Section 2.0 Existing Conditions

The Croton River watershed (Figure 2-1) encompasses the Croton River, its tributaries and 12 reservoirs constructed by New York City. The perimeter of the watershed extends through Putnam County and into Dutchess County on the north, into Fairfield County, Connecticut on the east and to a basin divide line that extends east/west across Westchester County (just north of Chappaqua) on the south. The natural discharge point is to the west where the Croton River flows into the Hudson River at the Village of Croton-on-Hudson.

The study area for Indian Brook-Croton Gorge Watershed Conservation Action Plan, (the plan), is limited to the portion of the Croton River watershed within Westchester County that is downstream of the New Croton Dam. This portion is identified as the Croton Bay Watershed and serves as an important tributary to the Hudson River.

2.1 Physical Setting

The Croton Bay Watershed, (the watershed), encompasses approximately 3,400 acres (5.3 sq. mi.) within portions of the Towns of Cortlandt (2 sq. mi.), Ossining (0.90 sq. mi.) and New Castle (0.8 sq. mi.), and the Villages of Croton-on-Hudson (1.4 sq. mi.) and Ossining (0.16 sq. mi.). The watershed is made up of two subwatershed areas: Croton Gorge and Indian Brook, see Figure 2-2. The Croton Gorge Subwatershed totals 2,040 acres (3.2 sq. mi.) and is the larger of the two subwatersheds. It lies within of the Towns of Cortlandt, Ossining and New Castle, and the Villages of Ossining and Croton-on-Hudson. The Croton Gorge Subwatershed includes the Croton-on-Hudson drinking water aquifer and the Croton River, which begins at the New Croton Dam and terminates at the Croton Bay. The Indian Brook Subwatershed totals 1,369 acres (2.1 sq. mi.) and lies within the Towns of Cortlandt, Ossining and New Castle and the Village of Ossining. The Indian Brook Subwatershed includes the Indian Brook and the Indian Brook Reservoir, a drinking water source for the Town and Village of Ossining.

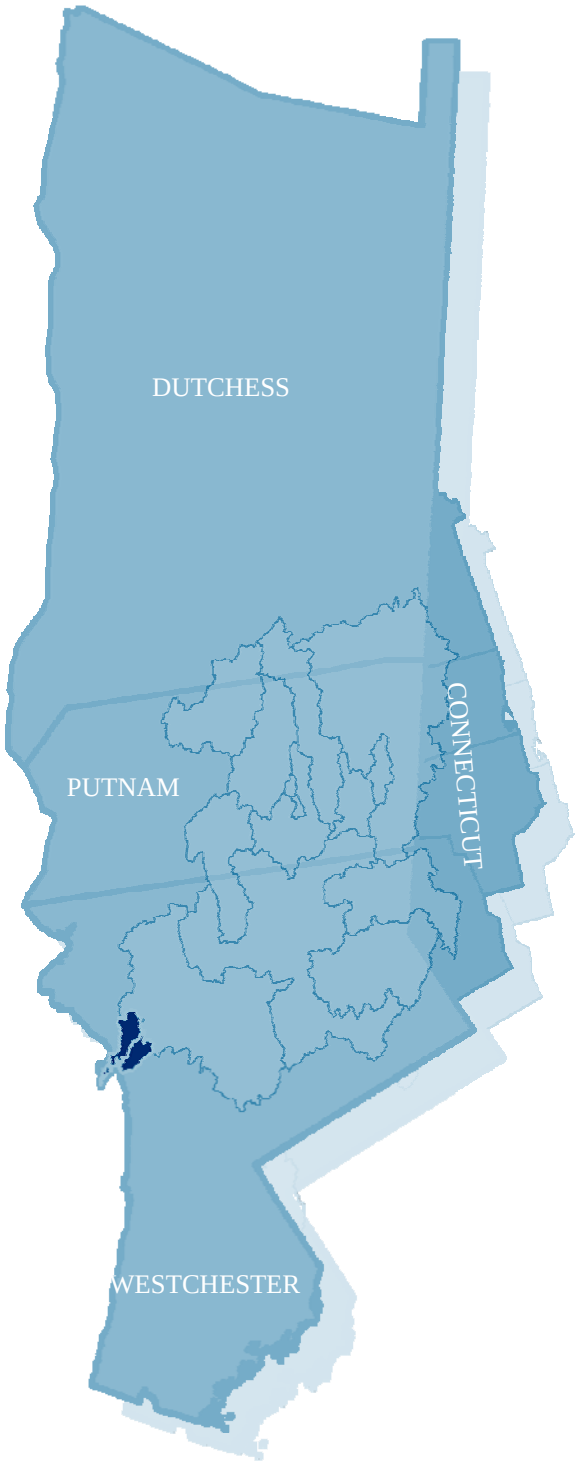


Figure 2-1. Croton River Watershed

Figure 2-2: Aerial photo and municipal boundaries of the Croton Bay Watershed

2.2 Bedrock and Surficial Geology

The topography and bedrock of the watershed are the result of complex geologic processes that began more than 1.3 billion years ago. Rocks found in Westchester County record at least three episodes of mountain building and two major periods of volcanic activity (McGuire, 1991). The bedrock found in the watershed is a result of millions of years of continual erosion of the original mountain chains by wind, water and glaciers so that only the base of these mountains now remains. The bedrock primarily consists of metamorphic (altered) rock of both sedimentary (sediments) and igneous (volcanic) origin. Croton Point Park is the only area of the watershed that does not consist of metamorphic rock. Instead, the composition consists of glacial and alluvial (river) deposits left by the most recent ice age and river system erosion.

The surficial geology in Westchester County is a result of glaciers advancing and receding from the area during the last ice age (~ 12,000 years ago) leaving various sized sediments and rocks, known as till, on top of the underlying bedrock. The surficial geology of the watershed consists mainly of glacial deposits including till and lacustrine (lake) silt and clay from proglacial lakes (lakes that existed during the last glacial period). Some areas in the watershed glacial deposits do not exist on the surface and only the underlying bedrock can be found.

The local geology of the watershed has played an important role in the economic development of the area. Inwood marble, which is found throughout Westchester County and in the watershed, was the largest source of quarried marble in the United States until about 1850. Prisoners at the Sing Sing Correctional Facility quarried the marble in the Village of Ossining. The quarry at Sing Sing also uncovered a number of interesting minerals in the marble, including graphite, pyrite, quartz, rutile, calcite, diopside (malacolite), dolomite and tremolite (McGuire, 1991).

Emery, which is a mixture of two minerals, corundum and magnetite, can be found in Cortlandt. It is an extremely hard substance and not very common in the United States. Emery was quarried in Cortlandt and one of the quarries was located near the watershed boundary on Mount Airy Road near the Village of Croton-on-Hudson (McGuire, 1991).

Clay was also excavated extensively at Croton Point Park where at one point in time there were at least five brick making factories. In addition, Croton Point was excavated for its sand and gravel to use in road building and other construction projects (McGuire, 1991).

2.3 Steep Slopes

The Croton Bay Watershed is located in the Hudson River Valley and includes the Croton River Valley, thus much of the watershed has steep slopes. Steep slopes develop in river valleys as a result of down cutting from rivers. Steep slopes in the watershed are also the result of glacier advancement and recession.

The definition of a steep slope for the purposes of the Indian Brook-Croton Gorge Watershed Conservation Action Plan includes any slope that is greater than 15% in grade. Figure 2-4 displays steep slopes located in the watershed that are between 15-25% and slopes that are greater than 25%. A total of 33% of the watershed contains steep slopes, with 23% being slopes of 15-25% and 10% being slopes greater than 25%. Unvegetated slopes have greater instability and much higher rates of erosion than vegetated slopes. The root systems of plants help maintain slope stability and reduce the amount of erosion that takes place on steep slopes. Therefore, it is very important to keep steep slopes as natural and as vegetated as possible.

2.4 Soils

Fifty-five soil types exist in the watershed. A majority of the soils found in the watershed were formed from glacial deposits. Most of the soils are loamy, which means that approximately 7-27% of the grain content is clay; 28-50% of the soil is silt and less than 52% of the grain content is sand. The soils found in the watershed are typically deep soils with a depth to bedrock of at least 6 feet and all tend to be acidic. Although the soils have similar parent material, the soils vary in permeability, depth to water table, drainage potential, runoff speed and hydrologic classification. Supplement A: Additional Resources contains a detailed map of the soils in the watershed, descriptions of the soil types, taxonomy and hydrologic classification.

Eleven percent of the soils in the watershed are considered hydric soils, which are formed under conditions of saturation, flooding or ponding for a period long enough to develop anaerobic (low oxygen) conditions. Hydric soils can be indicative of wetlands. Supplement A: Additional Resources also includes information on which soils are considered to be hydric.

Section 2.5 Natural Resources

A. Wetlands

The Croton Bay Watershed contains both federal and state regulated tidal and freshwater wetlands. Approximately 7% (239 acres) of the watershed is wetland (refer to Figure 2-4). Of the 239 acres, 120 acres are New York State Department of Environmental Conservation (NYSDEC) designated wetlands, which are wetlands greater than 12.4 acres. NYSDEC recognizes that not all wetlands are of equal quality. In order to establish the different qualities of wetlands, the NYSDEC developed a four class regulatory system that designates a class to every NYSDEC

Figure 2-4: Steep slopes in the Croton Bay Watershed

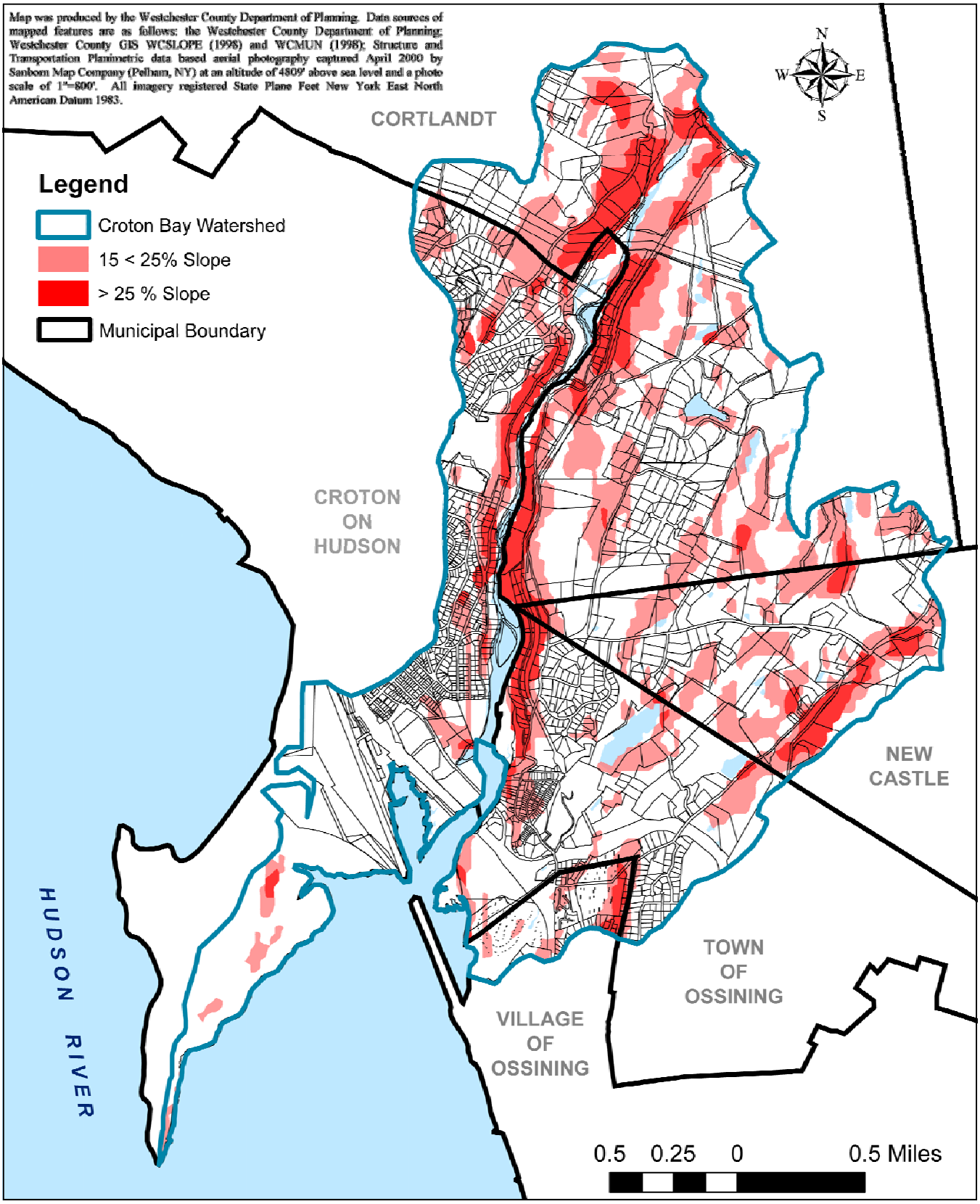


Figure 2-3. Westchester County's Croton Point Park, Croton-on-Hudson, NY

wetland. Class I wetlands are considered to provide the most beneficial qualities in terms of ecological association, special features, hydrologic features and pollution control features. Class IV wetlands provide the least. There are 68.35 acres of Class I, 8.64 acres of Class II and 43.53 acres of Class III wetlands (Need to check these numbers). All of the Class I and Class II designated wetlands are located in the tidal portions of the Croton Bay and the Croton River. The Class III wetland is the largest wetland in the watershed, known as the Glendale Wetland, located in the Town of New Castle. This wetland is currently designated as a nature preserve. Refer to Supplement A: Additional Resources for more information on wetlands.

Even though over 50% of the NYSDEC wetlands in the watershed are designated Class I, over the years they have become degraded due to invasive species. An invasive species is a plant that has an aggressive growth pattern that invades habitats and crowds out native species. Invasive species can also destroy biodiversity, and wildlife food sources. Most of the tidal wetlands in the watershed are dominated by phragmites, a common reed, considered to be an invasive species. The table in Figure 2-5 lists the primary invasive wetland species found in New York State.

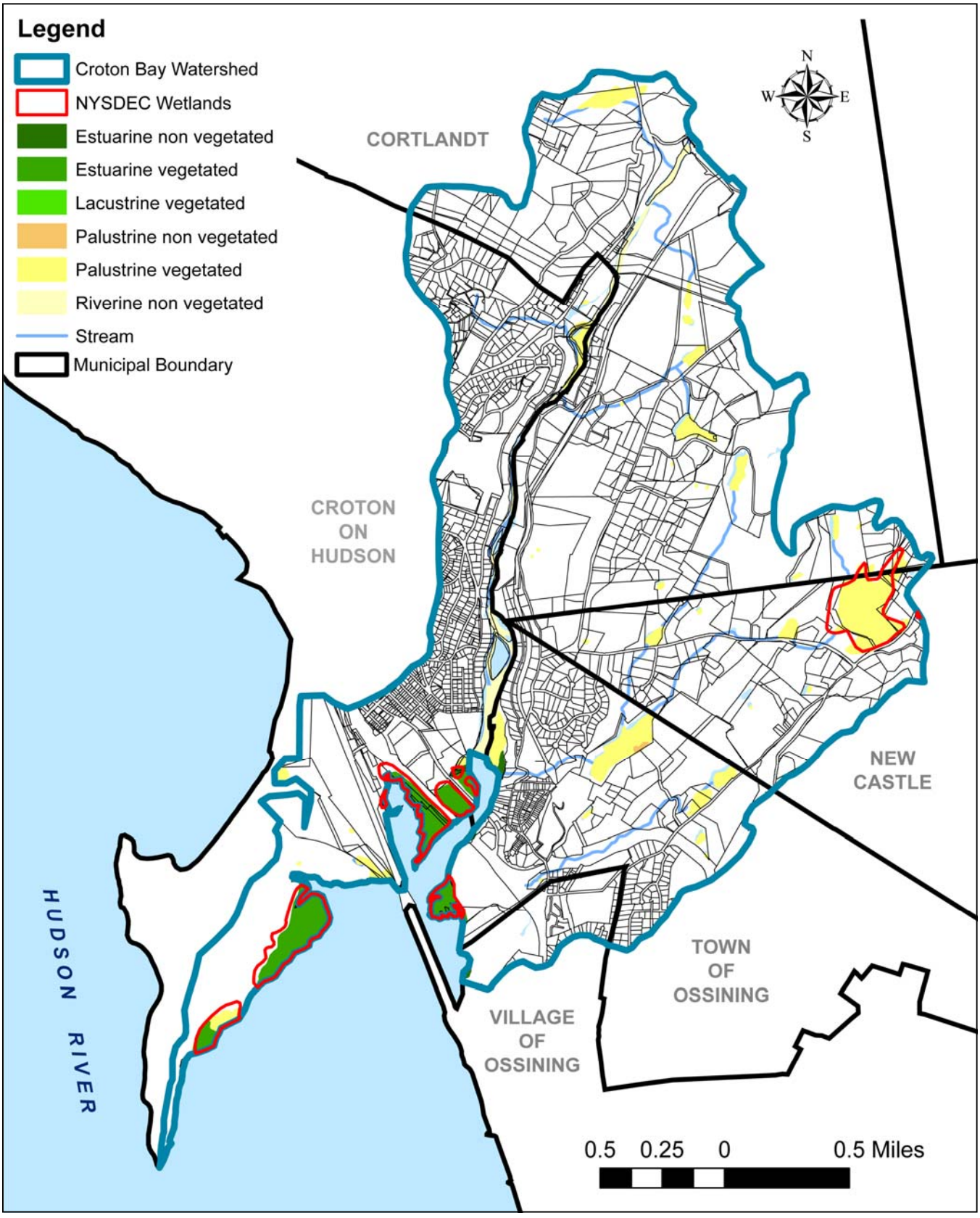
The watershed contains 73.1 acres of estuarine wetlands, in addition to NYSDEC wetlands, that are located in the brackish tidal portions of the Croton Bay near Croton Point Park and the mouth of the Croton River. There are 128.3 acres of palustrine (marsh) wetlands that are found throughout the watershed. There are 37.5 acres of riverine wetlands; all but 1.7 acres are nonvegetated wetlands. Finally, the watershed contains 0.1 acres of lacustrine (lake) wetlands. Listed in Figure 2-5 are

Common Name	Latin Name
Common buckthorn	Rhamnus cathartica
Smooth buckthorn	Rhamnus frangula
Common reed	Phragmites australis
Curly pondweed	Potamogeton crispus
Eurasian water milfoil	Myriophyllum spicatum
Japanese knotweed	Polygonum cuspidatum
Japanese stilt grass	Microstegium vimineum
Multiflora rose	Rosa multiflora
Porcelain-berry	Ampelopsis brevipedunculata
Purple loosestrife	Ampelopsis brevipedunculata
Purple loosestrife	Lythrum salicaria
Water chestnut	Trapa natans

Figure 2-5. Table of Common invasive plants found in New York State wetlands (Invasive Plant Council of New York)

Figure 2-6. Glendale Wetland, New Castle, NY

Figure 2-7: Wetlands in the Croton Bay Watershed



the different United States Army Corps National Wetland Inventory (NWI) wetlands that are found in the watershed.

According to the NYSDEC wetland regulations, each municipality has the ability to designate wetlands of local significance. Eleven percent of the watershed contains hydric soils, a wetland indicator, and only 7% of the watershed is designated as wetland. There may be other wetlands not identified by the federal or state government that could become designated as wetlands of local significance. No municipality in the watershed to date has designated wetlands of local significance. For more information on wetlands, wetland regulations and regulatory definitions of wetlands refer to Supplement A: Additional Resources.

Figure 2-8. Phragmites dominated tidal wetlands of the Croton Bay

Figure 2-9. Table of US Army Corps NWI of the Croton Bay Watershed

Wetland Type	Acres	Percent of Total Wetlands
Estuarine non vegetated	8	3%
Estuarine vegetated	65	29%
Palustrine non vegetated	1	>1%
Palustrine vegetated	127	53%
Riverine vegetated	2	>1%
Riverine non vegetated	36	15%
Lacustrine vegetated	>1	>0%
Total	**239**	**100%**

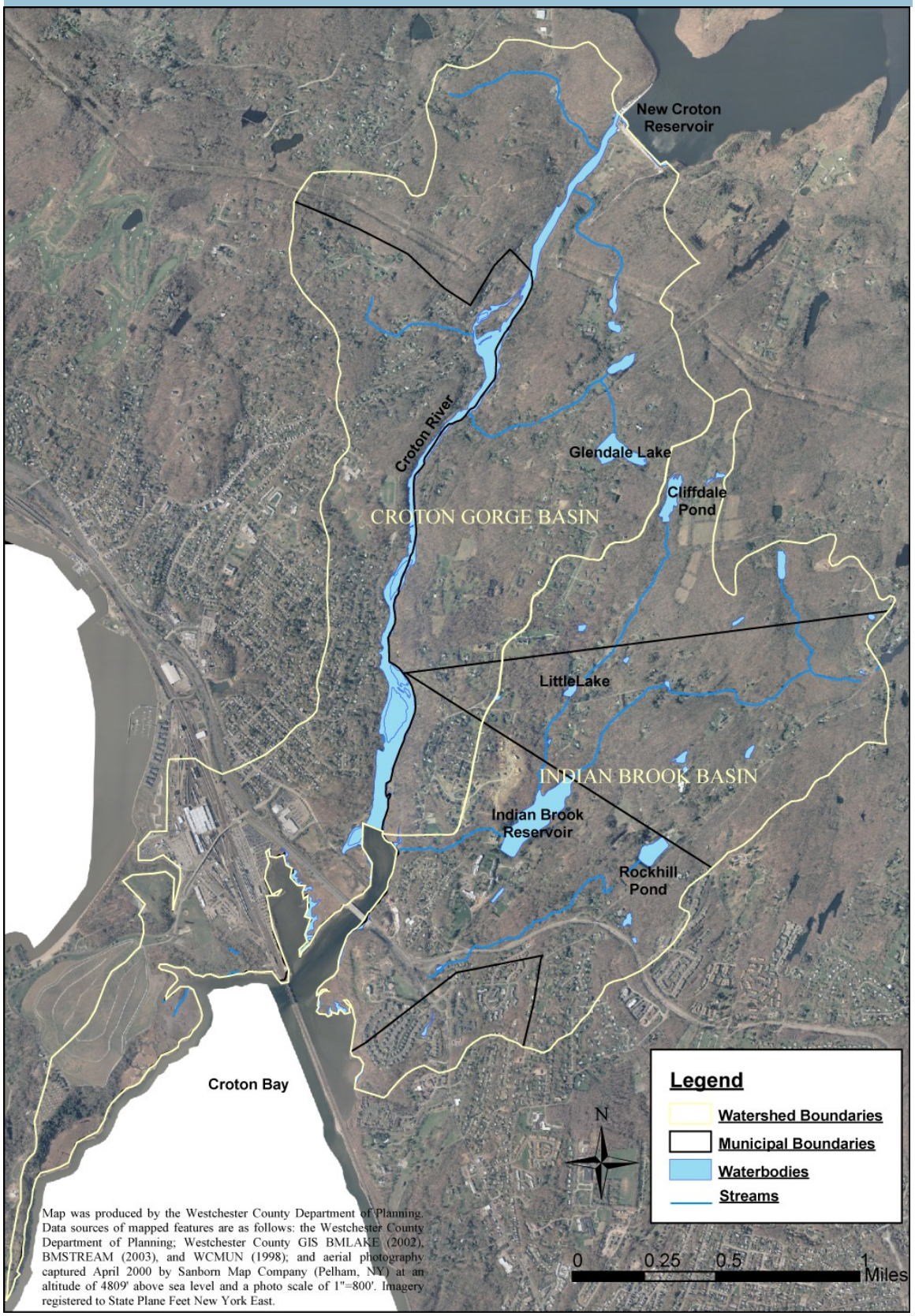
B. Significant Waterbodies

The Croton Bay Watershed consists of 45 acres of waterbodies (refer to Figure 2-5). The Croton River is the main river system in the watershed, flowing approximately three miles from the New Croton Dam and discharging into the Croton Bay. Five tributaries feed into the Croton River and the most significant is the Indian Brook. The Indian Brook Reservoir, a drinking water source for the Town and Village of Ossining, is located in the watershed. Numerous ponds serve as water sources for Croton River tributaries. The Croton River empties into the Hudson River. The Hudson River runs 315 miles from its source in the Adirondacks to the New York Harbor. The lower reaches of the Hudson River, from Newburgh to the New York Harbor, are tidally influenced and contain brackish water. The Croton Bay is part of the tidally influenced portion of the Hudson River.

The State of New York adopted regulations (NYCRR §703) that identify stream use classifications and water quality regulations. The regulation's standards legally set the maximum amount of pollutants allowed in a waterbody and still be considered clean. The maximum amount of pollution varies depending on the assigned stream use classification. Each stream is assigned the highest use classification that it could reach as determined by the State of New York.

The waterbodies in the watershed have different NYSDEC Surface Water Classifications. Table 2-3 lists the surface waterbodies and their respective surface water classifications. In the watershed, the Class A surface waterbodies are all associated with the drinking water sources of either the Croton aquifer or the Indian Brook Reservoir. Class B was designated to all of the lakes and ponds not used as drinking water sources. Class C waters are tributaries of the Croton River or the Indian Brook. The tidal portion of the Croton River is designated as Class SC. Refer to Supplement A: Additional Resources for more information about NYSDEC Surface Water Classifications.

Figure 2-10: Waterbodies in the Croton Bay Watershed



Croton Gorge Waterbodies

The Croton River runs three miles from the New Croton Dam and discharges into the Croton Bay on the Hudson River. Prior to the 1800's, mills were built along the riverfront and the Croton River was used as a harbor. In the early 1800's, the Croton River was dammed to create the Croton Reservoir, a drinking water source for New York City. In 1906, the existing New Croton Dam was completed. The Croton River below the dam shrunk in size, resulting in the river becoming unable to support the industries along its riverfront. Today, the Croton River primarily supports wildlife and recreational uses. Portions of the Croton River are stocked with approximately 900 rainbow trout yearlings, 100 two year old (12-15 inches) brown trout and 200 brown trout yearlings each March and April by the NYS DEC.

The Croton River receives its water flow from New Croton Reservoir water releases, dam spillway overflow, sheet flow and storm drain outfalls. The water re-

Figure 2-11. Croton River

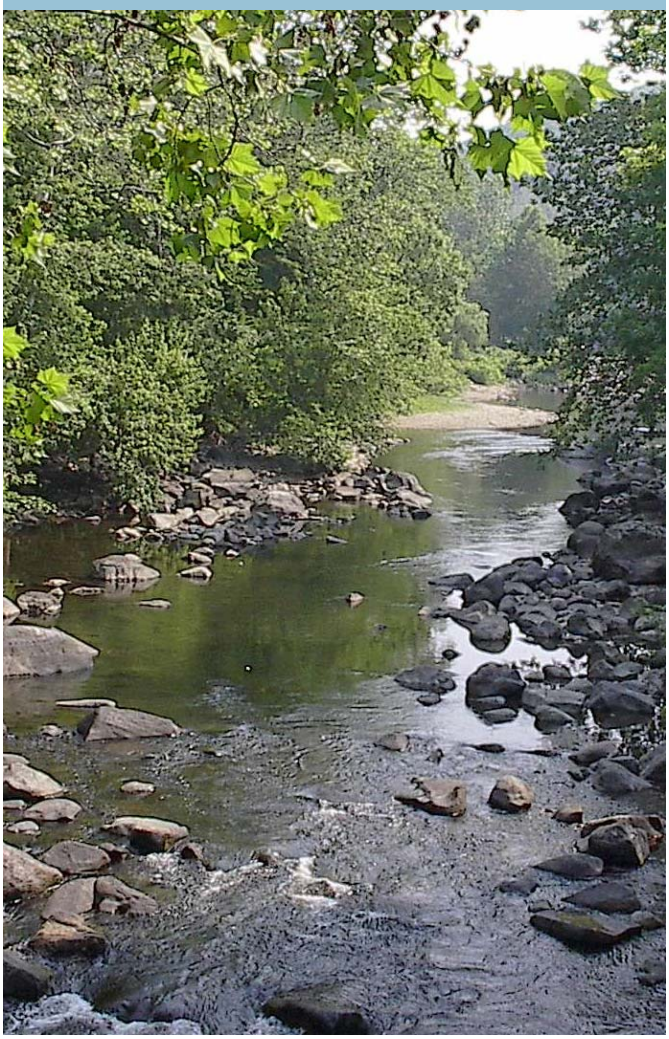


Figure 2-12. Table of Croton Bay Waterbodies and New York State Surface Water Classifications

Waterbody	NYS DEC Classification
Croton River	
New Croton Dam to Glendale Lake Tributary	A
Glendale Lake Tributary to Tidal Portion	B
Tidal Portion	SC
Indian Brook	
Indian Brook from Source to Reservoir	C
Indian Brook Reservoir	A
Indian Brook from Reservoir to Croton River	A
Other Waterbodies	
Other Croton River Tributaries	C
Cliffdale Pond	B
Glendale Lake	B
Little Lake	B
Rockhill Pond	B
Small Pond near Glendale Lake	B

leases into the Croton River from the New Croton Reservoir are connected to precipitation, stormwater runoff, reservoir storage status, water demand of New York City and the status and legal constraints of the remaining NYC water supply sources. Like all dammed rivers that are located in developed areas, the Croton River at times experiences fluctuations in its stream flow. Some fluctuation is normal for a river, but extreme fluctuation can cause increased erosion of the stream banks, excessive silting and drastic temperature changes. These severe changes can cause damage to fish and in-stream wildlife habitats.

Maintaining river flows for wildlife and wildlife habitats downstream from water supply reservoirs is inherently complicated and requires a difficult balance between human demands and sustainable flows to conserve the ecological health of a river. The Croton River below New Croton Reservoir is no exception. During certain years, and during certain months of those years, the flow rate in the Croton River (below the reservoir) is only a fraction of what naturally would be observed under pre-dam conditions. The health of the three-mile section of the Croton River between the Croton Reservoir and the tidal Hudson River is highly influenced by manipulation of the New Croton Reservoir.

Aquatic ecosystems are sensitive to flow changes and fluctuations. An individual high, low or extreme flow event can influence the aquatic ecosystem of a river. Data documenting ecological impacts of the New Croton Reservoir on the Croton River are sparse. The information available on the dam release and the effects of sheet flow and storm drain discharges on Croton River baseflow is limited. However, the available data does demonstrate that the Croton River does experience fluctuations that could adversely affect the River's ecosystem. As a result, additional studies are needed to determine how flow changes actually affect wildlife in the Croton River corridor. For more information on the New Croton Dam release please see Supplement A: Additional Resources.

Indian Brook Waterbodies

In 2002, a streamwalk was conducted by the residents of the Town of Ossining in the Indian Brook subwatershed. All sections of ponds, lakes, wetlands and streams in the subwatershed were included in the stream assessment surveys, which provided information regarding potential water quality and habitat concerns. The segment survey assessment forms were designed to act only as a preliminary identification tool to pinpoint those areas needing more in-depth investigation.

Overall, according to streamwalk surveys the Indian Brook subwatershed contains fair to good water quality ratings. Poor ratings were noted in the following areas:

- Barriers to Fish Movement,
- In-stream Fish Cover, and
- Pools.

Poor ratings for these parameters are typical ratings for streams that have an average depth of less than one foot. A majority of the streams in the Indian Brook Subwatershed had a stream depth of less than one foot when they were assessed. Even though the Indian Brook Subwatershed is a fairly healthy watershed, the prominent areas of concern listed as part of the Streamwalk assessment include stream bank erosion and runoff of polluted stormwater from roadways. Excessive erosion can cause increased turbidity and silting of the reservoir, streams and other ponds. Sections that are receiving runoff from roadways will have poorer water quality as a result of stormwater discharge pollutants such as nutrients, metals, sediments and petroleum products. For more details on the individual sections that were assessed as part of the Indian Brook Streamwalk please see Supplement A: Additional Resources.

The Indian Brook Reservoir serves as a drinking water source for the Town and Village of Ossining. In 2004, the Indian Brook Plant pumped over 15 million gallons of water each month from the Reservoir, with a maximum of 58 million gallons, totaling 555 million gallons for the year. The Indian Brook Reservoir is surrounded by forest. Three inlet streams to the Reservoir and one outlet stream exist and vary between 4-10 feet wide and vary between 3-8 inches deep. The overall water quality rating based on the Indian Brook Streamwalk for the Reservoir was good. The noted areas of concern for the Reservoir included streams that were flowing directly into it. Streambank erosion was identified along the northern inlet stream. This erosion can contribute to increased turbidity and silting of the stream

Figure 2-13. Indian Brook Reservoir, Ossining, NY

and the Reservoir. The eastern inlet stream of the Reservoir was reported to have poor canopy cover, which can affect the habitat quality for stream organisms. It was also noted to exhibit poor insect and invertebrate habitat, which can affect the viability of the stream ecosystem.

Portions of the Indian Brook that run parallel to Glendale Road and eventually discharge into the Reservoir might contribute stormwater pollutants to the Reservoir. Runoff discharges into the stream during storm events through outfalls or sheet flow. Two drainage pipes that discharge untreated stormwater directly into the stream were identified along the Glendale Road segment. The first discharge pipe drains runoff from Glendale Road and the second collects runoff from surrounding residences. Other segments of the Indian Brook are located in private backyards that can also receive stormwater runoff and pollutants associated with landscape management activities.

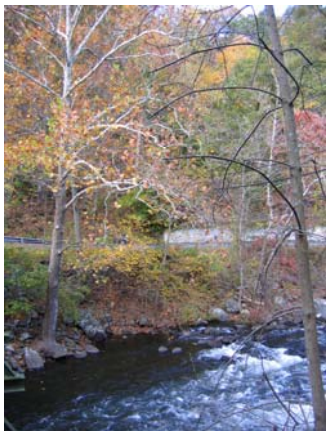
C. Groundwater

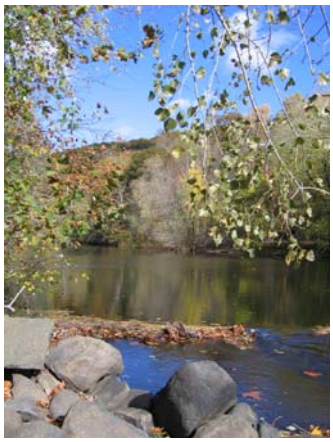
The Croton Bay Watershed contains one bedrock aquifer that is used as a drinking water source for the Village of Croton-On-Hudson. The Village well field is located downstream from the New Croton Dam. The natural groundwater that flows through the aquifer runs parallel to and in the same direction of flow as the Croton River. According to a 2004 report by the Chazen Companies, groundwater near the well fields is drawn towards the wells under pumping conditions. In non-pumping conditions the water table of the well fields is, generally, in equilibrium with the elevation of the river. Recharge to this system comes from a number of sources including precipitation, surface flow from the Croton River and groundwater flow from upland overburden and bedrock formations.

The extent to which the Croton River influences the water located in the aquifer is not completely known. As indicated by the 2004 Chazen Companies report, when the well fields were investigated according to NYSDOH guidance document PWS-42 (Public Water Supply 42) protocols there was no evidence that the wells should be designated as Ground Water Under the Direct Influence (GWUDI) GWUDI is a federal regulatory term that specifically refers to groundwater sources where conditions are such that pathogens are proven or have a high potential to travel from nearby surface waters into the groundwater source. The EPA left it up to the states to develop programs to make the determination of whether or not a source is GWUDI. With respect to the Croton-on-Hudson aquifer, the 2004 Chazen Companies report acknowledges that the zone of contribution from each well does include the Croton River. At the present time, the Westchester County Department of Health has not made its final decision regarding the Croton-on-Hudson well fields GWUDI determination. Even if the well fields end up not being designated as GWUDI, there still might be surface water interactions from the Croton River into the underlying aquifer.

Some of the residents in the Towns of New Castle and Cortlandt have private drinking water wells. Currently no government oversight regarding monitoring water quality of private drinking water wells exists. It is the homeowner's responsibility to monitor their well water. Both the New Castle and Cortlandt attempt to provide groundwater quality protection in the watershed through overlay protection zones, but the current provisions do not provide adequate protection for groundwater drinking water sources.

Figure 2-14. The Croton River





Section 2.6 Wildlife and Significant Wildlife Habitats

The Croton Bay Watershed has a diversity of plants, animals and habitats, despite a relatively small land area that has significant development. The diversity of plants, animals and habitats, (biodiversity), provides many benefits to the surrounding communities. Natural areas are important because they provide recreational opportunities, enhance the quality of life and contribute to keeping water clean. Whether public or private, natural areas help define community identity by connecting residents to the natural landscape in which they live. Open space, pedestrian and bicycle trailways and native plant gardens are just some of the ways to connect residential areas to the surrounding natural environment. The watershed provides many recreational opportunities including hiking, boating, bird-watching, fishing and outdoor photography.

Providing habitats for biodiversity helps to preserve good water quality while providing a community connection to nature. Wetlands, stream corridors and forests all work together to clean, replenish and store water and poorly planned development can displace habitats. Suburban and urban sprawl threaten habitats on both developed and conserved lands. Poorly planned development can disrupt groundwater flow, spread invasive species and cut off essential wildlife corridors, adding more stress to already fragile ecosystems. As healthy habitats are lost, the many benefits that natural ecosystems provide may be lost as well. It is possible, however, to sustain a healthy economy and environment if community growth is prepared with nature in mind.

A. Significant Habitats and Species

The Croton-to-Highlands Biodiversity Plan was a result of a collaborative planning effort between the Towns of Yorktown, New Castle, Cortlandt and Putnam Valley, the Wildlife Conservation Society's Metropolitan Conservation Alliance (WCS/MCA), NYSDEC Hudson River Estuary Program and the Westchester Community Foundation. The eastern portions of the Croton Bay Watershed (in Cortlandt and New Castle) were described in the biodiversity plan as high quality habitats for reptiles, amphibians and breeding birds.

Amphibians, Reptiles and Breeding Birds

The Croton-to-Highlands Biodiversity Plan found that the Croton Bay Watershed is home to many different species of amphibians, reptiles and breeding birds. Signifi-

cant species identified include the Eastern box turtle, Northern copperhead, Worm-eating warbler, Prairie warbler, Kentucky warbler, Canada warbler and Wood thrush. Figure 2-17 is an inventory of the common and Latin names of focal species identified in the Croton Bay Watershed portion of the Croton to Highlands Biodiversity Plan. Table 2-6 also lists if the species can be found under the NYS-DEC or Westchester County Endangered Species Programs, or the Audubon Watch List. More species may exist than those listed in Figure 2-17 in the watershed but they have not been identified in the Biodiversity Plan or they may be located in areas outside of the Plan's study area.

Croton Bay and Croton River

The tidally influenced Croton Bay and River are important aquatic habitats. The bay is one of the largest shallow bay areas in the lower Hudson that is sheltered from strong currents and wind. The mouth of the Croton River is documented as a migratory fish hub used as a resting, foraging and nursery area. Currently, portions of the river are stocked each year by the NYS DEC with trout. The federally endangered shortnose sturgeon has been found to use the Croton River. The NYS-DEC Hudson River Estuary Program has noted that spawning use of the Croton River by blueback herring and alewife fish species could potentially increase if minimum flow requirements were established for the Croton River.

Figure 2-16. Great Blue Heron, (above), Pickerel frog (below) source: U.S. Fish and Wildlife Service

The Croton Bay has a productive year-round habitat for resident warm-water fish, such as largemouth bass, brown bullhead, carp and panfish. It contains 120 acres of submerged aquatic vegetation (SAV) beds full of native water celery. SAV is critical to the aquatic ecosystem of the estuary, providing habitat and food for larval and adult fish, waterfowl and invertebrate species.

In New York, brackish tidal wetlands and swamps are found only in the Hudson River north of the Tappan Zee Bridge. They are a prominent shoreline feature of the mouth of the Croton River and the Croton Bay, covering nearly 100 acres. More than 90 of those acres of tidally influenced wetlands are found on the Bay's shoreline but are dominated by invasive vegetation, such as the Common Reed (Phragmites). The productive aquatic habitat of the Croton Bay is important for the migrating osprey, which is a threatened species. Eight acres of wooded swamp are found in higher areas. Trees found in the wooded swamp are primarily locust and willow, with some sycamore, ash and maple. The understory of the swamp is dominated by invasive species such as catbriar, honeysuckle, grape and false bamboo.

The tidal wetlands provide an ideal habitat for several species of invertebrates, amphibians, reptiles, fish, birds, and mammals. The salinity in the bay water and the abundance of marshes make it an ideal habitat for striped bass, perch, American eels and blue claw crabs. Croton Point Park is home to raccoons, opossums and muskrats that frequent the shoreline foraging for food. Diamondback terrapins, a

species not commonly found in the Hudson Valley, have been observed in the Park. The short-eared owl (state endangered species) is known to use the Park as a wintering area. Bald Eagles, another endangered species, roost at Croton Point and have been seen on the mainland in the Town and Village of Ossining. A variety of waterfowl, such as great blue herons and cormorants also make the tidal wetlands their home at different times of the year.

B. Wildlife Corridors

The Croton-to-Highlands Biodiversity Plan identifies biodiversity areas and connections that provide a habitat for flora and fauna, (Figure 2-16). Biological surveys conducted by the Wildlife Conservation Society defined the areas and where connections are tenuous. Identified biodiversity areas, along with a detailed study of wildlife, exist for areas within the watershed.

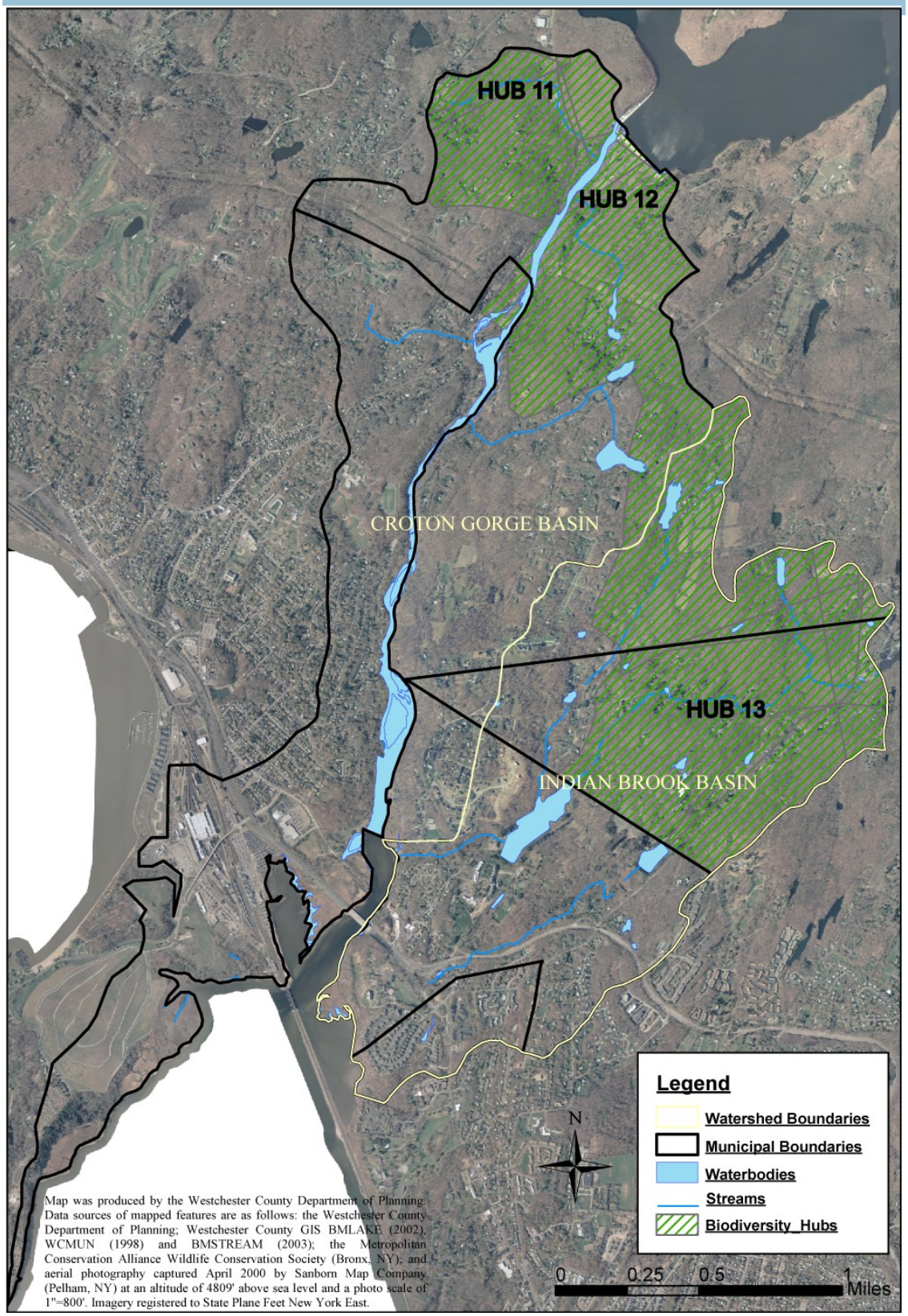
As identified in the Croton-to-Highlands Biodiversity Plan, Biodiversity Hub 11, located in the northwest section of the Croton Bay Watershed west of the Croton Dam, is an important corridor between Teatown Lake Reservation, Blue Mountain Reservation and Hunter Brook. This area contains mostly residential and undeveloped land. According to the Biodiversity Plan this hub contains development sensitive species such as spotted salamanders, black rat snakes, wood frogs, gray treefrogs and Fowler's toads. Conservation-focused land use planning and land preservation efforts may protect or improve the existing biodiversity corridor.

Biodiversity Hub 12, located south of the Croton Dam, includes some of the Briarcliff-Peekskill Trailway and acts as an important connection between Hub 11 and Hub 13, Teatown Lake Reservation. The area is primarily residential with a few parcels of undeveloped land, which could be preserved to continue to provide a wildlife corridor between the two hubs.

Biodiversity Hub 13, Teatown Lake Reservation, is located in the southeast section of the watershed and includes portions of the Indian Brook subwatershed. Wildlife, such as the eastern box turtle and spotted turtle, were identified in this area. Hub 13 abruptly ends at the municipal boundary between the Towns of New Castle and Ossining and it appears that the corridor may continue into the Town of Ossining.

The Croton River is an important biodiversity corridor, even though it is not discussed in the Croton-to-Highlands Biodiversity Plan. The river runs through the Town of Cortlandt, the Village of Croton-on-Hudson and along the northern border of the Town of Ossining. It provides an area for wildlife to move through the watershed with minimal barriers resulting from human development. As noted earlier, the Croton River is also home to many fish species including the endangered shortnose sturgeon. The land adjacent to the river is characterized by large-lot residential and undeveloped parcels. Preserving land from further development along the Croton River corridor may be beneficial to the river ecosystem.

Figure 2-16. Wildlife Corridors Identified in the Croton Bay Watershed as part of the Croton to Highlands Biodiversity Plan



Mallard, Eastern Box Turtle, BullFrog and Northern Flicker

U.S. Fish and Wildlife Service's online digital media library

Figure 2-17. Table of Focal Species of the Croton Bay Watershed

Common Name	Latin Name	Notes
Amphibians		
Spotted salamander	*Ambystoma maculatum*	
Northern two-lined salamander	*Eurycea bislineata*	
Four-toed salamander	*Hemidactylium scutatum*	
Redback salamander	*Plethodon cinereus*	
American toad	*Bufo americanus*	
Gray treefrog	*Hyla versicolor*	
Northern spring peeper	*Pseudacris crucifer*	
Bullfrog	*Rana catesbeiana*	
Green frog	*Rana clamitans*	
Pickerel frog	*Rana palustris*	
Wood frog	*Rana sylvatica*	
Reptiles		
Eastern box turtle	*Terrapene carolina*	A, B
Northern black racer	*Coluber c. constrictor*	
Northern ringneck snake	*Diadophis punctatus edwardsii*	
Black rat snake	*Elaphe obsoleta*	
Eastern garter snake	*Thamnophis s. sirtalis*	
Northern copperhead	*Agkistrodon contortrix mokasen*	C
Breeding Birds		
Mallard	*Anas platyrhynchos*	
Wood duck	*Aix sponsa*	
Canada goose	*Branta canadensis*	
Wild turkey	*Meleagris gallopavo*	
Mourning dove	*Zenaida macroura*	
Red-tailed hawk	*Buteo jamaicensis*	
Yellow-billed cuckoo	*Coccyzus americanus*	
Hairy woodpecker	*Picoides villosus*	
Downy woodpecker	*Picoides pubescens*	
Pileated woodpecker	*Dryocopus pileatus*	
Red-bellied woodpecker	*Melanerpes carolinus*	
Northern flicker	*Colaptes auratus*	
Eastern kingbird	*Tyrannus tyrannus*	
Great crested flycatcher	*Myiarchus crinitus*	
Eastern phoebe	*Sayornis phoebe*	
Eastern wood-pewee	*Contopus virens*	
Blue jay	*Cyanocitta cristata*	
American crow	*Corvus brachyrhynchos*	
Brown-headed cowbird	*Molothrus ater*	
Red-winged blackbird	*Agelaius phoeniceus*	
Baltimore oriole	*Icterus galbula*	
Common grackle	*Quiscalus quiscula*	
House finch	*Carpodacus mexicanus*	
American goldfinch	*Carduelis tristis*	
Chipping sparrow	*Spizella passerina*	

Table of Focal Species of the Croton Bay Watershed, cont.

Common Name	Latin Name	Notes
Field sparrow	*Spizella pusilla*	
Song sparrow	*Melospiza melodia*	
Swamp sparrow	*Melospiza georgiana*	
Eastern towhee	*Pipilo erythrophthalmus*	
Northern cardinal	*Cardinalis cardinalis*	
Rose-breasted grosbeak	*Pheucticus ludovicianus*	
Indigo bunting	*Passerina cyanea*	
Scarlet tanager	*Piranga olivacea*	
Barn swallow	*Hirundo rustica*	
Tree swallow	*Tachycineta bicolor*	
Northern rough-winged swallow	*Stelgidopteryx serripennis*	
Cedar waxwing	*Bombycilla cedrorum*	
Red-eyed vireo	*Vireo olivaceus*	
Warbling vireo	*Vireo gilvus*	
Black-and-white warbler	*Mniotilta varia*	
Worm-eating warbler	*Helmitheros vermivorum*	C,D
Blue-winged warbler	*Vermivora pinus*	D
Yellow warbler	*Dendroica petechia*	
Black-throated green warbler	*Dendroica virens*	
Prairie warbler	*Dendroica discolor*	C,D
Ovenbird	*Seiurus aurocapilla*	
Northern waterthrush	*Seiurus noveboracensis*	
Louisiana waterthrush	*Seiurus motacilla*	
Kentucky warbler	*Oporornis formosus*	D, E
Common yellowthroat	*Geothlypis trichas*	
Canada warbler	*Wilsonia canadensis*	C, D
American redstart	*Setophaga ruticilla*	
Northern mockingbird	*Mimus polyglottos*	
Gray catbird	*Dumetella carolinensis*	
Carolina wren	*Thryothorus ludovicianus*	
House wren	*Troglodytes aedon*	
White-breasted nuthatch	*Sitta carolinensis*	
Tufted titmouse	*Baeolophus bicolor*	
Black-capped chickadee	*Poecile atricapillus*	
Blue-gray gnatcatcher	*Polioptila caerulea*	
Wood thrush	*Hylocichla mustelina*	C, D
Veery	*Catharus fuscescens*	
American robin	*Turdus migratorius*	
Eastern bluebird	*Sialia sialis*	

Notes:
A: NYS Special Concern
B: Westchester County Threatened
C: Westchester County Special Concern
D: Audubon Society Special Concern
E: Westchester County Endangered

Indigo Bunting, Cedar Waxwing, Ovenbird and Woodthrush

U.S. Fish and Wildlife Service's online digital media library

Section 2.7 Land Use

Land use analysis of a watershed permits an understanding of the potential for future change through new development and land alteration. A land use analysis examines the actual use of the land (residential homes, commercial businesses, etc.). Pollutants such as metals and toxins from cars, soil from land development and earth moving practices and pesticides and fertilizers applied to lawns can end up in drinking water sources. Assessing the potential impacts that various land uses can have on drinking water is of primary importance when quantifying the health of a

Table 2-18: Croton Bay Watershed Land Use

Land Use Category	Land Use (Acres)	Percent of Watershed
Residential		
R-2A (≥2 ac.)	805	23%
R-1A (.75-1 ac.)	220	6%
R-1/3A (.25-.75 ac)	188	6%
R-1/4A (<.25 ac)	240	7%
R-MF (Multi-family)	55	2%
Non-Residential		
Commercial/Mixed Use	29	<1%
Institution/Cemetery/Religious	169	5%
Manufacturing/Warehouse	10	<1%
Office	37	1%
Transportation General/Utility	201	6%
Open Space		
Private Recreation/Historic	71	2%
Conservation Land	55	2%
Water Supply	76	1%
Park	501	13%
Preserve	179	7%
Water Supply	76	2%
Undeveloped		
Undeveloped	370	11%
Non-Parcel		
Right of Way	83	2%

watershed and determining actions that should be taken to restore and protect drinking water sources.

Parcels in the watershed were categorized into 18 different land uses. In order to provide an overview of land use, the 18 different land uses were placed into four general categories, Residential, Non-Residential, Open Space and Undeveloped. The distribution of the general land uses located in the watershed are identified in

Figure 2-19. Percent impervious surface by land use in the watershed

Land Use	Percent Impervious
Residential	
R-2A	2%
R-1A	3%
R-1/3A	6%
R-1/4A	11%
R-MF	4%
Non-Residential	
Commercial General/Mixed Use	13%
Institution, Cemetery, Religious	3%
Manufacturing/Warehouse	10%
Office	7%
Transportation General/Utility	5%
Open Space	
Private Recreation/Historic	<1%
Conservation Land	<1%
Park	<1%
Preserve	<1%
Water Supply	<1%
Undeveloped	
Undeveloped	<1%

Figure 2-6. As indicated in the figure, the watershed is almost equally residential (45%) and open space and undeveloped (39%).

In order to accurately assess land use in the Croton Bay Watershed a detailed land use classification was created, which combined land use categorized in both the Westchester County 1996 land use and 2004 open space GIS data coverages. The overall structure of the various land use classification system and more detailed information on the land use analysis can be found in Supplement B: Methodologies.

The land use categories that fall within each of the general land use groupings can be found in Table 2-7. Table 2-7 also includes the total acreage and percent coverage for each land use found in the Croton Bay Watershed. Figure 2-7 is a land use map of Croton Bay Watershed.

Impervious surface was also calculated based on the 2000 Westchester County data for each land use (for details on the calculations of impervious surfaces refer to Supplement B).

Figure 2-20: General land uses found in the Croton Bay Watershed

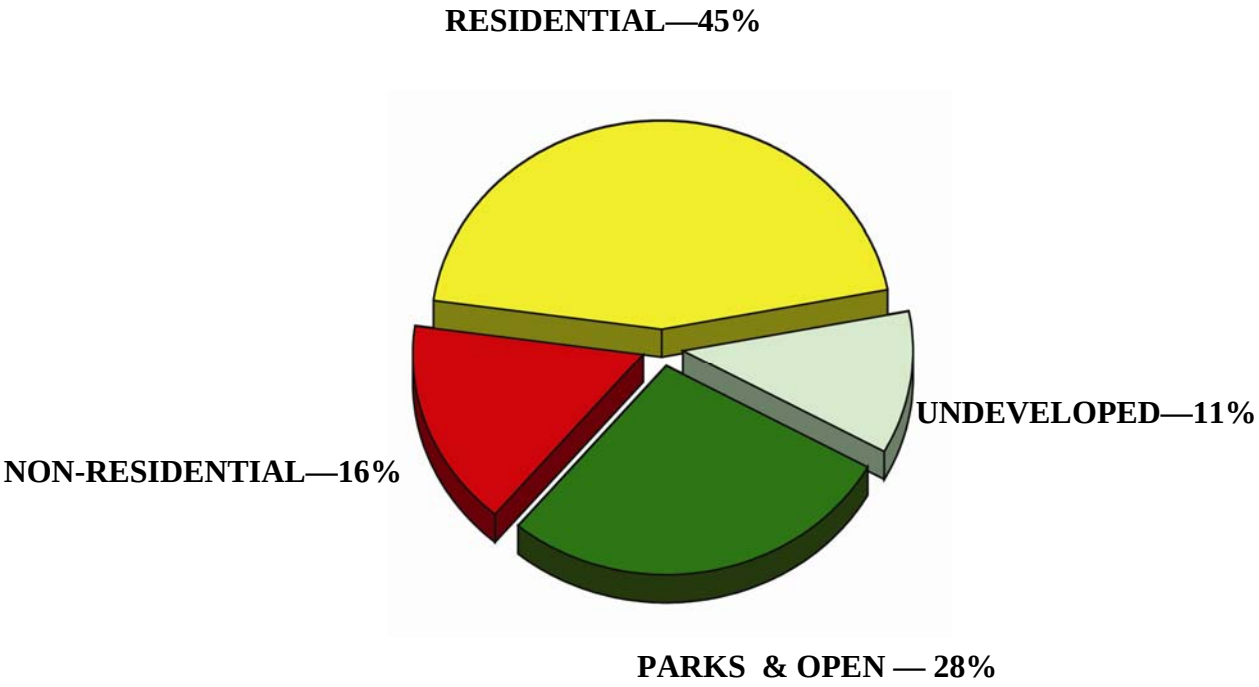
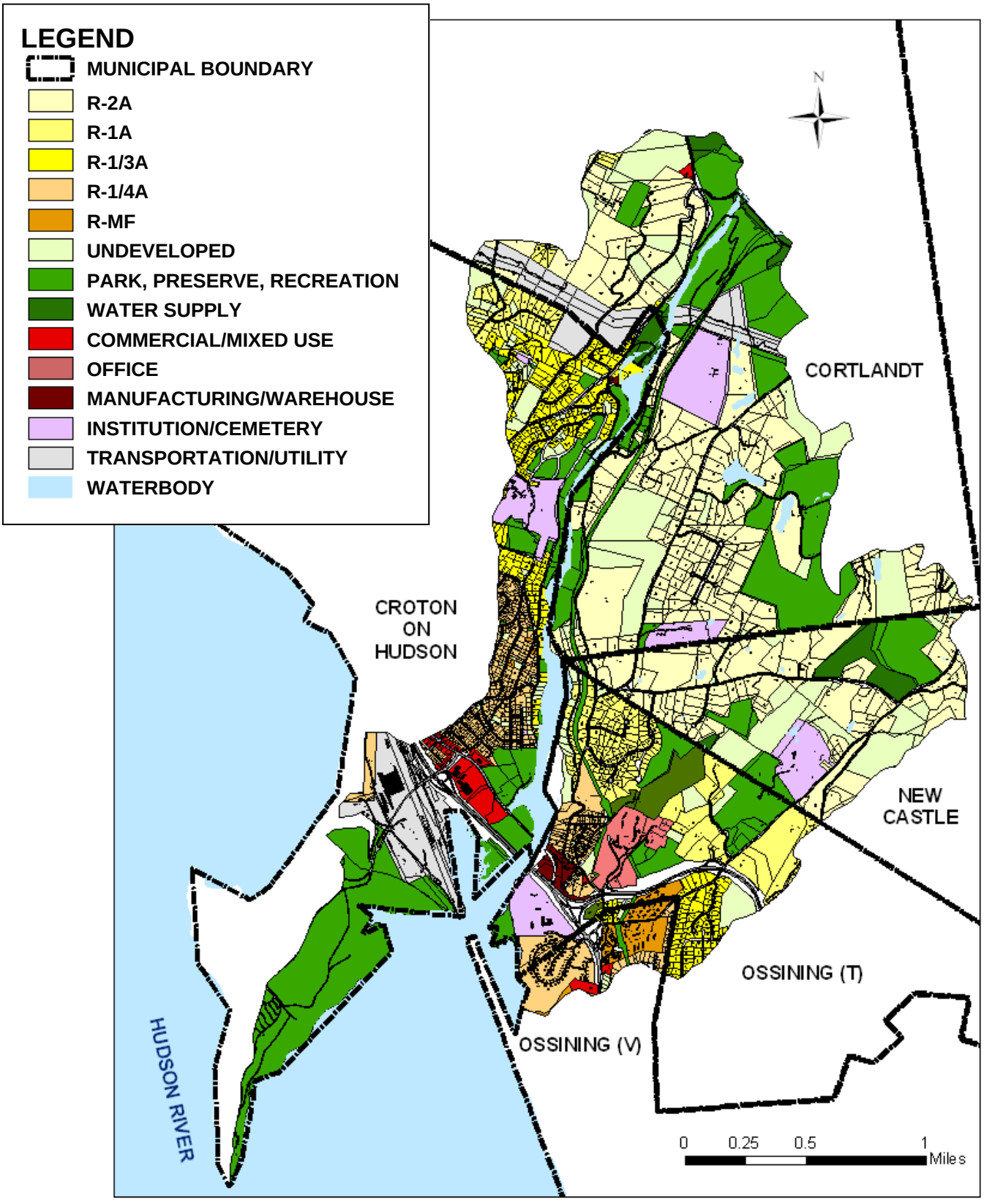


Figure 2-21: Map of general land uses found in the Croton Bay Watershed



RESIDENTIAL

Residential development is the most dominant land use throughout the watershed with 43 % characterized as residential. The five residential categories were created based on acreage: R-2A, R-1A, R-1/3A, R-1/4A and R-MF (refer to Table 2-7). Figure 2-8 illustrates the distribution of the residential land uses found in the watershed. Large homes on large properties are common in the watershed and found mainly in unsewered areas of the watershed. Denser development is found in the sewered areas of the watershed.

Figure 2-22. Typical R-2A single family home

Figure 2-23. Residential housing in Ossining.

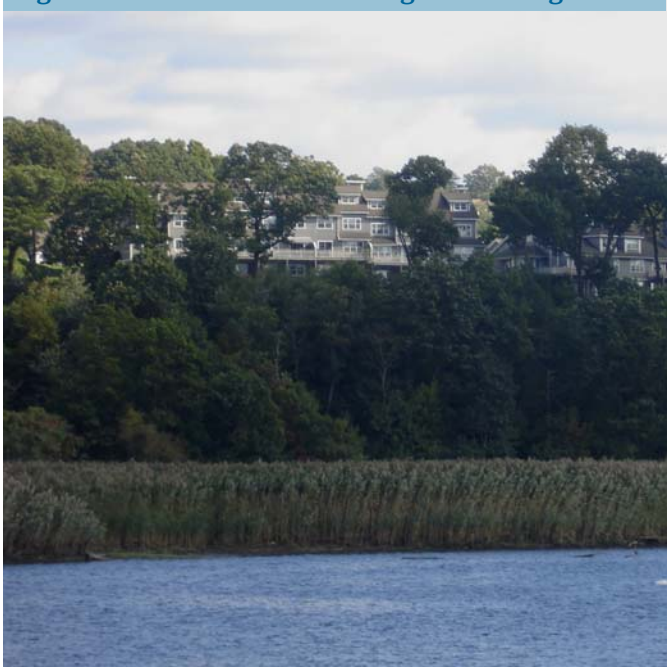
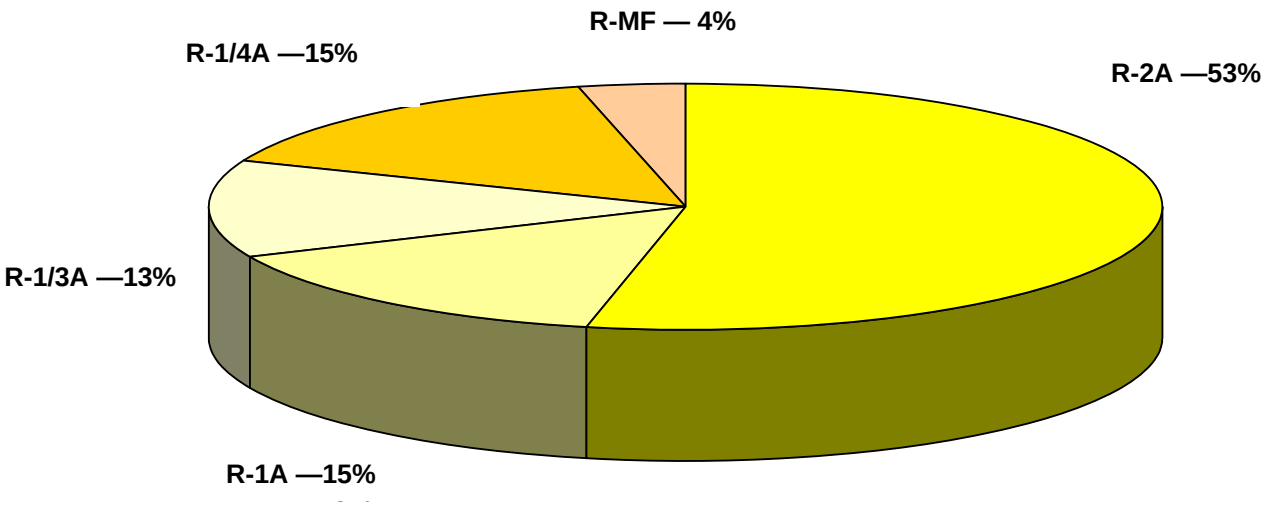


Figure 2-24: Distribution of residential land uses in the Croton Bay Watershed



NON-RESIDENTIAL

Non-Residential is the third largest general land use found in the watershed, making up 16% of the total watershed (refer to Figure 2-6). There are nine categories in the watershed under this heading that vary greatly in intensity of land use activities (refer to Table 2-7). Transportation and utility uses are the most prevalent non-residential land uses in the watershed due to the location of the Metro-North's Croton Harmon Station. Figure 2-9 displays the distribution of the non-residential land uses found in the watershed.

Figure 2-25. Distribution of non-residential land uses in the watershed

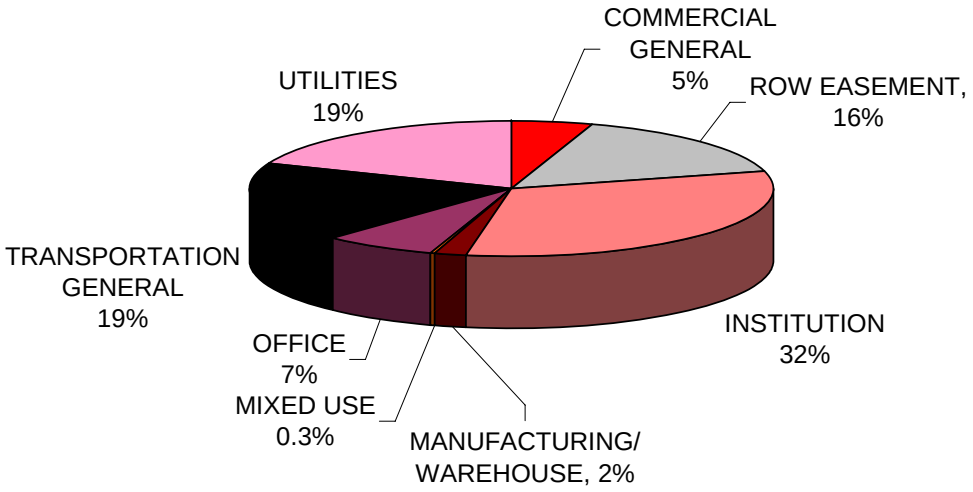


Figure 2-26. Commercial shopping center, Croton

Figure 2-27. Municipal Garage, Croton

OPEN SPACE:

Approximately 28% of the watershed can be classified as open space (refer to Figure 2-6). There are six categories of open space divided by the actual use of the land (refer to Table 2-7). This general land use group is the second largest land use group, after residential, in the watershed. As of 2004, there were 0.51 acres of open space for each one acre of residential use. Open space also includes a number of different land uses that are considered desirable land uses for environmental, recreational, wildlife and economic benefits. Figure 2-10 displays the distribution of the open space land uses found in the watershed.

UNDEVELOPED LAND

Approximately 11% of the Croton Bay Watershed consists of parcels that are undeveloped and are considered vacant land (refer to Figure 2-6). Undeveloped land has not been preserved as open space and is open for development and can be publicly or privately owned.

Figure 2-28. Croton Point Park, Croton

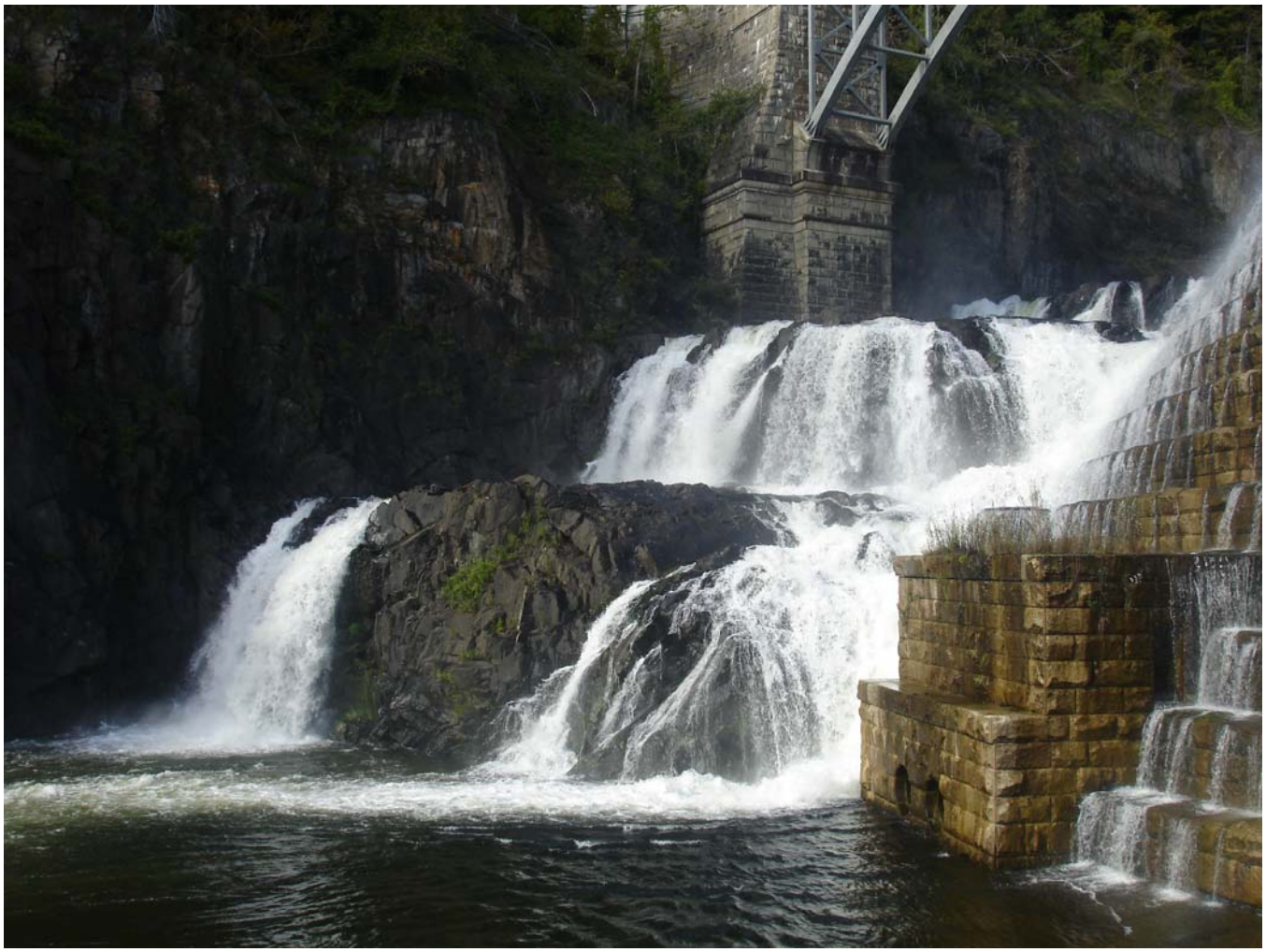
A. TOWN OF CORTLANDT

The Town of Cortlandt encompasses almost 35 square miles in northern Westchester. Although only 6% of the Town of Cortlandt is located in the Croton Bay Watershed, Cortlandt makes up 38% of the watershed. Cortlandt's area of the watershed is primarily large lot residential characterized by single family homes on parcels at least double the size found elsewhere in watershed.

Forty-two percent of the watershed in Cortlandt can be classified as steep slopes. In Cortlandt, steep slopes greater than 25% are primarily found adjacent to the Croton River where the parcels are generally residential or open space.

The Indian Brook Reservoir and its tributaries are very important environmental assets to the watershed. The Indian Brook Basin in Cortlandt is not fully developed. Any additional development could adversely impact water quality, especially without the utilization of stormwater best management practices. Such practices include measures such as leaf collection. Cortlandt has a leaf collection program and currently all leaf collection is done in the fall.

Figure 2-28. Croton Dam Falls, Cortlandt, New York



Many residents in Cortlandt are on private well water and no government monitoring exists for private wells. It is the homeowner's responsibility to monitor their water. Cortlandt has attempted to provide groundwater quality protection in the watershed through an overlay zone but the current provision does not provide adequate protection for groundwater drinking water sources.

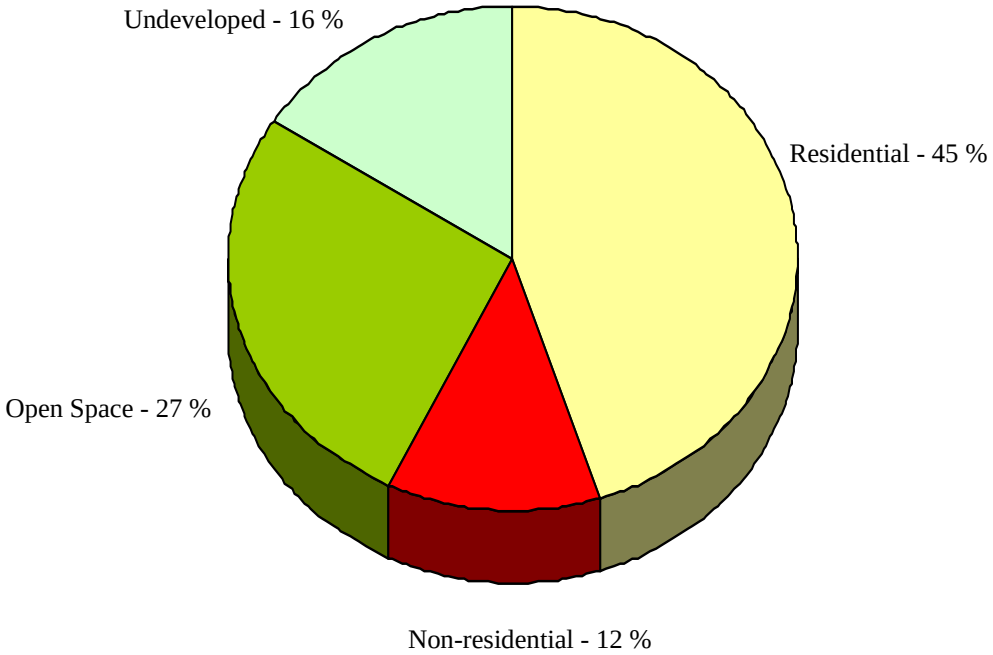
Cortlandt currently has environmental regulations that could potentially help to improve and protect water quality in the watershed. These regulations are included in the ordinance review and can be found in Supplement A: Additional Resources. The Town will be participating in Westchester County's EPA Phase II Stormwater Regulations Public Education and Outreach Program funded through NYS Environmental Protection Fund supported by the NYS DEC.

Cortlandt within the watershed is not sewered and no required monitoring of septic systems for proper functionality exists and malfunctioning septic systems could be a potential source of groundwater contamination.

A majority of the road runoff in Cortlandt's share of the watershed discharges into roadside swales. Properly constructed and maintained swales can be an environmentally friendly application to direct the flow of stormwater runoff. Many roadside swales in the Town, however, are not protected by vegetation or riprap and experience great amount of erosion. The erosion in the swales leads to structural instability of the road sides and increase in sedimentation in the receiving waterbody. In Cortlandt, the major area of concern exists along Quaker Bridge Road.

Outfalls in the Town discharge directly into the Croton River. Upon investigation,

Figure 2-29. Town of Cortlandt Land Use in the Croton Bay Watershed



the stormwater did not appear to be pretreated. Many outfalls discharge onto steep slopes causing the slopes to erode. The high rates of destructive erosion from stormwater discharges can lead to structural instability of the slopes and increase sedimentation of the Croton River.

CORTLANDT LAND USE SUMMARY:

Land in Cortlandt's area of the watershed is typified by large lot residential and open space. No hamlet area or commercial center exists. The residential areas are characterized as being semi-rural character. Route 129 is the only major road that goes through Cortlandt's area of the watershed. Croton Gorge Park, a County Park, is one of the largest uses of land as is the Danish Home, a retirement home for people of Danish Descent. The Danish Home practices organic gardening as a recreational activity for the residents. Figure 2-29 details the land use in Cortlandt's section of the watershed.

Undeveloped

Sixteen percent of the land area in Cortlandt is undeveloped, with the largest contiguous parcels of undeveloped land located between the Croton Aquifer and Quaker Bridge Road. If this land were developed, it could impact the water quality of the watershed by increasing impervious surfaces and stormwater runoff.

Nature Preserve, Parks and Conservation Land

Twenty-three percent of the land in Cortlandt consists of nature preserves, parks and conservation land. The largest park located in the Croton Bay Watershed is the Westchester County Croton Gorge Park, the site of the New Croton Dam which is National Register Landmark property.

Figure 2-30. Open Space in Cortlandt, New York

Non-residential

Institutional properties make up 5% of the total land area in Cortlandt and most parcels are underdeveloped. Institutional lands are approximately covered by 7% with impervious surfaces. If institutional land is developed to the fullest potential, impervious surface and the total stormwater runoff will increase.

R-2A: Lots of 2 Acres or Greater

A large portion of the R-2A district in Cortlandt does not have stormwater infrastructure. Sheet flow serves as the primary transportation method for stormwater runoff. If there is enough pervious surface for the water to infiltrate and water is not directed down steep slopes, sheet flow should not be a major concern. However, if development is to increase, flooding and pollutant loading from untreated stormwater runoff can become a major water quality issue. The primary areas of sheet flow concern are near the Croton River and waterbodies.

Figure 2-31. Typical R-2A land use in Cortlandt

B. VILLAGE OF CROTON ON HUDSON

The Village of Croton-on-Hudson's (Croton) area totals 3,056 acres of which 30%, 918 acres, is located in Croton Bay Watershed. Croton's portion of the watershed is only located only in Croton Gorge Basin, but encompasses the second largest area, 26 %, in the watershed by municipality. Figure 2-32 details Croton's land use in the watershed.

Croton's sole source of water comes from a drinking water aquifer. The Croton River is an important environmental asset not only to the watershed, but also to Croton aquifer. The river currently receives discharges from stormwater outfalls and sheet flow. A delicate ecosystem in the river and potential interaction between the river and Croton aquifer exists. Improving and monitoring the water quality of Croton River and determining how the flow regime affects the wildlife in Croton River corridor is important to protect the delicate balance of the river and aquifer.

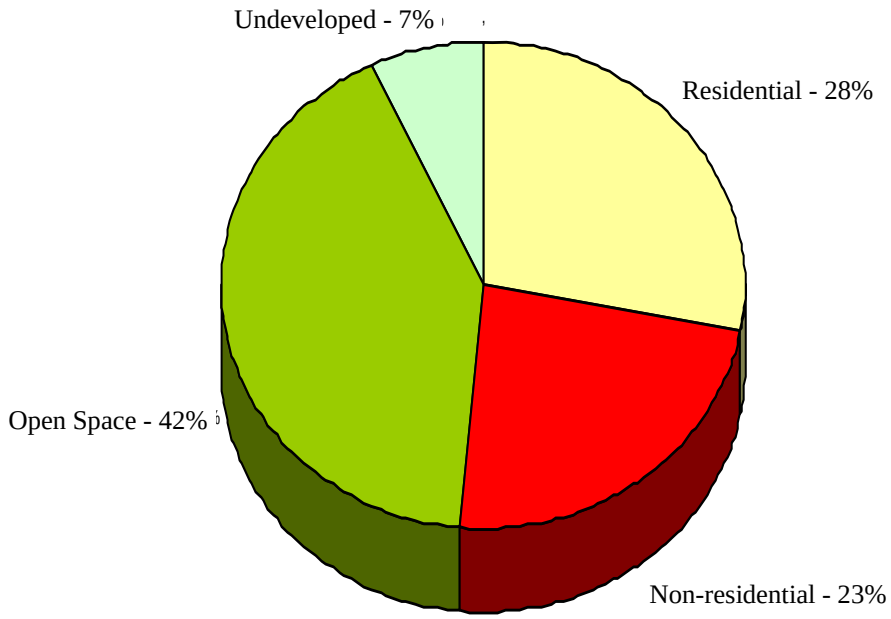
Additionally, it is very important that the Village maintain and monitor a sufficient buffer adjacent to the well fields to safe guard against contamination.

Wetlands in Croton have become degraded over the years as a result of invasive species. The greatest areas of concern are the tidal wetlands located along the Route 9/9A corridor. Eleven percent of Croton Bay Watershed soils are classified as hydric, a wetland indicator, although only 7% of the entire watershed is designated as wetland. Wetlands not identified by the federal or state government could therefore have the potential to become designated wetlands of local significance and some are located in Croton are in Croton Point Park and along Croton River. Twenty-two percent of Croton contains steep slopes. Most of the steep slopes are concentrated along Croton River and in developed areas.

The Village has a stormwater public information display, developed village stormwater newsletter inserts and will be participating in Westchester County's EPA Phase II Stormwater Regulations Public Education and Outreach Program funded through NYS Environmental Protection Fund supported by the NYS DEC. Croton currently has environmental regulations that help improve and protect water quality in the watershed. An ordinance review was conducted and can be found in Supplement A: Additional Resources.

Stormwater problem area investigations were conducted in Croton using site reconnaissance techniques. Currently, all stormwater runoff from Route 9/9A drains directly from the roadways discharging into Croton Bay. The Shop Rite Shopping Center, located on Riverside Avenue, has a large parking lot with little pervious surface. Sediments can be found throughout the parking lot that directly drain into

Figure 2-32. Village of Croton Land Use in the Croton Bay Watershed



the catch basins during each rainstorm. Currently no stormwater practices are being conducted in this area. Besides parking lot pollutants, dumpsters and other waste disposal containers exist which, if not properly maintained, could also contribute to stormwater runoff pollutants. Untreated runoff from the shopping center runs underneath Route 9/9A and into Croton Bay.

Land Use in Croton

The watershed slices through the Village of Croton taking in the full spectrum of land uses found throughout the Village. Croton is the most urbanized area within the watershed.

Residential

Twenty eight percent of the total land area in Croton is zoned for residential. Residential land use contributes to a majority of the nonpoint source pollution in Croton. The nonpoint source pollution comes from common activities in residential areas such as lawn care, car washing, pet fecal material and waste disposal.

Undeveloped

Seven percent of the total land area in Croton is undeveloped. Most of the undeveloped land is scattered throughout the Village, but found mostly in residential areas. Undeveloped parcels have a potential for development and if developed, may impact water quality of watershed due to an increase in impervious surfaces and stormwater runoff.

Parks and Conservation Land

Approximately 35% percent of the total land in Croton can be classified as historic, nature preserves, parks or conservation. A majority of this land is zoned for residential uses. A concern does not really exist for residential development but the potential increase of impervious surfaces by the existing land uses such as Croton Point Park or Van Cortlandt Manor.

Figure 2-33. Shop-Rite Plaza, Croton-on-Hudson, New York

Institution

Institutional land uses, which compose 4% of the total land area in Croton, are typically underdeveloped and are about 7% impervious. A potential exists under current regulations for further development of these properties and if further developed the total impervious surface and stormwater runoff will increase.

Nonresidential

Commercial and transportation uses comprise approximately 16% of Croton. Although nonresidential land uses are a small percentage of the total land area in Croton, nonresidential land uses typically have large areas of impervious surfaces and onsite activities that could degrade water quality. If stormwater from these parcels is not properly controlled and treated, these parcels have the potential to contribute significant pollutants into watershed. Major areas of concern are the shopping center located behind 9/9-A, Metro-North train station and Route 9/9-A.

C. TOWN OF NEW CASTLE

New Castle is approximately 26 square miles and about 3 % of the town is located in the watershed and almost entirely located in the Indian Brook Basin. The town comprises 15% of the watershed and similar to Cortlandt, most of town's watershed consists of single family homes on large lots.

Glendale wetland in New Castle is the largest and only upland NYS DEC designated wetland in the watershed. Steep slopes are found throughout the Town, primarily located on undeveloped and underdeveloped parcels. New Castle currently has environmental regulations to help improve and protect water quality. An ordinance review was conducted for the municipalities in the Croton Bay Watershed and can be found in Supplement A: Additional Resources.

The Town of Ossining wells are located on a large parcel in New Castle and some residents in the town rely on private well water for drinking water. New Castle has attempted to provide groundwater quality protection in the watershed through overlay zoning. New Castle has established an overlay zone to protect the Indian Brook Reservoir, but the restrictions are limited and pertain mostly to wetland buffers. Stormwater runoff flows as sheet flow towards the reservoir and reservoir tributaries. Current ordinance provisions do not provide adequate protection for all groundwater drinking water sources. Any additional development may have an adverse affect on the Indian Brook Reservoir water quality, especially if certain stormwater management practices are not instituted. Land surrounding the Indian Brook Reservoir in New Castle does not contain stormwater infrastructure.

Figure 2-34. Glendale Wetland, New Castle, New York

New Castle has an existing catch basin cleaning program. Most catch basins are cleaned once every year. To date, the sanitary sewers in the Town of New Castle have not been mapped and there is no official illicit discharge program in place. The town currently has a street sweeping program with streets swept twice a year by mechanical sweepers. The town participates in the Westchester County Household Hazardous Waste Collection Program and informs their residents of the program through informational mailings. No town leaf collection program in place. New Castle currently has no road salt management program or policies regarding snow disposal.

New Castle has education and outreach programs concerning stormwater which includes a section in the town's newsletter called Conservation Notes. The Town will also be participating in Westchester County's EPA Phase II Stormwater Regulations Public Education and Outreach Program funded through NYS Environmental Protection Fund supported by the NYSDEC. .

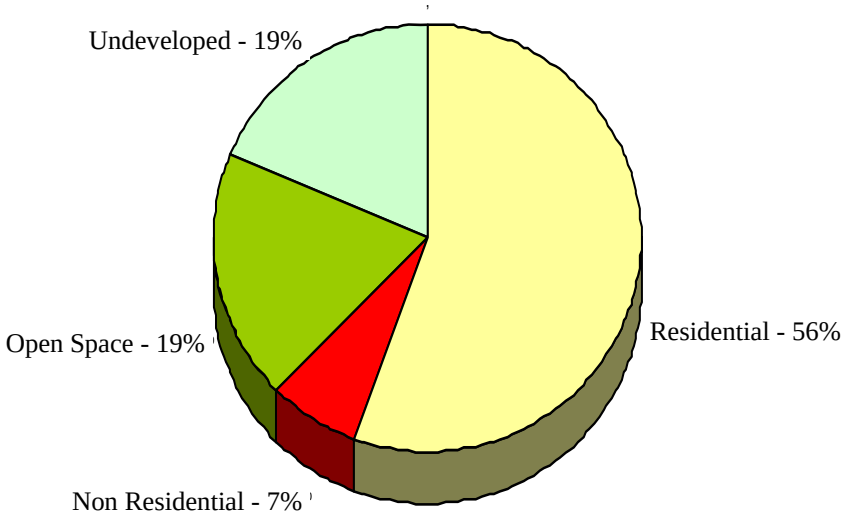
Land Use

Land in New Castle's area of the watershed can be typified similarly to that in the Town of Cortlandt, by large lot residential and open space. No hamlet area or commercial center exists. The residential areas are characterized as being semi-rural character, but no major roads pass through the town. Figure 2-35 details the land use in New Castle's section of the watershed.

Residential

Forty-eight percent of the watershed area in New Castle is zoned R-2A, two-acre residential. Eight percent of the watershed area in the town is zoned for R-MF, multi-family housing. Residential property impervious surface is only 7%, but residential land use generates a majority of the nonpoint source pollution found in New Castle. Also, many parcels found in R-2A zoning districts are underdeveloped and

Figure 2-35. Land Use in New Castle in the Croton Bay Watershed.



have a greater potential for development. Redevelopment in areas surrounding the Indian Brook Reservoir could potentially degrade water quality.

Undeveloped

Nineteen percent of the watershed area in New Castle is undeveloped. If the undeveloped land becomes developed it could potentially impact water quality in the watershed due to increases in impervious surface and thus stormwater runoff. Specific areas of concern include undeveloped properties surrounding the Indian Brook Reservoir.

Open Space

Approximately 12% of the watershed area in New Castle consists of nature preserves and parks. Proper management of preserve and park land adjacent to the Glendale wetland is considered to be of great importance for water quality protection.

Non-residential

Institutional land comprises 7% of the watershed in New Castle and is also underdeveloped. Currently, institutional land uses are covered with approximately 7% of impervious surfaces. If the institutional land uses are developed to the full potential the total impervious surfaces and associated stormwater will increase. New Castle has one of the largest institutions, the Asthmatic Children's Foundation of New York, in the watershed.

Figure 2-36. Asthmatic Children's Foundation of New York, Town of New Castle

D. TOWN OF OSSINING

The Town of Ossining has an area of 1,940 acres of which 29%, approximately 570 acres, are located in the watershed. The town has the third largest area in the watershed and is located in both the Indian Brook and Croton Gorge Basin. Figure 2-38 is shows the distribution of land use in the watershed.

Wetlands in the Town of Ossining consist of small Federal National Wetland Inventory (NWI) wetlands and one NYS DEC tidal wetland. The Indian Brook Reservoir and its tributaries are important environmental assets to the watershed. Underdeveloped land surrounds the Indian Brook Reservoir and if certain stormwater management practices are not instituted prior to development, any additional development could potentially degrade water quality in the Indian Brook Reservoir.

Twenty-three percent of the Town of Ossining can be classified at steep slopes. Steep slopes are found throughout the Town but tend to be concentrated along the Croton River and the Indian Brook Reservoir. Many of the steep slopes are located in areas that are already developed. If the land were to continue to be developed, increased erosion might result from an increase in stormwater runoff.

The Town of Ossining has environmental regulations that potentially can improve and protect water quality in the watershed. An ordinance review was conducted and can be found in Supplement A: Additional Resources. The town has not

Figure 2-37. View of Croton Bay from St. Augustine's Cemetery, Town of Ossining, New York

mapped stormwater infrastructure, catch basins and outfalls.

The Town of Ossining has a drinking water reservoir and it is important for the Town to maintain a buffer around the reservoir and provide that necessary storm-water management practices are instituted to protect water quality.

The Town of Ossining currently has education and outreach programs concerning stormwater consisting of informational mailings and a booth at the Village/Town of Ossining Fair. The town will also be participating in the Westchester County's EPA Phase II Stormwater Regulations Public Education and Outreach Program funded through NYS Environmental Protection Fund supported by the NYSDEC. The town participates in Westchester County's Household Hazardous Waste Collection Program and informs residents of the program by mail.

The town's current stormwater practices consist of catch basing cleaning, leaf collection and street sweeping. The Town of Ossining has an existing public catch basin cleaning program and most areas are cleaned annually with known problem areas being cleaned as necessary. The Town of Ossining collects leaf debris collection is done in the fall and in early winter by using a vacuum. Streets are usually swept by a Town-owned street sweeper four times per year. The Town of Ossining currently does not have a road salt management program or policies regarding snow disposal but all road salt is stored in a covered building.

Stormwater problem area investigations were conducted using site reconnaissance techniques with the town. Areas of concern were identified in the field:

Outfalls to Croton Bay and River

Untreated stormwater outfalls in the Town discharge directly into the Croton Bay and a often the discharge is on steep slopes causing erosion. The high rate of erosion creates both structural instability of the slopes and increased sedimentation of the bay. Stormwater outfalls of concern are located at St. Augustine's cemetery and Mystic Point condominiums.

Roadside Swales

A majority of the road runoff in the Town of Ossining discharges into roadside swales not protected by vegetation or riprap. The roadside swales are experiencing significant erosion that is creating structural road side instability and increasing sedimentation into the water. A major area of concern is located along Quaker Bridge Road.

Route 9/9A

Currently, all stormwater runoff from Route 9/9A drains directly from the roadways discharging into the Croton Bay. The stormwater is untreated and likely contributing pollutants into the Croton Bay.

Town of Ossining Land Use

Land use in the town's area of the watershed is typical for the Town of Ossining. The town is primarily residential with the exception of a few non-residential uses on large lots.

R-1/3A

Thirty-one percent of the Town of Ossining within the watershed is zoned for 1/3-acre lots and covered with 9% impervious surfaces. Many lots are underdeveloped with the potential for further development which could possibly lead to increase impervious surfaces and stormwater runoff. R-1/3A parcels surround the Indian Brook Reservoir in the town.

Undeveloped and Open Space

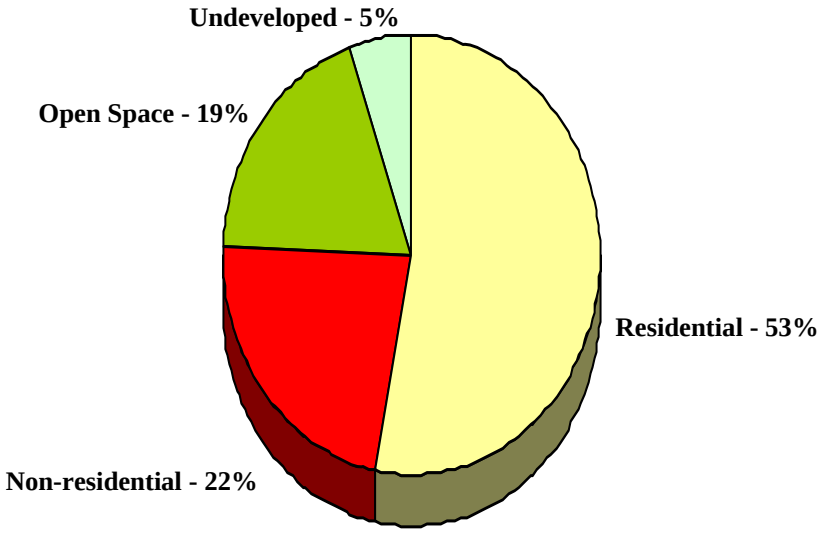
Five percent of the total land area in the Town of Ossining is undeveloped. Twelve percent of town in the watershed consists of nature preserves and parks.

Non-Residential

Office use comprises 7% of the total land area in the Town of Ossining and is also underdeveloped by current zoning standards. Currently, Office use consists only of the General Electric campus of which 16% is covered with impervious surfaces. If this parcel is developed to its fullest potential the total amount of impervious surface would potentially increase. The General Electric campus is also located adjacent to the Indian Brook Reservoir.

Approximately 11% of the Town of Ossining's land is Manufacturing or Warehouse. Although they do not make up a majority of the land area in the Town, the percentage of impervious surfaces is 15% and activities are associated with these uses that possibly generate polluted runoff.

Figure 2-38. Town of Ossining Land Use in the Croton Bay Watershed



E. VILLAGE OF OSSINING

The Village of Ossining area is 2, 036 acres of which 5%, approximately 99 acres is located in the Croton Bay Watershed. The Village of Ossining has the smallest land area of all municipalities in the watershed (3%) and is solely located in the Indian Brook Basin.

The Indian Brook Reservoir provides drinking water for the Village and even though the reservoir is located in the Town of Ossining it is owned by the Village. The Village is serviced by a sewer system that is treated at the County's Waste Water treatment facility located next to Sing Sing Correctional Facility in the Village.

Thirty-three percent of the Village of Ossining is classified as steep slopes. Steep slopes are found throughout the Village. Many of the steep slopes are located in developed areas. The Village of Ossining currently has environmental regulations that help improve and protect water quality in the Croton Bay Watershed. An ordinance review was conducted and the regulations can be found in Supplement A: Additional Resources.

The Village of Ossining currently has a street sweeping program for public streets. The Village has mapped stormwater infrastructure and will be participating in the Westchester County's EPA Phase II Stormwater Regulations Public Education and Outreach Program funded through the NYS Environmental Protection Fund supported by the NYSDEC.

The Village of Ossining has stormwater outfalls that discharge directly into the Croton Bay. The stormwater is not pretreated and often discharge occurs onto steep slopes causing erosion. The high rate of erosion on the slopes cause both structural

Figure 2-39. Indian Brook Reservoir, Town of Ossining, New York

instability of the slopes and increased sedimentation of the bay.

Currently, all stormwater runoff from Route 9 drains directly from the roadways and discharges into the Croton Bay. The stormwater is untreated and is most likely contributing many different types of pollutants to the Croton Bay.

Land Use in the Village of Ossining

Ninety four percent of the total area of the watershed in the Village of Ossining is zoned residential. Twenty-six percent of the residentially classified land in the Village of Ossining is covered with impervious surfaces and contributes a majority of the nonpoint source pollution found in the Village of Ossining. The nonpoint source pollution comes from common activities performed in residential areas such as lawn care, car washing and pet waste. Four percent of the watershed in the Village is classified as Open Space and 2% is classified as Non-residential.

Figure 2-40. Mystic Pointe, Village/Town of Ossining (photo credit Ginsburg Development Corporation)