4 Natural Resources

4.1 Geology and Soils

The State of Connecticut is composed of three distinct geologic units divided longitudinally across the state. These three units are known as the Western Uplands, the Central Valley, and the Eastern Uplands. The Western and Eastern Uplands are comprised of metamorphic rocks – rocks subjected to intense heat and pressure of the Earth's interior – while the Central Valley is a younger unit comprised of sedimentary rocks. The Central Valley began forming about 225 million years ago when the super-continent Pangaea began to break apart. A large rift formed a long, narrow valley through the middle of the state, eventually filling with sediments from the eroding hills to the east and west (presently known as the Eastern and Western Uplands). The sediments were compacted into soft, easily eroded, red and brown sandstones through which the Connecticut Rivers flows.

The North Branch Park River watershed is entirely within the Central Valley geologic region, which is separated from the Eastern Uplands by the Eastern Border Fault and the Western Uplands by the Cameron's Line Fault. The Central Valley is composed of Connecticut's youngest rocks (190 million years) and is primarily Brownstone (a sand-stone-like sedimentary rock) and Traprock (lava flows and intrusive rock). Talcott Mountain and the Metacomet Ridge form the western limit of the watershed. The Metacomet Ridge is a ridge of traprock that cuts across Connecticut from Branford to West Suffield and continues into western Massachusetts.

Drastic changes in the surficial geology have occurred within Connecticut since the formation of these geologic regions. Above the sandstone of the Central Valley lie extensive glacial deposits, or "glacial till," left as the large glaciers receded. Advancing glaciers left a moraine, or pile of glacial till, at Rocky Hill, Connecticut approximately 15,000 years ago. The moraine impounded the Connecticut River, forming Glacial Lake Hitchcock. Sediment settling out within the glacial lake laid down flat, fine deposits that result in high quality farmland in towns surrounding the Connecticut River north of Rocky Hill. Melting glacier ice formed rivers which sorted glacial till into layers of sand and gravel, or "stratified drift" (Bell, 1985).

The Natural Resources Conservation Service Soil Survey Geographic (SSURGO) database for the State of Connecticut indentifies five predominant surficial materials in the North Branch Park River watershed. Till is the predominant surficial material in the upland areas of the western portion of the watershed. The surficial material transitions to finer material moving east toward the Connecticut River. The northeast area of the watershed around Blue Hills Avenue is predominantly sand and fines. Smaller non-contiguous areas of surficial material include alluvial fines and thick till, which are found interspersed throughout the watershed.

The soil parent material in the watershed is predominantly bedrock in the western uplands west of the West Hartford Reservoir. The parent material gradually changes from bedrock to Ledgemont Till, then Glaciofluvial, Glaciolacustrine, and eventually Alluvial Floodplain moving east from the uplands toward the Connecticut River floodplain. The majority of the soil parent material in Hartford and the western portion of West Hartford is composed of Urban Influenced material.

4.2 Topography

The topography of the North Branch Park River watershed is generally characterized by steep hills along the Metacomet Ridge to the west, leading to a gently sloping valley on the eastern portion of the watershed near the Connecticut River. Based on U.S. Geological Survey topographic mapping of the area, elevations in the westernmost, upper portions of the watershed on Talcott Mountain are as high as 920 feet above mean sea level (MSL) sloping steeply (5-10% slope) eastward. The eastern portion of the watershed is gently sloped (less than 5%) with typical elevations of 130 feet above MSL. The elevation at the watershed outlet at the confluence with the South Branch Park River is less than 60 feet above MSL in an underground conduit. The Park River conduit discharges to the Connecticut River approximately 1 mile from the confluence of the North and South Branches at an elevation of approximately 10 feet above MSL. *Figure 4-1* presents a shaded relief map of the North Branch Park River watershed showing the variation in topography across the watershed.

4.3 Hydrology

The North Branch Park River is a 28.6-square mile (18,323 acre) sub-regional basin within the Park River basin (*Figure 2-1*). The watershed is located within the municipal boundaries of Avon, Bloomfield, Hartford, Simsbury, West Hartford, and Windsor, although greater than 97% of the watershed lies within the communities of Bloomfield, Hartford and West Hartford. The North Branch Park River has four named tributaries (listed upstream to downstream) – Tumbledown Brook, Wash Brook, Filley Brook, and Beamans Brook – that are fed by smaller tributaries in the upper portions of the watershed. Overall, there are approximately 48 miles of mapped perennial and intermittent streams within the North Branch Park River watershed. *Table 4-1* summarizes the miles of mapped streams within each subwatershed.

Table 4-1.Miles of Mapped Streams Within Each Subwatershed

Subwatershed	Length of Stream (miles)
Beamans Brook East	0.51
Beamans Brook West	2.59
Blue Hills Reservoir	1.70
Cold Spring Reservoir	3.96
Filley Brook	1.11
North Branch Park River	7.27
Tumbledown Brook	5.91
Tumbledown Brook South	5.15
Tunxis Reservoir	1.75
Wash Brook North	3.33
Wash Brook South	5.79
Wash Brook West	3.31
West Hartford Reservoir	4.30
Wintonbury Reservoir	1.35

Figure 4-1

Wash Brook begins north of Bloomfield Center and flows in a southerly direction to its confluence with Beamans Brook near the northwest corner of Hartford. Tumbledown Brook (also known as Tumble Brook), with its headwaters on the eastern slopes of Talcott Mountain, flows south, then east, and then north to its confluence with Wash Brook. Beamans Brook begins in the northeastern portion of the watershed and flows south to join Wash Brook. The junction of Wash and Beamans Brooks (just north of the Bloomfield-West Hartford town line) forms the North Branch Park River, which then flows in the southeastern direction through Hartford to its confluence with the South Branch.

The northern portion of the watershed drains to Wash Brook, which is located almost entirely in Bloomfield. The Wash Brook subwatershed is characterized by a commercial and industrial corridor along State Route 187 and moderate residential development, forested open space, golf courses, and some commercial and industrial facilities. The general patterns of natural drainage have not been significantly altered in this portion of the watershed. However, small impoundments and flood control reservoirs (that generally do not impound water during dry weather) are located throughout the upper portion of the watershed.

Drainage from the western portion of the watershed, a portion of the Tumbledown Brook watershed, is conveyed from the upland portions of the Talcott Mountain reservation area to the West Hartford Reservoir No. 6, controlled by the Metropolitan District Commission (MDC). Water from the Nepaug River, a tributary of the Farmington River, and Barkhamsted Reservoir is also diverted to West Hartford Reservoir No. 6. Water from West Hartford Reservoir No. 6 is treated at a facility located at the reservoir. Water may also be diverted from West Hartford Reservoir No. 6 to West Hartford Reservoir No. 5, which is located in the South Branch Park River watershed.

Filley Brook is a small intermittent stream that flows in a southerly direction through the center of Bloomfield. Filley Brook joins Wash Brook south of Cottage Grove Road (State Route 218), less than a quarter-mile upstream from the confluence of Wash Brook and Beamans Brook where the North Branch Park River begins.

The mainstem of the North Branch Park River flows through the southern and eastern portions of the watershed. The majority of the North Branch Park River subwatershed is located in Hartford and West Hartford and is characterized by high-density urban development, including primarily residential, institutional, and commercial land use. The channel of the North Branch Park River and significant portions of the drainage in this section of the watershed have been significantly altered from natural conditions as a result of urban development. An approximately half-mile section of the North Branch flows underground through a conduit system before reaching the confluence with the South Branch and ultimately flowing to the Connecticut River via the Park River conduit.

Figure 4-2 shows the seasonal pattern of mean monthly streamflow in the North Branch Park River measured at the stream gage 60 feet downstream from the stone-arch bridge on Albany Avenue in Hartford and 3 miles upstream from the confluence with the South Branch (United States Geological Survey Stream Gage 01191000, at Hartford, CT [Latitude 41°47'03", Longitude 72°42'31" NAD27]) for the period of record (11/1/36 to 9/30/86). Note that stream flow measurements have been discontinued at this stream gage. Normalized by drainage

area, the streamflow data in *Figure 4-2* are presented in units of cubic feet per second per square mile (CFSM). The highest streamflow generally occurs during March and April, while seasonal low-flows typically occur during late summer or early fall.

The United States Geological Survey (USGS) has also estimated peak-flow magnitudes for 1.5-, 2-, 10-, 25-, 50-, 100- and 500-year recurrence intervals (corresponding to exceedance probabilities of 0.67, 0.50, 0.10, 0.04, 0.02, 0.01, and 0.002, respectively) based on historical streamflow measurements at the North Branch Park River stream gage location near Albany Avenue (Ahearn, 2003). *Table 4-2* summarizes peak flow frequency estimates for given recurrence intervals and the maximum known peak flow for the North Branch Park River. Beginning in 1963, flows in the North Branch Park River watershed were affected by flood control regulation resulting from the construction of the Cold Spring, Bloomfield (Tunxis), Wintonbury, and Blue Hills flood control reservoirs. Details of these flood control reservoirs are presented in Section 5.1.

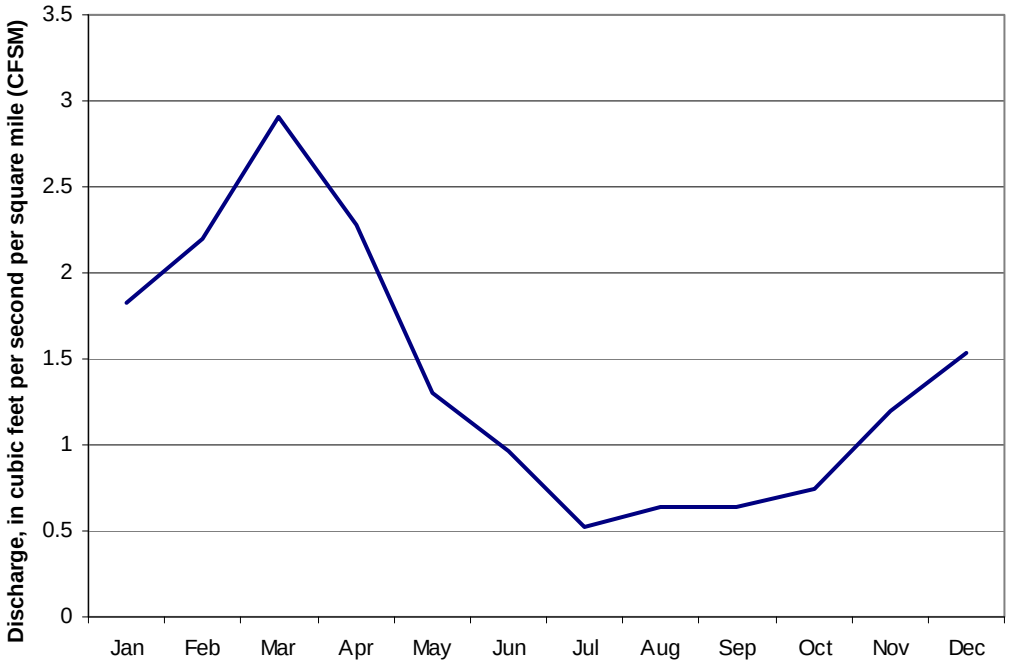

Figure 4-2. Mean Monthly Streamflow of North Branch Park River

Table 4-2.Peak Flow Frequency Estimates and Maximum Peak Flow	
Parameter	**Peak Flow (cubic feet per second)**
Peak-flow frequency estimates for given recurrence interval	
1.5 years	943
2 years	1,150
10 years	2,460
25 years	3,430
50 years	4,330
100 years	5,400
500 years	8,760
Maximum Known Peak Flow	
August 19, 1955	10,000

Source: Based on stream flow data from USGS Gage Station 01191000, North Branch Park River at Hartford, period of record 1936-1962 and 1963-1996 (regulated) (Ahearn, 2003).

4.4 Flood Hazard Areas

Figure 4-3 depicts flood hazard areas within the North Branch Park River watershed, including the 100-year and 500-year flood zones and CTDEP Stream Channel Encroachment Lines (SCELs). Flood zones are defined by the Federal Emergency Management Agency (FEMA) as the area below the high water level that occurs during a flood of a specified size. FEMA also defines a "floodway" as the stream channel and adjacent areas that carry the majority of the flood flow at a significant velocity, whereas "floodplain" also includes the flood fringe or areas that are flooded without a strong current. SCELs are regulatory boundaries associated with selected rivers and streams in Connecticut that define the jurisdiction of CGS Sections 22a-342 through 22a-349a. These areas are similar to floodways and delineate the portion of the waterway that is considered necessary for passage of flood flows. SCELs are mapped for the North Branch Park River upstream of Albany Avenue; Tumbledown Brook between its confluence with Wash Brook and Cold Spring Reservoir; Beamans Brook between its confluence with Wash Brook and the Blue Hills and Wintonbury Reservoirs, and Wash Brook to the Tunxis Reservoir. All of the SCELs in the North Branch Park River Watershed were established in 1965.

The September 2008 Hartford County Flood Insurance Study (FIS) prepared by FEMA indicates that much of the 100-year flood zone in the watershed is free of development. However, low-lying areas along the lower portions of the North Branch Park River routinely experience flooding, including buildings along Woodland Drive, Dillon Road, and Woodside Circle as well as other areas.

An example of flooding that is common along the lower portion of the North Branch Park River during a January 2006 storm.

Figure 4-3

The upper segment of the North Branch Park River from the confluence of Wash and Beamans Brooks to the Bloomfield/West Hartford boundary is another large flood-prone area, including residences on the east side of Kenwood Circle.

Based on the floodway information included in the 2008 FEMA FIS, the widest portion of the floodway along the North Branch Park River is approximately 1,000 feet downstream of the University of Hartford Road Dam (551 feet wide), while the narrowest portion of the floodway occurs near the conduit entrance (53 feet wide). The FIS reports the highest estimated water velocity within the North Branch Park River occurs near the University of Connecticut Road (10.1 feet per second) and the lowest is approximately 1,000 feet downstream of the confluence of Wash and Beamans Brooks (1.2 feet per second).

4.5 Climate

The North Branch Park River watershed is located in an area with a temperate and humid climate. The annual average precipitation in the Hartford area is 44.29 inches. Rainfall is fairly evenly distributed throughout the year. The wettest month of the year is May with an average rainfall of 3.99 inches, while the driest month is February. During a normal winter, snow cover can accumulate the equivalent of 5 inches of precipitation (average snowfall is 49 inches). On average, the Hartford area experiences approximately 128 days per year with 0.01 inches or more of precipitation. Typical air temperatures in the watershed are relatively mild with 19 days per year on average when temperatures are above 90° F and six days per year when temperatures are below 0°F.

Changes in climate are anticipated to occur over the next century. The magnitude of changes in temperature, sea level, and the timing and intensity of rainfall will depend upon future emissions of carbon dioxide and other greenhouse gases driving climate change. However, using different emissions scenarios, climate modelers have predicted the following changes to the climate in the Northeast United States as summarized below (Ashton et al., 2007; Fogarty et al., 2007; Frumhoff et al., 2007; Hayhoe et al., 2008; Kirshen et al., 2008).

Changes in climate are anticipated to occur over the next century. The magnitude of changes in temperature, sea level, and the timing and intensity of rainfall will depend upon future emissions of carbon dioxide and other greenhouse gases. In the Northeast, the anticipated hydrologic response will be higher winter and lower summer streamflow.

Over the next several decades, temperatures are anticipated to rise 2.5-4°F in winter and 1.5-3.5°F in summer. By the end of the century, winter temperatures are predicted to rise 5-12°F and summer temperatures 3-14°F compared to current conditions. As a result, days over 90°F will be more frequent, there will be a longer growing season, less winter precipitation falling as

snow and more as rain, a reduced snowpack, and an earlier spring snowmelt. In addition, regional sea surface temperatures are expected to rise 4-8°F by 2100.

The Northeast is anticipated to experience an increase in total precipitation of about 10% or 4 inches on an annual basis by the end of the century. Seasonally, winter precipitation is predicted to increase 20-30%, while summer precipitation amounts will remain relatively unchanged. In addition to increased precipitation amounts, more extreme precipitation is expected. Current model predictions include an increase in the precipitation intensity, i.e., the average amount of rain falling on a rainy day, and the number of heavy precipitation events. Precipitation intensity is predicted to increase 8-9% by mid-century and 10-15% by the end of the century. An 8% increase in the number of heavy precipitation events is expected by mid-century, with a 12-13% increase by the end of the century. The anticipated hydrologic response will be higher winter and lower summer streamflow.

4.6 Wetlands

4.6.1 Resource Description

Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance. Wetlands and buffer zones between watercourses and developed areas help to preserve stream water quality by filtering pollutants, encouraging infiltration of stormwater runoff, and protecting against stream bank erosion.

Wetlands are considered valuable because they clean surface waters, recharge water supplies, reduce flood risks, and provide fish and wildlife habitat. In addition, wetlands provide recreational opportunities, aesthetic benefits, and sites for research and education.

Differing definitions of wetlands are used in Connecticut depending on the legal jurisdiction being considered. The State of Connecticut designates wetlands by soil classification since certain soils can cause groundwater to linger near the ground surface and since, conversely, groundwater lingering near the ground surface tends to transform soil characteristics. Wetland soils can also be defined by landscape position. The following classes of soils are defined by the Connecticut Inland Wetland and Watercourses Act (CTDEP, 2009).

- *Poorly drained soils*. These soils occur in places where the groundwater level is near or at the ground surface during at least part of most years. These soils generally occur in areas that are flat or gently sloping.

- *Very poorly drained soils.* These soils are typically characterized by groundwater levels at or above the ground surface during the majority of most years, especially during the spring and summer months. These areas are generally located on flat land and in depressions.

- *Alluvial and floodplain soils.* These soils form where sediments are deposited by flowing water, and thus typically occur along rivers and streams that are flooded periodically. The drainage characteristics of these soils vary significantly based on the characteristics of the flowing water, ranging from excessively drained where a stream tends to deposit sands and gravel to very poorly drained where a stream deposits silts or clays.

Connecticut's definition of inland wetlands is based on soil characteristics. In contrast, the Federal Clean Water Act definition for wetlands is based on a three-part criteria: 1) soil characteristics; 2) hydrophytic vegetation; and 3) hydrology. The federal wetland designation, established by Cowardin *et al.* (1979) defines wetlands as:

> "Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominately hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water as some time during the growing season of each year."

Vernal pools are a unique category of wetlands. A vernal pool is an isolated land depression which lacks a permanent aboveground outlet. Vernal pools vary in size and may be the size of a small puddle or shallow lake. In the Hartford area, as is true for much of the Northeast, a vernal pool fills with freshwater in the fall and winter due to the rising water table and/or in the spring due to the meltwater from winter snow and runoff from spring rains. Many vernal pools in the Northeast are covered with ice in the winter months. They contain water for a few months in the spring and early summer but by late summer, are generally dry.

As vernal pools usually dry up during a period of most years, species tend to use the area for specific portions but not all of their life cycle. "Obligate" vernal pool species (typically reptiles and amphibians) are those that must use a vernal pool for a portion of their life cycle. Common obligate species in Connecticut include spotted, Jefferson's, and marbled salamanders, wood frogs, eastern spadefoot toads, and fairy shrimp.

Vernal pools are unique and very fragile, containing significant biodiversity, frequently including endangered plants and animals. They are typically threatened by adjacent land uses and development including changes to the natural topography. Given the importance of these microhabitats, the EPA, CTDEP, and the U.S. Army Corps of Engineers regulate their protection.

4.6.2 Existing Wetlands Information

Figure 4-4 depicts the extent and distribution of wetland soils in the North Branch Park River watershed based on Natural Resources Conservation Service soil classifications, following the State of Connecticut definition. *Figure 4-4* also shows wetland classifications available from the U.S. Fish & Wildlife Service National Wetlands Inventory. State-designated wetlands and surface waters comprise nearly 20% of the overall watershed (approximately 3,600 acres), while approximately 8% of the watershed area (approximately 1,500 acres) is mapped as freshwater emergent wetlands or freshwater forested/shrub wetlands following the Federal definition or as surface waters.

Mapped wetland soils are generally located in riparian and floodplain areas along the North Branch Park River and its tributaries. The concentration of wetland soils is generally higher in the less developed northern portions of the watershed such as Bloomfield, and significantly lower in the southern, more densely-developed areas of the watershed such as Hartford and West Hartford. *Table 4-3* summarizes wetland soils coverage by subwatershed.

Table 4-3. Wetlands in the North Branch Park River Watershed

Subwatershed	Area of Mapped State Wetlands & Surface Waters (ac)	% of Subwatershed	Area of Mapped Federal (NWI) Wetlands & Surface Waters (ac)	% of Subwatershed
Beamans Brook East	50.7	31.2%	19.3	11.8%
Beamans Brook West	320.6	27.1%	57.9	4.9%
Blue Hills Reservoir	259.1	25.0%	83.8	8.1%
Cold Spring Reservoir	225.3	19.5%	145.9	12.6%
Filley Brook	39.2	9.7%	14.0	3.5%
North Branch Park River	447.2	11.1%	115.3	2.9%
Tumbledown Brook	344.7	22.1%	101.5	6.5%
Tumbledown Brook South	336.3	20.7%	116.5	7.2%
Tunxis Reservoir	240.6	27.5%	141.0	16.1%
Wash Brook North	123.1	16.2%	55.5	7.3%
Wash Brook South	280	18.0%	117.2	7.5%
Wash Brook West	350.7	34.1%	170.5	16.6%
West Hartford Reservoir	337.4	16.5%	255.5	12.5%
Wintonbury Reservoir	239.5	26.8%	67.7	7.6%
North Branch Park River Watershed	**3,594.6**	**19.6%**	**1,461.7**	**8.0%**

The Town of Bloomfield completed a town-wide wetlands inventory in 1985 (Inwoods Environmental Consultants, 1985). The inventory identified and mapped wetland areas within the Town and evaluated these areas for their hydrologic, biological, and cultural functions using a common rating scale to allow for relative comparisons between wetlands. The Bloomfield inventory identified a number of priority wetlands for preservation and protection because of their importance in maintaining water quality, providing open space and wildlife habitats, and

Figure 4-4

providing flood protection. The 1985 inventory concluded that relatively few wetlands are providing significant water quality protection functions, but many of Bloomfield's wetlands are providing valuable wildlife habitat, recreational sites, and flood protection.

The Town of Bloomfield has also identified numerous vernal pools within the North Branch Park River watershed, which are shown on the Town's inland wetlands and watercourses maps (http://www.bloomfieldct.org/adminonline/upload/1223961542_Wetlands_Index_Web_Dial Up.pdf) but were unavailable digitally for incorporation into the mapping for this report. Inland wetlands and watercourses mapping is also available for the other watershed municipalities.

4.6.3 Wetlands Field Assessment

A field assessment of selected wetlands throughout the North Branch Park River watershed was performed to augment the existing wetland information and mapping. The purpose of the field assessment was to evaluate the current functions and values of representative wetlands in the watershed and to compare current wetland conditions to those identified in the 1985 Bloomfield wetland inventory. Details of this assessment are presented in the following sections.

4.6.3.1 Selection of Study Areas

As indicated in *Table 4-3,* areas classified as State-designated wetland soils account for more than 3,500 acres (more than 5.5 square miles) of land in the North Branch Park River watershed. Given the limited resources available for this baseline watershed assessment, a desktop analysis was performed to identify a priority list of wetlands for field assessment, which are representative of wetlands throughout the entire watershed. Several wetlands were selected for field assessment from the categories listed below. Additionally, some of the wetlands that were previously assessed in the 1985 Bloomfield wetland inventory were selected for comparison purposes. The selected wetlands are shown in *Figure 4-5*.

- *Baseline Wetlands.* These are large, high-quality wetlands located in protected open space areas with little development in their contributing drainage areas. These baseline wetlands can provide a basis for comparison to wetlands in more developed areas. Wetlands in the vicinity of the Blue Hills Reservoir in Bloomfield and Hoe Pond in West Hartford were selected as baseline wetlands. The Blue Hills Reservoir was also assessed in 1985 (referred to as wetland #34 in the 1985 inventory).

- *Headwater Wetlands.* These wetlands are located at or near headwater areas of mapped streams, but may be at risk for impacts from future development. Hoe Pond and the associated wetlands were identified as representative of this category, since it is located on private land in the Reservoir No. 6 watershed. Several other wetlands listed below are also located in headwater areas with future development potential, including Dudley Town Pond and Adams Road to Duncaster Hollow.

Figure 4-5

- Potentially Impacted Wetlands. These wetlands are located near more urbanized areas of where wetland impacts are more likely. Wetlands near several different land uses were assessed, including residential, commercial, and industrial development, agriculture, and unsewered areas. The wetland areas assessed in this category include:
    - Croydon Drive, North Branch Park River subwatershed – This wetland, identified as Wetland #5 in the 1985 inventory, is located in the North Branch Park River subwatershed near the municipal boundaries of Bloomfield, Hartford, and West Hartford and is located adjacent to an older residential neighborhood.
    - School Street/Wheeler Park, Beamans Brook West subwatershed – This area includes wetlands assessed in 1985 as Wetland #30 and a portion of Wetland #26, and is located near former agricultural land west of School Street in Bloomfield.
    - COPACO Shopping Mall, North Branch Park River subwatershed – The wetland assessed in this location consists of a portion of wetland #4 in the 1985 inventory, and is located west of Goodman Street in Bloomfield, adjacent to commercial land use.
    - Cliffmont Open Space, Tumbledown Brook subwatershed – This wetland, assessed in 1985 as wetland #20, is adjacent to residential land uses between Burnwood and Cliffmont Drives in Bloomfield.
    - Sunset Lane and Valley View Drive, Wash Brook South subwatershed – This wetland is adjacent to residential and agricultural land uses and was assessed as Wetland #23 in 1985.
    - Adams Road to Duncaster Hollow, Wash Brook West subwatershed – This headwaters portion of previously-assessed Wetland #38 is adjacent to agricultural land use areas.
    - Dudley Town Pond, Wintonbury Brook subwatershed – This wetland, near the headwaters of Beamans Brook and located south of Route 187, is adjacent to commercial/industrial land uses.

4.6.3.2 Assessment Methods

The selected wetlands were assessed by New England Environmental, Inc. (NEE) on September 14, 2009 using the "Highway Methodology" developed by the U.S. Army Corps of Engineers. This is a descriptive methodology in which a standard set of criteria are evaluated for each wetland. These criteria indicate the degree to which a particular function or process is present in a wetland, and ultimately allow an assessment of the "principal" functions associated with the wetland.

4.6.3.3 Assessment Results

The assessed wetlands range from completely isolated to fully integrated with watercourses, from small to large, from degraded to relatively pristine, and include the full range of wetland types, often in combination. Below is a summary of the assessment results for the selected wetlands. The complete letter report, functions and values forms, and hand sketches of the wetland locations are included in *Appendix A*.

Blue Hills Reservoir

The assessment was performed in the southwestern portion of the Blue Hills Reservoir, which lies within the Beamans Brook East subwatershed. The assessment transect passed through wet meadow and marsh in the open, southern end of the site, shrub habitat and a small stream walking north, a recreational field which contains large patches of mown wet meadow, a Red Maple swamp adjacent to another stream north of the field, mixed shrub/herbaceous and wetland/upland along a power line easement, and exited along the reservoir dike. The reservoir (which is not normally flooded) contains a mosaic of uplands as well as wetlands.

As noted in the 1985 report, this is a diverse and rich habitat, protected as open space. Aside from ongoing maintenance of the recreational field and the power line corridors, and its function as flood control in extreme storm and meltwater events, it will remain a large unit of undisturbed habitat. The site contains multiple circles on the CTDEP Natural Diversity Data Base (NDDB) map. Although the transect did not run through any potential vernal pools, vernal pools could be potentially present in wooded areas north and east of the transect route.

School Street – Wheeler Park

Wheeler Park is located in a former agricultural field west of School Street. It is maintained in an open condition by seasonal mowing. It incorporates both wetland #30 and a portion of wetland #26 from the 1985 inventory. It was mown in late summer 2009, and periodic mowing may be a consistent policy to preserve grassland bird breeding capacity. The mowing practices noted in 1985 are now limited, and grazing, and agricultural practices noted then now appear to be eliminated, improving the habitat functions and reducing erosion potential. Its park status and location adjacent to Bloomfield Middle School enhance its capacity to provide educational and recreational functions. Its groundwater and surface water quality functions remain important.

COPACO Shopping Center

Although much of this area was altered in the past and continues to be impacted by stormwater runoff from the shopping center and other nearby impervious areas, a square-shaped wooded portion in the southeast corner of the assessment area remains relatively undisturbed. Open water and marsh dominate the northern end of this wetland. Four distinct vernal pools (breeding habitat not confirmed) are evident within the undisturbed woods. One of them held a small amount of water on the date of the assessment, while the other three were dry. Because of the large amount of water directed to these wetlands from developed areas, they provide important water quality functions.

Wooded wetland near the COPACO Shopping Center (NEE, 2009).

Croydon Drive

Much or all of the forested swamp designated as wetland #5 in the 1985 inventory is hydrologically isolated on the surface, and contains potential vernal pool habitat in isolated depressions. The 1985 assessment classified this area with low wildlife habitat function, due to the assessment matrix used, which did not take into account important connectivity and contextual qualities. The area is connected to a long stretch of the North Branch Park River by relatively undisturbed forest, and contains tightly interspersed wetlands and uplands.

Hoe Pond

Hoe Pond is impounded by a dam at the south end, and its outlet flows though an extremely rocky channel to the east, ultimately discharging to West Hartford Reservoir #6. It occupies an unusual place in the landscape for a pond, near the top of a stony ridge with steep slopes nearby on the west and east. Emergent wetlands along the shore are narrow. The pond and its shoreline are on private land, but this land is surrounded on three sides by Talcott Mountain State Park. The south end is covered by a habitat circle on the NDDB map.

Cliffmont Open Space

This small isolated wetland is within a pocket of open space in the middle of a mature residential development, and appears to have changed very little since its assessment in 1985. It is in a wooded depression with no outlet, and does not apparently hold standing water for an extended period. It has a groundwater recharge function, and provides limited wildlife habitat and educational/recreational opportunities within its residential setting.

Outlet stream from Hoe Pond (NEE, 2009).

Sunset Lane and Valley View Drive

This is a wetland fragmented and altered by agricultural use (now reduced to a single corn field) and residential development. While the corn field and surrounding residential neighborhoods continue to exert pressure on this wetland corridor, it remains a diverse system providing important functions, especially with respect to water quality. The main stream running through the middle of the corridor drains east to Wash Brook. A marsh south of Sharon Lane, identified as a cat-tail marsh in 1985, is now dominated by Common Reed (*Phragmites australis*). The wetland north of Sharon Lane is a patchwork of Red Maple swamp, marsh, and shrub/scrub habitat.

West of the end of Ryefield Hollow Drive on the west side of the stream, an area of extensive wetland vegetation is present in the bottom of the plowed field. The resource area also includes open water at a small pond west of Countryview Drive, with a wet meadow covered with Reed

Canary-grass and an open stream channel bordered by Alders and other shrubs nearby. From the end of Valley View Drive, the transect accessed the wooded swamp adjacent to the main stream as it turns east. There are some shallow potential vernal pools in this area, and also some trash and abandoned vehicles and equipment, as noted in the 1985 report. The northernmost section of woods, extending to Terry Plains Road, is within a circle on the NDDB map.

Adams Road to Duncaster Hollow

Ground-pine on former farmland (NEE, 2009).

The wetland complex assessed in 2009 is within the northern, headwaters portion of a large wetland system, #38 in the 1985 inventory. A portion of this wetland north of Adams Road and south of Duncaster Hollow was assessed. The area is a patchwork of old farmland in various stages of regeneration, from second growth forest to recently abandoned fields. Varieties of habitat observed included wet meadow, shallow marsh, and shrub/scrub patches. Among the diverse wetland vegetation, Swamp Lousewort (*Pedicularis lanceolata*), a rare plant (listed as Threatened in Connecticut) was observed. A circle on the NDDB map touches the southwestern corner of the wetlands assessed where the plant was found. A second area of this wetland complex was also assessed. The transect followed an old farm road extending from Duncaster Road to Harvest Lane, running along the northern edge of a large open field that appeared to have been farmed recently but was fallow or abandoned at the time of assessment. The eastern end of the field is dominated by wetland vegetation, and beyond the edge of the field is a wooded swamp. North of the old farm road is a dammed farm pond, surrounded by woods on three sides. As noted in 1985, this is a diverse, functionally-rich wetland system.

Dudley Town Pond

Commercial and industrial development along Dudley Town Road borders this pond to the east. A very large warehouse complex was recently built to the northwest, and a large area which was previously forested to the west has now been cleared and was in the process of being regarded at the time of the assessment. Emergent wetlands extend out from the pond to the north and northwest. The pond and these wetlands are generally protected by a forested buffer in most places, but the pond is suffering from eutrophication. On the date of assessment, it was almost completely covered with a thick, green, foul-smelling scum. Ducks were landing in the water at the northern end of the pond despite the algae, but the southern end was covered in a solid mat of thick algae. A wooded swamp and open cat-tail marsh are present along a northwest branch of the pond. With the exception of the wetlands along the stream corridors to the north and northwest, the wetland fringe around the pond is narrow.

The 1985 inventory lists under upstream impacts, "direct runoff from surrounding industries into the pond." However, it does not mention eutrophication, and specifically mentions diverse wildlife use around the pond. It appears that there has been significant degradation of this pond and wetlands since 1985.

4.7 Fish and Wildlife Resources

Portions of the North Branch Park River have abundant habitats supportive of a variety of fish and wildlife. Various waterbodies, wetlands, and upland areas provide habitat for fish, mammals, amphibians, and birds. Ecological assets in the Park River include common species such as the great blue heron, mallard, wood ducks, white-tailed deer, coyote, and fox. A 1988 fish survey by the CTDEP Fisheries Division found pickerel, abundant blacknosed dace, large-mouth bass, and other varieties of fish (Normen, 2008).

A number of relatively large areas of open space are present within the North Branch Park River watershed. These areas, which are generally located in the upper reaches of the watershed, vary in their level of protection and quality of their habitats. See Section 7.1 for a discussion of open space in the watershed.

4.7.1 Fish

The North Branch Park River and its tributaries support a variety of fish species despite the significant level of development within the watershed and historical modification of the rivers and streams including channel modifications, road crossings, flood control dams, and other impoundments.

The CTDEP Ambient Monitoring Program conducted ambient fish community sampling in 2000 in the North Branch Park River at Albany Avenue and in 2008 in Wash Brook at Cottage Grove Road. The fish species observed in Wash Brook were all native, including plentiful numbers of Blacknose dace, Longnose dace, Tesselated darter and White sucker. A combination of native and exotic species was identified in the North Branch Park River, including the exotic species Bluegill sunfish, Carp, Largemouth Bass, and Rock Bass. *Table 4-4* summarizes the fish species identified during these surveys.

Table 4-4. Fish Species Surveyed in the North Branch Park River Watershed

Fish Species	North Branch Park River (8/22/00 Survey)	Wash Brook (6/13/08 Survey)
American eel	15	2
Banded killifish	1	--
Blacknose dace	4	46
Bluegill sunfish	3	--
Carp	8	--
Common shiner	1	--
Fallfish	--	6
Largemouth Bass	3	--
Longnose dace	3	34
Pumpkinseed	15	--

Table 4-4. Fish Species Surveyed in the North Branch Park River Watershed

Fish Species	North Branch Park River (8/22/00 Survey)	Wash Brook (6/13/08 Survey)
Pumpkinseed X Red breast	1	--
Redbreast sunfish	9	1
Rock Bass	8	--
Tesselated darter	69	28
White sucker	23	26

4.7.2 Birds

As noted in the Eastern Connecticut Environmental Review Team Report (2000), blue heron, mallards, wood ducks, belted kingfisher, American robin, blue jay, northern flicker, mourning dove, American goldfinch, catbird, black-capped chickadee, tufted titmouse, and American crow have been observed along the North Branch Park River.

The Atlas of Breeding Birds of Connecticut (1994) collected information from 1982 to 1986 and found approximately 97 confirmed or probable species in the watershed. A complete species list is provided in *Appendix B*.

Mr. Jay Kaplan of the Roaring Brook Nature Center has organized summer bird counts (second weekend in June) along the North Branch Park River from Route 44 north to the University of Hartford Magnet School over the past two years (2008-2009). During these counts 32 species were observed including red-tailed hawk, barn swallow, and Baltimore oriole. It should be noted that the count only indicates birds which were observed, it does not indicate if the bird witnessed is confirmed as a breeder at the location. A complete species list is provided in *Appendix B*.

Additionally, Mr. Kaplan has organized Christmas Bird Counts (CBC) every December for approximately the past 20 years. The study area covers a 7.5-mile radius from the Old State House in downtown Hartford. Within the North Branch Park River portion of the study area, approximately 44 species of birds have been observed over the approximate 20 years of data collection, with 5 of the species including bald eagle, peregrine falcon, and ruby-crowned kinglet witnessed on a few occasions. Other notable species witnessed over the period of data collection include the great horned owl, yellow-rumped warbler, and fox sparrow. The birds witnessed during the CBC are considered permanent residents, winter visitors, or lingering migrants that may have not yet moved southward for a variety of reasons. A complete species list is provided in *Appendix B*.

4.7.3 Amphibians & Reptiles

Documentation is not readily available regarding the extent and population of amphibians and reptiles within the North Branch Park River watershed. However, the extent of available habitats (e.g., wetlands, watercourses, sandy upland areas, old field, etc.) within the watershed suggests that it likely supports a broad range of amphibians and reptiles. For example,

suburban areas with medium to small wetlands, intermittent or small perennial streams, or moist woodland areas can support species such as the American toad, northern spring peeper, wood frog, redback salamander, and garter snake. Any of the numerous ponds and lakes either associated with water supply reservoirs, farms, or golf courses can support species such as bullfrogs, green frogs, spring peepers, painted turtles, spotted turtles, and snapping turtles. Finally, upland areas may support snakes including garter, northern ringneck, black racer and black rat snake. The presence of these common species within the watershed was confirmed by Mr. Hank Gruner of the Connecticut Science Center. A listing of the reptiles and amphibians he has observed in the various North Branch Park River subwatersheds is also included in *Appendix B*.

Mr. Brian Kleinman of Riverside Reptiles, a wildlife education company specializing in reptiles, has completed many bioinventories in the North Branch Park River watershed. He reports having observed within the watershed all of the common amphibians and reptiles found in Connecticut as well as less common species, including the eastern box turtle, the Jefferson/blue-spotted complex spotted salamander, the black rat snake and northern copperhead. Similar to the rest of Connecticut, the populations of these species within the watershed are threatened by development and potential additional fragmentation of their habitats.

4.7.4 Threatened and Endangered Species

The CTDEP Natural Diversity Data Base (NDDB) maintains information on the location and status of endangered, threatened, and special concern species in Connecticut. The Connecticut Endangered Species Act defines "Endangered" as any native species documented by biological research and inventory to be in danger of extirpation (local extinction) throughout all or a significant portion of its range within Connecticut and to have no more than five occurrences in the state. The Act defines "Threatened Species" as any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within Connecticut and to have no more than nine occurrences in the state. "Species of Special Concern" means any native plant or any native non-harvested wildlife species documented to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high economic demand that its unregulated taking would be detrimental to the conservation of its population, or has become locally extinct in Connecticut.

Figure 4-6 displays the generalized areas of endangered, threatened, and special concern species in the North Branch Park River watershed. *Table 4-5* presents a list of species known to exist within the watershed. The areas represent a buffered zone around known species or community locations.

The locations of species and natural community occurrences depicted on the NDDB mapping are based on data collected over the years by the Environmental and Geographic Information Center's Geologic and Natural History Survey, other units of the CTDEP, conservation groups, and the scientific community. Approximately fourteen such areas were identified throughout

Figure 4-6

the watershed. Because new information is continually being added to the Natural Diversity Database and existing information updated, the areas are reviewed on an annual basis by the CTDEP. Areas can be removed or added based upon the results of the review.

Table 4-5. Endangered, Threatened, and Special Concern Species

Common Name	Scientific Name	Status
Flora		
Sedge	*Carex squarrosa*	Special Concern
Goldie's Fern	*Dryopteris goldiana*	Special Concern
Swamp Lousewort	*Pedicularis lanceolata*	Threatened
Fauna		
Jefferson Salamander	*Ambystoma jeffersonianum*	Special Concern
Upland Sandpiper	*Bartramia longicauda*	Endangered
Bobolink	*Dolichonyx oryzivorus*	Special Concern
Peregrine Falcon	*Falco peregrinus*	Endangered
American Kestrel	*Falco sparverius*	Threatened
Atlantis Fritillary	*Speyeria atlantis*	Special Concern
Eastern Meadowlark	*Sturnella magna*	Special Concern
Eastern box turtle	*Terrapene c. carolina*	Special Concern
Brown thrasher	*Toxostoma rufum*	Special Concern
Habitats		
Subacidic rocky summit/outcrop	--	--

Source: CTDEP Natural Diversity Data Base, 2009.

The 2009 wetland field assessment described in Section 4.6.3 of this report identified the presence of one "threatened" species, Swamp Lousewort (*Pedicularis lanceolata*) within the wetland complex between Adams Road and Duncaster Hollow.