

**Biological Survey and
Restoration Concepts for
The Meadows
Borough of Highland Park**

**Prepared on behalf of
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Authorization, Purpose and Scope

In accordance with our agreement for consulting services dated April 3, 2001, Thonet Associates Inc. was authorized by the Borough of Highland Park to conduct a "Biological Survey and Develop Restoration Concepts for a Parcel of Woods & Marsh located Downstream of Donaldson Park." This parcel of land is referred to as "The Meadows" in this report. The Borough was awarded a matching grant for funding this project from the New Jersey Department of Environmental Protection (NJDEP), Office of Environmental Services (OES).

Our agreement specifies the following tasks:

1. A multi-season survey of threatened, endangered, and rare species of flora and fauna on the property;
2. A multi-season survey of the existing flora and fauna, mapped in general ecological groupings, to be used as a biological baseline;
3. Tagging of selected tree specimens, particularly in areas near a proposed nature trail; and
4. A survey of specific restoration opportunities.
5. The project would produce:
 - a. A map showing the site's general ecological communities utilizing the best existing base map currently available from public sources such as an enlarged copy of the appropriate USGS map;
 - b. A report addressing the following:
 - 1) The site's threatened, endangered, and rare species and the suitable habitat for attracting or introducing such species;
 - 2) Characterization of the sites general, existing biological characteristics by ecological groupings
 - 3) Restoration concepts including locations of small, achievable projects; suggested species to introduce; and areas for removal of invasive exotic species.

This report presents our investigations, findings, conclusions and recommendations.

General Location and Description of Site

The municipally owned project site is located in the southeastern corner of Highland Park Borough (**Figure 1 - Location Map**). The total acreage is about 18 acres, which is unequally divided by the bike path into two separate areas. The larger area, also known as Tax Lot 6 in Block 75, is a 16.6 acre irregularly-shaped property within a Conservation & Recreation (C/R) Zoning District, located at the end of South Seventh Avenue, Valentine Street, Crowells Road, and along Donaldson Street, bordering on Donaldson County Park on the west, Edison Township to the east, and extending south to the Raritan River. The smaller area contains several residentially zoned and subdivided lots totaling about two acres, located between South Fifth Avenue and South Seventh Avenue. A privately owned property, containing the WCTC radio tower, is located to the west of the site, on Lot 8 (**Figures 2 and 2A - Tax Maps**).

The site is currently vacant and undeveloped, but is not "pristine." Except for about four acres of open field along Donaldson Street opposite the apartment complex, most of the site is densely wooded, although there are discernible paths throughout the site and a few clearings. There is visual evidence that considerable disturbance of the land has taken place on the site, including clearing, excavation and filling, which is consistent with the fact that a municipal landfill once occupied the northern portion of the site.

As pointed out by Mr. Arnold Henderson, Vice Chairman of the Environmental Commission, there are three relatively distinct topographic areas that Mr. Henderson refers to as "plateaus." The upper plateau would be the open field area, the lower plateau would be the flood plain along the river, and the middle plateau would be the area in-between these two.

Near the northeastern corner of the site, starting near the intersection of Donaldson Street and Crowells Road, where the topography is quite steep, is a watercourse that flows out of a large drainage pipe. From this pipe, the stream runs through a small "gorge" with steep rock walls.

A recently constructed paved bike path connects Donaldson Street and Valentine Street. Currently, access to the interior of the site is at the end of the bike path near Valentine Street.

There is a large area of freshwater wetlands present in the southwestern portion of the site in the vicinity of the radio tower and along the river.

Color photographs taken during recent site visits depicting many of the existing features are contained in **Appendix A**.

Investigations

Our investigations included the following:

1. Review of relevant publicly available state and federal environmental maps and information, including the following:
 - a. USGS Topographic Quadrangle for New Brunswick;
 - b. US Department of the Interior, Fish & Wildlife Service, National Wetlands Inventory (NWI) Map, New Brunswick Quadrangle;
 - c. NJDEP Freshwater Wetlands Map, New Brunswick NE Quarter Quadrangle;
 - d. USDA/SCS Soil Survey of Middlesex County;
 - e. Information obtained from NJDEP Bureau of Floodplain Management regarding the existence of flood plains on the site; and
 - f. Information obtained from the NJDEP Natural Heritage Program regarding threatened and endangered species on or near the site.
2. Initial meeting on May 8, 2001 in the Highland Park Municipal Building, between Mr. Blaine Rothauser and Mr. Henry Reisen of Thonet Associates, and Mr. Henderson of the Environmental Commission, followed by a site visit.
3. Review of various Highland Park Borough files and documents, including:
 - a. Borough of Highland Park 1995 Master Plan Update, prepared by Sheehan Consulting Group;

- b. Portions of 1992 Highland Park Natural Resource Inventory, prepared by Townplan Associates; and
 - c. Environmental Study Report, Proposed YM/YWHA Site (Former Highland Park Municipal Landfill), South Fifth Avenue and Valentine Street, South Seventh Avenue, Donaldson Street and Crowells Road, Highland Park, New Jersey -- Volume I, dated September 2000, prepared by Remediation Technology and Engineering, Inc. (RTE) of PMK Group, Inc.
4. Communications with various interested parties, including local naturalists and birders, through Mr. Henderson.
 5. Detailed site investigations by Mr. Rothauser, Thonet Associates' Senior Naturalist, on May 8, June 14, June 28, and October 24, 2001.
 6. On-site meetings with Arnold Henderson on May 8 and June 14, 2001.

Findings

Our findings include the following:

1. During his multi-season field surveys, Mr. Rothauser of Thonet Associates documented the presence of numerous species of plants, animals, and birds, including over 100 native plant species, over 60 species of birds, a dozen species of invertebrates, six species of mammals and three species of herptiles. These species are documented in **Appendix B**.
To date, Thonet Associates has not observed any threatened or endangered species of plants or animals on the site though suitable habitat for some threatened or endangered species are present.
2. During his field investigations, Mr. Rothauser made notes regarding the environmental characteristics associated with each of the site's ecological communities or zones and further recorded his observations regarding opportunities for ecological restoration. Appendix C details Mr. Rothauser's notes in this regard.
3. Appendix D presents Mr. Rothauser's responses to specific questions raised by the Environmental Commission and provides site-specific observations and recommendations for the five ecological zones he identified, including specific recommendations for small, achievable projects involving the removal of invasive exotic species, the planting of native species, and the construction of various recreational features.
4. Relevant findings from the publicly available state and federal environmental maps and information are as follows:
 - a. The USGS Topographic Quadrangle for New Brunswick (**Figure 3**) shows an unnamed "blue-line" stream along the western boundary of the site and the symbol for marsh (swamp) along the Raritan River. NJ State Plane Coordinates are N 604,400 x E 2,069,000. In general, this finding is consistent with our field observations.
 - b. The US Fish & Wildlife Service's NWI Map -- New Brunswick Quadrangle (**Figure 4**) shows an area of freshwater wetlands on the site along the river. The wetlands are designated as E2EM (Estuarine Intertidal Emergent). In general, this finding is consistent with our field observations.

- c. The NJDEP Freshwater Wetlands Map -- New Brunswick NE Quarter Quad (**Figure 5**) shows a larger area of freshwater wetlands on-site than the NWI map. The wetlands are designated as .20 PSS1B (Palustrine Scrub/Shrub Broad Leafed Deciduous Saturated). In general, this finding is consistent with our field observations.

Please note that NJDEP has not verified the location and resource value of the site's freshwater wetlands delineation. Such verifications required a formal application to NJDEP for a Letter of Interpretation (LOI).

- d. According to the USDA/SCS Soil Survey of Middlesex County (**Figure 6**), the following three types of soils are found on the site:
 - 1) Rowland silt loam (Ro) - Nearly level and moderately well drained or somewhat poorly drained, on flood plains along streams and large drainage ways.
 - 2) Klinessville-Urban land Complex 0-5% slopes (KWB) - Nearly level to gently sloping, well drained Klinessville soils and areas that are used for urban development.
 - 3) Psamments, nearly level (PN) - Deep, well drained or moderately well drained soils dominantly in regarded sand pits or borrow areas that have been smoothed.

In general, this finding is consistent with our field observations.

- e. The NJDEP Floodway and Flood Hazard Area Map and Profile prepared by the NJDEP Bureau of Floodplain Management illustrates the location and gives the elevations of the floodway and flood plain of the Raritan River on the site (**Figure 7**). The elevation of the flood hazard flood of the Raritan River at this location is 14' NGVD (**Figure 8**). This information is also depicted on **Enclosure 1**.
- f. Communications with the NJDEP Natural Heritage Program reveals that there are records for occurrences of three rare plants in the immediate vicinity of the site:
 - 1) Bur-marigold (*Bidens bidentoides*),
 - 2) American purple vetch (*Vicia americana*), and
 - 3) Nuttall's Mudwort (*Micranthemum micranthenoides*).

The Nuttall's Mudwort is listed as a State-endangered species. The other two rare plants are not listed as being either threatened or endangered.

A copy of the information received from the Natural Heritage Database is contained in **Appendix E**.

- 5. Our review of the Borough's files and documents revealed the following information:

- a. The Borough's *Master Plan* refers to "The Meadows" on page 87 as follows:

Aside from the two County Parks (Donaldson and Johnson) there is little Borough maintained parkland. In order to fill the local recreation need, a fifteen (15) acre Borough recreation area is proposed for a location along the waterfront between Donaldson Park and the Edison Township boundary and would include unstructured open space, bike paths, walkways, and possibly an environmental/educational center.

A seven-acre conservation area along the Raritan River adjacent to the northeast corner of Donaldson Park has been dedicated for public use to protect a significant wetland area and an area confirmed to be the habitat of at least two endangered flora species.

Please note that although our field observations did not confirm the existence of any endangered plants, we would agree that suitable habitat does exist in certain areas.

- b. On page 88, the *Master Plan* describes a *1994 Greenway Feasibility Study* undertaken by the Highland Park Environmental Commission for the undeveloped strip of lands "bordering the Raritan River from Johnson Park and Piscataway on the west to Donaldson Park and Edison on the east." As stated in the *Master Plan*,

The greenway would provide a conservation buffer along the Raritan River by protecting important habitats for plant and animal communities ... The greenway would also provide for human access via County or Borough owned parcels to natural environment increasing opportunities for observation of plants, animals, and the riverfront scenery.

Similarly, as part of a *7-Point Master Plan for the Riverfront*, the project site is designated as a "proposed national recreation trails project linking Donaldson Park to surrounding areas." A reduced copy of a map of the plan that was found in the Borough's file is provided in this report as **Figure 9**.

These observations and recommendations indicate that long range planning for the Borough's future includes and supports the idea that The Meadows should be preserved as open space and enhanced as an ecological resource.

- c. Although we were not provided with a complete copy of the Borough's *Natural Resource Inventory* (NRI), we requested and received from the Borough Clerk's office photocopies of several relevant pages for review.

The NRI provides a general description of the Borough's environmental characteristics. Aside from general descriptions of the Raritan River corridor, including the "presence of a floodplain and wetlands," there is no specific reference to the natural resources in The Meadows.

One paragraph on page 12 briefly describes the municipal landfill and the early investigations of the environmental impacts. There is also map depicting the wetlands area and an approximate outline of the landfill site (**Figure 10**). An aerial photo taken on August 26, 1977 shows access roads into the interior of the site, but there is no other supporting data given for this delineation of the landfill boundary (**Figure 11**).

- d. On behalf of the Borough, Remediation Technology and Engineering (RTE) performed a detailed environmental study for future development of the former municipal landfill located on the northern portion of the site.

The scope of work included an evaluation of the existing subsurface conditions of the site, including groundwater sampling and analysis, slug tests within selected wells to evaluate hydro geologic characteristics of the screened material, and a preliminary landfill delineation/characterization. **Figure 12** is taken from the report and depicts the approximate known landfill boundary.

The relevant conclusions found in the RTE study were as follows:

- 1) The underlying on-site soil mainly consists of sand/silty clay;
- 2) The on-site groundwater quality does not seem to have been impacted by constituents of the waste and fill material;

- 3) The landfill waste/refuse material was observed to consist mainly of construction debris (i.e. concrete, bricks, etc.) and household refuse. No other industrial or toxic waste was encountered during the test pit excavations;
- 4) The soil/waste sampling results did not reveal any contamination above NJDEP Soil Cleanup Criteria, except for localized impacts of benzo(a)pyrene and benzo(b)fluoranthene that in TP-5 and TPH and barium in TP-7, at concentrations marginally exceeding the most stringent NJDEP cleanup criteria.

Please note that the additional investigations recommended in the RTE study were made in anticipation of future development of the former municipal landfill for a proposed YM/WHA facility, and mostly do not apply to this report. However, we would support RTE's recommendation that a geochemical investigation be conducted consisting of a surface water sampling program involving collecting water and sediment samples from the on-site streams and the river to assess current water quality and the impacts, if any, from landfill waste.

6. Communications with Mr. Henderson and other interested parties yielded the following additional information:
 - a. Mr. Henderson provided us with an annotated hand-drawn map (**Figure 13**), showing an area similar to the map we prepared as Enclosure 1, from which we were able to locate some existing features of the site, including the topographic "plateaus," existing paths, clearings, streams, etc.

He also provided us with a list of wildlife sightings consolidated from various people reporting over the past few months and his "trail notes" from a February 2001 field walk. The notes contained a number of unanswered questions regarding the current conditions and the future possibilities for the site. The trail notes and the wildlife list are included in **Appendix F**.
 - b. Ms. Joanne Williams, a local birder and member of the NJ Audubon Society, has been recording bird sightings in Donaldson Park and Johnson Park since 1995. **Appendix G** contains Ms. Williams' bird list. The various species marked "D" were observed in Donaldson Park, and document 31 species of birds in the vicinity of the site, as well as some documented sightings of herptiles, mammals and insects. It is likely that many of these species would also be present in The Meadows.

Conclusions and Recommendations

Based on the foregoing investigations and findings, we conclude the following:

1. The site exhibits significant biodiversity. This report documents over 100 native plant species, over 60 bird species, a dozen species of invertebrates, six species of mammals, and three species of herptiles, on, or in the proximity to the site.

To date, Thonet Associates has not observed any threatened or endangered species of plants or animals on site during our field investigations. However, based on reported sightings by others on, or in proximity to the site, and the significant biodiversity exhibited on the site, it is possible that some State-threatened or endangered species utilize the site.

2. There has been a considerable amount of disturbance on the site, including dumping, digging, filling, grading and an old landfill.

3. The existing paths and clearings are adequate for limited access but at present would not be suitable for general public access.
4. We agree with the general opinion of the Environmental Commission that this location presents excellent opportunity to conserve dwindling natural areas as well as to provide a passive recreational area in which to observe and study what remains of the natural environment along the river.

We recommend the following:

The Borough and the Environmental Commission should consider doing the following to restore and facilitate the beneficial use of the property:

1. Field-identify the approximate limits of the landfill area as determined by RTE. The natural restoration of a former landfill is an environmentally educational feature in and of itself;
2. Have the property's freshwater wetlands formally delineated and documented and then request a Letter of Interpretation from NJDEP to verify the wetlands boundaries and resource value. The location of these wetlands may influence the planning of other activities proposed on the site that may require permits from NJDEP. Such activities could include trail development, clearing of invasive vegetation, construction of a boardwalk system through the site's wetlands, etc.
3. Select a main entrance to the site and attractively landscape that entrance so that it would be readily visible and inviting for visitors.
4. Develop a trail system that follows the site's interesting natural features, such as the wetlands, specimen plants, and the riverbank. It should be well marked and easy to follow, graded as needed, and covered with benign or biodegradable materials such as wood chips, gravel, or cinders. Handicapped access should be provided to certain areas. At logical intervals, benches and information boards should be installed with brief descriptions of the natural features.

In the vicinity of the trails, specimens of native species of plants should be identified and labeled. Where present, rare plants should also be identified, but not necessarily labeled, to avoid disturbance.

5. Initiate a program for the removal of invasive plants.
6. Initiate a program to remove unsightly debris without causing significant disturbance to the existing terrain. Piles of construction debris, dirt, gravel, and shale should be leveled or relocated. A cleanup and maintenance program should be initiated to remove flotsam and jetsam along the riverbank.
7. Install a guardrail along the street and parking area above the Crowells Road stream. It should run roughly from the telephone pole at the Crowells/Donaldson intersection down to the concrete pad housing the dumpster of the apartment block.

This is a safety issue. The drop off into the "gorge" is sudden. A car skidding on winter ice could go over. It is also conceivable that a driver might deliberately pull a car off onto the soft shoulder or a pedestrian simply walk out onto the seemingly solid edge and have it collapse. (Parts are not solid but merely the accumulation of leaves that residents have been dumping off the roadside.)

8. The upper plateau of The Meadows, along Donaldson Street opposite the apartment buildings, is mostly meadow, but a part is sometimes used for construction parking and materials. In November 2001, for example, about a third of the Donaldson Street frontage was fenced off (with borough permission) to park the trucks and backhoes of a borough water-lining contract.

Such construction use has historically been intermittent. The area reverts to meadow afterward. This is not, however, a truly high-quality meadow because of being disrupted and compacted every few years. The borough seems to have no other large area for such uses, so any natural space probably needs to work around the occasional disruption.

In no case, however, should construction parking or piles of materials be allowed very close to the Crowells Road stream or any trails. Users should feel they are "out in nature." As a rule of thumb, the 2001 fencing begins about as close to the stream as should ever be allowed. This is about in line with the west end of the easternmost apartment block. The area from there to the stream should stay natural and could even be enhanced by planting patches of meadow flowers, knowing they would not be disturbed. Shrubs or trees could be planted for screening. Anyone walking here would have nice views down into the stream. Residents report that each spring its bank at this point becomes a mass of the pink-and-white bloom of spring beauty.

Thus the construction parking, though not a desirable use for any part of a natural area could remain a tolerated intermittent use if confined to a more-or-less central area that leaves both ends of the upper plateau (former landfill) undisturbed.

We hope this report will assist the Environmental Commission in proceeding with their planning efforts regarding the restoration and beneficial use of The Meadows.

Respectfully submitted,
THONET ASSOCIATES INC.

John A. Thonet, PE, PP
President

Appendix A

Color Photographs

Appendix B

Biological Inventory

BIOLOGICAL INVENTORY

Key Code for Flora

D = Dominant
C = Common
S = Sporadic
R = Rare
P = Planted
I = Invasive
T = Trees

S = Shrubs
OP = Open Areas
M = Mushroom
CC = Under Canopy Cover
U = Uncommon
NN = Non-Native

Zone #1

Flora

Sweet pepperbush (P)
White Pine (P)
Japanese Knotweed (I)
Mugwort (D)
Honey Locust (D)
Reed Canary Grass(C)
Multi-Flora Rose(C)
Mullein (C)
Mulberry (T)
Japanese Honeysuckle (I)
Hedge Bindweed
Curly Dock (C)
Yellow Sweet Clover
English Plantain (C)
Willow Oak (C)
Yarrow (OP)

Mimosa (T)
Wood Sorrel (OP)
White Ash (T)
Evening Primrose
American Elm (T)
Crown Vetch (C) (OP)
Silver Maple (T)
Lupine (P)
Wild Cherry
Wine berry (I)
Poison Ivy (C)
Garlic Mustard (C)
English Ivy (C)
White Wood Aster(C)
Norway Maple (T)
Wild Strawberry (In fruit)

Fauna

Silver Spotted Skipper (C)
Cabbage White (D)
Box Elder Bog (C)
Wood Chuck
Gray Squirrel
Raccoon (scat)
Skunk (scat)
White-tailed Deer (scat)
Blue Jay

Cardinal
Catbird (C) (and nests)
Grackle (D)
House Sparrow
Robin (C) (and nest)
Ruby Crowned Kinglets
Starlings
Tufted Titmouse

Flora (On Top of Hill)

Virginia Creeper (C)
Correl Fungus (R)
Box Elder (D)
Cinquefoil
Moth mullein (C)
Dogbane (C)
Black Oak (U)

Jewelweed (C)
River Oats (P) (G)
White Clover (C) (OP)
Prickly Lettuce (U) (OP)
Feverfew (U) → Edges (NN)
Lance leaved Coreopsis (P) (OP)
Carex Flava

Fauna (On Top of Hill)

Red Backed Salamander
Centipede (C)
Raccoon Scat Piles
Baltimore Oriole (U)
Sweat Bee(C)

Carpenter Bee
Mourning Dove (C)
Least Skipper (C)
Steel Blue Cricket Hunter

Zone #2

Flora

Japanese Honeysuckle(C)
Hedge Bindweed(S)
Bicknell's Crane Bill (U)
Garlic Mustard (D)
Virginia Creeper (C)
Poison Ivy (C)
Bl. Locust (T)
Bl. Cherry (T)
Tall Bush Blackberry
White Avens (C)
Tartarian Honeysuckle (NN) (A) (I)
White Wood Aster
Calico Aster
Wine berry (NN) (C)
Box Elder (T)
N. Catalpa (T)
Pin Cherry (SH)

Wisteria (A) (NN) (I)
American Elm (T)
Swamp Dewberry (C)
Red Mulberry (Rivers edge)
Multi-Flora Rose (A) (NN)
Jewelweed (C)
Reed Canary Grass
Tansy Mustard (NN) (I)
Canada Goldenrod (C) (OP)
Crown Vetch (C) (OP)
Ailanthus (NN) (I)
Curly Dock(S)
Orchard Grass(S)
Burdock (C)
Mugwort (OP)
Chicory (S)
Japanese Knotweed (NN) (I)

Flora – Marsh

Cattail > Lance Leaved (C)
Spiked Rush (C)
Joe Pye Weed (U)
Soft Rush (C)
Carex Stipata(C)
Boneset (C)
Phragmites (C)

Swamp Rose Mallow (C)
Wild Onion (S)
Hedge Bindweed (S)
Water Pimpernel (U)
Swamp Lousewort (U)
Reed Canary Grass(C)

Baltimore Oriole (C) (and nest)
Blue Jays
Blue-gray Gnatcatcher (and nest)
Canada Geese (C)
Cardinal (C)
Catbird (C)
Common Yellowthroat (U)
Grackle (D)
Greater Yellow Legs
House Sparrow
Mourning Doves (C)
Pine Warbler

Fauna

Red Winged Blackbird (C)
Robin (C) (and nests)
Ruby Crowned Kinglets
Song Sparrow (C)
Starlings
Yellow Warbler (U)
Least Shrew (dead)
Woodchuck (C)
Least Skipper (C)
Gray Squirrel (C)
Cabbage White (A)
Eyed Brown (U)

Zone # 3

Mugwort (D) (OP)
Phragmites (C)
Sweet Vernal Grass (OP) (C)
Bindweed (C)
Deptford Pink (C) (OP)
Staghorn Sumac (C)
Daisy Fleabane (C) (OP)
Virginia Creeper (U) (OP)
American Elm (T) (C)
Black Cherry (C)
Tartarian Honeysuckle (V) (SH)
Wisteria (C)
Black Locust (C) (T)
Multi-flora Rose (C)
Silver Maple (T) (U)
Turkey Tail Mushroom (M)

Flora

Moneywort (CC) (C)
Box Elder (T) (C) (D)
R. Cedar (T) (OP) (U)
Apple (P) (OP)
H. Bush Blackberry (C) (OP)
Moth Mullein (C) (OP)
Poison Ivy (C) (OP) (CC)
Orchard Grass (C) (OP)
Sweet Vernal Grass (OP) (C)
Hop Clover (C) (OP)
Curly Dock (C) (OP) (M)
Norway Maple (U) (OP)
Sweet Vernal Grass (C) (OP)
Horse Nettle (U) (OP)
Spotted Blue-Eyed Grass (S) (OP)

Blue Jays
Cardinal (C) (nest)
Grackle (D)
Great Crested Flycatcher (nest)
House Sparrow
Ruby crowned kinglets (nest)

Fauna

Song Sparrow (C) (nest)
Starlings
Yellow Warbler (U) (nest)
Yellow-rumped Warbler
Gray Squirrel (C)
Rabbit

Zone # 4

Mugwort (D)

Box Elder (A)
Black Locust (EA)
Silver Maple (EA)
Sweet Vernal Grass (C)
Reed Canary Grass (C)
Smooth Sumac (SH)

Catalpa (T) (EA)
Trumpet Creeper (U) (EA)
Willows Sp. (P) (EA)
E. White Pine (P) (EA)
Canada Thistle (C)
Poison Ivy (C)
Prickly Thistle (U)
Sweet Vernal Grass (C)
Daisy Fleabane (C)
Moth Mullein (S)

American Robin (nests)
Blue Jays
Catbird (nest)
Common Yellowthroat (Feeding fledgling)
Goldfinch
House Sparrow
Rusty Blackbird
Red Winged Blackbird
Ruby crowned kinglets
Starlings

Flora

Crown Vetch (D)

Saplings

Red Chokeberry (U) (P)
Multi-flora Rose (S)
Queen Anne's Lace (S)
Coreopsis (P)
Black Eyed Susan (C)
Elderberry (SH) (U)

Edge of Area

English Plantain (C)
Red Clover (C)
Mimosa (T) (U) (S)
Yellow Sweet Clover(S)
White Clover (C)
Lupine (P)
Curly Dock (C)
Hop Clover (S)
Heal All (S)

Fauna

Yellow Warbler
Yellow Jacket
Bumble Bees
Eastern Tail Blue Butterfly
Morning cloak Butterfly
Sooty Under Wing Butterfly
Sulphur Butterfly
Green Frog (Ditch)
Gray Squirrel
Woodchuck

Zone # 5

Flora:

Ailanthus (C) (T)
Black Cherry (C) (T)
Garlic Mustard (D)
Japanese Honeysuckle (S)(V)
Black Elder (D) (C) (T)
Black Locust (D) (C) (T)
White Snakeroot (S)
Mayapple (U)
Virginia Creeper (S)
Poison Ivy (S)
Silver Maple (T) (C)

Green Ash (T) (U)
Multi-flora Rose (C)
Hackberry (T) (U)
American Elm (U) (T) (AS)
Giant Weeping Willows (U) (AS)
Red Oak (AS) (TN) (C)
Pokeweed (C)(AS)
Wine berry (AS) (C)
Norway Maple (AS)
Showy Aster

Fauna

Baltimore Oriole (U)
Black & White Warbler (nest)
Blue Jay
Catbird(C)
Chickadees
House Finch (C)
R. Eyed Vireo(R)
Robin(C)

Ruby Crowned Kinglets
Starlings
Yellow rumped Warbler
Cabbage White Butterfly
Eyed Brown Butterfly
Gray Squirrel
Woodchuck Burrows

Additional Biological Inventory Notes

(Notes from field visit on October 24th)

The following is a list of bird nests that have become visible after the leaf drop for this season. These sightings have been incorporated into the overall biological inventory for the site:

# of nests	Species	Zone	Comments
3	American Robin	2	All in trees found between 5 and 10 feet
3	American Robin	4	All three in small trees between 8 and 12 feet
1	American Robin	1	Found in Hawthorne tree at 7 feet
1	Common Yellowthroat	2	At the base of marsh vegetation
1	Baltimore Oriole	2	60 feet high in American Elm
1	Baltimore Oriole	1	70 feet in American Elm
2	Yellow Warbler	4	In Open Field Shrub
1	Yellow Warbler	3	In Open Filed Shrub
2	Catbird	1	In Wisteria tangle
1	Catbird	4	In Grey stemmed dogwood shrub
1	Song sparrow	3	In grass bottom open field
1	Black & White Warbler	5	At Base of Oak. *This nest was broken up – placement and nest materials indicate this species.
1	Great crested Flycatcher	3	Dead Tree snag. * Cavity size and shape indicate this species – it could also be Red- Bellied Woodpecker. I believe I had seen a flycatcher in this area during our spring survey – positive I.D. was not established
1	Ruby throated Hummingbird	3	At the end of a Silver Maple branch.
1	Blue-grey Gnatcatcher	2	In canopy limb of Red Maple
1	Cardinal	5	In shrub.
1	Cardinal	3	In shrub

Note: Many Small cavities in rotted dead wood most likely are used by downy woodpeckers, chickadees and titmice.

ADDITIONAL FAUNA OBSERVED DURING OCTOBER 24TH FIELD VISIT:

Birds

Pine Warbler – Zone 2	Tufted Titmouse – Zone 1
Chickadees (Small flock <6) – Zone 5	Greater Yellow legs – Zone 2 along river edge
Blue Jays – Throughout complex	House Finch (Small flock<10) – Zone 5
Canada Geese – River	Ruby crowned kinglets – throughout complex
Ring billed Gulls – River	Starlings – small to large flocks throughout complex
Herring Gulls – River	Black Vulture – Flying overhead
House Sparrows – Zone 1, 3, 2, and 4.	Turkey Vulture – Flying overhead
Rusty Blackbirds (Small flock <20) – Zone 4	Red Tailed Hawk – Flying overhead
Yellow-rumped Warblers (Small flock <5) – Zone 3 & 5	
Common Grackles – Throughout complex	
Song Sparrows – Zone 2 in marsh area	

Amphibians

1 Green frog in wetland area of Zone 3

Invertebrates

Vespid sp. Many nectaring off fruit remains of crab apple	Green stink Bug – Zone 2
PA. leatherwing beetles on golden rod florets	Two Eyed Click Beetle
Lady bug beetles throughout complex	Ant Mounds observed throughout complex
1 Morning cloak butterfly – Zone 4	Amnicola Sp. (Snail) These pond snails belong to the gilled snail group
3 Monarch Butterfly Butterflies– Most likely migrating through the property	Prosobranchs – Arnold Henderson found them in the stream on leaves. These snails can tolerate moderately polluted water.
Colorado potato Beetle	

Mammals

Grey squirrels – throughout complex	Dead Least shrew found in floodplain of Zone 2
Chipmunk – Zone 5	Deer scat found along stream bank of Zone 1
Woodchuck – Zone 4 - Borrows exist throughout complex	
Rabbits – Zone 4 & 3 – Scat is present throughout complex	

Flora in Bloom

New England Aster – Bike trail area	Calico Aster – Zone 3, 4, 2
White snakeroot – throughout complex	Showy Aster – Zone 5

Note: Inventory of streams yielded only midge & mosquito larvae, various forms of algae. Drought conditions. Water depths ↓ 1” with slow flows. We have had below average rainfall in summer and fall months year 2001. No fish species have been observed.

Appendix C
Notes on Environmental Characteristics and
Restoration Opportunities

Notes on Environmental Characteristics and Restoration Opportunities

Zone #1

- Debris needs to be removed from stream. 4 men @ 5 Hours
- Small trail creation along slope. This the most interesting feature on the northwest side.
- Remove Japanese Knotweed & Multi-Flora Rose, These are the only two species that can reasonably be attacked. Sparse native shrub cover. Introduce native shrubs and protect from herbivores.
- Plant native wildflowers along bike bath. Plant insect attracting species wherever possible. We suggest planting fruit producing shrubs along path to attract neotropical Songbirds during migration.
- Underlying rock is Red Shale
- Sub-habitat Types:
 - Shrub / Scrub – Open field along Bike path characterized by planted shrubs, trees, grasses.
 - Secondary Sere Stage Forest – Heavy invasive garlic mustard, Knotweed, Multi-Flora Rose, Norway Maple, Mature Black Oak, Honey locust and Box Elder exist.
 - Rivulet Bottomland Strip – Jewelweed, Box Elder, Reed Canary Grass common.
 - Intermediate Field openings throughout – 1 acre field herbs and grasses

Zone # 2

- Many non-native ornamental herbs in area adjacent to bike route. Disturbed soils.
- Many waste species exist in woodlands and along river (i.e. Wisteria, Multi-Flora Rose, Honeysuckle, Knotweed)
- Removal of Wisteria should be a priority. This vine engulfs all that is in its path.
- Native Shrubs should be reintroduced to forested areas. Emphasis on berry producing shrubs
- Vacant lot in front of communication tower has too many non-native ornamentals. Looks visually out of place. I suggest top soil applied after sterilizing the propagule (seed bank) and introduction of meadow species.
- Marsh is the most ecologically important area on the site. There are more native to non-native plant species per unit of biomass than any other site. The edge of the marsh and marsh proper provide good wildlife cover. Potential for providing habitat for the threatened American Bittern. Yellow Warblers, Common Yellowthroats were seen here.
- Riverside Trail Towards Edison: I did an extensive search of the three rare species to keep an eye out for but the result was negative. The rarest plant I found on the property (S3 on the state list) was Water pimpernel. This was found in the Marsh near the WCTC tower. Brush heaps in general make for good habitat. Keep in place. Removal of garbage here requires 60 man hours.

Zone # 3 and Zone #5

- 2 Sub Habitat Types
 - Open field – shrub/scrub area characterized by Mugwort, Sporadic shrubs and herbs.
 - Deciduous Secondary Sere Stage Forest: Dominant Tree – Box Elder; Secondary Dominance – Black Locust.
- Approximately 200 man-hours to remove debris from woodlands and fields. Brush piles should be directed over concrete piles. Multi-Flora Rose is destroying many trees. Especially emphasize removal of vines on Hackberry. Hackberry should be nurtured in any way possible. It is disappearing fast in the East.
- What is the sign in the hole with the high-level frequency label on it? This is just north of the middle plateau in woodlands. Refer to picture in Appendix
- Stream Trail Back up to Crowells Road: I found many Songbirds feeding on Black Cherry drupes here. The wet condition yielded Green frogs. This is an interesting area as it climbs up hillside toward Crowells Road. It is rocky with much piled concrete pieces. I believe you can establish a trail here. Again, many man-hours of labor would be needed. I like this area ecologically, and believe it would be worth the effort.
- Refer to my list in Zone 3 & 5 under Flora. Many berry producing trees and shrubs exist here.
- In the area Northeast of the Gorge, the soils appear to be more humic and less disturbed as testified by the existence of May apple. This would be a good place for a native woodland garden with shade tolerant Perennials planted. May need deer enclosure. 4 men @ 4 hours, approximate cost \$750.00
- The Gorge and the stream must be cleared of garbage in order for people to take this project serious. This is a beautiful red shale feature. No fish were seen the two days I was out. I did not find any salamanders in the corridor. More survey time would be needed for a conclusive, presence/ absence of these two taxa.
- Gold Algae tints stream bottom.
- Field Next to Donaldson Road: I had observed most of any bird activity in this field. With a little bit of management this could be transformed from a Mugwort forest into a nice meadow complex. Bluebird boxes could be established and maintained. Meadow seed mixes broadcast where you remove Mugwort. This would need considerable maintenance from a volunteer base. Bat boxes can be placed along ecotone areas next to field. Screech Owl boxes can be also placed along edges. Berry producing shrubs would do nicely with in the interior of the meadow. Remove Multi-Flora Rose wherever possible.

Note: All man hours and expenses are based on my past experience with the Great Swamp Watersheds Ecological Restoration Area where I am the project coordinator.

Appendix D
Responses to Questions of the
Environmental Commission

Responses to Questions of the Environmental Commission

General Wildlife

What can be done to attract birds? Are field areas suitable for bluebird/tree swallow houses? Would an osprey platform get them to nest? Is there any chance of cliff swallows using The Meadows for insect catching or nesting?

As discussed elsewhere in this report, there are numerous ways to attract birds, including specific planting of food sources, providing cover and/or habitat, etc. The field areas would be suitable for bluebird and/or tree swallow houses. If the environment in The Meadows provides suitable habitat and a food source for cliff swallows, then it is possible that they will discover the site.

Northwest Corner

How healthy are the springs and streams?

Red Backed Salamanders were found along stream under logs. Stream did not have any observable macro invertebrates. No T & E's found in adult forms. Consider a baseline survey to produce a biological index, which may give a better clue to the health of the streams. Vegetation around stream are common species indicative of a healthy rivulet. No fish observed. Depth under 1 inch (slow trickle, cobble bottom).

What restoration/preservation steps are recommended for the stream and municipal lots above the bikeway?

This area should be planted with native species. Control of invasive should be emphasized here. Bluebird boxes and bat boxes a good idea here.

How can we work around the supposedly temporary piles of asphalt, gravel, and dirt so that the stream has a proper buffer? What are DEP requirements or recommendations for stream buffer, silt fence, etc.? Should we try to put a path around the piles on the west (stream) side, up the middle, or farther along the bikeway (by removing rails from one section of fence)?

The temporary piles could be surrounded with hay bales, or a silt fence, and visually screened from view with a solid stockade type fence. Environmental standards in NJDEP's stream encroachment rules (NJAC 7:13-3.2) require that "Trees, shrubs, grasses, and other existing vegetation located within 25 feet of the top of the channel bank ... shall not be disturbed ..."

Entry to Trail to River

What trail locations are best?

One of the best places to put educational information is by the existing entry and along the bikeway area. Also, the blue flagged area is a good place to start trail for the following reasons:

- Easy access from bike trail
- Follows an already established route
- Minimal need to clear brush
- Relatively easy slope for walking

What species are the two tall reeds/grasses here?

Phragmites and Reed Canary Grass

Is there some way to have a more all-weather trail (eg raising with dirt, chips, or crushed stone)?

Wood chips are the best way to line trail, easy to apply, and may be donated by local tree service. Their disadvantage is that they deteriorate easily and need constant maintenance. Stone or gravel is more expensive, but relatively permanent. Also may need permit.

Are thorny rose tangles an exotic invasive to be eradicated or a native to be replanted?

The tangles are mostly multi-flora rose, an invasive, with some patches of greenbriar, a native. These plants block the path in many areas. They should be cleared wherever possible, as no one likes to walk into these thorny plants. Approximate 240 man-hours to remove (1 man @ 6 weeks)!

Should we cart away concrete debris or cover with dirt or brush (creating habitat for wrens)? Or make them educational with signs about habitat? Should part of the Meadows be made "out of bounds" for safety reasons?

Concrete piles should be covered with pruned invasive materials to create sub-habitat types for wildlife. Trails should be directed away from major dump areas for public safety.

Spur Trail

Are there any special species to be found or expected in the successional field habitat off the spur trail? What are the chances for bobolink?

Almost any neotropical songbird can utilize this area (middle plateau open fields) during spring and fall migration. It is too disturbed for nesting neotropical species (although rare sightings have been observed). Yellow warbler and common yellowthroat have been observed to nest here (my own observation). Small (under 20 acres) mixed woodlands surrounded by development are very important habitats because they act as stop over feeding stations for

birds in during migration. Fields are too small for Bobolinks. They need areas greater than 40 acres. I will address this further when I discuss zone #4. Two Baltimore Oriole nests found in tall elms during my visits in June.

Comment: I believe a loop trail would be a nice feature to travel throughout the property. Directing this loop through meadow and forested areas would serve as an educational tool for teachers in the future who could (in a half-hour) show students two habitat types quickly. When clearing a trail, remove invasives and plant natively. Make a point for public education of what was done.

Wisteria Tangle and Slope to Lower Plateau

What should be done about invasive wisteria? Does slope need erosion control?

Wisteria should be removed as previously suggested, possibly with a systemic herbicide. The area of greatest disturbance exists between Zones #2 and #3. I would make this a high priority on the list of management activities.

Placement of a "Council Circle" in the clearing here is a good idea. Cleanup, maintenance, native planting and invasive plant removal will all be key ingredients to success. Keep the orchard trees intact as a historical perspective as a property. Removal of Multi-Flora Rose (25 man hours) and Wisteria (10 hours). Plant more native shrubs (i.e. Dogwoods, Chokecherry). Clear Mugwort on at least 300 square foot area of meadow and plant native wild flowers. The lack of biodiversity in this area should be nurtured with a native mix of wildflowers, grass and shrubs. Small, controlled areas of invasives can remain strictly for educational reasons only.

What is recommended for restoring tidal marsh? What is the species of vegetation?

I would suggest clearing some trees along the trail from middle plateau to the lower plateau to offer a better view of the marsh and the river. There exists enough ground cover and trees to hold the soil together here. The marsh is an exceptional feature of the property. Try to establish a more diverse area of wetlands species here. Always be vigilant as to the degree of Purple Loosestrife infiltration. Consider using biological controls in the future (such as Gallirucella beetles). Consider controlling phragmites with herbicides. Phragmites has a mixed history in respect to its ecological value. My opinion is to control it to some degree, as there is too much on this site. I recommend planting Marsh Elder in this area. I have seen less and less of this species throughout the state. Wax Myrtle would be a great buffer species along ecotone (edge between two habitat types).

Would erecting an osprey nesting platform somewhere be likely to succeed?

Although it would take some time to establish a nesting pair of Ospreys, the effort would be worth it in terms of an attraction to the site once a pair has been established.

Area Nearing Riverside

How to keep path clear of rose tangle, plus burdock?

Weed-wackers, hand-clippers, shovels, pickaxes, weed killer and many volunteer man-hours.

What are young thorn trees at right of the trail by the marsh edge?

Honey Locust trees.

Should log seats be placed in clearing under trees?

Rustic benches are always a nice amenity. If needed, clear a section of trees to enhance view. Existing Rubs and Blowouts are always easiest on volunteers.

Should limbs be cut so as to keep the old route, or find a new route turning left here on higher ground before dropping to the river?

Aesthetically the existing trail is fine. Trees and limbs can easily be chain-sawed if in the way. Compaction by foot travel is a good way to achieve permanency to a trail. Wood chips are good to use at the beginning of a trail as they are more inviting to visitors. Also, they are easy to establish and maintain. As stated above, the existing trailhead at the end of South 5th Street is the best place to start the trail. Make this your information center (Signs, placards, brochures, etc.) May be a parking issue here.

There are Black Locust trees near marsh. Maintain this native species here. A nice feature at this point would be a simple platform with a bird blind, equipped with viewing holes to observe the marsh. A simple log seat would be second best. The trail direction from middle plateau to the lower plateau should be designed where the marsh is easily viewed on your right.

The lower route should be established where the view of the river is observable in as many places as practical. Clearing and compacting of soil is most likely the only way to maintain a clear trail here. In the future, you may be able to afford other materials that are more aesthetically pleasing.

Should there be some crossing (bridge or boardwalk) from Donaldson Park? Is a crossing advisable? If so, where might it run and what construction would be least damaging? Has there been good experience with boardwalks of recycled plastic boards that float up on steel posts in floods?

Boardwalks are expensive and may require state permits. In the wettest areas you could cut logs the width of the path and use halves to lie across wettest area. I call these poor man boardwalks. Ecologically speaking, the marsh area is the most interesting location on the property. It has three sub-habitat types within view of a potential boardwalk, hence the best opportunity for wildlife viewing. Plastic boards have worked well throughout the state. The Hackensack Meadowlands is a good example. The limiting factor is that plastic wood is very expensive.

How can trash be removed from low riverside land?

The river's edge is terribly polluted with human garbage. Approx. 120 man-hours of trash removal lie ahead of you. Renting a boat would be helpful. Making a big deal of this aspect might be helpful to gain publicity and potentially attract funding to the cleanup project.

What is recommended for eradication of bush honeysuckle and rose and for restoration of native species?

As above, weed-wackers, hand-clippers, shovels, pickaxes, weed killer and many volunteer man-hours. Approximately 150 man-hours to remove invasives from riverside.

Seasonal Stream/Wetland

Would you call this a seasonal stream corridor? Might it support salamanders, frogs, or other wetland species?

My observation of the habitat structure, between E-F, has been discouraging. Heavily invaded cultural pollution has played negatively in terms of biodiversity. The only amphibians I observed in any area on site have been Green frogs in the stream/wetland complex near the Edison line.

How can the trail run in this wet area? Would we provide something to step on, like more stepping stones, pallets, or true raised boardwalk? Or should the trail shift uphill?

Boardwalks are expensive and require permits. In the wettest areas you could use poor man boardwalks. Keep the trail near the river as long as can be maintained to yield good wildlife viewing.

Southeast Corner

Should brush heaps stay (as habitat for wrens, etc.)?

The existing brush piles should stay and be maintained with prunings from trail clearing, invasive removal, etc. Will make good cover for birds.

Stream Corridor Trail Back up to Crowells Road

Can a trail be made here? Is there a potential trail route in the woods up to Crowells Road?

Yes.

What trail route can give views of the stream, with its miniature canyon at top and slower meander below? What trail route up to Donaldson Street is feasible?

Could a trail start up on the west and cross to join the diagonal trail?

Can a new trail be cut up the west side and onto the high plateau of the landfill near the stream?

We have proposed a trail route on the eastern side of the site as shown on Enclosure 1.

Final Note and My Strongest Suggestions

I believe that the best thing you can do is to create a web site with a lists of your plans and goals for this project. Take and post up present conditions in pictorial form. List your plans to create a trail system and create wildlife viewing platforms. Show pictures of present flora and fauna and show people a map that highlights the best places one might begin to look for these creatures. Invite people to get involved. Form a committee just for this project. Describe behaviors of animals that are posted on the web site. Give interesting factoids about the native and non-native plants on the site. Describe the history of the property on the site. Post up pictures of your volunteers performing basic tasks on the site. Give contact numbers so others can get involved. Give links to other websites i.e. www.greatswamp.org, wildflower nurseries, Environmental Commission members, etc.

The Web site would be the catapult and fulcrum for success with any potential volunteer base.

Appendix E
Natural Heritage Database Information

Appendix F
Environmental Commission Trail Notes
and Wildlife Sightings

Appendix G

Additional Bird Sightings

Appendix H
Latin Names of Species Sighted

Latin Names of Species Sighted

Ailanthus *ailanthus altissima*
American Elm *ulmus americana*
Apple *prunus*
Baltimore Oriole
Bicknell's Crane bill (*Geranium beckenelli*)
Bindweed
Black Cherry *prunus serotina*
Black Locust *robinia pseudoacacia*
Back Eyed Susan *rubeckia seroontina*
Black Oak *quercus nigra*
Blue Jay *cyanocitta cristata*
Boneset *eupatorium perfoliatum*
Box Elder *acer negundo*
Bumble Bee *bombus sp.*
Burdock *arctium mimes*
Cabbage White Butterfly *pieris rapae*
Canada Goose *branta canadensis*
Canada Goldenrod
Canada Thistle *cercium arvense*
Cardinal *cardinalis cardinalis*
Carex Flava
Carex Stipata
Carpenter Bee
Catalpa
Catbird *dumatella carolinensis*
Cattail Lance Leaved *typha lanceslata*
Centipede
Chicory *chichorium intybus*
Cinquefoil
Common Yellowthroat *geothypic trichos*
Correl Fungus
Crown Vetch *coronilla varia*
Curly Dock *rumix crispus*
Daisy Fleabane *erigeron annus*
Deptford Pink *ddianthus armeria*
Dogbane *apocynum sp.*
Eastern White Pine *pinus strobus*
Eastern Tail Blue Butterfly *evetes comyntas*
Elderberry *sambucus canadensis*
English Ivy
English Plantain *plantago lanceolata*
Evening Primrose *oenothera biemis*
Eyed Brown Butterfly *lethe eurydice*
Feverfew *chrysanthemum parthenium*
Garlic Mustard *allaria officinalis*
Goldfinch *careluelis tristis*
Grackle *quiscalus quiscula*
Gray Squirrel *sciurus carolinensis*
Green Ash *fraxus pilanceolata*
Green Frog
High Bush Blackberry *rubus allegheniensis*
Hackberry *celtis occidentalis*
Heal All *prunella vulgaris*
Hedge Bindweed *convolvulus sepium*
Honey Locust *gleditsia triacanthus*
Hop Clover *triphylum agrium*
Horse Nettle *solanum carolinense*
House Finch *carpodacus mexicanus*
Japanese Honeysuckle *lonicera japonica*
Japanese Knotweed *polygunum cuspidatum*
Jewelweed *impatiens capensis*
Joe Pye Weed *eupatorium sp.*
Lance leaved Coreopsis *coreopsis lanceolata*
Least Skipper *ancyluxypha numitor*
Lupine *lupinus perennis*
Mayapple *podophyllum pectatum*
Mimosa *albisia julibrissin*
Moneywort *lysimachia nummularia*
Moth mullein *verbascum blattaria*
Mourning Dove *zenaida macroura*
Mugwort *artemesia vulgaris*
Mulberry *morus sp.*
Mullein *verbascum thapus*
Multi-Flora Rose *rosa multiflora*
Northern Catalpa *catalpa speciosa*
Norway Maple *acer platanoides*
Orchard Grass *dactylis glomerata*
Phragmites *phragmites sp.*
Pin Cherry *prunus pennsylvanica*
Poison Ivy *rhus radicans*
Pokeweed *phytolacca americana*
Prickly Lettuce *lactuca scaripla*
Queen Anne's Lace *daucus carota*
Red Cedar *juniperus virginiana*
Red Eyed Vireo *vireo olivaceus*
Raccoon *procyon lotor*
Red Backed Salamander *plethodon*
Red Chokeberry *pyrus arbutifolia*
Red Clover *trifolium pratense*
Red Oak *quercus borealis*

Red Winged Blackbird *agelaius phoeniceus*
Reed Canary Grass *phalaris arundinacea*
River Oats *avena sp.*
Robin *turdus migratoris*
Silver Maple *acer saccherinum*
Silver Spotted Skipper *epargyreus clarus*
Skunk *melphitis melphitus*
Smooth Sumac *rhus glabra*
Soft Rush *juncus effusus*
Song Sparrow *melospiza melodia*
Sooty Under Wing Butterfly
Spiked Rush *eleocharis acicularis*
Spotted Blue-Eyed Grass *sisyrinchium atlanticum*
Staghorn Sumac *rhus typhina*
Steel Blue Cricket Hunter *chlorion aerarium*
Sulphur Butterfly *phoebes sennae*
Swamp Dewberry *rubus hispidus*
Swamp Lousewort *pedicularis lanceolata*
Swamp Rose Mallow *hibiscus palustris*
Sweat Bee
Sweet pepperbush *clethra alnifolia*
Sweet Vernal Grass *anthoxanthum odoratum*

Tansy Mustard
Tartarian Honeysuckle
Trumpet Creeper *campois radicans*
Turkey Tail Mushroom
Virginia Creeper *parthenocissus quinquefolia*
Water Pimpernel *sandes pariflorus*
Weeping Willow *salix babylonica*
White Ash *fraxinusus americana*
White Avens *geum americana*
White Clover *trifolium repens*
White Snakeroot *eupatorium rugosum*
White Wood Aster *aster divaricatus*
Wild Onion *allium cernuum*
Wild Strawberry
Willow Oak *quercus plellos*
Wine berry *rubus phoenicolaseus*
Wisteria *wisteria sinensis*
Wood Sorrel *oxalis montana*
Woodchuck *marmota monax*
Yarrow *achillea millefolium*
Yellow Jacket *vespula ssp.*
Yellow Sweet Clover *melilotus officianalis*
Yellow Warbler *dendroica petechia*

Appendix I

Qualifications of Preparers

Statement of Qualifications of Preparers

Mr. Thonet holds a B.S. and M.S. degrees in Forestry from SUNY College of Environmental Science and Forestry at Syracuse and is a licensed Professional Engineer in the State of New Jersey, Massachusetts, Michigan, and West Virginia, and is a licensed Professional planner in the State of New Jersey. Mr. Thonet has twenty-eight years of experience in fourteen different states and U.S. Territories. This experience includes the preparation of environmental studies, assessments and impact statements for hundreds of land and water resources development projects and programs, including the preparation of community-wide and site-specific flood plain management maps and studies, community-wide and site-specific wetlands delineation maps and environmental planning and development suitability studies and planning for residential, commercial, industrial and recreational projects.

Mr. Thonet has prepared studies for the U.S. Army Corps of Engineers, the U.S. Department of Housing and Urban Development, The Federal Emergency Management Agency-Flood Insurance Administration, and the New Jersey Department of Environmental Protection, municipal governments, architecture-engineering firms, planning firms, banks, insurance companies and private development interests.

Blaine J. Rothauser is Thonet Associates' chief biologist and senior naturalist. Mr. Rothauser has his Bachelors degree in Biology and is a naturalist with over 15-years of experience. Mr. Rothauser has participated in over thirty biologic inventory studies of threatened and endangered species for Thonet Associates and the State Non-game Species Program. Mr. Rothauser has testified as an expert witness at public hearings and in front of planning boards in the State of New Jersey. Mr. Rothauser has been the chief biologic consultant for the Great Swamp Watershed Associations Ecological Restoration Site located in Harding Township since 1997.

Mr. Rothauser has participated in scientific research studies of Tamarian monkeys in Panama and white-footed mice in Liberty State Park, New Jersey during undergraduate internships.

Mr. Rothauser is particularly well known as an accomplished photographer of natural history. His photographs have appeared in N.J. Outdoor Magazine, Corporate reports nationwide, books, calendars, and environmental reviews. His photographic exhibits are regularly seen throughout the state. Mr. Rothauser has lectured and presented slide programs throughout the state on the ecology and biodiversity of the Great Swamp National Wildlife Refuge. Many of his programs are presented to Corporate Centers as sponsored by the Great Swamp Watershed Association to raise awareness of this invaluable asset to the community.