SANGAT FOUNDATION INC	3 GRAMERCY RD	MONMOUTH JCT	NJ	8852
ISLAMIC SOCIETY OF CENTRAL JERSEY	PO BOX 628	MONMOUTH JCT	NJ	8852
NEW LIFE WORSHIP CENTER	146 DEANS LN	MONMOUTH JCT	NJ	8852
SKY MEDITATION CENTER A NJ NONPROFIT CORPORATION	10 OAK TREE RD	MONMOUTH JCT	NJ	8852
SOLID ROCK MINISTRIES OF SOUTH BRUNSWICK INC	1807 POPLAR CT	MONMOUTH JCT	NJ	8852
SOUTH BRUNSWICK CHRISTIAN FELLOWSHIP INC	115 SAND HILLS RD	MONMOUTH JCT	NJ	8852
ST BARNABAS EPISCOPAL CHUCH	142 SAND HILLS RD	MONMOUTH JCT	NJ	8852
SHIRDI SAI DHAM INC	12 PERRINE RD	MONMOUTH JUNCTION	NJ	8852
TAMIL GOSPEL CHURCH	142 B SAND HILLS RD	MONMOUTH JUNCTION	NJ	8852
HOUSE OF HUMANITY INC	8 SANIBEL CT	MONROE	NJ	8831
CHRISTIAN CITIZENSHIP MINISTRIES INC	267N-MILFORD LANE	MONROE TOWNSHIP	NJ	8831
CHABAD HOUSE OF MONROE	4 KELLY CT	MONROE TWP	NJ	8831
CHABAD LUBAVITCH JEWISH CENTER OF MONROE INC	261 GRAVEL HILL RD	MONROE TWP	NJ	8831
CONGREGATION BEIT SHALOM OF MONROE TOWNSHIP INC	1600 PERRINEVILLE ROAD	MONROE TWP	NJ	8831
JOURNEY 212	321A SHARON WAY	MONROE TWP	NJ	8831
KATHY BICHSEL MINISTRIES INC	56 MANDRAKE RD	MONROE TWP	NJ	8831
LIVING WATER CHRISTIAN FELLOWSHIP INTL	35 BAY HILL BLVD	MONROE TWP	NJ	8831
RESURRECTION CHURCH OF MUNROE	241A VERNON RD	MONROE TWP	NJ	8831
SAINT ANIANUS COPTIC ORTHODOX CHURCH	15 MIDDLESEX BLVD	MONROE TWP	NJ	8831
THE CLASSIS OF NEW BRUNSWICK OF THE REFORMED CHURCH IN AMERICA	712 A SUSSEX WAY	MONROE TWP	NJ	8831
BRUNSWICK CHURCH OF CHRIST INC	19 GOODWIN DR	N BRUNSWICK	NJ	8902
CHABAD OF SOUTH BRUNSWICK INC	1 RIVA AVE	N BRUNSWICK	NJ	8902
CORNERSTONE INTERNATIONAL BIBLE CHURCH	PO BOX 7240	N BRUNSWICK	NJ	8902
DR CHERYL RICKARDS MINISTRIES A NJ NON-PROFIT CORPORATION	10 LAKE DR	N BRUNSWICK	NJ	8902
FAITH COMMUNITY CHURCH INC	1395 OAK TREE DR APT C	N BRUNSWICK	NJ	8902
GRACE CHURCH OF NORTH BRUNSWICK	321 OLD GEORGES RD	N BRUNSWICK	NJ	8902
IGEM CHRIST COVENANT CHURCH INCORPORATED	923 NASSAU ST	N BRUNSWICK	NJ	8902
IGLESIA CHRISTIANA BEL DIOS VIVO INC	1035 NEWTON ST	N BRUNSWICK	NJ	8902
JEWISH COMMUNITY CENTER OF NORTH AND SOUTH BRUNSWICK INC	1001 FINNEGAN LN	N BRUNSWICK	NJ	8902
KINGDOM AMBASSADORS CHURCH INC	27 PIN OAK DR	N BRUNSWICK	NJ	8902
PENTECOSTAL COUNCIL CHURCH OF GOD	276 HAMLIN RD	N BRUNSWICK	NJ	8902
REFORMED CHURCH OF NORTH BRUNSWICK	17 LAUREL PL	N BRUNSWICK	NJ	8902
RESTORATION CHRISTIAN MINISTRIES	PO BOX 7729	N BRUNSWICK	NJ	8902
ALL NATIONS MISSION CHURCH INC	100 LIVINGSTON AVE	NEW BRUNSWICK	NJ	8901
ANSHE EMETH MEMORIAL TEMPLE	222 LIVINGSTON AVE	NEW BRUNSWICK	NJ	8901
ANTIOCH CHRISTIAN CHURCH	28 OLIVER AVE	NEW BRUNSWICK	NJ	8901

BAHAIS OF NEW BRUNSWICK	48 MANOR CT	NEW BRUNSWICK	NJ	8901
BURNING BUSH EVANGELISTIC CHURCH	89 FRENCH ST	NEW BRUNSWICK	NJ	8901
CALVARY CHAPEL NEW BRUNSWICK INC	46 BAYARD ST STE 301	NEW BRUNSWICK	NJ	8901
CATHOLIC CAMPUS MINISTRY AT RUTGERS	29 MINE ST	NEW BRUNSWICK	NJ	8901
CENTER FOR ISLAMIC LIFE	PO BOX 1701	NEW BRUNSWICK	NJ	8903
CHABAD HOUSE - LUBAVITCH INC	170 COLLEGE AVE	NEW BRUNSWICK	NJ	8901
EBENEZER BAPTIST CHURCH OF THE CITY OF NEW BRUNSWICK NJ	126 LEE AVE	NEW BRUNSWICK	NJ	8901
FIRST BAPTIST CHURCH	226 HALE ST	NEW BRUNSWICK	NJ	8901
FIRST REFORMED CHURCH	9 BAYARD ST	NEW BRUNSWICK	NJ	8901
FRIENDSHIP CHRISTIAN CHURCH	71 THROOP AVE # 73	NEW BRUNSWICK	NJ	8901
FRIENDSHIP CHRISTIAN CHURCH DISCIPLES OF CHRIST NEW BRUNSWICK	71 THROOP AVE	NEW BRUNSWICK	NJ	8901
HOLY FAMILY PARISH	56 THROOP AVE	NEW BRUNSWICK	NJ	8901
HOLY VIRGIN PROTECTION RUSSIAN ORTHODOX CHURCH	301 HANDY ST	NEW BRUNSWICK	NJ	8901
IGLESIA DE JESUCRISTO 1ERO DE CRONICAS 410 INC	89 BURNET ST	NEW BRUNSWICK	NJ	8901
IGLESIA JESUCRISTO REINA INC	100 LIVINGSTON AVE	NEW BRUNSWICK	NJ	8901
IGLESIA PENTECOSTAL DE JESUCRISTO REVELACION DIVINA INC	PO BOX 5282	NEW BRUNSWICK	NJ	8903
IGLESIA PENTECOSTAL Y MISIONERA EL MESIAS MI INC	8 WRIGHT PL	NEW BRUNSWICK	NJ	8901
JESUS THE KING COPTIC CATHOLIC CHURCH CORPORATION	27 MANOR CT BLDG 5	NEW BRUNSWICK	NJ	8901
JEWISH EDUCATION FOUNDATION INC	170 COLLEGE AVE	NEW BRUNSWICK	NJ	8901
LIVING MANNA INTERNATIONAL CHURCH	16 STOCKTON RD	NEW BRUNSWICK	NJ	8901
LUTHERAN CAMPUS MINISTRY AT RUTGERS UNIVERSITY	14 STONE ST	NEW BRUNSWICK	NJ	8901
MESSIAH CHURCH OF GOD	71 THROOP AVE	NEW BRUNSWICK	NJ	8901
MINISTERIO EL FUERTE DE CRISTO	4 PENNINGTON RD	NEW BRUNSWICK	NJ	8901
MINISTERIO INTERNACIONAL FUENTE DE VIDA EN RESTAURACION	570 JERSEY AVE	NEW BRUNSWICK	NJ	8901
MOUNT CALVARY MISSIONARY CHURCH	150 THROOP AVE	NEW BRUNSWICK	NJ	8901
MT ZION MINISTRIES	62 LARCH AVE	NEW BRUNSWICK	NJ	8901
NEW BRUNSWICK ISLAMIC CENTER INC	PO BOX 481	NEW BRUNSWICK	NJ	8903
NEW BRUNSWICK THEOLOGICAL SEMINARY	17 SEMINARY PL	NEW BRUNSWICK	NJ	8901
NEW LIFE IN CHRIST FELLOWSHIP MINISTRIES	PO BOX 713	NEW BRUNSWICK	NJ	8903
PARISH OF THE VISITATION	192 SANDFORD ST	NEW BRUNSWICK	NJ	8901
SAINT JOHN THE EVANGELIST CHURCH	189 GEORGE ST	NEW BRUNSWICK	NJ	8901
SAINT MARY OF MOUNT VIRGIN CHURCH	190 BANDFORD ST	NEW BRUNSWICK	NJ	8901
SECOND PROTESTANT REFORMED DUTCH CHURCH OF NEW BRUNSWICK	100 COLLEGE AVE	NEW BRUNSWICK	NJ	8901
SHAVACH CHRISTIAN CENTER INC	144 COMSTOCK ST	NEW BRUNSWICK	NJ	8901
ST JOSEPHS HUNGARIAN GREEK CATHOLIC CHURCH NEW BRUNSWICK N J	30 HIGH ST	NEW BRUNSWICK	NJ	8901
ST VINCENT DE PAUL ST PETER THE APOSTLE CONFERENCE	94 SOMERSET ST	NEW BRUNSWICK	NJ	8901
SUYDAM STREET REFORMED CHURCH	74 DRIFT ST	NEW BRUNSWICK	NJ	8901
TABERNACLE BAPTIST CHURCH INC	239 GEORGE ST	NEW BRUNSWICK	NJ	8901
THE MAGYAR REFORMED CHURCH NEW BRUNSWICK NJ	179 SOMERSET ST	NEW BRUNSWICK	NJ	8901
TREES OF RIGHTEOUSNESS CRUSADE INC	15 LLEWELYN PL	NEW BRUNSWICK	NJ	8901
UNITED CAMPUS MINISTRY AT RUTGERS	3 SEAMAN ST	NEW BRUNSWICK	NJ	8901
UNITY FELLOWSHIP CHURCH NEW BRUNSWICK NJ	PO BOX 347	NEW BRUNSWICK	NJ	8903
ADVANCING CHRISTIANITY THROUGH INDIVIDUAL OPPORTUNITY & NEED CHUR	1566 RT 130	NORTH BRUNSWICK	NJ	8902
GEORGES ROAD BAPTIST CHURCH	4090 GEORGES RD AND CHURCH LN	NORTH BRUNSWICK	NJ	8902
NEW HOPE CHRISTIAN CENTER INC	2480 STATE HIGHWAY 27	NORTH BRUNSWICK	NJ	8902
CALVARY CHAPEL OF OLD BRIDGE	127 WHITE OAK LN	OLD BRIDGE	NJ	8857
CAMP BETHEL CHURCH INCORPORATED	231 GREEN ST	OLD BRIDGE	NJ	8857
CHARITOS CHRISTIAN FELLOWSHIP CENTER INC	18 THROCKMORTON LN STE 202	OLD BRIDGE	NJ	8857
CONGREGATION BETH OHR	PO BOX 206	OLD BRIDGE	NJ	8857
GARDEN STATE BAPTIST CHURCH OF OLD BRIDGE TOWNSHIP	174 AUSTIN AVE	OLD BRIDGE	NJ	8857
GRACE CHRISTIAN FELLOWSHIP	40 MADISON AVE	OLD BRIDGE	NJ	8857
GRACE PRAYER CAMP INTERNATIONAL	33 PINE TREE RD	OLD BRIDGE	NJ	8857
NEW JERSEY BIBLE PRESBYTERIAN CHURCH INC	20 HILLIARD RD	OLD BRIDGE	NJ	8857
PATTY BELL WORD UP MINISTRIES	PO BOX 5262	OLD BRIDGE	NJ	8857
RIVERS OF LIVING WATER INTERNATIONAL MINISTRY	PO BOX 623	OLD BRIDGE	NJ	8857
ROXANNE TAURIELLO MINISTRIES INC	109 THROCKMORTON LN	OLD BRIDGE	NJ	8857
SANKAT MOCHAN HANUMAN MANDIR USA INC	40 LA VALENCIA RD	OLD BRIDGE	NJ	8857
SIMPSON UNITED METHODIST CHURCH	2095 ROUTE 516	OLD BRIDGE	NJ	8857
ST AMBROSE CONFERENCE	83 THROCKMORTON LN	OLD BRIDGE	NJ	8857
GLORY LIFE MINISTRIES INTERNATIONAL INC	137 KENDALL DR	PARLIN	NJ	8859
GODS INC MINISTRIES	135 PRINCETON RD	PARLIN	NJ	8859
HEAVEN BELONGS TO YOU MINISTRIES CORP	31 SKYTOP GDNS APT 23	PARLIN	NJ	8859
JOHN ZAVLARIS WORLD WIDE MINISTRIES INC	PO BOX 247	PARLIN	NJ	8859

NEW LIFE PENTECOSTAL MINISTRIES INC	57 SUCH ST	PARLIN	NJ	8859
NORTH BRUNSWICK CULTURAL CENTER	2 WOODS EDGE CT	PARLIN	NJ	8859
OPEN HEAVEN WORSHIP CENTER INC	7 DEVONSHIRE RD	PARLIN	NJ	8859
RIVER OF LIFE CHRISTIAN CENTER INC	31 FLORENCE DR	PARLIN	NJ	8859
SHRI BHAKTINIDHI INC	717 WASHINGTON RD	PARLIN	NJ	8859
SIKH AMERICAN CULTURAL ASSOCIATION OF USA INC	49 FELA DR	PARLIN	NJ	8859
SWEET BETHEL CHURCH OF THE LIVING GOD INTERDENOMINATIONAL INC	171 PRINCETON RD	PARLIN	NJ	8859
BETHEL CHRISTIAN CHURCH INC	PO BOX 1116	PERTH AMBOY	NJ	8862
CALVARY CHAPEL PERTH AMBOY	PO BOX 1761	PERTH AMBOY	NJ	8862
CHURCH OF GOD CHRIST IS THE ANSWER	795 STATE ST	PERTH AMBOY	NJ	8861
CONCORD MISSIONARY BAPTIST CHURCH	PO BOX 1730	PERTH AMBOY	NJ	8862
COVENANT ECUMENICAL FELLOWSHIP AND CATHEDRAL ASSEMBLIES	205 SMITH ST	PERTH AMBOY	NJ	8861
CPC OF THE WMM- PERTH AMBOY NJ-ONE INC	PO BOX 2354	PERTH AMBOY	NJ	8862
CRISTO EL REFUGIO MOVIMIENTO MISIONERO MUNDIAL INC	160 WAYNE ST # 2	PERTH AMBOY	NJ	8861
EXTENDIENDO LAS MANOS	231 1ST ST	PERTH AMBOY	NJ	8861
FAITH APOSTOLIC MINISTRIES INC	310 SUTTON ST	PERTH AMBOY	NJ	8861
FAITH DELIVERANCE FAMILY WORSHIP CENTER CORP	337 HERBERT ST	PERTH AMBOY	NJ	8861
FIRST BAPTIST CHURCH	234 HIGH ST	PERTH AMBOY	NJ	8861
GODS ARMY MINISTRIES OF NJ A NJ NONPROFIT CORPORATION	365 NEW BRUNSWICK AVE	PERTH AMBOY	NJ	8861
GRACE CHRISTIAN FELLOWSHIP	74 HARNED AVE	PERTH AMBOY	NJ	8861
GREATER WORD CHURCH	145 DALLY CT	PERTH AMBOY	NJ	8861
HISPANIC CHRISTIAN CENTER INC	299 BARCLAY ST	PERTH AMBOY	NJ	8861
HOLY CROSS CHURCH WOMENS AUXILIARY	351 LAWRIE ST # 355	PERTH AMBOY	NJ	8861
IGLESIA BAUTISTA EBENEZER	411 NEVILLE ST	PERTH AMBOY	NJ	8861
IGLESIA BAUTISTA EBENEZER	411 NEVILLE ST	PERTH AMBOY	NJ	8861
IGLESIA CIUDAD DE REFUGIO CORP	436 MARKET ST	PERTH AMBOY	NJ	8861
IGLESIA PENTECOSTAL MANANTIAL DE VIDA INC	361 SILZER ST	PERTH AMBOY	NJ	8861
IGLESIA PENTECOSTAL UNIDOS PARA ADORAR A DIOS INC	PO BOX 454	PERTH AMBOY	NJ	8862
INTERNATIONAL APOSTOLIC RIVERS OF THE HOLY SPIRIT MINISTRIES INC	216 SHERIDAN ST	PERTH AMBOY	NJ	8861
MINISTERIO RESTAURANDO LOS MUROS INC	154 RECTOR ST APT 1	PERTH AMBOY	NJ	8861
NEW BEGINNINGS DELIVERANCE TEMPLE INC	516 N PARK DR	PERTH AMBOY	NJ	8861
RADIANCE CHURCH	446 MARKET ST	PERTH AMBOY	NJ	8861
ST JOHNS FIRST HUNGARIAN WEND EVANGELICAL LUTHERAN CHURCH	664 AMBOY AVE	PERTH AMBOY	NJ	8861
ST PAULS EVANGELICAL REFORMED CHURCH	PO BOX 1160	PERTH AMBOY	NJ	8862
ST PETERS EPISCOPAL CHURCH	183 RECTOR ST	PERTH AMBOY	NJ	8861
ST SPIRIDON RUSSIAN ORTHODOX CHURCH	649 ELIZABETH ST	PERTH AMBOY	NJ	8861
THE CHURCH OF JESUS CHRIST LED BY THE HOLY SPIRIT INC	186 MARKET ST	PERTH AMBOY	NJ	8861
THE REDEEMED CHRISTIAN CHURCH OF GOD SANCTUARY OF PRAISE CHAPEL INC	489/493 AMBOY AVENUE	PERTH AMBOY	NJ	8861
VICTORY AND TRIUMPH WORSHIP CHURCH INC	95 BARNES CT	PERTH AMBOY	NJ	8861
VIDA CHURCH	348 MAPLE ST	PERTH AMBOY	NJ	8861
ABUNDANT LIFE WORSHIP CENTER INC	482 STELTON RD	PISCATAWAY	NJ	8854
AL BASEERAH INTERNATIONAL INSTITUTE A NJ NONPROFIT CORPORATION	605 S WASHINGTON AVE	PISCATAWAY	NJ	8854
BAHAIS OF THE PISCATAWAY TOWNSHIP	9 DEBORAH DR	PISCATAWAY	NJ	8854
BAPS DEVELOPMENT INC	81 SUTTONS LN	PISCATAWAY	NJ	8854
BAPS ENDOWMENT INC	81 SUTTONS LN	PISCATAWAY	NJ	8854
BAPS NORTHEAST DEVELOPMENT INC	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHREE ANSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHREE AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHREE AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHREE AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHRI AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA -	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHRI AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA -	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHRI AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA -	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHRI AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA -	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHRI AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA -	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHRI AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA I	81 SUTTONS LN	PISCATAWAY	NJ	8854
BOCHASANWASI SHRI AKSHAR PURUSHOTTAM SWAMINARAYAN SANSTHA	81 SUTTONS LN	PISCATAWAY	NJ	8854
CENTRAL JERSEY MEDITATION GROUP INC	255 OLD NEW BRUNSWICK ROAD	PISCATAWAY	NJ	8854
CENTRO CRISTIANO REY DE GLORIA INC	158 N RANDOLPHVILLE RD	PISCATAWAY	NJ	8854
CHRIST CHURCH OF PISCATAWAY INC	PO BOX 8308	PISCATAWAY	NJ	8855
CHRIST UNITED METHODIST CHURCH	485 HOES LN	PISCATAWAY	NJ	8854

CHURCH OF GOD OF REVIVAL TO THE NATIONS	122 METLARS LN	PISCATAWAY	NJ	8854
COMPASSIONATE CARE NETWORK - NEW JERSEY	2 WYNDMERE RD	PISCATAWAY	NJ	8854
DILIGENT SEEKERS CHRISTIAN MINISTRIES	25 MITCHELL AVE	PISCATAWAY	NJ	8854
DIOCESE OF METUCHEN	146 METLARS LN	PISCATAWAY	NJ	8854
EMMANUEL FULL GOSPEL ASSEMBLY	10 HELEN CT	PISCATAWAY	NJ	8854
FAITH-IN-ACTION BAPTIST CHURCH	PO BOX 625	PISCATAWAY	NJ	8855
FILIPINO CLERGY ASSOCIATION INC	50 VAN WINKLE PL	PISCATAWAY	NJ	8854
FIRST BAPTIST CHURCH NEW MARKET	450 NEW MARKET RD	PISCATAWAY	NJ	8854
FULL GOSPEL PENTECOSTAL CHURCH INC	274 RICHARDS AVE	PISCATAWAY	NJ	8854
GLORIOUS BLESSED ASSURANCE BAPTIST CHURCH	102 HIGH ST	PISCATAWAY	NJ	8854
GRACE ALLIANCE CHURCH OF PISCATAWAY NJ	240 STELTON RD	PISCATAWAY	NJ	8854
ISLAMIC CIRCLE OF MERCER COUNTY	312 VASSER DR	PISCATAWAY	NJ	8854
LESLEY DEVEREAUX GLOBAL MINISTRIES INC	74 AZALEA PL	PISCATAWAY	NJ	8854
LIGHTHOUSE MINISTRIES	5 GRACE PL	PISCATAWAY	NJ	8854
LIVING HOPE OUTREACH CTR	PO BOX 8596	PISCATAWAY	NJ	8855
MACEDONIA ORIGINAL FREEWILL BAPTIST CHURCH	372 HIGHLAND AVE	PISCATAWAY	NJ	8854
NEW DURHAM CHAPEL	225 NEW DURHAM RD	PISCATAWAY	NJ	8854
OUR LADY OF TENDERNESS HERMITAGE A NEW JERSEY NONPROFIT CORPORATION	2400 B COOPER STREET	PISCATAWAY	NJ	8854
PISCATAWAY JEWISH COMMUNITY CONGREGATION	PO BOX 965	PISCATAWAY	NJ	8855
POWER OF GOSPEL MINISTRIES INC	200CENTENNIALAVESTE200	PISCATAWAY	NJ	8854
ROCK OF AGES CHRISTIAN FELLOWSHIP	6 MIMOSA LN	PISCATAWAY	NJ	8854
ROCK OF AGES CHURCH OF GOD INC	80 PARK AVE	PISCATAWAY	NJ	8854
SAINT MOSES AND ANBA ABRAAM COPTIC ORTHODOX CHURCH	40 DAVIDSON RD	PISCATAWAY	NJ	8854
ST JUDE S HOUSE OF PRAYER	1561 W 6TH ST	PISCATAWAY	NJ	8854
SWAMINARAYAN AKSHARPITH INC	81 SUTTONS LN	PISCATAWAY	NJ	8854
TABERNACLE OF PROMISE INC	1122 MANOR BLVD	PISCATAWAY	NJ	8854
TEMPLE CHURCH OF GOD IN CHRIST INC	406 PLEASANT AVE	PISCATAWAY	NJ	8854
THE CHURCH IN PISCATAWAY - A NON- PROFIT CORPORATION	645 BUENA VISTA AVE	PISCATAWAY	NJ	8854
THE I AM MINISTRIES	45 BRISTOL RD	PISCATAWAY	NJ	8854
THE MUSLIM CENTER OF MIDDLESEX COUNTY	1000 HOES LN E	PISCATAWAY	NJ	8854
VICTORY THRU FAITH FAMILY WORSHIP CENTER	574 BUCKINGHAM DR	PISCATAWAY	NJ	8854
WOMEN AND MEN OF GOD SHARING MINISTRY INC	428 PROSPECT AVE FIRST FLR	PISCATAWAY	NJ	8854
WORD AND DELIVERANCE INC	120 JOHNSON AVE	PISCATAWAY	NJ	8854
YESHIVA SHAAREI TZION	51 PARK AVE	PISCATAWAY	NJ	8854
ZION HILL BAPTIST CHURCH PISCATAWAY N J INC	450 HIGHLAND AVE	PISCATAWAY	NJ	8854
EMMANUEL PRAYER HOUSE OF PEACE	162 SCHALKS CROSSING RD	PLAINSBORO	NJ	8536
GOODWILL TRUE VINE MISSION NATIONWIDE INC	3211 WYNDHURST DR	PLAINSBORO	NJ	8536
GOSPEL FELLOWSHIP OF PLAINSBORO	626 PLAINSBORO RD	PLAINSBORO	NJ	8536
GREAT HOPE BAPTIST CHURCH	21 POND VIEW DR	PLAINSBORO	NJ	8536
NITHYAVIBHUTHI	203 RAVENS CREST DR	PLAINSBORO	NJ	8536
PLAINSBORO BIBLE CHURCH	PO BOX 38	PLAINSBORO	NJ	8536
PRINCETON CHURCH OF THE CHRISTIAN AND MISSIONARY ALLIANCE	20 SCHALKS CROSSING RD	PLAINSBORO	NJ	8536
QUEENSHIP OF MARY CONFERENCE	16 DEY RD	PLAINSBORO	NJ	8536
UNIVERSITY BIBLE FELLOWSHIP	5 MARKET ST	PLAINSBORO	NJ	8536
GURDWARA DASHMESH DARBAR INC	800 PORT READING AVE	PORT READING	NJ	7064
SINGH SABHA INC	941 PORT READING AVE	PORT READING	NJ	7064
ST ANTHONYS CHURCH	436 PORT READING AVE	PORT READING	NJ	7064
BIG NET MINISTRIES INTERNATIONAL	370 SAYRE DR	PRINCETON	NJ	8540
TEKSKILLS FOUNDATION	5 INDEPENDENCE WAY	PRINCETON	NJ	8540
EVERLASTING MINISTRIES	SECOND AND STOCKTON ST	S AMBOY	NJ	8879
BUDDHAS LIGHT INTERNATIONAL ASSOCIATION NEW JERSEY INC	1007 NEW BRUNSWICK AVE	S PLAINFIELD	NJ	7080
CENTURY CHURCH	PO BOX 883	S PLAINFIELD	NJ	7080
CHURCH OF THE SACRED HEART	200 RANDOLPH AVE	S PLAINFIELD	NJ	7080
DASHMESH SIKH CENTER A NJ NONPROFIT CORPORATION	111 SNYDER RD	S PLAINFIELD	NJ	7080
IGNITE CHURCH OF CENTRAL JERSEY INCORPORATED	226 ARLINGTON AVE	S PLAINFIELD	NJ	7080
NATIVITY OF THE BLESSED VIRGIN ORTHODOX CHURCH	416 DELMORE AVE	S PLAINFIELD	NJ	7080
NATIVITY OF THE BLESSED VIRGIN ORTHODOX CHURCH OF S PLAINFIELD NJ	416 DELMORE AVE	S PLAINFIELD	NJ	7080
NEW APOSTOLIC CHURCH OF FARMINGDALE NJ	120 W HENDRICKS BLVD	S PLAINFIELD	NJ	7080
NEW JERSEY BUDDHIST CULTURE CENTER INC	1007 BRUNSWICK AVENUE	S PLAINFIELD	NJ	7080
PILGRIM COVENANT CHURCH-S PLAINFIELD NJ	3121 PARK AVE	S PLAINFIELD	NJ	7080
PILGRIM COVENANT LEARNING CENTER INC	3121 PARK AVE	S PLAINFIELD	NJ	7080
SAI DATTA MANDIR INC	902 OAK TREE AVE STE 100	S PLAINFIELD	NJ	7080
SHIELDS OF FAITH MINISTRIES OF SOUTH PLAINFIELD	1715 CLINTON AVE	S PLAINFIELD	NJ	7080

ST STEPHENS EVANGELICAL LUTHERAN CHURCH	3145 PARK AVE	S PLAINFIELD	NJ	7080
UPPER ROOM FULL GOSPEL CHURCH INC	102 E NASSAU AVE	S PLAINFIELD	NJ	7080
WESLEY UNITED METHODIST CHURCH OF PLAINFIELD	1500 PLAINFIELD AVE	S PLAINFIELD	NJ	7080
REDENTOR PRESBYTERIAN CHURCH	PO BOX 444	S RIVER	NJ	8882
AHAVAT ISRAEL INC	6001 BORDENTOWN AVE	SAYREVILLE	NJ	8872
GENTLE WHISPER MISSION	47 WINDING WOOD DR APT 1A	SAYREVILLE	NJ	8872
JESUS HOUSE NEW JERSEY A MINISTRY OF THE REDEEMED CHRISTIAN CHURCH	PO BOX 1422	SAYREVILLE	NJ	8872
OUR LADY OF VICTORIES CONFERENCE	42 MAIN ST	SAYREVILLE	NJ	8872
FIRST BAPTIST CHURCH OF WOODBRIDGE INC	130 SEWAREN AVE	SEWAREN	NJ	7077
SAINT JOHNS EPISCOPAL CHURCH	17 WOODBRIDGE AVE	SEWAREN	NJ	7077
CALL OF SALVATION AND DELIVERANCE MINISTRIES	23 WESTMINSTER BLVD APT A	SOUTH AMBOY	NJ	8879
CHRIST GOSPEL APOSTOLIC CHURCH INC	PO BOX 204	SOUTH AMBOY	NJ	8879
EVERLASTING STRENGTH MINISTRY INC	PO BOX 208	SOUTH AMBOY	NJ	8879
POLISH CHRISTIAN CENTER	150 N BROADWAY	SOUTH AMBOY	NJ	8879
IMPACT CHURCH WORLDWIDE INC	1253 NEW MARKET AVE	SOUTH PLAINFIELD	NJ	7080
CHERRY HILL ASSOCIATED PRESBYTERIAN CHURCH	190 WILLIAM STREET	SOUTH RIVER	NJ	8882
CHRISTIAN LIFE FELLOWSHIP CENTER INC	PO BOX 235	SOUTH RIVER	NJ	8882
CHRISTIAN LIFE FELLOWSHIP OF NEW JERSEY	45 FERRY ST	SOUTH RIVER	NJ	8882
CORPUS CHRISTI-SOUTH RIVER	106 KAMM AVE	SOUTH RIVER	NJ	8882
FIRST REFORMED CHURCH OF SOUTH RIVER	40 THOMAS ST	SOUTH RIVER	NJ	8882
GODS LAST CALL REVIVALS INC	PO BOX 45	SOUTH RIVER	NJ	8882
HOSANNA OUR MESSIAH EMMANUEL CHRISTIAN CENTER INC	46 HERITAGE DR	SOUTH RIVER	NJ	8882
HOUSE OF ABRAHAM A NJ NONPROFIT CORPORATION	50 MAIN ST	SOUTH RIVER	NJ	8882
JESUS THE ONLY SOLUTION ASSEMBLY OF GOD CHURCH	45 FERRY ST	SOUTH RIVER	NJ	8882
PASSIONISTS INTERNATIONAL INC	80 DAVID ST	SOUTH RIVER	NJ	8882
POWERHOUSE REVIVAL MINISTRY	176 WHITEHEAD AVE	SOUTH RIVER	NJ	8882
SAINT MARY AND ARCHANGEL RAPHAEL COPTIC ORTHODOX CHURCH A NJ NONPRO	50 MAIN ST	SOUTH RIVER	NJ	8882
SAINT MARY AND SAINT STEPHEN COPTIC ORTHODOX CHURCH	50 MAIN ST	SOUTH RIVER	NJ	8882
SS PETER AND PAUL CHURCH	153 KAUIM AVE	SOUTH RIVER	NJ	8882
WORLD WORSHIP CHURCH	85 A MAIN STREET	SOUTH RIVER	NJ	8882
THE MINISTERS ELDERS AND DEACONS OF THE REFORMED CHURCH OF SPOTSWOOD	429 MAIN ST	SPOTSWOOD	NJ	8884
TRINITY UNITED METHODIST CHURCH	70 MANALAPAN RD	SPOTSWOOD	NJ	8884
TRUCKERS CHRISTIAN CHAPEL MINISTRIES EAST INC	473 MANALAPAN RD	SPOTSWOOD	NJ	8884
CATHOLIC DAUGHTERS OF THE AMERICAS	346 AMBOY AVE	WOODBIDGE	NJ	7095
FAITH CHRISTIAN FELLOWSHIP OUTREACH MINISTRIES	PO BOX 1125	WOODBIDGE	NJ	7095
FRIENDS OF MY FIRE	90 WOODBRIDGE CTR DR STE 600	WOODBIDGE	NJ	7095
MUSLIM COMMUNITY OF NEW JERSEY INC WOODBRIDGE	PO BOX 865	WOODBIDGE	NJ	7095
TOTAL SALVATION MINISTRIES INC	270 W PROSPECT AVE	WOODBIDGE	NJ	7095
TRINITY CHURCH	650 RAHWAY AVE	WOODBIDGE	NJ	7095
WOODBIDGE GOSPEL CHURCH INC	121 E PROSPECT AVE	WOODBIDGE	NJ	7095
CENTRO EVANGELISTICO PENTECOSTES INC	219 E SMITH ST	WOODBIDGE	NJ	7095

Source: Homeland Infrastructure Foundation-Level Data (HIFLD). (2020, July). All Places of Worship. *HIFLD*. [Dataset].
<https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::all-places-of-worship/about>

REFERENCES

- ¹ *About Cultural Landscapes*. (2020). The Cultural Landscape Foundation. Retrieved September 29, 2021, from <https://tclf.org/places/about-cultural-landscapes> <https://www.nps.gov/subjects/culturallandscapes/understand->
- ² National Park Service. (2021, June 15). *Understand Cultural Landscapes*. National Park Service- Cultural Landscapes.
- ³ *NJGS - state.nj.us*. (n.d.). Retrieved December 10, 2021, from <https://www.state.nj.us/dep/njgs/pricelst/ofmap/ofm27.pdf>.
- ⁴ Ibid.
- ⁵ BEM Systems, INC. (2022, March). Characterization of Ambient Level of Selected Metals and CPAHs in New Jersey: Year III - Rural Areas of New Jersey Highlands, Valley and Ridge, and Coastal; Plain Physiographic Provinces. NJDEP. https://www.nj.gov/dep/dsr/publications/Characterization%20of%20Ambient%20Levels%20of%20Selected%20Metals%20and%20cPAHs%20in%20NJ%20Soils_Year%20Three_Highlands,%20Valley%20and%20Ridge,%20and%20Coastal%20Plain%20_Full%20Report.pdf
- ⁶ Woods, A. J., J. M. Omrnik, and B. C. Moran. (2007, January). Level III and IV Ecoregions of New Jersey. EPA. https://gaftp.epa.gov/EPADDataCommons/ORD/Ecoregions/nj/nj_eco_desc.pdf
- ⁷ Ibid.
- ⁸ History Buff's Guide to Middlesex County. (2007). United States: Middlesex County Board of Chosen Freeholders. Retrieved December 10, 2021.
- ⁹ John P. Snyder, "The Story of New Jersey's Civil Boundaries 1606-1968," 1. <https://www.state.nj.us/dep/njgs/enviroed/oldpubs/bulletin67.pdf>
- ¹⁰ John P. Snyder, "The Story of New Jersey's Civil Boundaries 1606-1968," 1. <https://www.state.nj.us/dep/njgs/enviroed/oldpubs/bulletin67.pdf>
- ¹¹ John P. Snyder, "The Story of New Jersey's Civil Boundaries 1606-1968," 1. <https://www.state.nj.us/dep/njgs/enviroed/oldpubs/bulletin67.pdf>
- ¹² Ibid.
- ¹³ A., D. A. W., History buff's guide to Middlesex County (2007). New Jersey; Middlesex County Board of Chosen Freeholders.
- ¹⁴ Whitehead, W. A. (1856). *Contributions to the Early History of Perth Amboy and Adjoining Country*. Making of America. <https://quod.lib.umich.edu/cgi/t/text/text-idx?c=moa&cc=moa&view=text&rgn=main&idno=AFK3972.0001.001>
- ¹⁵ Whitehead, W. A. (1856). *Contributions to the Early History of Perth Amboy and Adjoining Country*. Making of America. <https://quod.lib.umich.edu/cgi/t/text/text-idx?c=moa&cc=moa&view=text&rgn=main&idno=AFK3972.0001.001>
- ¹⁶ Ibid.
- ¹⁷ Whitehead, W. A. (1856). *Contributions to the Early History of Perth Amboy and Adjoining Country*. Making of America. <https://quod.lib.umich.edu/cgi/t/text/text-idx?c=moa&cc=moa&view=text&rgn=main&idno=AFK3972.0001.001>
- ¹⁸ Ibid.
- ¹⁹ Ibid.
- ²⁰ Ibid.
- ²¹ Snyder, John F. The Story of New Jersey's Civil Boundaries 1606-1968. (1969). New Jersey Geological Survey. First Edition. Pg. 60-61. Retrieved December 17, 2021, from <https://www.state.nj.us/dep/njgs/enviroed/oldpubs/bulletin67.pdf>
- ²² A., D. A. W., History buff's guide to Middlesex County (2007). New Jersey; Middlesex County Board of Chosen Freeholders.

-
- ²³ Listokin, Berkhout, D., & Hughes, J. W. (2016). *New Brunswick, New Jersey: the decline and revitalization of urban America*. Rutgers University Press. <https://doi.org/10.36019/9780813575582>
- ²⁴ 1910. 1910 | New Jersey League of Municipalities. (n.d.). Retrieved December 17, 2021, from https://www.njlm.org/176/_1910
- ²⁵ Ibid.
- ²⁶ Plan of New York and Its Environs. (1922, May). New York. https://s3.us-east-1.amazonaws.com/rpa-org/pdfs/Timeline-PDFs/1922_Plan-of-NewYork-and-Its-Environs-Meeting.pdf
- ²⁷ Regional plan of New York and its environs. RPA. (n.d.). Retrieved December 17, 2021, from <https://rpa.org/work/reports/regional-plan-of-new-york-and-its-environs>
- ²⁸ Walker, J. (2012, August). *Hadley Air Field, New Brunswick. New Jersey*. New Jersey Postal History Society. <https://njpostalhistory.org/august12featuredcover.html>
- ²⁹ Ibid.
- ³⁰ Ibid.
- ³¹ History.com Editors. (2010, May 27). G.I. Bill. History.com. Retrieved December 17, 2021, from <https://www.history.com/topics/world-war-ii/gi-bill>
- ³² Listokin, Berkhout, D., & Hughes, J. W. (2016). *New Brunswick, New Jersey: the decline and revitalization of urban America*. Rutgers University Press. Pg. 21. <https://doi.org/10.36019/9780813575582>
- ³³ Ibid. Pg. 24.
- ³⁴ New Jersey Transportation Authority. (n.d.). Garden State Parkway Historic Journey. GSP History. Retrieved December 20, 2021, from <https://www.njta.com/gsphistory/index.html>
- ³⁵ The New Jersey Turnpike Authority. New Jersey Turnpike Authority. (n.d.). Retrieved December 20, 2021, from <https://www.njta.com/about/who-we-are>
- ³⁶ Congress approves the Federal-Aid Highway Act. U.S. Senate: Congress Approves the Federal-Aid Highway Act. (2019, December 12). Retrieved December 17, 2021, from https://www.senate.gov/artandhistory/history/minute/Federal_Highway_Act.htm
- ³⁷ Ibid. Pg. 24.
- ³⁸ Reiss, E. (2018, January 2). *The History of the Brunswick Square Mall... and Its Future*. Tap into Piscataway. <https://www.tapinto.net/articles/the-history-of-the-brunswick-square-mall-dot-dot-dot-and-it-1>
- ³⁹ Woodbridge Township, New Jersey. (n.d.). *A Brief History of Woodbridge Township*. Woodbridge Township, New Jersey. <https://www.twp.woodbridge.nj.us/313/A-Brief-History-of-Woodbridge-Township>
- ⁴⁰ NJDEP. (2007). *Land Use Land Cover Classification System, NJDEP Modified Anderson System 2002*. New Jersey Department of Environmental Protection. <https://www.state.nj.us/dep/gis/digidownload/metadata/lulc02/anderson2002.html>
- ⁴¹ NJDEP Bureau of GIS. (2019, January 28). Land use/land cover of New Jersey 2015. NJGIN Open Data. Retrieved December 15, 2021, from <https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-2015-download/about>
- ⁴² NJDEP, OIRM, BGIA. (2012). *2012 LAND USE/LAND COVER CLASSIFICATION NJDEP MODIFIED ANDERSON SYSTEM*. New Jersey Department of Environmental Protection. Retrieved December 10, 2021, from <https://www.state.nj.us/dep/gis/digidownload/metadata/lulc12/anderson2012.html>
- ⁴³ NJDEP. (2007). *Land Use Land Cover Classification System, NJDEP Modified Anderson System 2002*. New Jersey Department of Environmental Protection.
- ⁴⁴ Tiner, Ralph. Wetlands of New Jersey. National Wetland Inventory. July, 1985. <https://www.fws.gov/wetlands/Documents/Wetlands-of-New-Jersey.pdf>. Retrieved December 13, 2021.
- ⁴⁵ "How Wetlands Are Defined and Identified under CWA Section 404," EPA (Environmental Protection Agency), accessed September 27, 2021, <https://www.epa.gov/cwa-404/how-wetlands-are-defined-and-identified-under-cwa-section-404>. Retrieved December 14, 2021.

-
- ⁴⁶ NJDEP Bureau of GIS. (1998). Land Use/Land Cover of New Jersey 1986 [Data Set]. NJ Dept. of Environmental Protection Bureau of GIS. Retrieved December 13, 2021 from, <https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-1986-download/about>
- ⁴⁷ “Appendix F: Ecosystem Services Provided by Floodplains” (Forest Service Department of Agriculture, 2017). Retrieved December 13, 2021, from https://www.fs.usda.gov/nfs/11558/www/nepa/98306_FSPLT3_4130975.pdf.
- ⁴⁸ U.S. Fish and Wildlife Service; National Wetlands Inventory; National Standards and Support Team., U. S. F. & W. S. (n.d.). Wetlands Mapper. National Wetlands Inventory. Retrieved December 15, 2021, from <https://www.fws.gov/wetlands/data/Mapper.html>
- ⁴⁹ “Appendix F: Ecosystem Services Provided by Floodplains” (Forest Service Department of Agriculture, 2017). Retrieved December 13, 2021, from https://www.fs.usda.gov/nfs/11558/www/nepa/98306_FSPLT3_4130975.pdf.
- ⁵⁰ FEMA. (2020). *FEMA Flood Zone Classifications* [Data file]. Retrieved from, <https://www.fema.gov/glossary/flood-zones>
- ⁵¹ NOAA. (n.d.). *NJ Northern SLR Data Dist* [Data file].
- ⁵² “N.J.A.C. 7:7A FRESHWATER WETLANDS PROTECTION ACT RULES” (New Jersey Department of Environmental Protection), 2020, Retrieved September 27, 2021 from, https://www.nj.gov/dep/rules/rules/njac7_7a.pdf.
- ⁵³ Environmental Protection Agency. (n.d.). *Basic Information about Estuaries*. EPA. Retrieved December 10, 2021, from <https://www.epa.gov/nep/basic-information-about-estuaries>
- ⁵⁴ Hajna , L., & Shinske , C. (2020, April 8). *DEP ADOPTS NEW PROTECTIONS FOR 600 MILES OF RIVERS AND STREAMS*. OFFICIAL SITE OF THE STATE OF NEW JERSEY. Retrieved December 10, 2021, from https://www.nj.gov/dep/newsrel/2020/20_0013.htm.
- ⁵⁵ Department of Environmental Protection. (2012, June 8). *Watershed Information*. NJDEP-Watershed Restoration-watershed information. Retrieved December 10, 2021, from <https://www.state.nj.us/dep/watershedrestoration/info.html#watershed>.
- ⁵⁶ NJDEP. (2007). *New Jersey's Watersheds, Watershed Management Areas and Water Regions*. Official Site of the State of New Jersey. NJDEP Division of Watershed Management. Retrieved December 10, 2021, from <https://www.state.nj.us/dep/seeds/docs/watersheds.pdf>.
- ⁵⁷ Rutgers University - New Brunswick. (n.d.). Raritan.rutgers.edu. Retrieved December 10, 2021, from <http://raritan.rutgers.edu/>.
- ⁵⁸ *NYNJ baykeeper*. NYNJ Baykeeper. (n.d.). Retrieved December 10, 2021, from <https://www.nynjbaykeeper.org/campaigns/advocacy/raritan-bay-initiative/>.
- ⁵⁹ Department of Environmental Protection. (2012, June 8). *Watershed Information*. NJDEP-Watershed Restoration-watershed information. Retrieved December 10, 2021, from <https://www.state.nj.us/dep/watershedrestoration/info.html#watershed>.
- ⁶⁰ NJDEP, OIRM, BGIA. (2012). *2012 LAND USE/LAND COVER CLASSIFICATION NJDEP MODIFIED ANDERSON SYSTEM*. New Jersey Department of Environmental Protection. Retrieved December 10, 2021, from <https://www.state.nj.us/dep/gis/digidownload/metadata/lulc12/anderson2012.html>.
- ⁶¹ *Note that few urban or built-up land categories are not included in this analysis, such as recreational land; transportation, communication & utilities; Industrial and Commercial complexes; mixed-land; and other
- ⁶² NJDEP, OIRM, BGIA. (2012). *2012 LAND USE/LAND COVER CLASSIFICATION NJDEP MODIFIED ANDERSON SYSTEM*. New Jersey Department of Environmental Protection. Retrieved December 10, 2021, from <https://www.state.nj.us/dep/gis/digidownload/metadata/lulc12/anderson2012.html>.
- ⁶³ Ibid.
- ⁶⁴ Ibid.
- ⁶⁵ Ibid.

-
- ⁶⁶ NJDEP. (2019). Land Use Land Cover 2015. ESRI GIS Area (ac) Field Calculator. PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet. Retrieved from, <https://njogis-newjersey.opendata.arcgis.com/datasets/njdep::land-use-land-cover-of-new-jersey-2015-download>
- ⁶⁷ “What is an impervious surface.” NJDEP New Jersey Department of Environmental Protection. (n.d.). Retrieved December 15, 2021, from https://www.nj.gov/dep/stormwater/sw_rule_faqs.htm#10_0
- ⁶⁸ Environmental Protection Agency. (n.d.). *Basic Information about Nonpoint Source (NPS) Pollution*. EPA. Retrieved December 15, 2021, from <https://www.epa.gov/nps/basic-information-about-nonpoint-source-nps-pollution>
- ⁶⁹ EPA. (2022, April 19). *Sources and Solutions: Stormwater*. EPA. <https://www.epa.gov/nutrientpollution/sources-and-solutions-stormwater>
- ⁷⁰ NJDEP. (2019). Land Use Land Cover 2015. ESRI GIS Area (ac) Field Calculator. PCS: NAD 1983 State Plane New Jersey FIPS 2900 Feet. Retrieved from, <https://njogis-newjersey.opendata.arcgis.com/datasets/njdep::land-use-land-cover-of-new-jersey-2015-download>
- ⁷¹ “What is an impervious surface.” NJDEP New Jersey Department of Environmental Protection. (n.d.). Retrieved December 15, 2021, from https://www.nj.gov/dep/stormwater/sw_rule_faqs.htm#10_0
- ⁷² EPA. (2022, April 11). *Natural Resources Damages: A Primer*. EPA. <https://www.epa.gov/superfund/natural-resource-damages-primer#:~:text=discharge%2C%20of%20oil.-,Natural%20Resources%20Defined,the%20public%2C%20termed%20Trust%20Resources.>
- ⁷³ United States Department of Agriculture Forest Service. (2016). More About Ecosystem Services. Valuing Ecosystem Services. Retrieved December 17, 2021, from https://www.fs.fed.us/ecosystems/services/About_ES/
- ⁷⁴ Ibid.
- ⁷⁵ Sustainable Jersey. (n.d.). *Heat Island Assessment and Mitigation*. Sustainable Jersey. Retrieved from https://www.sustainablejersey.com/fileadmin/media/Actions_and_Certification/Actions/Heat_Island_Assessment_and_Mitigation/HIAMPAction_Dec20_2017B_Appendix.pdf.
- ⁷⁶ Akbari H, Kurn DM, Bretz SE, Hanford JW. (1997). Peak power and cooling energy savings of shade trees. Energy and buildings. United States: Elsevier B.V. Vol. 25(2):139-148. doi:10.1016/S0378-7788(96)01003-1
- ⁷⁷ Urban Forestry Network. (n.d.). *Trees Improve Our Air Quality*. Urban Forestry Network. <http://urbanforestrynetwork.org/benefits/air%20quality.htm>
- ⁷⁸ The Nature Conservancy. (2022). *What is a Carbon Footprint?* The Nature Conservancy. <https://www.nature.org/en-us/get-involved/how-to-help/carbon-footprint-calculator/#:~:text=The%20average%20carbon%20footprint%20for,highest%20rates%20in%20the%20world>
- ⁷⁹ The Value of Urban Tree Cover. The value of urban tree cover - urban natural resources stewardship - northern research station - USDA forest service. (2013). Retrieved December 20, 2021, from https://www.nrs.fs.fed.us/urban/monitoring/value_urban_tree_cover/
- ⁸⁰ Sander, Heather; Polasky, Stephen; Haight, Robert. The value of urban tree cover: A hedonic property price model in Ramsey and Dakota Counties, Minnesota, USA. *Ecological Economics* 69(8): 1646-1656.
- ⁸¹ NJDEP. (n.d.). *Urban & Community Forestry in New Jersey*. NJDEP Forest Service. <https://www.nj.gov/dep/parksandforests/forest/docs/community-forestry-bro.pdf>
- ⁸² MRLC. (2016). *NLCD 2016 USFS Tree Canopy Cover (CONUS)*. MRLC. <https://www.mrlc.gov/data/nlcd-2016-usfs-tree-canopy-cover-conus>
- ⁸³ U.S. Forest Service. (2016). *NLCD 2016 USFS Tree Canopy Cover (CONUS) [Data set]*. Multi-Resolution Land Characteristics Consortium. Retrieved from, <https://www.mrlc.gov/data/nlcd-2016-usfs-tree-canopy-cover-conus>.
- ⁸⁴ *Terrestrial Habitat Map for the Northeast US and Atlantic Canada*. The conservation gateway: The nature conservancy. (n.d.). Retrieved December 15, 2021, from

<https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/habitatmap/Pages/default.aspx>

⁸⁵ National Park Service. (2017, March 17). *Physiographic Provinces*. National Park Service.

<https://www.nps.gov/subjects/geology/physiographic-provinces.htm>

⁸⁶ *Terrestrial Habitat Map for the Northeast US and Atlantic Canada*. The conservation gateway: The nature conservancy. (n.d.). Retrieved December 15, 2021, from

<https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/habitatmap/Pages/default.aspx>

⁸⁷ Tallamy, D. W. (2021). *The nature of oaks: The rich ecology of our most essential native trees*. Timber Press.

⁸⁸ "Northeastern Interior Dry-Mesic Oak Forest," Habitat Guide (The Nature Conservancy), accessed September 27, 2021,

<https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/HabitatGuides/68.pdf>.

⁸⁹ "North Atlantic Coastal Plain Hardwood Forest," Habitat Guide (The Nature Conservancy), accessed September 27, 2021,

https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/HabitatGuides/terrestrialhabitats_DC.pdf.

⁹⁰ "North Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest" (The Conservation Gateway: The Nature Conservancy), accessed September 27, 2021,

<https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/HabitatGuides/48.pdf>.

⁹¹ *Northern Swamp*. The conservation gateway: The nature conservancy. (n.d.). Retrieved December 15, 2021, from <https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/hg/terrestrial/Pages/NorthernSwamp.aspx>

⁹² "North Atlantic Coastal Plain Tidal Salt Marsh," Habitat Guide (The Nature Conservancy), accessed September 27, 2021,

<https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/HabitatGuides/57.pdf>.

⁹³ New Jersey State Park Service. (2014, March 14). *Rare Plant Species and Ecological Communities Presently Recorded in the NJ Natural Heritage Database*. OFFICIAL SITE OF THE STATE OF NEW JERSEY. Retrieved December 10, 2021, from <http://njintouch.state.nj.us/dep/parksandforests/natural/docs/middlesex.pdf>

⁹⁴ *Yellow Giant Hyssop (agastache nepetoides)*. Illinois Wildflowers. (n.d.). Retrieved December 15, 2021, from https://www.illinoiswildflowers.info/savanna/plants/yg_hyssop.htm

⁹⁵ *White Milkweed (asclepias variegata)*. Illinois Wildflower. (n.d.). Retrieved December 15, 2021, from [https://www.illinoiswildflowers.info/savanna/plants/wht_milkweed.html#:~:text=White%20Milkweed%20\(Asclepias%20variegata\)&text=Description%3A%20This%20herbaceous%20perennial%20wildflower,in%20either%20patches%20or%20lines](https://www.illinoiswildflowers.info/savanna/plants/wht_milkweed.html#:~:text=White%20Milkweed%20(Asclepias%20variegata)&text=Description%3A%20This%20herbaceous%20perennial%20wildflower,in%20either%20patches%20or%20lines).

⁹⁶ *Fringed Loosestrife Lysimachia ciliata*. Illinois Wildflower. (n.d.). Retrieved December 15, 2021, from https://www.illinoiswildflowers.info/wetland/plants/fr_loosestrife.htm

⁹⁷ Ascher, J. S. 2005. Species Profile: *Epeoloides pilosula*. In Shepherd, M. D., D. M. Vaughan, and S. H. Black (Eds). Red List of Pollinator Insects of North America. Portland, OR: The Xerces Society for Invertebrate Conservation.

⁹⁸ "Appendix F: Ecosystem Services Provided by Floodplains" (Forest Service Department of Agriculture, 2017). Retrieved December 13, 2021, from https://www.fs.usda.gov/nfs/11558/www/nepa/98306_FSPLT3_4130975.pdf.

-
- ⁹⁹ "Landscape 3.3 Vernal Pools of New Jersey," NJGIN Open Data (New Jersey Department of Environmental Protection, 2019), <https://njgis-newjersey.opendata.arcgis.com/datasets/njdep::landscape-3-3-vernal-pools-of-new-jersey/explore?location=40.141247%2C-74.743900%2C10.56>. Source 2
- ¹⁰⁰ New Jersey Department of Environmental Protection. (2021, October 5). N.J.A.C. 7:7A FRESHWATER WETLANDS PROTECTION ACT RULES. Retrieved December 21, 2021, from https://www.nj.gov/dep/rules/rules/njac7_7a.pdf
- ¹⁰¹ Fisheries, N. O. A. A. (n.d.). *Shortnose Sturgeon*. NOAA. Retrieved December 10, 2021, from <https://www.fisheries.noaa.gov/species/shortnose-sturgeon>.
- ¹⁰² NJDEP. (2019). Terrestrial Wildlife Habitat Cores and Corridors in New Jersey, Connecting Habitat Across New Jersey (CHANJ) [Data set]. Retrieved from, <https://gisdata-njdep.opendata.arcgis.com/datasets/njdep::terrestrial-wildlife-habitat-cores-and-corridors-in-new-jersey-connecting-habitat-across-new-jersey-chanj/about>
- ¹⁰³ Ibid.
- ¹⁰⁴ NJ Division of Fish and Wildlife. (2012, February 21). *NJ Endangered and Nongame Species Program Special Concern – Species Status Listing*. OFFICIAL SITE OF THE STATE OF NEW JERSEY. Retrieved December 15, 2021, from <https://www.nj.gov/dep/fgw/ensp/pdf/spclspp.pdf>
- ¹⁰⁵ Tiner, Ralph. Wetlands of New Jersey. National Wetland Inventory. July, 1985. Retrieved December 13, 2021 from, <https://www.fws.gov/wetlands/Documents/Wetlands-of-New-Jersey.pdf>.
- ¹⁰⁶ Tesauro, J. (n.d.). *New Jersey's Vernal Pools*. New Jersey Division of Fish and Wildlife. Retrieved December 15, 2021, from <https://www.state.nj.us/dep/fgw/vpoolart.htm>
- ¹⁰⁷ NJ Division of Fish and Wildlife. (2012, February 21). *NJ Endangered and Nongame Species Program Special Concern – Species Status Listing*. OFFICIAL SITE OF THE STATE OF NEW JERSEY. Retrieved December 15, 2021, from <https://www.nj.gov/dep/fgw/ensp/pdf/spclspp.pdf>
- ¹⁰⁸ Ibid.
- ¹⁰⁹ NJDEP. (2006). Ground Water Recharge Areas in New Jersey [Data set]. NJ Dept. of Environmental Protection Bureau of GIS. Retrieved from, <https://njgis-newjersey.opendata.arcgis.com/datasets/njdep::ground-water-recharge-areas-in-new-jersey/explore?location=40.140800%2C-74.743250%2C8.40>
- ¹¹⁰ *New Jersey Stormwater Best Management Practices Manual: Chapter 6 groundwater recharge*. NJ stormwater. (2004, April). Retrieved December 10, 2021, from https://www.njstormwater.org/bmp_manual/NJ_SWBMP_6%20print.pdf.
- ¹¹¹ "Environment-issue, n." OED Online. December 2021. Oxford University Press. <https://www-oed-com.proxy.libraries.rutgers.edu/view/Entry/63089?redirectedFrom=environment+issue> (accessed December 17, 2021).
- ¹¹² n. (a) an issue relating to the surroundings or conditions in which a person or thing lives, works, or exists; (b) the general concern about protection of the natural environment from the harmful effects of human activity; (also) a particular issue relating to this.
- ¹¹³ New Jersey Department of Environmental Protection. 2020. New Jersey Scientific Report on Climate Change, Version 1.0. (Eds. R. Hill, M.M. Rutkowski, L.A. Lester, H. Genievich, N.A. Procopio). Trenton, NJ. 56 pp.
- ¹¹⁴ FEMA's full definition of a flood: "A general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties (at least 1 of which is the policyholder's property) from: Overflow of inland or tidal waters; Unusual and rapid accumulation or runoff of surface waters from any source; or Mudflow; Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclic."
- ¹¹⁵ "Definitions." Federal Emergency Management Agency (FEMA), October 1, 2011.
- ¹¹⁶ Federal Emergency Management Agency. (2020). National Flood Hazard Layer (NFHL). Version 1.1.1.0. <https://msc.fema.gov>

-
- ¹¹⁷ Center, U. S. G. S. W. W. S. (n.d.). U.S. GEOLOGICAL SURVEY Fact Sheet 076-03. Effects of urban development on floods. Retrieved December 20, 2021, from <https://pubs.usgs.gov/fs/fs07603/>
- ¹¹⁸ Edyta Kiedrzyńska, Marcin Kiedrzyński, and Maciej Zalewski. (2014, November) "Sustainable Floodplain Management for Flood Prevention and Water Quality Improvement." Springer. Retrieved from, <https://doi.org/10.1007/s11069-014-1529-1>. 961.
- ¹¹⁹ Ida's record NJ deaths from flash flooding | NJ spotlight news. (n.d.). Retrieved December 20, 2021, from <https://www.njspotlightnews.org/2021/09/nj-tropical-storm-ida-record-death-toll-flash-floods/>
- ¹²⁰ NASA. (2021, September 13). Sea level. NASA: Global Climate Change. Retrieved December 20, 2021, from <https://climate.nasa.gov/vital-signs/sea-level/>
- ¹²¹ NJ Climate Change Resource Center. (2020, May). *Sea level rise in New Jersey: Projections and impacts*. New Jersey Climate Change Resource Center. Retrieved December 10, 2021, from https://njclimateresourcecenter.rutgers.edu/climate_change_101/sea-level-rise-in-new-jersey-projections-and-impacts/.
- ¹²² New Jersey Department of Environmental Protection. 2020. New Jersey Scientific Report on Climate Change. (Version 1.0., p. 64). (Eds. R. Hill, M.M. Rutkowski, L.A. Lester, H. Genievich, N.A. Procopio). Trenton, NJ.
- ¹²³ Campo, Matthew; Blum, Julie; and Herb, Jeanne. (2020, August). *Middlesex County Climate Change Exposure Assessment*. Sustainable Raritan River Initiative and Rutgers Raritan River Consortium. (Draft).
- ¹²⁴ Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Office for Coastal Management (OCM). 2017 Charleston, SC. NOAA's Ocean Service, Office for Coastal Management (OCM). <https://www.coast.noaa.gov/slr> <https://coast.noaa.gov/digitalcoast/tools/slr> <https://coast.noaa.gov/slrdata>
- ¹²⁵ New Jersey Department of Environmental Protection. 2020. New Jersey Scientific Report on Climate Change. (Version 1.0., p. 58-62). (Eds. R. Hill, M.M. Rutkowski, L.A. Lester, H. Genievich, N.A. Procopio). Trenton, NJ.
- ¹²⁶ Environmental Protection Agency. (n.d.). Climate Change Indicators: Heavy Precipitation. EPA. Retrieved December 20, 2021, from <https://www.epa.gov/climate-indicators/climate-change-indicators-heavy-precipitation>
- ¹²⁷ Campo, Matthew; Blum, Julie; and Herb, Jeanne. (2020, August). *Middlesex County Climate Change Exposure Assessment*. Sustainable Raritan River Initiative and Rutgers Raritan River Consortium. (Draft).
- ¹²⁸ Environmental Protection Agency. (n.d.). Heat Island Effect. EPA. Retrieved December 20, 2021, from <https://www.epa.gov/heatislands>
- ¹²⁹ Ibid.
- ¹³⁰ Ibid.
- ¹³¹ Ibid.
- ¹³² Sustainable Jersey. (n.d.). *Heat Island Assessment*. Sustainable Jersey. Retrieved December 10, 2021, from https://www.sustainablejersey.com/actions/?type=1336777436&tx_sjcert_action%5BactionObject%5D=570&tx_sjcert_action%5Baction%5D=getPDF&tx_sjcert_action%5Bcontroller%5D=Action&cHash=8f76cd17161e49003a727d3d254b6078.
- ¹³³ Solecki, W. (2004, April). *Urban Heat Island and Climate Change: An Assessment of Interacting and Possible Adaptations in the Camden, New Jersey Region*. The Official Website of New Jersey. Retrieved December 10, 2021, from <https://www.nj.gov/dep/dsr/research/Urban%20Heat%20Island%20and%20Climate%20Change-RPS.pdf>.
- ¹³⁴ Middlesex County Destination 2040 Open Space and Recreation Plan Update. (Adopted 2022). **Open Spaces**. Functional Plan. Middlesex County Office of Planning.

-
- ¹³⁵ NJDEP Bureau of GIS. (2019, January 28). Land use/land cover of New Jersey 2015. NJGIN Open Data. Retrieved December 15, 2021, from <https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-2015-download/about>
- ¹³⁶ Middlesex County Open Space and Recreation Plan Update, 2022.
- ¹³⁷ Middlesex County NJ. Office of Parks and Recreation | Middlesex County NJ. (n.d.). Retrieved December 10, 2021, from <https://www.middlesexcountynj.gov/government/departments/departments-of-infrastructure-management/office-of-parks-and-recreation>.
- ¹³⁸ Middlesex County Office of Planning. *Parcel Data*. Middlesex County. (n.d.). Retrieved December 10, 2021.
- ¹³⁹ New Jersey Green Acres Program. State, Local, and Nonprofit Open Space in New Jersey. (2020, July). New Jersey Department of Environmental Protection. <https://njogis-newjersey.opendata.arcgis.com/datasets/njdep::state-local-and-nonprofit-open-space-of-new-jersey?geometry=-78.862%2C38.661%2C-70.622%2C41.600>
- ¹⁴⁰ Ibid.
- ¹⁴¹ Middlesex County Destination 2040 Open Space and Recreation Plan Update. (Adopted 2022). **Open Spaces**. Functional Plan. Middlesex County Office of Planning.
- ¹⁴² Middlesex County Planning Department. (2008, September 9). *Middlesex County Comprehensive Farmland Preservation Plan 2008: Preserving Farmland and Foresting Sustainable Agriculture in Middlesex County*. Middlesex County Planning Department - Division of Environment, Park, & Comprehensive Planning. <https://www.middlesexcountynj.gov/home/showpublisheddocument/2200/637686017743570000>
- ¹⁴³ USDA. (2018). *USDA Farmers Market Layer 2017* [Data Set]. Retrieved from, <https://www.arcgis.com/home/item.html?id=1e76414a681446f69f2295d7fc973230>
- ¹⁴⁴ Middlesex County Planning Department. (2008, September 9). *Middlesex County Comprehensive Farmland Preservation Plan 2008: Preserving Farmland and Foresting Sustainable Agriculture in Middlesex County*. Middlesex County Planning Department - Division of Environment, Park, & Comprehensive Planning. <https://www.middlesexcountynj.gov/home/showpublisheddocument/2200/637686017743570000>
- ¹⁴⁵ Ibid.
- ¹⁴⁶ Ibid.
- ¹⁴⁷ "Race & Ethnicity." United States Census Bureau, January 2017. United States Census Bureau. January 2017. <https://www.cosb.us/home/showpublisheddocument?id=5935>.
- ¹⁴⁸ "Minority, n. and adj.". OED Online. September 2021. Oxford University Press. <https://www-oed-com.proxy.libraries.rutgers.edu/view/Entry/118943?redirectedFrom=minority> (accessed September 17, 2021). * A small group of people differing from the rest of the community in ethnic origin, religion, language, etc.
- ¹⁴⁹ U.S. Census Bureau quick facts: Perth Amboy City, New Jersey. Quick Facts Perth Amboy City 2019. (n.d.). Retrieved December 17, 2021, from <https://www.census.gov/quickfacts/fact/dashboard/perthamboycitynewjersey/PST045219>
- ¹⁵⁰ U.S. Census Bureau quick facts: Edison Township, Middlesex ... Quick Facts Edison Township 2019. (n.d.). Retrieved December 17, 2021, from <https://www.census.gov/quickfacts/edison townshipmiddlesexcountynewjersey>
- ¹⁵¹ U.S. Census Bureau quick facts: Piscataway Township. Quick Facts Piscataway Township 2019. (n.d.). Retrieved December 17, 2021, from <https://www.census.gov/quickfacts/piscatawaytownshipmiddlesexcountynewjersey>
- ¹⁵² U.S. Census Bureau quick facts: New Brunswick City, New Jersey. Quick Facts New Brunswick City 2019. (n.d.). Retrieved December 17, 2021, from <https://www.census.gov/quickfacts/newbrunswickcitynewjersey>
- ¹⁵³ U.S. Census Bureau quick facts: Carteret Borough, New Jersey. Quick Facts Carteret Borough 2019. (n.d.). Retrieved December 17, 2021, from <https://www.census.gov/quickfacts/carteretboroughnewjersey>

-
- ¹⁵⁴ Bureau, U. S. C. (2021, November 22). How the Census Bureau Measures Poverty. Census.gov. Retrieved December 21, 2021, from <https://www.census.gov/topics/income-poverty/poverty/guidance/poverty-measures.html>
- ¹⁵⁵ *Middlesex County, NJ*. Data USA. (n.d.). Retrieved December 15, 2021, from <https://datausa.io/profile/geo/middlesex-county-nj>
- ¹⁵⁶ Ibid.
- ¹⁵⁷ US Census Bureau & American Community Survey. (2019). *U.S. Census ACS 5 Year Estimate* [Data set]. Retrieved from, <https://data.census.gov/cedsci/table?q=&g=05000000US34023%241500000&tid=ACSDT5Y2019.B01003>
- ¹⁵⁸ United States Census Bureau. (n.d.). Median household income - census.gov. Median Household Income. Retrieved December 21, 2021, from <https://www.census.gov/quickfacts/fact/note/US/INC110219>
- ¹⁵⁹ Lenard, Patti Tamara, (2020). Culture, The Stanford Encyclopedia of Philosophy (Winter 2020 Edition), Edward N. Zalta (ed.), <<https://plato.stanford.edu/archives/win2020/entries/culture/>>.
- ¹⁶⁰ NJDOT. (2019). *Railroad Network* [Dataset]. Retrieved from, <https://njogis-newjersey.opendata.arcgis.com/datasets/NJDOT::railroads-network/about>
- ¹⁶¹ NJOGIS. (2020). *NJ TRANSIT, PATH, PATCO and SEPTA Passenger Rail Station points, 2018* [Data set]. New Jersey Office of GIS. Retrieved from, <https://njogis-newjersey.opendata.arcgis.com/datasets/NJTRANSIT::rail-stations-of-nj-transit/about>
- ¹⁶² Ibid.
- ¹⁶³ Ibid.
- ¹⁶⁴ NJOGIS. (2020). *Transit Village Centers* [Data set]. Retrieved from, <http://njgin.state.nj.us/oit/gis/download/TransitVillageNJ.zip>
- ¹⁶⁵ Official site of the State of New Jersey. Office of the Governor | Governor Murphy Announces Newark's Designation as a Transit Village. (n.d.). Retrieved December 21, 2021, from <https://www.nj.gov/governor/news/news/562021/20211022a.shtml>
- ¹⁶⁶ NJDOT. (2022). *Frequently Asked Questions*. NJDOT. [https://www.state.nj.us/transportation/community/village/faq.shtm#:~:text=They%20are%20Pleasantville%20\(1999\)%2C,%20Journal%20Square%2FJersey%20City%20](https://www.state.nj.us/transportation/community/village/faq.shtm#:~:text=They%20are%20Pleasantville%20(1999)%2C,%20Journal%20Square%2FJersey%20City%20)
- ¹⁶⁷ DiPetrillo, S. (2020, February 17). *Celebrating 20 Years of the NJ Transit Village Initiative*. NJTOD.org. Retrieved December 15, 2021, from <http://www.njtod.org/celebrating-the-transit-village-initiative/>
- ¹⁶⁸ Middlesex County Office of Planning. (n.d.). *Transit Villages* [Data set]. Retrieved from, https://mcgisweb.co.middlesex.nj.us/arcgis/rest/services/Economic_Development/Economic_Development/MapServer/6
- ¹⁶⁹ Webadmin. (n.d.). *Transit Village Initiative Overview, Community Programs*. Official site of the State of New Jersey. Retrieved December 15, 2021, from <https://www.state.nj.us/transportation/community/village/>
- ¹⁷⁰ Voorhees Transportation Center, Rutgers University (VTC). (2021, September). Transit Service. Middlesex County Coordinated Public Transit-Human Services Transportation Plan. [Digital Map].
- ¹⁷¹ HIFLD. *Electric Power Transmission Lines*. Homeland Infrastructure Foundation Level Database, (2020). Retrieved December 10, 2021.
- ¹⁷² Ibid.
- ¹⁷³ NJDEP. (2021, April 26). *New Jersey and National Registers of Historic Places*. NJDEP Historic Preservation Office. https://www.nj.gov/dep/hpo/1identify/nrsr_lists.htm
- ¹⁷⁴ NJDEP. (2021, April 26). *New Jersey and National Registers of Historic Places Definitions*. NJ/NRHP. Retrieved December 15, 2021, from https://www.nj.gov/dep/hpo/1identify/nrsr_lists.htm

-
- ¹⁷⁵ New Jersey Department of Environmental Protection (NJDEP). (2020). Historic Districts of New Jersey, Edition 20200401 (Land_use_HPO_district) (Web Mercator ArcGIS Online Service).
https://www.nj.gov/dep/gis/digidownload/zips/OpenData/Land_use_HPO_district.zip
- ¹⁷⁶ New Jersey Department of Environmental Protection (NJDEP). (2022, June). Historic Property Features of New Jersey. NJDEP. [Dataset].
https://www.nj.gov/dep/gis/digidownload/zips/OpenData/Land_use_HPO_property_features.zip
- ¹⁷⁷ Proprietary House. (2022). *Home*. Proprietary House: the Royal Governor's Mansion.
<https://www.theproprietaryhouse.org/>
- ¹⁷⁸ NJDEP. (2021, April 26). *New Jersey and National Registers of Historic Places*. NJDEP Historic Preservation Office. https://www.nj.gov/dep/hpo/1identify/nrsr_lists.htm
- ¹⁷⁹ Middlesex County. (n.d.). *Division of History and Historic Preservation*. Middlesex County.
<https://storymaps.arcgis.com/stories/924c2972c275479f8195bb047af735a8>
- ¹⁸⁰ NJDEP. (2022). *Historic Districts of New Jersey* [Data set]. Retrieved from, https://njogis-newjersey.opendata.arcgis.com/datasets/7b83f7b8348d473bb6c610a8ef57808d_57/explore?location=40.474510%2C-74.403069%2C13.84
- ¹⁸¹ Ibid.
- ¹⁸² *Middlesex Greenway*. Great Places in New Jersey. (n.d.). Retrieved December 15, 2021, from
<https://greatplacesnj.org/map-location/middlesex-greenway/>
- ¹⁸³ U.S. Census Bureau. (2012). *Govt Census Block 2010* [Data file].
https://www.nj.gov/dep/gis/digidownload/metadata/statewide/Govt_census_block_2010.html
- ¹⁸⁴ New Jersey Department of Environmental Protection (NJDEP). (2019). *Place Name Locations in New Jersey* [Data set]. Retrieved from, <https://njogis-newjersey.opendata.arcgis.com/datasets/place-name-locations-in-new-jersey/explore?location=40.141280%2C-74.743550%2C11.67>
- ¹⁸⁵ Middlesex County Economic and Business Development. (2020). *Arts Cultural Historic Sites* [Dataset].
- ¹⁸⁶ Middlesex County Economic and Business Development. (2020). *Arts Cultural Historic Sites* [Dataset].
- ¹⁸⁷ Homeland Infrastructure Foundation-Level Data (HIFLD). (2020, July). All Places of Worship. *HIFLD*. [Dataset].
<https://hifld-geoplatfrom.opendata.arcgis.com/datasets/geoplatfrom::all-places-of-worship/about>
- ¹⁸⁸ Pacione, M. (2013). Glossary. In *Urban Geography: A Global Perspective* (Third, p. 675). Taylor and Francis.
- ¹⁸⁹ CH 9 urban geography. Open Geography Education. (n.d.). Retrieved December 20, 2021, from
<https://www.opengeography.org/ch-9-urban-geography.html>
- ¹⁹⁰ Ibid.
- ¹⁹¹ State of New Jersey Department of Community Affairs. (2012). Main Streets. *Middlesex County Office of Economic & Business Development*. [Dataset].
- ¹⁹² Downtown New Jersey. (2022). Join Downtown New Jersey. *Downtown New Jersey*.
<https://www.downtownnj.com/membership/join-today/>
- ¹⁹³ State of New Jersey Department of Community Affairs. (2012). Main Streets. *Middlesex County Office of Economic & Business Development*.
- ¹⁹⁴ *About Us*. Downtown Metuchen. (n.d.). Retrieved December 10, 2021, from
https://www.downtownmetuchen.org/about-us/?gclid=Cj0KCQIAzMGNBhCyARIsANpUkzMoudQ1yPesrollAVHtTFvG3-MLLF_BthPIJ-ghzx_sp_OokArY2QYaAk04EALw_wcB
- ¹⁹⁵ *Main street Highland Park*. Main Street Highland Park. (n.d.). Retrieved December 10, 2021, from
<https://www.mainstreethp.org/>

¹⁹⁶ *The State of New Jersey*. (2022). *Main Street New Jersey*. NJ Department of Community Affairs.

<https://www.nj.gov/dca/divisions/lps/msnj.html>.

¹⁹⁷ *Office of Main Street New Jersey & Improvement District Programs*. (2016). *Main Street New Jersey: Program Guide Handbook*. NJDEP. https://www.nj.gov/dca/services/lps/pdf/Program_Guide_Handbook.pdf

¹⁹⁸ Middlesex County Office of Planning and Middlesex County Office of Economic Development. (2017). *Central Business Districts*. Middlesex County Office of Planning and Middlesex County Office of Economic Development. [Dataset].

¹⁹⁹ CUES Rutgers University. (2021). *Downtown Streets* [Data set]. ESRI GIS.

²⁰⁰ Lenard, Patti Tamara, (2020). Culture, *The Stanford Encyclopedia of Philosophy* (Winter 2020 Edition), Edward N. Zalta (ed.), <<https://plato.stanford.edu/archives/win2020/entries/culture/>>.

²⁰¹ Rails to Trails Conservancy. (2021). Connecting People to Safe Outdoor Space During COVID-19. *Rails to Trails Conservancy*. <https://www.railstotrails.org/about/financials/annualreportfy2020/safe-outdoor-space/>

²⁰² Middlesex County. (n.d.). *History Month*. Middlesex County.

<https://www.middlesexcountynj.gov/government/departments/departments-of-business-innovation-education-and-opportunity/arts-institute-of-middlesex-county/history-month>

GLOSSARY

Basins: Large to small depressions that hold water

Brackish: Slightly salty water where saltwater meets fresh water

Cell Size: A dimensional unit with an applied numeric value in ArcGIS ⁽²⁰³⁾

Census Designated Places: Areas usually with name identities different from the incorporated municipality name that coincide with census geography ⁽²⁰⁴⁾

Census Places: technical identities used for Census data collection ⁽²⁰⁵⁾

Detention Basin: Temporarily stores and attenuates stormwater runoff. ⁽²⁰⁶⁾

Evapotranspiration: Water evaporation from plants and land surfaces ⁽²⁰⁷⁾

Freshwater Swamps: Vital ecological wetland systems with primarily woody vegetation that help to filter water, soak up runoff from heavy rains and snow melts, provide critical habitats for endangered species, and provide high-quality open space for recreation and tourism. ²⁰⁸

Floodplain Forests: Habitat growing on alluvial soils in a riverine system. The dominant plant species include hardwood trees. ⁽²⁰⁹⁾

Geomorphological: Physical features of the earth and relation to geological structures ²¹⁰

Glacial Outwash Plains: Flat areas dominated by braided rivers that occur in front of melting glaciers. ⁽²¹¹⁾

Glaciation: ice sheet or glacier covering

Incorporated Communities: communities that are legally bound and established by the government, in this instance, the municipalities ⁽²¹²⁾

Infiltration: Water percolates into the soil through air pockets

Infiltration Basin: Stormwater management systems constructed with highly permeable components designed to both maximize the removal of pollutants from stormwater and

promote groundwater recharge. Pollutants are treated through settling, filtration of the runoff through, and biological and chemical activity within the components. ⁽²¹³⁾

Marsh Accretion: Accumulation of herbaceous plant material in a marsh wetland ⁽²¹⁴⁾

Migratory Birds: Avian species that fly over distances of hundreds and thousands of miles to find the best ecological conditions and habitats for feeding, breeding, and raising their young ⁽²¹⁵⁾

Nonpoint Source Pollution: natural or human-made pollutants carried in stormwater to local water bodies. The pollution source is unknown.

Precipitation: Rain, snow, sleet, or hail falling to the ground

Rain Garden: Landscaped, shallow depressions capture rainwater and allow it to percolate slowly into the ground. Large rain gardens are called bioretention basins. ⁽²¹⁶⁾

Seepage Swamps: Coastal Plain wetlands containing trees and saturated soils with groundwater. ⁽²¹⁷⁾

Spawning: Process of laying eggs.

Stream Terraces: form when streams carve downward into their floodplains, leaving discontinuous remnants of older floodplain surfaces as step-like benches along the sides of the valley. ⁽²¹⁸⁾

Unincorporated Places: communities that do not have their own local governments but have their own identity.

Wet Pond (Retention Basin): A stormwater facility that has an elevated outlet structure that creates a permanent pool where stormwater runoff detention and attenuation occur. ⁽²¹⁹⁾

DATA DICTIONARY

Map Title	Layer	Citation
Topography	State Contours	NJ Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS). NJDEP Elevation Contours for the State of New Jersey (20 Foot Intervals). (1987). Trenton, NJ. http://www.state.nj.us/dep/gis/digidownload/zips/statewide/stcon.zip
2015 Land Use Land Cover	Land Use Land Cover 2015	NJDEP Bureau of GIS. (2019, January 28). Land use/land cover of New Jersey 2015. NJGIN Open Data. Retrieved December 15, 2021, from https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-2015-download/about
1986 Land Use Land Cover	1986	NJDEP Bureau of GIS. (1998). Land Use/Land Cover of New Jersey 1986 [Data Set]. NJ Dept. of Environmental Protection Bureau of GIS. Retrieved December 13, 2021 from, https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-1986-download/about
Wetlands and Waterbodies	National Wetland Inventory	U.S. Fish and Wildlife Service; National Wetlands Inventory; National Standards and Support Team., U. S. F. & W. S. (2021). <i>Wetlands Mapper</i> . National Wetlands Inventory. Retrieved December 15, 2021, from https://www.fws.gov/wetlands/data/Mapper.html
	Streams (C1)	New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS). National Hydrography Dataset (NHD) Streams in New Jersey 2002. Edition 20101101. November, 2010.
	Waterbodies	New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS). National Hydrography Dataset (NHD) Waterbody 2002 for New Jersey (NHDWaterbody_2002). Edition 20101101. November, 2010.
	Land Use Land Cover 1986 (Wetlands)	NJDEP Bureau of GIS. (1998). Land Use/Land Cover of New Jersey 1986 [Data Set]. NJ Dept. of Environmental Protection Bureau of GIS. Retrieved December 13, 2021 from, https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-1986-download/about
Watershed Management Areas	Watershed Management Areas (WMA)	NJ Department of Environmental Protection (NJDEP). Watershed Management Areas in New Jersey, Edition 200901 (Govt_admin_WMA_bnd) (Web Mercator ArcGIS Online Service). Edition 200901. January 2009. Updated 2019. https://www.nj.gov/dep/gis/digidownload/zips/OpenData/Govt_admin_WMA_bnd.zip
Major Urbanized Land Use	Land Use Land Cover 2015	NJDEP Bureau of GIS. (2019, January 28). Land use/land cover of New Jersey 2015. NJGIN Open Data. Retrieved December 15, 2021, from https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-2015-download/about
	Land Use Land Cover 2015	NJDEP Bureau of GIS. (2019, January 28). Land use/land cover of New Jersey 2015. NJGIN Open Data. Retrieved December 15, 2021, from

Change in Commercial Areas		https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-2015-download/about
	Land Use Land Cover 1986	NJDEP Bureau of GIS. (1998). Land Use/Land Cover of New Jersey 1986 [Data Set]. NJ Dept. of Environmental Protection Bureau of GIS. Retrieved December 13, 2021 from, https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-1986-download/about
Impervious Surfaces	Land Use Land Cover Impervious Surfaces	NJ Department of Environmental Protection (NJDEP). Impervious Surface (2015) of Middlesex County, New Jersey. Edition 20180930. (Land_lu_2015_is). NJDEP January 2018. https://www.nj.gov/dep/gis/digidownload/zips/OpenData/Land_is_2015_Middlesex.zip
Parking Lots by Sizes	Land Use Land Cover Impervious Surfaces	NJ Department of Environmental Protection (NJDEP). Impervious Surface (2015) of Middlesex County, New Jersey. Edition 20180930. (Land_lu_2015_is). NJDEP January 2018. https://www.nj.gov/dep/gis/digidownload/zips/OpenData/Land_is_2015_Middlesex.zip
Tree Canopy Cover	Tree Canopy Cover Raster	U.S. Forest Service. (2016). NLCD 2016 USFS Tree Canopy Cover (CONUS) [Data set]. Multi-Resolution Land Characteristics Consortium. Retrieved from, https://www.mrlc.gov/data/nlcd-2016-usfs-tree-canopy-cover-conus .
Terrestrial Macrohabitats and Physiographic Regions	Macrohabitats	Terrestrial Habitat Map for the Northeast US and Atlantic Canada. The Conservation Gateway: The Nature Conservancy. (2015). Retrieved December 15, 2021, from https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/habitatmap/Pages/default.aspx
	Physiographic Regions	NJ Department of Environmental Protection (NJDEP). (2002). Physiographic Provinces of New Jersey. Edition 20020630, Series DGS02. June, 2002. https://www.nj.gov/dep/gis/digidownload/zips/OpenData/Geol_province.zip
Wildlife Habitats of Concern	Endangered Habitat Ranks	State of New Jersey Department of Environmental Protection (NJDEP), Division of Fish and Wildlife (DFW), and Endangered and Nongame Species Program (ENSP). (2019, December). Landscape Project Piedmont Plains Region of New Jersey. Version 3.3. https://www.nj.gov/dep/gis/digidownload/zips/landscape/piedmont_v3_3_gdb.zip
	Vernal Pool Habitats	New Jersey Endangered and Nongame Species Program. (2017, May). NJDEP Species Based Habitat, Vernal Pools. Version 3.3. New Jersey Department of Environmental Protection. https://www.nj.gov/dep/gis/digidownload/zips/landscape/vernal_v3_3gdb.zip
Groundwater Recharge	Groundwater Recharge Zones	NJDEP. (2006). Ground Water Recharge Areas in New Jersey [Data set]. NJ Dept. of Environmental Protection Bureau of GIS. Retrieved from, https://njogis-newjersey.opendata.arcgis.com/datasets/njdep::ground-water-recharge-areas-in-new-jersey/explore?location=40.140800%2C-74.743250%2C8.40

FEMA Flood Risk Zones	FEMA Flood Zones 2020	Federal Emergency Management Agency. (2020). National Flood Hazard Layer (NFHL). Version 1.1.1.0. https://msc.fema.gov
Projected Sea Level Rise	NOAA Sea Level Rise Projection	Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Office for Coastal Management (OCM). 2017 Charleston, SC. NOAA's Ocean Service, Office for Coastal Management (OCM). https://www.coast.noaa.gov/slr https://coast.noaa.gov/digitalcoast/tools/slr https://coast.noaa.gov/slrdata
Urban Heat Island (8/10/2021) (8/26/2021)	Urban Heat Island Raster	U.S. Geological Survey. (2021). LandSat 8 OLI/TIRS c2 L2) August 26, 2021. Band_10. U.S. Geological Survey. (2021). LandSat 8 OLI/TIRS c2 L2) August 10, 2021. Band_10.
Open Space and Natural Land	Open Space	New Jersey Green Acres Program. State, Local, and Nonprofit Open Space in New Jersey. (2020, July). New Jersey Department of Environmental Protection. https://njogis-newjersey.opendata.arcgis.com/datasets/njdep::state-local-and-nonprofit-open-space-of-new-jersey?geometry=-78.862%2C38.661%2C-70.622%2C41.600
	County Golf Courses	Middlesex County Office of Parks. (2014, January). Middlesex County Golf Courses. Middlesex County Office of GIS. Retrieved from MCOP, 2020.
	Land Use Land Cover 2015 (Wetlands, Forest)	NJDEP Bureau of GIS. (2019, January 28). Land use/land cover of New Jersey 2015. NJGIN Open Data. Retrieved December 15, 2021, from https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-2015-download/about
	NJFPP Preserved Farmland	The New Jersey Farmland Preservations Program. (2020). NJFPP_Preserved_Farms. [Data set]. (2020, July).
	Historic Properties in Parks	New Jersey Department of Environmental Protection (NJDEP). (June, 2020). Historic Property Features of New Jersey. NJDEP. https://www.nj.gov/dep/gis/digidownload/zips/OpenData/Land_use_HPO_property_features.zip
Farmland and Farmers Markets	USDA Farmers Markets	USDA. (2018). USDA Farmers Market Layer 2017 [Data Set]. Retrieved from, https://www.arcgis.com/home/item.html?id=1e76414a681446f69f2295d7fc973230
	Land Use Land Cover 2015 (Agriculture)	NJDEP Bureau of GIS. (2019, January 28). Land use/land cover of New Jersey 2015. NJGIN Open Data. Retrieved December 15, 2021, from https://njogis-newjersey.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-2015-download/about
	NJFPP Preserved Farmland	The New Jersey Farmland Preservations Program. (2020). NJFPP_Preserved_Farms. [Data set]. (2020, July).
Population Density	ACS 5-year (2015-2019) population estimate	US Census Bureau & American Community Survey. (2019). <i>U.S. Census ACS 5 Year Total Population Estimate</i> [Data set]. Retrieved from, https://data.census.gov/cedsci/table?q=&g=05000000US34023%241500000&tid=ACSDT5Y2019.B01003

	Tiger Line geography Census Block Group 2019	U.S. Census Tiger data. tl_2019_34_bg. (2019). [Data set]. Version 6.2 http://www2.census.gov/geo/tiger/TIGER2019/BG/tl_2019_34_bg.zip
Racial and Ethnic Minority (SIF, Invest Smart Team).	ACS 5-year (2015-2019) estimate	US Census Bureau & American Community Survey. (2019). <i>U.S. Census ACS 5 Year Estimate</i> [Data set]. Retrieved from, https://data.census.gov/cedsci/table?q=&g=0500000US34023%241500000&tid=ACSDT5Y2019.B01003
Poverty (SIF, Invest Smart Team).	ACS 5-year (2015-2019) estimate	US Census Bureau & American Community Survey. (2019). <i>U.S. Census ACS 5 Year Estimate</i> [Data set]. Retrieved from, https://data.census.gov/cedsci/table?q=&g=0500000US34023%241500000&tid=ACSDT5Y2019.B01003
Railroad Network, Transit Villages, and Bus Routes	Railroads	NJDOT. (2019). Railroad Network [Data set]. Retrieved from, https://njogis-newjersey.opendata.arcgis.com/datasets/NJDOT::railroads-network/about
	NJ Transit Train Lines	New Jersey TransitGIS Department. (2021). Rails Line if NJ Transit. NJ Transit. [Dataset]. https://njogis-newjersey.opendata.arcgis.com/datasets/NJTRANSIT::rail-lines-of-nj-transit/about
	Train Stations	NJ Office of Information Technology, Office of GIS (NJOGIS). (2018). NJ TRANSIT, PATH, PATCO and SEPTA Passenger Rail Station points, 2018 (NAD83, NJSP feet). July, 2016. http://newjersey.maps.arcgis.com/home/item.html?id=acf1aa71053f4bb48a1aad7034f35e48
	Transit Village Centers	NJ Department of Environmental Protection (NJDEP), New Jersey Department of Transportation (NJDOT). (2020). Transit Village Centers. January, 2020. http://njgin.state.nj.us/oit/gis/download/TransitVillageNJ.zip
	Bus Routes	New Jersey Transit. (2021). Bus Routes of NJ Transit. [Data set] Retrieved from, https://njogis-newjersey.opendata.arcgis.com/datasets/NJTRANSIT::bus-routes-of-nj-transit/about
Electrical Transmission Line Network	Transmission Lines	HIFLD. Electric Power Transmission Lines. Homeland Infrastructure Foundation Level Database, (2020). Retrieved from, https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-power-transmission-lines .
Historical Locations	Historic Properties	New Jersey Department of Environmental Protection (NJDEP). (June, 2020). Historic Property Features of New Jersey. NJDEP. https://www.nj.gov/dep/gis/digidownload/zips/OpenData/Land_use_HPO_property_features.zip
	Historic Districts	New Jersey Department of Environmental Protection (NJDEP). (2020). Historic Districts of New Jersey, Edition 20200401 (Land_use_HPO_district) (Web Mercator ArcGIS Online Service). https://www.nj.gov/dep/gis/digidownload/zips/OpenData/Land_use_HPO_district.zip

	Middlesex County Historic Markers	Middlesex County Historical Markers. Received from Middlesex County Office of Planning November, 2020. [Dataset].
Places	U.S. Census Bureau Place Geography	US Census Bureau. (2018). Cartographic Boundary Files. [Data set] https://www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html
	Place Names	New Jersey Department of Environmental Protection (NJDEP). (2019). <i>Place Name Locations in New Jersey</i> [Data set]. Retrieved from, https://njogis-newjersey.opendata.arcgis.com/datasets/place-name-locations-in-new-jersey/explore?location=40.141280%2C-74.743550%2C11.67
Arts and Culture Centers	Middlesex County Arts and Culture Centers	Middlesex County Economic and Business Development. (2020). <i>Arts Cultural Historic Sites</i> [Dataset].
Houses of Worship	All Places of Worship	Homeland Infrastructure Foundation-Level Data (HIFLD). (2020, July). All Places of Worship. <i>HIFLD</i> . [Dataset]. https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::all-places-of-worship/about
Commercial Centers and Designations	Middlesex County Central Business Districts	Middlesex County Office of Planning and Middlesex County Office of Economic Development. (2017). Central Business Districts. Middlesex County Office of Planning and Middlesex County Office of Economic Development. [Dataset].
	Middlesex County Main Streets	State of New Jersey Department of Community Affairs. (2012). Main Streets. <i>Middlesex County Office of Economic & Business Development</i> . [Dataset].
	CUES Downtown Streets/Locations	CUES Rutgers University. Downtown Street Locations. [Data Set]. November, 2021.

²⁰³ ArcGis. (2021). *Cell Size of Raster Data*. ArcGis. <https://desktop.arcgis.com/en/arcmap/latest/manage-data/raster-and-images/cell-size-of-raster-data.htm>

²⁰⁴ *ibid*.

²⁰⁵ US Department of Commerce, Census Bureau. (1994). Chapter 9: Places. *Geographic Area Reference Manual*. Retrieved December 15, 2021, from <https://www2.census.gov/geo/pdfs/reference/GARM/Ch9GARM.pdf>

²⁰⁶ NJ Storm Water. (2014, September). *9.4 Extended Detention Basins*. New Jersey Stormwater Best Management Practices Manual. Retrieved December 15, 2021, from https://njstormwater.org/bmp_manual/Archived_NJ_SWBMP_9.04.pdf

-
- ²⁰⁷ USGS. (2018, June 12). *Evapotranspiration and the Water Cycle*. USGS. <https://www.usgs.gov/special-topics/water-science-school/science/evapotranspiration-and-water-cycle#:~:text=What%20is%20evapotranspiration%3F,the%20soil%20through%20its%20roots>.
- ²⁰⁸ NJDEP. (2022, April 12). *Freshwater Wetlands*. NJDEP Division of Land Resource Protection. https://www.nj.gov/dep/landuse/fww/fww_main.html
- ²⁰⁹ USACE. (n.d.). *Section 3: Floodplain Forests*. USACE. <https://www.mvp.usace.army.mil/Portals/57/docs/regulatory/WetlandBook/WetlandBook2016/Part%207%20-%20Floodplain%20Forests;%20Seasonally%20Flooded%20Basins;%20Appendices;%20Glossary;%20Bibliography;%20Index.pdf>
- ²¹⁰ Merriam-Webster. (2022, June 6). *Geomorphological*. USACE. <https://www.mvp.usace.army.mil/Portals/57/docs/regulatory/WetlandBook/WetlandBook2016/Part%207%20-%20Floodplain%20Forests;%20Seasonally%20Flooded%20Basins;%20Appendices;%20Glossary;%20Bibliography;%20Index.pdf>
- ²¹¹ National Park Service. (2018, February 22). *Outwash Plains and Eskers*. National Park Service. <https://www.nps.gov/articles/outwashplainsandeskers.htm>
- ²¹² *What is a Census Place?* Conduent Healthy Communities Institute . (2021, July 26). Retrieved December 15, 2021, from <https://help.healthycities.org/hc/en-us/articles/115013485248-What-is-a-Census-Place->
- ²¹³ NJ Storm Water. (2016, February). *9.5 Infiltration Basins*. New Jersey Stormwater Best Management Practices Manual. Retrieved December 15, 2021, from https://njstormwater.org/bmp_manual/Archived_NJ_SWBMP_9.05.pdf
- ²¹⁴ Weis, P. (2016). Salt Marsh Accretion. In: Kennish, M.J. (eds) *Encyclopedia of Estuaries*. Encyclopedia of Earth Sciences Series. Springer, Dordrecht. https://doi.org/10.1007/978-94-017-8801-4_28
- ²¹⁵ World Migratory Bird Day. (2010). *What are Migratory Birds?* World Migratory Bird Day. https://www.worldmigratorybirdday.org/2010/index23c2.html?option=com_content&view=article&id=18&Itemid=4
- ²¹⁶ NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION · DIVISION OF WATER QUALITY. (n.d.). *Green Infrastructure in New Jersey*. OFFICIAL SITE OF THE STATE OF NEW JERSEY. Retrieved December 15, 2021, from https://www.nj.gov/dep/gi/pdf/gi_rain_gardens.pdf
- ²¹⁷ DCR. (2021, March). *The Natural Communities of Virginia Classification of Ecological Groups and Community Types*. Virginia Department of Conservation and Recreation. <https://www.dcr.virginia.gov/natural-heritage/natural-communities/ncpc3>
- ²¹⁸ USGS. (2009, December 18). *Stream Terraces and Older Surfaces*. USGS. <https://www.dcr.virginia.gov/natural-heritage/natural-communities/ncpc3>
- ²¹⁹ NJ Stormwater. (2021, March). *10.5 Wet Ponds*. New Jersey Stormwater Best Management Practices Manual. Retrieved December 15, 2021, from https://www.njstormwater.org/bmp_manual/NJ_SWBMP_10.5-wet-ponds.pdf