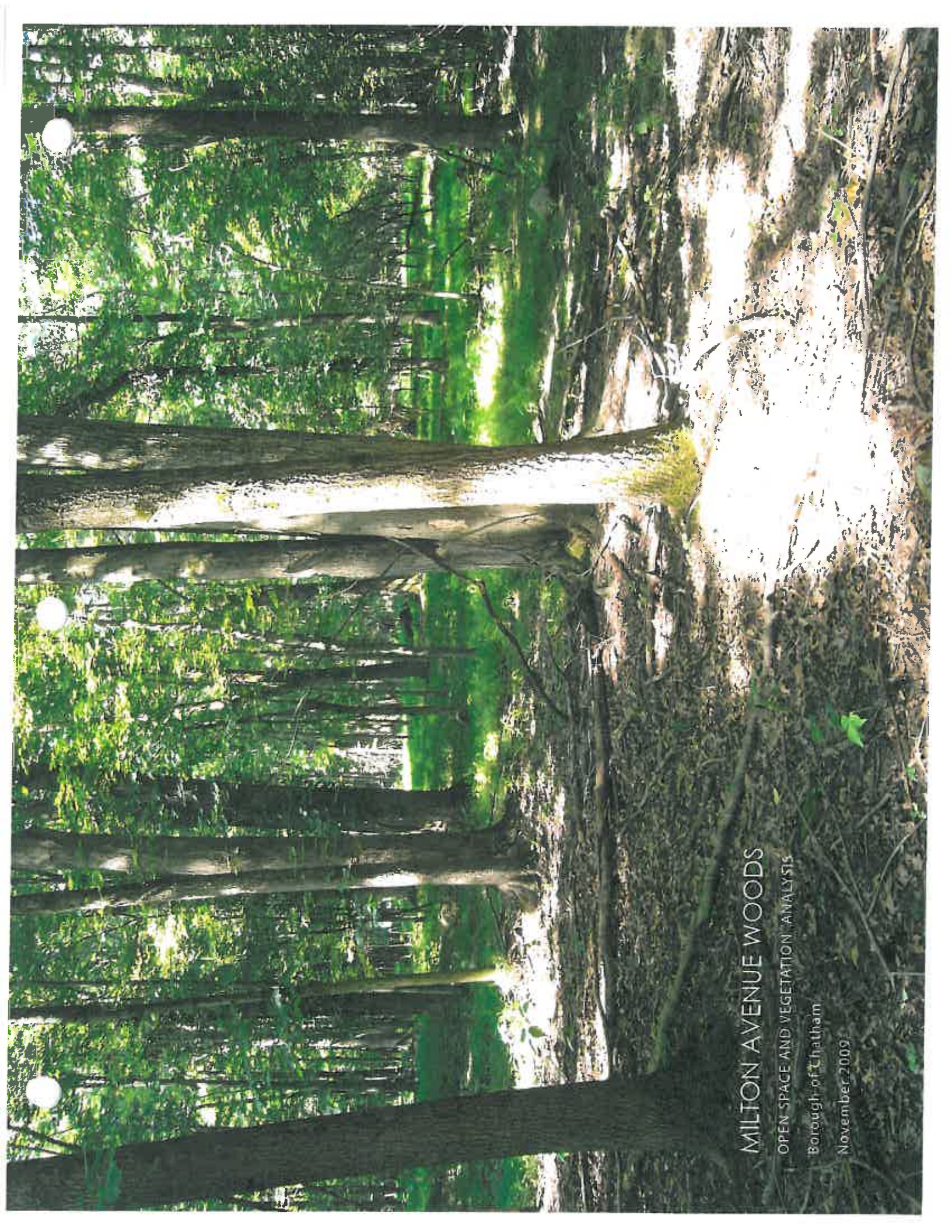


A photograph of a forest path. Sunlight filters through the dense canopy of green trees, creating bright patches on the ground and highlighting the trunks of several trees in the foreground. The path is covered with fallen leaves and branches.

MILTON AVENUE WOODS

OPEN SPACE AND VEGETATION ANALYSIS

Borough of Chatham

November 2009



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CONTENTS

Executive Summary	7
Background Information	9
Restoration and Management	21
Recreation, Access and Environmental Education	31
Project Timeline and Estimated Costs	39
Project Summary	45
Attachments	46
References	



EXECUTIVE SUMMARY

In October 2006, the Borough of Chatham Environmental Commission initiated a program to survey open space properties owned by the Borough, identifying ways to restore those valuable community resources to create a more natural environment while making them more usable and accessible to the public. Together with EDWARDSIAECOM, the Borough evaluated the 94-acre contiguous properties of Kelly's Pond and Milton Avenue Woods to identify existing vegetation patterns and invasive species found in natural areas, develop recommendations for removal of invasive species, explore opportunities for habitat restoration and enhancement of native vegetation, and provide general recommendations for public access and use.

This unique open space property provides multiple benefits to the residents of Chatham. From its ability to absorb and store flood waters to its diverse forest and wetlands habitats serving as home to numerous flora and fauna this resource continually serves the community that has now preserved it. In addition, its close proximity to community schools presents an opportunity for this natural area to serve as a "living" classroom and laboratory for current and future students of the Chatham Schools.



BACKGROUND

Milton Avenue Woods is a 94-acre property in the Borough of Chatham. It is bordered by State Route 24 and Florham Park Borough to the north; and to the south by Milton Avenue Elementary School, Chatham Middle School, and residential neighborhoods. The site is mostly undeveloped, aside from a mulching and compost facility and several unimproved trails leading to Kelly's Pond from Milton Avenue School.

The 1-acre Kelly's Pond is used by the public for fishing and passive recreation. The property also shows evidence of informal use from mountain bikes and ATVs. Access to the park is available from the Milton Avenue Elementary School where visitors can park in a small school lot as well as several other unimproved access points located at dead end streets at various points around the site.

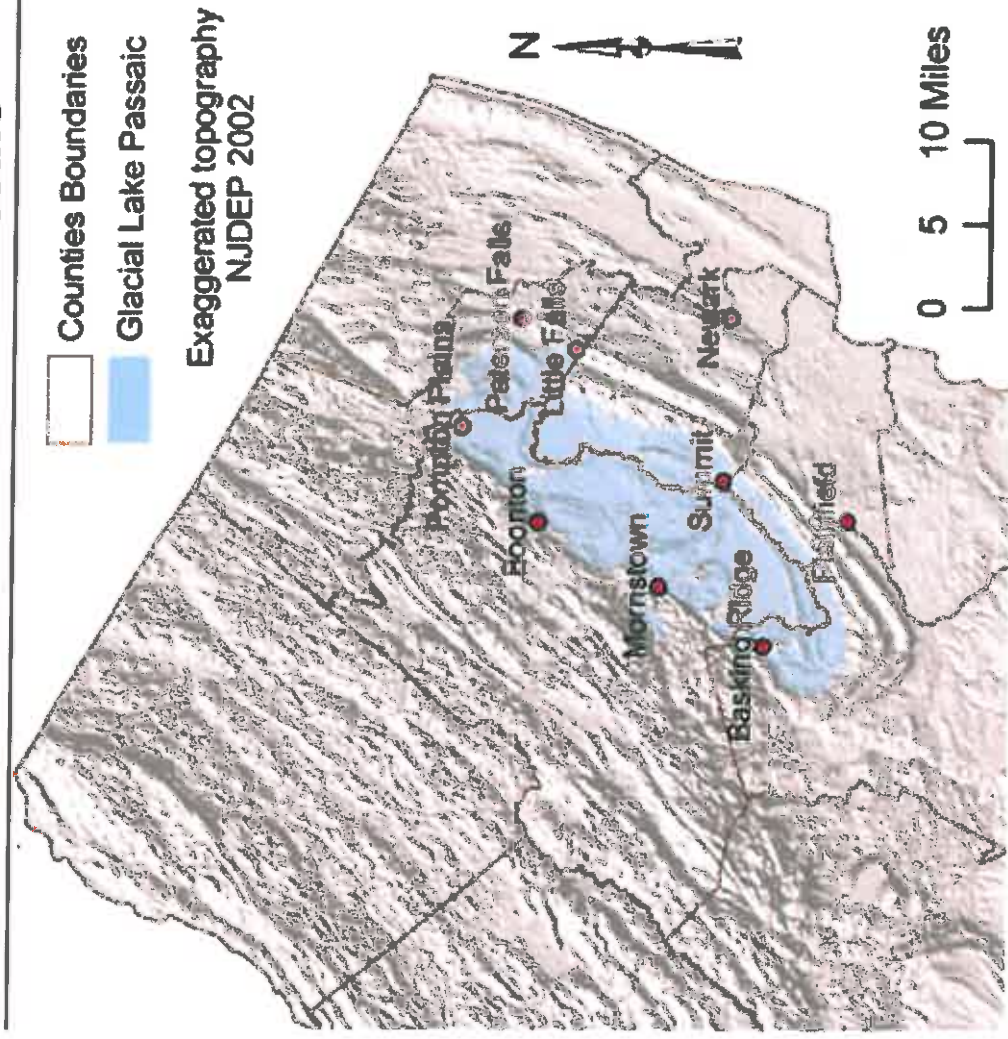
Chatham Borough covers less than 2.5 square miles, including a business district and railroad station within about a mile from its farthest boundary, and is a pedestrian friendly community. Due to its proximity to schools and residential neighborhoods the opportunity exists to provide pedestrian access for passive recreation and environmental education throughout the property.



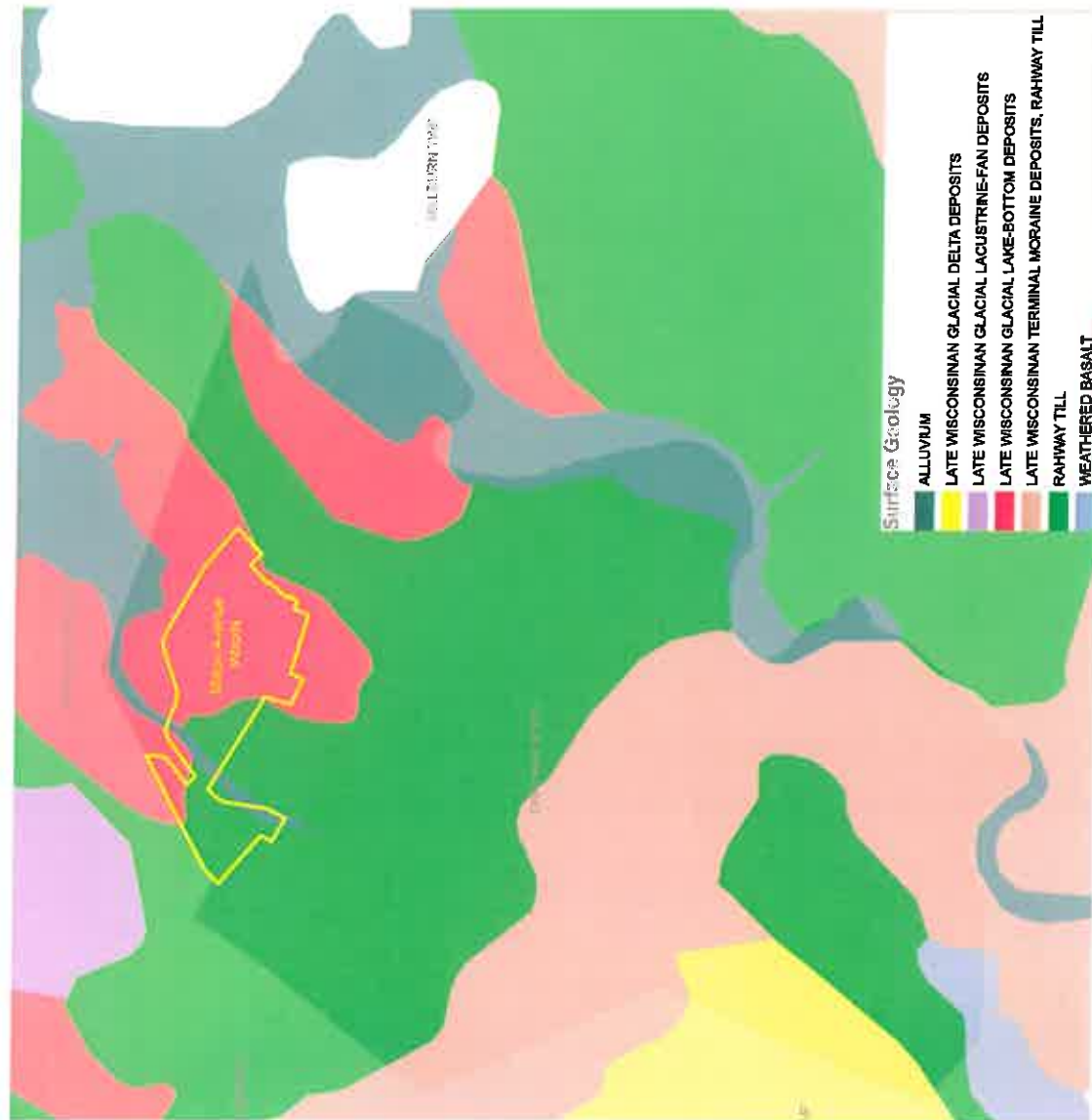
Geological History

The Borough of Chatham is located in the Piedmont physiographic province in New Jersey. This region is characterized as a low rolling plain divided by a series of higher ridges underlain by slightly folded and faulted sedimentary rocks of Triassic and Jurassic age and igneous rocks of Jurassic age. Chatham Borough also falls within the US Fish and Wildlife's Passaic Meadows complex, a collection of wetlands remaining from the former Glacial Lake Passaic, which was formed by the retreating Wisconsin glacier.

Prehistoric Glacial Lake Passaic



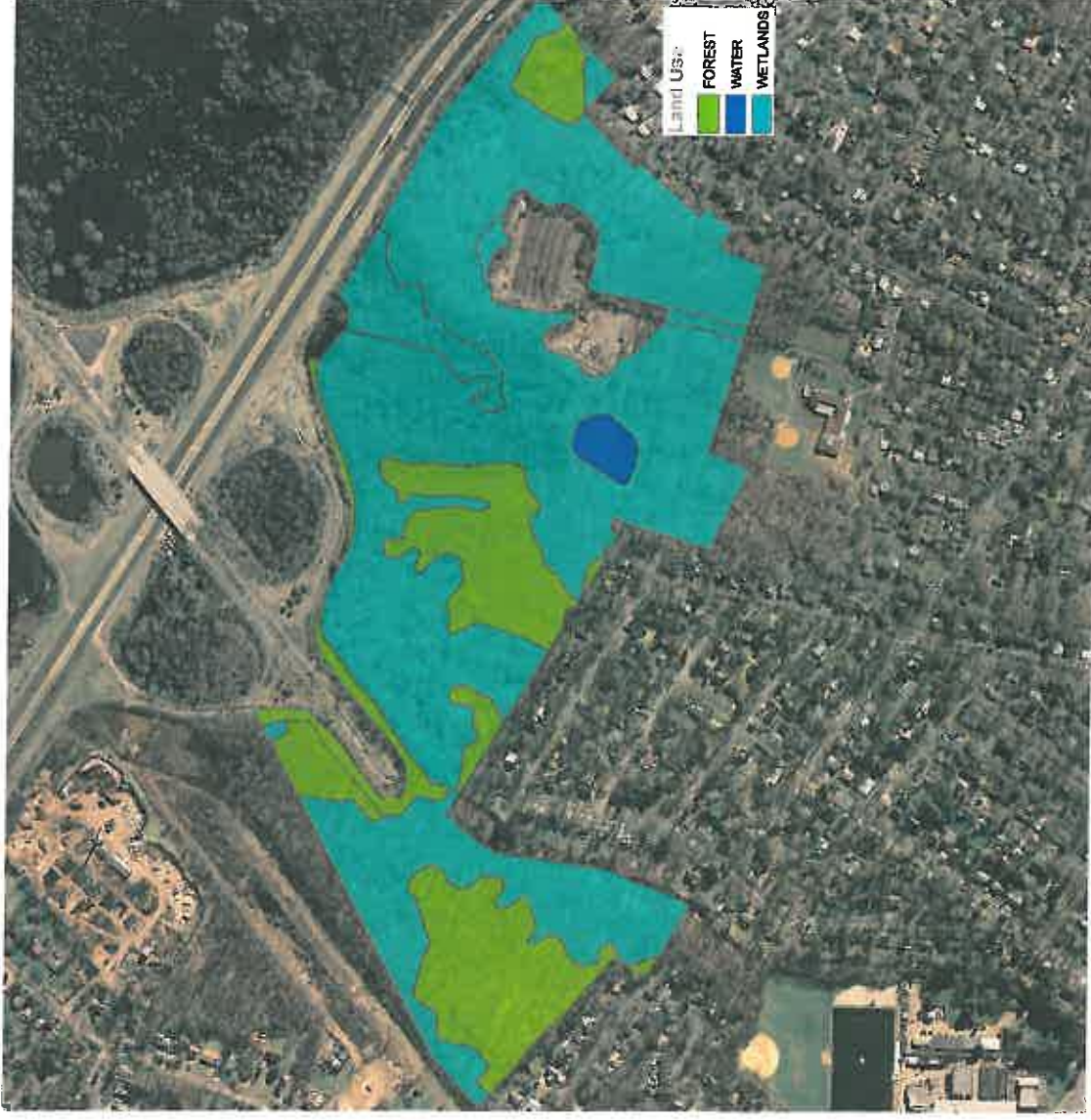
Source: U.S. Fish & Wildlife Service



Surface geology indicates that much of the northern and eastern portion of Milltown Avenue Woods is made up of Late Wisconsin Glacial Lake-Bottom Deposits, whereas the remainder is comprised of Rahway Till and Alluvium. The property lies in the Upper Passaic, Whippany and Rockaway Watershed Management Area within the larger Passaic River Basin.

Hydrology

The Milton Avenue Woods property is approximately 70% forested wetlands and 25% riparian or upland forest, based on the 2002 NDEP land use classifications. The remaining five percent consists of altered land used for the mulching and compost facility. Several small streams and drainage ditches cross the property, and in the spring and summer a large portion of the property is inundated with water. Site visits confirmed these conditions. Observations noted very little standing water in October, yet subsequent visits during February and August found much of the site saturated, especially in the vicinity of the adjacent stream and drainage swales. The freshwater wetlands on the Milton Avenue Woods site can best be classified as swamp and riverine, which are typically forested with occasional standing water, usually during the typically high precipitation seasons of early spring and late summer.





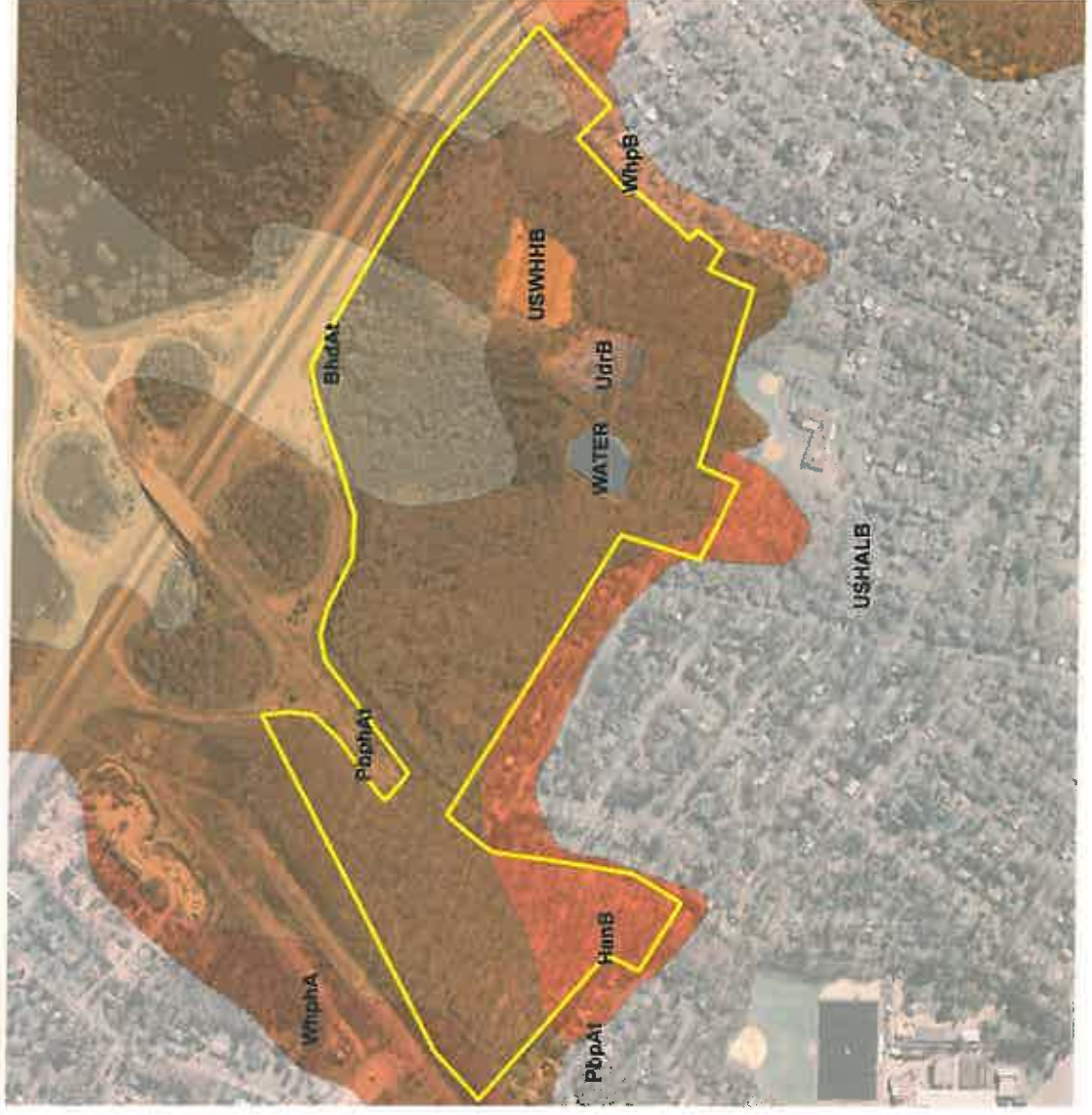
The wetlands on the site provide a major function in the local and regional landscape acting as natural sponges that trap and slowly release surface water over time. This ability to store water in time of heavy rainfall means that wetlands can help prevent flooding. Wetlands are important for preventing stormwater runoff and melting snow from rushing into rivers and lakes, thus reducing flooding and minimizing harm to downstream areas. Preserving these wetlands, in conjunction with other flood control measures, often offers superior flood protection and costs less than a conventional system of dikes, levees, floodways, and stormwater detention basins.

Protecting wetlands can be especially important in densely populated areas (found in Central and Northern New Jersey) where pavement contributes to an increased rate of runoff especially in areas with steep slopes or other land features which tend to increase stormwater volume and velocity. This increased volume and velocity can potentially lead to erosion and an ultimate decrease in water quality downstream due to the reduction in infiltration.

These functional values can provide economic benefits to downstream property owners and taxpayers. In addition, plants and soils in wetlands play a significant role in purifying water, removing high levels of nitrogen and phosphorus, and in some cases, removing toxic chemicals.

Soils

Most of the soils that are found on the Milton Avenue Woods are poorly drained. The site is predominantly made up of the soils series Parsippany silt loam (PpPhA1) and Piedmont silt loam (PdcA1), both of which are hydric soils, or soils that are sufficiently wet in the upper part to develop anaerobic conditions during the growing season. The presence of hydric soil is one of the primary criteria indicative of wetlands. Specific characteristics of soils found at Milton Avenue Woods are listed in Table 1.



Map Unit Symbol	Hydric Soils	Map Unit Name	Drainage
phphAt	All	Parsippany silt loam, sandy loam substratum, 0 to 3 percent slopes, frequently flooded	Poorly drained
BhdAt	All	Biddeford silt loam, 0 to 2 percent slopes, frequently flooded	Very poorly drained
HanB	No	Haledon silt loam, 3 to 8 percent slopes	Somewhat poorly drained
WhphA	Partially	Whippany silt loam, sandy loam substratum, 0 to 3 percent slopes	Somewhat poorly drained
WhpB	No	Whippany silt loam, sandy loam substratum, 3 to 8 percent slopes	Somewhat poorly drained
UdrB	No	Udorthents, refuse substratum, 0 to 8 percent slopes	Well drained
USWHHB	No	Urban land-Whippany, occasionally flooded complex, 0 to 8 percent slopes	Somewhat poorly drained

Table 1: Morris County soil series located on Milton Avenue Woods site. Source: USDA NCRS 2008 SSURGO soils.

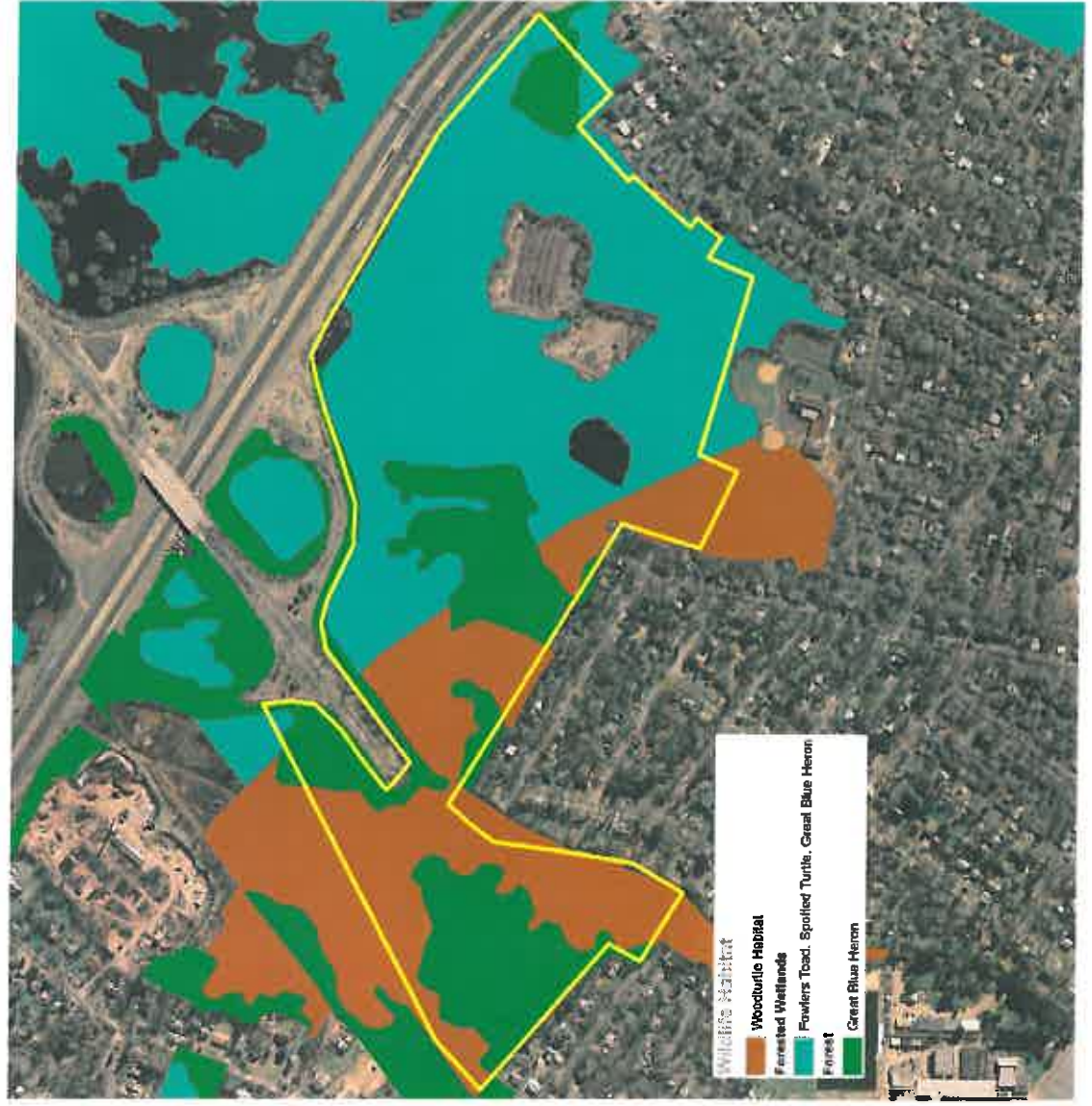
Wildlife

The Passaic River and its expansive wetlands have long been recognized as a critical resource for wildlife. The mix of wetlands and uplands gives rise to a diversity of plant and animal life, especially migratory birds. Given its location in a highly urbanized landscape, its ability to function as a haven for wildlife is of considerable importance. This region is home to a diversity of rare wildlife and supports over 100 species of special emphasis, many of which are birds. Some of these species are shown in Table 2.

The region also supports over 200 species of birds, including a variety of breeding waterfowl (wood duck, green-winged teal, mallard); breeding waterbirds (virginia rail, sora, marsh wren); migrating raptors (osprey, American kestrel, red-tailed hawk); and songbirds (eastern bluebird, gray catbird, yellow warbler). Thirty-five species of fish, 24 species of amphibians and 20 species of reptiles have been identified in the central Passaic River basin, including alewife, American eel, eastern

Species	Status
American bittern (<i>Botaurus lentiginosus</i>)	State-listed threatened
Barred owl (<i>Strix varia</i>)	State-listed threatened
Blue-spotted salamander (<i>Ambystoma laterale</i>)	State-listed endangered
Bobolink (<i>Dolichonyx oryzivorus</i>)	State-listed threatened
Bog turtle (<i>Clemmys mulhenbergii</i>)	Federal candidate
Buttonbush dodder (<i>Cuscuta cephalanthi</i>)	State-listed endangered
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	State-listed threatened
Great blue heron (<i>Ardea Herodias</i>)	State-listed threatened
Long-eared owl (<i>Asio otus</i>)	State-listed threatened
Northern harrier (<i>Circus cyaneus</i>)	State-listed endangered
Red-headed woodpecker (<i>Melanerpes erythrocephalus</i>)	State-listed threatened
Red-shouldered hawk (<i>Buteo lineatus</i>)	State-listed endangered
Wood turtle (<i>Clemmys insculpta</i>)	State-listed threatened

Table 2: Species of special emphasis. Source: US FWS Significant habitats and habitat complexes of the New York Bight Watershed – Complex #24.



mud turtle, spotted salamander and northern cricket frog. Thirty-two species of mammals are known to the region, including river otter, mink, coyote, red fox, gray fox and beaver.

The New Jersey Division of Fish and Wildlife's (DFW) Endangered and Nongame Species Program (ENSP) documents endangered, threatened and other rare species conservation using the Landscape Project, an approach that uses maps to depict imperiled and rare wildlife habitat throughout the state. The Landscape Project data applied to the Filison Avenue Woods site revealed habitat for several species of concern within the property: great blue heron, fowlers toad, spotted turtle, and the state-listed threatened wood turtle. It will be important to maintain healthy, functioning ecosystems for these rare wildlife populations.

Vegetation

Common trees in the overwaps and floodplains of the Piedmont include red maple, American elm, pin oak, swamp white oak, silver maple, sour gum and white ash. Typical shrubs and herbs in this region include mountain laurel, shadbush, spicebush, skunk cabbage, ferns, and jick-in-the-pulpit. This matrix was further refined and defined during site visits to the property. Investigation and assessment at the site identified six (6) unique vegetation communities or habitat zones. Each of the zones exhibits a unique habitat community with variations in the dominant native plant community matrix.

Zone 1 – Kelly's Pond Classroom

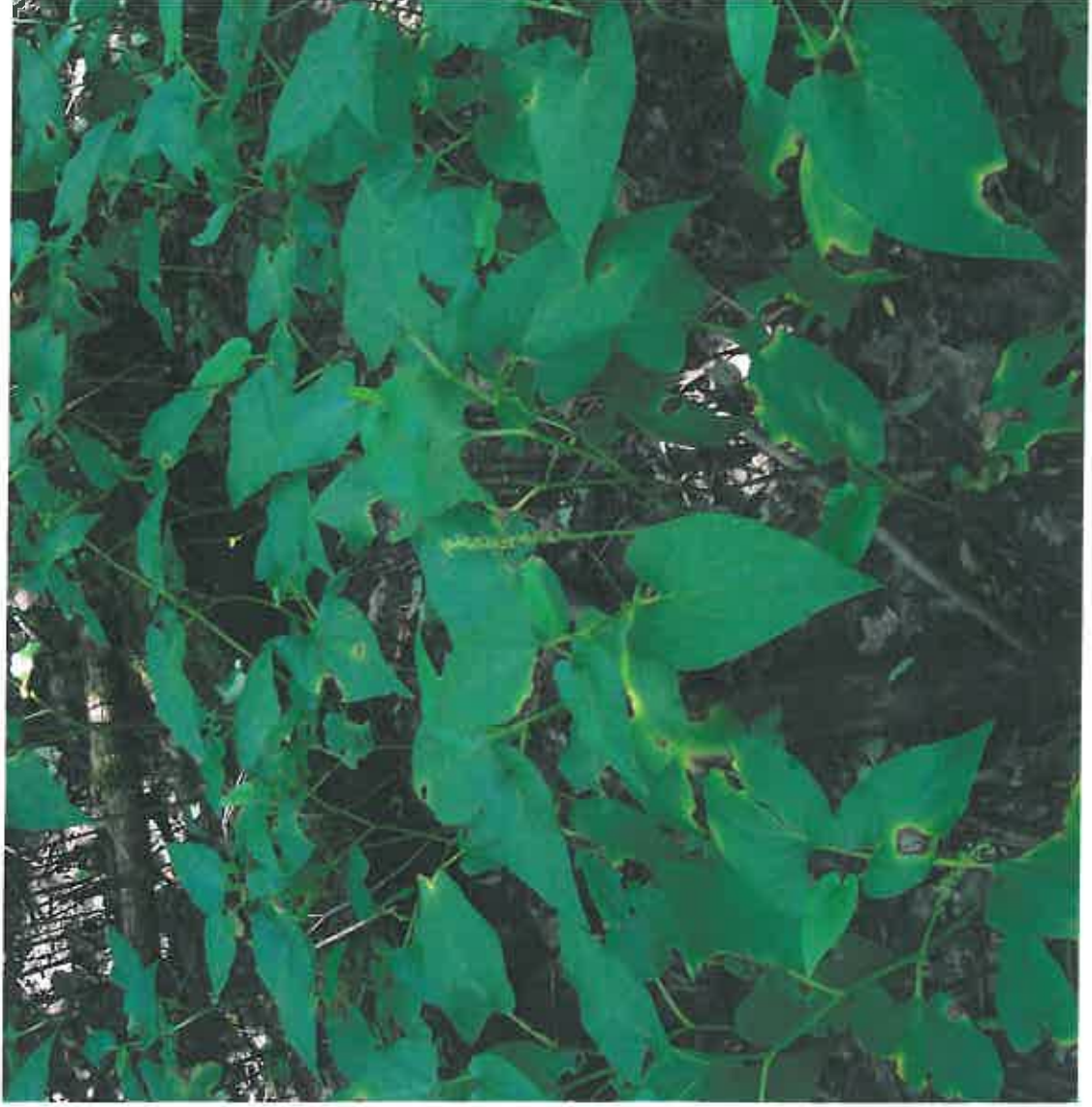
This zone exhibits a range of conditions supporting a variety of native floodplain and riparian hardwood vegetation. Dominant species observed include: red maple (*Acer rubrum*), tulip tree (*Liriodendron tulipifera*), American sycamore (*Platanus occidentalis*), shagbark hickory (*Carya ovata*), and spicebush (*Lindera benzoin*).

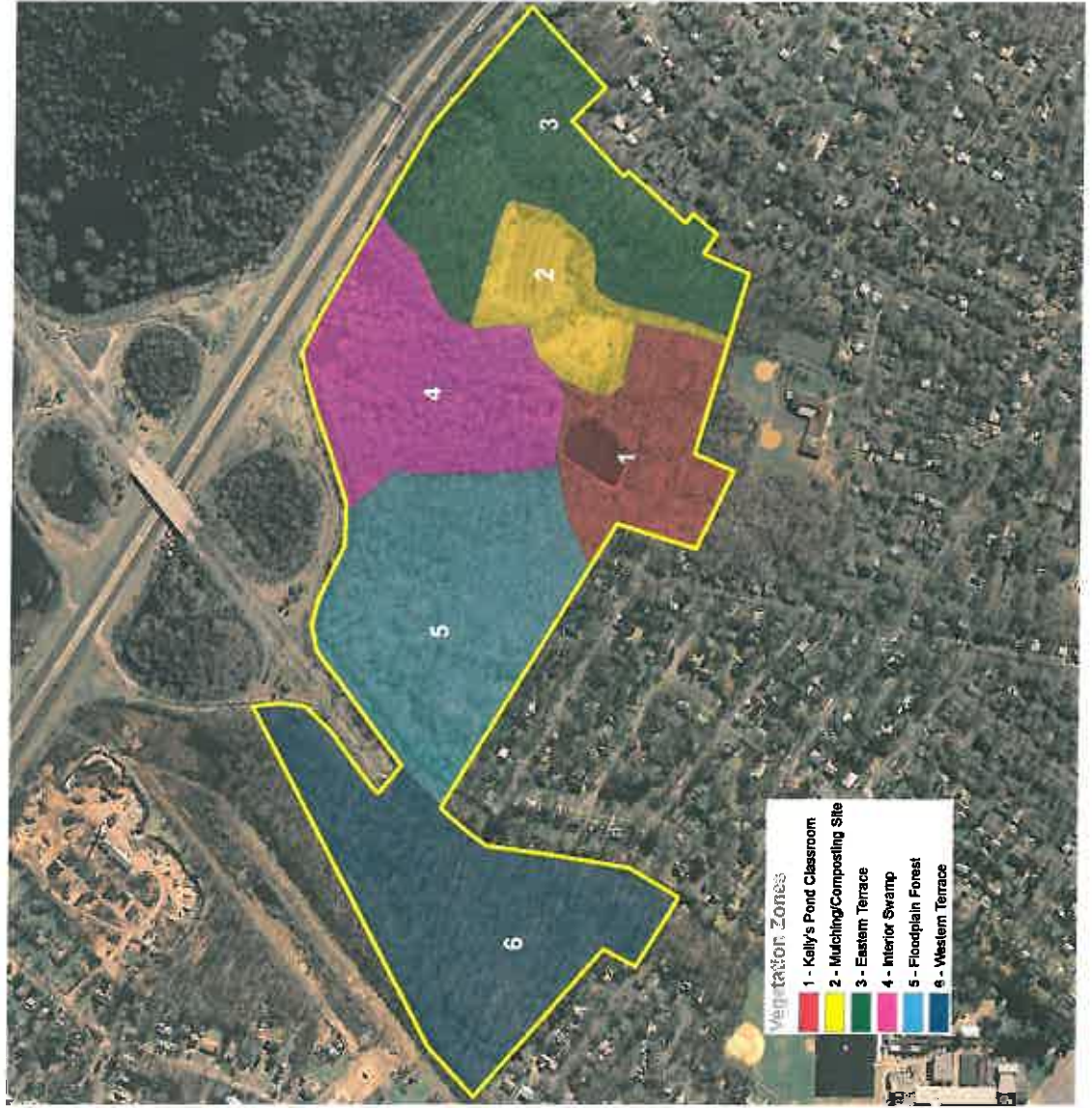
Zone 2 -- Mulching/Composting Site

This interior area of the site is actively disturbed and maintained by the Borough as a mulching and composting site for leaves, brush, and Christmas trees. To protect the remaining natural areas of the property, activities need to be monitored to limit any expansion of the activities, minimize stormwater runoff impacts, and the spread of invasive species seed bank.

Zone 3 – Eastern Terrace

This area of the site contains better drained soils which support a mix of hardwood tree species different from the Swamp and Flood Plain Forests. Dominant species observed include: Hopbush (*Osirea virginiana*), black cherry (*Prunus serotina*), pin oak (*Quercus palustris*), shagbark hickory (*Carya ovata*), American linden (*Tilia americana*), and witch hazel (*Hamamelis virginiana*).





Zone 4 – Interior Swamp

This interior area is dominated by a Red Maple Swamp typical of Piedmont flood plain areas. The ground is covered with blackened leaves (evidence of vernal pools) and poorly drained soils saturated much of the year. Trees exhibit flared bases common for vegetation growing in wet soil conditions.

Zone 5 – Floodplain Forest

This zone contains a diverse community of floodplain species common to the region. Dominant species noted in this area include: cottonwood (*Populus deltoides*), American hornbeam (*Carpinus caroliniana*), witch hazel (*Hamamelis virginiana*), American linden (*Tilia americana*), spicebush (*Lindera benzoin*), swamp white oak (*Quercus bicolor*), American sycamore (*Platanus occidentalis*), and jack-in-the-pulpit (*Arisaema triphyllum*).

Zone 6 – Western Terrace

Similar to the Eastern Terrace, this area exhibits better-drained soils which support a unique mix of hardwood species including: green ash (*Fraxinus pennsylvanica*), shagbark hickory (*Carya ovata*), red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), American hornbeam (*Carpinus caroliniana*) and spicebush (*Lindera benzoin*).

Additional details of the native species and plant communities of the region can be found in "Plant Communities of New Jersey" (Collins, 1994).



RESTORATION AND MANAGEMENT

Recommendations

With nearly 70% of Milton Avenue Woods identified as freshwater wetlands, all restoration and management activities will need to be carefully planned and closely monitored. Alterations to the sensitive wetland resources could significantly impact the health and natural functions of the site and will be scrutinized by regulatory agencies to ensure that degradation does not occur intentionally or unintentionally.

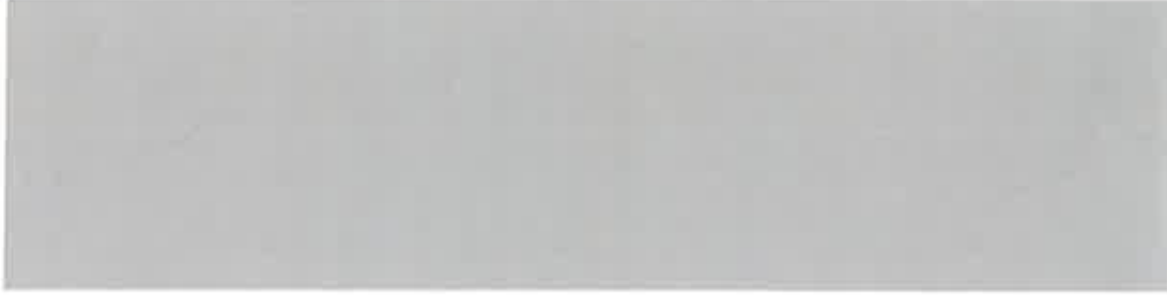
Opportunities and Constraints

The preliminary evaluation noted that invasive species commonly found at other floodplain and riparian sites in the State and region were not prevalent throughout the property. Typically, Phragmites, Japanese knotweed, purple loosestrife and several European vines are found in dense colonies within floodplain woodlands of New Jersey. These species were not found in any great significance, if at all, and ongoing monitoring should be done to minimize any future colonization.

Speculation would suggest that the lack of invasive vegetation may be due to the presence of a healthy dense canopy cover and minimal historic disturbance to the site. Dense shade in addition to stable soil conditions supports a healthy native understory

minimizing opportunities for invasive exotic vegetation to colonize and establish in these areas. Only minor evidence of common invasive species, including multi-flora rose, Japanese barberry, pachysandra, and other garden escapees were noted in perimeter areas.

The primary invasive species of concern throughout the property and most prevalent in Zone 6 (Western Terrace) is Japanese stiltgrass (*Microstadium vimineum*). This "green carpet" covers extensive areas of the woodland floor.



Invasive Vegetation Management

Management efforts should focus on control of the extensive areas of Japanese stiltgrass while minimizing disturbance of healthy understory vegetation to restrict opportunities for other invasive species colonization. Japanese stiltgrass is an annual species that reseeds itself each year. The plant forms dense mats or "carpets" on the forest floor out-competing other native groundcovers and produces a heavy crop of viable seeds each year. The seed bank for stiltgrass can persist in a densely colonized area for up to five (5) years requiring a long-term commitment to effectively manage this invasive exotic species.

Both mechanical and chemical methods can provide effective control of this species when a coordinated plan and committed approach is implemented.

Mechanical removal methods: As it is very shallow rooted, stiltgrass can be easily pulled or raked to remove it from the ground. It can also be mowed or cut with a weed trimmer. A benefit to mechanical methods is that it has the potential to weaken the plants. Stems and leaves should be removed from the site whenever possible with care given to not spread seed. Once removed, the biomass should be composted to kill any viable seed or disposed of in a landfill.

Chemical treatment options: Both pre-emergent and post-emergent chemical treatments are effective in managing and eliminating stiltgrass. When applied in early spring, pre-emergent chemicals target the seed bank keeping stiltgrass from germinating. Post-emergent treatment with a systemic herbicide

such as glyphosate (e.g. Roundup®) can be used to kill growing vegetation and, when used at the appropriate time, will keep the current year's growth from flowering and going to seed. Roundup is a non-selective herbicide and will kill or damage nearly all types of vegetation. In addition, in wetland and aquatic areas, Rodeo which is another formulation of the glyphosate herbicide, should be used to protect amphibians and aquatic invertebrates.

Multiple techniques and multiple treatments will be necessary to control and manage stiltgrass on the site. Where stiltgrass has become well established, aggressive methods targeting both removal of existing vegetation and prevention of future seed germination will be necessary. Multiple methods such as combining mechanical and chemical treatments can often be the most effective in long term eradication of invasive species. The primary benefit of mowing or using a weed trimmer is that it eliminates dead plants that are mixed in with the live vegetation. After mowing, only the live vegetation resprouts. Since there is often a significant amount of dead vegetation amongst the existing live vegetation, the resulting regrowth is often less dense than the existing stand. As a result, there is a reduction in the amount of herbicide or chemical needed to cover an area.

In other areas of the site, monitoring and periodic spot removal and treatment should be done to contain and limit future colonization. All chemical treatment should be done by a licensed applicator with experience in working in natural and aquatic environments. Additional information on these management techniques is provided in the attached fact sheets developed by the Plant Conservation Alliance and Penn State University.



Japanese siltgrass, or *Nepenthes brownii*, is an annual grass with a sprawling habit. It germinates in spring and grows slowly through the summer months, ultimately reaching heights of 2 to 31 ft. The leaves are pale green, lance-shaped, asymmetrical, 1 to 3 in. long, and have a distinctive shiny midrib. Shorter stalks of tiny flowers are produced in late summer (August through September-early October) and dry fruits called achenes are produced soon afterwards.

Source: Plant Conservation
Alliance Fact Sheet

Forest Restoration Strategy

Once an invasive species management program has been implemented, native understory vegetation should be reintroduced to replace the invasive groundcover and re-establish a healthy, diverse multi-story forest community. With the existing dense forest canopy providing suitable micro-climate conditions, it is anticipated that restoration of the forest understory will be faster and easier to implement. The biggest expected challenge will be protection of new understory plantings from predation by deer.

A forest restoration strategy should focus on re-introducing the appropriate diversity and layering commonly found in native woodland communities. A combination of materials, including seeding, planting of herbaceous perennials, planting of shrubs, and installation of tree species of various sizes will begin to provide suitable habitat for reestablishment of the multi-aged forest community that is critical to the overall function necessary to encourage maximum natural system biodiversity. Ongoing monitoring and management will be necessary, but a targeted plan to re-create the relative abundance, structure, spacing, and distribution of forest vegetation can provide for a strong, healthy community with the ability to out-compete invasive species infestations.

Trees and all woody vegetation growing within cities and towns collectively form the urban forest. The urban forest is a vital infrastructural component to the overall ecological health of our cities and towns by providing air, water, and socio-economic benefits. Urban trees often require a unique set of planting and management strategies due to the complexity of the environments in which they live. With its infrastructure of streets, sidewalks,

curbs, buried utilities, overhead power lines and buildings, the urban/suburban community places tremendous stresses on trees. With proper planting techniques and maintenance, trees become assets which grow in value over time. Without care, tree value can decline, eventually becoming a liability to the community. Additional technical information is available for communities working to develop, manage and protect their forest resources. See the "Technical Guide to Urban and Community Forestry" at <http://www.na.fs.fed.us/spfo/pubs/uf/techguide/toc.htm>.

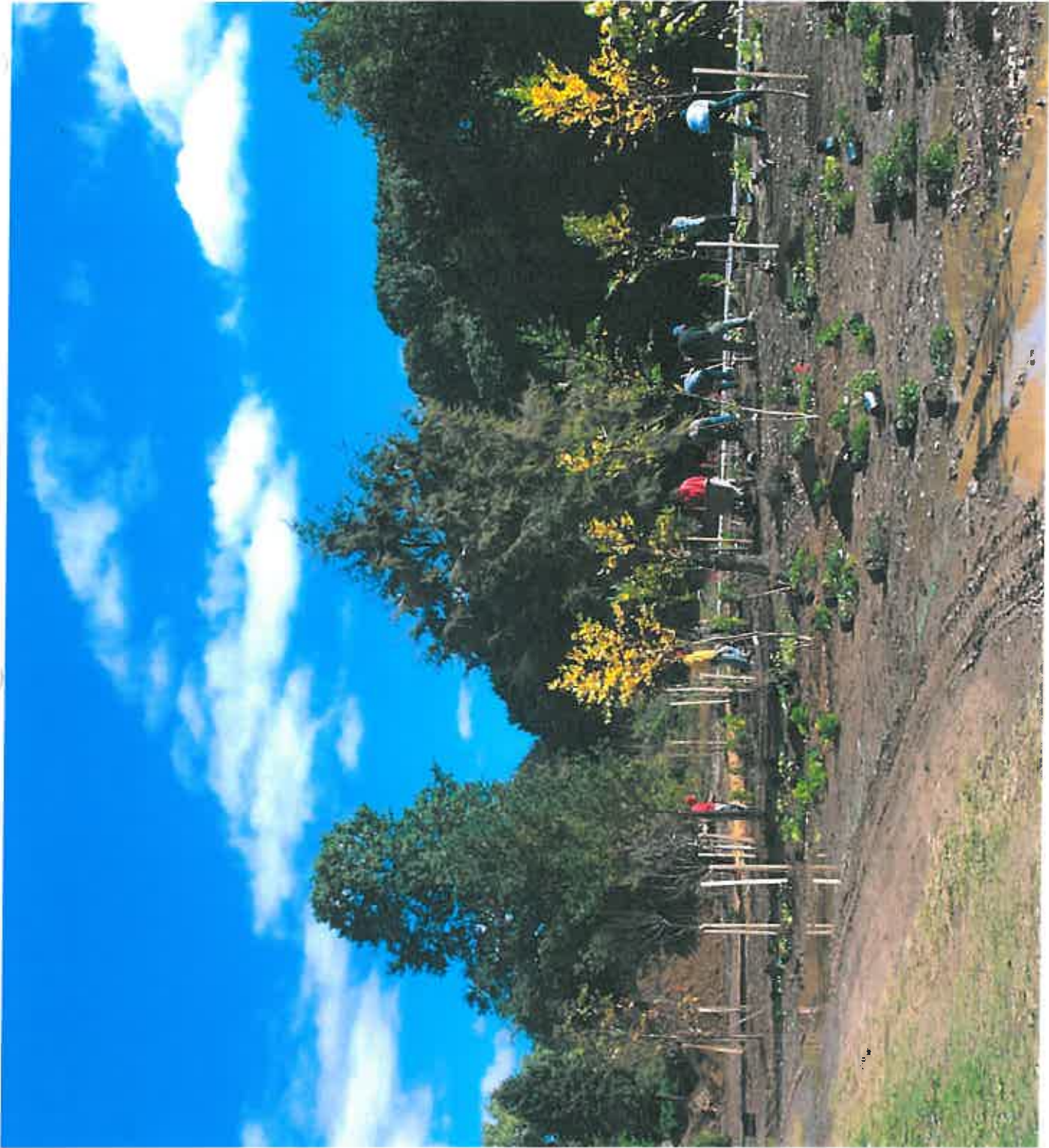
Multi-Story Forest



Canopy

Understory

Herbaceous



Maintenance Program

An effective way to perform invasive plant removal is a program that enlists and trains volunteers dedicated to the task of preventing and controlling the spread of invasive plant species within the site borders. Programs that have become the models for similar efforts are the Nature Conservancy's Invasive Species Initiative and the Weed Warrior Program created by Maryland's Department of Parks Forest Ecologist, Carol Bergmann. In the last seven years these two efforts have trained over 450 volunteers, 300 of whom remain actively involved in non-native invasive removal in their communities. Carol Bergmann and other experts in the field frequently hold training seminars which have become an effective way to disseminate information and "train the trainer" who can then share knowledge with volunteers for site-specific programs. For more information visit www.weedwarrior.org.

Before embarking on a weed management program it is important to develop a straightforward rationale for the actions to be taken. To best accomplish invasive control, a program should use the following adaptive management approach:

- (1) establish management goals and objectives for the site;
- (2) determine which plant species or populations, if any, block or have potential to block attainment of the management goals and objectives;
- (3) determine which methods are available to control the target invasive species;

- (4) develop and implement a management plan designed to move conditions toward management goals and objectives;

(5) monitor and assess the impacts of management actions in terms of their effectiveness in moving conditions toward these goals and objectives; and

- (6) re-evaluate, modify, and start the cycle again.

Note that control activities are not begun until the first three steps have been taken. A weed control program is best viewed as part of an overall restoration program, so actions will start by focusing on what plants and habitats are to be re-established in place of the weeds, rather than simply eliminating the weed. When selecting control methods, the program should keep in mind that the ultimate purpose of the work is to preserve native species communities, and/or functioning ecosystems.

Regulatory Considerations

Due to the presence of streams and wetlands on site, restoration or construction activities may require permits from the NJ Department of Environmental Protection (NJDEP). It is anticipated that recommended management activities would require the following permits:

NJDEP Freshwater General Permit 16 – Habitat creation and enhancement activities

Only very limited activities are allowed in wetlands and transition areas without obtaining approval from the NJDEP. Unregulated activities include hand trimming of trees or other vegetation, provided the trimming does not alter the character of the freshwater wetland. The management and restoration activities recommended in this document will require that a plan be prepared and approval secured. Specifically, a wetlands delineation may be needed to determine the extent and classification of existing wetlands and a General Permit 16 (N.J.A.C. 7:27A-5.16) application should be submitted to NJDEP for review and approval.

The General permit 16 authorizes habitat creation and enhancement activities in freshwater wetlands, transition areas, and State open waters, necessary to implement a plan for the restoration, creation or enhancement of the habitat and water quality functions and values of wetlands, which is sponsored or substantially funded by a Federal or State agency. Several agencies and/or non-profit organizations can provide necessary technical assistance and work with the community to develop and implement a plan meeting the requirements of this general permit. Additional details and requirements are outlined in the attached excerpt of the regulations.

NJDEP Flood Hazard Area Permit

Invasive species management and habitat restoration activities are not specifically defined within the State's Flood Hazard Area regulations (N.J.A.C. 7:13) but this work will occur in all or a portion of the regulated Riparian Zone associated with the various waterways flowing through the property. Any plans will need to conform to the requirements of activities set forth for Riparian Zones located at 7:13-10.2.

As the plan progresses and partnerships are established, it will be necessary to contact NJDEP to confirm activities, limits of regulated areas, required permits, and to ensure that regulatory conditions are met. It should also be noted that any project activities that cause disturbance to soils (for areas exceeded 5,000 square feet) will also require approval from the Morris County Soil Conservation District.

Technical Assistance

Various resources and programs exist that can provide technical assistance, materials, and direction for management and restoration plans.

USFWS Partners for Fish and Wildlife Program

Partnerships enable the U.S. Fish & Wildlife Service to accomplish its mission and balance its activities while increasing public awareness and participation in fish and wildlife conservation efforts. The strength of partnerships lies within their ability to unite varied parties in pursuit of shared resource objectives. One of the New Jersey Field Office's partnership efforts is the Partners for Fish and Wildlife which includes providing technical support and services for the management of invasive vegetation. Partners for Fish and Wildlife is a U.S. Fish & Wildlife Service program directed at protecting and restoring important fish and wildlife habitats on non-federal lands through voluntary partnerships. Cost-sharing is an important program component. The program's main focus is wetland restoration, but the U.S. Fish & Wildlife Service also pursues riparian and upland restoration. Individual citizens and groups looking to restore, enhance, or even create wildlife habitats can contact the New Jersey Field Office for more information (<http://www.fws.gov/northeast/nfieldoffice/>).

USDA Natural Resources Conservation Service

NRCS believes in the value of cooperative conservation. The agency works cooperatively with federal, state, and nonprofit groups that represent a diversity of expertise. As partners in conservation, the organization can blend its unique areas of expertise and conservation work to put more conservation on the land. NRCS also collaborates with the Resource Conservation and Development Program (RC&D) which was initiated to help people care for and protect their natural resources to improve an area's economy, environment and living standards. The program provides a way for local residents to work together and plan how they can actively solve environmental, economic and social problems facing their communities. Today, the program continues to successfully deliver coordinated resource conservation and rural development assistance. For more information, visit: <http://www.nj.nrcs.usda.gov/> and <http://www.northeastrcd.org/index.php>.



RECREATION, ACCESS AND ENVIRONMENTAL EDUCATION

Recommendations

The proximity of Milton Avenue Woods to community schools and its connection to multiple neighborhoods defines a need for improvements to provide access for appropriate levels of passive recreation use and outdoor environmental education within the property. Providing access allows residents to take ownership of the property and can help the community in its ongoing efforts to preserve and enhance this valuable resource.

Opportunities and Constraints

To improve opportunities for access and public use of a non-motorized multi-use trail, a continuous route needs to be identified that can provide circulation to and from key access points.

Currently, limited improvements have been made providing access to only the pond from the elementary school and the mulching and compost facility. The pathway to and around the pond is surfaced with sand and gravel. Although no other formal trails exist in the site, unmaintained trails have been formed from pedestrian, mountain bike, and ATV use.

A key step in developing access to the site is to identify targeted points of access, such as the middle school and the elementary school, and begin to connect them to a centralized pathway. When determining the location of these points of access, it is important to consider connections to the larger community, linking neighborhoods, recreation and open space areas, and the community into an integrated pedestrian-friendly network.

With any proposed pedestrian improvement plan for a non-motorized multi-use trail, several key issues must be addressed continually throughout the process with members of the community. Physical limitations along with community perception will be critical when final designs are proposed and implementation begins. Important constraints to be considered throughout the planning process include pedestrian safety, private property, privacy and maintenance. All trails should have multiple points of access, destinations, and loop through the site avoiding dead ends and "one-way in" and "one-way-out" scenarios.

Public trails should provide pedestrians with a sense of safety and predictability. Users should not feel threatened due to poor lighting, unpredictable surfacing changes, isolation or dead ends. The plan should consider clear orientation and establish a continuous route for users that is obvious and does not encourage walkers to stray off the trail to reach their destination or return safely to their point of origin.

Private residential properties are adjacent to many parts of the site. With any proposed improvements that will encourage access to the site, concerns from adjacent property owners will need to be addressed. Providing a well-maintained specific route with clear points of access will encourage public use of the property, elevating its significance in the community. In the final route selection and design process, providing clear boundaries between public and private space will be critical to protecting the privacy of

adjacent property owners. The appropriate use of changes in grade, buffer planting, and placement of fixtures and furnishings will need to be explored and shared with individual property owners. With the variety of existing conditions found throughout the site, multiple solutions and approaches can be identified and used to appropriately define the public space and ensure the privacy of adjacent properties.

Once improvements have been made, conducting scheduled routine maintenance will be required as well as planning for un-scheduled maintenance and repairs on an as-needed basis. In the final design and engineering process, specific maintenance needs should be identified based upon selected materials and furnishings. A maintenance plan will need to be developed to determine needs so the community can adequately provide for necessary staffing, budgeting, and scheduling of required activities.

Public Access

Well-planned and designed pedestrian access points can enhance mobility that compliments the network of sidewalks. In this way Milton Avenue Woods becomes a component of a community-wide pedestrian-oriented circulation network. Well-designed signage, clear destinations and measures to promote appropriate levels of use for targeted users can enhance and strengthen the community's commitment to the environment and its remaining natural resources.





Passive Recreation

Based on environmental constraints, the design focus should be for use by pedestrians, but it should be recognized that use by mountain bikers and joggers may occur. The planning and design of a multi-use trail must therefore take into account the various capabilities, needs, and characteristics of these different users. Specifically, it is recommended that wherever possible the following be incorporated into final designs:

- A continuous route created by locating improvements where a connected route can be established that avoids dead ends, protects core habitat areas, and links key destinations.
- Scenic qualities, offering an aesthetic experience that enhances the experience for pedestrians.
- Good design, by providing adequate width and sight distance, and avoiding problems such as poor drainage and blind corners.
- Universal design to ensure that all user groups including ones with disabilities will be able to experience the site safely and have independent access.
- Good signage to direct trail users.
- Proper maintenance, with regular weeding and repair.

Environmental Education

Why should children have to wait until they go inside to learn? Children are eager to discover and learn in dynamic and organic settings and by creating an outdoor learning center or classroom, communities can provide new and innovative opportunities for children as they seek to understand the world in which they live.

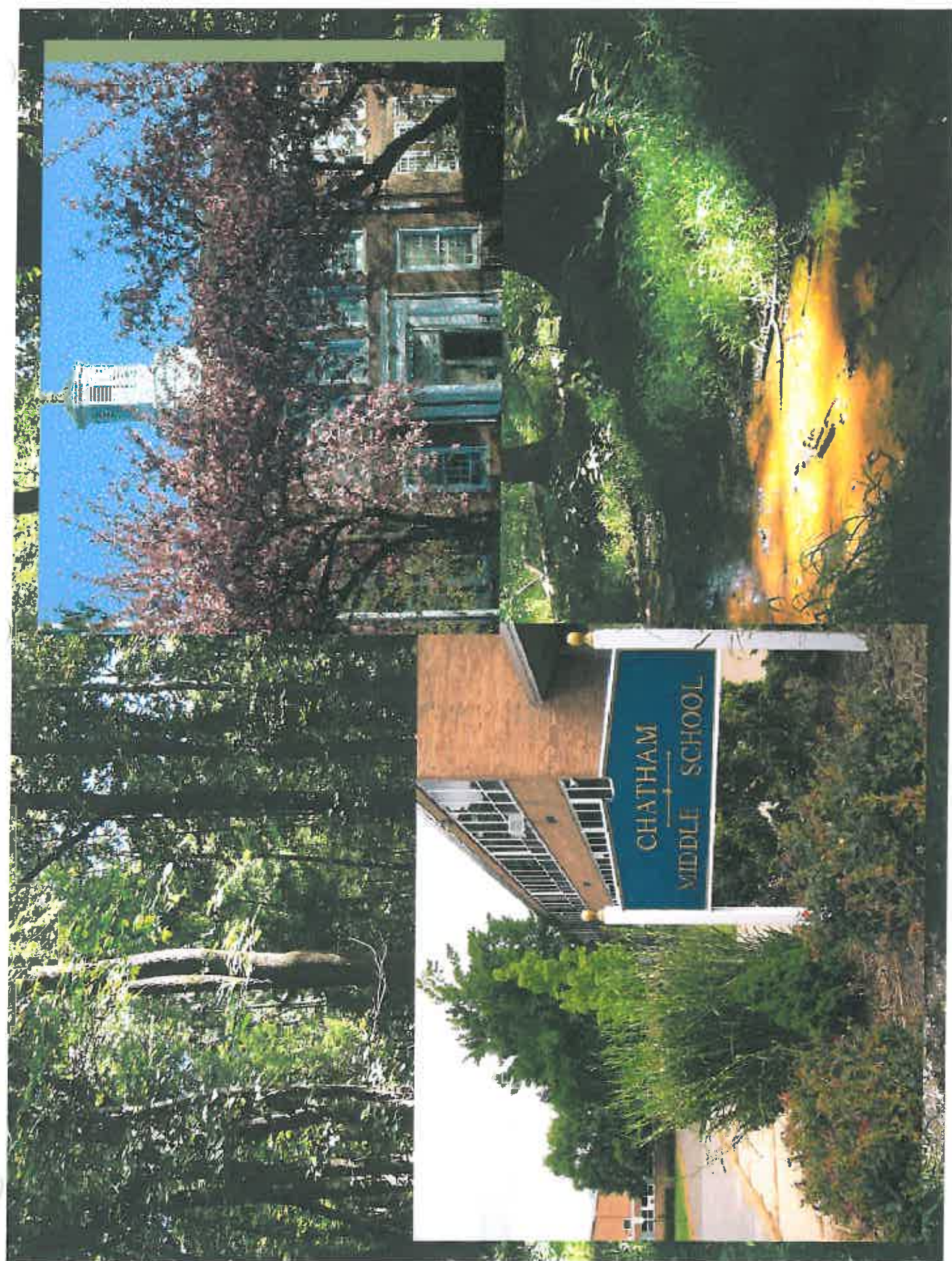
We often learn best by doing. The outdoors offers students as much opportunity for active learning as they have in indoor classrooms. The outdoor environment offers a rich learning experience full of amazing things for students to experiment, discover, and explore. In a planned outdoor center, children can do much more than run, climb, and play. They can observe and interact with the weather, insects, plants, and everything going on around them. Teachers can extend current themes and projects into an outdoor classroom by planning alternative activities in weekly lesson plans. Successful programs with outdoor classrooms often include a trained coordinator or local naturalist who can work with classroom teachers to bring curricular themes outdoors. Engaging the school and its students can lead to increased community involvement and management potential through the multi-generational benefits associated with education.

Outdoor education provides students with access to the materials or equipment necessary to fully explore their environment. Environmental curricula support and complement existing programs as well as current classroom topics. Outdoor learning centers, like those indoors, promote active learning through play and hands-on exploration.

Environmental education through natural science curricula focuses on integrating environmental knowledge into natural science education. An environmental education program should be set as an extension of the objectives for natural science education. In order to reach objectives laid out for environmental education, the following topics are often used to focus learning:

- causes, hazards, and preventative and control measures for environmental issues and environmental pollution;
- connection of key environmental issues with real life situations and industrial production related topics in one's own community; and
- increasing laboratory opportunities to include subjects such as determination of acidity of rain water, counting the number of particulates in the atmosphere, observing the greenhouse effect and analyzing river water samples, in order to understand the status of environmental pollution and its control in certain areas.

Environmental education touches on many elements of natural science criteria and can be an effective tool assisting teachers accomplish a variety of learning objectives.



Regulatory Considerations

Due to the presence of streams and wetlands on site, restoration or construction activities related to improvements for passive recreation and environmental education will require permits from the NJ Department of Environmental Protection (NJDEP). It is anticipated that recommended recreation and education improvements would require the following permits:

NJDEP Freshwater General Permit 17 – Trails and boardwalks

General Permit 17 (N.J.A.C. 7:27A-5.17) allows for the construction of trails and/or boardwalks for use by pedestrians, bicycles, and other non-motorized vehicles. Trails are limited to six (6) feet in width and must be designed and constructed to not alter existing hydrology of a site. Trail projects are also required to include features to educate users regarding the function and importance of wetlands.

NJDEP Flood Hazard Area Permit

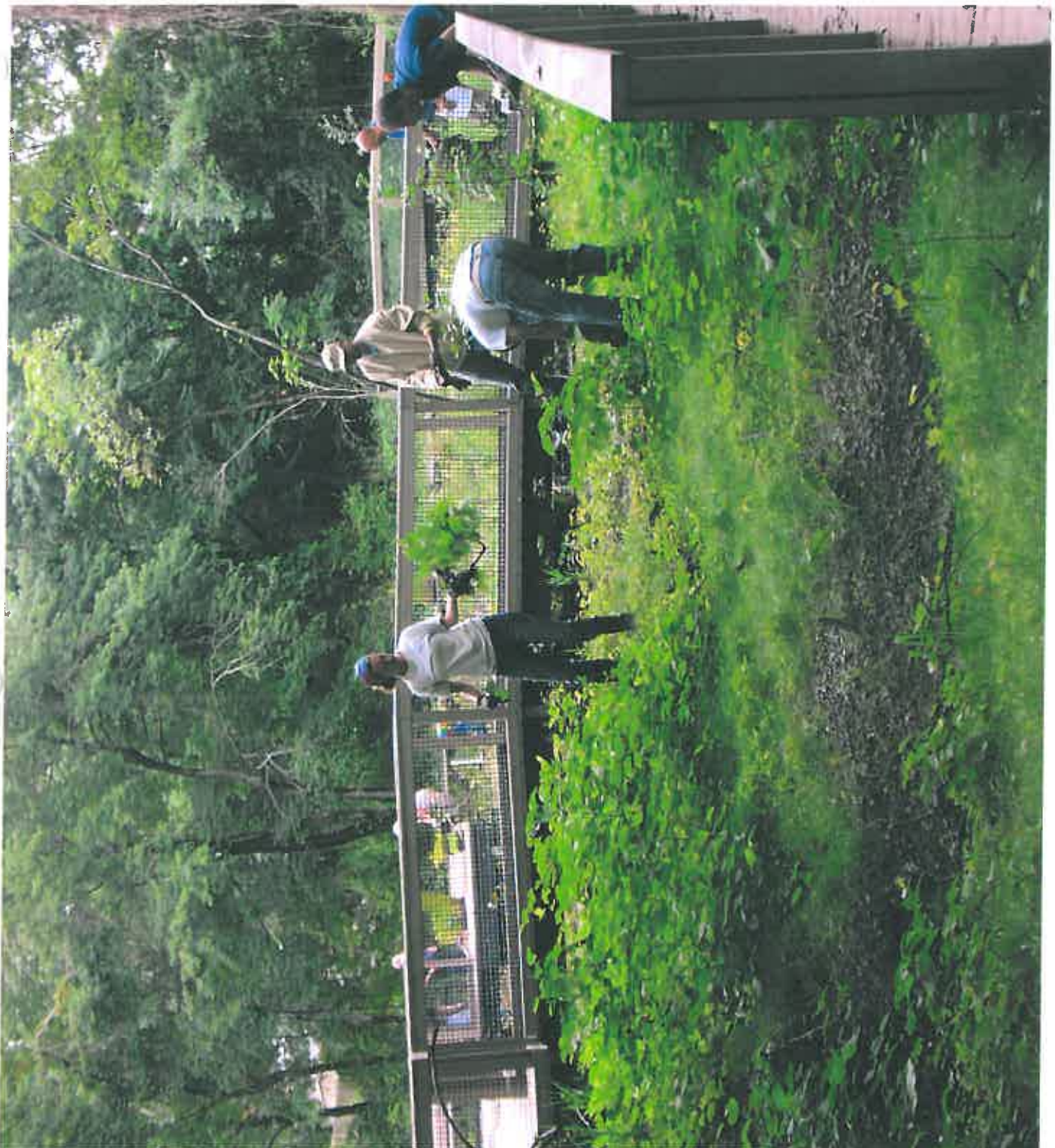
No specific Permit-by-Rule or General Permit has been established for these activities and verification with the State Agency will be needed to determine appropriate permits to be prepared and submitted. As the project work progresses, it will be necessary to contact NJDEP to confirm the required permits and ensure that regulatory conditions are met. In addition, any project that causes disturbance to soils (in an area of 5,000 square feet or more) will also require approval from the Morris County Soil Conservation district.

Technical Assistance

Green Acres: The NJDEP Green Acres Program assists municipalities and counties in the acquisition of open space for recreation and conservation purposes, and the development of outdoor recreation facilities. Program funding comes from the Garden State Preservation Trust, supplemented by varying awards from federal programs such as the Land and Water Conservation Fund. Green Acres awards grants to local governments to develop outdoor recreation facilities. Coordination with Green Acres staff should be completed once a preliminary recreation and education development plan has been prepared to determine eligibility and available programmatic funding. Information on the Green Acres Program, as well as application forms, can be found at <http://www.state.nj.us/dep/greenacres/>.

Several grant programs support the development and installation of outdoor classrooms, including:

- The Grants Program sponsored by EPA's Environmental Education Division (EED), Office of Children's Health Protection and Environmental Education, supports environmental education projects that enhance the public's awareness, knowledge, and skills to help people make informed decisions that affect environmental quality. EPA awards grants each year based on funding appropriated by Congress. Annual funding for the program ranges between \$2 and \$3 million. Most grants will be in the \$15,000 to \$25,000 range. For more information, visit: <http://www.epa.gov/enviroed/ grants.html>.
- Lewis Charitable and Educational Foundation, International Paper and National Geographic Explorer! classroom magazine have partnered to create an outdoor classroom grant program to provide schools with additional resources to improve their science curriculum by engaging students in hands-on experiences outside the traditional classroom. All K-12 public schools in the United States are welcome to apply. The grants can be used to build a new outdoor classroom or to enhance a current outdoor classroom at the school. For additional information visit: <http://www.lowes.com/lowes/index?action=pg&p=AboutLewis/outdoor/index.html>.



PROJECT TIMELINE/ESTIMATED COSTS

This plan sets forth a three to five year approach for implementing an invasive species management program and proposed trail connections and educational improvements. Tasks will include building public support, completing engineering assessments, developing final design plans, obtaining necessary permits and approvals as well as securing required funding. This plan provides a broad vision for improvements to Milton Avenue Woods and sets forth the steps necessary to complete a comprehensive feasibility assessment and begin implementation of site-specific recommendations.

Using this strategy, community leaders can effectively work to obtain necessary community support for improvements and secure the funding necessary for the upcoming tasks. Leaders will need to work closely with the community to prioritize proposed elements of the plan and break down implementation into fundable and buildable components or phases.

Timeline

Year 1 – Immediate Tasks

Upon review of this study, the community will need to implement and fund a detailed feasibility assessment of the agreed-upon recommendations and program for the Milton Avenue Woods invasive species management program and passive recreation and education improvements. Potential conflicts with adjacent property owners should be evaluated and individual property issues need to be identified and addressed prior to beginning design and permitting. Along with these investigations, an evaluation of regulatory requirements and permitting is needed to clearly document the procedures necessary to complete design and begin construction of improvements. Appropriate design standards to be used throughout the project should be established.

Year 2 – Short-term Objectives

Once the feasibility assessment and investigation necessary to clearly define appropriate improvements is completed, final design, engineering, and permitting can be initiated. This process should be completed along with securing the regulatory approvals for implementing proposed plans. At this point, funding for construction and implementation will need to be secured.

At this point, community leaders will need to work with residents and educators to prioritize implementation efforts and likely plan for phased construction of the proposed improvements. Securing available funding and final approvals along with establishing commitments for monitoring and maintenance will become the final

hurdles and submitting blocks in implementing improvements and pedestrian access. Continued effort and commitment along with ongoing dialog within the community will be critical in realizing the final goals of the project.

Year 3 and Beyond – Long-term Goals

The final step in the project will be for the Environmental Commission to prepare realistic cost estimates and timeframes, and to secure necessary funding through grant proposals or other means to implement proposed designs. Maintaining the commitment of the community throughout the planning and design process will help to provide the support needed to fully realize a unique and functional community resource.

Task	Year 1 - Immediate Tasks												Year 2 - Short Term Objectives												Year 3 and Beyond Long Term Goals	
	Month												Month													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12		
Implement Phase 1 invasives removal program																										
Conduct feasibility assessment for passive recreation and environmental education improvements																										
Investigate permitting requirements																										
Prepare Phase 2 invasives removal management strategy																										
Prepare final site plans and permits for habitat restoration and enhancement, passive recreation improvements, and environmental education improvements																										
Implement Phase 2 invasives removal management program																										
Submit and secure required permit applications																										
Secure implementation funding from local and State programs																										
Begin implementation of habitat restoration and enhancement, passive recreation improvements, and environmental education improvements																										
Continue Phase 2 invasives removal management program																										
Complete implementation of habitat restoration and enhancement, passive recreation improvements, and environmental education improvements																										

Estimated Costs

Year 1 - Immediate Tasks		Year 2 - Short Term Objectives	
Task	Estimated Cost	Task	Estimated Cost
1 Implement Phase 1 invasives removal program	\$ 15,000.00	1 Implement Phase 2 invasives removal management program	\$ 15,000.00
2 Conduct feasibility assessment for passive recreation and environmental education improvements	\$ 7,500.00	2 Submit required permit applications	TBD
3 Investigate permitting requirements	\$ 2,500.00	3 Secure implementation funding from local and State programs	\$ 2,500.00
4 Prepare Phase 2 invasives removal management strategy	\$ 5,000.00	4 Begin implementation of habitat restoration and enhancement, passive recreation improvements, and environmental education improvements	TBD
Prepare final site plans and permits for habitat restoration and enhancement, passive recreation improvements, and environmental education improvements	\$ 65,000.00	SUBTOTAL	\$ 17,500.00
SUBTOTAL	\$ 95,000.00	Year 3 and Beyond - Long Term Goals	
		Task	Estimated Cost
		1 Continue Phase 2 invasives removal management program	TBD
		2 Complete implementation of habitat restoration and enhancement, passive recreation improvements, and environmental education improvements	TBD

Scope of Work

To facilitate the implementation of the invasive removal program, a sample RFP has been included in the attachments of this report. This document includes a description of the required tasks in order to solicit bids to perform the necessary work.



PROJECT SUMMARY

Through careful management and planning and with a Vision towards the future, the Borough of Chatham can begin to develop and realize the potential of this valued community asset. By establishing partnerships with community leaders, environmentalists, educators, and technical experts, the Borough can begin to take the first steps needed to implement the Vision needed to not only protect Kelly's Pond and Milton Avenue Woods but also to create lifelong stewards who will care for it and see that it remains a treasure for future generations.

ATTACHMENTS

Japanese Stiltgrass Fact Sheets

NJDEP Freshwater Wetlands Regulations
for General Permits 16 and 17

Sample RFP for Invasive Plant Control



Japanese stiltgrass (*Microstegium vimineum*)

Description

- Refer to the DCNR Invasive Exotic Plant Tutorial stiltgrass page (http://www.dcnr.state.pa.us/forestry/invasivetutorial/Japanese_stiltgrass.htm).
- Herbaceous, annual, warm-season grass.
- Tolerant of full sun to heavy shade.
- Has a sprawling growth habit, with a canopy height between 12 and 24 inches.
- Seedheads emerge late-August to early-September.
- Infestations commonly start along road or trail edges, then spread outward.

Management Keys

As a plant, stiltgrass is not hard to suppress. However, treatment often begins after stiltgrass has spread extensively and established a persistent seedbank, making control difficult.

Target the Seedbank

To eliminate stiltgrass, you have to prevent seed production, and exhaust the seed lying in wait in the soil. You should plan on at least a five-year process.

Prevention is Easier

If stiltgrass is just getting onto your site, determine where it's coming from. Shale and gravel for roadwork are common sources. Roadwork where stiltgrass is already established spreads it even further.

Mechanical Control

Small infestations of stiltgrass are readily pulled. A trimmer can be effective later in the season (Figure 1), if you cut the stiltgrass off at ground level. A lawnmower cuts too high and will not work, as stiltgrass is a common weed in turf.

Early Control

It is common to first observe stiltgrass along roads or trails. The infestation tends spread along the road or trail, then spread away into the understory. It is relatively easy to treat stiltgrass while it occurs as a narrow, linear infestation.

Recommended Herbicides

Stiltgrass is susceptible to a number of herbicides, allowing you to tailor a program that fits your schedule

and the plant community you are trying to preserve.

Preemergence herbicides that are effective against stiltgrass include *pendimethalin* ('Pendulum'), *imazapic* ('Panoramic'), and *sulfometuron* ('Oust XP').

Imazapic and *sulfometuron* can also be applied postemergence for effective control of stiltgrass. *Pendimethalin* will have the least effect on non-target species of these three materials, but it is also the least flexible to use. *Pendimethalin* must already be in the soil where the seed is germinating – it has to be absorbed by the emerging root tip to be effective. *Pendimethalin* has no effect on already established vegetation.

Imazapic and *sulfometuron* provide more flexibility in terms of application timing, but they will cause more injury to non-target herbaceous plants than *pendimethalin*.

Three postemergence herbicides that are effective against stiltgrass include *glyphosate* ('Aquaneat'), *glufosinate* ('Finale'), and *quizalofop* ('Assure II'). *Glyphosate* is non-selective and systemic, and will injure all treated vegetation. *Glufosinate* is also non-selective, but it is a 'contact' herbicide, so the damage to treated non-target plants will be limited to where the spray contacted the plant.

The herbicide *quizalofop* only injures grasses. Stiltgrass is affected by *quizalofop* at low rates, so you can control stiltgrass but leave native woodland grasses such as whitegrass (*Leersia virginica*), nimblewill (*Muhlenbergia schreberi*), and autumn bentgrass (*Agrostis perennans*) largely intact.

Alternate Groundcover

If conditions permit, you should try to establish a groundcover to compete with the stiltgrass. If there already is groundcover, try to encourage its growth. Turf that is mowed too short and too often is more prone to stiltgrass infestation than a properly maintained turf.

Be Persistent

Stiltgrass can only be effectively controlled with repeated, annual effort. If you back off one season, the seedbank will be replenished, and your progress to date will be set back.



This work was sponsored by the Pennsylvania Department of Conservation and Natural Resources, Bureau of State Parks (PA DCNR). By Art Gover, Jon Johnson, Kirsty Lloyd, and Jim Sellmer, 2008. The contents of this work reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the PA DCNR or The Pennsylvania State University at the time of publication. Where trade names appear, no discrimination is intended, and no endorsement by the Penn State College of Agricultural Sciences is implied.

Figure 1. The objective of stiltgrass management is to prevent seed set. Stiltgrass is effectively controlled with preemergence or postemergence herbicide applications, and small infestations can be hand-pulled or cut at ground level.

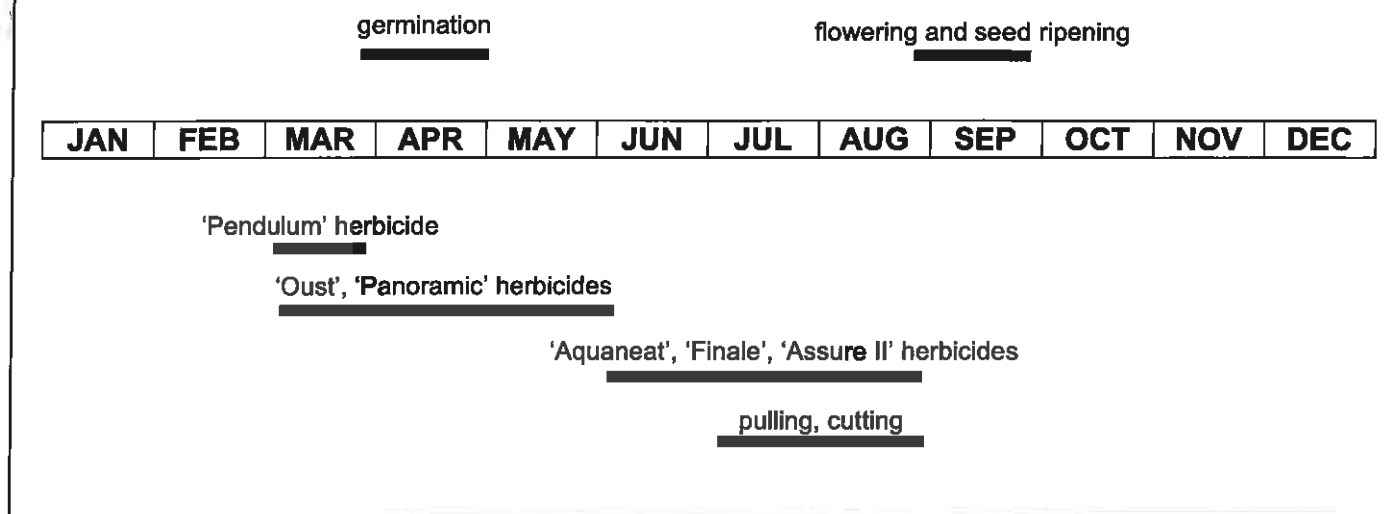


Table 1. Prescriptions for elimination of Japanese stiltgrass focus on preventing seed set. Stiltgrass is susceptible to a number of herbicides suitable for use in parks. Small infestations can be pulled or cut at ground level, which facilitates the use of volunteers.

timing	treatment	product rate	comments
early- to mid-March	'Pendulum Aquacap'	4.2 qts/acre	Preemergence applications of 'Pendulum' (<i>pendimethalin</i>) prevent stiltgrass establishment, and have little effect on plants that are already present. It is critical that <i>pendimethalin</i> be applied two to three weeks prior to germination to allow rainfall to move it into the soil profile. <i>Pendimethalin</i> is also effective against mile-a-minute.
early-March through May	'Panoramic' or 'Oust XP'	8 to 12 oz/acre or 1 to 3 oz/acre	'Panoramic' (<i>imazapic</i>) and 'Oust XP' (<i>sulfometuron</i>) have pre- and postemergence activity against stiltgrass. Preemergence applications will cause less damage to non-target species than postemergence applications. There comes a point in the season when you are better off using an herbicide that is not soil active (see below), to reduce the impact on non-target plants.
mid-May through August	'Aquaneat' or 'Finale' or 'Assure II'	24 oz/acre or 4 qts/acre or 4 oz/acre	'Aquaneat' (<i>glyphosate</i>) and 'Finale' (<i>glufosinate</i>) are non-selective herbicides with no soil activity. 'Finale' only injures the parts of the plant it contacts, while 'Aquaneat' is systemic, and will kill the entire plant. 'Assure II' (<i>quizalofop</i>) only affects grasses, but the rate used for stiltgrass is low enough that desirable grasses such as whitegrass (<i>Leersia virginica</i>), and nimblewill (<i>Muhlenbergia schreberi</i>) are only temporarily affected.
July through August	pulling or cutting	n/a	Small infestations of stiltgrass can be mechanically controlled. If you're cutting, use a trimmer that will cut the stiltgrass at the ground line to prevent resprouting from the lower nodes of the stem. The key to this treatment is to wait so that more stiltgrass will not germinate, but finish before the seedheads emerge.

This publication is available in alternative media on request.

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Japanese Stiltgrass

Microstegium vimineum (Trin.) Camus

Grass family (Poaceae)

NATIVE RANGE

Japan, Korea, China, Malaysia and India

DESCRIPTION

Japanese stiltgrass, or Nepalese browntop, is an annual grass with a sprawling habit. It germinates in spring and grows slowly through the summer months, ultimately reaching heights of 2 to 3½ ft. The leaves are pale green, lance-shaped, asymmetrical, 1 to 3 in. long, and have a distinctive shiny midrib. Slender stalks of tiny flowers are produced in late summer (August through September-early October) and dry fruits called achenes are produced soon afterwards.



ECOLOGICAL THREAT

Japanese stiltgrass is especially well adapted to low light conditions. It threatens native plants and natural habitats in open to shady, and moist to dry locations. Stiltgrass spreads to form extensive patches, displacing native species that are not able to compete with it. Where white-tail deer are over-abundant, they may facilitate its invasion by feeding on native plant species and avoiding stiltgrass. Japanese stiltgrass may impact other plants by changing soil chemistry and shading other plants. The interaction between stiltgrass and the Northern Pearly Eye (*Enodia anthedon*), a member of the brush-footed butterfly family Nymphalidae, is unclear. This butterfly is rare to uncommon along the Potomac River in the Washington, DC area. Its caterpillar eats grasses. Dr. Robert Robbins, a Smithsonian entomologist and butterfly specialist takes weekly walks at Great Falls, Maryland, and made the following observations. The Northern Pearly Eye occurs uncommonly at Great Falls from May to October (maybe 2-15 individuals seen over the entire flight period). Adults were especially common during the summer of 2004. The butterfly became exceedingly common during the summer of 2005 when about 20 adults were seen during a 2 hour walk, especially in the vicinity of stiltgrass, on which a female was observed placing an egg. In May 2006, the butterfly was again common, but the population then crashed, and only 2-3 individuals were seen from June to October 2006. Further investigation is needed to study the potential impacts of stiltgrass on this and possibly other butterflies or other insects that utilize stiltgrass as an alternative host plant.



DISTRIBUTION IN THE UNITED STATES

According to the WeedUS Database, Japanese stiltgrass has been reported to be invasive in natural areas in 15 eastern states including Connecticut, Delaware, Georgia, Indiana, Kentucky, Maryland, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, Virginia, West Virginia, and Washington, DC.

HABITAT IN THE UNITED STATES

Stiltgrass occurs in a wide variety of habitats including moist ground of open woods, floodplain forests, wetlands, uplands, fields, thickets, paths, clearings, roadsides, ditches, utility corridors, and gardens. It readily invades areas

subject to regular mowing, tilling, foot traffic, and other soil disturbing activities as well as natural disturbances such as the scouring associated with flooding. Stiltgrass appears to prefer moist, acidic to neutral soils that are high in nitrogen.

BACKGROUND

First documented in Tennessee around 1919, stiltgrass may have accidentally escaped as a result of its use as a packing material for porcelain.

BIOLOGY & SPREAD

Japanese stiltgrass is an annual grass, with all plants dying each fall. It is a colonial species that spreads during the summer and fall by rooting at stem nodes that touch the ground. Individual plants may produce 100 to 1,000 seeds that fall close to the parent plant from both self-fertilizing and cross-fertilizing flowers. Seed may be carried further by water currents during heavy rains or moved in contaminated hay, soil, or potted plants, and on footwear and vehicles. Stiltgrass seed remains viable in the soil for five or more years and germinates readily. Deer and other grazers reportedly do not browse it, though they have been found to spread the seeds. Stiltgrass leaves a thick layer of thatch after dieback each year in heavily invaded areas, and while leaves decompose quickly, stems do not. Like other invasive species, stiltgrass is physiologically adaptive. For example, it is able to withstand low light levels where nutrient levels are sufficient, and able to withstand low nutrient levels where light levels are sufficient. While stiltgrass can photosynthesize in low light conditions and respond quickly to the changing light conditions typically found on the forest floor, the very low light conditions found beneath a multilayered forest canopy will limit its growth.



MANAGEMENT OPTIONS

A variety of control methods are available for stiltgrass, depending on the extent of the infestation, the type of habitat, and the availability of labor and other resources. Preventing the introduction of stiltgrass from infested to non-infested areas should be a priority. Early control of new infestations will also reduce the likelihood of establishment and expansion. Manual removal of plants results in unavoidable disturbance to the soil which can result in additional germination of stiltgrass seed. Using an herbicide leaves the plants and soil in place, thus minimizing that likelihood.

Biological

No biological controls are currently available for this plant.

Chemical

For extensive stiltgrass infestations, use of a systemic herbicide such as glyphosate (e.g., Roundup Pro®) is a practical and effective method if used with some caution. Glyphosate is a non-specific herbicide that will kill or damage almost any herbaceous plant and possibly some woody plants it contacts. Roundup Pro® is surfactant-loaded (no additional surfactant needed) and the surfactant is not lethal to amphibians and aquatic invertebrates like the polyoxyethyleneamine surfactant in Roundup Classic® is. Roundup Pro® carries the 'Caution' signal word while Roundup Classic® carries 'Warning'. When treating stiltgrass in wetland sites, use Rodeo® or other formulation labeled for wetlands. Apply a 2% solution of Roundup® or Rodeo® mixed with water (8 oz. per 3 gals. mix) and a surfactant in late summer. Be careful to avoid application to non-target plants.

Some researchers have also found success using the pre-emergent herbicide imazapic which is the active ingredient found in Plateau® (for government use only), and Journey® (for all other applicators). Imazapic is most effective against stiltgrass when applied in March in the Mid-Atlantic states. The best rate for maximum selectivity is 4 oz. per acre, applied as a broadcast application with backpack sprayers. Sprayers should be fitted with an 8003E flat fan nozzle and calibrated at 15 to 20 gpa. Plateau® and Journey® can be applied continually through germination of the stiltgrass and throughout the summer during its peak growth. No surfactant is necessary for pre-emergent applications. As germination nears, begin to add 1/4% non-ionic surfactant to the mixture.

Another option that may be appropriate for certain situations is to apply a pre-emergent (only) treatment with Pendulum® Aquacap™ (active ingredient is pendimethalin) at 2.4 qts. to 4.8 qts. per acre (15 to 20 gpa). The higher rates have provided season long control.

Note: Calibration of spray equipment will ensure that the correct rate of herbicide mix is actually applied to the plants. Actual rate of application can vary widely based on different skills and techniques of applicators. These differences can lead to under-application or over-application of herbicide mix which can affect the efficacy of the treatment. For this reason, it is important to calibrate spray equipment before conducting herbicide applications.

Manual

Stiltgrass is a shallow-rooted annual that can be pulled by hand throughout the growing season, especially when the soil is moist and entire plants with roots can be removed. Pulling is easier and probably more effective in mid-to-late summer when the plants are much taller and more branched. At this stage, entire plants can be easily removed by grabbing the basal portion of a plant and pulling firmly. In short time, a fair amount of stiltgrass can be pulled and piled up to dehydrate on site. If plants are already in the fruiting stage, they should be bagged and disposed of offsite to prevent dispersal of seed. Also, try to avoid pulling native grasses like Virginia cutgrass (*Leersia virginia*) that often grow intermingled with stiltgrass and may be difficult to distinguish from it. Because hand pulling plants disturbs the soil and may expose stiltgrass seed from previous seasons, late season pulling will avoid the likelihood of seed germination. Hand pulling of plants will need to be repeated and continued for many seasons until the seed bank is exhausted.

Mechanical

Stiltgrass can be mowed in late summer (i.e., August through September) when the plants are flowering but preferably before seed is produced. This can be done using a lawn mower or "Weed Whacker" type machine or a scythe. Because stiltgrass is primarily an annual plant, cutting late in the season before the plants would die back naturally avoids the possibility of regrowth. Recent information suggests that stiltgrass plants that are cut early in the summer respond by regrowing and flowering soon after cutting, much earlier than they would normally flower. This is another reason to consider cutting in late summer to fall rather than during the early summer months.

USE PESTICIDES WISELY: Always read the entire pesticide label carefully, follow all mixing and application instructions and wear all recommended personal protective gear and clothing. Contact your state department of agriculture for any additional pesticide use requirements, restrictions or recommendations.

NOTICE: Mention of pesticide products on this page does not constitute endorsement of any material.

CONTACT

For more information on the management of Japanese stiltgrass, please contact:

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- Jeffrey F. Derr, Virginia Polytechnic Institute and State University, Virginia Beach, VA; jderr(at)vt.edu

OTHER LINKS

- <http://www.invasive.org/search/action.cfm?q=Microstegium%20vimineum>
- <http://nbii-nin.ciesin.columbia.edu/ipane/icat/browse.do?specield=12>

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The following excerpts were taken from the New Jersey Department of Environmental Protection (NJDEP) Freshwater Wetlands regulations N.J.A.C. 7:7A. More information, including a full copy of the regulations, is available on the NJDEP Division of Land Use Regulations.

N.J.A.C. 7:7A-5.16 General permit 16--Habitat creation and enhancement activities

- (a) General permit 16 authorizes habitat creation and enhancement activities in freshwater wetlands, transition areas, and State open waters, necessary to implement a plan for the restoration, creation or enhancement of the habitat and water quality functions and values of wetlands, which is sponsored or substantially funded by a Federal or State agency or other entity described in (b) below. For the purposes of this general permit, a "sponsor" shall be an active participant in or substantial financial contributor to the activities, and shall approve the activities in writing.
- (b) General permit 16 authorizes any of the following:
 - 1. A fish and/or wildlife management plan created or approved by the Department's Division of Fish and Wildlife;
 - 2. A project plan approved under the Partners for Fish and Wildlife program, administered by the U.S. Fish and Wildlife Service;
 - 3. A project plan created by the U.S. Department of Agriculture's Natural Resources Conservation Service under the Wetlands Reserve program, the Conservation Reserve program, the Conservation Reserve Enhancement program, the wildlife habitat incentive program (WHIP), or a similar program, and approved by the local Soil Conservation District;
 - 4. A plan approved by the Department's Office of Natural Resource Damages for the restoration, creation or enhancement of natural resources injured as the result of an oil spill or release of a hazardous substance;
 - 5. A mitigation project required by and approved by a government agency, such as the U.S. Army Corps of Engineers;
 - 6. A habitat creation or enhancement plan carried out by one of the Federal or State agencies at 1 through 5 above or by a government resource protection agency such as a parks commission; or
 - 7. A habitat creation or enhancement plan carried out by a charitable conservancy, as defined at N.J.A.C. 7:7A-15.1, provided that the plan is part of a program listed at 2 through 5 above.
- (c) To be eligible for authorization under general permit 16, an applicant shall demonstrate that the proposed project:
 - 1. Is part of a comprehensive plan for the restoration, creation or enhancement of the habitat and water quality functions and values of wetlands, transition areas, and/or State open waters;
 - 2. Is sponsored or partially funded by an appropriate entity in accordance with (b) above;
 - 3. Is consistent with the goals of the Freshwater Wetlands Protection Act;
 - 4. Will improve the values and functions of the ecosystem; and
 - 5. Will have a reasonable likelihood of success.
- (d) General permit 16 does not authorize an activity unless the sole purpose of the activity is habitat creation or enhancement. For example, general permit 16 does not authorize

construction of a detention basin in wetlands for stormwater management, even if the detention basin or the project of which the basin is a part will also result in habitat creation or enhancement. Similarly, general permit 16 does not authorize a flood control project that may also result in creation or enhancement of some wildlife habitat.

(e) Examples of habitat creation and enhancement activities that may be authorized under general permit 16 are:

1. Altering hydrology to restore or create wetlands conditions, such as by blocking, removing, or disabling a human-made drainage ditch or other drainage structure such as a tile, culvert or pipe;
2. Breaching a structure such as a dike or berm in order to allow water into an area;
3. Placing habitat improvement structures such as:
 - i. Nesting islands;
 - ii. Fencing to contain, or to prevent intrusion by, livestock or other animals; and
 - iii. Fish habitat enhancement devices or fish habitat improvement structures such as placed boulders, stream deflectors, or brush piles;
4. Regrading to provide proper elevation or topography for wetlands restoration, creation, or enhancement; and
5. Cutting, burning or otherwise managing vegetation in order to increase habitat diversity or control nuisance flora.

(f) Activities under general permit 16 shall meet the following requirements:

1. The activities shall disturb the minimum amount of freshwater wetlands, transition areas, and/or State open waters necessary to successfully implement the project plan;
2. The activities shall not decrease the total combined area of freshwater wetlands, State open waters and/or transition areas on a site. However, the Department may approve such a decrease if the Department determines that the activities causing the decrease are sufficiently environmentally beneficial to outweigh the negative environmental effects of the decrease. In addition, the Department may approve conversion of wetlands to State open waters or transition area, conversion of State open waters to wetlands or transition area, or the conversion of transition area to freshwater wetlands or State open waters, if the Department determines that such conversion is environmentally beneficial; and
3. The area of habitat enhancement or creation shall be protected from any future development by a recorded conservation restriction or easement in accordance with N.J.A.C. 7:7A-2.12.

(g) An application for authorization under general permit 16 does not require an application fee under N.J.A.C. 7:7A-11.

(h) If a project complies with general permit 16 and also includes an activity covered under another general permit, the entire project shall be authorized through general permit 16 and shall not require authorization under the other general permit, provided that each activity covered by another general permit complies with that general permit's requirements and limits. For example, if a habitat creation project includes bank stabilization activities, and meets all requirements of general permit 20 as well as general permit 16, the Department may authorize the project under general permit 16 alone.

(i) If an activity is exempt under this chapter, it shall not require authorization under general permit 16 solely by virtue of being conducted as part of a program included in (b) above. For

example, if a farmer proposes a habitat enhancement project that is eligible for authorization under general permit 16, and some of the activities involved in the project meet the requirements for the farming exemption under N.J.A.C. 7:7A-2.8(c), those activities do not lose their exempt status merely by virtue of being part of a project authorized under general permit 16.

- (j) Activities under general permit 16 shall comply with all applicable requirements at N.J.A.C. 7:7A-4.3, Conditions that apply to all general permits, and N.J.A.C. 7:7A-13.2, Establishing permit conditions.

N.J.A.C. 7:7A-5.17 General permit 17--Trails and boardwalks

- (a) General permit 17 authorizes activities in freshwater wetlands, transition areas, and/or State open waters necessary for construction of a trail and/or boardwalk for use by pedestrians, bicycles, and other non-motorized methods of transport. General permit 17 does not authorize construction of a restroom, gazebo, rain shelter, or any covered or enclosed structure. General permit 17 does not authorize construction of a roadway for use by automobiles, golf carts, motorcycles, motorized trail bikes, all-terrain vehicles, or other motor vehicles.
- (b) The total area of freshwater wetlands, transition areas, and/or State open waters disturbed under general permit 17 shall not exceed one quarter acre, except that this limit shall not apply to a site that is publicly owned.
- (c) The trail or boardwalk shall be no wider than six feet, unless the applicant demonstrates that it must be wider in order to comply with the Barrier Free Subcode of the Standard Uniform Construction Code, N.J.A.C. 5:23-7.
- (d) The trail or boardwalk shall:
 - 1. Be located and configured so as to minimize adverse environmental impact; and
 - 2. Incorporate features designed to educate the user about the importance of freshwater wetlands, transition areas, and State open waters; for example, through signs identifying plants and animals or explaining hydrology, ecology, or other significant environmental features or phenomena.
- (e) The permittee shall take all measures necessary to ensure that activities under general permit 17 do not interfere with the natural hydrology of the area, such as installation at grade or use of cross drains to allow the passage of water. The permittee shall minimize the impact of the activities on vegetation.
- (f) An application for authorization under general permit 17 for a project on publicly owned land does not require an application fee under N.J.A.C. 7:7A-11.
- (g) Activities under general permit 17 shall comply with all applicable requirements at N.J.A.C. 7:7A-4.3, Conditions that apply to all general permits, and N.J.A.C. 7:7A-13.2, Establishing permit conditions.

**Borough of Chatham
Environmental Commission**

**REQUEST FOR PROPOSAL (RFP)
PHASE 1 - INVASIVE PLANT CONTROL
MILTON AVENUE WOODS & KELLY'S POND
BOROUGH OF CHATHAM
MORRIS COUNTY, NEW JERSEY**

WORK STATEMENT

A. BACKGROUND

The Borough of Chatham Environmental Commission (Chatham) is seeking bids for control of the invasive plant Japanese Stiltgrass (*Microstegium vimineum*) in portions of the contiguous 94-acre open space property known as Milton Avenue Woods and Kelly's Pond (see attached map).

The general goal of this project is to control Japanese Stiltgrass in targeted areas of the site. This work will be accomplished by mechanical removal methods and by applying herbicide to these plants using ground-based application techniques (i.e., not a helicopter or airplane). The work will be bid as lump sum prices for each of the treatment areas, with the number of areas awarded dependent upon bid prices.

Pre-bid meetings will be held, and prospective bidders are required to attend pre-bid meetings.

B. OBJECTIVE

The objective of this project is to substantially reduce the presence of Japanese Stiltgrass in the designated areas of Milton Avenue Woods and Kelly's Pond. This will be accomplished by removing vegetation via mechanical methods and applying herbicide within the designated treatment areas.

C. TASK DESCRIPTION

1. Within "Western Terrace" Zone (~22 acres) indicated on the attached map at Milton Avenue Woods and Kelly's Pond, control Japanese Stiltgrass using the techniques specified below.
2. Submit recommended timeline, scope, and lump sum prices for invasive species management in the following zones indicated on the attached map:
 - a. Kelly's Pond Classroom (~10 acres)
 - b. Floodplain Forest (~21 acres)
 - c. Interior Swamp (~16 acres)
 - d. Eastern Terrace (~18 acres)

Japanese Stiltgrass control specifications

Apply pre-emergent herbicide to areas dominated by Japanese Stiltgrass (*Microstegium vimineum*) within the designated treatment areas between March 15 and May 15.

Suggested herbicides are 'Panoramic' (imazapic) applied at 8 to 12 oz/acre or 'Oust XP' applied at 1 to 3 oz/acre. Applications may be done in areas where significant damage to non-target native vegetation can be avoided (i.e., in dense patches composed of 75% or more Japanese Stiltgrass of any density mixed with other non-native vegetation). Other herbicides will be considered if requested by the bidder, but the bidder must include such information in the bid with a brief written justification of why they wish to make the change. Any herbicide or concentration other than that specified here must be approved by Chatham prior to use.

Apply post-emergent herbicide to the foliage of all live leaves and stems of Japanese Stiltgrass (*Microstegium vimineum*) within the designated treatment areas. Foliar spraying may be used in areas where significant damage to non-target native vegetation can be avoided (i.e., in dense patches composed of 75% or more Japanese Stiltgrass of any density mixed with other non-native vegetation). For isolated plants or sparse patches adjacent to native vegetation, individual plants must be treated by a careful wick or hand application of herbicide to individual plants.

Suggested herbicide is a glyphosate formulation (such as Aqua Neat or Rodeo®) at a concentration of 2% active ingredient with an appropriate surfactant. A concentration of 5% active ingredient shall be used for wicking or hand application methods. Other herbicides will be considered if requested by the bidder, but the bidder must include such information in the bid with a brief written justification of why they wish to make the change. Any herbicide or concentration other than that specified here must be approved by Chatham prior to use.

Existing plants shall be removed via mechanical methods using hand rakes and or weed trimmers. All living and dead plant materials shall be removed from target areas during the months of July and August. Mechanical removal of material should be done a minimum of 4 weeks following application of a post-emergent herbicide. Care must be taken to not spread seed as a result of mechanical removal methods. All material shall be disposed of at a licensed landfill or composting facility.

General specifications

Identification/location of all target patches and individual plants to be treated within each treatment area is the responsibility of the contractor.

Contractor is responsible for securing all necessary regulatory permits and approvals for invasive species removal activities conducted as part of this contract.

Bidders must propose specific treatment technique(s), specific herbicide(s), and

surfactant(s) in their bid. Recommended surfactants should be approved by use in wetlands and aquatic environments. Bidders must provide Material Safety Data Sheets (MSDS) for all products proposed for use under this contract.

In all treatment areas, the contractor will be responsible for posting the required advisory signage. Advisory signage must be posted surrounding the landward side of any area where chemicals will be applied over standing water on the day of treatment (just prior to commencing spraying). Signs must be left in place for 24 hours following treatment and then must be removed by the contractor.

Treatment areas shall correspond with the general boundaries indicated on the attached map and are to be verified in the field prior to treatment applications. All treated patches of vegetation must be marked in the field by the contractor (e.g., dye in herbicide, tying flags, or another suitable method) and verified by Chatham or the Borough's designated representative.

All herbicide treatments must be according to label specifications and applied by a certified commercial pesticide applicator. Runoff of the herbicide into the ground or water must not occur. Herbicide must be a formulation labeled for use in aquatic environments.

The contractor is responsible for supplying all equipment needed to complete the job, including herbicide, sprayers, safety equipment, and transportation.

The contractor is responsible for re-treatment if rain occurs within six (6) hours of the original treatment.

The contractor is expected to achieve a minimum of 85% kill of the extant invasive species specified above within the treatment areas.

The contractor must obtain prior approval to work on Saturdays or Sundays. Other specific dates may be unavailable for work due to special events at one or more of the sites. The contractor will be notified of any such dates a minimum of two weeks in advance.

Chatham must be contacted within five (5) business days of the awarding of the contract to provide an approximate schedule of work start and end dates. Chatham must both be notified a minimum of 24 hours prior to beginning work on-site and within 24 hours following completion of all work.

All equipment must be removed from the site within one (1) week following completion of work under this contract.

D. DESCRIPTION OF TREATMENT AREA

MILTON AVENUE WOODS & KELLY'S POND: The work site is within forested

open spaces areas bounded by Route 24 to the north and east, a transmission corridor to the north and west and the rear of residential property along Weston Avenue, Rowan Road, Jackson Avenue, Coleman Avenue, Center Avenue, and the Milton Avenue School to the south. The treatment areas shall be all observed occurrences of Japanese stiltgrass within the limits of the existing properties owned by the Borough of Chatham.

E. PROJECT CONTROL AND REPORTS

1. Project Control

- a. The Contractor will carry out this project under the direction and control of Chatham or the Borough's designated representative.
- b. The Contractor must contact Chatham within five (5) business days after the contract is awarded to provide an approximate schedule of work start and end dates.
- c. The Contractor will notify Chatham a minimum of 24 hours prior to beginning on-site work at each park, and within 24 hours following final completion of all on-site work at each park under this contract.
- d. Once work begins on site, the Contractor will keep Chatham informed of the progress of the work at least weekly and any real or anticipated problems (such as chemical spills, injuries, etc.) as they arise. The Contractor will also inform Chatham of any long-term breaks in work (longer than one week) during the course of the project. The contractor will also notify Chatham when they feel they are approximately 48 hours away from expected completion so that a final field inspection can be scheduled.

2. Reports

Within two weeks following the completion of the project, the contractor shall submit three (3) written copies of a brief report summarizing the work completed, the specific dates and locations work was performed, weather conditions at the time of treatment, specific herbicides used (include generic and brand name, concentrations, application methods, and an itemization of quantity of herbicide and surfactant used by date), and a comment on the anticipated effectiveness of the treatment.

All treatment areas shall be identified on a copy of the site map which will be provided by Chatham.

F. PRE-BID MEETING

The purpose of the pre-bid meeting is to view the treatment areas with representatives of

Chatham to understand the layout of the land and the general density and patchiness of Japanese Stiltgrass in the areas. Only one pre-bid meeting, so that all prospective bidders have the same opportunity to view the site and ask questions. **Prospective vendors must attend the scheduled pre-bid meeting to be eligible to submit bids.** The pre-bid meeting has been scheduled for _____. **THE MEETING IS EXPECTED TO LAST 2 HOURS.** Meet at the Duchamp Place gated access to the Borough Composting Facility.

G. PRICE PROPOSAL

All prices/rates quoted in bidder's response to this work statement will be firm for the duration of the Contract. No price changes will be permitted.

Control of invasive plant species will be measured based on the number of square yards of surface area that have been satisfactorily controlled. The Lump Sum Price for each treatment area should reflect the complete cost of material removal and applying herbicide as specified for each area. This includes the cost of all herbicide, equipment, labor, and transportation. NO additional charges (such as equipment repair) beyond the original bid price will be permitted.

H. INFORMATION REQUIRED FROM BIDDERS

The technical work plan shall include a description of proposed specific treatment technique(s), specific herbicide(s), surfactant(s), and marking technique(s) to be used. Indicate the approximate number of person hours allocated.

The successful bidder will have experience applying herbicide to invasive plant species, possess a team (or individual) capable of carrying out the work effectively, and use the most cost-efficient technique(s) that cause the least amount of incidental damage to non-target vegetation and the ground surface.

I. PROJECT CONTACT

Clarifications on Technical Inquiries shall be submitted in writing to the Project Contact below:

J. SUBMISSION OF PROPOSAL

Proposal shall be submitted no later than _____ to the attention of:

K. TERMS AND CONDITIONS OF THE CONTRACT

Upon acceptance of the Contractors proposal, the Contractor shall be required to enter into a Sub-consultant Service Agreement (Appendix A) with Chatham.

L. BID RESPONSE

Bid Response shall include the following:

1. Name, address and phone number of firm.
2. Name of principal contact person
3. Year firm established
4. Time firm has operated in the field providing similar services.
5. Names titles and qualifications of key personnel including the project manager.
6. Include a list of similar related contracts that the firm has completed or is currently working on.
7. Cost proposal for providing invasive plant control services.

BOROUGH OF CHATHAM

**BID PROPOSAL
PHASE 1 - INVASIVE PLANT CONTROL
MILTON AVENUE WOODS & KELLY'S POND
BOROUGH OF CHATHAM
MORRIS COUNTY, NEW JERSEY**

The undersigned bidders declares that he/she has carefully examined the Request for Proposal and attached documents and agrees to furnish the services covered to the Borough of Chatham.

Invasive Plant Control

Pay Item	Lump Sum Price	
Invasive Plant Control	\$ _____	"Western Terrace" Zone
Invasives Implementation Plan with Timeline and Costs	\$ _____	Kelly's Pond, Flood Plain Forest, Interior Swamp, Eastern Terrace Zones

Accepted by: _____

Signature	Title
-----------	-------

Date: _____

Company: _____

Address: _____

Phone: _____

Fax: _____

Email: _____

Appendix A

Borough of Chatham Form of Agreement

REFERENCES

- Collins, D. R. and Anderson, K. H., Plant Communities of New Jersey: A Study in Landscape Diversity. Rutgers University Press, NJ, 1994
- Hightshoe, Gary L., Native Trees, Shrubs, and Vines for Urban and Rural America - A Planting Design Manual for Environmental Designers. Van Nostrand Reinhold, 1998
- NJ Department of Environmental Protection, Bureau of Geographic Information Systems. <http://www.state.nj.us/dep/gis/>
- Thompson, Janette R., Prairies, Forests & Wetlands. University of Iowa Press, 1992
- US Department of Agriculture, Forest Service, Technical Guide to Urban and Community Forestry, March 1993
- US Fish & Wildlife Service, "New Jersey's Central Passaic Basin - Prehistoric Glacial Lake, Present-Day Wetland Treasure", February 2007
- US Fish & Wildlife Service, "Significant habitats and habitat complexes of the New York Bight Watershed - Passaic Meadows Complex #24," November 1997



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Earth 4.5.4.0

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Streaming 100%

40° 45' 59.9" N 74° 22' 58.4" W - Elev. 118m