THE ECO-STRATEGIES GROUP

Box 433
Allamuchy, NJ 07820

Phone: 908-850-0859
Fax: 908-850-8406
Email: royal@theeco-strategiesgroup.com

13 November 2009

Borough of Chatham Environmental Commission
Municipal Building
54 Fairmont Avenue
Chatham, New Jersey 07928

Dear Environmental Commissioners:

In July , the Borough of Chatham's Mayor and Council issued The Eco-Strategies Group LLC a contract to conduct a survey of the Invasive Plant Species in Wuhala Woods and develop a plan for management of these species. Within this contract were requirements to develop a plan for managing the trash and debris, provide engineer's cost estimates for implementation of our recommendations and provide a cost for developing bid documents for implementation of these recommendations.

Attached to this Letter are copies of the Invasive Species Survey and Management Plan, the Trash and Debris Management Plan and a report on Parking within Wuhala Woods. Each of these are stand-alone final draft documents. We expect that you may have questions and comments that we will need to incorporate into the final reports. The remaining two documents (the engineers estimates and bid format) will be submitted within a few days as email attachments to Lee Byrd and Dick Ligertwood as these submittals will not have any photos or large file attachments.

You are to be commended for your concern and stewardship efforts for the Wuhala Woods and other Open Space tracts within the Borough of Chatham and if we can be part of your future stewardship activities, we will be pleased to provide assistance.

Sincerely yours,

Royal J. Nadeau PhD
President - The Eco-Strategies Group LLC

December 3, 2009

Environmental Commission Subcommittee Report on Review of Eco-Strategies Group regarding Wuhala Woods

Recommendations for consideration when preparing the final report:

1. Need cost estimates for invasive plant removal and replenishing.
2. Would like a larger map (11x17)
3. spot GPS coordinates for invasive species on map
4. Provide a time line, 7-10 years for various activities
5. Indicate proposed parking locations on the map

Another question the subcommittee has, Who is going to prepare the bid document?

Spelling

John Tancredi
Barbara Montague
Dick Ligertwood

INVASIVE SPECIES and MANAGEMENT PLAN

for

THE WUHALA WOODS

BOROUGH OF CHATHAM, NJ

Prepared by

THE ECO-STRATEGIES GROUP LLC
Allamuchy, New Jersey

HERITAGE TREE & PLANT & DESIGN
Califon, New Jersey

APPLIED SERVICES INC
Lafayette, New Jersey

October 2009

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I. INTRODUCTION

Invasive alien plants are a serious threat to native species, plant communities and ecosystems around the world. They often compete with and displace native plants, animals and other organisms that depend on native species, alter ecosystem functions and cycles, hybridize with native species and even promote further invasions from other aliens.

The good news is that many plant invasions can be halted or slowed and reversed, and in certain situations, even badly infested areas can be restored to healthy systems dominated by native species. This requires taking action to control and manage these invasive species.

Hopefully, this Invasive Species Management Plan will provide enough detailed information and techniques for you to make intelligent decisions towards controlling or, at least, manage the invasive plants in the Wuhala Woods within the Borough of Chatham.

Approach

Before embarking on an Invasive Species Management program, it is important to develop a straightforward rational for the actions that you plan on taking. (Certainly your commissioning this Plan is an important step in this rationale.)

We believe that by using an adaptive management approach (shown below) as the one used by The Nature Conservancy (Tu, et al 2000), you will be able to meet your goals in managing the invasive plants on both Wuhala Woods tracts.

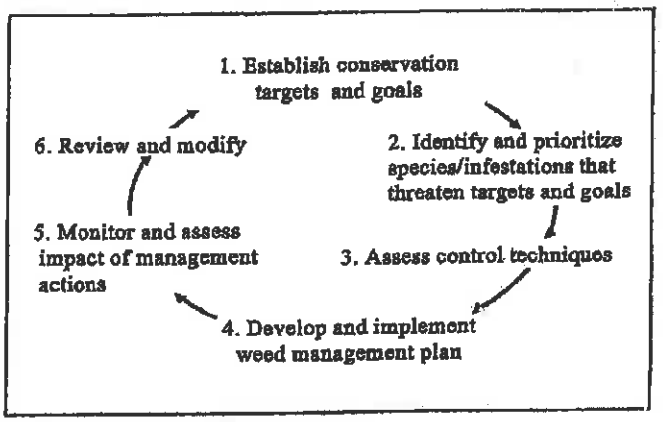

Figure 1. Adaptive Weed Management Approach

Weed Control Methods Handbook, The Nature Conservancy, Tu *et al.*

An invasives management program is best viewed as part of an overall restoration program, so focus on what you want in place once the invasive has been brought under control. When selecting control methods, keep in mind that the ultimate purpose of the effort is to preserve native species, communities and/or functioning ecosystems.

II. INVASIVE PLANT SPECIES SURVEY

Site History

The Wuhala Woods has had special meaning to the residents of the Borough of Chatham when in 1956, 14.56 acres was designated as a conservation area.

Figure 1 Aerial Photo

In May of 1960, the Garden Council and the Board of Recreation held an "Open Woods" event for the public. The Mayor opened the woods to the public officially in a ribbon cutting ceremony.

Over the years, the Woods was enjoyed by many with tours given by the Garden Council members to students, interested adults and scouts. The Woods was visited by botanists, biologists and naturalists and served as a natural history classroom to the students of Chatham High School.

But unfortunately, stewardship of the Woods waned as the original volunteers of the Garden Council and other kindred souls left the scene. However in 2005, the Borough Open Space Committee was able to purchase 50 acres from the American Water Company located on the other side of Route 24 adding another whole segment to the Wuhala Woods. With this additional acreage, interest in entire Woods has been rekindled with the realization that the Woods has such a great ecological and recreational resource value to the Borough of Chatham. The work encompassed in this project is an expression of acknowledgment of the Woods as a valuable resource to citizens of the Borough of Chatham through its Environmental Commission.

Now the threat posed by invasive and nuisance plants to the diversity and structure of the native plant communities is greater than ever. It will take the same degree of stewardship once given to the

original tract to restore and maintain the entire Wuhala Woods to attain the long term goals for conserving and wise use of the Woods as a natural resource.

Site Description

The Landscape Project of the NJDEP has characterized the entire state in regards to specific ecologically important criteria. The entire Wuhala Woods has been characterized by the Landscape Project as being a Forested Wetland which means that it serves as critical habitat for state and/or federally listed threatened and endangered species (see Figure 2). The Floodplain forests of Chatham Borough have been nicely characterized in the Environmental Inventory (Borough of Chatham ERI 2008).

Figure 2 NJDEP i-MAP of Wuhala Woods as a Forested Wetland

Forested Wetlands serve important functions as groundwater recharge areas and if occurring within major stream corridors, flood water retention areas. The eastern section of the Wuhala Woods definitely serves in this capacity for the Passaic River during flood conditions. As the Passaic exceeds its stream corridor capacity, it spills over into the adjacent floodplain. These flood waters stay within the forest and serve to characterize the area as a wetland with unique ecological function and character. With the annual or periodic flood comes a problem with fresh load of water borne seeds of plants, both native and invasive form upstream sources. Herbaceous plants, e.g. garlic mustard and Japanese stilt grass are often prominent within floodplain plant communities. Garlic mustard and stilt grass are prominent in both the Western and Eastern Sectors of the Wuhala Woods.

Survey Methodology

Several site visits were made during this past summer and last autumn by Antonio Pasquini (Heritage Tree and Plant Design). The results of these site visits are shown in data sheets displayed in Appendix A. A Summary Data Sheet with all the Invasive Plant and Nuisance Species observed during these visits is shown below.

Generalized Occurrence of Invasive and Nuisance Plants for Wuhala Woods

Vines	**Vines: Sparse(<20),Moderate(20-100),Dense(>100)**
Oriental Bittersweet (Celastrus orbiculatus)	**Sparse (Negligible)**
Japanese Honeysuckle (Lonicera japonica)	**Sparse (Negligible)**
Poison Ivy (Rhus radicans) NUISANCE	**Dense**
Shrubs	**Shrubs: Sparse(<20),Moderate(20-100),Dense(>100)**
Bush Honeysuckle (Lonicera spp.)	**Moderate(20-100)**
Autumn Olive (Eleagnus umbellata)	**Sparse (Negligible)**
Multiflora Rose (Rosa multiflora)	**Dense**
Japanese barberry (Berberis thunbergii)	**Dense**
Privets (Ligustrum spp)	**Sparse (Negligible)**
Japanese Knotweed (Polygonum cuspidatum)	**Sparse (Negligible)**
Siebold viburnum (Viburnum sieboldii)	**Sparse (Negligible)**
Trees	**Trees: Sparse(<5),Moderate(5-10),Abundant(>10)**
Tree-of-Heaven (Allanthus altissima)	**Moderate**
Norway Maple (Acer platanoides)	**Sparse (Negligible)**
Herbaceous	**Herbs: Sparse(individuals found but not common), Moderate(>1 patch of plants), Abundant(several large patches, wide distribution)**
Wineberry (Rubus phoenicolasius)	**Sparse**
Purple Loosestrife (Lythrum salicaria)	**Sparse**
Phragmites (Phragmites australis)	**Sparse (Negligible)**
Garlic Mustard (Alliaria petiolata)	**Abundant(several large patches, wide distribution)**
Japanese Stilt Grass (Microstegium vimineum)	**Abundant(several large patches, wide distribution)**
Blackberry (Rubus allegheniensis)NUISANCE	**Moderate**

III. INVASIVE AND NUISANCE SPECIES MANAGEMENT STRATEGIES

First and foremost is the realization that one control method is not going to be the most effective for all invasive species. We will present a variety of control methods for each of the species in the Wuhala Woods and provide a brief discussion of which method, in our opinion, will be most effective.

The main three methods of control are mechanical removal, chemical and biological. Mechanical controls vary form hand pulling to mowing/cutting with hand tools or power mowers and saws. These methods are very labor-intensive but usually very effective. Chemical control means having to use herbicides which vary in price, effectiveness, safety and methods of application and timing. As ecologists, we are not enthused about having to use herbicides to control invasives, but are necessary to control particularly troublesome species. Also, herbicides are effective in situations where soil integrity and structure has to remain intact. Mechanical control methods often create soil disturbance that is conducive for yet another invasive species to grow. Biological control is the most desirable and appealing to the public but in reality, there are too few biological controls for the number of plant invasives present in our landscape. Fortunately, search for natural biological agents has made great strides in finding control agents but takes years to gain clearance and approval from the US Department of Agriculture as any introduced control species has to be shown not to harm the natural ecological systems more so than the invasives themselves.

Most important is that once invasives and nuisance species have been removed, restoration of the area is a must. This will require re-planting the area with ecologically appropriate native species, controlling the plantings against erosion and vandalism, and monitoring for any new invasives that might try to inhabit the area.

In the pages to follow, we will present a description of the invasive species, how it impacts the ecosystem and a list of control procedures that we feel will work best against the invasive and nuisance species in the different locations that we observed its occurrence. For many invasive species, it is not realistic to think of total eradication but only to bring its presence in the ecosystem to less dominance and abundance.

Multiflora Rose (*Rosa multiflora*)

- Identify Multiflora Rose shrubs
- Cut to ground with machete, loppers or brush cutting mower
- Read product instructions and warnings
- Apply Pathfinder II generously with dauber to the stumps within 5 to 10 minutes following cutting
- Herbicide treatment requires 3 to 4 hours to dry before precipitation
- Patherfinder II has basil oil in preparation which adheres to stumps for higher absorption
- Roundup or Rodeo used undiluted is another management option
- Chip or mow cut briars without berries
- Monitor each season, cut and re-apply herbicide as necessary
- As tree canopy closes, Mulitflora rose will be shaded out
- In Wuhala Woods much of the Multiflora rose is sparse in the understory increasing treatment success
- Stands are larger and more prolific in gaps where full sun is present
- Repeated mowing 2 to 3 times alone may deter spindly stands of multiflora rose in areas of tree canopy closure
- Applications are best in summer, fall and winter

Multiflora Rose - Wuhala Woods West

Multiflora Rose - Wuhala Woods along Princeton Road

Multiflora Rose – Wuhala Woods – East near wastewater treatment plant

Ailanthus (*Ailanthus altissima*)

- Identify Ailanthus trees
- Tree of less than 2 inch diameter girdle completely in 16 inch vertical cuts at waist level
- Read product instructions and warning
- Apply Pathfinder II with quality paint brush generously within 5 to 10 minutes
- Herbicide treatment requires 3 to 4 hours to dry before precipitation
- Pathfinder II has oil in formula to ensure adherence and absorption
- Apply the cut and paint method for trees above 2 inches in diameter
- Apply at 3 to 4 feet above ground level
- Peel back bark in 2 inch wide strips to expose moist cambium layer with machete, hatchet or chain saw
- Leave alternating intact bark strips 2 inches wide between the 16 inch vertical cuts
- Alternating cuts and intact bark inhibits vigorous stump sprouting
- Cut and paint method can be applied in summer, fall and winter

Tree of Heaven (*Ailanthus altissima*) Wuhalla Woods East near Blue Trail entrance

Second Treatment of Ailanthus Trees

Eradication of the Ailanthus tree takes repeated treatments to effectively kill the leaves, trunks and roots

- Allow 1 to 2 months between subsequent treatments
- In late summer, fall or winter apply a basil spray around trunks from ground level 16 inches upwards
- Spray Pathfinder II with backpack sprayer the entire circumference of the trunk uniformly without runoff
- Pathfinder II has oil in formula to ensure adherence and absorption
- Apply at 3 to 4 feet above ground level
- Application in winter is effective without snow or ice interference
- Basil spray method is applied to in tact bark from ground level upwards to 16 inches
- Allow at least 16 inch gap of untreated bark between basil spray; and cut and paint applications in case another treatment is necessary

Large trees above a 6 inch diameter may need a second basil spraying in 1 to 2 months in the remaining section of untreated bark. Stands of large trees are particularly difficult to eradicate. Trees of 1 to 2 inch diameter should be killed after 1 or 2 treatments. Medium trees and smaller trees may proceed to directly to Step 3, cut stump treatment. Trees killed without the cut stump treatment may be left standing if not in dangerous location.

Cut Stump Treatment

- Cut stump treatment involves chain sawing of tree at the base followed by immediate application of Pathfinder II brushed directly on the cut stump
- If Ailanthus tree is still vigorous apply the basil bark herbicide treatment again prior to the cut stump treatment to avoid causing stump sprouts
- If Ailanthus tree has rampant stump sprouting, ongoing periodic mechanical treatments may be the only remaining effective eradication method
- This 2nd, 3rd or 4th treatment should kill small to medium-sized trees
- Do not cut down larger trees before exhausting bark application methods
- Monitor for stump sprouting
- Minimal sprouting can be countered by foliar spraying of the entire sapling

Poison Ivy (*Toxicodendron radicans*)

Although Poison Ivy is not an Invasive in the true sense as it is a native species here in North America, it is definitely a nuisance species when it comes to people being able to use natural areas for recreational purposes. We are including here as one of the target species for management within the Wuhala Woods.

There are many specimen and otherwise healthy trees that have old poison ivy vines growing up to 40 and even the 60 foot level. In the western section of Wuhala Woods there are many poison ivy vines toward the center of that property. With diligence they can be treated and killed. There are approximately 400 vines. In the eastern section on the other side of Route 124 the poison ivy vines are widespread and very numerous. There may be over 2000 vines. This is the main serious problem in the eastern section along with 5 gaps in the forest canopy that have occurrences of invasive and nuisance plants. In some area along the Passaic River the poison ivy vines are split into numerous small vines making treatment more difficult. It is a massive production but freeing up so many trees would have an enormously positive long-term effect on Wuhala Woods.

Poison Ivy Management

- Identify Poison Ivy vines
- Prioritize treatment areas and use flagging to keep track of progress
- Take precaution from getting poison ivy - gloves, hats, long sleeves, Tecnu, or employ someone not allergic to poison ivy.
- Cut the poison ivy vine at the 5 foot level. Cut the vine 1 foot from the base of the tree trunk with machete, loppers or hatchet.
- Be careful to not create saw dust or flying particles
- Multiple, small vines could be cut carefully with a sharp, curved pruning saw, machete, or bow saw without damaging the tree's bark (This may be very time consuming).
- Pry off and remove poison ivy vine with spade, machete or shovel: discard vines in small piles

Poison Ivy wines on mature trees
Wuhala Woods-East

- Apply Pathfinder II with paint brush directly to the cut vine immediately. Work in herbicide thoroughly without runoff.
- Allow the vine to stay on the tree. It will die and eventually decompose and fall from the tree.
- Proceed in a practical manner to stay on track. Cut and treat vines in teams of 2 people before moving along.
- Eradicating the poison ivy vines and associated foliage will open the forest canopy to more sunlight. The unrestrained trees should grow faster to help compensate for the temporary reduction in the forest canopy.
- There are thousands of poison ivy vine growing up trees. A team of 2 persons would need approximately 80 to 100 hours to accomplish a total treatment. One could prioritize by first treating specimen trees, trees closest to the trails, or devise some comprehensive coverage strategy.
- Total removal will greatly improve the overall health of Wuhala Woods and utilization of the Woods by the citizens of Chatham.

Trees in Wuhala Woods-
East with Poison Ivy vines alongside Blue Trail

Japanese Knotweed (*Polygonum cuspidatum*)

Fortunately there is only one small patch of Japanese Knotweed located by the potential entrance at the end of Cornell Street. Multiflora Rose is also present. Unfortunately Japanese Knotweed is one of the Invasives that is hardest to remove. It involves cutting the above ground portion and then spraying or injecting the stems with Rodeo or Roundup. Injecting the stems helps in getting the herbicide into the root/rhizome system but it still may take many years and several applications to finally eradicate this troublesome invasive. It is very important to bring this species under control as it can spread quickly from seed production and rhizomes and will take over large areas within a forest.

Japanese Barberry (*Berberis thumbergii*), Privet (*Ligustrum lucidum*), Asiatic Honeysuckle (*Lonicera mackii*), Siebold viburnum (*Viburnum seiboldi*)

These invasive shrubs have a sparse occurrence of fewer than 10 total plants each. The following treatment is effective with all of these plant species:

- Identify invasive shrub species
- Cut shrubs to 5 to 10 inch stumps with machete, chain saw, or loppers
- Apply herbicide treatment of Pathfinder II, Rodeo or commercial grade Roundup directly to stump with quality paint brush
- Chip or mow brush without the berries to disperse
- Monitor treated plants seasonally for stump sprouting or signs of life
- Cut and reapply herbicide or spray entire root sprouts until plant is totally eradicated

Japanese Knotweed in Wuhala Woods west near Cornell Street entrance

Japanese Barberry - Wuhala Woods West near Cornell Street entrance

Treatment of *Microstegium vimineum* - Japanese Stiltgrass, *Alliaria petiolata* – Garlic Mustard

Dense stand of Japanese Stiltgrass Wuhala Woods-West near Cornell Street Entrance

Japanese Stiltgrass and garlic mustard both grow lushly and tend to take cover the whole forest floor. They are very difficult to treat and usually come back and again and again. Garlic mustard can be pulled or sprayed. There is not very much garlic mustard in Wuhala Woods. The stiltgrass in both sections of the Wuhala Woods is growing mostly in disturbed areas and in gaps in the forest canopy. Manually pulling and bagging is an effective management method although it can be very labor intensive. Although chemical treatment with a grass herbicide is possible; it is somewhat futile as both these species are prolific seed producers. Planting native trees and shrubs into the stiltgrass can help to restore these areas.

Antonio Pasquini documenting extensive stand of Japanese Stiltgrass in Wuhala Woods-East

A combination of deer-resistant native shrubs and understory trees; and tube protected trees help restore the true forest character and ecology. It is recommended to obtain the largest containerized plants at least 6 to 7 foot tall from native plant nurseries. Installation of ferns is also very effective in colonizing these areas along with the tree plantings.

Norway Maple (*Acer platenoides*), Hawthorne (*Crataegus species*), White Mulberry (*Morus alba*), Sweet Cherry *Prunus avium*)

These non-native trees that have naturalized (Spread naturally in the wild). Norway maple and white mulberry should be cut and stump treated with Pathfinder II, Rodeo or Roundup painted directly onto the stump. Hawthorne and Sweet Cherry are not colonizers, aggressive or out of place to the degree that they have to be treated or removed.

IV. RECOMMENDATIONS

Most important is that once invasives and nuisance species have been removed, restoration of the area is a must. This will require re-planting the area with ecologically appropriate native species, controlling the plantings against erosion and vandalism, and monitoring for any new invasives that might try to inhabit the area.

The cost of restoration an area the size and character of the Wuhala Woods will likely be as much if not more than the cost of removing and managing the Invasive Species. But to not restore the area would be a travesty and waste of all the money and time spent on Invasive removal. Some invasives e.g. Japanese Knotweed may require several years for the control methods to reduce the threat of re-colonization to a level where planting with native species is ecologically sensible.

Antonio Pasquini (Heritage Tree and Native Plant Design) has prepared a native species candidate list for planting in the Gap areas now occupied by Japanese Stiltgrass in both sectors of the Wuhala Woods.

List of suggested Native Plants for Gaps in both Sectors of Wuhala Woods

Trees - Overstory

Acer saccharum - Sugar maple
Betula nigra - River birch
Carya Species
Celtis occidentalis - Hackberry
Fraxinus americana - White ash
Fraxinus pennsylvanica - Green ash
Platanus occidentalis - Sycamore
Quercus bicolor - Swamp white oak
Quercu palustis - Pin oak
Quercus rubra - Red oak
Quercus velutina - Black oak
Tilia americana - Linden

Trees - Understory

Carpinus caroliniana - Ironwood
Cornus florida - Flowering dogwood
Nyssa sylvatica - Black gum
Viburnum lentago - Nannyberry viburnum
Viburnum prunifolium - Blackhaw viburnum

Shrubs

Cornus racemasa - Gray dogwood

Viburnum dentatum - Arrowwood virburnum

Herbaceous Plants

Osmunda regalis – Royal fern
Osmunda cinnamomea – Cinnamon fern
Eupatorium maculatum – Spotted joe-pye
Panicum clandestinum – Deer tongue
Elymus virginicus – Virginia Wild Rye
Verbena hastate – Blue Vervain
Monada fistulosa – Wild Bergamot
Eupatorium fistulosum- Boneset
Desmodium canadense – Showy Tick Trefoil

V. LITERATURE USED IN PREPARATION OF THIS PLAN

Kaufman, Sylvan Ramsey. 2009, Invasive Plants: a guide to identification and the impacts and control of common North American species. STACKPOLE BOOKS, Mechanicsburg, PA. http://www.stackpolebooks.com

Tu, M.,C. & J.M. Randall. 2001. Weed Control Methods Handbook, The Nature Conservancy, http://tncweeds.ucdavis.edu, version: April 2001

Uva, Richard H.; Joseph C. Neal, and Joseph M. DiTomaso, 1997, Weeds of the Northeast. Cornell University Press

APPENDIX A

1. Invasive and Nuisance Plant Species Survey Results for Wuhala Woods 2009.
2. Photo Documentation of Invasive and Nuisance Plants in Wuhala Woods – Borough of Chatham, N.J.

Wuhala Woods Invasive and Nuisance Plant Species Datasheet		
Section: WESTERN Survey Location: South of Cornell Trail		
GPS Coordinates (optional): Lat. 40° 44' 33.2" Long. 74° 22' 25.3" Habitat Description: Woodland (large gap) Date: August 12, 2009		
Invasive Plant Species	**Presence (Y = yes, N = no)**	**Abundance (1=Sparse, 2=Moderate, 3=Dense)**
Vines		**Vines: Sparse(<20),Moderate (20-100),Dense(>100)**
Oriental Bittersweet (*Celastrus orbiculatus*)	N	
English Ivy (*Hedera helix*)	N	
Japanese Honeysuckle (*Lonicera japonica*)	N	
Ground Ivy (*Glechoma hederacea*)	N	
Poison Ivy (*Rhus radicans*) NUISANCE	N	
Wild Grape (*Vitus sp*) NUISANCE	N	
Shrubs		**Shrubs: Sparse(<20),Moderate (20-100),Dense(>100)**
Bush Honeysuckle (*Lonicera spp.*)	N	
Autumn Olive (*Eleagnus umbellata*)	N	
Common Buckthorn (*Rhamnus cathartica*)	N	
Multiflora Rose (*Rosa multiflora*)	Y	**Sparse to West; Dense to East**
Japanese barberry (*Berberis thunbergii*)	N	
Privets (*Ligustrum spp*)	N	
Japanese Knotweed (*Polygonum cuspidatum*)	N	
Siebold viburnum (*Viburnum sieboldii*)	N	
Burning Bush (*Euonymus alata*)	N	
Trees		**Trees: Sparse(<5),Moderate (5-10),Abundant(>10)**
Tree-of-Heaven (*Allanthus altissima*)	N	
Empress Tree (*Paulownia tomentosa*)	N	
Norway Maple (*Acer platanoides*)	N	
		Herbs: Sparse(individuals found but not common),
		Moderate(>1 patch of plants),
Herbaceous		**Abundant(several large patches, wide distribution)**
Wineberry (*Rubus phoenicolasius*)	N	
Purple Loosestrife (*Lythrum salicaria*)	N	
Phragmites (*Phragmites australis*)	N	
Garlic Mustard (*Alliaria petiolata*)	N	
Japanese Stilt Grass (*Microstegium vimineum*)	N	
Blackberry (Rubus allegheniensis)NUISANCE	N	
TRASH		**Yard waste and debris dumped along property lines**

Wuhala Woods Invasive and Nuisance Plant Species Datasheet		
Section: WESTERN Survey Location: WEST Off Princeton Street		
GPS Coordinates (optional): Lat. 40° 44' 53.2" Long. 74° 22' 22.4" Habitat Description Woodland (large gap) Date: August 12, 2009		
Invasive Plant Species	**Presence (Y = yes, N = no)**	**Abundance (1=Sparse, 2=Moderate, 3=Dense)**
Vines		**Vines: Sparse(<20),Moderate (20-100),Dense(>100)**
Oriental Bittersweet (*Celastrus orbiculatus*)	N	
English Ivy (*Hedera helix*)	N	
Japanese Honeysuckle (*Lonicera japonica*)	N	
Ground Ivy (*Glechoma hederacea*)	N	
Poison Ivy (*Rhus radicans*) NUISANCE	Y	Sparse
Wild Grape (*Vitus sp*) NUISANCE	Y	Sparse
Shrubs		**Shrubs: Sparse(<20),Moderate (20-100),Dense(>100)**
Bush Honeysuckle (*Lonicera spp.*)	N	
Autumn Olive (*Eleagnus umbellata*)	N	
Common Buckthorn (*Rhamnus cathartica*)	N	
Multiflora Rose (*Rosa multiflora*)	N	
Japanese barberry (*Berberis thunbergii*)	N	
Privets (*Ligustrum spp*)	N	
Japanese Knotweed (*Polygonum cuspidatum*)	N	
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Phragmites (*Phragmites australis*)	N	
Garlic Mustard (*Alliaria petiolata*)	N	
Japanese Stilt Grass (*Microstegium vimineum*)	N	
Blackberry (Rubus allegheniensis)NUISANCE	N	

Wuhala Woods Invasive and Nuisance Plant Species Datasheet		
Section: WESTERN Survey Location: WEST Off Harvard Street		
GPS Coordinates (optional): Lat. 40° 44' 50" Long. 74° 22' 24" Habitat Description: Woodland (large gap) Date: August 12, 2009		
Invasive Plant Species	**Presence (Y = yes, N = no)**	**Abundance (1=Sparse, 2=Moderate, 3=Dense)**
Vines		**Vines: Sparse(<20),Moderate (20-100),Dense(>100)**
Oriental Bittersweet (*Celastrus orbiculatus*)	N	
English Ivy (*Hedera helix*)	N	
Japanese Honeysuckle (*Lonicera japonica*)	N	
Ground Ivy (*Glechoma hederacea*)	N	
Poison Ivy (*Rhus radicans*) NUISANCE	N	
Wild Grape (*Vitus sp*) NUISANCE	Y	**Sparse**
Shrubs		**Shrubs: Sparse(<20),Moderate (20-100),Dense(>100)**
Bush Honeysuckle (*Lonicera spp.*)	N	
Autumn Olive (*Eleagnus umbellata*)	N	
Common Buckthorn (*Rhamnus cathartica*)	N	
Multiflora Rose (*Rosa multiflora*)	Y	**Sparse**
Japanese barberry (*Berberis thunbergii*)	Y	**Sparse**
Privets (*Ligustrum spp*)	N	
Japanese Knotweed (*Polygonum cuspidatum*)	N	
Siebold viburnum (*Viburnum sieboldii*)	N	
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Phragmites (*Phragmites australis*)	N	
Garlic Mustard (*Alliaria petiolata*)	N	
Japanese Stilt Grass (*Microstegium vimineum*)	Y	**Abundant(several large patches, wide distribution)**
Blackberry (Rubus allegheniensis)NUISANCE	N	

Wuhala Woods Invasive and Nuisance Plant Species Datasheet		
Section: EASTERN Survey Location: Along Blue Trail GPS Coordinates (optional): Lat. Long. Habitat Description: Flood Plain Woodland with large gaps Date: October 2008		
Invasive Plant Species	**Presence (Y = yes, N = no)**	**Abundance (1=Sparse, 2=Moderate, 3=Dense)**
Vines		**Vines: Sparse(<20),Moderate (20-100),Dense(>100)**
Oriental Bittersweet (*Celastrus orbiculatus*)	N	
English Ivy (*Hedera helix*)	N	
Japanese Honeysuckle (*Lonicera japonica*)	N	
Ground Ivy (*Glechoma hederacea*)	N	
Poison Ivy (*Rhus radicans*) NUISANCE	Y	Moderate
Wild Grape (*Vitus sp*) NUISANCE	N	
Shrubs		**Shrubs: Sparse(<20),Moderate (20-100),Dense(>100)**
Bush Honeysuckle (*Lonicera spp.*)	N	
Autumn Olive (*Eleagnus umbellata*)	N	
Common Buckthorn (*Rhamnus cathartica*)	N	
Multiflora Rose (*Rosa multiflora*)	Y	Sparse
Japanese barberry (*Berberis thunbergii*)	Y	Moderate along river bank
Privets (*Ligustrum spp*)	N	
Japanese Knotweed (*Polygonum cuspidatum*)	N	
Siebold viburnum (*Viburnum sieboldii*)	N	
Burninig Bush (*Euonymus alata*)	N	
Trees		**Trees: Sparse(<5),Moderate (5-10),Abundant(>10)**
Tree-of-Heaven (*Ailanthus altissima*)	N	
Empress Tree (*Paulownia tomentosa*)	N	
Norway Maple (*Acer platanoides*)	N	
		Herbs: Sparse(individuals found but not common),
		Moderate(>1 patch of plants),
Herbaceous		**Abundant(several large patches, wide distribution)**
Wineberry (*Rubus phoenicolasius*)	Y	Moderate(>1 patch of plants),
Purple Loosestrife (*Lythrum salicaria*)	N	
Phragmites (*Phragmites australis*)	N	
Garlic Mustard (*Alliaria petiolata*)	N	
Japanese Stilt Grass (*Microstegium vimineum*)	N	
Blackberry (Rubus allegheniensis)NUISANCE	Y	Abundant(several large patches, wide distribution)
TRASH		Plastic bottles and bags remaining from floodwaters

Wuhala Woods Invasive and Nuisance Plant Species Datasheet		
Section: WESTERN Survey Location: WEST Cornell Street Access Point GPS Coordinates (optional): Lat. 40° 54' 10.9" Long. 74° 50' 39.6" Habitat Description: Woodland Date: July 02, 2009		
Invasive Plant Species	**Presence (Y = yes, N = no)**	**Abundance (1=Sparse, 2=Moderate, 3=Dense)**
Vines		**Vines: Sparse(<20),Moderate (20-100),Dense(>100)**
Oriental Bittersweet (*Celastrus orbiculatus*)	N	
English Ivy (*Hedera helix*)	N	
Japanese Honeysuckle (*Lonicera japonica*)	N	
Ground Ivy (*Glechoma hederacea*)	N	
Poison Ivy (*Rhus radicans*) NUISANCE	Y	Dense
Shrubs		**Shrubs: Sparse(<20),Moderate (20-100),Dense(>100)**
Bush Honeysuckle (*Lonicera spp.*)	N	
Autumn Olive (*Eleagnus umbellata*)	N	
Common Buckthorn (*Rhamnus cathartica*)	N	
Multiflora Rose (*Rosa multiflora*)	Y	
Japanese barberry (*Berberis thunbergii*)	N	
Privets (*Ligustrum spp*)	N	
Japanese Knotweed (*Polygonum cuspidatum*)	Y	Sparse
Siebold viburnum (*Viburnum sieboldii*)	N	
Burninig Bush (*Euonymus alata*)	N	
Trees		**Trees: Sparse(<5),Moderate (5-10),Abundant(>10)**
Tree-of-Heaven (*Ailanthus altissima*)	N	
Empress Tree (*Paulownia tomentosa*)	N	
Norway Maple (*Acer platanoides*)	N	
		Herbs: Sparse(Individuals found but not common), Moderate(>1 patch of plants),
Herbaceous		**Abundant(several large patches, wide distribution)**
Wineberry (*Rubus phoenicolasius*)	N	
Purple Loosestrife (*Lythrum salicaria*)	N	
Phragmites (*Phragmites australis*)	N	
Garlic Mustard (*Alliaria petiolata*)	Y	Abundant(several large patches, wide distribution)
Japanese Stilt Grass (*Microstegium vimineum*)	N	
Blackberry (Rubus allegheniensis)NUISANCE	N	

Trash and Debris Management Plan

for

Wuhala Woods

prepared

for the

Environmental Commission

Borough of Chatham, NJ

November 2009

by

The Eco-Strategies Group LLC

Heritage Tree & Plant Design

Applied Services, Inc

Trash and Debris Management Plan for Wuhala Woods
Borough of Chatham, NJ

I. INTRODUCTION:

All to often, open space lands in urban and suburban environments alike become the dumping grounds and repository for trash and litter. This indiscriminant and mostly illegal dumping activity leads to the deterioration of the natural habitats of these areas and actually pose a threat to the animal populations inhabiting the areas. In addition, the areas become unsightly and casual hikers, bird watchers and school children that might want to use these areas become discouraged and disheartened from these unsightly and unsafe trash materials and debris.

II. EXTENT OF THE PROBLEM

Each sectors of the Wuhala Woods are unique in topography, habitat and recreational usage. In the Western Sector, the area most accessibly to the citizens of Chatham, the acreage is much less than the Eastern Sector. However, the problem with dumping and trash is so much more evident.

Western Sector

Construction debris in Western Sector of Wuhala Woods **Yard wastes in Western Sector of Wuhala Woods**

Yard debris in Western Sector of Wuhala Woods **Remains of a party in the Western Sector of Wuhala Woods**

Remains of an old washing machine in Western of Wuhala Woods

Remains of an old lawn mower in Western Sector of Wuhala Woods

Eastern Sector

The nature of the trash problem associated with the Eastern Sector is limited to floatables transported on to the site during flood events and the occasional beverage discard from a hiker or biker. The problem is not nearly as extensive as in the Western Sector. However, the Eastern Sector is a much larger tract and will have to be surveyed very carefully each year after the flood waters have receded as a new crop of floatables is very likely.

Remnants of a pool liner in the Eastern Sector of Wuhala Woods

Beverage container in the Eastern Sector of the Wuhala Woods

III. RECOMMENDATIONS

Western Section

Before embarking upon a physical removal of the trash and debris, a group of concerned citizens should be formed e.g. **Stewards of Wuhala Woods** that could serve as the core for all activities including trash removal but more importantly to provide vigilance on a regular basis.

A management plan for dealing with the existing trash and debris should incorporate citizens and potential future visitors and users of Wuhala Woods. Physically removing the trash and debris is easy once the user public is educated to the problem. In fact, the unsightliness and ecologically deterrent aspects of the trash, particularly the lawn wastes and household chemical containers should be pointed out to all ages, parents and children during tours for the sole purpose of using the various kinds of trash and debris piles as teaching moments. Hopefully, tours of the Woods in its present status will engender interest that can be channeled into a long term involvement and commitment to the overall stewardship of the entire Wuhala Woods Tract.

Once the user public has been identified that can serve as a source of volunteers; personal safety gear, bags and carts can be obtained as donations from local hardware supply stores. Disposal

receptacles would have to be provided by the Department of Public Works or a local disposal vendor.

Eastern Sector

The task of collecting all these items is a great activity for volunteer groups e.g. civic organizations, Boy Scouts, Girl Scouts, and Church Groups with some sort of recognition being given to the individuals or groups who are able to collect the most individual items, the most unique items in terms of age, shape or origin.

All of the materials collected will have to taken off site as having on-site trash receptacles may not practical because of the flood inundation problem. Any receptacles will have to be secured and not be able to float.

All of the activities associated with this sector should be under the direction of the **Stewards of Wuhala Woods** under the auspices of the Borough of Chatham Environmental Commission who serve as the Open Space custodians for the Borough of Chatham.

The Issue of Parking Areas

for

Wuhala Woods

prepared

for the

Environmental Commission

Borough of Chatham, NJ

November 2009

by

The Eco-Strategies Group LLC

Heritage Tree & Plant Design

Applied Services, Inc

The Issue of Parking Areas for Wuhala Woods

BACKGROUND

One of the line items on the Bid Proposal Request from the Environmental Commission was to investigate some candidate areas where a parking area(s) could be designed and installed for the various Open Space sites.

APPROACH

On July 28, 2009, we made a site visit with Environmental Commissioner Dick Ligertwood to inspect a number of locations for entrance parking areas to the Western Sector of the Wuhala Woods.

We parked in the parking lot of the Swim Club at the end of Princeton Street and walked through the Woods to the opposite streets. We examined the existing parking conditions at the ends of Cornell and Harvard Streets as shown in the photos below.

Figure 1 Looking out to Cornell Street from inside Wuhala Woods

Figure 2 Showing Stormwater Catch basin at end of Cornell Street

Figure 3 End of Harvard Street with Wahala Woods in background

Mark Areas
to Visit or Coordinate

The Map below shows the locations of these potential parking areas. The Cornell Street and Harvard Street sites are on the top of the map with the Wilson Street on the left side..

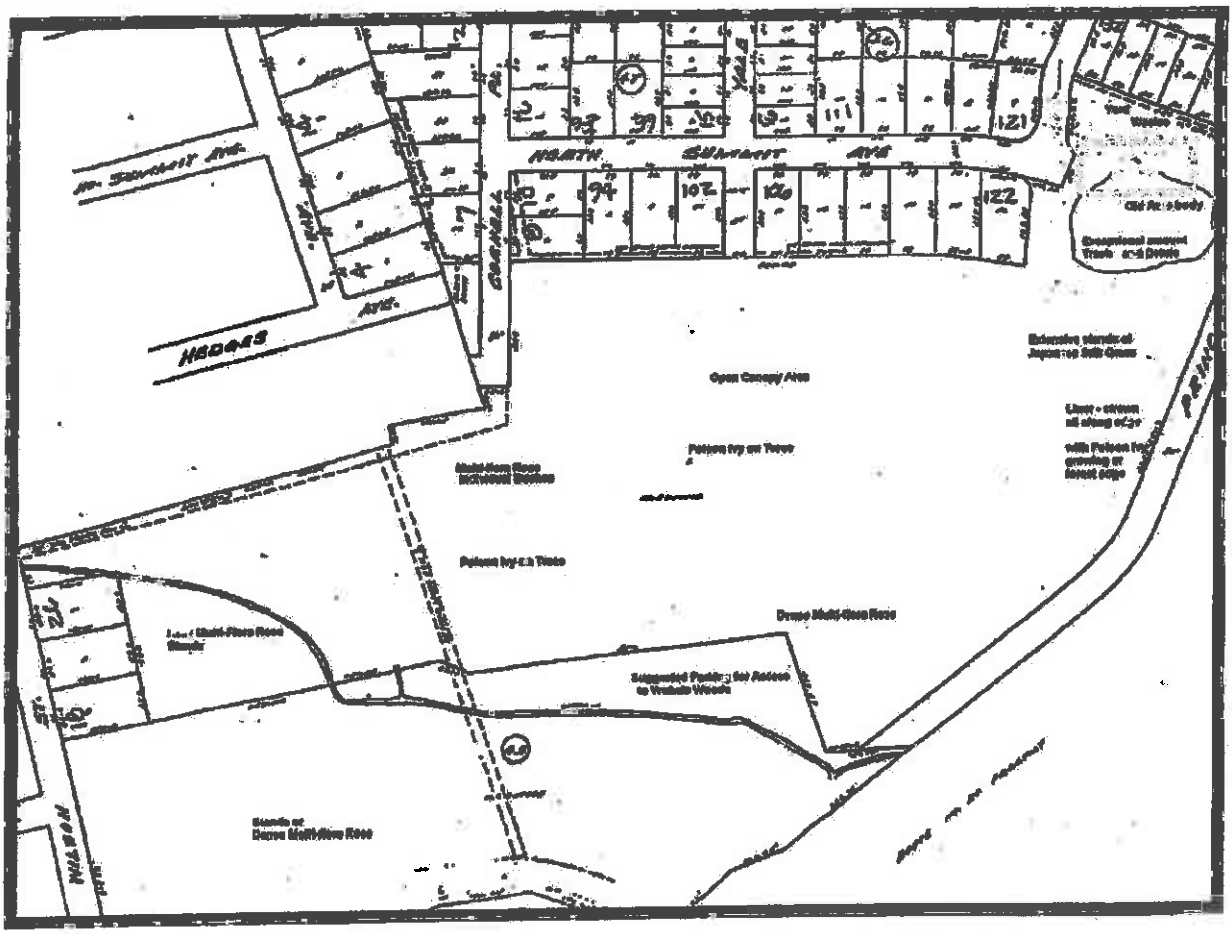
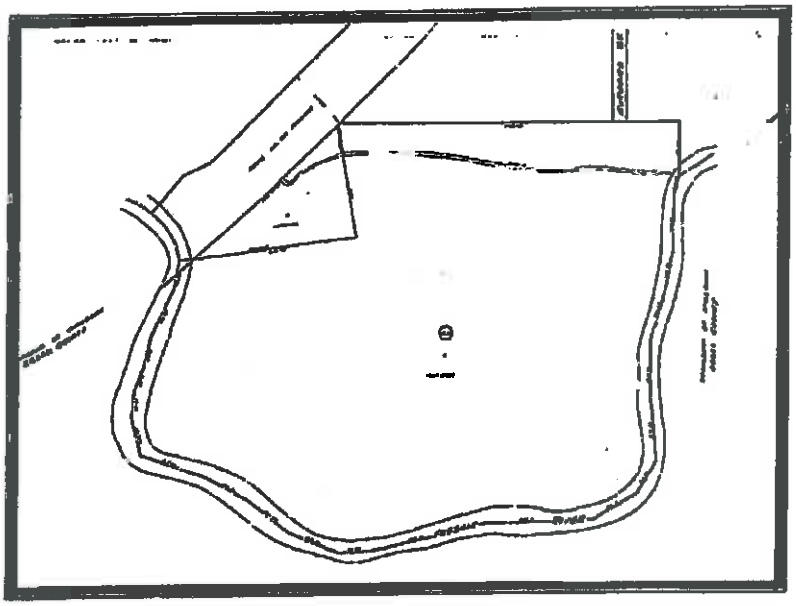


Figure 4 Map of possible parking sites for the Western Sector of Wuhala Woods

The Wilson Street site suggested as a possibility by Dick Ligertwood was visited by Antonio Pasquini at a later date.

Eastern Sector

The only reasonable parking access for the Eastern Sector is at the end of Rutgers Street as shown on the Map below.



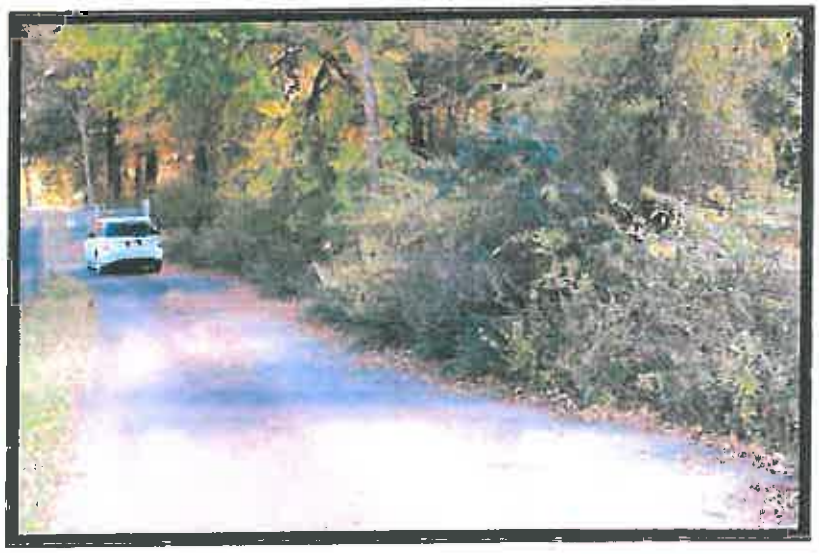


Figure 5 View of Wuhala Woods Eastern Sector entrance at end of Rutgers Street

ANALYSIS AND RECOMMENDATION

Our recommendation for parking at both the Western and Eastern Sectors is to use existing parking available at the ends of Cornell, Harvard and Rutgers Streets mainly for the following reasons.

Both tracts of the Wuhala Woods as shown below are listed in the NJDEP's Landscape Project as being Forested Wetlands meaning that the NJDEP considers these areas to have value as critical habitat.

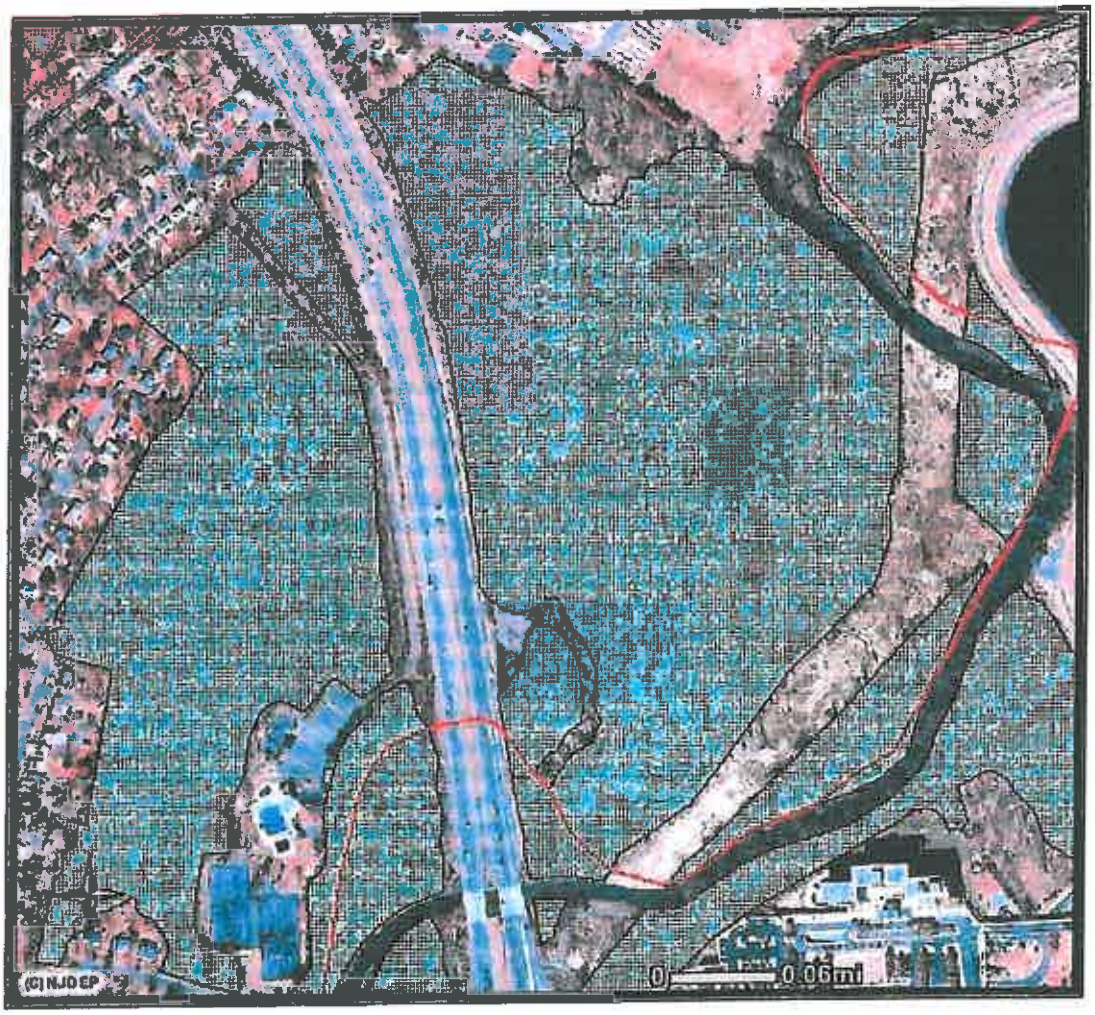


Figure 6 Wuhala Woods shown as Forested Wetlands on NJDEP iMAP web site.

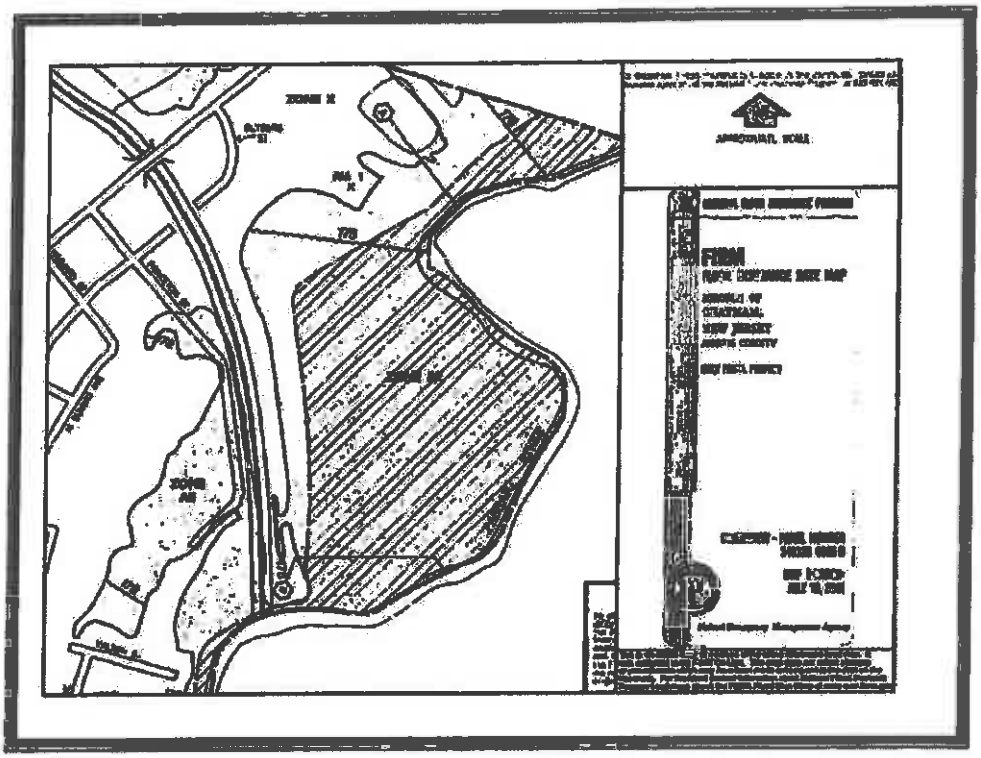


Figure 7 FEMA Flood Hazard Area designation for Wuhala Woods

Zone AE designation means that these areas are subject to inundation by the 100-year flood determined in a Flood Insurance Study by detailed methods. Base flood elevations are shown within these zones. The striations indicate the area with Zone AE considered to be the actual Floodway of the Passaic River.

Zone X are areas that have been have been identified in the community flood insurance study as areas of moderate or minimal hazard from the principal source of flood in the area. However, buildings in these zones could be flooded by severe, concentrated rainfall coupled with inadequate local drainage systems.

The above designations by FEMA indicate that these areas lie within the regulated areas addressed in the Flood Hazard Area Control Act Rules (N.J.A.C. 7:13-10.4). Construction of Parking Areas within these designated areas or within 300 ft of these areas will require applying for a permit from the NJDEP. This activity is not covered by a permit-by-rule or general permit and will require an Individual Permit as outlined in N.J.A.C. 7:13-9, 10 and 11.

The restrictions and constraints likely to be imposed by the NJDEP (the first of which will be to prove the absolute necessity of having such a structure within the regulated area) by the Wetlands Act and the Flood Hazard Area Control Rules are such that we feel that using the existing options of on-the-street parking until usage of the Wuhala Woods requires constructing on-site parking facilities is the most sensible course of action.

Wuhalla Woods Western Sector

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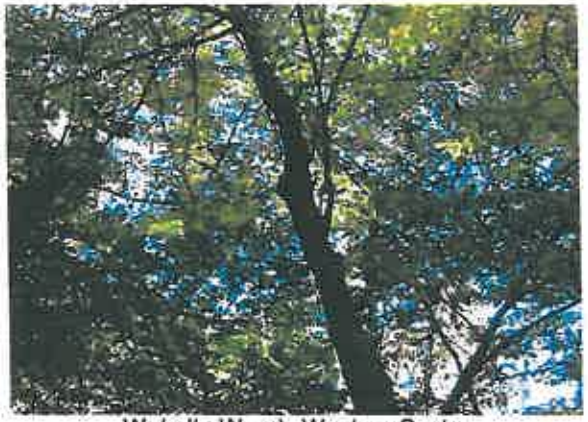

Wuhalla Woods Western Sector

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