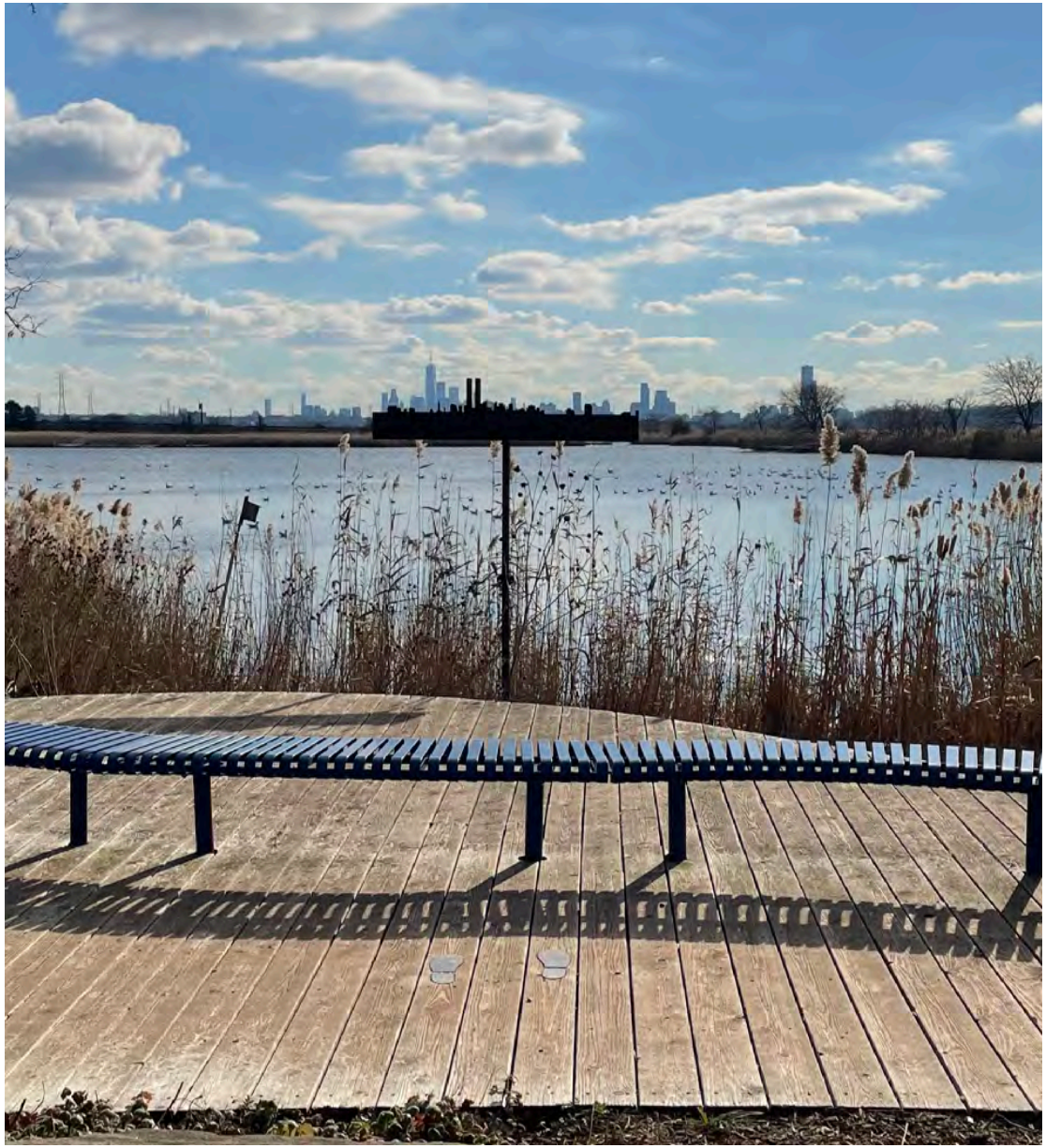
ENVIRONMENTAL & NATURAL RESOURCES

New Jersey Palisades. Source: Donna Brennan, Bergen County

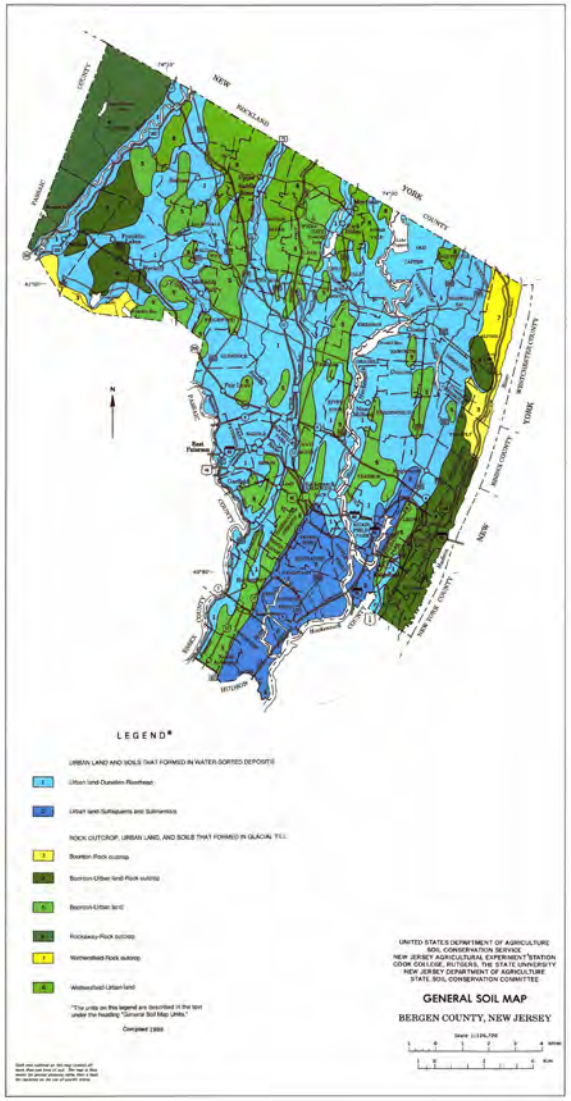
ENVIRONMENT AND NATURAL RESOURCES

Bergen County contains a mix of environs, from highly urbanized, high-density places to quasi-rural locations to natural areas. The landscapes vary from the upland cliffs of the Palisades, to the wetlands of the Meadowlands, while also supporting a population just under 1 million residents and where developed lands comprise over three quarters of the county's land area. Development and its relationship with the surrounding (and underlying) environment are inextricably linked, however, and despite these different landscapes and natural systems, fresh water is necessary to sustain life, wastewater must be managed safely, and rainwater still must go somewhere. Further complicating this picture is the presence of numerous different political jurisdictions (including the Meadowlands District, Highlands Planning and Preservation Areas, Palisades Interstate Park, utility authorities and other utility franchise services, and numerous other special districts in addition to the state, county, and 70 municipalities) where boundaries do not often neatly coincide with natural systems, meaning that decisions in one area ultimately have impacts elsewhere. For the county to remain a desirable place to invest, live, work and play, it is critical to understand how development complements and responds to these natural systems. This Element reviews Bergen County's physical geography and natural systems, as well as the existing management of these systems as part of the developed landscape to identify goals, objectives and potential actions that maintain or improve these critical inter-relationships.



Hackensack Meadowlands.
Source: Colliers Engineering & Design

EXISTING CONDITIONS



General Soil Map of Bergen County (1988)
Source: United States Department of Agriculture, Soil Conservation Service

PHYSICAL GEOGRAPHY AND NATURAL FEATURES

This section seeks to provide a summary snapshot of Bergen County's natural landscape, as these factors have formed the historical development patterns in the county over time and will continue to affect future development. These natural features provide the county with unique opportunities and challenges.

CLIMATE

Bergen County is defined as being a humid continental climate,[1] with an average winter temperature of 28 degrees Fahrenheit and an average summer temperature of 82 degrees Fahrenheit, and an average annual precipitation of 45 inches.[2] The US Department of Energy's Building America Program classifies Bergen County's climate as "Cold" for construction and heating purposes, based on climate designations used by the International Energy Conservation Code.[3]

AIR QUALITY

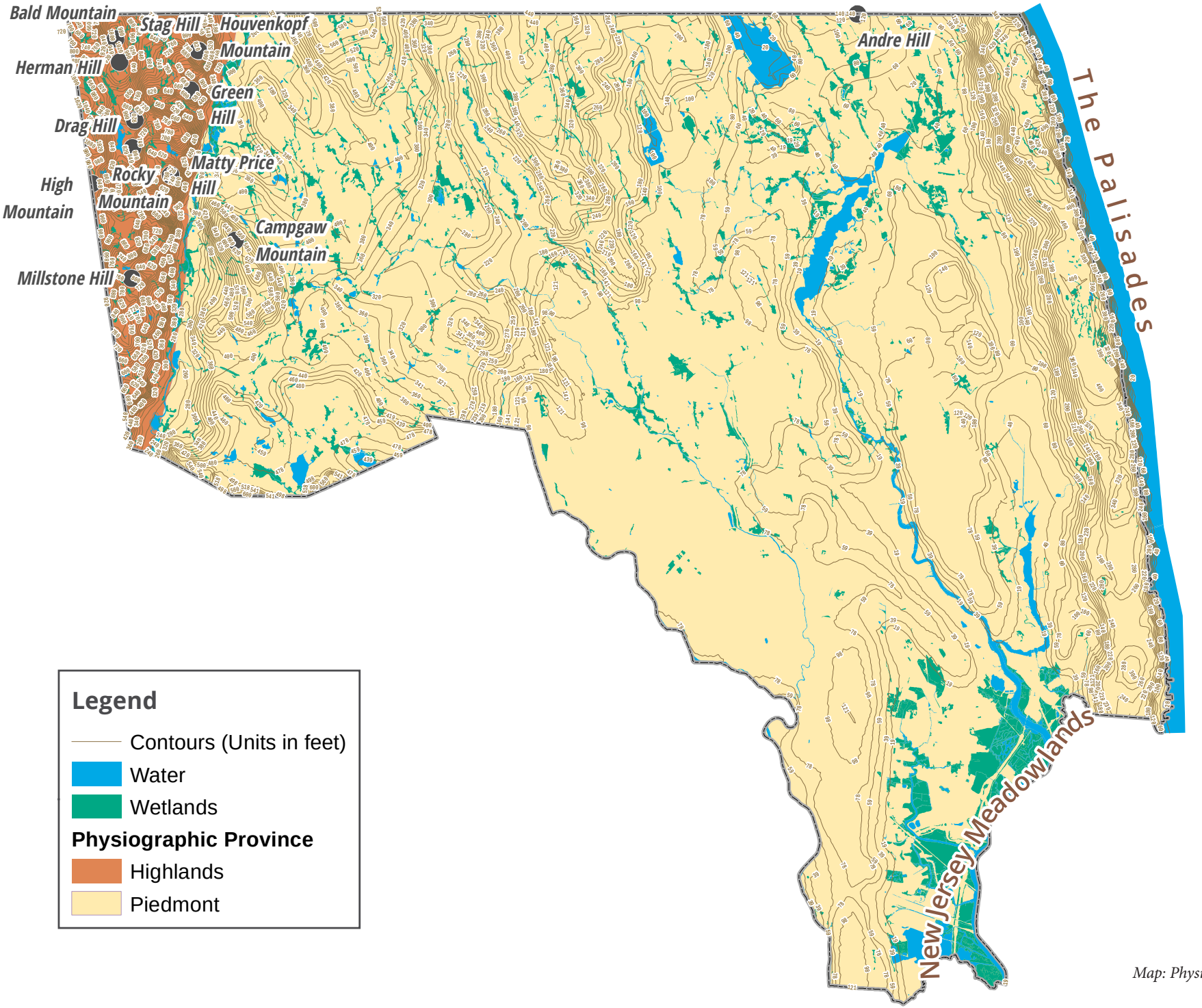
Despite a growing population, air quality has improved since 2001. One indicator of this is the trending decrease in fine particulate matter in the air from 2001-2020. Fine particulate matter is comprised of very small, solid particles, such as smoke, dust and ash that can make their way into the lungs. Breathing in these particles can lead to asthma attacks, coughing, shortness of breath, bronchitis, lung cancer, and premature death. Concentrations of fine particulate matter have decreased since 2001, and Bergen County continues to meet federal air quality standards.[4] While concentrations of fine particulate matter have continued to trend downward from 2001, data from recent years have fluctuated following a sustained period of decreases (2007-2014);[5] it is not clear what has caused this increase, although potential sources could include: an increase in automobile use as gas prices decreased during this period; more people commuting to work as employment continued to increase following the Great Recession; increased construction activity leading to more airborne dust and other particulates; or increased adoption of e-commerce, which generally relies on trucks and vans for customer fulfillment. Ground-level ozone, formed from the interaction between nitrogen oxides and volatile organic compounds in the presence of sunlight, is another pollutant that can irritate and damage lungs, and harm human health in other ways. While data is not available for 2012 and 2015, the number of days where ozone exceeded the regulatory threshold of (0.075 parts per million) has trended notably downward in Bergen County from 31 days in 2002, to one day in 2014. Data from 2016-2020 show an increase in the number of days exceeding the standard, with 8 in 2016, peaking at 13 in 2018, and dropping to 3 in 2020. It should be noted that after December 2015, the standard was dropped from 0.075 parts per million to 0.070 parts per million.[6] Additionally, Bergen County's rate of asthma-related hospitalizations and emergency department visits (3.7 per 10,000 residents) is less than the statewide average (6.9 per 10,000 residents).[7]

Ramapo Valley County Reservation. Source: Colliers Engineering & Design

SOILS AND GEOLOGY

Bergen County is divided between two distinct physiographic provinces, the Piedmont and the New England (or Highlands), which are divided by the Ramapo River.[8] Physiographic provinces characterize regions based on their underlying geology. The Piedmont Province makes up approximately 20 percent of the state of New Jersey.[9] Most of Bergen County is located within the Piedmont Province, an area defined by slightly folded and faulted sedimentary rocks from the Triassic and Jurassic periods, as well as igneous rocks from the Jurassic period, and characterized by low rolling plains with a series of higher ridges. This underlying geology is particularly visible along the Palisades. The highest point of the Piedmont in Bergen County is Campgaw Mountain at 771 feet. The New England or Highlands physiographic province is characterized by metamorphic granite and rugged slopes, with elevations ranging from 214 feet above sea level at Pompton Lake, to 1,164 feet at Bald Mountain. These rocks are commonly exposed on valley walls and ridgetops and are some of the oldest rocks found in the state.

The county's soils are largely characterized by their impacts from the last ice age from 10,000 years ago. This includes unstratified glacial till left behind when the glaciers retreated, and stratified drift, composed from water flows from melting ice sheets. The unstratified soils range in depth, with thinner soils along ridges and thicker soils in the lowlands. Additional sediments include deposits from streams, marshes, and swamps. The US Geological Survey's Natural Resources Conservation Service estimates that 57 percent of the county consists of soils that were formed in water-sorted material and the remaining soils, approximately 43 percent, were formed in glacial till. The region now known as the New Jersey Meadowlands is a remnant of the ancient Glacial Lake Hackensack, created when glacial deposits dammed the valley between the Palisades and Second Watchung Mountain, before it breached approximately 10,000 years ago.



Map: Physical Features

TOPOGRAPHY

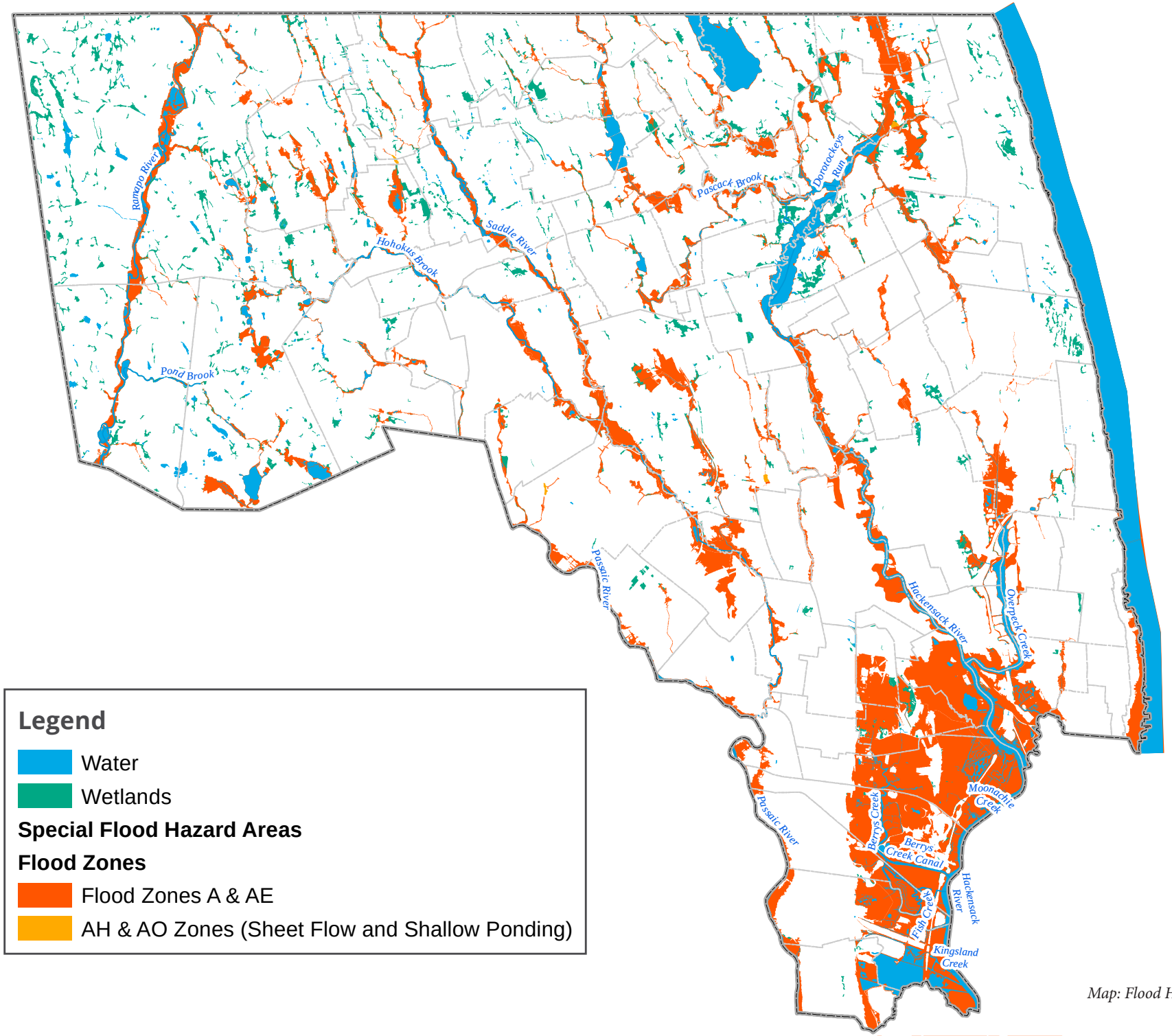
The Northeastern Highlands region extends into Bergen County along the northwest border in **Mahwah** and **Oakland** in a ridge known as the Ramapo Mountains. Its topography is characterized by high hills, glacial lakes, and wetlands. The Palisades run along the county's eastern border with the Hudson River from **Alpine** to **Edgewater**. This region is characterized by rocky hills and outcrops. Similar rocky conditions can be found in parts of **Mahwah, Oakland**, and **Franklin Lakes** with Campgaw Mountain at the northernmost extent of the Watchung Mountains. Most of the central part of the county is highly urbanized lowland area in the rolling plains between the Highlands and the Palisades. The Meadowlands Area in the southern portion of the county are at low elevation and are characterized by marshland.

Ramapo Valley County Reservation. Source: Colliers Engineering & Design

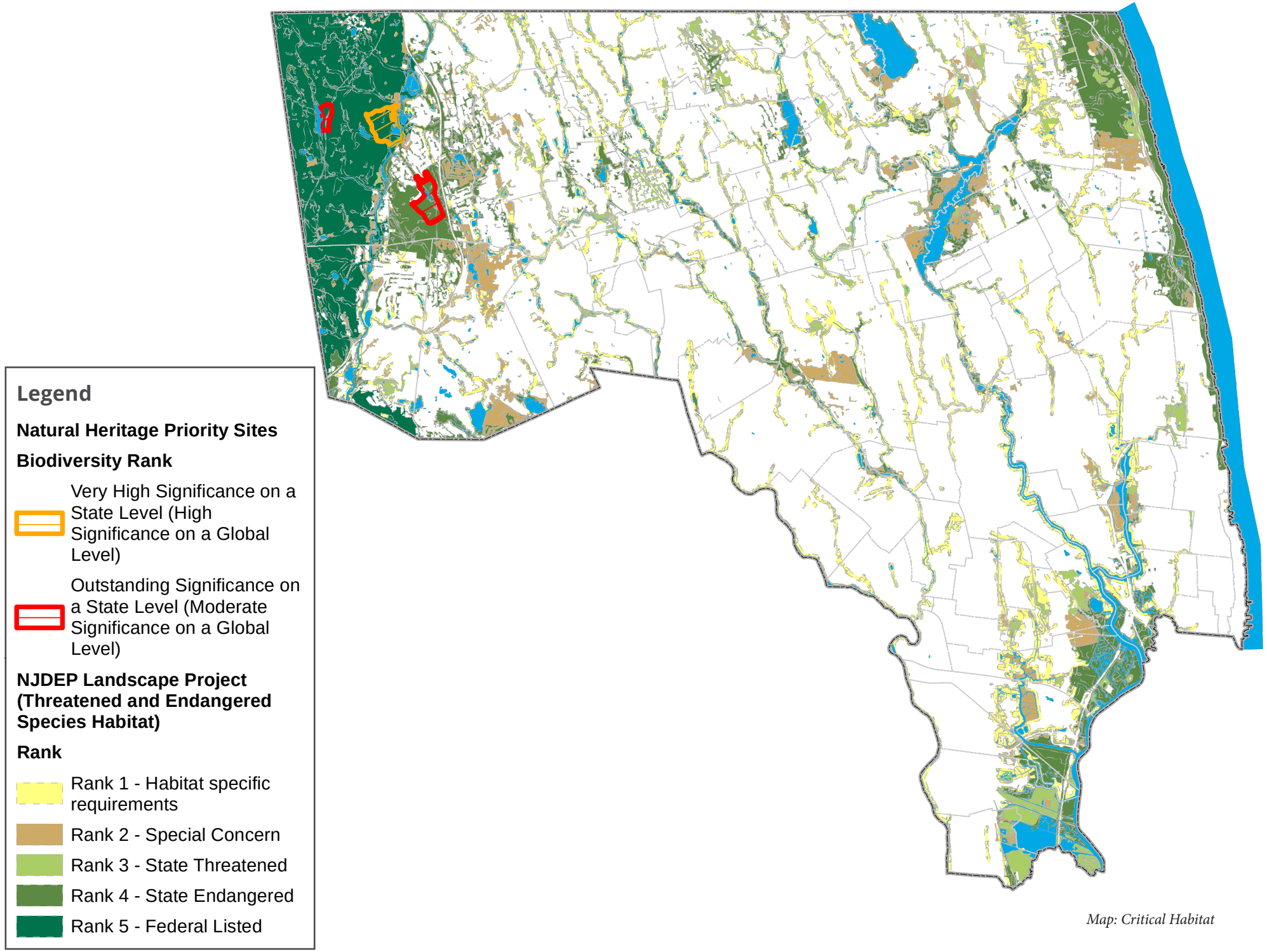
FLOODPLAINS/DRAINAGE

The Federal Emergency Management Agency (FEMA) is the agency responsible for preparing Flood Insurance Rate Maps (FIRMs), which delineate the special flood hazard areas and the risk premium zones applicable to the community. These flood hazard areas include areas affected by riverine flooding, as well as coastal areas where flooding is compounded by wave action. For communities that wish to participate in the National Flood Insurance Program (NFIP) and receive flood insurance through this program, these maps guide certain development regulations. Of Bergen County's 70 municipalities, all but two municipalities participate in the NFIP (**Alpine** and **Englewood Cliffs**),[10] however, these communities do not contain any identified Special Flood Hazard Areas.

From the river corridors of the Highlands and northern parts of the county, the Pascack Valley and Hackensack River corridor in the central part of the county, to the lowland marshes of the Meadowlands region, nearly every municipality in Bergen County contains special flood hazard areas as mapped by FEMA. Except for **Edgewater**, the Palisades serve as a protective buffer from the Hudson River during flood events, where tidal impacts from the river can exacerbate local flooding. This is not to suggest that the county is completely protected from flooding, however. Heavy rains can cause streams, rivers, and waterbodies to overtop their banks, sending water into low-lying areas. These impacts are exacerbated by development in floodplain areas; both from the reduction of pervious surfaces that can absorb floodwaters, and from the volume of water displaced by structures. This means that floodplain development upstream can increase the severity of a flood downstream. Considering that most of the land in Bergen County is developed, this means that increased development in a floodplain will impact downstream communities.



Map: Flood Hazards



Map: Critical Habitat

NATURAL ECOSYSTEMS AND WILDLIFE

The New Jersey Highlands is a 1,343-square mile area in the northwest part of the state, noted for its scenic beauty and environmental significance. The northwest portion of Bergen County falls within the New Jersey Highlands Region, which includes **Mahwah** and **Oakland**. The Highlands' diverse natural communities, including its extensive forests, wetlands, rivers, and streams, are of statewide importance. **Mahwah** and **Oakland**, for example, provide habitat for wildlife listed as threatened and endangered pursuant to the Federal Endangered Species Act. In addition to the Highlands, New Jersey's Natural Heritage Priority Program and Landscape Project have identified numerous sites throughout the county as being of critical importance. This includes the New Jersey Palisades, which also provides habitat for federally-listed threatened and endangered species, while portions of **Alpine, Tenafly**, and **Old Tappan** in the Northern Valley, and Southwest Bergen contains extensive habitat for state-listed threatened and endangered species.

Ramapo Valley County Reservation. Source: Colliers Engineering & Design

VEGETATION

Despite significant urbanization over the past century, Bergen County still contains large tracts of deciduous forest area, particularly in the county's Highlands and Palisades regions, including **Alpine, Tenafly, Oakland**, and **Mahwah**. These forests provide habitat for native species and protect water quality, in addition to providing some of the county's most scenic recreational resources. The most recent assessment of statewide land cover in 2012 estimated that around 25,400 acres or just over 16 percent of the county was forested. This assessment identifies that of this total, approximately 22,300 acres, or 14 percent, is composed of deciduous forest with over 50 percent crown closure. Crown closure refers to the percentage of forest area covered by the vertical projections of the tree, used to estimate the density of a forested area. By contrast, coniferous forests account for fewer than 70 acres of land in the county.

The Meadowlands Area once contained vast swamps, forests, and marshes, formed after the glaciers retreated from the most recent ice age and the subsequent breach of Glacial Lake Hackensack. Development of significant portions of this region in the 19th and 20th centuries led to protections of the remaining marshlands by the state and federal government due to the environmental benefits provided by these landscapes to provide habitat for numerous species, filter pollutants, absorb floodwaters and dissipate other impacts from storm events. In Bergen County, the Meadowlands still contains over 2,500 acres of wetlands, the majority of which are characterized by phragmites, a plant also known as the common reed. While some native varieties of phragmites exist, non-native varieties are highly invasive and will outcompete native wetland plants, especially in areas of disturbance. The Meadowlands also contains areas of saline marshes, scrub wetlands, and deciduous wooded wetlands. Outside of the Meadowlands, riparian wetlands are also common in the Highlands region of the county, with the largest portion of wetland area comprised of deciduous wooded wetlands. In total, wetlands account for 5.7 percent of the county, or just over 9,000 acres.

WATER

Water is a critical resource for the provision of safe drinking water and natural habitats, but also for certain industries. Approximately 6 percent of Bergen County is covered by water, including reservoirs, rivers, streams, lakes and creeks. New Jersey's Surface Water Quality Standards (N.J.A.C. 7:9B) regulate the types of development around surface waters (including the ocean and its tributaries, springs, streams, rivers, lakes, ponds, wetlands, and artificial waterbodies). The level of protection to the surface water and the development requirements for surrounding areas is based on the classified use of the waterway. Classifications are divided into three (3) categories: "Outstanding National Resource Waters" (ONRW), "Category One (C1) Waters," and "Category Two (C2) Waters." (N.J.A.C. 7:9B)

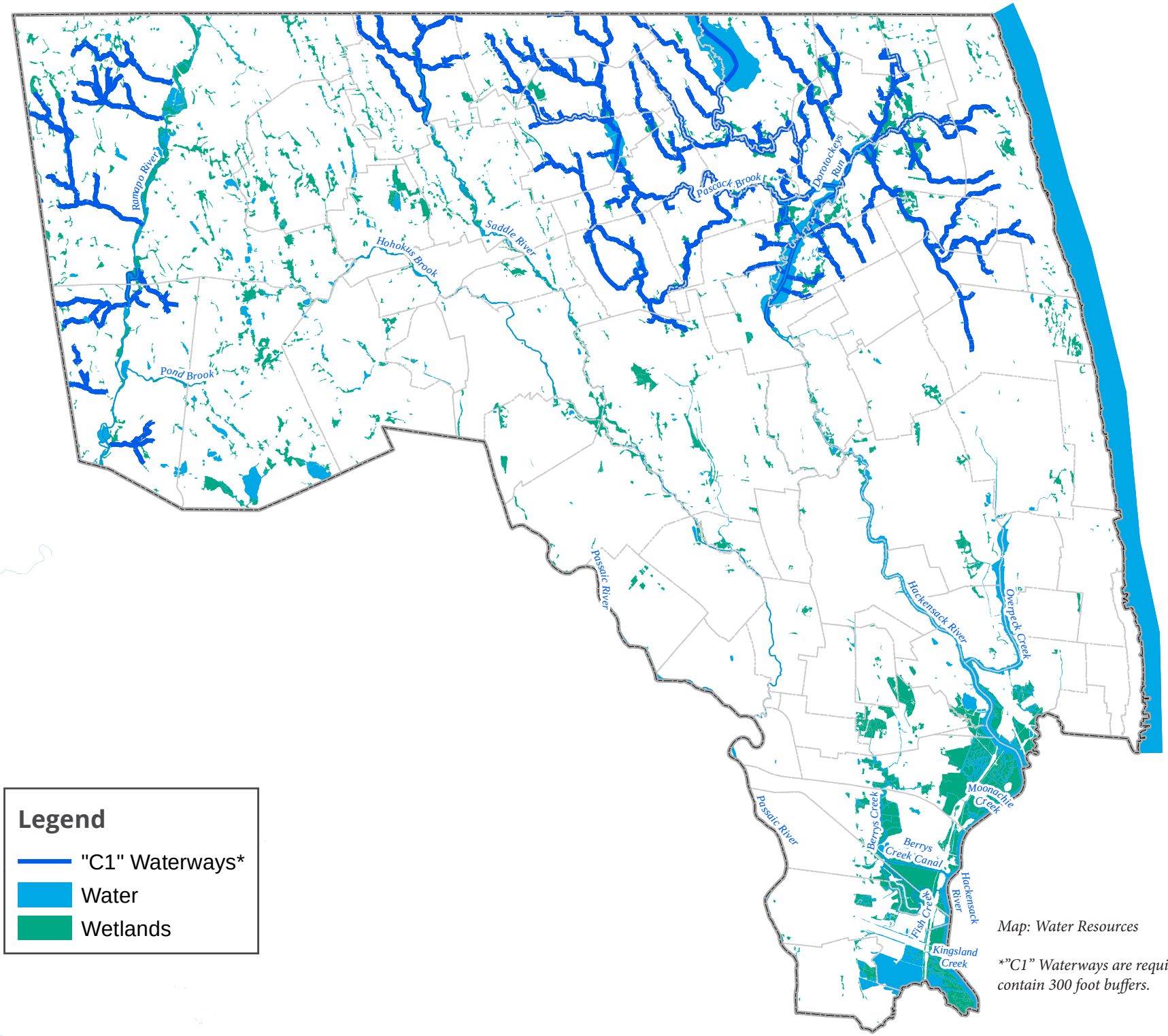
ONRW waters are those waterways known as "nondegredation waters" due to their unique ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resources, and as a result receive the highest level of protection where no activities or wastewater discharges are permitted that might alter the existing water quality. Waters classified under the ONRW category are found in the Pinelands (Subclassification: PL), and in several areas of Sussex, Warren, Morris and Passaic Counties (Subclassification: FW1). No waterways in Bergen County are classified as ONRW.

The next level of protection is C1, which prohibits any measurable change in water quality. Category One (C1) waters are more prevalent in the state than ONRW waters, and include most of the Highlands and surrounding areas, scattered sites along New Jersey's coastline, and areas surrounding the Pinelands. Bergen County contains several C1 waterways, including in the Highlands towns of **Mahwah** and **Oakland**, as well as the neighboring community of **Upper Saddle River.** These waters are classified based on their exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resources. Most of the waterways in the Pascack Valley have the C1 designation, as well as many of the northern communities (including **Old Tappan, Northvale, Norwood, Harrington Park, Closter, Haworth, Demarest, Cresskill**, and parts of **Alpine, Rockleigh**, and **Tenafly**).

These waterways all feed into the drinking water supply provided by the reservoirs of the Hackensack River and its tributaries. C1 buffers are required to have a 300-foot buffer from developments resulting in one (1) acre of disturbance or a quarter acre increase in impervious surface to minimize impairments to water quality from stormwater. In addition, the 300-foot buffer is required under the state's Flood Hazard Control Act (N.J.A.C. 7:13-3) to protect the riparian zones around waterways to protect the waterway and water quality.

Category Two (C2) waters compose the remainder of the regulated waterways in Bergen County. For these waterways, existing water quality is maintained, however, the water quality may be lowered if there is an important economic or social justification. C2 waterway riparian zones are required to have a 150-foot buffer around waters related to trout production or trout maintenance, as well as areas containing habitat for a threatened or endangered species. Waterways without these characteristics are required to maintain a 50-foot riparian buffer.

Ramapo Valley County Reservation. Source: Colliers Engineering & Design



Map: Water Resources

**"C1" Waterways are required to contain 300 foot buffers.*