THE DWAAS KILL NATURE PRESERVE
2009 CONCEPT & MANAGEMENT PLAN
TOWN OF CLIFTON PARK

Prepared by:
Chazen Engineering, Land Surveying &
Landscape Architecture CO., P.C.

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ACKNOWLEDGMENTS

Developing a thoughtful and holistic plan for the Dwaas Kill Nature Preserve would not have been possible without the dedication of a few individuals who traipsed through water and mud, braved the mosquitoes and black flies, and spent long nights together. The following people contributed many hours of their personal time to the creation of this plan.

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Peter Brooks

Special Thanks

Jonesville Volunteer Fire Department
Oscar Lenss (Cover Photo)

EXECUTIVE SUMMARY

This Management Plan is the end product of nearly 20 years of work by many individuals in the Town who have worked cooperatively to help preserve one of Clifton Park's premier natural resources—the Dwaas Kill Nature Preserve. It is a complex of relatively undisturbed upland, wetland, and aquatic habitats and is considered a significant environmental and open space resource at both the local and state levels. Proper management of this valuable resource is of prime importance to the Town. For this reason, the Town has adopted a management philosophy for the Preserve which is guided by the following principles:

- Base decisions on local factors
- Use the most current scientific findings
- Adapt decisions to changing circumstances
- Use measurable objectives to direct and evaluate performance
- Recognize the interconnections among and within ecosystems
- Involve those affected by decisions

In addition to preserving the natural resources of the site, the Town would like to provide the means for the public to benefit from the Preserve in several ways. Quiet passive recreation, environmental education, and scientific research are all approved activities. However, because the site is largely undisturbed, there are no parking facilities or trails. An existing sewer easement path has served to provide some access in the Preserve. However, the Town would like to formalize a trail system within the Preserve and provide safe and adequate access parking. A Concept Plan (see page 14) has been designed which shows possible parking areas, trailhead locations and trail routes.

The creation of these plans has been a cooperative effort between the Town and interested citizens who formed a Working Group to review and refine these plans. It is their recommendation that the Town work slowly in developing the Preserve amenities and that research take place in any area within the Preserve that is to undergo construction before the plans for an area are finalized. Preservation of the natural resources, especially those labeled ecologically sensitive, takes precedence over the development of amenities.

For this reason, a critical first step is developing a catalog of information that will serve as a foundation for subsequent decision making. Continual monitoring of the Preserve will allow decision makers to "adaptively" develop or hone site specific management strategies.

Management Philosophy

Building collaborative based partnerships has proven to be one of the most effective strategies in protecting environmental resources. In order to further the initiatives set forth in this Management Plan, and given the importance of continued public participation, it is recommended that a Nature Preserve Management Committee be formed to work with the Town's Open Space and Trails Advisory Committee to oversee management strategies and plan implementation.

Management Strategies

Strategies to manage these precious resources include:

- Conduct ongoing research and monitoring of key indicators for habitat stability and health. Special attention should be given to study of the eastern brook trout.
- Build one small parking area, trailhead and trail segment as soon as possible to provide access
- Use construction methods that minimize disruption to the natural resources
- Direct research in areas that would be affected by further construction of trails. Let research guide the decisions on trail routes and access points.
- Continue to build trail segments and access points as research, funds, and demand for use allows
- Deepen established relationships with local educators to create a multi-level environmental education program
- Restore habitats of the Preserve that have been disrupted by human use
- Eradicate and prevent the spread of invasive species
- Encourage appropriate public use and enjoyment of the Preserve by providing signage, safe access parking and trailheads, interesting and educational trails. Provide handicapped accessibility on short and interesting segments of trail routes.
- Encourage public participation in research and monitoring of the Preserve's habitats.

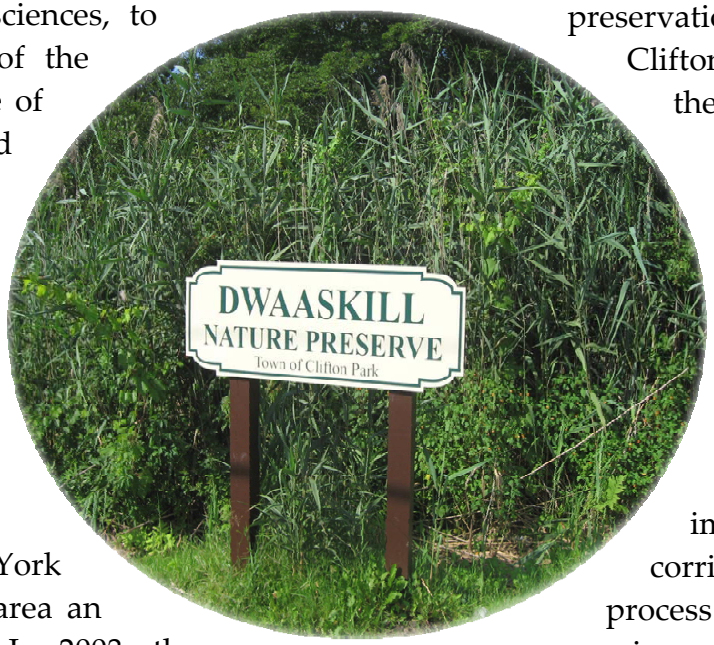
Action Plan

An Action Plan concludes the Management Plan with specific recommendations that fall into three categories: immediate, short term, and medium term actions. It will be the role of the Town and the Town's Nature Preserve Management Committee to determine the specific future actions to be taken to develop the Preserve's access and trails, to initiate research and monitoring, to restore and preserve this unique and beautiful natural resource.

INTRODUCTION

Project Background

In 1997, the Saratoga Land Conservancy, now Saratoga PLAN, commissioned Hudsonia, a not-for-profit institute specializing in research, education, and technical assistance in the environmental sciences, to conduct a biological assessment of the area that surrounds the confluence of the Dwaas Kill, Cooley Kill, and Long Kill. The report found that "the areal extent, relatively unpolluted character, extent of wetland and riparian habitats, and absence of intense human disturbance make the Dwaas Kill natural area a *de facto* refuge for many kinds of plants and animals."



In 1998, the State of New York identified the Dwaas Kill natural area an area of "statewide significance." In 2003, the Town of Clifton Park Open Space Concept Plan highlighted the Dwaas Kill site as one of the last undeveloped open spaces in eastern Clifton Park and the region.

In 2004, after being awarded $320,000 as part of a matching Federal Land and Water Conservation Fund grant, the Town successfully purchased the site for preservation purposes. In 2005, the Town of Clifton Park offically desginated the site the "Dwaas Kill Nature Preserve."

In 2006, the State of New York reiterated the ecological significance of the Preserve, stating: "Hemlock-laden ravines, a large wetland complex and relatively undisturbed riparian habitat provide a solid diversity of native flora and fauna plus important wildlife habitat and travel corridors." Today, Clifton Park is in the process of developing a series of progressive management strategies that reflect the public's desire to protect this important natural resource. This plan is the next step in that continued effort.

SITE PLANNING PROCESS

The Concept Plan and Management Plan described in this report is the end product of nearly a year of work by many individuals who worked cooperatively to help protect the Dwaas Kill Nature Preserve's natural resources, and who are committed to sharing these natural resources with their friends and neighbors.

Working Group

The Dwaas Kill Nature Preserve Working Group was comprised of local residents, representatives from the Town of Clifton Park, Trout Unlimited, local educators, and the Town's consultants (The Chazen Companies) specializing in environmental sciences, planning, and design. The members of the Working Group met regularly while developing this report, and drew upon a myriad of local, county, and state resources. In addition, the Working Group helped evaluate existing data, reports, and maps that were available from previous studies and took part in the field assessments.

Field Assessments

Field assessments were conducted on August 7, and August 21, 2008 by the Town's consultants. Observations were made with respect to habitat, possible parking and access points, educational opportunities, presence of native and invasive species, and evidence of local fauna. The results of these assessments are described in the Existing Conditions Assessment Report, October, 2008 prepared by The Chazen Companies. Observations made and information gathered on-site were subsequently used to prepare the Concept Plan (page 14) and this Management Plan.

Public Participation

Providing opportunities for Clifton Park residents to participate in the planning process was a high priority for the Working Group. The Working Group held two public workshops, one on September 25, 2008 and another on November 13, 2008. The workshops focused on identifying the Preserve's natural resources, potential trails, access points, and educational opportunities, and developing potential management strategies. The public was asked to identify their goals for the site and to discuss use of the Preserve for recreation.

Both workshops proved to be a valuable part of the planning process. Attendees discussed their ideas and concerns, and demonstrated a commitment to protecting the Dwaas Kill Nature Preserve—many pledging their time and energy to help with research and the management of the Preserve's natural resources. Appendix D is a summary of public comments as a result of the workshops.

SITE HISTORY & SETTING

A large area—approximately 500 acres—was identified as the Dwaas Kill Natural Area in the 1990's by groups recognizing the area's value. Nearly 250 acres out of those 500 acres were acquired by the Town of Clifton Park and is now designated the Dwaas Kill Nature Preserve. The site has been primarily unutilized for decades with some exceptions noted below.

Historic and Current Use

An archeological study of the site has not been conducted to date so little is know about ancient history of the site. More recently, portions of the site have been utilized for mining of molding sand, a common activity that occurred in the Town of Clifton Park prior to the 20th century. This activity no longer occurs.

Individuals have been using the lands for years for cross-country skiing, hiking and walking. The streams have historically been used by fishing enthusiasts, both deep within the site, and also at the edges. Both the New York State Department of Environmental Conservation (NYSDEC) and the County of Saratoga have conducted fish stocking programs at the site. All these activities are consistent with the activities allowed in the Town's nature preserves.

Two activities occur in the Preserve that are not in accord with allowed activities. A small portion of the site has been and continues to be used for recreational motorbike and all terrain vehicle (ATV) activities—primarily the northeast corner adjacent to the railroad tracks. Motor bikes and ATVs have also been known to traverse the sewer line easement paths. In addition, the site shows evidence of hunting activities.

While there are no buildings on the site, Saratoga County Sewer District maintains a utility easement for a sewer line through the Preserve. The sewer district inspects and maintains the sewer line as needed.

Adjacent Land Uses

Immediately to the north, the Canadian Pacific Railway owns a strip of land that is actively used for freight rail transportation. North of the rail line there is a large tract of undeveloped wooded land that is currently zoned for commercial use. North of that is Van Patten Drive which provides access to a large residential neighborhood.

To the east is Pierce Road—a two lane Town road which is lightly traveled with moderate traffic speeds. Several businesses and residences are located along Pierce Road which is in the Light Industrial zoning district. Further to the east is the Northway transportation corridor.

Kinns Road, to the south, is a two lane County road. It is fairly heavily traveled with higher traffic speeds than Pierce Road. Individual residences and neighborhoods border Kinns Road. The Clifton Park Water Authority maintains a well and pumping station on an adjacent property along Kinns Road—making the Preserve a part of the groundwater recharge area for the public drinking water supply. Further west on Kinns Road is Kinns Park, which is a County park. A multi-use path borders Kinns Road from Kinns Park to Carlton Road.

To the west is Carlton Road, a two lane Town road. Carlton Road becomes one lane as it passes under the narrow railroad bridge and provides access to the Van Pattern Drive neighborhoods.

See Land Use Map on next page for map of adjacent land uses.

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Dwaas Kill Nature Preserve

Land Use Map

Town of Clifton Park
Saratoga County, New York

Created by:	PWC
Date:	07/09/2008
Scale:	1 inch equals 250 feet
Project:	9081.4.00
Figure:	NA

RESOURCES & FEATURES OF THE PRESERVE

The Dwaas Kill Nature Preserve includes a heterogeneous matrix of upland, wetland, and aquatic habitats in a relatively undisturbed state that is free of structures and improved roads within the interior of the Preserve. Because these varied habitats exist together in relative isolation from human disturbance, they continue to support a rich and diverse vegetative community. The following is a brief description of the Dwaas Kill Nature Preserve's existing resources. This information was obtained from both the 1997 Hudsonia report (Appendix E) and the 2008 Existing Conditions Assessment Report.

> *"The areal extent, relatively unpolluted character, extent of wetland and riparian habitats, and absence of intense human disturbance make the Dwaas Kill natural area a de facto refuge for many kinds of plants and animals."*
>
> Hudsonia 1997

Geology & Soils

Underlying the Dwaas Kill Nature Preserve is a mix of shale, argillite, and siltstone. Clayey, silty and mucky soils can be found in around the wetland and central portions of the preserve, while the uplands are comprised of sandy soils. According to the 1997 Hudsonia report, "Fill material along the sewer road may have been excavated from borrow pits along the road or imported from offsite."

Streams and Wetlands

Streams

The streams of the Dwaas Kill watershed make up a large hydrological system and interlace a complex series of habitats, draining approximately 10,430 acres of area before they confluence with one another within the boundary of the Preserve. These streams are the Cooley Kill, the Dwaas Kill and the Long Kill. Under New York State Public Health Law, all waters within the state are given a classification by the DEC which is based on the best usage of the waters. The classifications range from AA to D. Class A and AA waters are suitable for drinking, while class D waters are suitable for secondary contact recreation (i.e. boating). Some streams are given a sub-classification of (t) or (ts), indicating whether the waters can support trout or trout spawning, respectively. The Cooley Kill, Long Kill, and Dwaas Kill, along with their respective tributaries, are designated either class C or C(t) – a designation for water that is suitable for both fish propagation *and* secondary contact.

Wetlands

The Preserve's wetlands and water resources are some of the most defining and ecologically significant features of

the site. A majority of the Preserve consists of forested, shrub-scrub or meadow wetlands. This vast complex of cattail marshes, wet herbaceous meadows, floodplains, and riparian (stream side) areas play an essential role in maintaining the health of the Preserve's greater ecological network. These wetlands help reduce flood damage by acting as natural "sponges" or impoundments, storing water temporally and then slowly releasing it.

Extensive intact floodplains maintain the structural integrity and productivity of aquatic systems in varied ways. One example is their capacity to filter pollutants and sediment from surface water runoff. Wetlands also serve as an interface between surface and groundwater, helping to recharge aquifers. Finally, they can act as "carbon sinks," promote biodiversity, and fishery health.

Plant Communities

Thirteen vegetative plant communities have been identified within the Dwaas Kill Nature Preserve: successional hardwoods, white pine-hardwood, hemlock-hardwood, open land, floodplain, forest, swamp forest, shrub swamp, mixed/woodland swamp, cattail marsh, wet herbaceous meadow, vegetated sluggish stream segments/floodplain pools, and purple loosestrife/phragmites marsh (considered invasive).

Working together, these diverse plant communities enhance the ecological functions and landscape conditions of the site. They help maintain water quality, provide habitat for aquatic and terrestrial wildlife, stabilize soils, and filter stormwater runoff. For recreational purposes, they offer an aesthetically pleasing mix of experiences for all the senses.

Wildlife

The Hudsonia report claims that the Preserve is not a "highly unusual area biologically," but its abundance of wildlife (mammals, birds, reptiles, amphibians, and insects) make it regionally significant. It's possible that future research will discover species that are threatened, endangered or rare.

The site is ideal for river otter, mink and bat populations. Birds such as a great blue heron, American bittern, American black and wood ducks, northern harrier, red-shouldered hawk, American woodcock, barred owl, eastern screech-owl, eastern bluebird, sedge wren and marsh wren, ruffed grouse, pileated woodpecker, swamp sparrow, and a host of "noeotropical" migrant songbirds (e.g., great crested flycatcher, gray catbird, yellow warbler, scarlet tangier, northern oriole) are all likely to nest or breed in the Preserve. Reptiles and amphibians such as the wood turtle, spotted turtle, and spotted salamander are likely present. Fish such as the fathead

minnow, blacknose dace, creek chub, white suker, redfin pickerel, brook trout, pumpkinseed, and tessellated darter have been identified at site. Finally, the Dwaas Kill Nature Preserve is home to many species of invertebrates and macro-invertebrates.

Mammals such as deer, rabbit, squirrels and beaver are known to live in the Preserve. Many other mammals are likely to live or hunt there as well. Further research is needed to determine which species live in or frequent the area and their numbers.

Ecological Communities

The absence of human disturbance has left much of the ecological functionality of the Preserve intact. To date, six (6) distinct ecological areas have been identified: seeps at toe slopes, upland forests, upland meadows, forested and shrub/scrub wetlands, wet meadows, and aquatic and floodplains.

Habitat & Ecological Corridors

A habitat is the arrangement of food, water, space and cover that is required by a species individual or population to survive. Streams, waterways, wetlands, and riparian habitats are linear by nature. These linear corridors are complex ecosystems that include the land, plants, animals, and network streams within them. While the Dwaas Kill Nature Preserve encompasses 250 acres of land, the habitat within the Preserve is connected to, and part of, an even greater area by these linear corridors—allowing animals to travel and migrate, plants to propagate, and genetic interchange between regions.

Landscape Conditions

The 2008 field assessments verified that landscape conditions in the Preserve have not changed significantly since the 1997 Hudsonia study. With a few noted exceptions, most habitats remain free of recent human activity and are subject only to natural processes of disturbance and succession.

Environmental Issues, Concerns and Threats

Impacts of Regional Development

The Dwaas Kill Nature Preserve is part of a large watershed—in fact the largest in Clifton Park. Any building or construction within that watershed has some affect. The incremental conversion of natural areas in the Preserve's watershed to other, manmade uses reduces and isolates those species that live within the Preserve. In addition, pollutants conveyed through stormwater accumulate in the Preserve's water resources (i.e., streams and wetlands), degrading water quality and impacting aquatic health. Roads surrounding the Preserve on three sides add to the pollutants entering the

waterways as untreated surface runoff, in many locations, enters the streams and wetlands.

Additional impacts to the Preserve include: hydrologic modifications such as diversions and culverts which effects species movement; loss of riparian habitat which results in changes in water chemistry and temperature; and, removal of certain stream debris, such as large woody debris, and alterations to the streambed and wetlands, which can destroy habitat structures and promote erosion and widening of the stream channel.

For these reasons it is recommended that the Town develop either a Dwaas Kill or a town-wide watershed management plan. See Appendix B: Land Stewardship of the Greater Dwaas Kill Watershed, for more information on this topic.

Invasive Species

Invasive plants are introduced species not native to an area that can thrive in areas beyond their natural range of dispersal. These plants are characteristically adaptable, aggressive, and have a high reproductive capacity. Their vigor combined with a lack of natural enemies often leads to outbreak populations replacing native plants and thereby altering the ecosystem. Once the conditions of an area are changed, new species including pathogens may be able to survive where they previously could not.

Three species of invasive plants have been identified in the Preserve and management of these species is discussed at length later in the report. These species have become established in the Preserve by natural and human activity. As trails are developed and human use increases within the Preserve, invasive species will have greater access to the interior of the site.

DEMAND FOR USES AND ACTIVITIES AT THE PRESERVE

Nature Experience

The natural settings and bucolic vistas found throughout the Dwaas Kill Nature Preserve have a special ambiance that is spiritually engaging and uplifting. These natural areas have both personal and profound intrinsic value. Forests, wetlands, fields, and streams offer a place for personal explorations in a natural environment. In an increasingly connected and faster-paced world, natural areas serve as timeless reminders of who we are and our connection to the larger natural world.

"Natural areas such as fields or woods or a pond, or marsh that are not too far away often play a special role for people. Even if they are not used frequently, their potential availability makes an important contribution. Such areas are often appreciated for their "thereness."

The knowledge that one could enjoy such an area is in itself a source of satisfaction. By counting only the number of visitors or interviewing only those in a park, one can easily loose sight of the fact that for many individuals the knowledge of the park's existence is a source of pride and satisfaction."

-Rachel Kaplan and Stephen Kaplan
The Experience of Nature

Recreation

It has been recognized that the Dwaas Kill Nature Preserve has the potential to be part of a larger town-wide and county wide system of trails providing many public benefits.

The 2003 Town of Clifton Park Open Space Plan calls for "a town-wide path system [that] will help knot the community together by allowing people a safe, alternative transportation system to reach activity centers as well as quieter nature preserves." The Town's Open Space plan also called for the creation of a "stream corridor greenway" along the Dwaas Kill, supporting such recreational activities as fishing and hiking.

Similarly, the 2006 Green Infrastructure Plan for Saratoga County envisions a system of "interconnected" greenways, parks and trails that "provides a balanced diversity of appropriate trial experiences and uses and ensures compatibility with resource conservation goals." One of the conceptual trails highlighted in the plan is the Alplaus Kill Greenway. The proposed greenway would link the Alplaus Kill, a tributary of the Mohawk River, with the Dwaas Kill Nature Preserve and the Galway/Charlton wetland complex located in the west, southwest portion of Saratoga County, on up to the southern Adirondacks.

Throughout the planning process for the Preserve, Clifton Park residents have helped further identify those recreational activities that were well-suited for the Dwaas Kill Nature Preserve. Recognizing that both the County's and the Town's plans seek to develop recreational opportunities in and around the Preserve that are compatible with resource

conservation goals, the public workshop participants and Working Group members agreed that certain uses would have the least impact on the Preserve's ecological resources, and were the most conducive to user tranquility. The following recreational uses are most appropriate for the Preserve:

- Walking and Hiking
- Trail running
- Snowshoeing
- Cross-country skiing
- Bird watching
- Fishing
- Nature enjoyment

While it is not viewed as a compatible use within the Preserve, bike riding *to* the Preserve is strongly encouraged. Bike racks should be provided at trailhead access points with appropriate signage prohibiting bike use. Providing opportunities to bike to the Preserve would be in-keeping with the multi-use trail development along Kinns Road that the Town is currently undertaking and the greenway vision for the Dwaas Kill and its tributaries as noted above.

Environmental Education

Throughout the planning process, residents and members of the educational community have expressed interest in the many opportunities for student education and participation. Good land stewardship is a societal value that is passed from one generation to the next. Functional ecosystems such as the Dwaas Kill Nature Preserve serve as "living" or "outdoor" classrooms for all members of the community.

Monitoring and Research

The ultimate success or failure of any management strategy is inevitably measured by the ecological integrity of the resource being protected. Immediate research is need in the Preserve to establish a baseline of information on a variety of environmental and ecological factors. On-going monitoring and research will indicate the success or failure of management strategies in the Preserve. Because research is costly, public participation with monitoring and assessment could help offset this cost.

Public Utilities

As previously noted, although there are no buildings on the site, Saratoga County Sewer District maintains a utility easement for a sewer line through the Dwaas Kill Nature Preserve. The sewer district inspects and maintains the sewer line as needed. This activity must be an ongoing consideration in the management and planning of amenities and activities at the Preserve.

VISION AND GOALS

The vision statement for the Dwaas Kill Nature Preserve evolved out of the public planning process and reflects the community's values and intentions for the Preserve. The goals were also established through this process and will continue to be used to steer the Town in its future management and use of the Preserve.

Vision Statement

"To provide a place for the current and future generations to experience the variety of habitats, diverse populations of animals, plants and various other natural wonders of the area.

To maintain a wild place where the community can savor the vitality of nature and be transported in body, mind and spirit–a place to listen, smell, hear and use all of one's senses.

To keep as a place to promote and enhance the preservation of a vital natural ecosystem where little human alteration to the landscape and environment has occurred–allowing for educational and recreational opportunities within a natural setting."

Goals for the Preserve

- To conserve, enhance, and restore the Dwaas Kill Nature Preserve as a mosaic of habitats to optimize its biodiversity, with special consideration for the toe of slope seepage and its respective plant and wildlife communities, and acknowledging its significance throughout the greater Dwaas Kill watershed and respective habitat corridors.
- To maintain the health and integrity of native species within the Dwaas Kill Nature Preserve and avoid/prevent the spread of invasive species in the Preserve.
- To utilize and promote the Dwaas Kill Nature Preserve as a place for environmental education and research.
- To maintain the Dwaas Kill Nature Preserve as a place for reflection and quiet recreation.
- To utilize the Dwaas Kill Nature Preserve as a place for monitoring the stream health and thereby, the community's commitment to water quality protection and stormwater management under the Municipal Separate Storm Sewer System (MS4).

CONCEPT PLAN

Overview

A Concept Plan has been developed for the Preserve which identifies possible parking areas and trailheads, trail routes, and areas of interest for environmental education and research. It consists of several features and key components which are described below. A rendering of the plan follows this section. Concept vignettes have been developed that show close-ups, in plan view, how an area might be developed. These vignettes can be found in Appendix A.

Habitat Identification

Habitats within the Preserve are color coded on the Concept Plan. The exact boundaries of these areas will need to be determined before design and construction of trails or other amenities.

Parking and Access

The plan indicates possible parking locations providing pedestrian access to the Preserve. Parking lots would be small (6 to 8 vehicles) with possible bus parking in one location. Each area will need to be evaluated to determine the full impacts of construction. Regardless of location or design, bike racks should be provided at each location to encourage biking to the Preserve.

Trailheads

The proposed trailheads would serve as a place to exhibit a map of the Preserve, explain rules of use, and indicate the environmental education opportunities to be found along the trails. Bike racks and signage at trailheads would encourage bikers to leave their bikes outside the Preserve.

Trail Routes, Overlooks, and Gathering Places

The proposed trail routes combine three types of trails: compacted stone dust or a type of stabilized surface that is universally accessible, primitive foot trails of native material, and boardwalks where wet conditions dominate. Benches, overlooks and gathering places will be placed at appropriate locations along the trails.

Much more information will need to be collected before the exact location of trails can be designed. Some of this information includes topography, wetland delineation, and high water levels, locations of legacy trees and natural clearings.

Restoration

The plan designates two areas in the Preserve for restoration. One is in the northeast corner near the railroad tracks. Human activity—most recently ATV activity—in the area has created an eroded slope on sandy soils. The plan recommends stabilizing the eroded

slopes and restoring the area to a natural habitat. Once restored, and with the inclusion of trails, signage and possibly a pavilion, it could be a destination and gathering area for environmental education. The area could be a pleasant place to spend an hour because of the raised elevation, sunny southern exposure and mixture of vegetative communities.

The other disturbed area for restoration is in the southeast corner of the Preserve at the corner of Pierce and Kinns Road. Human activity has eliminated large sections of the riparian buffer around the Dwaas Kill, allowing salts and pollution from the road to enter the stream. Restoring appropriate vegetation in this area would protect the stream from pollution and from further human disturbance.

Observation Platform

The wet meadow is an area of outstanding visual beauty and educational interest. The concept plan illustrates a universally accessible route to an overlook and observation platform at the edge of the wet meadow.

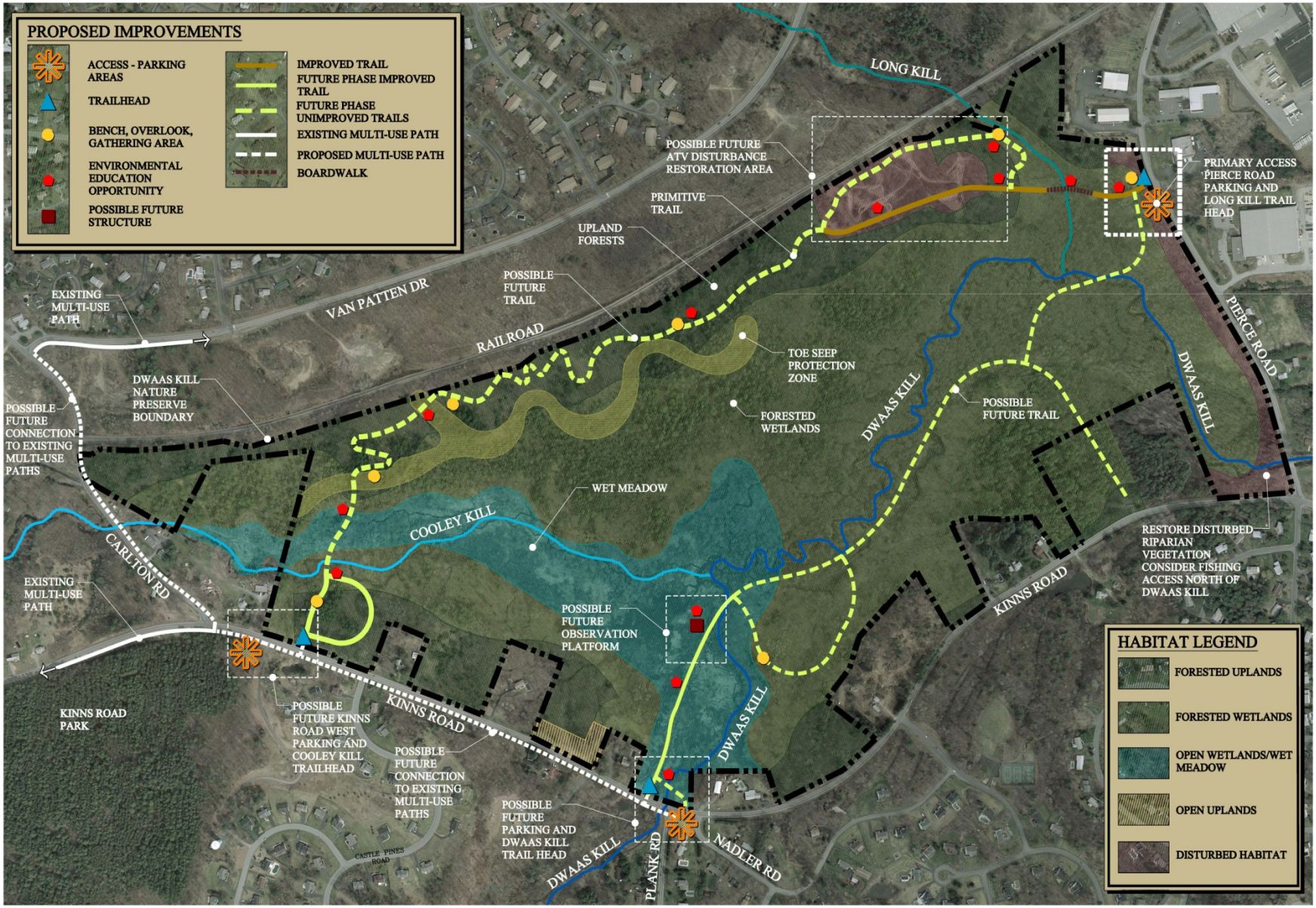
Environmental Education

There are many opportunities for environmental education throughout the Preserve. Locations are indicated on the plan where some of these opportunities are most likely to exist. It would be well to work with researchers and environmental educators to determine the best locations for interpretive signage and possible programs.

Multi-Use Path

The plan shows two proposed extensions of the existing multi-use path which currently terminates at Carlton Road. The purpose of these extensions would be to encourage and provide a safe route for people from surrounding areas to bike or walk to the Preserve.

One extension would connect the path from Carlton Road to Plank Road. Another desirable connection would be a multi-use path along Carlton Road that would connect the existing Van Patten Drive path to the Kinns Road path. The railroad bridge underpass on Carlton Road has long been considered an obstruction to this connection. However, it's possible that a raised pedestrian sidewalk under the railroad bridge and alongside the vehicular travel lane could be explored as a viable solution.



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0 50' 200' 400'
ORIGINAL SCALE

NORTH

DWAAS KILL NATURE PRESERVE
CONCEPT PLAN

PLAN PREPARED FOR:
TOWN OF CLIFTON PARK
ONE TOWN HALL PLAZA
CLIFTON PARK, NY 12065
Tel: (518) 371-6054
FEBRUARY 13, 2009
TCC PROJECT #: 90814.00

PLANNING CONCEPTS FOR FUTURE DEVELOPMENT OF AMENITIES

This section describes the planning concepts used to create the Concept Plan and those that will be used to guide future development of the amenities within the Preserve. After careful discussion and study, it was the recommendation of the Working Group that minimal construction be planned for the Preserve. And that a minimal amount of research is conducted before any construction projects begin.

Public Access and Signage

Public access is recommended as the first amenity to be built in the Preserve. This section discusses how to provide adequate public access without compromising the delicate natural resources that define the site. Both the present and future ecological health of the Preserve depends on how and where people access and use it.

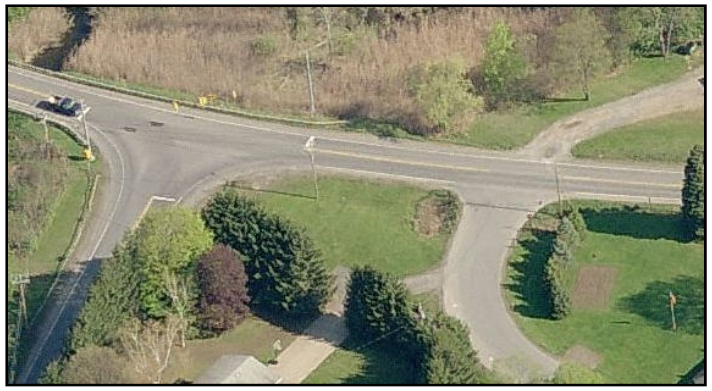
Parking & Trailheads

Parking for the Preserve is limited by design and necessity. While there are only a few locations that can actually offer safe parking and access, such limitations are viewed as an asset. By providing a small number of parking spaces at select locations, a balance between preservation and public enjoyment is better met. Proposed trailhead locations correspond with parking amenities.

Pierce Road Parking & Trailhead: This already established location is adjacent to the lightly traveled Pierce Road. This makes it a desirable location for a main access to the Preserve and a good drop-off and pick-up point for visiting groups. The vignette below shows one possible parking area and trailhead configuration. Amenities include signage, benches, bike rack, an off road pull through parking area for eight to ten cars, and an outdoor classroom. As a drop-off point for groups, this location would also need to provide for large vehicle access. This parking area will most likely be developed first as the primary access point to the Preserve.

Above: Proposed Pierce Road Parking & Trailhead

Kinns & Plank Road Parking & Trailhead: This location was identified as a possible parking area. It may be possible to locate a small parking area on the Town owned parcel on the south side of Kinns Road between Plank and Nadler Roads. Visitors could access the Preserve via a proposed trailhead located to the west of the Dwaas Kill. Improvements to the intersection would be necessary to increase pedestrian safety at this busy intersection. The final design of the trailhead and access point at this location must either safely navigate the roadside guard rail or possibly enter the site through the wetlands via a boardwalk. The proposed extension of the multi-use path along Kinns Road could provide bicycle and pedestrian access to this trailhead. See Appendix A for two concept vignettes of possible parking and trailhead.



Above: Possible Kinns & Plank Road Parking & Trailhead location (source: http://maps.live.com/)

Western Kinns Road Trailhead: This location was also identified as a possible parking area. This Town owned parcel is near the access road to the Town's water tower on the southern side of Kinns Road. From this location, visitors could cross Kinns Road and enter the Preserve at a new proposed trailhead. This trail would be in close proximity to a small tributary to the Cooley Kill to the east and the Cooley Kill itself to the north. Amenities could include parking for four or five vehicles, bike rack, signage, and benches. A desirable feature of this location is it's proximity to Kinns Park and the termination of the Kinns Road multi-use path. Extension of that path to Castle Pines Road would essentially connect the Preserve to a larger, region wide trail system and an existing residential neighborhood. The parking area could provide the dual purposes of access to the Preserve and the regional trail system. See concept vignette on next page.

Above: Possible Kinns Road West Parking and Trailhead

Trail

Routes and Construction

The Working Group recommended that only a few trails be planned for the Preserve to minimize impact to the ecological habitats. After the August 2008 site assessments, it was decided that a loop trail around the Preserve would be difficult largely because of the extent of wetlands and stream. Large segments of such a trail would have to be constructed of boardwalks with bridges at several locations. Not only would this be costly but construction of such a trail would have a large impact on the environment. Therefore, trail routes were restricted to three main locations with possible future routes planned if the needs of visitors and/or researchers warranted it.

Three main trails proposed are each named for the stream the trail crosses or accesses. The trail from the Pierce Road parking area crosses the Long Kill. The trail from Kinns and Plank Roads crosses the Dwaas Kill. And the trail from the western Kinns Road parking area access the Cooley Kill.

When planning trail routes the natural features of the environment should be used rather than transforming the landscape to meet the proposed project's needs. The materials used, the construction and maintenance techniques required, and the size of a particular project should be considered carefully to identify the scale of the environmental impacts to Dwaas Kill Nature Preserve (e.g., erosion, loss of wetlands, etc). The following Best Management Practices (BMP) can be effective methods in preventing or reducing unnecessary clearing and erosion during site construction.

- Avoid the most ecologically sensitive areas (i.e., Seeps at Toe Slopes)
- Avoid the use of heavy equipment during construction and/or maintenance.
- Avoid grades of greater than 15 percent on trails.
- Use primitive trail designs.

- Use boardwalks and bridges in wetland and floodplain areas.
- As soon as possible after construction, establish ground cover of native vegetation on disturbed ground to prevent the colonization of invasive species.
- Ensure that all construction vehicles entering the Preserve are free of weed seeds.

The Long Kill trail would follow the current "herd path" and be built of a compacted stone material with a gently graded surface from the parking area to the ATV disturbance area. From there the trail would continue as a primitive trail through the upland forests at the north of the Preserve. Boardwalks would be added where necessary to avoid disturbance to sensitive ecological areas and to minimize clearing and grading where slopes may be too steep. Gathering areas along the trail may be as simple as a bench or two. Other gathering areas may be a larger circle of logs for classes with nearby interpretive signage. With the addition of boardwalks and bridges, this trail could eventually connect with the Cooley Kill trail.

The Cooley Kill trail would begin across from the western Kinns Road parking area. Initially, it may be a compacted and gently graded loop through the pine forests to the southern side of the Cooley Kill. Eventually, it could connect with the northern Long Kill trail with the construction of boardwalks and bridges.

The Dwaas Kill trail would most likely start as a short compacted and gently graded trail to the observation platform in the wet meadow. Eventually, this trail could possibly travel through the wooded wetlands to the south of the Dwaas Kill and, with the construction of a bridge, cross the Dwaas Kill to connect to the northern Long Kill trail. This trail—along the Dwaas Kill—would be the route most desirable for providing fishing access. It would be a primitive trail except where boardwalks are needed.

Universal Accessibility and Observation Platform

The trails and access points of the Preserve are intended to have a minimal impact on its natural resources and beautiful landscape. Their primitive designs (e.g., slopes greater than five (5) percent, narrow single track, natural terrain, etc.) may prove difficult for those with disabilities. In order to create a point of access where all can enter the Preserve and enjoy its natural splendor, the proposed observation platform and boardwalk in the wet meadow are to be ADA accessible, as is the trail leading to the proposed pavilion located near the ATV restoration site. These areas naturally have high educational value as well as beauty. It is anticipated that these areas will be visited by groups and younger children making the more stable and wider trails a

welcome convenience. See Appendix A for concept vignettes of the observation platform and ATV restoration area.

Access Restrictions

Certain uses are incompatible with the Dwaas Kill Nature Preserve. Current ATV activity must be restricted through site specific signage, security patrols and construction of site-appropriate barriers (i.e., earthen berms, native tree and shrub plantings, etc.) in order to prevent further degradation to the Preserve.

Other uses that are considered incompatible with the Preserve include any other motorized vehicle use, dogs on or off their leash, and horseback riding.

Some areas of the Preserve are ecologically sensitive—needing special protection. Trails will generally be located away from these areas or, if in proximity, constructed in a way that helps to restrict access.

Signage

The Town is in the process of designing and adopting a consistent Town-wide signage program that will help citizens recognize Town facilities. Any signage planned for the Preserve should use the sign templates adopted by the Town.

Public Recreation

As mentioned earlier in this report, recreational activities most appropriate for the Preserve are passive recreational activities that can be pursued on the Preserve's trails. Because of concerns for the sensitive habitat and the safety of the visitors, visitors will be encouraged to stay on the trails for walking and hiking, trail running, bird watching and nature enjoyment.

It's possible that winter activities, such as snowshoeing and cross country skiing, are less disruptive to the environment when the ground is frozen, and may be able to take place off trail.

Fishing is one activity that can not take place along most of the proposed trail routes. Routes for fishing access need to be considered as fishing is an allowed and popular activity in the Preserve. The Town will need to decide if it will continue to allow the types of fishing activities that currently take place. These activities include fishermen walking beside and in the streams for long distances. Such activities can disturb the stream beds and riparian habitats along the streams.

Because any human activity in the Preserve makes an impact, it will be important to increase public awareness of these impacts and how visitors can minimize their

impact on the environment. Brochures, signage, web-based information, community volunteers, town employees, and students can all be part of a campaign to educate the general public on sustainable use of the Preserve's amenities.

Environmental Education

Many opportunities exist to reach out to the public with information about the unique and valuable nature of the Dwaas Kill Nature Preserve. Interpretive signage within the Preserve can help educate people visiting the Preserve. Integrated school curriculums are a way to teach school age children about the importance of this unique ecological area. A key to long-term sustainability initiatives is to educate young people of their importance.

Desirable locations for environmental education will be determined after additional research and consultation with educators. The most successful environmental education programs have the following features:

- Curriculum tied in with the local schools
- Trained field guides
- Physical facilities
- Maximum habitat variety

And finally, web based information & simple handouts can give the public multiply ways of learning about the Preserve.

Decisions about trail routes should take into account the educational opportunities of an area and whether or not an area can sustainably hold the number of visitors it would attract. It may be necessary to build special facilities—for example an overlook platform—that provides visual access to an area but restricts physical access.

Restoration

Riparian Habitat Restoration

The Preserve's property at the corner of Pierce and Kinns Road is currently a large flat open area—partially gravel and partially mowed. The sewer easement trail starts in this open area and runs onto the adjacent property which is private and posted. Historically, fishermen and others have used this trail to access the Dwaas Kill. The neighboring property owners are concerned about this continuing trespass onto their property and are looking to the Town to help mitigate this problem. The Town has attempted to direct users away from this area with some success. However, this open flat area encourages parking and access through this location.

The other concern at this location is the disturbance to the riparian buffer and the impact to the water quality of the Dwaas Kill. The streamside native vegetation has been disturbed allowing for the spread of phragmites—

an invasive species. People using the area help spread the phragmites. And runoff from the roads has direct access to the stream. Replanting and restoring a native riparian buffer would eliminate the invasive species and stop the further spread of it into the Preserve. It would protect the stream banks from erosion, reduce pollutant migration to the stream from the adjacent roads, and discourage parking and access through this location.

Since this has been a popular fishing site, some accommodation could possibly be made to provide a small parking pull-off on Pierce Road and access to the Dwaas Kill from the north. The goal would be to mitigation the conflict with the neighbor and eliminate trespassing onto their property.

ATV Area Restoration

There is an approximately 5 acre site, adjacent to the railroad tracks on the northern boundary of the Preserve that has a history of human disturbance. Vegetation has become established on portions of this site, however, within these areas there are deep ruts that continue to erode and threaten the vegetation.

The relatively open area and the sandy slope made this area attractive to ATV operators who have used the area for recreation. Unfortunately, repeated compaction and tearing from ATV wheels kills surface vegetation and leads to the erosion of underlying soils. Rain and wind further erode the sandy soils. This has created steep sandy slopes that resist vegetative growth, continue to erode, and offer no habitat value.

Fresh footprints have been observed on the sandy slope evidencing pedestrian use which further erodes the exposed soils.

There are several ways this area could be restored to provide habitat and prevent the further erosion of soils. However, the Working Group has recommended further study of this area before a restoration plan is formulated. This research would determine the type of vegetative species that have colonized the area as well as animal, bird and insect species that currently use this area. Restoration efforts would then allow for these current species.

The three different habitats that surround this area could be used as possible models for restoration. The three habitats are open grass meadow, successional shrub meadow, and hardwood forest. The hardwood forest would be the climax habitat with the open grass meadow and shrub meadow eventually giving way to the forest as trees from the surrounding forest seeded themselves and eventually shade out the grass and shrub species. It's important to keep in mind that the grass meadow and shrub meadow would need annual maintenance of mowing or even possibly burning to halt the eventual succession of habitats to the climax forest.

In the short term, it is recommended that the eroded slopes be stabilized to prevent further erosion of soils and vegetation and discourage ATV use in the area. To accomplish this, the deeply rutted slopes will need to be filled and graded and then stabilized with erosion control blankets and vegetation.

Research

It is recommended that initial research in the Preserve be conducted at the proposed Pierce Road trailhead and Long Kill trail up to and including the ATV disturbance area. This will allow designs for these critical first construction sites to be designed and constructed.

Because of the large area and considerable amount of research that could be conducted within the Preserve, the Town might want to consider hiring a consultant to direct the research and use volunteers, partnerships with universities, and internships to implement the research.

MANAGEMENT PHILOSOPHY

Humans are intimately linked to the ecosystems in which they live. The natural environment has influenced our settlement and transportation patterns, and even our economies. Historically, however, we have managed our environmental resources with a singular, reductionist approach. Natural resources are not only linked with one another but with human activities as well. Management of the Dwaas Kill Nature Preserve, therefore, requires an integrated approach that considers the entire ecosystem, including humans. This ecosystem based management is described below.

The Town will need a group to be stewards and champions of the Preserve, to oversee the planning, and construction of the Preserve's amenities, and to manage the integrated ecosystem based approach. One way to structure the Town's management of the Preserve is the committee structure described below.

Ecosystem Based Management Approach

The principal approach for managing the Preserve's natural resources is Ecosystem Based Management (EBM). EBM is fundamentally scientific, aiming to base decisions on the best available technical data and information. Its aim is to develop a body of knowledge about natural systems and solutions through experimentation, monitoring and evaluation, and adaptive management. EBM solutions integrate a range of regulatory and non-regulatory methods to address compatible objectives like stormwater mitigation, habitat and water quality protection, open space preservation and recreation. Such a management strategy aims to both protect and restore natural systems.

> *In order to protect biological resources and maintain environmental quality in the [Preserve], it is necessary to consider the relationship of the habitats and biota we describe to the human activities outside the natural area.*
>
> *-Hudsonia, 1997*

As a recently adopted state-wide environmental management strategy, the State of New York defines EBM as, "a systematic approach to decision making that considers the entire ecological community, including humans, to create a sound blueprint for the near and long-term…It switches the typical regulatory system, which is largely sector-based (e.g., water, transportation, economic growth) and often conflicted, to one that coordinates sectors and government agencies, balances competing uses, and focuses on interacting systems."

The following are the State of New York's recently adopted EBM Principles:

- Base decisions on local factors

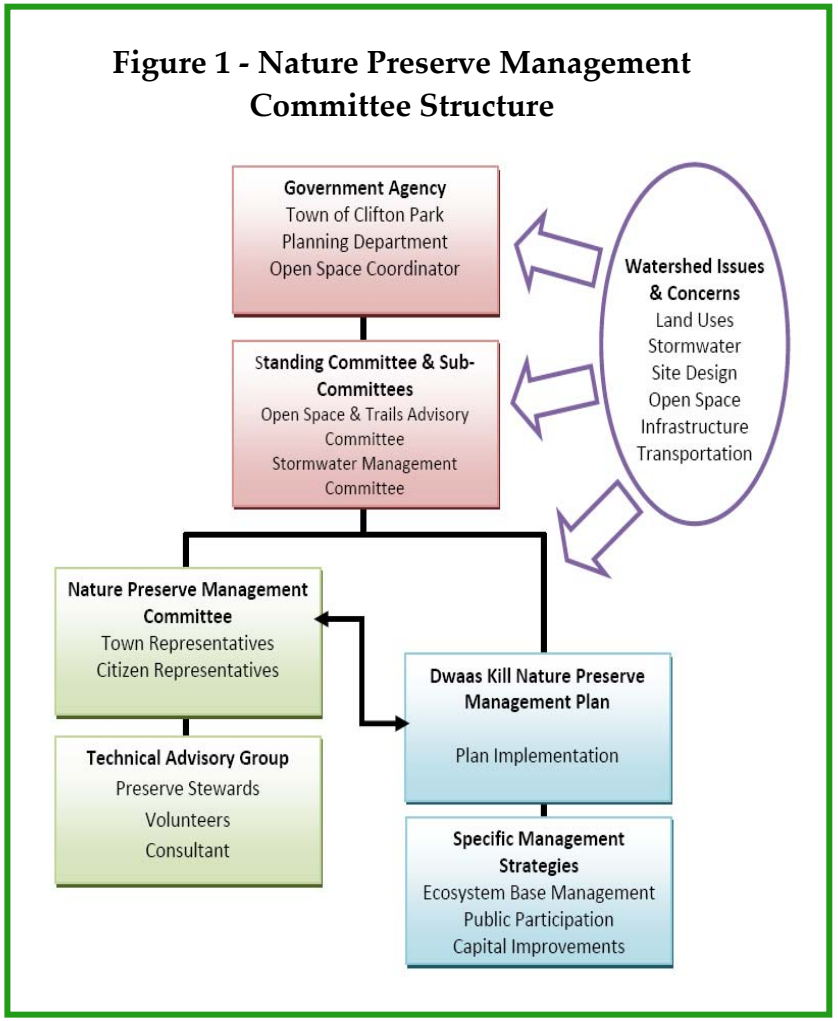
- Use the most current scientific findings
- Adapt decisions to changing circumstances
- Use measurable objectives to direct and evaluate performance
- Recognize the interconnections among and within ecosystems
- Involve those affected by decisions

These principles should serve as a foundation in managing the Dwaas Kill Nature Preserve. It's impossible to have all the answers or solutions all at once, however, through careful study, deliberation and a willingness to adapt collaborative partnerships and sound management strategies can come to fruition.

Nature Preserve Management Committee

Building collaborative based partnerships has proven to be one of the most effective strategies in protecting environmental resources. These partnerships can vary in both size and make up. For example, some groups are entirely made up of local citizens, others are made up of government representatives, while others are a hybrid of the two—part local citizen and part government representatives. In order to further the initiatives set forth in this management plan, and given the importance of continued public participation and the need for government leadership, it is recommended that a Nature Preserve Management Committee be formed to oversee management strategies and plan implementation. Figure 1, *Nature Preserve Management Committee Structure*, represents a conceptual management structure for the proposed committee.

Figure 1 - Nature Preserve Management Committee Structure



Nature Preserve Stewardship Program

As a further way to involve those affected by management decisions it's recommended that the Town adopt a stewardship program for the Preserve. The goal of a stewardship program is to incorporate individuals who would like to help increase public understanding and awareness about the Preserve. Stewards could also promote better stewardship of private lands within the vicinity of the Preserve and foster partnerships to help sustain management efforts. Preserve partners or stewards could respond to public inquiries and act as an "ombudsman" with respect to environmental impacts to the Preserve. They could also help with monitoring, assist the town with projects, and serve as overall Preserve advocates.

SPECIFIC MANAGEMENT STRATEGIES & ACTIONS

Management for Overall Habitat Diversity

A critical first step towards effectively managing the Dwaas Kill Nature Preserve is developing a catalog of information that will serve as a foundation for subsequent decision making. Such information can serve as a baseline or benchmark from which success or failures management can be measured. Because Ecosystem Based Management is an iterative learning process, the following are essential starting points.

Topographic Mapping/Survey

Developing a topographical survey for the Preserve is considered a high priority. Future data needs and management decisions will require a more detailed understanding of the Preserves topography. Trail locations, wetland delineations, and water related modeling necessitate such detailed mapping.

Wetlands Delineation

In addition to their ecological significance, wetlands are protected through a regulatory framework designed to protect and preserve functionality. In order to avoid any undesirable impacts to these fragile ecosystems, it is necessary to delineate wetland boundaries.

Stream Flow, Peak Discharge, and Flood Modeling

The Cooley, Long and Dwaas Kills all confluence with one another in the Dwaas Kill Nature Preserve. Furthermore, the Preserve is home to a 200+ acre wetland complex making the fluctuation of water volumes and levels one of its defining features. Modeling stream flow, peak discharge rates, and flood levels are essential to identifying specific trail locations. Trails need to be placed in areas that are dry for most of the year. Or, if boardwalks are proposed to elevate the trail above the wetland, high water elevations would be used to determine the final elevations of the boardwalks or bridges.

This information is also needed to fully understand the hydrological cycles that influence the ecological health of the Preserve. Plant communities exist in relationship to water levels as do wildlife communities. Abnormal water fluctuations could have widespread affect on the composition of species and long-term ecological health of the Preserve.

Habitat GAP Analysis

"GAP" is an acronym for Good, Average, Poor. A Habitat GAP analysis identifies those species and plant communities that are not adequately identified or fully understood including isolated or undocumented populations of endangered, threatened of regionally rare

plant and animal species. By identifying such species and their respective habitats, a habitat GAP analysis gives decision makers the information they need to make better-informed decisions when indentifying priority areas for monitoring and conservation. Below are some suggested steps in conducting a habitat GAP analysis:

1. Map land cover of the dominant plant species
2. Predict distribution of multiple or specific species
3. Delineate specific management areas
4. Analyze where animal and plant community distributions intersect with management areas

This analysis produces a "species richness" map, which highlights areas with high biodiversity potential, and a GAP map, which compares this potential with existing management strategies, highlighting any "gaps" in preservation. Using this information, decision makers can then compare current management strategies to specific species needs and then adapt their strategies to those needs.

Aquatic Monitoring & Assessment

Aquatic monitoring and assessment includes stream assessment and water quality monitoring, streamside biosurvey, wetlands assessment, outfall inventories, and illicit discharge investigations. Fundamentally, aquatic assessments are designed to collect data on in-stream and riparian conditions and identify areas of interest and/or concern. By monitoring and assessing the Dwaas Kill Nature Preserve's aquatic resource, it can serve as a "living laboratory," offering public participatory monitoring and research opportunities.

Native Brook Trout Monitoring

Eastern Brook Trout (EBT) are native to headwater reaches of rivers and streams in eastern North America from northern Canada south to Georgia and west to the Mississippi River. They prefer small, cold (below 65 degrees Fahrenheit) headwater streams; holding true to their species name, "fontanalis," which is translated as "living in springs." In the past, the streams of the Dwaas Kill Preserve were likely prime EBT streams; however, development in their watersheds has lead to a decline in water quality, and loss of EBT habitat. Recently though, observations of EBT in the Dwaas Kill watershed have indicated that EBT populations are surviving in the watershed. This has excited trout enthusiasts, local leaders, and the general public because it is widely accepted that a stream that supports EBT is a healthy stream with many environmental and community benefits. Research should focus on determining whether the Dwaas Kill system—including small tributaries and streams outside the Preserve—is capable of supporting self-sustaining EBT populations. If so, management

committee should then consider maintenance and improvement of EBT habitat within the Preserve, and the entire Dwaas Kill watershed a primary goal. The first step in EBT management would involve three items:

1. Conduct an EBT population survey,
2. Conduct an EBT habitat availability survey, and
3. Conduct a macroinvertebrate (aquatic and terrestrial insects) sampling study using NYSDEC protocol.

The design of the EBT population survey should consider non-lethal fish sampling methods that preserve existing populations. Properly used electro-fishing equipment, as was used in a Hudsonia's Dwaas Kill fish survey in 1996, would be a viable method.

The habitat availability portion of the study can be linked with the analyses described in the "Management of Streams/Riparian Habitats" section below. This study would identify spawning habitat, nursery habitat, feeding habitat (riffles and small pools), and resting habitat (large boulders or logs, undercut banks, etc) for the various life stages of EBT.

EBT feed mainly on drift, which means that they face upstream and feed on macroinvertebrates drifting downstream. EBT, like other drift-feeding fishes, situate themselves in areas of a stream were prey (energy) delivery outweighs the energy required to acquire the prey. Locations are chosen that avoid or lessen the chances that the fish become prey themselves.

The macroinvertebrate sampling and analysis portion of the EBT study should involve a literature review of trout streams in east-central NY. This would help determine typical macroinvertebrate species indicative of EBT streams in the region. A Dwaas Kill Preserve macro invertebrate sampling scheme should then be developed. This would most likely involve the use of drift nets to collect macro invertebrates during different times of day and different seasons. Collected macroinvertebrates could then be analyzed to assess the stream health, with regards to EBT. A detailed understanding of how EBT and their food sources are distributed in the Dwaas Kill Preserve could help manage future fish stocking (or lack thereof) needs in the Preserve.

Management of Ecological Habitats

The absence of human disturbance has left much of the ecological functionality of the Preserve intact indicating that preservation and management of the site should initially be somewhat of a "hands-off" or "less-is-more" approach. This will allow the natural processes to continue undisturbed. Continual monitoring and assessment of the Preserve will allow decision makers to "adaptively" develop or hone site specific management

strategies. To date, six (6) distinct ecological areas have been identified. They are defined as follows:

Seeps at Toe Slopes (ecologically sensitive area)

Several steeply pitched ravines cut eastward from the escarpment on the west side of the Preserve. Groundwater seepage at the base of these ravines has established perennially saturated soil conditions that support hydrophytic vegetation and wetland habitats. These ravines flow seasonally during and immediately after rainfall and snowmelt events. Because of the site specific combination of physical, chemical and biological conditions that may be unique among each individual seep, these areas have the potential to support rare plant or animal species with very narrow ranges of climatic or physiological life history requirements. Because these areas may support relatively rare species, it is recommended that these areas be avoided and left to develop naturally.

Forested Uplands

Large areas of upland forest exist within the Preserve. Three distinct species assemblages are present throughout these forest areas; pines and hardwoods, hemlock and hardwoods, and pure hemlock stands. These varied forest communities reflect some relation to the topography within the habitat unit. Successional hardwoods are present on the more level and gently sloping edges of the escarpment feature in the western portion of the Preserve. Pines and hardwoods are present on the more moderately pitched slopes where the escarpment ends and drops into the wetland areas of the Cooley Kill and Dwaas Kill floodplains. Hemlock-hardwood forests are common on the steepest slopes, where relief is greatest between the escarpment and adjacent wetlands and in some of the small, steeply pitched ravines coming off of the escarpment. Pure hemlock stands can also be found throughout the western portion of the Preserve.

Relatively flat, forested portions of the site contain successional hardwoods such as young cherry, birch, beech, and hickory. Scattered white pines, likely remnants of pine plantations, are present throughout

these flat, forested areas. These areas are limited in size and appear to be influenced by adjacent residential development and road construction. Preservation of these areas will allow for succession to run its course and assure development of healthy, mature upland forest.

The following is a brief description of each of the various forest types that make up the hardwood forests of the Preserve:

Old Growth Forest and Ravine: This limited area includes a very short reach of riparian habitat adjacent to Cooley Kill in the extreme northwest corner of the Preserve. Cooley Kill is easily accessible and its clear waters and sandy bottom area visible from the top of a steeply sloped and densely wooded ravine that drops 50 to 75 feet from the top of the escarpment. Mature stands of oak, maple and ash cover the ravine slope, limiting understory and ground cover development. Many species of fungi can be found in this area. The diversity of fungi is likely an expression of the microclimatic conditions created by the combination of topographic (steep north-facing slope) and vegetative (old-growth vegetative community) conditions that exist in this habitat feature. This upland forest feature is aesthetically pleasing and is not represented in any other areas of the Preserve.

Oak Plains and Sandy Bluffs: This area is situated on the level plains and sandy slopes of the escarpment area that covers the northeastern portion of the site, west of Long Kill. This is predominantly a second growth oak forest with a well developed canopy structure that includes an understory layer of shrubby growth and sapling trees and a well established ground cover. Deep, well-drained sandy soils are present; and combined with the southern aspect of the exposed bluffs the margins of this area express distinct oak barren or oak-savanna characteristics. Reestablishment and maintenance of open fields in this area may establish Barren/Savanna functionality to the vegetative community.

Trash and abandoned equipment strewn about in the northeastern part of the Preserve, near the oak plains and sandy bluffs, should be removed as soon as possible. Access and removal via the railroad corridor will help mitigate potential impacts to the Preserve.

There is at least one and possibly more abandoned well heads in the Preserve. These should be identified and decommissioned per NYSDEC guidelines.

Hemlock Groves: Pure stands of hemlock groves are located throughout the hemlock/hardwood forest in the west central portion of this habitat unit. Through a combination of factors (e.g., stressful physical conditions, low light from dense canopy coverage, and modification of soil pH from needle drop) these forests create a distinct microhabitat on the forest floor that lies within an established grove. These stands add variety and heterogeneity to the physical landscape. The hemlock stands within this habitat unit also provide a historical dimension to this portion of the forest, and reflect the conditions that are more characteristic of the original virgin forest species composition where cool north-facing slopes and ravines were typically vegetated with hemlocks and rhododendron or laurel. It has been observed that this is a favorite location for deer to bed down.

Legacy Trees

A fair number of old growth legacy trees are interspersed throughout the white pine/hardwood forest in the east central portion of this habitat unit. These legacy trees,

probably greater than 150 years old, are primarily white pine, although a few hemlock and hardwood species also are present. Legacy trees provide a unique suite of beneficial services to the surrounding forest.

Open Uplands

The Preserve contains only two small areas of upland meadow habitat. These include a small patch of meadow along Kinns road and a larger area of patchy meadow

that is interspersed with oak forest in the northeastern corner of the site.

The Kinns road meadow is unremarkable and might be the remnants of an abandoned agricultural field or residential clearing. The meadow is also subject to ongoing disturbances from road construction and adjacent residential development.

The patchy area of meadow in the northeast portion of the site is most predominant at the base of the sandy bluffs that front the escarpment. Situated between the base of these bluffs and the wooded/wetland areas to the south, these lands extend only a short distance to the west (approximately 100 feet) before they merge with the surrounding upland forest. The majority of this area has been overrun and pocketed with trails and pits created by unauthorized all-terrain-vehicle use at the site. This area is unique in its juxtaposition with a predominantly oak forest. This combination imparts a distinct oak barren or oak savanna character to this area. Restoration/reestablishment and maintenance of open fields may restore Barren/Savanna functionality to the vegetative and invertebrate communities in these meadows.

Forested and Shrub/Scrub Wetlands

Forested and Shrub/Scrub Wetlands are present throughout the interior of the site and represent the dominant habitat unit in the Preserve. Hudsonia (September, 1997) identified four variants of the Forested and Shrub/Scrub Wetlands habitat type. These include: Floodplain Forest; Swamp Forest; Shrub Swamp; and Woodland Swamp. These variants differ in their predominating vegetative communities, hydrology, and soils composition. Almost all of these areas (excepting the shrub/shrub areas) support mature forests with greater than 50% canopy coverage. They also support well developed understory vegetative communities with highly diverse assemblages of shrubs, herbs and forbs. A number of characteristic physical features within the Preserve's boundaries contribute to the diverse wetland communities at the site. These include the three on-site drainages (Dwaas, Cooley, and Long Kill) that combine to create seasonally high flood waters within a large area of the lowlands. A second feature is periodically high groundwater tables that keep a large portion of the site wet throughout the year. A third feature, the toe-of-slope seep, is common where wetland and upland forests meet at the base of the northern escarpment and its deeply notched ravines. As noted above, relatively rare Woodland Swamp communities have become established at these toe-of-slope seeps. These areas contain relatively rare plant species because of the unique microhabitat they create.

The wetland communities in the Preserve exist as a contiguous and unfragmented block of high quality

habitat for woodland birds, amphibians, reptiles, and a variety of small mammals.

Open Wetlands

A large, expansive wet meadow is located in the south-central portion of the site, west of the sewer line north of Kinns Road south of Cooley Kill. This meadow is dominated mostly by herbaceous vegetation including sedges, rushes, grasses, and mixed forbs such as common boneset (Eupatorium perfoliatum), blue vervain (Verbena hastata), Joe-pye-weed (Eupatorium purpureum), and spotted touch-me-not (Impatiens capensis). Sparse areas of woody vegetation, including dogwoods (Cornus spp.), willows (Salix spp.), and buttonbush (Cephalanthus occidentalis), are also scattered throughout this meadow. Cooley Kill and Dwaas Kill, both streams with deeply cut banks and a compact, sandy substrate, meander through this meadow and converge in the northeastern portion.

Wet meadows are typically very fertile areas that are capable of supporting a wide assemblage of wildlife; including birds, small mammals, and insects (dragonflies, damselflies, and butterflies). Important ecological benefits provided at this meadow may include breeding habitat for many herpetofauna and invertebrates, and foraging habitat for resident and transient birds. Due to its large size and openness, it is anticipated that this area is likely be used as a stopover by many water birds (e.g., wading birds such as herons, rails) during migration.

In addition to supporting wildlife, this extensive meadow area and its contiguous forested wetland areas are extremely beneficial to water quality and the maintenance of downstream riparian habitat quality, particularly due to their natural ability to provide flood attenuation and removal of excess nutrients.

Aquatic & Floodplains

Confluence of the Cooley Kill, Long Kill and Dwaas Kill within the Preserve creates a large, hydrological system. Habitat values and management principles specific to the Preserve's streams are discussed under the "Management of Streams/Riparian Habitats" section below.

The floodplain areas immediately adjacent to the three onsite streams are important habitat areas. As riparian communities, floodplains protect the quality of aquatic habitats through functions that include thermal regulation (shading), shoreline stabilization, energy cycling, nutrient regulation, and flow attenuation. Where they merge with meadow and upland habitats, they create productive edge habitats for both forest interior and grassland/aquatic bird species. Aquatic habitats and riparian zones provide an enhanced array of ecological services to on-site and downstream biological communities, including humans, and these areas deserve special consideration for protections and impact avoidance with regard to utilization of preserve resources.

Management of Streams and Riparian Habitats

Understanding the Preserve's water resources is essential to understanding how its ecology might become impaired as a result of site-specific and upland management decisions. The presence of native eastern brook trout places added incentive to develop a body of knowledge that will enhance the effective management of the Preserve. Information has been placed in Appendix C which explains how ecologists divide watersheds and landscapes into basic components and the natural processes that operate on those components to shape them. This information should be understood by anyone helping to make decisions about the management of these landscapes. Some of that information has been condensed here as it directly relates to the Dwaas Kill Nature Preserve.

To understand how to best management the streams and riparian habitats of the Preserve, it's necessary to study the following processes and characteristics: hydrological processes, geomorphic processes, chemical characteristics, and biological characteristics. The results of these studies will give an overall picture of the quality of the stream and riparian habitats.

Hydrologic Processes

Modeling stream flow, peak discharge rates, and flood levels are essential to fully understand the hydrological cycles that influence the Preserve's ecological functions.

Geomorphic Processes

Successful stream and riparian management, whether active (direct intervention) or passive (removal of disturbances), depends on how water and sediment are related to the formation and function of the stream. Because the size, shape, and profile of a stream naturally evolves over time, it is important to determine whether the alteration to a stream is part of a natural process, and therefore desirable, or the consequence of a local disturbance. A "geomorphic assessment" includes the gathering of historic and/or comparable site data, conducting a streamside field investigation and a channel/bank stability assessment. These studies examine the influences of current or historical hydrologic alterations.

Chemical Characteristics

Assessing the water chemistry in a stream is a necessary step in determining which management strategies to initially adopt. Preliminary analysis should focus on parameters that serve as indicators for a variety of other higher order variables. For example, pH and turbidity levels, dissolved oxygen and temperature measurements integrate the net impact of many physical and chemical processes within a stream. Equally important is frequency and location of sample collection, sample preservation, handling, storage and analysis. Data management protocols are needed for quality assurance and control of all chemical analyses.

Biological Characteristics

Prior to making strategic management decisions, it is important to conduct a systematic stream assessment to evaluate stream and riparian habitat conditions. The following indicators should be examined: riparian composition, water appearance, nutrient enrichment levels, in-stream fish cover, barriers to fish movement, pools, insect/invertebrate habitats, canopy cover, water temperature, salinity, and macroinvertebrate populations. Because macroinvertebrates or non-fish species are a useful indicator of stream health and water quality, a streamside biosurvey should be conducted as well. This method gathers, sorts, and counts macroinvertebrates present in a sampling area and rates stream health based upon the abundance and distribution of species.

Stream and Habitat Restoration

The incremental conversion of upland natural areas outside the Preserve to other uses, coupled with hydrologic modifications, increased steam flows, peak discharge rates, and turbid stormwater runoff have impacted riparian habitats (e.g., stream bank erosion) and in-filled streambeds (e.g., sandbars and sediment deposition). Stream bed and bank restoration may have a positive effect on the aquatic habitat. However, prior to any restoration activities, it is imperative that the information needs identified in the "Management for Overall Habitat Diversity" section above be obtained in order to accurately identify areas of impairment.

Culvert Identification, Study and Replacements

Culverts, especially perched culverts can have negative impacts on streams and aquatic life. A perched culvert is one with an outlet elevated above the downstream water surface allowing a freefall condition. This prevents fish and aquatic wildlife from accessing the culvert from the downstream pool. Water is constricted at the culvert and therefore, at high water flows, water exits the culvert at high velocities. This fast moving water has a high erosive potential that results in downstream scour of the channel bed and banks.

There are two culverts within the Preserve that need to be replaced in the near future. One is an approximately 2′ diameter culvert that runs under the sewer easement path adjacent to the Dwaas Kill where it passes under Kinns Road. A portion of the Dwaas Kill goes through this culvert and into the adjacent wetland meadow. It's unclear why the Dwaas Kill has a split in the stream at this point. Perhaps this was an existing condition when the sewer pipe was laid through this area. The reason this culvert needs replacing is that it is perched.

Because of the difficulties for aquatic life and the erosive potential, this perched culvert should be either removed or replaced. However, because of its location in the sewer easement, discussions and research with the County Sewer District must take place before an appropriate replacement can be designed. If it is decided that the culvert can be removed then a bridge or boardwalk may be able to replace it. If that does not suffice, an open bottom culvert, opening habitat connectivity, would be the most viable solution.

The second culvert that needs to be removed is in the Long Kill. The primitive path from the Pierce Road parking area crosses the Long Kill over a culvert approximately 6′ in diameter and 5′ in length. A minimal dirt path crosses the middle of the culvert exposing the rusty and corroded edges. This culvert constricts the flow of water during flood conditions creating high water velocities which could contribute to erosion of downstream banks. A bridge or elevated boardwalk over the Long Kill would be safer for pedestrians and beneficial to the stream and stream bank habitat.

A third culvert has direct impact on the Preserve's water quality and fish habitat but appears to be just outside the Preserve. (A survey will be needed to verify its exact location.) This is the culvert which conveys the Long Kill under the railroad. It is a large culvert—approximately 8′ in diameter—and is severely perched. The bottom of the pipe is about 3′ from the water surface. A large pool has been created by high velocity water exiting the pipe. This eroded stream bed has contributed to downstream turbidity and deposition of sediment which further degrades habitat quality. It is extremely difficult, if not impossible, for dispersing fish and wildlife to migrate upstream through this culvert.

There are additional culverts that run under the sewer easement path that should be catalogued and evaluated for their impact on the streams and the Preserve's habitats. And there could be other perched culverts within the Dwaas Kill watershed that are effecting trout movement and populations. This would be a worthy research project.

Watershed Management Considerations

The health of the water resources and related flora and fauna within the Preserve is affected by many activities occurring outside the Preserve. Nonpoint sources of pollution, such as urban and agricultural stormwater runoff, are the most significant sources of water impairment in New York State. Impervious parking lots, streets and rooftops reduce water infiltration and increase the amount of stormwater runoff, which in turn exacerbates drainage, flooding problems and channel erosion downstream.

Furthermore, stormwater helps convey pollutants, which then bio-accumulate in waterways, lakes, reservoirs, and aquifers—degrading water quality and impacting aquatic health.

Because stormwater management, open space, and recreational objectives often align with one another, a comprehensive watershed management plan could serve as a vehicle to catalog these interrelations and identify those strategies most desirable and efficient. Developing a comprehensive watershed management plan is beyond the scope of this Plan. Material has been placed in Appendix B which points to programs and partnerships that could be developed to help protect the greater Dwaas Kill watershed.

Management for Environmental Education

It is recommended that the Town team with educators that were members of the Working Group and others that are interested to guide the environmental education programs in the Preserve. The site needs to be studied carefully to assess the best locations for environmental education and interpretation. This will be a continuing process as plans for protecting and using the Preserve unfold.

The Town will also need to develop a strategy for managing visitors, especially groups. This could be as simple as groups registering their intent with the Town ahead of their visit. Or, there could be guides available who love to share their knowledge and commitment to the preservation of this natural area.

Management for Public Use and Enjoyment

Public use of the Preserve will, to a large extent, be determined by the development of trails and access areas. The current Concept Plan calls for a single access point and trail to be developed first with future research guiding any further development. This limited access has ecological benefits. The Town will have the opportunity to develop its research strategies and determine the extent of sensitive ecological areas before those areas are disturbed by trail building. It is recommended that the Town direct its research in those areas where trails and

parking access are proposed so that these amenities can be constructed over time.

Management of Invasive Species

All plants provide some environmental benefits. For example, reducing carbon dioxide or providing food for animals; however, invasive species can threaten the biodiversity of an environment. Invasive species can spread rapidly, replacing native plants and thereby altering the ecosystem. Once the conditions of an area are changed, new species including pathogens may be able to survive where they previously could not. Other insects and diseases may follow such as the emerald ash borer, hemlock aphid, and numerous tree blights and diseases. The following invasive species have been identified at the Dwaas Kill Nature Preserve:

Purple loosestrife

- Colonizes in wetland habitats
- Large populations can limit food and habitat available for native wildlife
- Difficult to control once it becomes widespread
- Attempting to dig up the roots can actually increase its spread.

Management Suggestion: Dig or hand-pull all purple loosestrife plants, including the root crown, or several years of cutting the plant to the ground can be effective. Older plants that are too large and deep-rooted to be removed can be hand sprayed with a chemical inhibitor (i.e., glyphosate) directly on the leaves. Please note, that the application of chemical inhibitors in aquatic environments requires special licensing. Furthermore, controlling purple loosestrife in wetlands by any method may require advance approval by state and federal agencies before treating.

Phragmites

- Very difficult to remove without mechanical aid, such as a backhoe or steam shovel
- Has an extensive rhizome system (i.e., deep and wide root system)
- Competes with native plants found in wetland habitats
- Pure stands limit the wildlife habitat value

Management Suggestion: Removal of the plant below its root system with "clean" mechanical equipment and treat the site with chemical inhibitors (i.e., glyphosate). Please note, that the application of

chemical inhibitors in aquatic environments requires special licensing. Furthermore, controlling phragmites in wetlands by any method may require advance approval by state and federal agencies before treating.

Japanese Honeysuckle

- Very difficult to remove and smothers surrounding vegetation
- Inundates shrubs and young trees as it twines up to reach better light
- Grows when most other plants are dormant
- Vigorous bloomer and produces an abundant seed crop that is dispersed by birds

Management Suggestion: Small populations can be controlled by hand removal of trailing vines. In larger populations, two-week intervals of cutting or burning the plant to the ground, thereby depleting the plants nutrient reserves, is effective. Treating the site with chemical inhibitors (i.e., glyphosate) can be a supplemental measure. However, the application of chemical inhibitors in aquatic environments requires special licensing.

As it is true with all invasive species, early detection and local eradication is essential. As such, regular monitoring for invasive species is an important part of any effort to mitigate the introduction and/or spread of invasive species, particularly along proposed trails and trailheads were increased access can hasten infestation. However, environmental conditions do not conform to political or private property boundaries. Therefore, it is important to help educate area residents on what they can do to protect the Dwaas Kill Nature Preserve's ecological resources. For example, a land owner's and interactive web based guide to invasive species management could be an invaluable tool in preventing the spread of invasive species throughout the greater Dwaas Kill area.

Early detection and quick coordinated responses are needed to eradicate or contain invasive species before they become too widespread and control becomes technically and/or financially impossible. Through education and outreach, individuals and community groups can begin to understand the impacts associated with invasive species. They can be taught to recognize the most common and ecologically disruptive invasive species and encouraged to accept responsibility for control of these species on their own property, in order to reduce the availability of invasive species seed sources to the Preserve. Assisting volunteers and community groups with planning, organization and technical expertise, the Town can help the public take an active role in monitoring for and eradicating invasive species that threaten the Dwaas Kill Nature Preserve.

Management of Research

There are a range of research initiatives that would be useful to the long term management of the Preserve. It might be prudent for the Town to hire a consultant to direct the research efforts, help prioritize initiatives, and monitor and direct the activities of volunteer groups.

The two most useful research projects to begin are the Eastern Brook Trout Habitat Quality and Inventory Mapping and the Biodiversity Inventory. These research programs would give a baseline of data and answer many of the questions needed to begin the design of amenities such as parking and trail routes. These research activities performed together would help accomplish the mapping and inventory of habitats which is a critical long-term management tool.

Eastern Brook Trout

There are two groups that have a strong interest in participating in the Eastern Brook Trout research—Trout Unlimited and NYSDEC. The Town should be able to partner with these groups, and possibly others, to plan and implement the key components of the Brook Trout research. These are:

- Inventory, Mapping and Quality Assessment of Critical Habitat for spawning, nursery and structure.
- Assessment of mature and immature populations.
- The need for and opportunities for habitat enhancement such as gravel beds for spawning, vegetation beds for nursery, and structure (logs, boulders, undercut banks) for foraging and thermal refuge.

Biodiversity Inventory

The goal of this research is to inventory all species of plants and animals within the boundary of the Preserve. It may be possible to coordinate with local universities to hold annual or semi-annual "Bioblitzes" where teams go into the Preserve and collect data on all representatives of certain groups of species, e.g., trees, shrubs, forbs, grasses, sedges, fungi, algae, animals, birds, amphibians, etc. and then catalogue and map significant populations. This is a great way for university classes to get field lab time and training for novice biologists.

Public Participation

It's possible to identify small research projects that can be completed by other community service groups. Some of these groups are: Eagle scouts, public schools, and offender community service programs. It would be most helpful for someone either on the Nature Preserve Management Committee or a consultant to oversee these research programs.

A key reason for involving the public in research is that public participation provides for environmental education; and personal experience promotes a greater environmental awareness and understanding by the public. The following is one example of the type of research program that engenders public participation.

Water Monitoring & Stream Assessment:
There are many regional examples where members of the community have taken part in gathering water quality information. For example, New York State's Citizens Statewide Lake Assessment Program (CSLAP) is a citizens' based monitoring program coordinated by the NYSDEC and NYS Federation of Lake Associations. In 2007, over 1,000 trained volunteers across the state took part in monitoring over 120 sampling locations on 90 lakes. CSLAP volunteers monitor several parameters related to the trophic state of a lake, including the clarity of water, the amount of nutrients in the water, and the amount of algae resulting from those nutrients.

Management for Health and Safety

The health and safety of visitors to the Preserve is important. A trail sign in at each entrance will maintain a log of who has visited the site. Educational material on safe use of the Preserve should be available at trailheads and on the Town's website. It has been observed that the site receives cellular phone coverage which can be used in case of emergencies. Finally, increased use of the Preserve will engender a greater sense of shared commitment to the Preserve and its resources. Preserve users will be more apt to discourage inappropriate behavior that they may witness or experience while visiting site.

Summary of Management Actions

The following are recommended actions that could be implemented over time. These actions fall into three phases: Immediate actions that could be initiated within six months, Short Term actions that could be initiated within one year, and Medium Term actions that could be initiated within two years. These actions would require Town support and funding. Strategies for implementing each recommendation would need to be developed before associated costs could be estimated.

Immediate Actions (initiate within 6 months)

1. **Create Nature Preserve Management Committee**
   One of the first actions about the Preserve the Town may wish to consider is the creation of the management committee. It would be most

valuable to have the committee organized and functioning as the decision making body for the Preserve as it moves into the critical initial phases.

2. **Eradication of Invasive Species**
   One of the first actions in the Preserve the Town may wish to consider is the eradication of invasive species within the Preserve. Methodology and strategies for this has been discussed in previous sections.

3. **Biotic Resource Inventory**
   Prior to any construction within the Preserve, an inventory of all the biota that would be disturbed by the construction should be conducted.

4. **Trash Removal**
   Locate and remove all trash within the Preserve.

Short Term Actions (initiate within 1 year)

The ability to complete these short term actions is dependant upon completion of the Immediate Actions described above.

1. **Develop Long Term Fiscal Plan for the Management of Dwaas Kill Nature Preserve**
   The cost of implementing the Dwaas Kill Management Plan is difficult to determine without further study. Once the Town has examined the biotic and hydrological resources of the Dwaas Kill, it should develop a capital plan that would outline the potential future costs of managing the site, thereby allowing the Town to budget accordingly and helping to identify potential funding needs.

2. **Pierce Road Entrance, Long Kill Trail Enhancements and ATV Area Stabilization: Design Development Plan**
   The first access and parking area to be developed will be the Pierce Road entrance. The concept plan calls for an off road loop parking area and trailhead for approximately eight (8) to ten (10) vehicles. A gathering area will be created adjacent to the trailhead as an "outdoor classroom". The existing primitive trail associated with this entrance will be enhanced as far as the ATV disturbance area. Enhancement will include gently grading the trail, providing a more stable surface, and replacing the culvert over the Long Kill. This will reduce erosion and create a safer trail for visitors.

Information and actions needed for this phase of the work will be:

- Topographic and Boundary Survey
- Wetland Delineation and possible permitting
- Geotechnical investigations of soils in ATV disturbance area
- Design Development Plans
- Grant writing

3. **Corner of Pierce and Kinns Roads Riparian Habitat Restoration: Design Development Plan**

The Preserve's property at the corner of Pierce and Kinns Road is currently a large flat open area—partially gravel and partially mowed. The sewer easement access path starts in this open area and runs onto the adjacent property which is private and posted. Historically, fishermen and others have used this path to access the Dwaas Kill. The neighboring property owners are concerned about this continuing trespass onto their property and are looking to the Town to help mitigate this problem. The Town has attempted to direct users away from this area with some success. However, this open flat area encourages parking and access through this location.

The other concern at this location is the disturbance to the riparian buffer and the impact to the water quality of the Dwaas Kill. The streamside native vegetation has been disturbed allowing for the spread of phragmites—an invasive species. People using the area contribute to the spread of phragmites in this area. Replanting and restoring a native riparian buffer would eliminate this invasive species, stop the further spread of it into the Preserve, protect the stream banks from erosion, reduce pollutant migration to the stream from adjacent roads, and discourage parking and access through this location. However, because this site is currently the primary point of access for the fishing community, access for said use should continue until a viable alternative is established.

Information and actions needed to create a restoration plan will include but not necessarily be limited to:

- Topographic and Boundary Survey
- Wetland Delineation and possible permitting
- Possibly County approvals for work in the Kinns Road ROW

- Coordination with the County for work in the sewer easement
- Design Development Plans

4. **Initiate Research**

   Decide on who will coordinate and direct the research efforts and programs. This person creates a plan to prioritize research and assign research projects.

5. **Continue Environmental Education Discussions and Planning with local educators**

   Meet with educators interested in creating environmental education programs. Coordinate educational efforts with the research program.

Medium Term Actions (initiate within 2 years)

1. **Pierce Road Entrance, Long Kill Trail Enhancements and ATV Area Stabilization: Construction Plans**

   Hire consultants to complete the plans for the construction of the parking area, trailhead, and trail routes.

2. **Construction of Pierce Road Entrance, Long Kill Trail Enhancements and ATV Area Stabilization**

   Engage Town departments or a hired contractor to construct the parking area and trail.

3. **Corner of Kinns and Pierce Roads Riparian Habitat Restoration: Construction Plans**

   Hire consultants to complete the plans for the restoration of the riparian habitat.

4. **Construction of Corner of Kinns and Pierce Roads Riparian Habitat Restoration**

   Hire a contractor to construct and install the riparian habitat.

DWAAS KILL ACTION PLAN

Priority Level	Recommendation	Leadership
Immediate (initiate within 6 months)	**Nature Preserve Management Committee**	**Town Board** **Open Space & Trails Advisory Committee**
	Eradication of Invasive Species	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**
	Biotic Resource Inventory	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**
	Trash Removal	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**
Short Term (initiate within 1 year)	**Long Term Fiscal Plan for the Management of Dwaas Kill Nature Preserve**	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**
	Pierce Road Entrance, Long Kill Trail Enhancements and ATV Area Stabilization: Design Development Plan • Topographic and Boundary Survey • Wetland Delineation • Geotechnical testing of soils in disturbance area • Design Development Plans	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**

	Corner of Kinns and Pierce Roads Riparian Habitat Restoration: Design Development Plan • Topographic and Boundary Survey • Wetland Delineation • Design Development Plans	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**
	Initiate Research	**Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**
	Continue Environmental Education Planning with local educators	**Nature Preserve Management Committee**
Medium Term (initiate within 2 years)	**Pierce Road Entrance, Long Kill Trail Enhancements and ATV Area Stabilization: Construction Plans** • Construction Plans and Details • Possible wetland disturbance permitting	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**
	Construction of Pierce Road Entrance, Long Kill Trail Enhancements and ATV Area Stabilization	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**
	Corner of Kinns and Pierce Roads Riparian Habitat Restoration: Construction Plans	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**
	Construction of Corner of Kinns and Pierce Roads Riparian Habitat Restoration	**Town Board** **Open Space & Trails Advisory Committee** **Nature Preserve Management Committee**

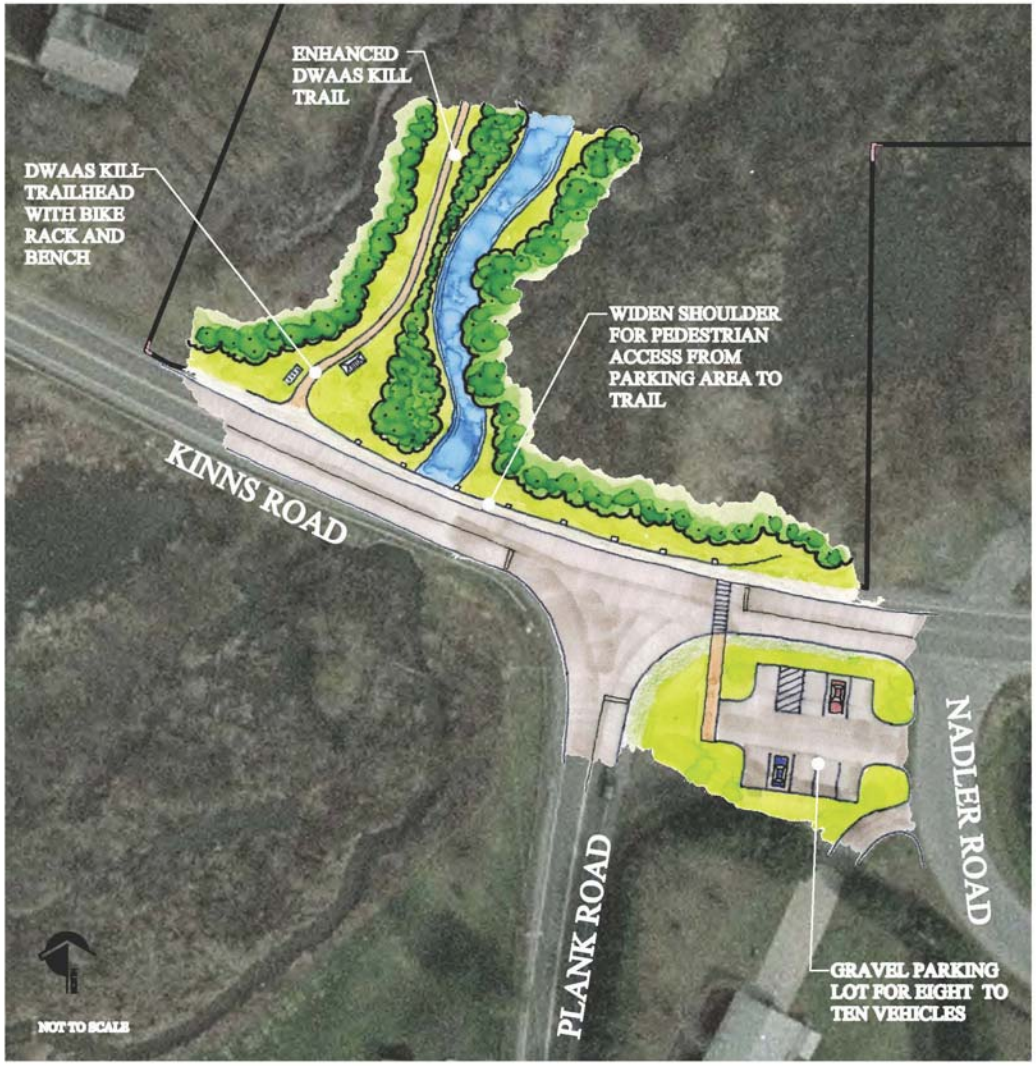
APPENDIX A

Dwaas Kill Nature Preserve Concept Vignettes

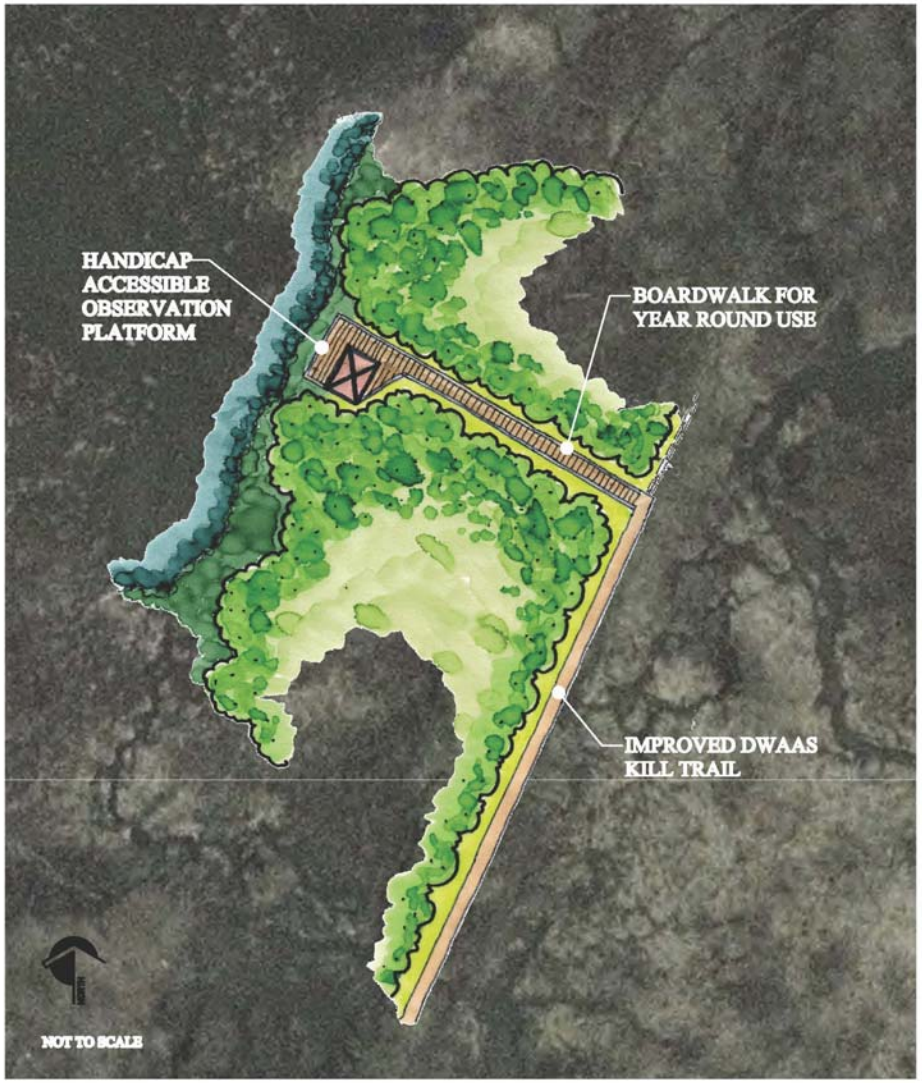
PIERCE ROAD PARKING AND LONG KILL TRAIL HEAD

PIERCE ROAD PARKING AND LONG KILL TRAIL HEAD
ALTERNATE LAYOUT

KINNS AND PLANK ROAD INTERSECTION: POSSIBLE PARKING AND ACCESS TO DWAAS KILL TRAIL HEAD



KINNS AND PLANK ROAD INTERSECTION: POSSIBLE PARKING AND ACCESS TO DWAAS KILL TRAIL HEAD ALTERNATE LAYOUT



POSSIBLE OBSERVATION PLATFORM AT THE EDGE OF THE WET MEADOW ALONG THE DWAAS KILL TRAIL

ATV DISTURBANCE AREA AND POSSIBLE RESTORATION ALTERNATIVE

APPENDIX B

Land Stewardship of the Greater Dwaas Kill Watershed

Watersheds are geographical areas that share a common drainage point such as a lake, river, or even a wetland. Watersheds, by definition, occur at multiple scales ranging from the very large that drain hundreds of miles of river, to an area that may drain a very small stream and measure only a few acres. The Dwaas Kill is the largest watershed within the Town of Clifton Park, draining approximately 10,430 acres of land (32 percent of Clifton Park's total land area). As such, it is important to recognize the influences and impacts of upland uses and management decision have on both the water quality and ecological health of the Dwaas Kill Nature Preserve.

The Town of Clifton Park Open Space Plan (2003) not only identified the Dwaas Kill site as a potential nature preserve, but the Cooley, Long, and Dwaas Kill stream corridors as well. Such efforts would have value added benefits on maintaining the ecological health of the Preserve. Furthermore, the protection and/or restoration of not only the Dwaas Kill's, but the riparian corridors of all its tributaries, coupled with the continued preservation of open spaces throughout its watershed, and the mitigation of stormwater impacts by way of better site design would help to ensure long-term health of the Dwaas Kill Nature Preserve as well. In order to best address such efforts, it is recommended that the Town develop either a Dwaas Kill or a town-wide watershed management plan. A Watershed (Catchment) Map of the Dwaas Kill Nature Preserve is provided following this section.

Watershed Management Considerations

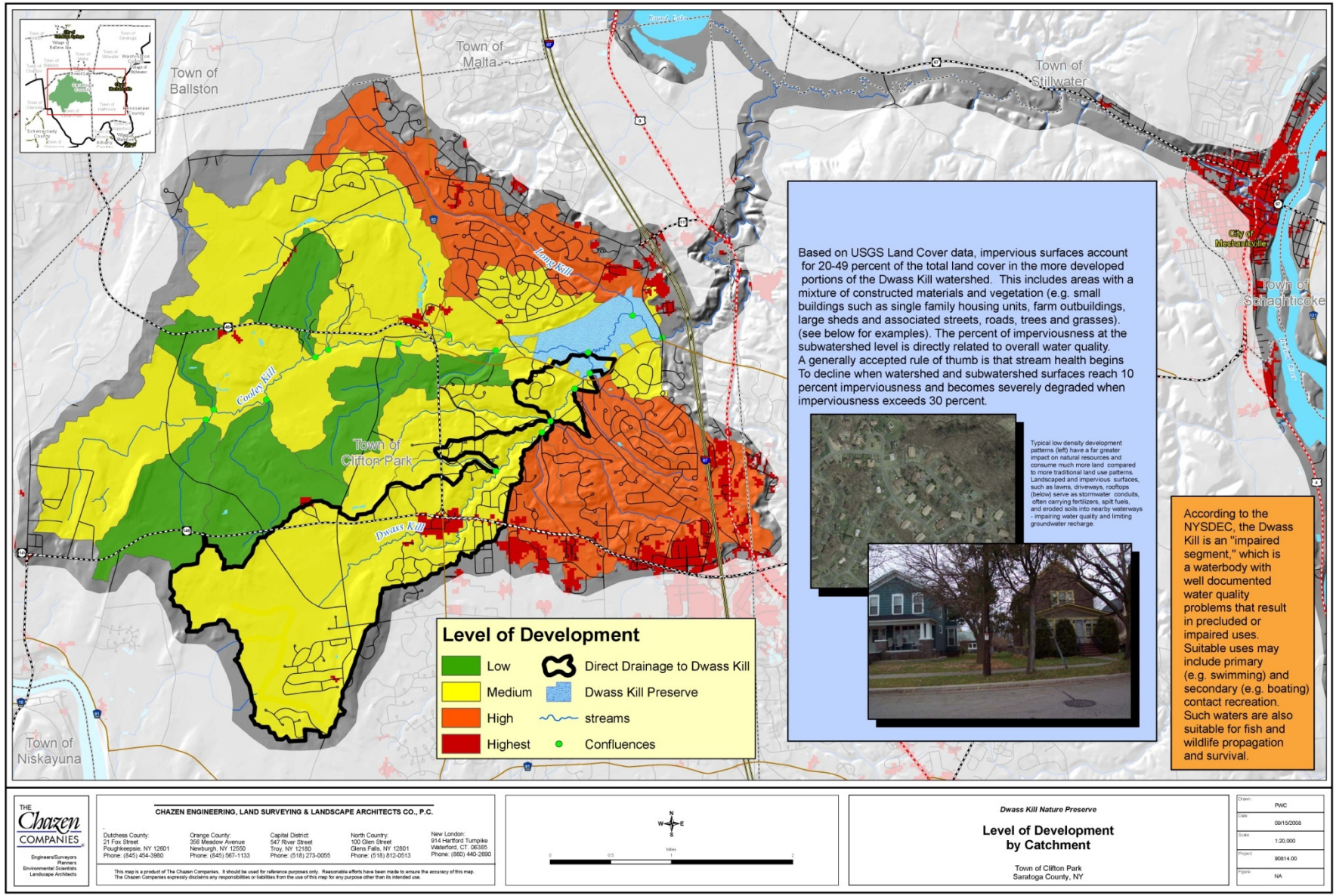
Nonpoint sources of pollution, such as urban and agricultural stormwater runoff are the most significant sources of water impairment in New York State. In more urbanized areas, smooth impervious parking lots, streets and rooftops, tend to reduce infiltration and increase the rate of accumulation and the amount of stormwater runoff, which in turn exacerbates drainage and flooding problems and channel erosion downstream. Furthermore, stormwater helps convey pollutants, which then bio-accumulate in waterways, lakes, reservoirs, and aquifers – degrading water quality and impacting aquatic health. In many regions of the country, as little as 10 percent watershed impervious cover has been linked to stream degradation, with the degradation becoming more severe as impervious cover increases. The Watershed (Catchment)

Map following this section illustrates the various sub-watersheds of the Dwaas Kill. The map also illustrates the relative imperviousness for each of these sub-watersheds.

Pursuant to Section 402 of the U.S. Clean Water Act, the Town of Clifton Park, as a Small Municipal Separate Storm Water Systems (MS4s) community, must address stormwater runoff through Best Management Practices (BMPs) to reduce pollutants to the "Maximum Extent Practicable." To do so, the Town must address stormwater related issues through public education, outreach and participation, illicit discharge detection and elimination, and construction and post-construction stormwater management strategies.

Because stormwater management, open space, and recreational objectives are often align with one another, a comprehensive watershed management plan could serve as vehicle to catalog these interrelations and identify what implementation strategies are most desirable and efficient. While developing a watershed management plan can be a complex process, the U.S. EPA has developed three guiding principles to help focus such efforts:

- *Partnerships*: Watershed management is a distinctive because it is collaborative. Watershed partnerships should recruit and involve the people most affected by management decision and ensure that these people shape key decision about planning and implementation, whether or not they are already organized as interest groups.
- *Geographic focus*: Agencies should define watershed management area based on physical assessment of drainage patterns.
- *Sound management techniques based on strong science and data:* Watershed partnerships should gather and analyze data about the water quality and ecological functions of regional waterways and the surrounding landscape. Data gathering and analysis should be iterative, as problems are identified, plans developed, and results evaluated.


Town of Ballston
Town of Malta
Town of Stillwater
Town of Clifton Park
Town of Niskayuna
City of Mechanicville
Town of Schaghticoke
Round Lake
Long Kill
Cooley Kill
Dwass Kill
Level of Development
Low
Medium
High
Highest
Direct Drainage to Dwass Kill
Dwass Kill Preserve
streams
Confluences
Based on USGS Land Cover data, impervious surfaces account for 20-49 percent of the total land cover in the more developed portions of the Dwass Kill watershed. This includes areas with a mixture of constructed materials and vegetation (e.g. small buildings such as single family housing units, farm outbuildings, large sheds and associated streets, roads, trees and grasses). (see below for examples). The percent of imperviousness at the subwatershed level is directly related to overall water quality. A generally accepted rule of thumb is that stream health begins To decline when watershed and subwatershed surfaces reach 10 percent imperviousness and becomes severely degraded when imperviousness exceeds 30 percent.
Typical low density development patterns (left) have a far greater impact on natural resources and consume much more land compared to more traditional land use patterns. Landscaped and impervious surfaces, such as lawns, driveways, rooftops, (below) serve as stormwater conduits, often carrying fertilizers, spilt fuels, and eroded soils into nearby waterways - impairing water quality and limiting groundwater recharge.
According to the NYSDEC, the Dwass Kill is an "impaired segment," which is a waterbody with well documented water quality problems that result in precluded or impaired uses. Suitable uses may include primary (e.g. swimming) and secondary (e.g. boating) contact recreation. Such waters are also suitable for fish and wildlife propagation and survival.
THE Chazen COMPANIES
Engineers/Surveyors
Planners
Environmental Scientists
Landscape Architects
CHAZEN ENGINEERING, LAND SURVEYING & LANDSCAPE ARCHITECTS CO., P.C.
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Orange County: 356 Meadow Avenue Newburgh, NY 12550 Phone: (845) 567-1133
Capital District: 547 River Street Troy, NY 12180 Phone: (518) 273-0055
North Country: 100 Glen Street Glens Falls, NY 12801 Phone: (518) 812-0513
New London: 914 Hartford Turnpike Waterford, CT. 06385 Phone: (860) 440-2690
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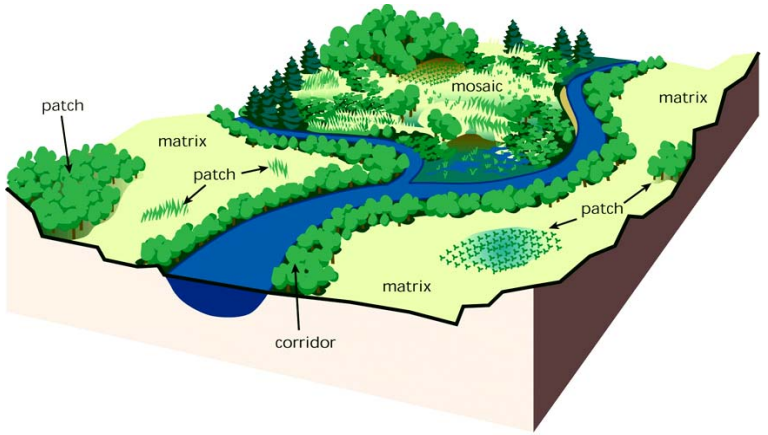
N
W
E
S
0
0.5
1
2
Miles
Dwass Kill Nature Preserve
Level of Development by Catchment
Town of Clifton Park
Saratoga County, NY
Drawn: PWC
Date: 09/15/2008
Scale: 1:20,000
Project: 90814.00
Figure: NA

APPENDIX C

Management of Wetlands Streams and Riparian Habitats

The confluence of the Dwaas, Cooley, and Long Kills, along with their adjoining riparian habitats, is among the most defining characteristic of the Dwaas Kill Nature Preserve. As such, understanding the Preserve's water resources is essential to understanding how its ecology might become impaired as a result of site-specific and upland management decisions. The presence of native eastern brook trout places added incentive to develop a body of knowledge that will enhance the effective management of the Preserve.



Ecologists divide watersheds and landscapes into four basic components: matrix, patch, corridor, and mosaics.

- **Matrix** is the land cover type that is dominant and interconnected over the majority of any distinct land surface (e.g. forest, agriculture, urban).
- **Patch** is a smaller, isolated nonlinear polygon area less abundant than and different from matrix
- **Corridor** is a linear or elongated patch that links other patches in the matrix (e.g. forested riparian zone).
- **Mosaic** is a collection of patches, none of which are dominant enough to be interconnected through the landscape.

Watersheds are areas that not only drain water to a common outlet, but drain sediment and dissolved materials, minerals, organisms, and energy as well. Through this process, biomass moves throughout these ecological components, simultaneously interfacing with surface and subsurface water resources. This exchange fluctuates as water levels vary with the seasons.

As water flows downstream, increases and decreases in velocities and transitions from groundwater to surface water can be explained – in part – by local differences in impervious surfaces, slope, soils types, and vegetative cover as found along a stream's "longitudinal profile." The longitudinal profile of any given stream can be divided into three zones: headwaters, transfer, and depositional zones.

- **Headwaters** streams are often defined by swift waters and steeper slopes, deep v-shaped valleys, and turbulent flows (rapids).
- **Transfer zone** is an area where lower-elevation streams merge, velocity begins to decrease, and channel width increases. As the stream(s) begins to meander, there is an increase in sinuosity (frequency of bends in a stream).
- **Depositional zone** is an area that is defined by higher sinuosity, and increased water volumes, channel width, and depth. As it reaches its terminus, the stream promotes deltafication by depositing up-river sediments at its confluence.

The cross-section or "lateral" characteristics of a particular stream section (i.e., stream channel, floodplain, and riparian habitat composition) are very much influenced by the zone in which the stream section is located. For example, stream velocity, channel size, discharge regime, and riparian/upland ecology are a function of such characteristics.

The Dwaas Kill Nature Preserve can be described as a "patch" of several ecological communities, which is located within an urban/suburban "matrix." The Preserve can also be described as an area that falls within the transfer and/or depositional zones of the Dwaas Kill. Therefore, management of the Preserve's streams and riparian habitats will be an exercise in understanding both these lateral and longitudinal characteristics. In order to develop such an understanding, the following are the necessary subjects for analysis:

Hydrologic Processes

How fast, how much, how deep, how often, and when water flows are important basic questions that are necessary to answer in order to make effective management decisions. As it was previously noted, modeling Steam flow, peak discharge rates, and flood levels are essential to identifying specific trial locations. In addition, they are needed to fully understand the hydrological cycles that influence the Preserve's ecological functions.

Geomorphic Processes

Successful stream and riparian management, whether active (direct intervention) or passive (removal of disturbances), depends on how water and sediment are related to the formation and function of the steam. Because the size, shape, and profile of a stream naturally evolves over time, it is important to determine whether the alteration to a stream is part of a natural process, and therefore desirable, or the consequence of a local disturbance. A "geomorphic assessment" generally includes the gathering of historic and/or comparable site data, conducting a streamside field investigation and a channel/bank stability assessment, and examining the influences of current or historical hydrologic alterations.

Chemical Characteristics

While the quality of the water at the Preserve is more likely influenced by upland land uses, the water quality monitoring and assessment opportunities that the Preserve offers are significant. Assessing the water chemistry in a stream is not only a way to determine if management strategies are effective, but is a necessary step in determining which management strategies to adopt in the first place. Preliminary analysis should focus on parameters that integrate or serve as indicators for a variety of other higher order variables. For example, pH and turbidity levels, dissolved oxygen and temperature measurements integrate the net impact of many physical and chemical processes within a stream. Equally important is where and how often such information is collected. Finally, sample preservation, handling, storage, analysis, and data management protocols are needed for quality assurance and control of all chemical analyses.

Biological Characteristics

A prerequisite to successful Ecosystem Based Management is an understanding of the biological components of the system along with the physical and chemical processes that influence the Preserve's biological characteristics. Resident fish, wildlife, and plant communities, transient wildlife, and human visitors to the Dwaas Kill Nature Preserve are key elements to consider, not only in terms of securing populations or species diversity, but also in terms of a more concerted focus for enhancement restoration, or management efforts. Prior to making and/or implementing any management

decisions, it is important to conduct a systematic stream assessment using accepted protocol to evaluate stream and riparian habitat conditions. The following indicators should be examined: riparian composition, water appearance, nutrient enrichment levels, in-stream fish cover, barriers to fish movement, pools, insect/invertebrate habitats, canopy cover, water temperature, salinity, and macroinvertebrate populations. Because macroinvertebrates or non-fish species are a useful indicator of stream health and water quality, a streamside biosurvey should be conducted as well. The method gathers, sorts, and counts macroinvertebrates present in a sampling area and rates stream health based upon the abundance and distribution of species.

APPENDIX D

Summary of Public Comments at Two Public Workshops

Public Workshop #1
Meeting Summary

Public Workshop Date: September 25, 2008

Meeting Summary by: Susan Boyer, The Chazen Companies

Next Public Workshop: November 13, 2008, 7:00 PM, Jonesville Fire Department

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Scott Hughes opened the workshop with an introductory presentation. Jennifer Viggiani presented the history of how the town acquired the property and why it is a special place. John Scavo discussed the process and schedule for the project. Susan Boyer of the Chazen Companies presented the results of the field studies and Stan Duncan of Trout Unlimited discussed the importance of the Eastern Brook Trout habitat within the Dwaas Kill and its tributaries. Paul Cummings of the Chazen Companies discussed the importance of the Preserve in the context of the larger watershed in which it is located and its role in protecting water quality.

Following the presentation, workshop participants broke out into small groups of 4 – 8 people and discussed ideas for the future of the preserve and marked up working maps with their ideas. At the end of the session, each group presented their ideas to the larger group.

A summary of the results of the workshop is provided below:

What areas should be protected?

1. Watersheds, streams, steep hills
2. Preserve the entire site with minimal or no paved trails; Use existing paths
3. Do not create new paths
4. Use natural trails only
5. Keep people and preserve users away from sensitive areas

6. Locate trails away from wetlands and between railroad tracks and wetlands near the north end of the preserve
7. Wooded areas – maintain & preserve
8. Water quality & flood prevention – clean up water; reduce silt
9. Pockets for hiking, biking, fishing
10. Establish gravel beds in streams
11. Decrease brown trout stocking / increase brook trout stocking
12. Quality, minimal disturbance trail network built off what already exists
13. Streams, improve water quality, retain nature of the land now

What are the most important features or points in the preserve to create access to?

1. Hills, streams, fields, wetlands, sewer trunk trails, points where Dwaaskill meets Cooley and Long Kill
2. Preserve environment, improve water quality, and promote brook trout spawning.
3. Pierce to Plank trail thru to Dwaaskill Neighborhood Park to Kinns Park.
4. Wet Meadow
5. Would like to bring people to where the streams meet

What activities would be compatible with the Preserve?

1. Hiking, biking, fishing, field trips, winter activities (cross country skiing, snowshoeing)
2. Make parts of the preserve an educational site by working with the school system
3. Fishing
4. Wildlife viewing
5. Education
6. Loosestrife eradication initiative
7. Mountain Biking
8. Use majority of parcel with trail system – even steep and high spots
9. Don't want to shy away from having trails on steep areas – that is where you get nice views
10. Discussed multiple uses and designing trails that don't overlap – some just for biking, some for hiking: 'single track concept'
11. leashed dogs in park, want to see uses similar to Visher's Ferry park; want mountain biking to be allowed on dirt trails similar to Moreau State Park

What improvements should be made?

1. A trail on the sewer path
2. A trail that loops around the whole site
3. Brook trout habitat to increase spawning
4. Fishing Lean-to
5. Signs with rules
6. Maps and kiosks
7. Trail rules – limited bicycle access
8. Designate the different trails with difficulty or ease levels / color code
9. Trail Map Bulletin Board
10. Remove trash / re-vegetate what is eroded
11. Benches at trail heads
12. Boardwalks in handicapped access areas near Plank to view birds, etc. in wetlands
13. Possibly another boardwalk on northern part of the site
14. Signs that explain the environmental features of the site.
15. Want access/entrances closest to where the main features are so people don't have to walk too far
16. Small loop for ADA near parking area

What should be prohibited?

1. Motorized vehicles of any type
2. Mountain bikes
3. Buildings on the site
4. Picnic tables
5. Trail bikes (especially motorized),
6. Dogs, even on leash
7. Impervious surfaces, except for parking areas
8. Hunting
9. Large scale recreation
10. Skateboards
11. Ballfields
12. Camping

Access:

1. Don't want entrances close to homes
2. Possible entrance near Plank Road
3. Potential parking and entrance at Pierce Road and at Town Owned parcel on Kinns Road (water treatment plant parcel)
4. Want to have a place to park a bus for school visits
5. Consider Pierce Road Parking Area

Other concerns:

1. Repair the culvert at Bear Brook and Bruno– inadequate – repair/replace, improve water flow.
2. Improve water quality for flow
3. User education
4. That the Town Board work with private owners to support town initiative and protect private property
5. Town should look out for development projects that can impact the watershed in the preserve
6. Make access to the preserve trails season dependent
7. Explore grants
8. The Town has made positive efforts to delineate private property boundaries. It is a constant worry without more developed safeguards or other ideas.
9. Make it easy to get to and do education
10. Want a central gathering place for classes/education
11. Delineate private property boundaries; develop a formal way to distinguish private vs. public; solve in a positive manner

Conflicting ideas:

1. **Trails** – some groups do not want to create new trails; others do.

2. **Mountain bikes** – some groups want to allow mountain bikes, others do not.

3. **Sensitive areas** – some groups want to bring people to sensitive areas (e.g. confluence of three streams); others do not want to bring people to these areas.

4. **Dogs** – some groups want to allow leashed dogs; others do not want dogs at all.

5. **Steep Slopes** – some groups are in favor of developing trails on steep slopes / high points; others do not want trails on steep slopes.

6. **Pavement** – some groups want a small loop for ADA / handicap access; other groups do not want any pavement or impervious surfaces in the preserve, except for parking.

Public Workshop #2
Meeting Summary

Public Workshop Date: November 13, 2008

Meeting summary by: Susan Boyer, The Chazen Companies

Next Work Group Meeting: December 1, 2008

Jim Romano and David Miller, co-chairs of the Open Space Trails and Riverfront Committee, opened the workshop welcoming the participants. Susan Boyer and Paul Cummings of the Chazen Companies conducted an hour long presentation that covered:

- a review of the material introduced in workshop #1
- a compilation of public comments from workshop #1
- the working group decisions since the 1st workshop
- elements and features of the draft concept plan and management plan

Following the presentation, Susan and Paul led a fifty minute group discussion that allowed all participants to voice questions and comments. Some participants turned in written comments on the handout that was provided. Jennifer Viggiani concluded the workshop, thanking the participants and explaining the next steps for the project. The workshop officially concluded at 9:00 p.m. However, many participants stayed to look closer at the concept plan and vignettes, talk to town leaders and TCC consultants. The building was vacated at 10:00 p.m.

Public Comments

Verbal Comments

Following is a summary of the public comments made during the discussion period:

- Have you ranked the parking area access points?
- Have you identified sensitive areas?
- It makes sense to stage the development of the preserve—build on what is there—start with the trail from Pierce to the ATV disturbed area first.
- Sensitive areas vs. education—mention the sensitive areas but not where.
- It's possible to introduce people to sensitive places carefully.
- Dogs disturb wildlife even if they are on a leash—they know the dogs are there.
- Consider pamphlets for education rather than expensive signage.
- Create an education classroom close to the parking area that includes benches where rules, safety and other information can be given to children before they enter the Preserve.
- Look at making connections to Van Patten and Ushers Road trails.
- A runner commented that he likes the idea of loop trails.
- Likes the idea of bridges and getting close to the streams—especially to see the fish.
- An idea for educational opportunity—leave a portion of the disturbed land in the ATV section as is and restore the rest. This would demonstrate the damage humans can do and especially ATVs.
- What happens as the Van Patten area gets developed? How does it affect the value of the northern trail?
- There was a brief discussion about how to limit access to the Preserve from the north. One suggestion was a fence. Jim Romano discussed policing and fining ATV activity as way to discourage it. Paul Cummings introduced the idea of Integrated Access Management. Paul Cummings also noted that the more people who use the Preserve a greater level of "communal policing" will take place – thereby discouraging inappropriate behavior. A community spirit is built around doing the right thing.
- How will the County sewer trail be maintained in the future? Jen Viggiani talked about the need for the Town to form a closer relationship with the County around this issue.
- Should we leave a portion of the ATV area intact to reminder everyone of their impacts?
- What about incorporating volunteers and/or preserve stewards in research and management efforts?

- Don't wait until a feature will be constructed to assess the habitat.
- How will private property be treated?
- Are there rare species in the ATV area? There are portions of Karner Blue Butterfly habitat in the surrounding areas of Clifton Park. Do we create a habitat here? Is it possible that the sandy banks are now or in the past were Karner Blue habitat?
- There needs to be a holistic approach to biological assessment. Such information needs to be obtained before trail design and construction.
- Frank Berlin mentioned the history of the site—the sand was used as modeling sand as far back as the Civil War. The cultural history of the site could be used as part of the education of the area.
- Jen Viggiani talked about looking for partners at local universities to assist with research and someone else mentioned DEC interns.

Written Responses

Following is a summary of the written comments received from the public.

The Preserve

Is enough of the Preserve protected and undisturbed?

(2) yes

Is enough of the Preserve accessible for education and recreation?

(1) yes, (1) no—need more trails to the interior.

Proposed Parking

Is enough parking provided? Too much?

Not enough—kind of dangerous and too close to road on Pierce.

Please be certain that there is safe off the road access for children.

Is the proposed parking in the right locations?

(2) yes—Also, consider an extreme west lot by the railway underpass.

Proposed Trails

Do the proposed trails reach and traverse the appropriate habitats and parts of the Preserve for education? For recreation?

(3) yes—Also, consider south side of river from water tower road down to Plank road.

Maybe some side loop trails if possible.

Are the proposed trails of the right type (unpaved footpaths and boardwalks)?

(3) yes.

Would additional trails be beneficial? Harmful?

Additional trails would be beneficial with careful planning.

Proposed Trailheads

Are the trailheads in the right locations?

(3) yes—Consider an extreme west location. Kinns Road will be a challenge to get right.

Are the right elements included at the trailheads?

No responses.

Proposed ATV Restoration

Should the disturbed area be restored and maintained as a meadow for educational purposes or restored as a woodland?

Restore as a meadow—more diverse habitat.

Is this an appropriate location in the Preserve for a pavilion/gathering place?

This could be a nice place for a pavilion—but one is needed closer to the trailhead for education.

Other comments about the restoration area?

The disturbed area should remain as a meadow—the more diverse the habitat the better for educational purposes.

Possible Karner Blue habitat.

Proposed Observation Tower

Is this an appropriate structure for the Preserve?

(2) yes

Other thoughts about accessing the wet meadow?

Seasonal with bridge.

Handicap ADA access would be difficult.

This is a great idea! Go for it.

Other comments or concerns with the Concept or Management Plan?

17. I am very impressed with the work and planning. I had no idea this much planning and thought was involved. Tonight was inspiring.

18. I was surprised that there was no preferred trail near the bridge where fishermen already park and walk the "trail" to the sewer trail to fish. It is already in use now.
19. Building Carlton Road trail (Skunk Hollow trail to the Van Patten trail). Building extension of the Kinns Road trail to Plank Road. One can build to Castle Pines
20. Consider as part of the restoring the "disturbed area" grading into the slope a small "amphitheater" suitable for outdoor classrooms. Stone dust trail to this point then natural trails to Long Kill ravine overlook and "toe seeps" (east and west). Also possible Karner blue habitat creation potential in this area?
21. At certain points could GPS location markers be installed for students to find? Mostly on the trails to keep people on the trails.
22. Protect all water that enters the Dwaas Kill. No canoes, no cutting of trees in stream.
23. No bikes—there are many miles to bike in town. Foot traffic only.
24. Support loop concept, soft trails for running and cross country skiing. A trail going gradually or zig zagging up a steeper slope. Stay away from stairs unless they are very shallow.
25. A bridge crossing by Plank Road. A bridge crossing by the west edge to link up with Kinns Road.
26. Support some mowing to keep the stinging nettles down in the summer.
27. Trailheads are loop—think about one on the extreme west to hook up with areas to the north.
28. The working group's solutions to the "conflicting ideas" are very thoughtful. The presentation is exciting and the educational opportunities are amazing K-12.
29. The goals: Quiet reflection & recreation, stream health and living classroom are great!
30. No dogs please!
31. Off beat idea—What happens to nearly buried early 1960's chevy auto? Can that or another similar human left item remain as an educational example of how humans degrade the natural environment?

Your Vision Statements for the Preserve:

1. A natural site of a combination of uplands, wetlands, natural reservoirs that need to be preserved to maintain the brook trout habitat of Bear Brook, the Long Kill and the Dwaas Kill.
2. A natural area that is close to neighborhoods—a "wilderness" close to home!
3. A place for study and observation.
4. A place to enjoy the trails, the rivers and the changing seasons. A place to wander for hours, stopping to reflect on the beauty of the moment. (Thanks, you guys are doing a great job.)
5. I liked the third vision statement that was shown tonight.

APPENDIX E

Hudsonia, “Biological Assessment of the Dwaas Kill Natural Area” (1997)

Hudsonia

a non-profit institute

Biological Assessment of the Dwaas Kill Natural Area, Town of Clifton Park, Saratoga County, New York

Report to the Saratoga Land Conservancy

by Spider Barbour, Erik Kiviat and Robert E. Schmidt

Hudsonia Ltd.

Bard College Field Station, Annandale NY 12504

29 September 1997

Table of Contents

Abstract

At the request of the Saratoga Land Conservancy, Hudsonia conducted a biological assessment of the Dwaas Kill Natural Area (DKNA) in the Town of Clifton Park, Saratoga County, New York. The DKNA has been approved by the Region 5 Open Space Committee for inclusion in the New York State Open Space Plan, and comprises approximately 200 ha (500 acres) of streams, wooded and herbaceous wetlands, upland forests, and non-wooded upland habitats. A large contiguous area is free of structures and improved roads. We found two plants listed as rare in New York by the New York Natural Heritage Program, Schreber's aster and false hop sedge. We also found two regionally-rare species, false mermaid (a plant) and sedge skipper (a butterfly). These four rarities are associated with the wetlands, floodplains, and streams. Other rare plants and animals are potentially present. The lowlands (wooded and herbaceous wetlands, riparian areas and floodplains) are the most significant portions of the DKNA; the upland areas constitute a buffer zone that protects and enhances the lowland areas. The fish fauna of the Dwaas Kill stream system suggests good water quality. The greatest importance of the DKNA is its large size, abundance of habitats for common and uncommon species, and lack of fragmentation close to a major urban-industrial area. We recommend that the DKNA be protected from fragmentation, off-road vehicles, dumping, water pollution, and soil disturbance.

Introduction

At the request of the Saratoga Land Conservancy (SLC), we conducted a biological assessment of the Dwaas Kill natural area (DKNA) in the Town of Clifton Park, Saratoga County, New York (U.S. Geological Survey Round Lake and Niskayuna topographic map sheets). The DKNA is a complex of aquatic, wetland, and upland habitats associated with the middle reaches of the Dwaas Kill stream system, west of the Adirondack Northway 27 km north of Albany. In July 1997, the Dwaas Kill Natural Area was approved by the Region 5 Open Space Committee for inclusion in the New York State Open Space Plan. The Plan encourages recreational, educational, and wildlife enhancement throughout the state for the benefit of future generations. The SLC desires to preserve open space and biological resources in the DKNA by conservation easements or other means. Our study was undertaken to provide information concerning the biological resources, threats to these resources, and ways of conserving and protecting the natural character of the area.

We conducted field work as follows:

-Initial reconnaissance by Erik Kiviat, in part accompanied by Penny Vaillancourt (SLC), 11 September 1996

-Plant community and flora survey by Spider Barbour, 1-2 October 1996

-Additional flora survey and a butterfly survey by Barbour, 7 July (part of day) and 6 August (part of day), 1997

-Fish survey by Robert E. Schmidt, 11 October 1996

During our field work (as early in the season as receipt of our contract allowed), the weather was warm to cool, occasionally windy, and without significant rainfall. Summer 1996 was wet and water levels in the streams and wetlands were presumably somewhat higher than normal in September and October. There was a protracted drought in summer 1997 which may have resulted in some plants and animals not being visible at the dates of survey work.

Barbour and Schmidt wrote the sections of the report on plant communities and fish, respectively, and Barbour contributed to the Habitat and Discussion sections. Kiviat wrote the other sections and edited the report. Barbour prepared the plant list (Appendix) which was edited by Gretchen Stevens. A variety of information was provided by Penny Vaillancourt and others of the Saratoga Land Conservancy and the Town of Clifton Park. Frank Murphy (personal communication to P. Vaillancourt) provided records and comments on birds.

Hudsonia Ltd. is a non-advocacy, nonprofit, scientific research and education institute based at the Bard College Field Station in Dutchess County, New York. Hudsonia does not support or oppose economic development projects, but conducts scientific studies to collect and analyze data and make recommendations for environmentally sound land management. These findings are provided impartially to those persons and organizations involved in public decision making. Hudsonia's ability to do complete biological and ecological studies may be limited by season, funding, or other factors. Although Hudsonia's studies are usually biological and ecological in focus, our observations, analyses and recommendations may range into other subject areas as determined by the site, its resources, and the potential environmental impacts upon these resources.

Metric units of measurement are used in this report. English equivalents are:

1 cm (centimeter)	= 0.39 inch
1 m (meter)	= 3.28 feet
1 km (kilometer)	= 0.62 mile
1 ha (hectare)	= 2.47 acres

Environmental Setting

The general vicinity of the DKNA (Figure 1) is underlain by shale, argillite, and siltstone. Bedrock is extensively exposed in the Cooley Kill below Route 146a. Soils are clayey in the bed of the Dwaas Kill in the central area, silty and mucky in the wetlands, and sandy on the uplands. Fill material along the sewer road (Figure 1) may have been excavated from borrow pits along the road or imported from offsite.

The mainstem of the Dwaas Kill rises in wetlands northwest of Groom Corners about 4 km southwest of the DKNA. The Dwaas Kill flows into the Anthony Kill about 3 km northeast of the DKNA, and the Anthony Kill flows into the Hudson River at Mechanicville about 8 km east of the DKNA. Elevations along the Dwaas Kill mainstem range from 100 m at the headwaters to 49 m at its junction with the Anthony Kill. The DKNA itself has elevations of ca 63-91 m.

The DKNA covers about 200 ha (500 acres) overall. The DKNA comprises a large "core area" generally south of the Boston-Delaware Railroad and north of Kinns Road, and corridors along the upper Dwaas Kill (south) and its tributary the Cooley Kill (west). Kinns Road, Bruno Road, Pierce Road, Carlton Road, Route 146a, and the Boston-Delaware Railroad border or cross the DKNA. A sewer line and access road ("sewer road") runs approximately northeast-southwest through the southern portion of the core area, paralleling the Dwaas Kill mainstem. The DKNA is relatively undisturbed and fairly well-buffered by natural or semi-natural soils and vegetation, even though the surrounding area is moderately developed (low to medium density residential).

Plant Communities

by Spider Barbour

I spent two days (1 and 2 October, 1996) at the Dwaas Kill site examining wetland and upland communities, and searching for rare plants and animals. The weather on 1 October (0920-1710 h) was clear, with a moderate wind and a temperature of 18-22 C; 2 October (0910-1720 h) was mostly cloudy and occasionally gusty, with a temperature of 15-18 C. On 1 October I surveyed wetlands and uplands north of Kinns Road between the Cooley Kill and the Dwaas Kill and along the Dwaas Kill south of Kinns Road, and on 2 October, wetlands and uplands north of Cooley Kill and along the Dwaas Kill east of the Cooley Kill mouth, including the northeast corner east of the Long Kill near Pierce Road.

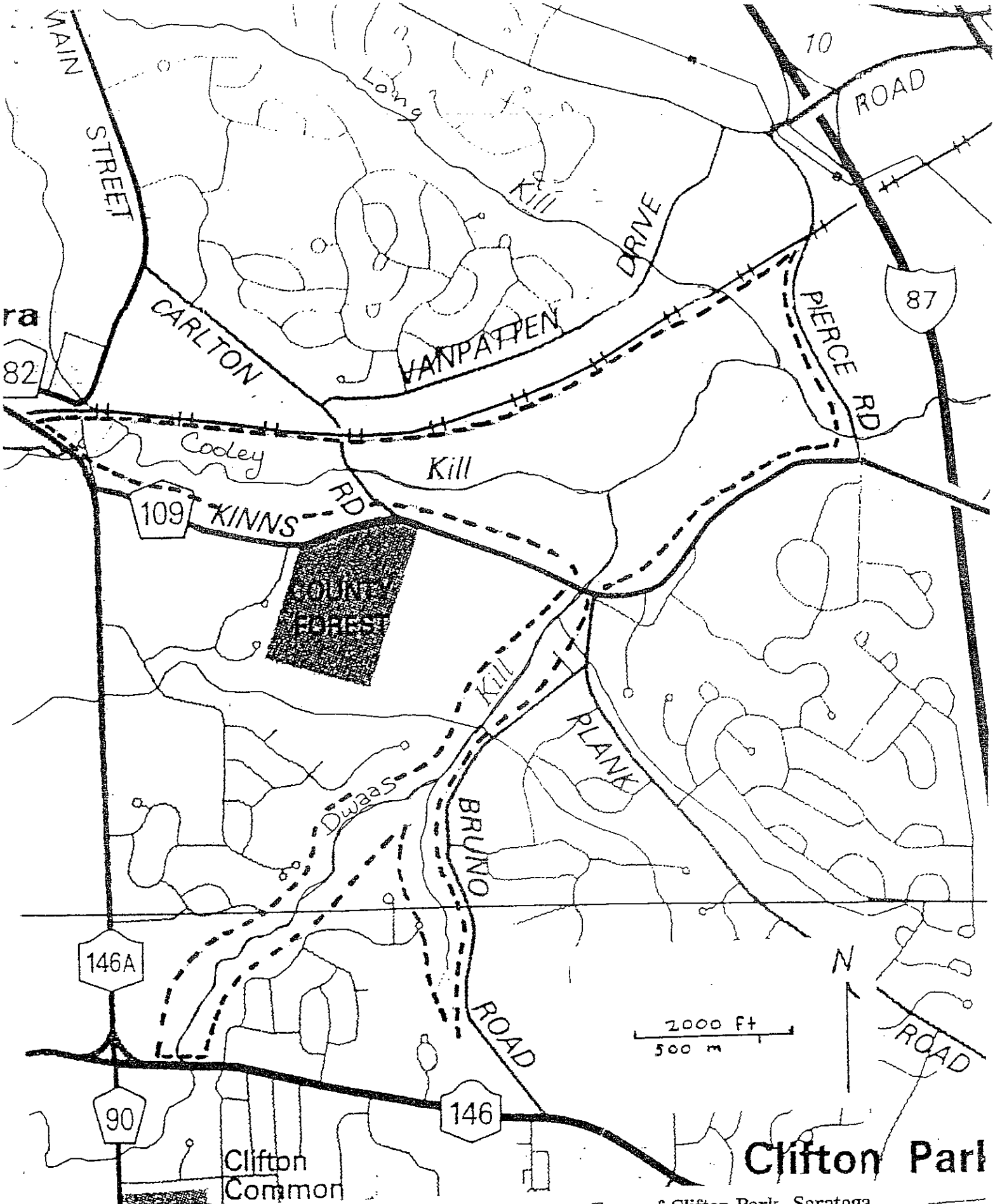

Figure 1. Map of the Dwaas Kill Natural Area, Town of Clifton Park, Saratoga County, New York. Dashed line indicates Natural Area boundary. (Map provided by the Saratoga Land Conservancy.)

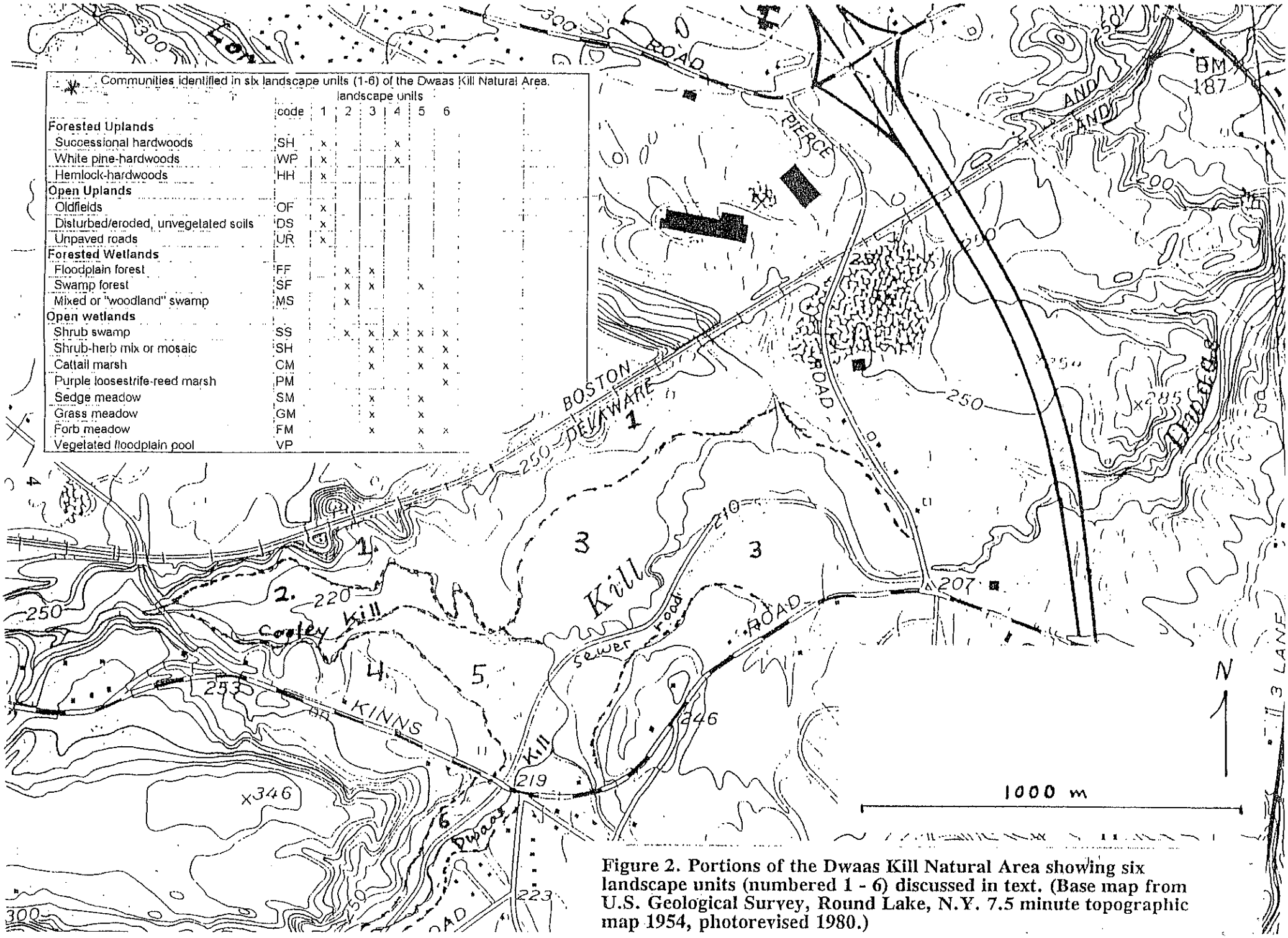

Figure 2. Portions of the Dwaas Kill Natural Area showing six landscape units (numbered 1 - 6) discussed in text. (Base map from U.S. Geological Survey, Round Lake, N.Y. 7.5 minute topographic map 1954, photorevised 1980.)

Figure 2 shows the locations of six "landscape units" numbered 1 through 6 (north to south, west to east), with a list of the major wetland and upland plant communities of each landscape unit. The landscape units are:

1. Cooley Kill Uplands (south of Boston-Delaware RR, north of Cooley Kill Wetlands)

2. North Cooley Kill Wetlands (slope toe seeps and floodplain wetlands west of upland lobe ca 100 m west of Cooley Kill - Dwaas Kill confluence)

3. North Dwaas Kill Wetlands (mostly floodplain forest and wetlands north of Dwaas Kill and mostly east of Cooley Kill)

4. South Cooley Kill Uplands (south of Cooley Kill, north of Kinns Road, west of Dwaas Kill)

5. South Cooley Kill Wetlands (wetlands south of Cooley Kill and north to east of Cooley Kill Uplands, west of Dwaas Kill, and north of Kinns Road)

6. South Dwaas Kill Wetlands (Dwaas Kill floodplain south of Kinns Road).

In the following community descriptions, plant species listed are common or dominant; state-rare and regionally-rare plants are discussed separately. The plant list (Table 3, at end of report) includes all plant species observed on the site during the survey, but is not a complete list, because many spring- and summer-fruiting plant species were not recognizable or even visible at the time of the survey.

Successional Hardwoods

Topography in areas with successional hardwoods was characterized by steep to moderate slopes, with few level areas except in the South Cooley Kill Uplands. Soils were mostly sand, sandy loam, and silt loam. Vegetation was early to mid-succession, with few large trees, and many young to mid-sized trees of common species. The forest of North Cooley Kill Uplands was mostly conifer-hardwood (see below), but with patches of pure hardwoods in certain areas. On upper bluffs along the railroad tracks was a dry-to-mesic forest of red oak, scarlet oak, black oak, white oak, red maple, white ash, quaking aspen and bigtooth aspen. On slopes just below the bluffs was a mesophytic forest of sugar maple, red oak and black birch with witch-hazel and American hazel shrubs, and an herbaceous layer dominated by marginal woodfern. Steep ravines had red maple and slippery elm with cinnamon fern and wild sarsaparilla.

South Cooley Kill Uplands had young (10-25 cm diameter-at-breast-height [dbh]) red maple, sugar maple, black oak, red oak, white ash, black cherry, gray birch, American beech, and shagbark hickory with a tall shrub layer of American hornbeam, American hazel and tree saplings in the understory. Herbs included woodland sedges (*Carex blanda, C. digitalis*, others), bracken, Christmas fern, wild sarsaparilla, white wood aster, rattlesnake-plantain, Indian cucumber-root and partridgeberry. The east end of this section had a blend of successional hardwoods and disturbed wetlands. Layers were poorly defined, with trees, shrubs and tall herbs distributed irregularly. Common species included eastern cottonwood, slippery elm, black locust, speckled alder, saplings of silver maple and white ash, silky dogwood, Bell's honeysuckle, purple loosestrife, phragmites, Canada goldenrod, New York aster, calico aster and other tall herbs.

White Pine-Hardwood

This was a secondary community of the narrow bluff along the railroad, with mostly young white pines mixed with oaks, red maple and poplars. Variations included patches with dense pine and poplar saplings; older mid-slope forests with sugar maple, red oak, poplars and black birch; and a few patches of pine-hemlock-hardwood forest on the lower slopes adjacent to the Cooley Kill Wetlands.

Hemlock-Hardwood

Hemlock forests occurred in ravines and on the toe slopes below the railroad bluffs. The most common hardwoods on the toe slopes were red maple and white ash, and in the ravines, white oak, sugar maple, black birch and American beech. Hemlock-hardwood forests occurred as well in the upper floodplains of the Cooley Kill and Dwaas Kill on patches of higher ground, with red maple and yellow birch.

Open Lands

There were a few open-land (i.e. non-wooded) areas in the east end of the North Cooley Kill Uplands, consisting of oldfields, patches of disturbed and eroded, bare soils, and at least two intersecting unpaved roads. The two largest oldfields covered perhaps 0.2 ha each. Both had abundant little bluestem and sheep sorrel, and one had scouring rush; both fields had scattered sweetfern and dewberry (*Rubus hispidus*) shrubs. Two small areas between the railroad and the oldfields appeared to have been denuded by off-road vehicle (ORV) activity; the soil was sandy, dry and eroding downslope. I followed two intersecting dirt roads leading from the disturbed area through young forests and across the Long Kill near a patch of floodplain forest. The wheel ruts were mostly unvegetated, but road centers and edges had common herbs, mostly grasses.

Floodplain Forest

Floodplain forests were extensive in the east end of the North Cooley Kill Wetlands area, and the North Dwaas Kill Wetlands area contiguous to its east (see Figure 2). Soils of these forests were sandy to silty loams. Vegetation in most places consisted of mostly medium-sized (20-40 cm dbh) trees, and a few in the 50-60 cm dbh range (60-90% canopy cover). The commonest trees were red maple, sugar maple, red ash and black ash. Most areas had an understory of low trees (mostly American hornbeam and young trees of the common canopy species), and tall shrubs (mostly spicebush, but also poison sumac, silky dogwood and gray dogwood). Low shrubs were few, the most common being black-raspberry in less-shaded patches. Herbs were abundant, a diverse mixture of hydrophytes and mesophytes, including wood fern, crested fern, sensitive fern, wild licorice, zigzag goldenrod, Schreber's aster, richweed, honewort, and common white avens. The best example of this community was on the north side of the Dwaas Kill about 500 meters east of the Cooley Kill convergence.

Swamp Forest (greater than 50% tree canopy)

Distinguished from floodplain forest by its different hydrology (groundwater, not floodwater, and more consistently wet) and other features (more hummocky topography, greater herbaceous diversity), swamp forests occurred in the North and South Cooley Kill and the north Dwaas Kill wetland areas. Swamp forest soils differed from those of floodplain forest, ranging from fine silt to muck. Canopy trees (red maple, red ash, black ash, slippery elm, hemlock) were mostly in 15-35 cm dbh range; tall shrubs were the same species common in floodplain forests; herb layers of swamps had cinnamon fern, intermediate woodfern, and more sedges than floodplain forests, especially brome sedge (*Carex bromoides*) and scaly sedge (*Carex scabrata*). The distribution of this community was scattered and patchy, most often occurring at wetland-upland transitions. The best example was a ca 1 ha (2-3 acre) patch of hemlock-hardwood swamp north of the Dwaas Kill along the Long Kill, the only location on the site having goldthread and corn lily.

Shrub Swamp

This widely scattered community type occurred mostly in the large, central wetland area south and east of the Long Kill debouch, and was associated closely with toe slope springs, slow flood overwash, and periodically high water tables (as judged from water and land features visible at survey time). The fine silt and muck soils were essentially the same as those of swamp forest. Vegetation varied from nearly pure alder (*Alnus incana*), often dense, to nearly pure crack willow, typically patchy with intervening marsh or meadow. Other shrub swamp areas were composed of mixes of alder, willow, silky dogwood or (rarely) buttonbush. Thickets of 70-95% alder cover appeared to admit only spring-blooming, summer-shade-tolerant herbs, which were detectable, some

even identifiable even at the late date of the survey, perhaps because of the prevailingly cool conditions. Many early-blooming sedges were present, but unidentifiable, the fruit having shattered and scattered earlier in the season. Some of these may have been rare species. The only two recognizable forbs were miterwort and wild ginger, but probably there were others that had died back by survey time. A variant of shrub swamp was a patchy mix of shrubs and tall forbs. Good examples of shrub swamp included a 0.7-acre alder swamp about 600 meters east of Carlton Road on the south side of the Cooley Kill; a willow-dogwood shrub swamp east of the sewer line and west of the Dwaas Kill north of Kinns Road and patches of both along the Dwaas Kill south of Kinns Road

Mixed or "Woodland" Swamp (greater than 50% tree canopy)

An unusual wetland community in our experience was that found on broad toe slopes in the south end of the North Cooley Kill Wetlands area. Springs flow from the base of the steep slope south of the railroad and stream flooding probably also reaches this area. Here the soils were typically mucky, with local sand and clay deposits from the adjacent upland slopes. The vegetation was the type characterized by Reschke (1990) as woodland. The 30-40% canopy consisted of 10-25 cm dbh red maple, yellow birch, white pine and hemlock, mixed with 25-35% cover of tall shrubs (poison sumac, spicebush, alder, gray dogwood). The herb layer was very diverse, with no dominant species; cinnamon fern, marsh fern, tussock sedge, scaly sedge, other sedges, boneset, wild sarsaparilla, miterwort, spreading goldenrod, purple-stemmed aster, swamp thistle, American water pennywort and sphagnum moss were all fairly common. Probably many spring and early summer herbs were not visible at survey time. Although we found no rare plants during the survey, the exceptional diversity suggests a strong possibility of rare plants, especially sedges. This type of wetland was restricted to the lower toe slope just above the Cooley Kill flood plain (see map), and probably covered more than 2 ha (5 acres).

Cattail Marsh

Cattail marsh patches were all within 50-70 m of streams, in areas of slow stream overwash in times of flood and high water table. We did not examine soils in cattails, but they were probably silt and muck. Some patches had pure cattail or nearly so; in others cattail was mixed with phragmites, purple loosestrife, rice cutgrass or tussock sedge. Cattail marsh occurred mostly in the broad, open area around the Cooley Kill-Dwaas Kill confluence and south along the upper Dwaas Kill.

Purple Loosestrife - Phragmites Marsh (greater than 50% loosestrife or reed cover)

This community may be an artifact of the disturbance of areas with hydrology and soils that would ordinarily support cattail marsh and wet herbaceous meadow. Purple loosestrife or phragmites dominate, one or both exceeding all other herbs combined; these plants nearly always indicate past disturbance. Reed beds were frequent in 3, 5 and 6; loosestrife frequent in 6 only, mostly within 100 m of Kinns Road.

Wet Herbaceous Meadow Complex

Like cattail marsh, wet herbaceous meadows were associated with areas of slow stream overwash and perennially high water tables. Vegetation type varied with elevation and moisture. Grass meadow, which occurred in the wettest places, including slow, shallow streamlets, had almost pure rice cutgrass, cutgrass with water-pepper or sedges (unidentifiable without fruit), or reed-canary grass with a few other grasses and forbs, especially tearthumb. Sedge meadow, which occurred on slightly higher ground, had pure or dominating sedges (especially lake sedge and tussock sedge) mixed with other sedges, grasses and forbs, especially reed canary grass, spotted touch-me-not, tearthumb and sensitive fern. Higher areas (just moist at survey time) had mixtures of sedges, grasses and forbs (mixed meadow), or forb meadow: boneset, Joe-Pye-weed, blue vervain, rough goldenrod, virgin's bower and other mesophytic herbs mixed with hydrophytes. Some examples contained 10-30% cattail, purple loosestrife or phragmites. Patches of this community were found in all open wetland areas along the Cooley Kill and Dwaas Kill, especially in the large, open wetland complex immediately west of the sewer line route north of Kinns Road south of Cooley Kill. South of Kinns Road, this community was rare, and tending toward the more common

loosestrife-phragmites marsh. A variant of herbaceous meadow with scattered or patchy shrubs, usually willows, dogwoods or buttonbush occurred mostly in the west end of the South Cooley Kill Wetlands.

Vegetated Sluggish Stream Segments and Floodplain Pools

A few sections of the Cooley Kill had moderately deep, slow-flowing or nearly standing water, with submerged or floating-leaved plants. Soils appeared to be firm silt or muck, or clay. Herbs included curly pondweed, common water-weed, and duckweeds. The ponded section of the Dwaas Kill just south of Kinns Road could potentially support this type of vegetation, but at survey time this (no doubt artificial) pond, though it had some duckweed, was choked with algae.

The "floodplain pools" near the sewer road may be natural floodplain pools, borrow pits for construction of the sewer road, or depressions of another origin. Whatever the history of these habitats, they are diverse and provide important habitat and potential habitat for many animals and plants.

Fish Survey of the Dwaas Kill System

by Robert E. Schmidt

I visited the area on October 11, 1996. Following suggestions from other Hudsonia field scientists, I sampled six sites in the area to determine species composition of the fish fauna. Fishes were collected with either a pulsed DC backpack electroshocker or a 3 m seine, depending on the conditions at each site. The sampling sites were:

Site 1- Dwaas Kill upstream (south) of Route 146. The stream here is very small and shallow with a sand and silt bottom. Cobble is present adjacent to the highway underpass, clearly placed there during culvert construction. The land immediately surrounding the stream is marsh dominated by phragmites.

Site 2- Dwaas Kill upstream (south) of the Kinns Road bridge. The substrate here was sand and silt with depths exceeding 1 m. The stream course is highly modified by beaver activity although I did not see recent beaver sign.

Site 3- Dwaas Kill downstream (north) of the Kinns Road bridge at the sewer line crossing. The stream here is relatively unorganized, flowing through a wide grassy marsh. The substrate is sandy with gravel near the sewer line right of way.

Site 4- Cooley Kill upstream and downstream of Route 146A bridge. The substrate in this area is composed of a series of shale bedrock outcrops. Little sand and gravel are present.

Site 5- Cooley Kill downstream (east) of Carlton Road bridge. The substrate here is cobble and gravel with a little silt mixed in.

Site 6- Long Kill downstream (south) of the railroad overpass. The stream bed here is entirely sand. The steep banks on the floodplain margins are also sand.

In addition to the above sampling sites, I examined the Dwaas Kill at the Pierce Road bridge. The stream was too deep and wide for our sampling gear to be effective when we were there. I collected eight species of fish in this survey (Table 1).

In addition to my survey, the New York State Department of Environmental Conservation (DEC) Fisheries Unit (Region 5) also surveyed the Dwaas Kill in early June 1996. The DEC sampled the lower (downstream) end of the Dwaas Kill where the stream is much larger than the areas I examined. They collected fish at the Route 9 crossing (well downstream of my study area), Pierce Road bridge (where I was unable to sample), and at the Kinns Road bridge (my Site 2 - Table 1). The DEC reported 16 species in their survey compared to my 8. I would expect them to collect more species since larger streams generally contain more species of fish than small streams. Most of the species that the DEC observed (that I did not) are characteristic of larger or more rocky streams than

I examined: American eel (*Anguilla rostrata*), cutlips minnow (*Exoglossum maxillingua*), common shiner (*Luxilus cornutus*), longnose dace (*Rhinichthys cataractae*), fallfish (*Semotilus corporalis*), brown bullhead (*Ameiurus nebulosus*), and rock bass (*Ambloplites rupestris*).

The DEC reported two species that raise some questions. They listed collecting chain pickerel (*Esox niger*) while all the pickerel I saw were the smaller redfin pickerel. Both species could be present. The DEC reported sand shiners (*Notropis ludibundus = stramineus*) from all sites they sampled including the Kinns Road bridge area. This species was not listed from this area of the state by C.L. Smith in his "Inland Fishes of New York," the closest record being from the southern end of Lake Champlain. I collected a fathead minnow (Table 1) from the Kinns Road bridge site. I doubt the sand shiner identification and I suggest that small fathead minnows could be mistaken for sand shiners because they have similar fin ray counts which are used in most keys to identify minnows.

The presence of brook trout is interesting from the perspective that this species has great sport fishing value. I doubt that brook trout are spawning in the Dwaas Kill. I saw no suitable spawning habitat for this species (cold water with small gravel substrates). One of the DEC (Region 5) biologists suggested that these trout may be coming from Bear Brook where a large native population exists. Overall, except for the dubious record of sand shiners, neither survey found any fishes that are rare or unusual.

All species reported (except sand shiner) would be expected in the habitat and geographic locality sampled. Given the sandy or bedrock habitat I examined, the fish fauna appears to be healthy and diverse, thus indicating no major water quality problems.

Table 1. Fishes collected in the Dwaas Kill system, Clifton Park, New York, on 11 October 1996.

	Site				
Species	1	2	3	4	5
Fathead minnow (*Pimephales promelas*)		x			
Blacknose dace (*Rhinichthys atratulus*)				x	x
Creek chub (*Semotilus atromaculatus*)				x	x
White sucker (*Catostomus commersoni*)				x	x
Redfin pickerel (*Esox americanus*)		x	x	x	x
Brook trout (*Salvelinus fontinalis*)		x			
Pumpkinseed (*Lepomis gibbosus*)				x	
Tessellated darter (*Etheostoma olmstedi*)	x	x	x		x

Special Habitat Values for Wildlife and Plants

by Erik Kiviat

The areal extent, relatively unpolluted character, extent of wetland and riparian habitats, and absence of intense human disturbance in the DKNA make the area a *de facto* refuge for many kinds of plants and animals. For this report, "wildlife" includes mammals, birds, reptiles, amphibians, and selected insects. The DKNA offers enough potential or suitable habitat for uncommon or rare biota that we believe it would be worthwhile to conduct surveys of breeding birds, reptiles, amphibians, and plants in selected areas.

Plants such as great blue lobelia, golden-saxifrage, green-headed coneflower, ostrich fern, water-parsnip, mermaidweed, and American prickly-ash indicate that at least portions of the wetlands and riparian areas have mildly to perhaps moderately limy (calcareous) soils. Some of these plants are present along the sewer road and associated pools where sewer line construction may have unearthed or imported calcareous soil materials; however, native subsoils or bedrock may also be somewhat calcareous. Limy soils are favorable to many amphibians and reptiles as well as many rare plants.

The wetland complex and stream system support a substantial population of the northern leopard frog. This species is rare south of Albany and more common to the north. Leopard frogs need quiet perennial waters as well as associated floodplain, wetland, and low-lying upland habitats. Because of the requirement for a complex of habitats, we expect this species to be sensitive to development and habitat fragmentation.

The rich woodland swamp (see above) is an unusual wetland type in our experience, and has the potential to support rare plants.

The DKNA does not stand out as a highly unusual area biologically (e.g. an area with many rare species), but it definitely has at least regional significance for Saratoga County and the Capital District. In addition to the rare species we discovered, there is suitable habitat for a number of other uncommon and rare species of conservation concern in the region or the state.

Mammals

The DKNA could be an important area for bats. Riparian and wetland habitats are important bat foraging areas, and cavities in dead or partly-dead trees in the swamps and floodplains are likely to be used by species that roost in tree cavities.

River otter is likely in the deeper stream reaches, beaver ponds, and deeper wetland habitats. Mink is almost certainly present. Depending on the trapping pressure, the area seems sufficiently large and unpolluted to support at least one family of otter and a small mink population.

Birds

Great blue heron is not listed as rare in New York but there are few breeding colonies. We saw no evidence of nests in the DKNA, but swamps, riparian woods, and beaver ponds with scattered larger trees are suitable for rookeries. Because great blue heron is sensitive to human disturbance near its nests, if this species begins to breed at DKNA it may be prudent to close a portion of the natural area (e.g. within several hundred meters of the rookery) to human use from about April through June.

American bittern could use the herbaceous wetlands during migration and possibly for breeding, although Frank Murphy thinks breeding is unlikely.

Habitat is present in the beaver ponds, floodplain pools, and sluggish stream reaches for migrant American black ducks. There may be a few breeding pairs.

The DKNA has good habitat for migrant and breeding wood ducks (breeding was reported by Frank Murphy).

Northern harrier is very likely during fall migration, and is a potential breeder. The wet meadows, marshes, shrubby areas, and woodland openings appear suitable for harrier foraging and nesting. Frank Murphy does not consider this species a potential breeder.

Red-shouldered hawk is a potential breeder. The extensive tree swamps, quiet shallow waters, and abundant frogs may attract breeding red-shoulders.

American woodcock is unlisted but undergoing substantial long-term declines in the East. Abundant habitat for migrant and breeding woodcock is present.

Barred owl, unlisted, is a likely breeder in and around the swamps.

Eastern screech-owl, unlisted but vulnerable, could nest in tree cavities (e.g. constructed by northern flicker or pileated woodpecker) in the wetland-upland margins.

Eastern bluebird (state special concern) is a very likely breeder and probably nests in natural cavities in dead or stressed wetland trees. Swamp edges, wet meadows, riparian areas, upland openings, and residential yards are suitable foraging areas.

Sedge wren and marsh wren are potential breeders. There may not be extensive enough cattail stands for marsh wren to nest. Frank Murphy does not consider sedge wren a potential breeder, and considers marsh wren unlikely.

The DKNA provides substantial areas of nesting habitat for neotropical migrant songbirds, many of which are reported to be declining in North America. Among the species breeding at DKNA are great crested flycatcher, eastern wood pewee, wood thrush, veery, gray catbird, warbling vireo, ovenbird, yellow warbler, American redstart, common yellowthroat, scarlet tanager, northern (Baltimore) oriole, and rose-breasted grosbeak (Frank Murphy observations).

Breeding ruffed grouse, pileated woodpecker, and swamp sparrow are of at least local interest, according to Frank Murphy.

Reptiles and Amphibians

Wood turtle (listed as state special concern) is likely. Wood turtles require large complexes of good-quality sluggish stream and pond habitats with adjoining wooded and herbaceous floodplain and wetland habitats.

Spotted turtle (state special concern) is probably present. The numerous floodplain pools and beaver ponds appear quite suitable for this species.

Intermittent floodplain pools in a matrix of woodland appear suitable for breeding spotted salamander (state special concern; common but vulnerable to loss of habitat complexes).

Swamps and wet floodplains could support the blue-spotted salamander (state special concern).

Fishes

Based on the character of the habitats in the stream system, and the biogeographic position in the state, we would not expect to find any rare fishes in the DKNA.

Invertebrates

On 7 July 1997, Barbour conducted a butterfly survey, and he returned briefly 6 August 1997 to look for rare sedge-associated skippers. The butterfly surveys focused on the central wet meadows, the woodland swamp, and to a lesser extent the oldfields and railroad corridor. Thirteen butterfly species were recorded (Table 2). The drought of summer 1997 may have reduced the numbers of some species.

Barbour found at least four individuals of the sedge skipper (Dion skipper, a butterfly) in stands of its larval food plant, lakeside sedge, in the herbaceous wet meadows. Sedge skipper is not listed by the New York Natural Heritage Program but is rare in eastern New York and may be an indicator of good habitat quality in a calcareous sedge meadow. No records of sedge skipper near Saratoga County were shown in Shapiro (1974); the closest records are Broome County (Shapiro 1974) and Dutchess County (Barbour, personal observation).

Three other rare, sedge-feeding skippers could inhabit the central wet meadow complex: two-spotted skipper, black dash, and broad-winged skipper. Black dash New York Natural Heritage Program rank S2S3) is locally common in the lower Hudson Valley, but rare in the Hudson-Mohawk watershed. Lepidopterists recognize two subspecies of broad-winged skipper in New York (Shapiro 1974): inland broad-winged skipper (S3) and coastal broad-winged skipper (unlisted). The DKNA lies geographically between the ranges of the two subspecies, so occurrence of this butterfly at DKNA would be of great taxonomic and ecological significance. We expected to find inland broad-winged skipper because its larval food plant, lakeside sedge, is common in the wet meadows. Barbour's search for these three rare butterflies in summer 1997 was negative, however. Black dash, two-spotted skipper, and broad-winged skipper (subspecies unknown) have been found in counties adjoining Saratoga (Shapiro 1974).

Table 2. Butterflies observed by Spider Barbour on 7 July 1997.

Area 1: Cooley Kill Uplands (along railroad)	
Epargyreus clarus	silver-spotted skipper
Megisto cymela	little wood satyr
Atrytone logan	Delaware skipper
Satyrium calanus	banded hairstreak
Area 2a: Cooley Kill Woodland Swamp	
Megisto cymela	little wood satyr
Poanes massasoit	mulberry-wing
Satyrodes appalachia	Appalachian brown
Area 2b: Cooley Kill Marsh (east end of Area 2)	
Epargyreus clarus	silver-spotted skipper
Pieris rapae	cabbage butterfly
Area 3: Central Wetlands Complex	
Ancyloxypha numitor	least skipper
Danaus plexippus	monarch
Epargyreus clarus	silver-spotted skipper
Euphyes dion	sedge skipper
Euphyes vestris	dun skipper
Limenitis archippus	viceroy
Megisto cymela	little wood satyr
Epargyreus clarus	silver-spotted skipper
Polygonia comma	eastern comma
Polygonia interrogationis	question mark
Satyrium acadia	Acadian hairstreak
Satyrodes appalachia	Appalachian brown
Thymelicus lineola	European skipper

The Baltimore (butterfly) is a likely inhabitant of wet meadows, sewer road, and swamp openings where calcareous soils are present. Turtlehead, the host plant of the young larvae, is present at low density. Baltimore is unlisted but fairly rare in the Hudson Valley.

Plants

Plant surveys were conducted September-October 1996 and July-August 1997. On 7 July 1997, Barbour focused on the central wet meadow complex and the woodland swamp, and briefly visited oldfields and the railroad corridor. He found 14 plant species not recorded in fall 1996. The small number of additional species suggests that our coverage (see plant list, Table 3, at end) was good, presumably excepting a few early spring species that are not detectable in July and some small, inconspicuous, or very local plants that we simply did not find.

Barbour found half a dozen plants of Schreber's aster (*Aster schreberi*) on a wooded bank of the Cooley Kill. This aster is on the New York Natural Heritage Program Watch List (as of January 1996) and is ranked as G4 (apparently secure throughout its range) and S3 (rare in New York, between 21 and 100 extant sites). Schreber's aster is readily identified only around the end of July and otherwise is difficult to distinguish from similar aster species; therefore it may have been under-reported in New York. Possibly this species is less common in the Capital District and northward than it is in the Mid-Hudson Valley.

Barbour collected false hop sedge (*Carex lupuliformis*) in a seasonal floodplain pool approximately 10 x 20 m in size on the south side of the sewer road about 400 m west of Pierce Road. There were probably more than 100 clumps of the sedge present, in our Hudson Valley experience a large population. This sedge is similar to hop sedge which is also present in the DKNA.

Kiviat found false mermaid, which is regionally-rare in eastern New York but not listed by the New York Natural Heritage Program, in a floodplain pool near the sewer road. The identification of immature sterile material was confirmed by Barbour.

A small colony of about 10 leaves of May-apple occurs on a small wooded promontory into the north side of the Cooley Kill well below Route 146A. May-apple is rare in the Hudson Valley but is not listed by the New York Natural Heritage Program.

Possibly additional rare plant species are present in the wetland communities. A species that is very local in its occurrence at DKNA, or that does not appear above ground every year, could be missed in general surveys such as ours.

Conservation and Management Issues

The DKNA is important because it is a large natural area close to the Capital District, there is extensive habitat for common and uncommon species that cannot live on farmland or suburban areas, there is potential for rare species, and at least two statewide rarities (Schreber's aster and false hop sedge) are present. The Dwaas Kill is the largest stream in the Town. In order to protect biological resources and maintain environmental quality in the DKNA, it is necessary to consider the relationship of the habitats and biota we describe to the human activities outside the natural area. Our survey raises a number of conservation and management issues.

To date, development adjoining the DKNA has been primarily residential. Any future commercial and industrial development may be more of a threat to water quality and other aspects of the natural area.

The railroad may help to buffer the DKNA against development on the north. Railroads, however, can be troublesome polluters (herbicides, maintenance debris, diesel soot, freight spills, wood preservatives) and may be avenues of dispersal for invasive plants.

Where Kinns Road crosses the Dwaas Kill, there is disturbance, increased pollution potential (from road salt and vehicular fluids), invasive plants, and a greater danger of highway mortality of animals. This location might benefit from planted vegetation buffers, which might also obscure the sewer line road entrance and discourage ORVs. Densely growing native woody plants could be used.

The east end of the bluffs and slope south of the railroad had intensive soil disturbance and erosion, apparently caused by ORVs on the old roads. We do not know the point of access for these vehicles, but it is probably on private property and the owner might be willing to block vehicular access to the bluffs.

Access by all motor vehicles (and perhaps bicycles) to the sewer road should be blocked with sturdy gates. Little vehicle damage is evident but this will inevitably increase. There is also potential for illegal dumping of garbage or hazardous materials. Vehicle use would disrupt passive recreation, disturb wildlife, and facilitate further spread of invasive plants like phragmites and purple loosestrife, as well as threatening the false hop sedge, false mermaid, and other organisms of the floodplain pools near the sewer road. ORV access to the sewer road could also result in damage to the central wet meadows and their rare species.

In September 1996, there was a small patch (10-20 stems) of great hairy willow-herb on the sewer road on the west bank of the Dwaas Kill. This is a potentially aggressive European plant that is still rare in New York. It may be appropriate to carefully hand-pull this plant when it is in flower and readily identifiable, before it spreads along the sewer road and possibly into the central wet meadow complex.

Private homes close to streams often have substandard septic systems which add to downstream pollution. The Town or the SLC could encourage and help home owners to test and upgrade septic systems as appropriate.

Further residential (or other) development in the Dwaas Kill and Cooley Kill watersheds above the DKNA will increase the erosion and sedimentation potentials of the streams. This will at some point alter the ecology of the streams and their floodplains and wetlands. Such changes may threaten Schreber's aster, false hop sedge, sedge skipper, and other rare and common biota of the DKNA lowlands.

The sandy bluffs of the north-central areas are extremely erosion-prone, and areas on these soils that become devegetated will be difficult to revegetate and restore. Any development in this area would likely cause massive soil erosion and sedimentation, with accompanying pollution of the wetlands and stream by sediment, nutrients, and other materials. If there is increased visitor use of this area, it should be confined to a foot trail that is carefully sited, constructed, and maintained to avoid erosion.

Beaver sign (mostly or all preceding the 1996 growing season) was widespread and common in the wetlands and riparian habitats of the core area. Many of the uncommon or rare animals that are likely to use the DKNA would be attracted to beaver works (active and abandoned ponds, beaver meadows, canals, lodges, drowned trees, and small riparian clearings). Beaver are also generally of interest to passive recreationists in urban-fringe open space areas. Biological diversity and nature observation should be considered in management of beaver at the DKNA.

The areal extent of the DKNA, especially the large central area, is one of its chief conservation assets. It is important to prevent fragmentation of the area (both the large central area, and the "tributary" linear corridors) by roads, utilities, and other construction if the open space and biological conservation values of the DKNA are to be maintained.

The SLC or Town should consider constituting an informal "Dwaas Kill Watch" staffed by interested residents and other volunteers. Participants would walk the railroad, sewer road, and selected stream segments at intervals to watch for dumping, spills, ORV damage, gross pollution, and other problems.

The sewer road (despite its name!), from Pierce Road west to at least the Dwaas Kill crossing, is suitable for educational field trips and possibly a self-guided nature trail. Beaver ecology, birds, frogs, many plant species, and the floodplain pools are among the potential education attractions. Group leaders should minimize treading damage to the floodplain pools and their margins.

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Shapiro, A.M. 1974. Butterflies and skippers of New York State. Search (Ithaca) 4, 60 p.

Table 3. Vascular plants identified at the Dwaas Kill Natural Area by Spider Barbour and Erik Kiviat in September-October 1996 and July-August 1997.

Communities Codes

SH	Successional hardwoods		HM	Shrub-herb mosaic	
WP	White pine-Hardwoods		CM	Cattail marsh	
HH	Hemlock-Hardwoods		LP	Loosestrife-Phragmites marsh	
OF	Oldfields		SM	Sedge meadow	
FF	Floodplain forests		GM	Grass meadow	
SF	Swamp forest		FM	Forb meadow	
MS	Mixed (woodland) swamp		VP	Vegetated floodplain pool	
SS	Shrub swamp		DG	Disturbed ground	

Latin Binomial	Common Name	SH	WP	HH	OF	FF	SF	MS	SS	HM	CM	LP	SM	GM	FM	VP	DG
Acalypha virginica var. *rhomboidea*	three-seeded mercury	x								x							x
Acer negundo	ash-leaved maple	x				x											
Acer rubrum	red maple	x	x	x		x	x	x									
Acer saccharinum	silver maple	x															
Acer saccharum	sugar maple	x	x	x		x		x									
Agrimonia gryposepela	agrimony					x											
Agrimonia sp.	agrimony					x											
Agrostis gigantea	redtop				x												
Alisma triviale	small water-plantain															x	
Alliaria petiolata	garlic-mustard	x				x											x
Alisma sp.	water-plantain															x	
Alnus incana	speckled alder	x						x	x								
Ambrosia artemisiifolia	common ragweed																x
Ambrosia trifida	giant ragweed														x		
Amelanchier sp.	shadbush	x															
Amphicarpaea bracteata	hog-peanut	x															x
Anemone sp.	anemone	x															
Apios americana	ground-nut									x					x		
Apocynum cannabinum	Indian-hemp				x												
Aralia nudicaulis	wild sarsaparilla	x	x					x									
Asarum canadensis	wild ginger	x				x			x								
Asclepias incarnata	swamp milkweed									x					x		
Asclepias syriaca	common milkweed				x												x
Aster cordifolius	heart-leaved aster	x															
Aster divaricatus	white wood aster	x															
Aster dumosus	bushy aster									x							
Aster lanceolata	lance-leaved aster									x							
Aster lateriflorus	calico aster	x								x							x
Aster novae-angliae	New England aster														x		
Aster novi-belgii	New York aster	x													x		
Aster puniceus	purple-stemmed aster							x							x		
Aster schreberi	Schreber's aster					x											
Aster spp.	aster	x															
Athyrium filix-foemina	lady fern	x				x											
Berberis thunbergii	common barberry	x															
Betula alleghenlensis	yellow birch	x		x		x		x									
Betula lenta	black birch	x	x	x													
Betula populifolia	gray birch	x															
Bidens cernua	nodding bur-marigold									x					x		
Bidens connata	bur-marigold									x					x		
Bidens sp.	bur-marigold									x					x		
Bidens tripartita	common bur-marigold					x				x					x		
Boehmeria cylindrica	false-nettle																
Brachyelytrum erectum	brachyelytrum	x															
Calystegia sepium	hedge bindweed				x												
Cardamine pensylvanica	Pennsylvania bittercress					x											
Carex blanda	sedge	x															
Carex bromoides	brome sedge				x		x										
Carex crinita	sedge									x			x				

Table 3. (continued)																	
Latin Binomial	Common Name	SH	WP	HH	OF	FF	SF	MS	SS	HM	CM	LP	SM	GM	FM	VP	DG
Carex cristatella	sedge									x			x				
Carex debilis var. *rudgei*	weak sedge	x	x														
Carex digitalis	sedge	x															
Carex hystericina	sedge									x			x				
Carex intumescens	sedge							x									
Carex lacustris	lake sedge												x				
Carex laxiculmis	sedge							x									
Carex longii	Long's sedge																
Carex lupuliformis	false hop sedge					x											
Carex lupulina	hop sedge					x											
Carex lurida	sedge									x			x				
Carex rosea	roseate sedge	x							x								
Carex scabrata	scaly sedge						x	x	x								
Carex spp.	sedge							x									
Carex stipata	sedge									x			x				
Carex stricta	tussock sedge							x			x		x				
Carex torta	sedge					x											
Carex vulpinoidea	fox sedge									x							
Carpinus caroliniana	American hornbeam	x				x	x	x									
Carya cordiformis	bitternut hickory	x															
Carya ovata	shagbark hickory	x				x											
Cephalanthus occidentalis	buttonbush							x	x	x					x		
Charophyceae	stonewort															x	
Chelone glabra	turtlehead									x					x		
Chrysosplenium americanum	golden saxifrage					x										x	
Cicuta bulbifera	water-hemlock									x					x		
Cinna latifolia	drooping woodreed					x	x										
Circaea lutetiana	enchanter's nightshade	x		x		x											
Cirsium palustre	swamp thistle							x									
Clematis virginiana	virgin's bower									x					x		
Clintonia borealis	corn lily			x			x										
Collinsonia canadensis	richweed	x				x											
Comptonia peregrina	sweet-fern				x												
Coptis trifolia	goldthread			x			x										
Corallorhiza maculata	spotted coralroot		x														
Cornus amomum	silky dogwood	x				x		x	x	x					x		
Cornus foemina	gray dogwood	x			x	x		x							x		
Corylus americana	American hazel	x															
Cryptotaenia canadensis	honewort					x	x		x								
Cuscuta gronovii	common dodder									x					x		
Daucus carota	wild carrot				x												x
Dennstaedtia punctilobula	hay-scented fern			x	x												
Dianthus armeria	Deptford pink				x												x
Diervilla lonicera	bush-honeysuckle	x															x
Dryopteris cristata	crested woodfern					x				x							
Dryopteris marginalis	marginal woodfern	x	x														
Dryopteris carthusiana	common woodfern	x	x	x		x											
Dryopteris intermedia	intermediate woodfern	x	x	x			x										
Echinochloa sp.	barnyard grass																x
Echinocystis lobata	wild cucumber					x				x							
Eleagnus sp.	Russian olive																x
Eleocharis acicularis	frog's hair															x	
Elymus sp.	wild-rye													x			
Elymus virginicus	Virginia wild-rye													x			
Epilobium coloratum	willow-herb														x		
Epilobium hirsutum	hairy willow-herb														x		
Epipactis helleborine	helleborine	x															x
Equisetum arvense	common horsetail				x												x
Equisetum hyemale	scouring rush				x												
Equisetum sylvaticum	wood horsetail						x	x									x

Table 3. (continued)																	
Latin Binomial	Common Name	SH	WP	HH	OF	FF	SF	MS	SS	HM	CM	LP	SM	GM	FM	VP	DG
Erigeron strigosus	daisy fleabane																x
Eupatorium maculatum	spotted Joe-Pye-weed									x					x		
Eupatorium perfoliatum	common boneset							x		x					x		
Eupatorium purpureum	purple Joe-Pye-weed									x					x		
Eupatorium rugosum	white snakeroot	x															
Euthamia graminifolia	grass-leaved goldenrod				x												
Fagus grandifolia	American beech	x		x													
Floerkea proserpinacoides	false mermaid					x											
Fragaria virginica	wild strawberry				x												x
Fraxinus americana	white ash	x		x													
Fraxinus nigra	black ash					x	x	x									
Fraxinus pensylvanica	red ash					x	x	x									
Galium aparine	bedstraw																x
Galium sp.	bedstraw					x		x		x							
Geranium maculatum	wild geranium	x															
Geum canadense	white avens	x				x											
Glechoma hederacea	gill-over-the-ground																x
Glyceria melicaria	mannagrass													x			
Glyceria striata	striped mannagrass													x			
Goodyera pubescens	downy rattlesnake-plantain	x															
Hamamelis virginiana	witch-hazel	x															
Helianthemum sp.	sunflower																x
Hydrocotyle americana	American water pennywort					x	x	x									
Hypericum punctatum	St. Johnswort				x												
Ilex verticillata	winterberry							x	x								
Impatiens capensis	spotted touch-me-not												x		x		
Iris versicolor	blue flag									x					x		
Juglans cinerea	butternut	x															
Juncus acuminatus	rush																
Juncus effusus	candle rush												x				
Juncus marginatus	marginate rush												x				
Juncus sp.	rush												x				
Lactuca canadensis	wild lettuce																x
Laportea canadensis	wood-nettle					x											
Leersia oryzoides	rice-cutgrass										x			x			
Lemna minor	small duckweed																
Lemna trisulca	duckweed																
Lindera benzoin	spicebush					x		x									
Lobelia cardinalis	cardinal flower									x					x		
Lobelia siphilitica	great blue lobelia					x			x								
Lonicera x bella	Bell's honeysuckle	x															
Ludwigia palustris	water purslane																
Lycopodium dendroideum	tree clubmoss	x	x														
Lycopus americana	American water-horehound														x		
Lycopus uniflorus	one-flowered water-horehound														x		
Lycopus virginicus	Virginia water-horehound														x		
Lyonia ligustrina	maleberry								x								
Lysimachia ciliata	fringed loosestrife														x		
Lysimachia nummularia	moneywort					x	x										
Lysimachia quadrifolia	whorled loosestrife	x			x												
Lysimachia terrestris	swamp candles														x		
Lythrum salicaria	purple loosestrife	x									x	x			x		
Matteuccia struthiopteris	ostrich fern					x			x								
Medeola virginiana	Indian cucumber-root	x															
Melilotus officinalis	yellow sweet clover																x
Mitchella repens	partridgeberry	x	x	x													
Mitella diphylla	miterwort							x	x								
Muhlenbergia sp.	muhly grass	x															
Onoclea sensibilis	sensitive fern					x			x	x			x				
Osmunda cinnamomea	cinnamon fern	x					x	x									

Table 3. (continued)																	
Latin Binomial	Common Name	SH	WP	HH	OF	FF	SF	MS	SS	HM	CM	LP	SM	GM	FM	VP	DG
Osmunda regalis	royal fern						x	x									
Ostrya virginiana	hop hornbeam	x															
Oxalis stricta	common yellow wood-sorrel											-					x
Panicum capillare	slender panic grass											–					x
Panicum clandestinum	sheathed panic grass																x
Parthenocissus sp.	Virginia creeper	x	x														x
Penthorum sedoides	ditch stonecrop									x							
Phalaris arundinacea	reed canarygrass												x	x			
Phleum pratense	timothy													x			x
Phragmites australis	common reed	x									x	x			x		
Pilea pumila	clearweed						x										
Pinus strobus	eastern white pine		x					x									
Plantago rugellii	smaller common plantain																x
Habenaria ?flava	tubercled orchid							x									
Platanus occidentalis	sycamore					x											
Poa palustris	swamp bluegrass							x						x			
Podophyllum peltatum	May-apple	x															
Polygonum caespitosum	smartweed																x
Polygonum hydropiper	water-pepper													x	x		
Polygonum pensylvanicum	Pennsylvania smartweed																x
Polygonum punctatum	spotted smartweed														x		
Polygonum sagittatum	tearthumb												x	x	x		
Polygonum scandens	climbing false-buckwheat	x	x														
Polystichum acrostichoides	Christmas fern	x															
Populus deltoides	cottonwood	x	x			x											
Populus grandidentata	big-tooth aspen	x															
Populus tremuloides	quaking aspen	x	x														
Potamogeton crispus	curly pondweed															x	
Potamogeton epihydrus	pondweed															x	
Potamogeton sp.	pondweed															x	
Potentilla simplex	common cinquefoil																x
Proserpinaca palustris	mermaidweed														x	x	
Prunella vulgaris	self-heal																x
Prunus americanus	American plum	x															
Prunus serotina	black cherry	x															
Prunus virginiana	choke cherry	x															
Pteridium aquilinum	bracken	x															
Pyrola elliptica	shinleaf	x															
Quercus alba	white oak	x		x													
Quercus coccinea	scarlet oak	x															
Quercus rubra	northern red oak	x	x														
Quercus velutina	black oak	x															
Ranunculus repens	creeping buttercup					x	x	x									
Rhamnus cathartica	common buckthorn	x						x									
Rhus typhina	staghorn sumac																x
Ribes americana	wild currant	x															
Ribes cynosbati	dogberry	x															
Ribes rotundifolium	Appalachian gooseberry																
Robinia pseudoacacia	black locust	x															x
Rorippa palustris	common yellow-cress														x		
Rosa caroliniana	Carolina rose				x												
Rosa multiflora	multiflora rose					x											x
Rubus allegheniensis	Allegheny blackberry				x												
Rubus flagellaris	dewberry				x												
Rubus hispidus	bramble				x												
Rubus idaeus	red raspberry							x									
Rubus occidentalis	black raspberry					x											x
Rubus sp.	bramble		x														
Rudbeckia laciniata	cutleaf coneflower									x					x		
Rumex acetosella	sheep sorrel				x												

Table 3. (continued)																	
Latin Binomial	Common Name	SH	WP	HH	OF	FF	SF	MS	SS	HM	CM	LP	SM	GM	FM	VP	DG
Rumex orbiculatus	swamp dock														x		
Rumex sp.	dock																x
Sagittaria latifolia	broad-leaved arrowhead															x	
Salix sp.	willow								x						x		
Salix alba	white willow								x								
Salix discolor	pussy willow								x								
Salix fragilis	crack willow								x								
Salix sericea	silky willow																
Sambucus canadensis	common elderberry										x						
Sanguinaria canadensis	bloodroot	x				x											
Sanicula virginica	Virginia sanicle	x															
Sassafras albidum	sassafras	x															
Schizachyrium scoparius	little bluestem				x												
Scirpus atrovirens	bulrush												x				
Scirpus cyperinus	common wool-grass										x		x				
Scirpus microcarpus	bulrush																
Scirpus tabernaemontanii	bulrush												x				
Scutellaria lateriflora	common skullcap														x		
Senecio aureus	golden ragwort					x											
Sium suave	water-parsnip					x		x									
Smilacina racemosa	false Solomon's seal	x															
Solanum dulcamara	purple nightshade																
Solidago caesia	blue-stemmed goldenrod	x															
Solidago canadensis var. *scabra*	goldenrod	x			x												
Solidago flexicaulis	zig-zag goldenrod					x											
Solidago gigantea	tall goldenrod														x		
Solidago nemoralis	gray goldenrod				x												
Solidago patula	spreading goldenrod							x									
Solidago rugosa	rough goldenrod				x										x		x
Solidago sp.	goldenrod				x												
Sparganium americanum	American bur-reed										x						
Sparganium eurycarpum	smooth-fruited bur-reed																
Spiraea latifolia	meadowsweet								x		x						
Symplocarpus foetidus	skunk cabbage					x	x										
Taraxacum officinale	common dandelion																x
Thalictrum pubescens	tall meadow-rue					x				x							
Thelypteris noveboracensis	New York fern	x	x														
Thelypteris palustris	marsh fern							x		x					x		
Tilia americana	basswood	x															
Toxicodendron radicans	poison-ivy	x															x
Toxicodendron vernix	poison sumac					x		x									
Trientalis borealis	starflower		x														
Tsuga canadensis	eastern hemlock			x			x	x									
Tussilago farfara	common coltsfoot																x
Typha latifolia	broad-leaved cattail										x				x		
Typha x glauca	hybrid cattail										x						
Ulmus rubra	slippery elm	x				x	x	x									
Urtica dioica	stinging nettle									x							
Uvularia sessilifolia	sessile-leaved bellwort	x															
Vaccinium angustifolium	lowbush blueberry		x														
Vaccinium pallidum	pale blueberry		x														
Verbena hastata	blue vervain														x		
Verbena urticifolia	white vervain			x				x									
Viburnum acerifolium	maple-leaved viburnum	x															
Viburnum lentago	nannyberry	x															
Viburnum recognitum	northern arrowwood	x															
Viola sp.	violet					x											
Vitis riparia	river grape					x											
Vitis sp.	grape	x															
Zanthoxylum americanum	American prickly-ash	x															