

Biodiversity Conservation Study Town of Yorktown Westchester County, New York



Report

Updated March 2010

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**BIODIVERSITY CONSERVATION STUDY
TOWN OF YORKTOWN
WESTCHESTER COUNTY, NEW YORK**

Prepared for
TOWN OF YORKTOWN, NEW YORK

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March 2010

Project No. 8110010

TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	
CHAPTER 1 - INTRODUCTION	
1.1 Background.....	1-1
1.2 Project Goals.....	1-1
1.3 The Process.....	1-2
CHAPTER 2 - METHODS	
2.1 Literature Review and Agency Inquires.....	2-1
2.2 Historical Research and Documentation.....	2-1
2.3 Site Selection.....	2-2
2.4 Vegetation Field Inventory.....	2-2
2.5 Wildlife Field Inventory.....	2-3
2.6 Sampling Methods.....	2-3
2.7 Mammals.....	2-4
2.8 Birds.....	2-5
2.9 Herptiles (Reptiles and Amphibians).....	2-6
CHAPTER 3 - FINDINGS	
3.1 Sampling Sites.....	3-1
3.2 Species Richness Survey.....	3-9
3.3 Special Concern, Threatened, and Endangered Species.....	3-10
3.4 Environmentally Sensitive Resources.....	3-12
3.5 Sensitive Habitats.....	3-14
CHAPTER 4 - LAND USE ORDINANCE REVIEW	
4.1 Introduction.....	4-1
4.2 Chapter 140 Conservation Areas.....	4-1
4.3 Chapter 161 Environmental Quality Review.....	4-2
4.4 Chapter 165 Erosion and Sediment Control.....	4-2
4.5 Chapter 175 Flood Damage Prevention.....	4-3
4.6 Chapter 178 Freshwater Wetlands.....	4-3
4.7 Chapter 195 Land Development.....	4-3
4.8 Chapter 248 Stormwater Management.....	4-3
4.9 Chapter 300 Zoning.....	4-4
4.10 Regulatory Limitations and Recommendations.....	4-4
CHAPTER 5 - RECOMMENDED BEST MANAGEMENT PRACTICES	
5.1 Site Planning Near Critical Areas.....	5-1
5.2 Common Site Planning Pitfalls.....	5-2
5.3 Site Planning Guidance Documents.....	5-3
5.4 Wetland Mitigation/Restoration Design.....	5-3
5.5 Mitigation/Restoration Pitfalls.....	5-5

TABLE OF CONTENTS (continued)

	<u>Page</u>
CHAPTER 5 (cont.)	
5.6 Mitigation Guidance Documents	5-6
5.7 Short- and Long-Term Management	5-7
5.8 Data Collection Protocols	5-8
5.9 Determining Cumulative Impacts From Development.....	5-9
5.10 Cumulative Impacts Guidance Documents.....	5-10
5.11 Discussion.....	5-10
CHAPTER 6 – NEXT STEPS	
6.1 Implement Recommendations	6-1
6.2 Monitor Progress.....	6-2
6.3 Expand Efforts Into A “Greenprint” for Yorktown.....	6-3

LIST OF APPENDICES

Appendix

- A References Cited
- B Agency Correspondence
- C Wildlife Predictive Matrix (Possible Species in the Town)
- D Plants and Wildlife Observed or Previously Documented
- E Photographs
- F Model Ordinance Language
- G Native and Non-native Plant Lists
- H BMP Details
- I Figures and Maps

EXECUTIVE SUMMARY

In 2007, the Town of Yorktown Planning Department received a grant to conduct a Biodiversity Conservation Study of the Town of Yorktown. The purpose of this study was to identify and document environmentally sensitive natural resources throughout the Town of Yorktown, and to develop recommendations for conserving those resources for the long term. This approach to land use planning is an important part of developing long-term, sustainable strategies for enhancing natural resources throughout the Town.

Stearns & Wheler, LLC, Environmental Engineers and Scientists, was retained by the Town of Yorktown to complete this project, which included the following tasks:

1. Establishment of and meeting with a stakeholders group to provide input on important environmental resources in the Town, and to provide local guidance.
2. Review of published and local literature, and inquiries to state and federal agencies regarding natural resources and biodiversity in the Town of Yorktown to avoid repeating work that had already been done.
3. Review of environmental regulations within the Town Code of the Town of Yorktown to determine whether changes or additions to the regulations might provide additional environmental protection.
4. Completion of a year-long natural resources inventory of discrete sample sites located throughout the Town, including field surveys for plant and wildlife species and remote sensing identification of wetlands, watercourses, and other landscape-based natural resources and environmentally sensitive areas.
5. Mapping of environmentally sensitive areas within the Town of Yorktown, creating a geodatabase of this information for use in a Geographic Information System (GIS).
6. Development of recommendations for improvements to Town of Yorktown environmental regulations.

7. Development of recommendations of best management practices (BMPs) and design standards for proposed developments and land use changes, and for proposed mitigation for such actions, to improve and maintain water quality and environmental integrity within the Town of Yorktown.

8. Development of recommended standards for environmental impact assessment information to be submitted with land use change applications.

This report outlines the detailed methods and results of the study and provides the Town of Yorktown with a set of recommendations for long-term sustainable natural resource management and regulation. The information contained herein provides a foundation for the development of a long-term sustainable resource management plan for the Town of Yorktown, along with baseline data against which later studies may be compared to measure the Town's progress in environmental conservation and sustainability.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The term “biodiversity” describes the variety or richness of living organisms within a defined space and time. The more species within a given space and time, the higher its biodiversity is said to be. Biodiversity is an important measure in ecology, because ecosystems with higher biodiversity are considered to be more resilient and able to sustain disturbances than those with less diversity. Therefore, areas with greater biodiversity are considered to be more ecologically healthy, and as such, are considered to be more ecologically valuable. Thus, as we manage the landscapes within which we live, we should strive to maintain high levels of biodiversity in order to maintain the resilience and sustainability that such ecosystems provide. As municipalities regulate land use to protect environmental quality, biodiversity provides a quantitative metric by which their progress may be measured.

In 2007, the Town of Yorktown received a grant to fund the completion of a Town-wide Biodiversity Conservation Study. The purpose of the study was to document baseline biodiversity and develop methods of promoting and conserving biodiversity within the Town. The Town retained Stearns & Wheler, LLC, Environmental Engineers and Scientists, to complete the study, which began in the late spring of 2008 and continued for one year. This report summarizes the purposes of the study, the methods used to conduct the study, the findings of the research conducted, and recommendations for the Town Planning Department and Conservation Board to implement that will help them to promote and maintain biodiversity within the Town of Yorktown.

1.2 PROJECT GOALS

The goals of the Biodiversity Conservation Study were to:

1. Sample the variety of ecological communities (habitats) within the Town of Yorktown to document existing conditions and quantify biodiversity within the Town.

2. Review current measures (primarily regulatory) being used by the Yorktown Planning Department and Conservation Board to protect the environment within the Town.
3. Develop recommendations for measures that could be implemented by the Yorktown Planning Department and Conservation Board to more effectively conserve biodiversity within the Town, thereby protecting the resilience and long-term sustainability and viability of ecosystems throughout the Town.

1.3 THE PROCESS

Stearns & Wheler began by reviewing existing data and information relating to biodiversity in the Town to determine the breadth and quality of existing data that could be used as a foundation for the proposed study. Stearns & Wheler also reviewed previous studies to avoid duplication of effort and ensure the study would focus on developing new information. We also reviewed environmental regulations in the Town Code to determine what measures and requirements are currently in place to protect the environment in the Town of Yorktown.

A local stakeholders group of 15 members was then assembled, including representatives from:

- Yorktown Conservation Board
- Yorktown Planning Department
- Yorktown Tree Commission
- Green Yorktown
- Teatown Reservation
- Yorktown Advisory Committee on Open Space (ACOS)
- Citizens for an Informed Yorktown
- Sierra Club

The purpose of the stakeholders group was to provide local input and guidance to Stearns & Wheler in conducting this study. The stakeholders met at the beginning of the study to provide input on environmental priorities and identified available information and sampling resources; again halfway through the study to learn progress to date and to provide feedback; and will convene one last time for a summary of this report.

Stearns & Wheler ecologists then began a year-long natural resources inventory of the Town of Yorktown which included literature review, agency inquiries, and field surveys. Natural resources identified included plant and wildlife species, regulated wetlands and watercourses, state-designated critical environmental areas, and natural corridors. Landscape-based resources (excepting plant and wildlife species) were plotted into a Geographic Information System (GIS) geodatabase so they could be mapped and overlaid to determine where they intersected or overlapped, thereby indicating locations of multiple environmental sensitivities.

Finally, Stearns & Wheler developed recommendations for best management practices (BMPs) for land use and wetland mitigation projects to help the Yorktown Conservation Board provide clear guidance to permit applicants not able to avoid impacting wetlands and other important landscape features. These BMPs are outlined in this report, along with sample detail drawings to illustrate how they might be used.

CHAPTER 2

METHODS

2.1 LITERATURE REVIEW AND AGENCY INQUIRIES

Several primary and secondary sources of information were reviewed and queried for existing information and historical records of flora and fauna and landscape-based resources (e.g., wetlands, watercourses, critical environmental areas, etc.). Literature sources and local experts consulted are cited in Appendix A, and correspondence with state and federal agencies and agency resources is contained in Appendix B.

The goal of reviewing existing literature and inquiring of public agencies was to determine the extent of information available on natural resources in the Town of Yorktown, and to incorporate that information with Stearns & Wheler's primary data to develop a thoroughly researched record of biodiversity and natural resources within the Town. This also helped to avoid collecting data that already existed, eliminating an unnecessary duplication of effort.

The New York State Department of Environmental Conservation (NYSDEC) Environmental Resource Mapper was consulted at <http://www.dec.ny.gov/imsmaps/ERM/viewer.htm>. The U.S. Fish & Wildlife Service (USFWS) at <http://www.fws.gov/northeast/nyfo/es/section7.htm> was also reviewed to identify listed species and state and federally-regulated wetlands, waters, and streams.

2.2 HISTORICAL RESEARCH AND DOCUMENTATION

Stearns & Wheler also made inquiries of local knowledgeable naturalists and obtained historical records of wildlife observations from a local wildlife biologist who has collected natural resource data throughout Yorktown. The species observed during that period were incorporated into the overall wildlife inventory, denoted as additional records, unless they were observed again during the survey period or as the study was updated.

The report "*Croton-to-Highlands Biodiversity Plan, Balancing Development and the Environment in the Hudson River Estuary Catchment, Yorktown, Cortlandt, New Castle, and*

Putnam Valley, New York” (Miller and Klemens, 2004) was also reviewed for information regarding wildlife and plant species on the site. The species lists in the Miller and Klemens report are based on habitat suitability and do not necessarily represent all cover types within the Town of Yorktown. The report also includes three other towns, which may have had habitat types that did not occur in Yorktown. The Miller and Klemens report only identified those sites they deemed to potentially function as habitat hubs or connectors between hubs based on their landscape configuration, and may not include cover types found throughout the entire Town.

2.3 SITE SELECTION

Sites throughout the Town were first selected based on available land access. The stakeholders group assisted in identifying potential sampling sites on public and private property throughout the Town. After identifying possible survey sites, spatial distribution of potential sites and availability of different cover types were weighed to eliminate duplication of effort across the Town. We sought an even spatial distribution of sites throughout the Town, so as not to bias our survey efforts to specific geographic regions within the Town. Cover types within each proposed site location were then compared using the 2001 National Land Cover Database (NLCD) to get a broad distribution of cover types within the Town. After identifying spatially distributed sample sites throughout the Town, with representational cover types, access permission was obtained from each site’s landowner. The sites were then investigated, initially using “windshield” surveys to eliminate duplication of efforts between sites. If a site was determined to be different from other sites, more in-depth pedestrian surveys were conducted on it.

2.4 VEGETATION FIELD INVENTORY

The vegetation inventory included identification of broad vegetation cover types, within which we conducted visual searches for herbaceous and woody plant species, or parts thereof, including leaves, bark, twigs, seeds, flowers, fruits, or other structures in each vegetation cover type encountered. Opportunistic encounter and systematic area search techniques as outlined in *Community Biodiversity Survey Manual* (National Parks Association of NSW, 1998) were used to identify herbaceous and woody plants at sampling sites.

Plants were identified to species level when possible. Some species could only be identified to genus level because floristic characteristics necessary for full identification could not be observed based on the time of year of the observation. When possible, plants lacking floristic

characteristics at first encounter were revisited to obtain the necessary data for complete identification. A cumulative list of vegetation found on the site is provided in Appendix D.

2.5 WILDLIFE FIELD INVENTORY

Field surveys for wildlife species richness (diversity of species or biodiversity) were conducted for terrestrial wildlife, including mammals, birds, and herptiles (reptiles and amphibians). Less formal surveys were conducted for invertebrate species. Surveys were conducted at different times of day, ranging from early morning to late night to account for different activity periods of wildlife. Multiple visits were made to sample several times during all four seasons to account for seasonal activity of wildlife. Multiple method/multiple observer survey approaches were used to improve the probability of detection of wildlife species in the Town. Specific methods used are outlined below.

2.6 SAMPLING METHODS

Wildlife and vegetation surveys were conducted using multiple observers and multiple methods because such methods increase the probability of species detection, yielding more thorough survey results. Some wildlife species were photographed with a Nikon D70 digital single lens reflex camera with several interchangeable lenses. Photographs of wildlife species, plants, and cover types are contained in Appendix E. Survey methods used included the following:

A. **Random Encounter Survey.** Random encounter surveys involved walking through site habitats, identifying species as they were encountered visually or acoustically. No specific route was traveled, except to sample as many habitat types as could be visually identified, initially taking advantage of available trails, but also making efforts to survey trail-less areas, identifying plant and animal species as they were encountered. Plants and animals were identified to species when possible, or to genus if necessary morphological characteristics for species identification were absent or unobserved.

B. **Sign Search.** Sign search included looking for visible evidence that a species was or had been present on the site. Signs for plants may have included leaves, fruits, bark, or seeds on the ground. Signs for animals may have included tracks, droppings, fur, feathers, nests, pellets or castings, eggshells, or shed antlers, skin, or shells. This method is considered effective for wildlife species that are nocturnal or shy of humans.

C. **Modified Point Count.** Point count surveys involve stopping for set time periods at regular intervals along an established route and listening for wildlife vocalizations (bird calls or songs, amphibian calls, etc.). The modified point count for this survey involved stopping at irregular intervals along the routes walked.

D. **Log Rolling.** Log rolling consisted of turning over logs, stones, plates of fallen bark, or other objects on the ground to view wildlife species that might be hidden underneath. This is an effective means of locating salamanders, snakes, small mammals and invertebrates.

E. **Call Playback.** A portable stereo cassette player was used to perform nocturnal call playback surveys to determine the presence of owls in the Town of Yorktown. We drove through probable habitat areas, stopping at irregular intervals to play recorded calls of the saw-whet owl (*Aegolius acadicus*), screech owl (*Megascops asio*), barred owl (*Strix varia*), and great horned owl (*Bubo virginianus*), in that order, to avoid scaring off smaller owls by playing the calls of larger owls first. This method is generally effective at determining the presence of owls, as they often use vocalizations to locate other owls and to defend their territory, and respond readily to recorded calls.

F. **Visual Encounter Survey.** Visual encounter survey is perhaps the simplest survey method, involving identifying and documenting species as they are observed in one's travels. It is an effective method of documenting common and easily observed species, but may miss secretive or inconspicuous species.

G. **Dip Netting.** Aquatic dip nets were used to sample aquatic wildlife at the edges of ponds and vernal pools. Dip nets were swept down through the water and then dragged through the vegetation or leaf litter on the bottom. While dip nets did not capture fish, they did capture larval and adult amphibians as well as invertebrates. Captured organisms were identified and returned alive to each pond.

2.7 MAMMALS

Field methods used to survey for mammal species richness were based on a modified multiple sampling occasions/multiple investigators method, as outlined in "*Measuring and Monitoring Biological Diversity: Standard Methods for Mammals*" (Wilson, et. al., 1996). This

methodology promotes the use of unspecified multiple survey methods that “lead to the detection and identification of different species.”

For our field survey, we employed the following survey methods that are outlined in detail in “*Community Biodiversity Survey Manual*” (National Parks Association of NSW, 1998):

1. Sign search, in which the observer records any recognizable signs (tracks, droppings, hair, bones, etc.) of mammal species.
2. Opportunistic mammal sightings, in which the observer identifies mammals encountered in the field at random.

Mammals were identified based on visual encounters, vocalizations, tracks, fur, bones, rubs, scrapes, droppings or other recognizable signs in habitats throughout the Town. Routes were established to sample a representative group of vegetation cover types. Established sampling routes were walked at periodic intervals over the year, and animals and signs were recorded as they were encountered. Efforts were also made to take advantage of snow cover and muddy soils to identify tracks left by mammals. This was effective at revealing secretive mammals in the Town that were not easily visually encountered. Mammals identified on the site are included on the cumulative wildlife list in Appendix D.

2.8 BIRDS

Field methods used to survey for avian species richness were based on methods outlined in the “*Handbook of Field Methods for Monitoring Landbirds*” (Ralph, et. al., 1998), and the “*Community Biodiversity Survey Manual*” (National Parks Association of NSW, 1998). These methods included:

1. Strip transect, in which the observer records all species encountered (seen/heard) along a trail.
2. Nocturnal call playback, in which the observer plays recorded calls and listens for conspecific responses.

3. Opportunistic bird sighting, in which the observer records birds encountered randomly.
4. Sign search, in which the observer records signs of birds (feathers, nests, droppings, tracks, etc.) encountered in the field.

Birds were detected and identified by visual encounter with individuals, vocalizations, tracks, feathers, bones, droppings, castings, nests, drillings, or other recognizable signs. Avian species identified in the Town of Yorktown are included on the cumulative wildlife list in Appendix D. Birds identified during migratory periods were also identified, as these species may use different habitats within the Town of Yorktown during migration.

Special surveys were conducted during the night for owls. Recorded calls were broadcast throughout the Town for the saw-whet owl, screech owl, barred owl, and great horned owl. Call surveys were successful in eliciting responses from the eastern screech owl, which is relatively common.

2.9 HERPTILES (REPTILES AND AMPHIBIANS)

Field methods used to survey for herptile species richness were based on the Visual Encounter Survey (VES) method outlined in “*Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*” (Heyer, et. al., 1994). In addition, acoustic surveys were conducted for vocal herptiles, such as Northern Spring Peeper (*Pseudacris c. crucifer*), and log rolling surveys were conducted to locate salamanders.

Herptiles were detected and identified by visual encounter, vocalizations, egg masses, larvae, and remains. Amphibian surveys were conducted primarily in March, April, May, and June to account for most breeding amphibians, as this is the period during which most amphibians are typically most active and visible. This survey included actively searching wetland areas throughout the Town to identify vernal pools and other likely breeding areas, as well as egg masses and larval developmental stages of amphibians. Searches included inverting rocks and logs in and near wetlands and watercourses and dip-net sampling (rocks and logs were returned to their original positions).

CHAPTER 3

FINDINGS

3.1 SAMPLING SITES

Stearns & Wheler and the stakeholders group identified 24 sites to be sampled during this study. Sites were selected based on geographic distribution within the Town of Yorktown, availability of access, and cover types available at each site. Descriptions of each site sampled during this study follow.

A. **South Side Croton Reservoir.** Sampling along Croton Reservoir was conducted along the unpaved road that follows the south side of the Reservoir between the dam and the western boundary of the Town. This road passed through a mature successional northern hardwood forest on New York City Department of Environmental Protection-managed property. North of the unpaved road was a vegetated steep slope, which slopes down to the reservoir. South of the unpaved road was a mature successional northern hardwood forest with very little ground cover. Species composition changed along the length of the unpaved road and consisted of plant communities typical of a northern successional hardwood forest in an area which has historically been disturbed. Common species found throughout the length of the road included American beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadensis*), muscle wood (*Carpinus caroliniana*), red oak (*Quercus rubra*), white oak (*Q. alba*), black cherry (*Prunus serotina*), black birch (*Betula lenta*), white ash (*Fraxinus americana*), green ash (*F. pennsylvanica*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), sugar maple (*Acer saccharum*), red maple (*A. rubrum*), Norway maple (*A. platanoides*), garlic mustard (*Alliaria petiolata*), and Queen Anne's lace (*Daucus carota*).

B. **Woodlands Park.** Woodlands Park was located in the northern part of Town adjacent to the Taconic State Parkway. The park was immediately north of and adjacent to a medium density residential setting. A trailhead was accessed at the north end of Strang Boulevard, just north of Barberry Road. Trails and the length of the brook were walked, recording flora and fauna as they were encountered.

Woodlands Park consisted of a northern successional hardwood forest with a meandering brook, which ran through the park. The upland plant communities were dominated by American beech and black birch. The riparian zone adjacent to Hunter Brook was dominated by skunk cabbage (*Symplocarpus foetidus*), false hellebore (*Veratrum viride*), and spice bush (*Lindera benzoin*). Understory throughout the park was sparse and included several non-native and invasive species such as Japanese barberry (*Berberis thunbergii*), Oriental bittersweet (*Celastrus orbiculatus*), Japanese honeysuckle (*Lonicera japonica*), garlic mustard, and multiflora rose (*Rosa multiflora*).

C. **Acadia Farm.** Acadia Farm was a horse farm with several maintained pastures which was located in the southwestern part of town, north of the New Croton Reservoir and immediately south of the Mohansic Golf Course on Baptist Church Road. Trails around the perimeter of the horse pastures were walked while observing and recording flora and fauna. Transects were also walked in the woods to identify other species of plants which otherwise would have been overlooked while staying on the maintained paths. Habitat on the farm within the woods consisted of mature successional northern hardwood forests around the pastures.

The horse pastures were maintained and used for grazing the farm's livestock. Species found within the pastures included timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), and Japanese stilt grass (*Microstegium vimineum*). The forests surrounding the pastures were mature and the dominant species included sugar maple, Norway maple, red oak, Japanese barberry, garlic mustard, and colt's foot (*Tussilago farfara*).

D. **Illington Road and the Taconic Parkway.** Illington Road was a dead-end road immediately south of the New Croton Reservoir, north of the exit off the Taconic Parkway for Kitchawan Road, and in between the northbound and southbound lanes of the Taconic Parkway. A narrow swale ± 15 feet wide exists between Illington Road and the northbound lane of the Taconic Parkway which controls stormwater runoff and overland flow from these two roads. Sampling in and adjacent to the swale was done by walking the length of both sides of the swale while recording species as they were observed. Dominant species found within the swale included green ash, red maple, swamp white oak, spicebush, sensitive fern (*Onoclea sensibilis*) and grape (*Vitis spp.*). The adjacent upland area consisted of tulip tree (*Liriodendron tulipifera*), eastern hemlock, witch hazel, black birch, ground ivy (*Glechoma hederacea*), multiflora rose, and Christmas fern (*Polystichum acrostichoides*).

E. Small, Unnamed Wooded Park Abutting Croton Heights Road and Carters Grove.

An unnamed wooded Town park surrounded by new residential development was located immediately north of Hilltop Hanover Farm. A paved trail meandered through the ±5-acre park, which abutted mowed grass lawns and private residences on three of the four sides of the park. Sampling within the park was done by following the paved trails through the length of the park, as well as doing random sampling throughout the mature successional northern hardwood forest. A successional old field adjacent to the south side of the park on the other side of Croton Heights Road was sampled by observing species from the road. Dominant species within the park were typical of disturbed areas in southern New York and included European privet (*Ligustrum vulgare*), European buckthorn (*Rhamnus cathartica*), Japanese barberry, multiflora rose, black cherry, garlic mustard, coltsfoot, and trumpet creeper (*Campsis radicans*). Immediately south of the park, on the south side of Croton Heights Road, was a successional old field dominated by goldenrod (*Solidago* spp.), and a few small patches of phragmites (*Phragmites australis*) and woolgrass (*Scirpus cyperinus*).

F. Teatown Lake Reservation. Teatown Lake Reservation was located in the southwest part of Yorktown where it extended beyond the Town line into the Towns of New Castle and Cortlandt. Sampling at the Teatown Lake Reservation was done by walking the trail networks throughout the reservation and recording species as they were observed and identified. No sampling was conducted off of the trails. Waterfowl, which otherwise may have gone undetected as they are elusive and shy of humans, were observed from a ‘blind’ built along the shore of Teatown Lake. Habitats at Teatown included lakes, successional old fields, emergent marshes, successional northern hardwood forests, intermittent streams, and ponds. Teatown Lake Reservation acted as an important habitat corridor or stepping stone for wildlife from the southwest corner of Yorktown into Cortlandt and New Castle..

G. Turkey Mountain (Nature Preserve). Turkey Mountain Nature Preserve was located in the central part of the Town abutting the west side of Saw Mill River Road and just north of Croton Lake Road. Sites were sampled within the Preserve by walking the established trail networks while encountering different cover types within the preserve. Prior to conducting field work, we reviewed the National Land Cover Database to identify multiple cover types throughout the Preserve.

Much of the Preserve was comprised of northern successional hardwoods with wetlands and intermittent streams located at the base of Turkey Mountain. Species composition within the

Preserve changed as slope and aspect changed up the mountain and through the Preserve. At the base of Turkey Mountain, there was a wetland dominated by royal fern, sensitive fern, tussock sedge, and skunk cabbage. The entrance and forest composition when entering the park was dominated by mountain laurel (*Kalmia latifolia*), black birch, American beech, chestnut oak, and white oak. A mature forested hillside led to the summit of Turkey Mountain, and consisted of tulip tree, red maple, sugar maple, eastern hemlock, witch-hazel, Christmas fern (*Polystichum acrostichoides*), hayscented fern, musclewood, eastern red cedar, Japanese barberry, pink lady's slippers (*Cypripedium acaule*), and low bush blueberry. An exposed rocky summit limited vegetative growth atop Turkey Mountain, where stunted oaks grew among the lichens and mosses on the rocks. Species diversity and dominance varied throughout the Preserve as slope and aspect changed.

H. Grants Lane and Spring Valley Road. An emergent scrub shrub marsh in a shallow depression was located immediately south of Grants Lane and east of Spring Valley Road, and was fed by an unnamed intermittent stream which was tributary to Bailey Brook and Teatown Lake. Emergent wetland was located $\pm 2,000$ feet west of Teatown Lake Reservation. Sampling within the wetland was done by walking transects within the wetland and recording species as they were observed. Dominant species within the marsh consisted of skunk cabbage, red osier dogwood (*Cornus sericea*), tussock sedge (*Carex stricta*), green ash (*F. pennsylvanica*), sensitive fern, poison ivy (*Toxicodendron radicans*), spicebush, and winged burning bush (*Euonymus alata*). The small wetland acts as a connective corridor with Teatown Lake Reservation and the Taconic State Parkway.

I. Kitchawan Preserve. Kitchawan Preserve was located in the southeast part of Yorktown, north of Kitchawan Road and south of the New Croton Reservoir. The Preserve acted as a corridor for dispersing wildlife which have managed to cross the reservoir. The Preserve is adjacent to the south side of the New Croton Reservoir along its northern and eastern sides. Sampling within the Preserve was conducted by walking the network of trails while also sampling off the trails to sample species which otherwise would not typically be found adjacent to trails due to their sensitivity to disturbance. Bioersivity of plant species within the preserve was typical of previously disturbed forests in the southeastern part of New York State. Species found throughout the preserve included sugar maple, tulip tree, black locust, white ash (*F. americana*), red oak, spicebush, Christmas fern, poison ivy, tartarian honeysuckle (*Lonicera tatarica*), American beech, and black birch. While diversity of this site is not particularly high, its

proximity to other forested sites and bodies of water made it a valuable asset for species to disperse across the landscape.

J. Hilltop Hanover Farm. Hilltop Hanover Farm was located both on the east and west side of Hanover Street in the east-central part of Yorktown, and provided educational experiences for community members, allowing them to interact with nature and wildlife. Sampling at Hilltop Hanover Farm was conducted by reviewing existing data in pamphlets and other resources available at the farm, and by walking trails and recording observed species in the different cover types located on the property.

A diverse number of habitats existed on the property including vernal pools, ponds, successional old fields, mature successional northern hardwood forests, pastures, agricultural crops, intermittent streams, and emergent wetlands. Such a diverse number of habitats aided in attracting a greater diversity of wildlife species. Dominant species on the farm varied based on habitat, but included black willow (*Salix nigra*), flowering dogwood (*Cornus florida*), sugar maple, red cedar (*Juniperus virginiana*), shagbark hickory (*Carya ovata*), black birch, tree-of-heaven (*Ailanthus altissima*), eastern hemlock, curled dock (*Rumex crispus*), teasel (*Dipsacus sylvestris*), and sweet pepper bush (*Clethra alnifolia*). Vernal pools located on the property provided breeding pools for amphibians, and also allowed for dispersal of amphibians across the landscape.

K. John Holland Residence. The Holland residence was located off of Baptist Church Road, with the New Croton Reservoir immediately to the south of the road. Habitats and cover types on the property were never addressed or documented, as our access to the property was limited to the driveway. Mr. Holland reported the presence of owls on his property and offered the use of his driveway to conduct call-playback surveys for owls. No responses were detected during the course of the survey at the Holland residence, although an eastern screech owl did call back at another sampling sight approximately $\pm 1,000$ meters from the Holland residence.

L. Franklin D. Roosevelt (FDR) State Park. FDR State Park was located in the center of the town abutting the east side of the Taconic State Parkway, south of Crompond Road, and north of Baldwin Road. FDR State Park abutted the wildlife corridor created by the Taconic State Parkway, providing a means of wildlife dispersal for animals using the parkway as a corridor. Cover types within FDR State Park varied depending on location and management of the lands. Mowed grass lawn, paved roads, pavilions, a pool, and other park related buildings

made up the cover types in the managed parts of the park. The mowed grass lawns abutted the mature mixed forests which encompassed most of the park, as well as Crom Pond and Mohansic Lake. Species composition found throughout FDR State Park changed as different cover types were encountered, and included red pine, eastern white pine, tulip tree, American shadblow (*Amelanchier canadensis*), European privet, American beech, white ash, London plane tree (*Platanus acerifolia*), multiflora rose, red-osier dogwood, scotch pine (*Pinus sylvestris*), Japanese honeysuckle (*Lonicera japonica*), oriental bittersweet (*Celastrus orbiculatus*), and several others. FDR State Park acts as another stepping stone along the length of the Taconic State Parkway allowing species to disperse to the north and the south along the length of the Parkway.

M. Donald J. Trump State Park, French Hill Section. The French Hill Section of the Donald Trump State Park was located off of the Taconic State Parkway south of FDR State Park. This park consisted of various habitats and cover types. Areas within the park, including the remnants of an old English-style garden, were taken over by forsythia (*Forsythia sp.*). There was mowed grass lawn around the old buildings, some of which have collapsed, providing habitat for small rodents and birds. A wetland complex ran through the park, providing vernal pools and dispersal stepping stones for aquatic reptiles and amphibians. Unpaved trails meandered through the mixed forest with tree species including red pine (*Pinus resinosa*), eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), tulip tree (*Liriodendron tulipifera*), flowering dogwood (*Cornus florida*), black cherry (*Prunus serotina*), silver maple (*Acer saccarhinum*), and several others. The wetland that ran through the property was dominated by soft rush, skunk cabbage, spicebush, and green ash.

N. Emergent Wetland Adjacent to Crompond Road. An emergent wetland which ran roughly parallel to Crompond Road was located immediately north of Garden Lane on the west side of Yorktown. The wetland was dominated primarily by common reed, red alder (*Alnus rugosa*), and skunk cabbage. The wetland was primarily dominated by common reed along much of its length and has very little biodiversity. Much of the wetland was filled with garbage and debris which collected along the banks of the wetland. There was a high density of impervious surface surrounding much of the wetland, with a garage and auto dealer's parking lot immediately north of the wetland. Several unnamed streams converged along the length of the wetland, which eventually drained to Mill Pond and eventually to the New Croton Reservoir.

O. **Mohegan Lake.** Two sites around Mohegan Lake were sampled: the western edge at Decatur Lane and the northern inlet off of Mohegan Avenue. Both sites were in low density residential neighborhoods. At the Decatur Lane site, the edge of water was dominated by silky dogwood (*Cornus amomum*), sensitive fern (*Onoclea sensibilis*), tartarian honeysuckle and red maple. Immediately back from the edge of water, the transitional upland areas was dominated by northern catalpa (*Catalpa speciosa*), red oak (*Quercus rubra*) and burning bush. The site at the northern inlet consisted of a phragmites-dominated marsh with black willow (*Salix nigra*), black cherry (*Prunus serotina*) and quaking aspen (*Populus tremuloides*). In this area, the phragmites extended directly up to the edge of pavement. The residential landscapes in the neighborhoods surrounding the lake consisted of a mixture of native and ornamental plant species typical of developed residential areas. Typical plant species in the residential areas included: common lilac (*Syringa vulgaris*), white cedar (*Thuja occidentalis*), sugar maple (*Acer saccharum*), thornless honey locust (*Gleditsia triacanthos*), European privet (*Ligustrum vulgare*), Japanese maple (*Acer palmatum*), Norway maple, crimson king maple, little leaf linden (*Tilia cordata*), flowering dogwood (*Cornus florida*), burning bush, Norway spruce (*Picea abies*), Canadian yew (*Taxus canadensis*) and various rhododendron and azalea species.

P. **Shrub Oak Park.** Shrub Oak Park was located in the northern portion of Yorktown on the Westchester-Putnam County line. A stream meandered through the park and a wooded wetland abutted the stream immediately to the north and west of the park. The watercourse and the wetlands provided habitat for different reptiles and amphibians, as well as waterfowl. Dominant plant species associated with the wetland were red maple, skunk cabbage (*Symplocarpus foetidus*), spicebush (*Lindera benzoin*), and green ash. The upland area around the wetland consisted of sugar maple, white ash (*Fraxinus americana*), American beech (*Fagus grandifolia*), tartarian honeysuckle, multiflora rose (*Rosa multiflora*), and mowed grass lawn where the park was maintained.

Q. **Lake Osceola.** An emergent floodplain at the northeast end of Lake Osceola was located immediately south of East Main Street. The floodplain sat at the bottom of a depression with roads to the north and south of it, abutting the northeastern finger of the lake. An unnamed intermittent stream in an eroded culvert from the north conveyed water into the floodplain where it then discharged into the lake. The hillside leading down to the floodplain was dominated by tartarian honeysuckle, goldenrods (*Solidago spp.*), Queen Anne's lace (*Daucus carota*), garlic mustard (*Alliaria petiolata*), chives (*Allium sp.*), and white ash. The plant community within the floodplain consisted of sycamore (*Platanus occidentalis*) and green ash.

R. **London Road.** A flashy, unnamed stream in a steep-sided ravine flowed between residential developments into a red maple hardwood swamp immediately south of London Road and ran roughly parallel to and east of Farm Walk Road. The banks of the ravine were heavily eroded from the volume of water which flowed through the creek during rain events. The hillside was dominated by American beech, white ash, and tree-of-heaven (*Ailanthus altissima*). Vegetative growth within the ravine near the water's edge was extremely limited due to the volume and velocity of water which flowed through the creek.

S. **Field of Dreams Park, Benjamin Boulevard.** Mowed grass lawn and a baseball diamond were located in the Field of Dreams Park, which was located at the end of Benjamin Boulevard, off of Broad Street in the eastern portion of the Town. An unnamed stream passed under Benjamin Boulevard east of the entrance to the park. A red maple hardwood swamp dominated the surrounding floodplain and riparian area. The unnamed stream was part of a contiguous wetland complex and red maple hardwood swamp located to the north, which extended to London Road. Dominant species within the wetland complex included red maple, red-osier dogwood, swamp white oak, green ash, speckled alder, black willow, sensitive fern, and tussock sedge. The surrounding upland in this area consisted of tulip tree, shagbark hickory, multiflora rose, goldenrods, and American beech.

T. **Junior Lake.** Junior Lake was a small lake on the east side of Town with mowed grass lawn in a medium density residential setting. Some common reed dominated a small portion of the shore, but has not become overgrown. Burning bush, tartarian honeysuckle, and various goldenrods were found throughout the upland areas around the lake where it has not been mowed. Soft rush (*Juncus effusus*) dominated the upland-wetland interface along with red-osier dogwood. The same stream associated with the Field of Dreams Park and London Road (see above) drained into Junior Lake.

U. **Route 118 Wetland and Power Line Right-of-Way (ROW).** This sampling site consisted of a phragmites-dominated emergent marsh associated with an unnamed tributary of the New Croton Reservoir. The marsh ran roughly parallel with Route 118/Saw Mill River Road and intersected with the power line ROW which ran roughly north-south through the town. The site was located immediately north of Turkey Mountain Nature Preserve. The marsh contained open water and emergent marsh zones which were dominated by common reed, and also included red-osier dogwood, red maple, green ash, tussock sedge, and Oriental bittersweet. The surrounding

upland consisted of a mixture of non-native invasive plant species included Oriental bittersweet, red maple and garlic mustard typical of disturbed road ROWs.

V. **Lakeside Park.** Lakeside Park was a small park located on the east side of Town, south of Crompond Road, immediately east of Hunterbrook Road in a medium density residential setting. Hunter Brook flowed through the park and was hydrologically connected to Mill Pond, creating a floodplain and riparian corridor along much of the length of the brook as it passed through the park. Dominant cover types within the park included mowed grass lawn at the baseball and soccer fields and successional northern hardwood forest. Dominant species along the floodplain included red maple and American sycamore.

W. **Mohansic County Park.** Successional northern hardwood forest and an emergent wetland were identified at the southwest side of Mohansic County Park immediately east of Hunterbrook Road and north of Baptist Church Road. Dominant species along the riparian corridor included cattail and soft rush. Species composition in the upland consisted of mixed hardwoods dominated by American beech and sugar maple. Multiflora rose dominated the understory along the upland-wetland interface.

X. **Crow Hill Road.** Windshield surveys were conducted along a portion of Crow Hill Road, immediately south of New Croton Reservoir, along Spring Meadow and Spring Pond Roads, and on Spring Hill Lane. A northern successional hardwood forest with little vegetative growth in the understory was the dominant cover type in the low density residential neighborhood. Dominant tree species included American beech, white ash, muscle wood, and mixed oaks. A mixture of native and non-native ornamental trees was found throughout uplands in residential yards.

3.2 SPECIES RICHNESS SURVEY

Species richness refers to the number of species of plants and animals found within a given area. Species richness is also referred to as biodiversity. Biodiversity is often seen as an indicator of environmental health or stability, since an area with many species can withstand environmental disturbances, such as diseases or physical disturbances, better than an area with relatively few species. The natural resources inventory identified 265 species of plants and 217 species of animals throughout the Town. Appendix D contains a list of plant and animal species identified in the Town. This number of species does not represent the complete diversity of the Town, as secretive or inconspicuous species such as some rodents, nocturnal wildlife, and invertebrates

went undetected, and the size of the subject site (more than 50 square miles) and property access restrictions were limiting factors in sampling. Therefore, these numbers are more of a representative index of diversity, indicating that the Town of Yorktown has a healthy diversity of species.

An estimate of biodiversity in Yorktown was prepared based on the habitat types identified throughout the Town. Habitat types are one predictor of wildlife species, but all available habitats are not universally occupied, so it is important to note that not all possible species in a habitat are necessarily present. Appendix C contains a matrix of wildlife species that may possibly be found on the site, based on the available habitats (DeGraaf and Yamasaki, 2001). The matrix also indicates how each habitat may be used by each species. This matrix is a valuable predictive tool to use when determining what species may possibly occupy a site proposed for development or other land use change. It provides the first indication of potential environmental impact to a site.

3.3 SPECIAL CONCERN, THREATENED, AND ENDANGERED SPECIES

The federal Endangered Species Act (ESA) requires the USFWS to maintain a list of organisms that are threatened (imminently in danger of becoming endangered) and endangered (imminently in danger of becoming extinct) either throughout the U.S. or in particular regions of the U.S. The New York State ESA requires the NYSDEC to maintain a list of threatened and endangered species within the state, and in addition, requires listing of species of special concern, which are species whose populations are in decline and in danger of becoming threatened. All of these groups are collectively and individually referred to as *listed species*.

The New York Office of the USFWS provides information on federally listed species to the public via their website, which lists endangered and threatened species found in each county of the state (they no longer provide site-specific lists in response to written or verbal requests). The list for Westchester County is provided in Appendix B. Of the species listed, Stearns & Wheler confirmed the presence of Bald Eagle in Yorktown, wintering over Croton Reservoir. It has the potential to use any of the larger water bodies in the Town for foraging at any time of year, though it may not currently nest in the Town. The Bald Eagle has been delisted at the federal level (it is no longer considered threatened or endangered), but remains on the USFWS lists because it is protected under the federal Bald and Golden Eagle Protection Act. It is also still considered a threatened species by the NYSDEC.

The Town of Yorktown falls within the range of the Indiana bat (*Myotis sodalis*), New England Cottontail (*Sylvilagus transitionalis*), and the bog turtle (*Glyptemys muhlenbergii*), and appropriate habitat for each exists within the Town. However, detection of these species requires live trapping or specialized surveys for individual species, which was beyond the scope of this study. Surveys for these species should be conducted as part of the environmental impact assessment for sites that contain appropriate habitat and are proposed for development. Atlantic and shortnosed sturgeon, also identified on the USFWS list for Westchester County, are confined to the Hudson River and lower reaches of tributaries to the Hudson River, so they do not occur in Yorktown.

The NYSDEC and New York Natural Heritage Program (NYNHP) maintain records of confirmed locations of state-listed species and provide that information on a site-specific basis in response to written requests. Stearns & Wheler did request information on state-listed species for the entire Town of Yorktown, but the NYNHP would only provide records of listed species for specific sites, not entire towns. Limited information is available on state-listed species online at the NYSDEC’s website via their interactive Environmental Resource Mapper (<http://www.dec.ny.gov/imsmaps/erm/viewer>). This site is a good resource for checking for existing records of listed species at specific sites, but it still cannot provide information for the entire Town at once. Stearns & Wheler conducted an online search for listed species information for the Hilltop Hanover Farm sampling site to provide an illustration of the information provided by the NYSDEC interactive Environmental Resource Mapper. The results of this search are provided in Appendix B. All environmental impact analyses conducted for sites proposed for development should begin with such an online search, and should be followed up with written inquiries to NYNHP and field surveys to confirm findings.

In addition to the online resources, Stearns & Wheler’s review of published species lists from local experts and our own field surveys identified a number of state- and federal-listed species. These included the following:

COMMON NAME	SCIENTIFIC NAME	LISTING STATUS
American bittern	<i>Botaurus lentiginosus</i>	State-special concern
Bald eagle	<i>Haliaeetus leucocephalus</i>	State-threatened
Common loon	<i>Gavia immer</i>	State-special concern
Common nighthawk	<i>Chordeiles minor</i>	State-special concern
Cooper’s hawk	<i>Accipiter cooperi</i>	State-special concern

COMMON NAME	SCIENTIFIC NAME	LISTING STATUS
Golden-winged warbler	<i>Vermivora chrysoptera</i>	State-special concern
Grasshopper sparrow	<i>Ammodramus savannarum</i>	State-special concern
Northern goshawk	<i>Accipiter gentilis</i>	State-special concern
Northern harrier	<i>Circus cyaneus</i>	State-threatened
Osprey	<i>Pandion haliaetus</i>	State-special concern
Peregrine falcon	<i>Falco peregrinus</i>	State-endangered
Pied-billed grebe	<i>Podilymbus podiceps</i>	State-threatened
Red-shouldered hawk	<i>Buteo lineatus</i>	State-special concern
Sharp-shinned hawk	<i>Accipiter striatus</i>	State-special concern
Vesper sparrow	<i>Poocetes gramineus</i>	State-special concern
Whip-poor will	<i>Caprimulgus vociferous</i>	State-special concern
Yellow-breasted Chat	<i>Icteria virens</i>	State-special concern

All of these species are protected under state endangered species law, and the bald eagle is also protected under the Bald and Golden Eagle Protection Act. Any proposed land use change that may adversely impact any of these species should include consultation with the NYSDEC, and may require application for a listed species license for incidental take. This list should be checked against NYSDEC's list of special concern, threatened, and endangered species annually for updates, since species are periodically added to the list as their numbers decline, or they are imperiled, and species may be removed from the list if their populations recover.

3.4 ENVIRONMENTALLY SENSITIVE RESOURCES

Stearns & Wheler has identified the following list of environmentally sensitive resources in the Town of Yorktown based on our field investigations, literature review, and GIS mapping.

A. **Wetlands, Water Bodies and Vernal Pools.** Wildlife habitat consists of four major components: food, water, protective shelter, and space for populations to disperse and mix. While many cover types provide food, shelter, and space, only water bodies, watercourses, and wetlands provide water. They are vital habitat resources for all wildlife species, as well as for humans. Wetlands provide a wide variety of functions and benefits to humans, including groundwater recharge and discharge, filtration of excess nutrients, capture of eroded sediments, export of nutrients to other ecosystems, fish and shellfish habitat, wildlife habitat, flood flow attenuation, shoreline stabilization, sources of recreation, education and research subjects, visual aesthetics, natural heritage value as unique habitats, and potential habitat for threatened and

endangered species (New England District U.S. Army Corps of Engineers, 1999) and should be protected. Aquatic resources, including wetlands, watercourses, and vernal pools are shown on Figure 2.

B. Critical Environmental Areas (CEAs). In New York State, certain areas are defined as CEAs. To be designated as a CEA, an area must have an exceptional or unique character as it relates to:

- ▶ a benefit or threat to human health;
- ▶ natural setting;
- ▶ agricultural, social, cultural, historic, archaeological, recreational, or educational values; or
- ▶ an inherent ecological, geological or hydrological sensitivity to change that may be adversely affected by any change.

There are three CEAs in the Town of Yorktown: (1) FDR State Park; (2) Mohansic County Park; and (3) Kitchawan Preserve (see Figure 3). These areas are all unique sites that have been recognized at the state level for their ecological attributes and value. Consideration should be given to these sites when making land use decisions in surrounding areas to avoid adversely impacting them.

C. Riparian Areas and Floodplains. Riparian areas are vegetated buffers along watercourses that provide bank stabilization, wildlife habitat, and water quality benefits via sediment and pollutant trapping. Often the riparian zone includes a floodplain which may be mapped according to the FEMA Flood Insurance Rate Map or the Town Code of Yorktown. The floodplain provides storage for runoff in high flow or storm events. Watercourses that have a well defined riparian buffer and floodplain free of obstructions are well suited for enhanced water quality. These resources should be conserved and protected for water quality benefits as well as to protect or limit damages to property.

D. Hydric Soils. Hydric (poorly and very poorly drained) soils are soils which are sufficiently saturated or inundated during the growing season to develop anaerobic conditions in their upper horizons that favor the growth and regeneration of hydrophytic vegetation ((USDA Soil Conservation Service 1985, as amended by the NOTCHES in December 1986). Hydric soils are not well-suited for land-uses requiring percolation (septic systems) or infiltration (stormwater

management). The Town Code of Yorktown protects hydric soils under Chapter 178 - Freshwater Wetlands. The location of hydric soils throughout the Town is shown on Figure 6 in Appendix I.

E. **Steep Slopes.** Steep slopes (greater than 15 percent) and adjacent watercourses and wetlands are often threatened from poor land-use decisions and site development practices inconsistent with the topography and natural conditions of steep slopes. Steep slopes are environmentally sensitive landforms which are susceptible to environmental hazards including increased erosion and sedimentation. These sensitivities often stem from physical features such as rock outcrops, shallow soils over bedrock, groundwater seeps, and poorly planned site development, which can have adverse impacts on surrounding watercourses and wetlands.

Steep slopes in the Town of Yorktown are shown on Figure 6 in Appendix I.

F. **Parks and Open Space.** The Town of Yorktown contains many public-owned (Town, county and state) parks, ballfields, and recreation areas. These resources create a network of open space which connects substantial portions of the Town. Many of these open space resources are adjacent to or are contiguous to aquatic resources. This juxtaposition provides opportunities for interpretation and education, as well as an opportunity to implement short- and long-term management strategies to increase overall biodiversity and protect surface water quality. The open space resources are shown on Figure 7 in Appendix I.

3.5 SENSITIVE HABITATS

Sensitive habitats are habitats that may or may not support rare species, but are particularly valuable because they provide important functions to both wildlife and human populations, including vernal pools and wildlife corridors.

A. **Vernal Pools.** Vernal pools are considered sensitive habitats because they provide breeding sites for amphibian species that are protected from predatory fish. Vernal pools also provide important travel corridors and the ability for amphibian populations to disperse and mix, so that those populations can remain healthy, diverse, and viable. Stearns & Wheler identified 10 vernal pools in several locations in Yorktown, based on field searches and reports from others, but there are undoubtedly more. Environmental impact assessments of all currently undeveloped lands should include surveys for vernal pools, and land use planning should aim to avoid impacts to

these features. Potential vernal pool locations identified during this study are illustrated in Figure 5 in Appendix I.

B. Wildlife Corridors. Wildlife corridors are routes regularly used by any wildlife species to travel from one area to another. Corridors can be defined on a macro scale (e.g., a forested area or hedgerow through which large mammals may travel), or on a micro scale (e.g., a fallen log along which a mouse or salamander may travel). Corridors are not evenly distributed in the landscape, are created by many different species at multiple scales, and therefore are not easy to define or plot on a map. For example, salamanders or birds may regularly use a particular woodlot or hedgerow to travel from one place to another, but each individual may use a different specific pathway for each trip. Conversely, deer are known to use one trail time after time, leaving easily identified concentrated trails of tracks through the woods, but they may only use such trails at certain times of year, or even at particular times of day. The one important factor that all corridors have in common is that they provide some measure of protective cover in which wildlife can safely travel. Wildlife corridors are important wildlife habitat elements because they provide the ability for wildlife species to travel across the landscape, enabling them to maintain mixed, diverse, and therefore healthy populations. Figure 6 in Appendix I illustrates potential and general landscape-scale wildlife corridors throughout Yorktown. While wildlife species are not limited to moving only within these corridors, it is important to maintain such corridors to facilitate wildlife movement throughout the Town.

CHAPTER 4

LAND USE ORDINANCE REVIEW

4.1 INTRODUCTION

The general legislation of the Town of Yorktown includes several existing codes and ordinances that deal with conservation and biodiversity issues:

- Chapter 140 Conservation Areas
- Chapter 161 Environmental Quality Review
- Chapter 165 Erosion and Sediment Control
- Chapter 175 Flood Damage Prevention
- Chapter 178 Freshwater Wetlands
- Chapter 195 Land Development
- Chapter 248 Stormwater Management
- Chapter 300 Zoning

The following is a brief overview of these regulations.

4.2 CHAPTER 140 CONSERVATION AREAS

Chapter 140 regulates areas which are “subject to conservation easements by agreement or a grant of easement or have been designated as such on a plat or map filed with the Westchester County Clerk”. A permit is required to conduct any of the following activities within a conservation area,:

1. Placement or any construction or use of any structure.
2. Any form of draining, dredging, excavation or removal of material, either directly or indirectly.
3. Any form of dumping, filling, or depositing of material, either directly or indirectly.

4. Installation of any service lines or cable conduits.
5. Introduction of any form of pollution, including but not limited to the installation of a septic tank, the running of a sewer outfall, or the discharging of sewage treatment effluent or other liquid wastes into or so as to drain into a conservation area.
6. Alteration or modification of natural features and contours.
7. Alteration or modification of natural drainage patterns and watercourses.
8. Installation of any pipes or wells.
9. The cutting or destruction of trees or destruction, mowing or trimming of vegetation.
10. Plowing and/or harrowing.
11. Grazing of horses and/or other animals.

4.3 CHAPTER 161 ENVIRONMENTAL QUALITY REVIEW

Chapter 161 deems the approval of a plat for a major subdivision, as that term is defined in Chapter 195, Land Development, of the Code of the Town of Yorktown to be "Type I Actions" consistent with the State Environmental Quality Review Act.

4.4 CHAPTER 165 EROSION AND SEDIMENT CONTROL

The purpose of this chapter is to "safeguard persons, protect property, prevent damage to the environment and promote the public welfare by guiding, regulating and controlling the design, construction, use and maintenance of any development or other activity which disturbs or breaks the surface of soil or results in the movement of earth on land situated in the Town." The code cites the soil conservation BMPs outlined in documents prepared and amended by Westchester County, the U.S. Department of Agriculture Soil Conservation Manual, and the New York State Guidelines for Urban Erosion and Sediment Control.

4.5 CHAPTER 175 FLOOD DAMAGE PREVENTION

Chapter 175 defines special flood hazard areas as Zones A, AE, AH, AO, A1-A30, A99, V, VO, VE, or V1-V30 on the FEMA Flood Insurance Rate Map. Chapter 175 also documents standards of construction with these designated areas.

4.6 CHAPTER 178 FRESHWATER WETLANDS

Chapter 178 of the Town of Yorktown Land Use Ordinance defines wetlands as a (1) watercourse and water body; (2) land that meets the definitions outlined in New York State Freshwater Wetlands Act; and (3) areas greater than 1,000 square feet comprised of hydric soils and/or are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support and under normal circumstances do support a prevalence of hydrophytic vegetation. The ordinance also establishes definitions of qualified professionals suited for wetland delineations and outlines procedures for wetland permitting and mitigation.

4.7 CHAPTER 195 LAND DEVELOPMENT

Chapter 195 states the Planning Board of the Town of Yorktown, New York, is authorized and empowered to:

1. Approve, modify and approve or disapprove plats in conjunction with applicable provisions of Chapter 300 Zoning.
2. Approve or disapprove modifications to existing streets, highways, or public areas shown on subdivision plats or maps filed in the Westchester County Clerk's office..
3. Review and approve, approve with modifications or disapprove site plans, land development plans and/or parking plans where any provisions of the Code of the Town of Yorktown requires approval by the Planning Board.

4.8 CHAPTER 248 STORMWATER MANAGEMENT

The Town of Yorktown's Stormwater Management Ordinance requires that all new or redevelopment projects must first receive Town approval if they: (1) will require a complete

Stormwater Pollution Prevention Plan; (2) include the creation, addition, or modification of 5,000 square feet of land; (3) are defined to be an environmentally sensitive land use; (4) include land development activities smaller than 5,000 square feet if it is completed as part of a larger action whose impact is greater than 5,000 square feet; and (5) result in modifications to an existing drainage system.

Similar to New York State Pollutant Discharge Elimination System permit requirements, the Town ordinance requires that the post-construction peak rate of runoff must not exceed pre-development conditions. However, the Town code is more stringent and requires that calculations be provided for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events. In addition, the Town code encourages the use of non-structural treatment measures and establishes a set of design standards for detention/retention ponds.

4.9 CHAPTER 300 ZONING

The Town Zoning Ordinance focuses on zoning and planning-related issues at the Town scale. It defines setback and development standards for the various zones and frequently cites environmental and conservation initiatives discussed in other chapters of the Town code, including Wetlands (178) and Land Development (195). In addition, the Zoning Ordinance permits the use of clustering and flexible standards to “encourage flexibility of design and development of land in such a manner as to promote the most appropriate use of land ... [and to] preserve the natural and scenic qualities of open land.”

Standards for site development, lot size, and preservation of open space are outlined, as are the intended protocols for developing lot density in relation to natural features and site limitations.

4.10 REGULATORY LIMITATIONS AND RECOMMENDATIONS

The existing Land Use Ordinances for the Town of Yorktown regulate a variety of conservation-related activities, most notably wetland protection. However, should the Town desire to address other conservation and biodiversity-related issues, such as critical habitat area conservation, Stearns & Wheler recommends developing additional ordinances or guidelines authorizing local jurisdiction over riparian areas, vernal pools, and conservation subdivisions. The regulation of these areas in addition to the existing land use codes provides a comprehensive approach to conserving biodiversity.

A. **Riparian Buffers.** Improving and maintaining good water quality helps to support a healthy biodiversity. The recent successes in improving water quality in Hallocks Mill Brook play an important role in conserving unique wildlife habitat. By protecting and enhancing local water quality, the Town can improve overall biodiversity. Riparian buffers, vegetated areas along watercourses, are critical to renovating stormwater runoff quantity and quality within the Town. Specifically, riparian zones have the following functions:

1. Remove particle pollutants and sediment from runoff.
2. Provide flood storage.
3. Provide wildlife habitat and corridors.
4. Provide bank stabilization which protects downstream water quality.
5. Reduce water temperature, protecting aquatic habitat.
6. Recreational and educational opportunities.

By asserting jurisdiction on riparian buffers, the Town can maximize conservation and biodiversity because of the many functions performed within the riparian zone. Reference is made to the attached model ordinances for riparian buffer (Appendix F) prepared by Westchester County and the Association of State Wetland Managers.

B. **Vernal and Woodland Pools.** Vernal pools are bodies of standing water that may dry up during the year, but remain flooded long enough to provide breeding habitat for a variety of amphibians (frogs and salamanders) and invertebrates, including some rare, declining, or listed (as special concern, threatened, or endangered) species. The key features of vernal pools are that they lack defined inlets and outlets, filling from overland runoff or groundwater; and that they do not support fish, which are often predators on amphibians and invertebrates. Thus, vernal pools provide amphibians and invertebrates with protected breeding areas. Yorktown should recognize vernal pools as an important and unique natural resource. Unfortunately, the isolated or ephemeral nature of vernal and woodland pools often leaves them unprotected under local, state, and federal wetland regulations.

Yorktown could amend Chapter 178 of the Town Code to add vernal and woodland pool definitions, and could add land use requirements to maintain their integrity. Calhoun and Klemens' (2002) "*Best Management Practices for Vernal Pools*" provides useful guidance on how vernal pools should be managed to maintain their viability as amphibian breeding and dispersal habitat. Some of their recommendations include maintaining an undisturbed vernal pool

envelope, the area within 100 feet of the pool, and limiting disturbance of natural cover within 750 feet of a vernal pool to 75 percent. These recommendations are not hard and fast rules, but rather ideal guidelines to aspire to.

C. Conservation Subdivisions. Conservation subdivisions are a low-impact development strategy that can help communities preserve open space and natural areas as part of residential housing developments. Essentially, a conservation subdivision is development with the maximum permitted number of dwellings on smaller sized, clustered lots that allow for protection and conservation of open space and resources. The benefits of planning conservation subdivisions include the preservation of open space, wildlife habitat, preservation of corridors and trail networks, improvement of infrastructure, and resource protection.

For Yorktown to authorize conservation subdivisions, the existing cluster development provisions in Chapter 300 and applicable portions of Chapter 195 of the Town Code would need to be modified. Model language relative to the establishment of a new conservation subdivision and/or open space ordinance is contained in Appendix F.

CHAPTER 5

RECOMMENDED BEST MANAGEMENT PRACTICES

Based on a review of the existing land use ordinances, current published literature, and past project experience, Stearns & Wheler environmental scientists and landscape architects have established BMPs and design standards for site planning near critical habitat areas in the Town of Yorktown. In addition, we have outlined potential BMPs and standards for environmental mitigation, short and long-term management of biodiversity corridors, and methods for determining cumulative impacts from land uses that will result in unavoidable adverse environmental impacts.

5.1 SITE PLANNING NEAR SENSITIVE NATURAL RESOURCES

The Town of Yorktown Biodiversity Conservation Study identifies sensitive natural resources and biodiversity corridors throughout the Town. These areas include aquatic resources, floodplains, steep slope, riparian areas, and vernal pools.

Vernal pools are bodies of standing water that may dry up during the year, but remain flooded long enough to provide breeding habitat for a variety of amphibians (frogs and salamanders) and invertebrates, including some rare, declining, or listed (as special concern, threatened, or endangered) species. The key features of vernal pools are that they are generally isolated water bodies, filling from overland runoff or groundwater; and that they do not support fish, which are often predators on amphibians and invertebrates. Thus, vernal pools provide amphibians and invertebrates with protected breeding areas. They also provide amphibians with a means of population mixing and dispersal if the pools are distributed in proximity to each other across the landscape and have relatively undisturbed wooded upland corridors that allow amphibians to travel over land. Vernal pool habitats are considered more valuable if they are surrounded by undisturbed forested habitat at least 750 feet in all directions, and have undisturbed upland wooded corridors connecting them to other vernal pools. As such, development near these critical habitat areas and unique resources should incorporate the following site planning BMPs:

1. Maintain undisturbed naturally vegetated corridors of at least 100 feet in width between water bodies and among vernal pools.

2. Maintain multiple corridors among these landscape features.
3. Applicant should prepare an alternatives analysis documenting the need for construction adjacent to the critical areas. When possible, applicant should incorporate the principle of low-impact development (LID). LID is a sustainable planning approach that incorporates natural watershed functions as part of a site development.
4. Permanent protection of sensitive resources in a form of conservation easements granted to the Town of Yorktown or to a local conservation organization or land trust.
5. Undertake special measures during grading and construction activities to avoid/minimize erosion and sedimentation. Use the New York State Standards for Erosion and Sediment Control.
6. Avoid the use of invasive, non-native plantings. A list of common non-native invasive species is included in Appendix G.
7. Limit the use of haybales for erosion and sediment control; require certified weed-free straw bales or silt screen.
8. Require post-construction monitoring reports. Provide annual monitoring reports for a period of five years describing the status of habitat areas and any recommended remedial actions.

5.2 COMMON SITE PLANNING PITFALLS

Stearns & Wheler has identified a number of common pitfalls in site planning that can result in the loss of biodiversity and long-term degradation of natural resources. These include:

1. Limited discussion of design alternatives resulting in construction unnecessarily close to critical areas. Site development which negatively impacts hydrology of vernal pool.
2. Lack of or limited erosion and sediment control between work site and critical areas.
3. Limited data provided outlining existing conditions.

4. No reporting or inspections.

5.3 SITE PLANNING GUIDANCE DOCUMENTS

The following is list of accepted guidance documents pertaining to site planning near critical habitat areas and LID. The Yorktown Planning Department should acquire copies of these resources and make them available for review by Planning Department and Conservation Board members.

1. Center for Watershed Protection, 2008. *“Better Site Design,”* New York State Department of Environmental Conservation
2. Prince George’s County, MD, 1999. *“Low-Impact Development Design Strategies: An Integrated Design Approach,”* Prince George’s County, Maryland, Department of Environmental Resources, Largo, MD.
3. Arendt, Randall, 1996. *“Conservation Design for Subdivisions: A Practical Guide to Creating Open Space Networks,”* American Planning Association. Chicago, IL.
4. Calhoun, A. J. K. and M. W. Klemens, 2002. *“Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States.”* MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, NY.

5.4 WETLAND MITIGATION/RESTORATION DESIGN

Some proposed land uses may result in unavoidable adverse impacts to wetlands. There are methods of design and construction which can minimize and offset these impacts through restoration, enhancement, or creation of wetlands, or in some cases, through conservation of upland habitats that provide similar functions and values to the impacted area.

Chapter 178 of the Town Code of Yorktown defines wetlands as a: (1) watercourse and water body; (2) land that meets the definitions outlined in New York State Freshwater Wetlands Act; and (3) areas greater than 1,000 square feet comprised of hydric soils and/or are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support and

under normal circumstances do support a prevalence of hydrophytic vegetation. In accordance with Town of Yorktown Land Use Ordinances and 6 NYCRR Part 663 NYSECL Article 24, an applicant may propose to mitigate wetland impacts, either through the enhancement of existing wetlands or the construction of new wetlands, for projects where wetland impacts are necessary. Such a proposal must meet the provisions outlined by Chapter 178 Section 17 of the Town Code of Yorktown:

1. The mitigation should occur on or in the immediate vicinity of the site of the proposed project.
2. The mitigation must provide substantially the same or more benefits than will be lost through the proposed activity.

In addition to these criteria, the following is a list of BMPs and design guidelines for effective environmental mitigation and/or restoration design and construction:

1. The mitigation planting plan should consist of native wetland and transitional upland plants. A list of appropriate native plants is included in Appendix G.
2. Plant locations are to be linked to anticipated hydrological regime and water depths to maximize plant growth and minimize unnecessary plant mortality and replanting.
3. Planting plans should account for anticipated plant mortality by calling for an anticipated survival rate. A 10 to 15 percent plant mortality rate in wetland mitigation is common.
4. Planting plans should also note plant quantities, methods used to determine quantities, plant size, and form and amount of seed per unit area. A list of appropriate wetland and wildlife seed mixes is included in Appendix G.
5. Planting with like plant materials should be preferred over seed alone.
6. Wetland mitigation areas should be designed to replace lost functions and values of impacted wetlands to the greatest extent possible. Therefore, impact assessments should

include an assessment of wetland functions and values. The Highway Methodology (New England District, USACE, 1999) is a useful method for this.

7. A detailed construction sequence should be prepared and submitted as part of a permit application.

8. A site monitoring and long-term maintenance plan should be included on mitigation plans.

9. For stream restoration or enhancements, the project sponsor of applicant should base their drawings on a “reference reach,” which is a length of stable stream with similar physical and flow characteristics to the area subject to restoration.

10. Vernal pools are unique ecosystems that are difficult to replicate. Therefore, avoiding impacts to vernal pools should be the primary focus of design, rather than mitigation. If impacts to vernal pools are unavoidable and replacement of vernal pools is proposed, replacement pools should be constructed prior to impact and allowed to develop for up to two years to determine efficacy of newly constructed pools, prior to developing the site.

11. When needed, install amphibian fencing and “salamander crossing” to limit impacts from roadways near vernal pool habitats. According to the FHWA Critter Crossings website (U.S. Department of Transportation Federal Highway Administration www.fhwa.dot.gov/environment/wildlifecrossings/salamand.htm), crossings should accommodate specific site conditions and avoid single-species designs. Also, tunnel crossings should be located close to the existing corridors of the subject species and be monitored so that appropriate adjustments can be made.

5.5 MITIGATION/RESTORATION PITFALLS

Wetland mitigations that fail generally do so because of poor design or poor execution and monitoring of the project. The following are common problems with mitigation projects that may lead to failure:

1. Limited or no detail shown on design drawings or engineering/environmental reports.

2. Inadequate/inappropriate planting lists, including non-native invasive species or plants not adapted for the proposed site conditions (see Appendix G).
3. Proposed soil and substrate material which contains non-native invasive weeds or remnant plant materials.
4. Mitigation areas not designed by a qualified professional experienced with wetland construction.
5. Limited or no long-term maintenance plan outlined on plan.
6. Relying on vernal pool mitigation without examining various land development scenarios or alternatives.
7. Not enforcing appropriate buffer zones around vernal pools or other areas of significant habitat.

5.6 MITIGATION GUIDANCE DOCUMENTS

The following is list of accepted guidance documents pertaining to constructed wetlands and wetland mitigation. The Yorktown Planning Department should acquire copies of these resources and make them available for review by Planning Board and Conservation Board members.

1. United States Army Corps of Engineers, 2008. *“Compensatory Mitigation for Losses of Aquatic Resources,”* Federal Register / Vol. 73, No. 70.
2. NYSDEC, 1993. *“Freshwater Wetlands Regulation, Guidelines on Compensatory Mitigation,”* Division of Fish and Wildlife.
3. USEPA, 2001. *“Stream Corridor Restoration Principles, Processes, and Practices,”* Federal Interagency Stream Restoration Working Group (EPA 841-R-98-900).

5.7 SHORT- AND LONG-TERM MANAGEMENT

Yorktown consists of many public-owned (Town, county and state) parks, ballfields, and recreation areas. These resources create a network of open space which connects substantial portions of the Town. The Town can implement a variety of short- and long-term maintenance practices at these facilities to increase overall biodiversity. The following is a list of short-term strategies for enhancing biodiversity:

1. Install native plant species in and around Town parks and recreation areas.
2. Provide no-mow buffers near aquatic resources. No-mow buffers near water bodies also limit potential for nuisance geese populations.
3. Maintain buffer zones around aquatic resources.
4. Public awareness and outreach. The Town should offer information to residents regarding native plant alternatives for non-native invasive species.

These short-term strategies can be implemented immediately at Town-owned facilities and can result in significant increases in overall biodiversity and water quality protection. However, a short-term approach alone may not be sufficient. A long-term strategy for these resources should be implemented to maximize biodiversity throughout the Town-wide open space network. These include:

1. Implement recommended BMPs and land use ordinance modifications outlined in the report.
2. Engage in large-scale invasive species control and removal. Specifically, common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*) are of major concern. The removal of these species often requires excavating root structures, burning, increasing hydrology, or shading with trees species. To do this, the Town should consider seeking funds and guidance from the New York State Invasive Species Task Force.
3. Initiate a Town-wide vernal pool mapping program.

4. Public education and outreach.

5.8 DATA COLLECTION PROTOCOLS

Proposed site development and land use modification presentations vary by project sponsors. Rarely will two applicants prepare the same level of quality in a proposed application packet. This can be problematic when a board seeks to make informed decisions about a land use modification, and frequently results in a delayed permitting process and can ultimately lead to poor land use decisions. Therefore, the Yorktown Planning Board and Conservation Board should require or request that future applicants and project sponsors provide background natural resources data which includes the following:

1. Description of site soils and vegetation including a list of ecological cover types. Ecological cover types should be based on “*Draft Ecological Communities of New York State*” (Edinger, et. al., 2002). The Town Boards can utilize the wildlife predictive matrix in Appendix C to evaluate potential impacts to wildlife based on ecological cover type.
2. Lists of observed flora and fauna species.
3. Identification and evaluation of aquatic resources, including wetlands, watercourses, isolated pools, vernal pools and description of any riparian or buffer zones.
4. Natural resources impacts assessment.
5. Discussion of design alternatives and the relation to natural resources impacts.

These are general protocols and may not apply for all project types. For example, the construction of a single-family home may not warrant the same level of effort and description as a multiple-lot subdivision or large-scale commercial complex. Therefore, the Town Boards will need to develop internal thresholds for project review. A large-scale project with the potential for substantial impacts may also require the applicant to prepare a wetland delineation report, a wetland functions and values assessment, and/or a natural resources inventory.

5.9 DETERMINING CUMULATIVE IMPACTS FROM DEVELOPMENT

Reviewing the cumulative adverse environmental impacts from proposed actions is challenging. In order to make a decision and determination based on cumulative impacts, a community must first understand how to define them.

New York State defines cumulative impacts as "two or more related actions undertaken, funded or approved by an agency, none of which has or would have a significant impact on the environment, but when considered cumulatively would meet one or more of the criteria for [consideration for potential significant adverse impacts]" 6 NYCRR §617.7(c)(1)(xii).

The most effective review of cumulative impacts can occur in the public scoping process through the State Environmental Quality Review (SEQR) process. Relative to cumulative impacts, one of the purposes of scoping is to determine if resources and ecosystems have already been affected by past or present actions and whether there are potential plans in place, which may affect the resource in the future. To do this, Yorktown should:

1. Identify the potential impacted resource(s).
2. Establish the geographic scope and time frame for the analysis.
3. Identify other actions affecting the resources, ecosystems, and human communities of concern.

According to the USEPA Council on Environmental Quality Handbook, future actions can be removed from the analysis of cumulative impacts if they are outside the geographic boundaries or time frame established, if the action will not affect the resources, or if the action's impacts are arbitrary or speculative.

Determining the environmental consequences of a proposed land use change entails describing the cause-and-effect relationships that produce cumulative effects and summarizing the total effect of each considered alternative. When reviewing potential cumulative impacts, the Town should consider probable impacts (impacts that are likely to occur), not speculative impacts (impacts that require far-reaching assumptions).

5.10 CUMULATIVE IMPACTS GUIDANCE DOCUMENTS

The following reference is the federal protocol for identifying and evaluating the cumulative impacts from a proposed land use change. The Yorktown Planning Department should acquire copies of these resources and make them available for review by Planning Board and Conservation Board members.

1. USEPA, January 1997. "*Considering Cumulative Effects Under the National Environmental Policy Act*". Council on Environmental Quality.

5.11 DISCUSSION

It is important that development near sensitive natural resources, including wetlands, streams, and vernal pools, maintains appropriate buffer zones, implements soil conservation BMPs and protects open space to the extent practicable. A series of design standards and BMPs were discussed for development near critical resources areas. Sometimes, situations will occur where development results in unavoidable adverse environmental impacts. In these situations, the Yorktown Conservation Board and Planning Board can require environmental mitigation and/or restoration to offset or minimize those impacts. An applicant proposing mitigation should provide enough detailed information and data so the Town can make a reasoned decision based on supporting facts. The information submitted by an applicant should account for proposed plantings (species, quantity and size), soil and substrate material, existing and proposed hydrology, and proposed post-construction inspection or maintenance routine.

When reviewing cumulative impacts under SEQR, the Town should identify the resources being impacted, define the geographic extent and time frame for the analysis, and identify future actions which may impact the resource. The Town Boards must keep open lines of communication with other Town and regional agencies to be aware of past or future actions which may need to be reviewed as part of a cumulative impacts analysis. Establishing clear parameters (geographic extents, timeframes, etc.) at the beginning of a cumulative impacts analysis will allow for a more efficient and accurate review.

CHAPTER 6

NEXT STEPS

6.1 IMPLEMENT RECOMMENDATIONS

A series of short and long-term recommendations aimed at enhancing overall biodiversity within the Town have been outlined in this report. These include:

1. Short and long-term maintenance recommendations for habitat areas.
2. Discussion of model ordinance for riparian buffers, vernal pool and conservation subdivision regulations.
3. Design standard for land-use planning near environmentally sensitive areas.
4. Design BMPs for wetland and stream mitigation or enhancement.
5. Data collection protocols for new land-use application.
6. Protocols for analyzing cumulative impacts from development.

Reference examples and citations for these have also been included in the appendices. Through the implementation of these measures, the Town can increase species richness and improve wildlife habitats. These benefits, although incremental, can be measurable and significant over a long period of time.

This study resulted in the production of useful and practical tools and recommendations that the Town of Yorktown Planning Department and Conservation Board can use to enhance and conserve biodiversity and healthy ecosystems. Now that the Planning Department and Conservation Board have these tools, it is time for them to take the next steps toward making the Town of Yorktown a long-term sustainable community. Implementation of the recommendations outlined in this report does not need to occur on any particular schedule, but

rather can be done as time and other resources allow. Some recommendations, such as adoption of new resource protection regulations in the Town Code will require long term planning efforts and public participation, and may therefore be longer term projects. Recommendations such as requiring BMPs in the restoration of habitats might be implemented more immediately, and can start showing results right away. Such short-term successes will help to encourage further management actions to improve environmental sustainability in the Town of Yorktown.

6.2 MONITOR PROGRESS

Achieving sustainability in landscape and natural resource management is a long-term proposition, but one that can start paying great dividends in environmental health almost immediately. The Town of Yorktown should monitor their progress in implementing the recommendations outlined in this report, and in using the tools that resulted from this study. Such monitoring should track locations and areas in which the Town Planning Department and Conservation Board uses the tools and recommendations from this study to plan for more healthy habitats and biodiverse ecosystems in Yorktown. Over time, the Planning Department and Conservation Board will begin to see the effects of these planning efforts on the landscape in the form of protected sensitive natural resources, such as vernal pools, wildlife corridors, and riparian corridors. In turn, such protected areas will lead to more productive and balanced wildlife populations and cleaner water.

Part of the monitoring of the progress of biodiversity conservation efforts is repeating the biodiversity survey. It is unlikely that significant or measurable changes in wildlife and plant populations will be observable immediately, but if the Town repeats the biodiversity survey in ten (10) years, substantial changes may be more evident. Methods and sample sites described in this study should be used when the survey is repeated.

Stearns & Wheler also recommends that the Town, using this study as a base, engage in a process known as “Greenprinting”. Essentially, greenprinting incorporates planning, GIS, engineering and ecosystem services to develop conservation and planning scenarios that help communities make informed decisions regarding infrastructure, energy and natural resources.

6.3 EXPAND EFFORTS INTO A “GREENPRINT” FOR YORKTOWN

A Greenprint is a plan for community sustainability that integrates natural resource conservation efforts (like the ones outlined in this report) with land use and community planning, facilities and asset management, energy conservation, carbon footprint reduction and total water quality management. In short, a Greenprint is a blueprint for green management. Now that Yorktown has taken the first step in developing a Greenprint by commissioning this study, they can continue and expand on their efforts by developing an integrated Greenprint for the Town, which could include recommendations for low impact community development, natural resource and human-made infrastructure management for minimal impact and energy use and maximum waste reduction, and measures for minimizing the Town’s carbon footprint and protecting its high quality water supply. Grant funding is available for Greenprinting, and Stearns & Wheeler can work with the Town Planning Department and the Conservation Board to identify potential funding sources, complete grant applications, and then can provide expertise and guidance in integrated, long-term sustainability solutions.