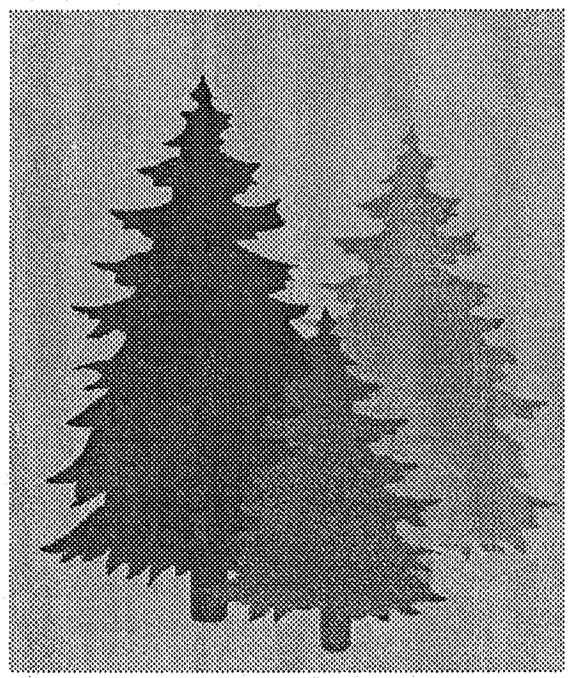
Witek Park
Field Improvements
Derby, Connecticut



King's Mark
Environmental Review Team Report

King's Mark Resource Conservation and Development Area, Inc.

Witek Park
Field Improvements
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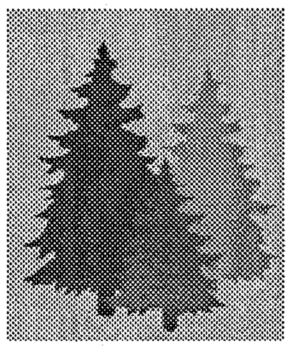

Environmental Review Team Report

Prepared by the
King's Mark Environmental Review Team
of the King's Mark
Resource Conservation and Development Area, Inc.

for the
Derby Inland Wetlands Agency
Derby, Connecticut

January 2003

CT Environmental Review Teams
1066 Saybrook Road, P.O. Box 70
Haddam, CT 06442
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Acknowledgments

This report is an outgrowth of a request from the Derby Inland Wetlands Agency to the Southwest Conservation District (SWCD). The SWCD referred this request to the King's Mark Resource Conservation and Development Area (RC&D) Executive Council for their consideration and approval. The request was approved and the measure reviewed by the King's Mark Environmental Review Team (ERT).

The King's Mark Environmental Review Team Coordinator, Elaine Sych, would like to thank and gratefully acknowledge the following Team members whose professionalism and expertise were invaluable to the completion of this report.

The field review took place on, Tuesday, December 17, 2002.

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I would also like to thank Fred Columbo, chairman, Derby Inland Wetlands Agency, Karen Kemmesies, secretary, Derby Inland Wetlands Agency, Al Felice, Park and Recreation Commission, Kathy Norwood, chairman, Derby Open Space Commission, other members of the Derby Open Space Commission, and Marc Garofalo, mayor, City of Derby, for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project, location and soils maps and additional reports. During the field review Team members were given plans and related documents. Following the review, reports from each Team member were submitted to the ERT coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site plans or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project - all final decisions rest with the city. This report identifies the existing resource base and evaluates its significance to the proposed use, and also suggests considerations that should be of concern to the city. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The King's Mark RC&D Executive Council hopes you will find this report of value and assistance in the review of the proposed field improvements to Witek Park.

If you require additional information please contact:

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INTRODUCTION

Introduction

The Derby Inland Wetlands Agency has requested Environmental Review Team (ERT) assistance in reviewing an application to construct soccer fields, parking and an access road at Witek Park.

The 144 acre Witek Park is located off of Academy Hill Road on the east side of the city. It is city owned and was purchased from the Birmingham Water Company in 1997. The parcel contains two reservoirs (±46 acres total), ±32 acres of wetlands and approximately 10 acres of steep slopes. The parcel is generally wooded with a portion on the easterly side consisting of old pasture land that is in transition to a wooded environment.

The application is seeking to construct two soccer fields on the easterly side of the parcel with associated parking and access. The disturbed area is 11.2 acres with the access drive crossing through wetlands.

Objectives of the ERT Study

The Derby Inland Wetlands Agency has asked for assistance in determining the impact this activity will have on the entire 144 parcel. Concerns that have been voiced at public hearings include: stormwater management, impacts to wildlife habitat, loss of open space, water quality concerns relating to turf management, erosion and sedimentation, and the appropriateness of the site design to the Park as a whole.

The ERT Process

Through the efforts of the Derby Inland Wetlands Agency this environmental review and report was prepared for the City of Derby.

This report provides an information base and a series of recommendations and guidelines which cover the topics requested by the city. Team members were able to review maps, plans and supporting documentation provided by the applicant.

The review process consisted of four phases:

1. Inventory of the site's natural resources;
2. Assessment of these resources;
3. Identification of resource areas and review of plans; and
4. Presentation of education, management and land use guidelines.

The data collection phase involved both literature and field research. The field review was conducted on Tuesday, December 17, 2003. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Being on site allowed Team members to verify information and to identify other resources.

Once Team members had assimilated an adequate data base, they were able to analyze and interpret their findings. Individual Team members then prepared and submitted their reports to the ERT coordinator for compilation into this final ERT report.

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Figure 1

Location/Topographic Map

Scale 1″ = 2000′

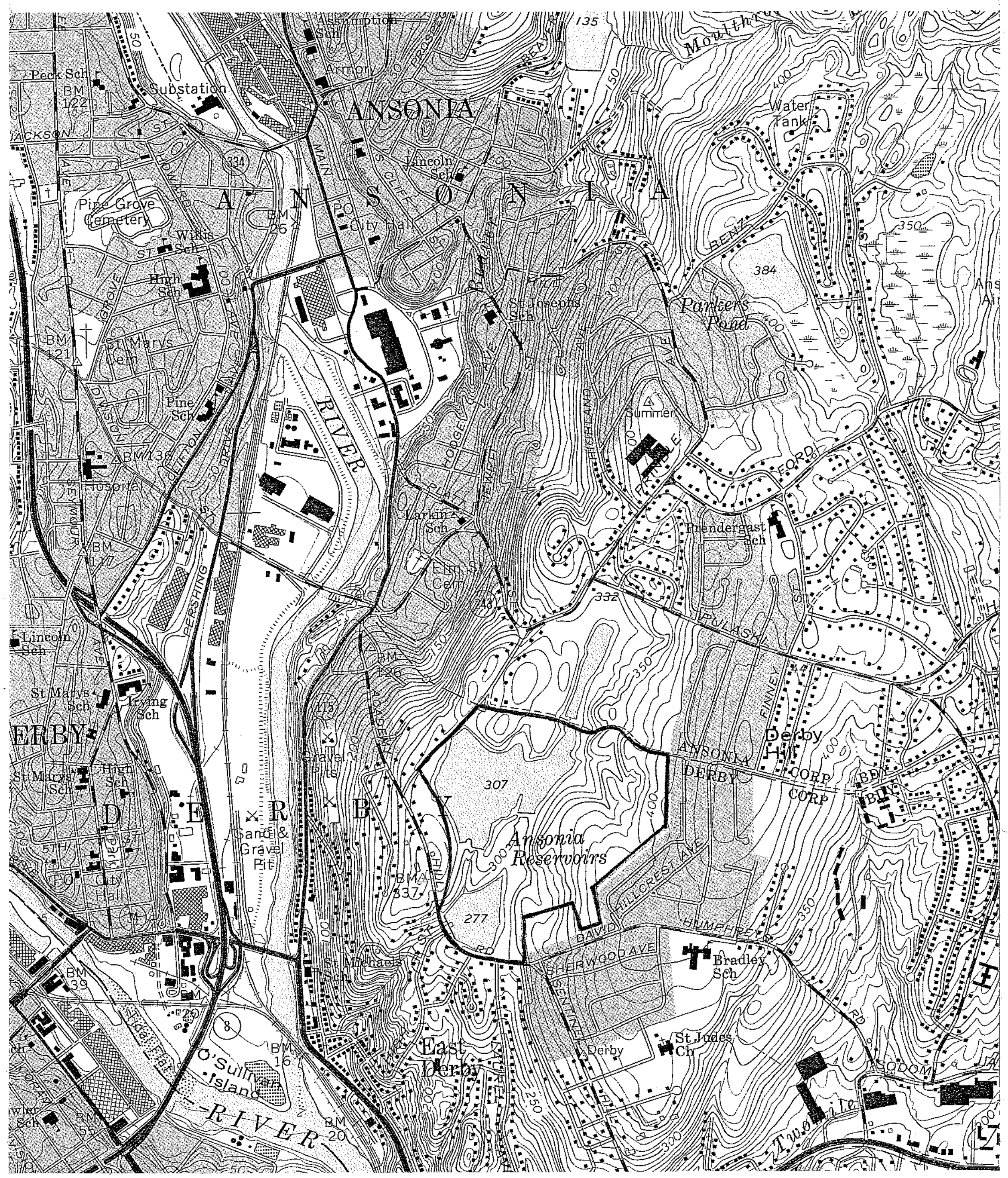
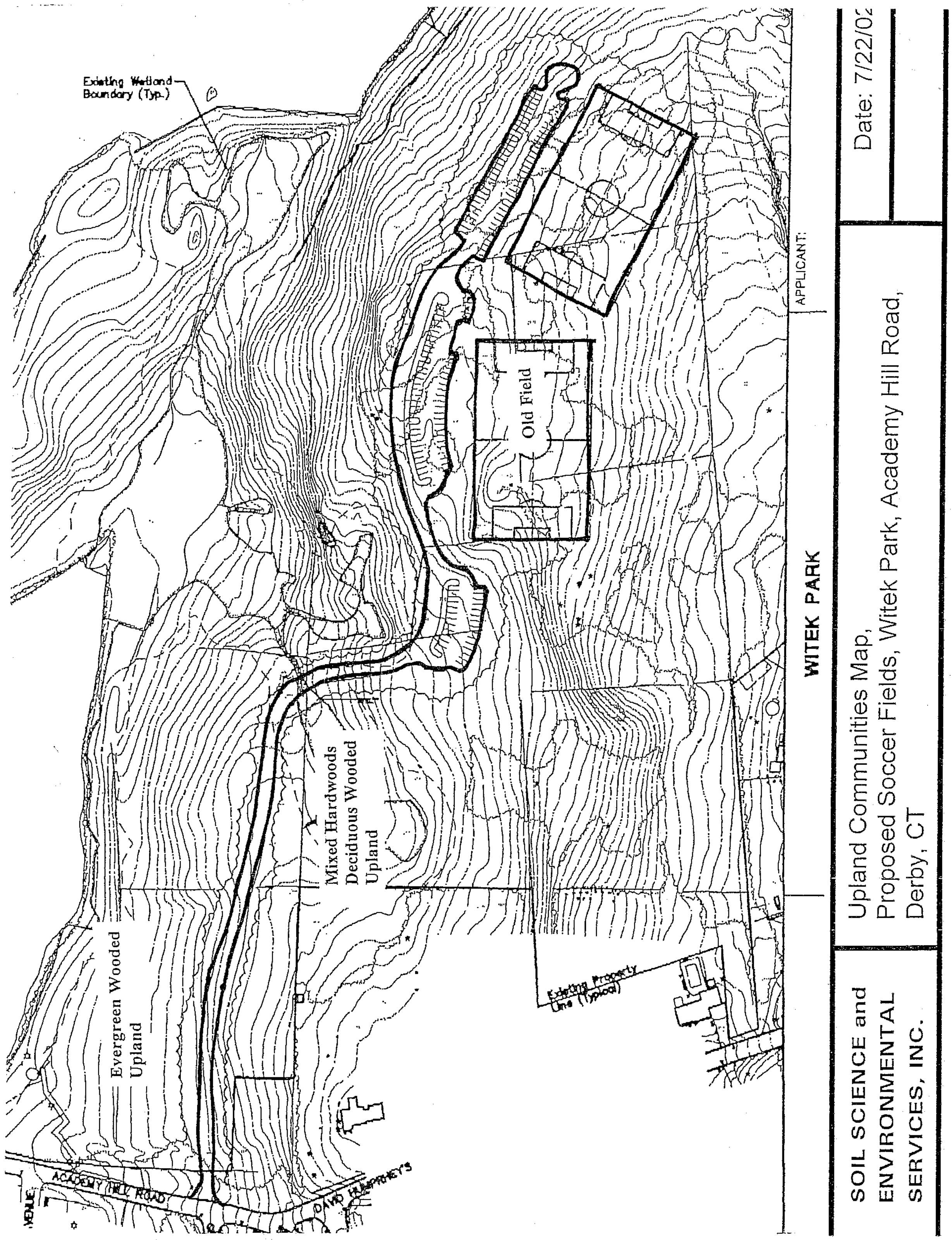


Figure 2

Proposed Project Layout



Conservation District Review

Soils

Wetland Soils

Aq - The Aq map unit consists primarily of man-made or man-disturbed cut and or fill areas that are wet. Slopes range from 0 to 12 percent. These soils have a seasonally high watertable at less than 2 feet; have an aquic moisture regime and can be expected to support hydrophytic vegetation. Typically, these soils are in places where less than a 2 foot thick layer of earthy materials have been excavated to the ground watertable. These soils are inland wetland soils. On the Witek site, these soil areas are associated with the Leicester and Ridgebury soils as described below.

Lc - Leicester fine sandy loam. This is a nearly level, poorly drained soil in drainageways and depressions of glacial uplands. Slopes are 0 to 3 percent and are smooth and concave. They are generally 50 to 300 feet long. The areas dominantly are long and narrow or irregular in shape and 3 to 30 acres in size. Typically, the surface layer is black fine sandy loam 6 inches thick. The subsoil is grayish brown, light grayish brown, and pale brown, mottled fine sandy loam 17 inches thick. The substratum, to a depth of 60 inches, is dark yellowish brown, mottled, friable gravelly fine dandy loam that has discontinuous firm lenses up to 4 inches thick.

Included with this soil in mapping are small intermingled areas, generally less than 1 acre in size, of moderately drained Sutton and Woodbridge soils and poorly drained Ridgebury, Walpole, and Rumney soils. Also included are areas where the surface layer is silt loam and a few areas where up to 3 percent of the surface is covered with stones and boulders. Included areas make up to 5 to 20 percent of this map unit.

This soil has a seasonal high water table at a depth of about 6 inches from late in fall until mid-spring. During the summer, the water table can drop to a depth of 5 feet or more. This soil has moderate or moderately rapid permeability. It has a high available water capacity. Runoff is slow. Good tilth is fairly easy to maintain. This soil dries out and warms up slowly in spring. It remains wet for several days after heavy rains in summer. It has a low shrink-swell potential. Unless limed, this soil is very strongly acid through medium acid.

This soil has poor potential for community development. It is limited mainly by the high water table during much of the year. This soil is difficult to excavate because the high water inundates the excavations. The steep slopes of excavations tend to slump when saturated. This soil has poor potential for building foundations and basements because footings are placed below the depth of the high water table. Waste disposal systems, such as septic tank absorption fields, do not function satisfactorily without very unusual and costly design and installation. Even then, septic systems are subject to a high rate of failure. Many area are subject to ponding during winter months. This soil has poor potential for landscaping because it is wet. Even during the summer this soil remains wet for several days after rains and is frequently soggy and difficult to mow. Many plants do not adapt to the wetness of this soil. During periods of construction, conservation measures are needed to prevent excessive siltation, runoff, and erosion.

This soil is fairly well suited to crops. Wetness is the major limitation for most crops, and drainage is needed for good crop production. Erosion is easy to control. This soil is suited to trees. Productivity is moderate. The use of equipment is severely limited by wetness. Machine planting is practical in open areas. Seedling mortality is high, and tree windthrow is common because the rooting depth is restricted by the high water table. Trees to favor in existing woodlots are eastern white pine and northern red oak. Trees to plant are eastern white pine, white spruce, and northern white cedar.

Rn - Ridgebury, Leicester, and Whitman extremely stony fine sandy loams. This unit consists of poorly drained and very poorly drained soils in depressions and drainageways on uplands and in valleys. Stones and boulders cover 5 to 35 percent of the surface. The areas are irregularly shaped or long and narrow and mostly range from 3 to 50 acres. Slopes range from 0 to 8 percent but are dominantly less than 3 percent.

The major soils in this unit have a seasonal high water table at or near the surface from fall through spring. The permeability of the Ridgebury and Whitman soils is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the substratum. The permeability of the Leicester soils is moderate or moderately rapid throughout. Available water capacity is moderate in all three soils. Runoff is slow on all three, and water is ponded on the surface of some areas of the Whitman soils. The Ridgebury and Leicester soils very strongly acid to medium acid, and the Whitman soils are very strongly acid to slightly acid. These soils dry out and warm up slowly in the spring.

The high water table, ponding, and the stones and boulders on the surface limit these soils for community development. Onsite septic systems require extensive filling and special design and installation because of the high water table. Excavations are commonly filled with water, and many areas do not have suitable drainage outlets. Quickly establishing plant cover and using siltation basins help to control erosion and sedimentation during construction.
This unit has fair suitability for use as woodland. The Ridgebury soils have moderate productivity. These soils are limited mainly by their wetness and stoniness. Seedling mortality is high and windthrow is common because the high water table restricts the rooting depth for trees during much of the year.

Woodland may, however, be one of the best uses of this unit. Trees to favor in existing woodlots are eastern white pine, sugar maple, red maple, and northern red oak. Trees to plant are eastern white pine and white spruce.

Non - Wetland Soils

CrC - Charlton -Hollis fine sandy loams, 3 to 15 percent slopes. This complex consists of gently sloping and sloping, well drained soils on uplands where the relief is affected by the underlying bedrock Slopes are concave or convex and mostly 50 to 300 feet long. The areas have a rough surface with bedrock outcrops and a few narrow intermittent drainageways and small wet depressions. In most areas, 3 to 25 percent of the surface is covered with stones and boulders. The areas are mostly 5 to 125 acres in size. Approximately 45 percent of these areas is Charlton fine sandy loam, 30 percent is Hollis fine sandy loam, and about 25 percent is other soils.

The Charlton and Hollis soils are in such a complex and intermingled pattern that they could not be separated in mapping. Included with this complex in mapping are small areas, generally less than 1 acre in size, of moderately well drained Sutton soils, well drained Paxton and Agawam soils, and poorly drained Leicester soils. Also included are many small and intermingled areas where the bedrock is 20 to 40 inches from the surface. Included areas make up 5 to 20 percent of this map unit.

The Charlton soil has moderate or moderately rapid permeability. It has high available water capacity. Runoff is medium to rapid. This soil has a low shrink-swell potential. This complex has fair to poor potential for community development. It is limited mainly by the steepness of slopes and stoniness. The included Hollis, Sutton, Leicester and Paxton soils all have limitations for community development (see descriptions above and below).

This soil complex is suitable for growing trees. Most of this complex is presently in woodland. The Charlton soil has moderate productivity. The Hollis soil has low productivity because of a severe hazard of seedling mortality and a moderate hazard of tree windthrow caused by the shallow rooting zone above the bedrock. Machine planting is somewhat difficult but feasible in areas without stones and boulders; however, it is not feasible in most areas because of stoniness, rock outcrops, and shallowness to bedrock. Trees to favor in existing woodlots are eastern white pine, northern red oak, sugar maple, and red maple. Trees to plant are eastern white pine, white spruce, European larch, and eastern hemlock.

CrE - Charlton-Hollis fine sandy loams, very rocky, 15 to 45 percent slopes. This complex consists of moderately steep to very steep, well drained and somewhat excessively well drained soils on hills and ridges. The areas of the complex are mostly irregular in shape and range from 5 to 300 acres. They are marked with exposed bedrock, a few drainageways, and a few small, wet depressions. Stones and boulders cover 1 to 5 percent of the surface and exposed bedrock up to 10 percent of the surface.

The complex is about 50 percent Charlton soils, 30 percent Hollis soils and 20 percent other soils and exposed bedrock. The Charlton and Hollis soils are so intermingled that it was not practical to map them separately. Included with this complex in mapping are small areas of well drained Paxton soils, moderately well drained Sutton soils, and poorly drained Leicester soils. Also included are small areas of soils with bedrock at a depth of 20 to 40 inches and a few areas where stones and boulders cover more than 5 percent of the surface.

These Charlton soils have moderate or moderately rapid permeability. Runoff is rapid. Available water capacity is moderate in the Charlton soils and low in the Hollis soils. Both soils are vary strongly acid to medium acid.

The major limitations of this complex for community development are slope, the stones and boulders on the surface, the areas of exposed bedrock, and the shallow depth to bedrock in the Hollis soils. Slope especially limits the complex as a site for onsite septic systems, and such systems commonly require special design and installation to prevent effluent from seeping to the surface. The depth to bedrock limits excavations in the Hollis soils. Quickly establishing plant cover, mulching, and using siltation basins and diversions help to control erosion and sedimentation during construction.

Slope, the stones and boulders, and the exposed bedrock make the use of farming equipment impractical and make the soils generally unsuitable for farming. The complex is suitable for trees, but the same limitations that restrict the use of farming equipment also limit machine planting. Slope and the shallow rooting depth in the Hollis soils result in the uprooting of many trees during windy periods.

PdB -Paxton very stony fine sandy loam, 3 to 8 percent slopes. This gently sloping, well drained soil is on drumlins and hills. Stones and boulders cover 1 to 5 percent of the surface. The areas are irregularly shaped and mostly range from 4 to 50 acres. Typically, this soil has a surface layer of dark brown fine sandy loam 6 inches thick. The subsoil is brown fine sandy loam 22 inches thick. The substratum is very firm, brittle, grayish brown gravelly sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of well drained Charlton and Stockbridge soils, moderately well drained Georgia and Woodbridge soils, and poorly drained Ridgebury soils. Included areas make up about 15 percent of this map unit.

The permeability of this Paxton soil is moderate in the surface layer and subsoil and slow or very slow in the substratum. Runoff is medium, and available water capacity is moderate. The soil is very strongly acid to slightly acid.

The slow or very slow permeability in the substratum is the main limitation of this soil for community development; onsite septic systems require special design and installation to prevent effluent from seeping to the surface. Quickly establishing a plant cover, mulching, and using siltation basins help to control erosion and sedimentation during construction.

SwB- Sutton very stony fine sandy loam, 3 to 8 percent slopes. This gently sloping, moderately well drained soil is in slight depressions and on the side of hills and ridges. Stones and boulders cover 1 to 5 percent of the surface. The areas are irregularly shaped and mostly range from 4 to 30 acres. Typically, this soil has a surface layer of dark grayish brown fine sandy loam 8 inches thick. The subsoil and substratum are yellowish brown, mottled fine sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of well drained Charlton and Paxton soils, moderately well drained Woodbridge soils, and poorly drained Leicester and Ridgebury soils. Also included are a few areas of nearly level soils. Included areas make up about 15 percent of this map unit.

This Sutton soil has a seasonal high water table at a depth of about 20 inches from late fall until midspring. The permeability of the soil is moderate or moderately rapid. Runoff is medium, and available water capacity is moderate. The soil is very strongly acid to medium acid in the surface layer and subsoil and very strongly acid to slightly acid in the substratum. The hazard of erosion is moderate.

The seasonal high water table and the stones and boulders on the surface limit community development. Onsite septic systems require special design and installation because of the seasonal high water table. Footing drains help prevent wet basements. Quickly establishing plant cover, mulching, and using siltation basins and diversions help to control erosion and sedimentation during construction. The stones and boulders also limit machine planting for woodland, but the soil is well suited to trees, and machine planting is practical in most areas.

Ud - Udorthents, smoothed. This unit consists of areas that have been altered by cutting or filling. The areas are commonly rectangular and mostly range from 5 to 100 acres. Slopes are mainly 0 to 25 percent. The material in these areas is mostly loamy, and in the filled areas are on flood plains, in tidal marshes, and on areas of poorly drained and very poorly drained soils.

Included with this unit in mapping are small areas of soils that have not been cut or filled. Also included are a few larger urbanized areas and a few small areas containing material such as logs, tree stumps, concrete, and industrial wastes. A few areas have exposed bedrock. Included areas make up about 30 percent of this map unit. The properties and characteristic of this unit are variable, and the unit requires onsite investigation and evaluation for most uses.

WyB - Woodbridge very stony fine sandy loam, 3 to 8 percent slopes. This gently sloping, moderately well drained soil is on the top of drumlins and at the base of drumlins and ridges on glacial uplands. It has 0.1 to 3 percent of the surface covered with stones and boulders. Slopes are smooth and concave and generally are 100 to 500 feet long. The areas are dominantly oval or long and narrow and are mostly 5 to 35 acres in size.

Included with this soil in mapping are small intermingled areas, generally less than 1 acre in size, of well drained Paxton Soils, moderately well drained Sutton soils, and poorly drained Ridgebury soils. In a few small areas, more than 3 percent of the surface is covered with stones and boulders. In a few areas, slopes are less than 3 percent. Included areas make up 5 to 15 percent of this map unit.

From late fall until early mid-spring, this soil has a water table at a depth of about 20 inches. Permeability is moderate in the surface layer and subsoil and slow in the substratum. This soil has a moderate available water capacity. Runoff is medium. This soil tends to dry out and warm up slowly in the spring. It has a low shrink-swell potential. In areas that are not limed, this soil is strongly acid through medium acid.

This soil has a fair potential for community development. It is fairly easy to excavate; however, the substratum is very firm, and in many areas there are stones and boulders in the soil as well as on the surface. Because of the seasonal high water table, excavations are frequently inundated. Steep slopes of excavations are not stable when the soil is saturated and tend to slump. Particular attention needs to be given to building houses that have a basement because the basement generally is below the depth of the water table. A wet basement results unless the soil is drained. Waste disposal systems, such as an onsite septic system, will generally not function satisfactorily with only normal design and installation because of the slowly permeable substratum and the seasonal high water table. Very careful and often costly design and installation are required to insure a satisfactory system. The stones and boulders on the surface interfere with landscaping and are costly to remove. During construction of community developments, conservation measures are needed to prevent excessive runoff, erosion, and siltation.

This soil is well suited to trees. Productivity is moderately high. The stones and boulders slightly hinder the use of harvesting and planting equipment, but machine planting is practical in open areas. Trees to favor in existing woodlots are eastern white pine, sugar maple, and northern red oak. Trees to plant in open areas are eastern white pine and European larch.

Included Soils

Hp -The Hollis series consists of somewhat excessively drained, nonstony to extremely stony soils that formed in a thin mantle of loamy glacial till derived mainly from gneiss and schist. Hollis soils are on the landscape with well drained Charlton soils, moderately well drained Sutton soils, poorly drained Leicester and Ridgbury soils, and very poorly drained Adrian, Carlisle, and Whitman soils.

These Hollis and Charlton soils have moderate or moderately rapid permeability. Runoff is medium to rapid. The available water capacity is low in the Hollis soils and moderate in the Charlton soils. Both soils dry out and warm up early in spring. Both are very strongly acid to medium acid.

These soils are considered having severe conditions for building site development and septic systems (soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required). The major limitations of this complex for community development are the shallow depth to bedrock in the Hollis soils and the areas of exposed bedrock. The shallow depth to bedrock causes the uprooting of many trees during windy periods. Quickly establishing plant cover, mulching, and using siltation basins and diversions help to control erosion and sedimentation during construction.

The stones and boulders on the surface restrict the use of farming equipment and make the soil unsuitable for cultivated crops. Although the stones and boulders hinder machine planting, the soil is well suited to trees, and machine planting is practical in most areas.

Sources of Soil Data

There are eight mapping units of soils indicated on the site plans provided (Milone & MacBroom, Existing Conditions Watershed Map Sheet 1 of 1), plus one significant included soil described (Hollis). The soils profiles provided with the application materials is limited to four test pit profiles given in Appendix 1 of the Engineering Report by Milone & MacBroom.

Other information on soils within Witek Park are indicated in the April, 1984 Ansonia Derby Water Company Lands King's Mark Environmental Review Team Report (pages 50 -53). Soil information is also provided in the document "Engineering Report, Witek Park Field Improvements Academy Hill Road & Sentinel Hill Road Derby, Connecticut" August 2002, by Milone & Macbroom. Page 4 of the site plan, completed by Milone & MacBroom, revised October 9, 2002 (1" = 100') also was used as a reference for this report. The report by Roy A. Shook, Jr., Soil Scientist, from Environmental Resource Associates, is found at the beginning of the Engineering Report. Finally, the USDA New Haven County Soil Survey was used as a source for soil information for this section.

It should be noted, as is noted by Mr. Shook, that there are some differences between the soil mapping units in the New Haven County Soil Survey and the soil mapping units indicated based on site gathered soil data. Basically, the site data indicates the included soils as more significant then the survey indicates. Details on these more critical soils are given below, as well as details on the major soil-mapping units.

Conservation of Soil and Water Resources

This site has complex soil and hydrologic regimes. Included areas of soils are wet, there are seeps and springs resulting from bedrock controlled groundwater and steep slopes, and bedrock outcrops that provide unique habitats. The existing natural vegetation cover maximizes storm water infiltration and supports the water quality of the reservoirs, as well as all the other inherent environmental and passive recreational values. It is prudent, therefore, to minimize the initial development impacts as much as possible and to also provide mechanisms for minimizing impacts into the future. All information provided by the Southwest Conservation District is strictly advisory.

To Minimize Site Disturbances and Maintain Environmental Quality

- *Relocate rock stockpile* to location more accessible after construction and to reduce disturbance near intermittent watercourse. Figure 4.

- *Minimize disturbance in the wetland buffer.* Particularly on the north side, the roadside disturbed area encroaches on the wetland buffer zone. Moving the roadway southward and decreasing the overall cleared margin would help minimize impacts to the buffer. Site line considerations for the access road could be mitigated by speed bumps or by increasing the curve radius which would be possible if the parking area were moved.

- *Move lower parking lot* closer to entrance area; lot can then be used for visitors to the memorial area and for other pedestrians accessing the park when access road is closed. Bringing the parking lot nearer to the entrance will decrease traffic on the access road and over the wetland crossing and reduce impermeable surfaces upslope of wetlands. Figure 5.

- *Amend section 2.3 of the Integrated Turf Management Plan.* Include a plan for minimizing mowing of areas "outside the playing surfaces" which should include all potentially landscaped areas such as setbacks along the access road and cleared areas outside those necessary for access by park users. Limit mowing to once per year (after August 15th), especially on steep slopes, in order to maximize storm water retention, minimize erosion, increase transitional areas for wildlife habitat and to minimize the costs and environmental impacts associated with excessive landscaping.

- *Modify section 4.0 of the Integrated Turf Management Plan* (monitoring section) to include a mechanism to allow for public input into the monitoring process. This encourages stewardship of the property by concerned citizens and can assist with the long-term environmental health of the property.

- *Detail a plan* for storm water infrastructure cleaning and maintenance.

- *Change the drainage* under the roadway at the wetland crossing from a 45 LF 24" RCP to a box culvert or preferably, a precast arch crossing to maintain wetland continuity and limit filling and disturbance. (Appendix A).

Maintain Water Quality

Many areas on this parcel have soils with shallow depth to bedrock. Disturbing soils and or bedrock upslope can affect ground water flow and thus can modify soil characteristics affecting dependent plant communities. It is beneficial therefore to not concentrate storm water flows to specific outlet points, but to duplicate the original hydrology as much as possible by dispersing flows and allowing infiltration at points that correspond to existing natural conditions. However, this needs to be weighed against the issue of controlling the larger volumes of runoff created from the impervious surfaces of development and the mitigation of pollutants from vehicles and added lawn nutrients and chemicals.

- *Modify drainage near entrance.* At a minimum use a Riprap Energy Dissipater With Vegetated Biofilter (detailed Site Plan Details Sheet 13, Milone & MacBroom Witek Park Field Improvements, October 9, 2002 Revised) for the wetland crossing and at the existing drainage swale near the proposed entrance, simultaneously providing the necessary stormwater controls as required by the construction of the access road, and enhancing reservoir water quality through retention of storm water from the existing storm sewer discharge. A bioretention can double as a landscaping augmentation near the entrance.

- *Redirect drainage system* for parking areas and recreational fields similar to Figure 6, to accommodate a single location for bioretention of runoff. Consider a system adaptable for use of stormwater for irrigation or for supplementing irrigation (Figure 7) and a structure which is designed and located for easy maintenance. The bioretention design should act to filter and to collect runoff for irrigation and or to retain for transpiration/evaporation, as opposed to favoring infiltration. Appendix B details bioretention design.

- *Show a plan for potable water and sanitation facilities* or include information in the application that demonstrates there is no need for such facilities. Any facility proposed would require careful design and design, given the extent and distribution of marginal soils on the site.

Figure 3

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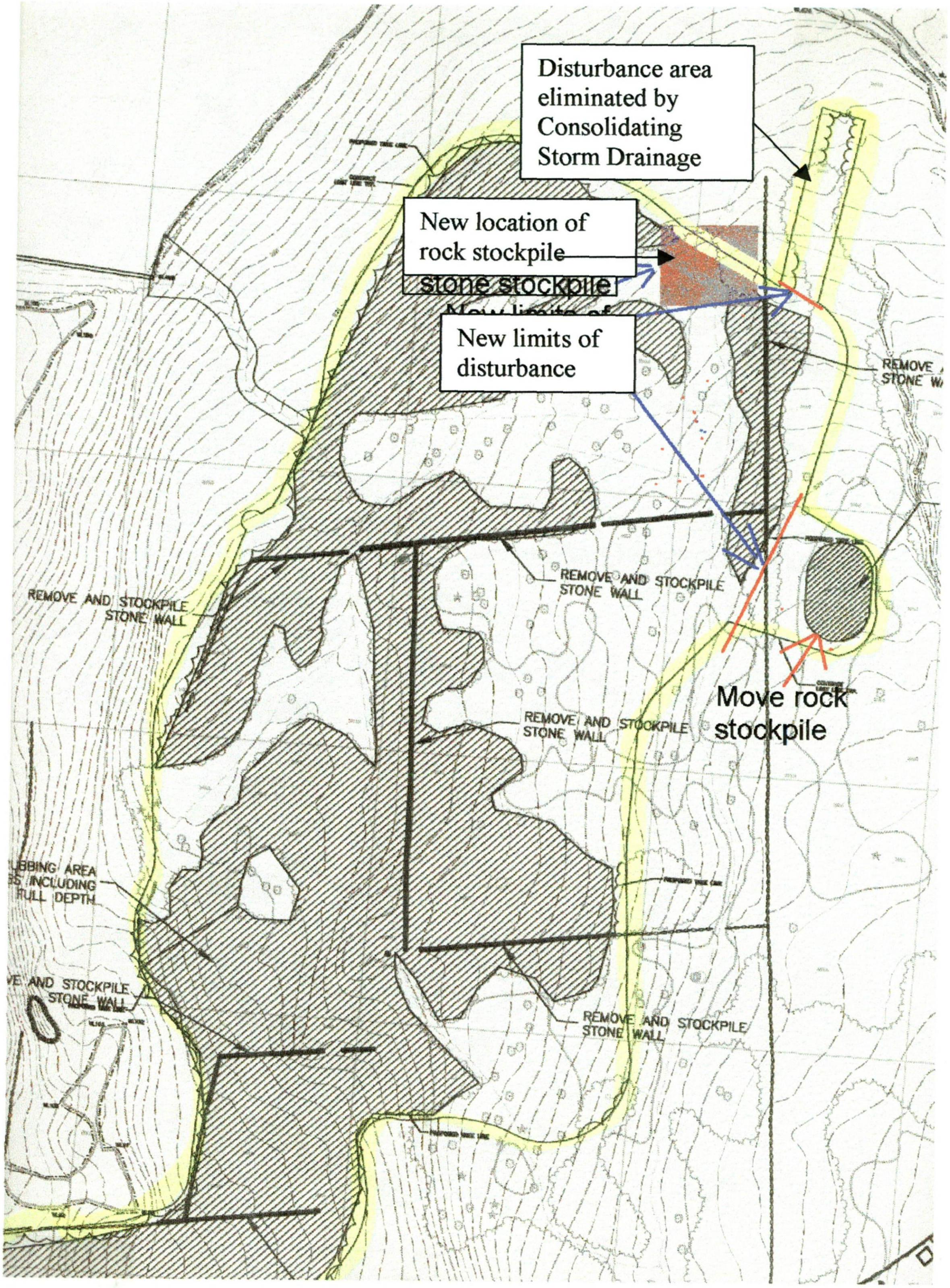
Soils Map

Scale 1″ = 1320′

Figure 4



Relocate rock stockpile to location more accessible after construction and to reduce site disturbance near intermittent watercourse.

Figure 5

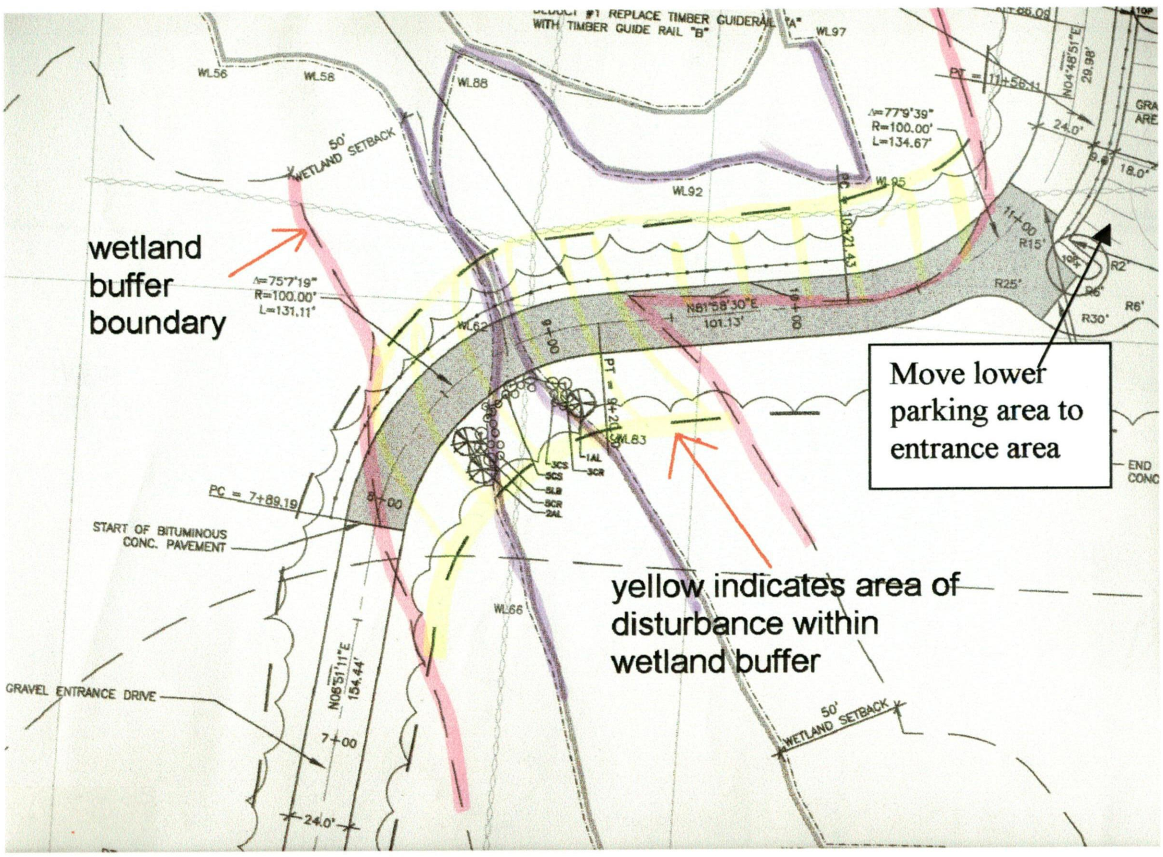


FIGURE 2 **Disturbance In The Wetland Buffer.** Particularly on the north side, the road side disturbed area encroaches on the wetland buffer zone. Moving the roadway southward and decreasing the cut vegetation margin would help minimize impacts to the buffer. Site line considerations for the access road could be mitigated by speed bumps or by increasing the curve radius that would be possible if the parking area were moved.

Figure 6

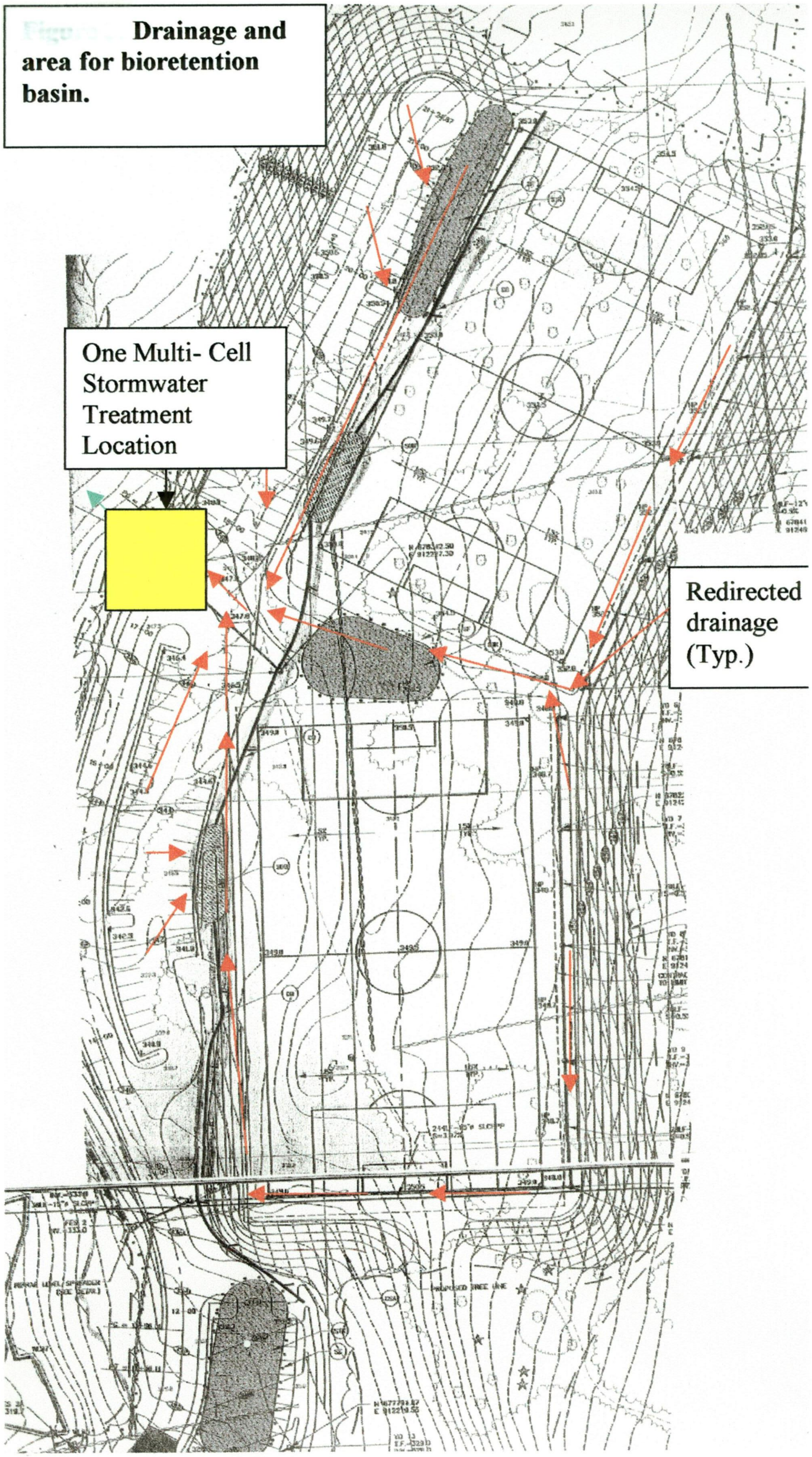
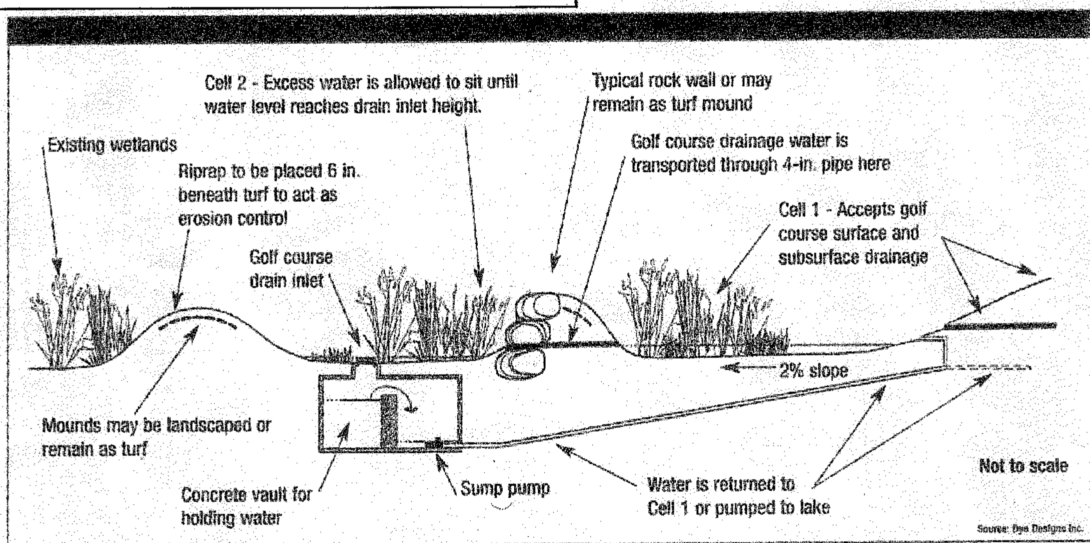

Drainage and area for bioretention basin.
One Multi- Cell Stormwater Treatment Location
Redirected drainage (Typ.)

Figure 7

Basic Design for capturing runoff for irrigation use.



Source: Erosion Control July/August 2002, page 34.

Wetland Review

The ERT Team has been asked to comment on the field improvement proposal as mapped on August 22, 2002. This proposal creates two soccer fields, parking and an entrance road onto the property.

The largest of the wet areas on the site are the open water reservoirs of which there are two. The largest or upper reservoir is to the north and is mapped by DEP as being 29.9 acres in surface area. It sits at 307 feet above sea level. The smaller reservoir to the south is mapped by the DEP as 8.7 acres and is 277 feet above sea level. The watercourse flowing southwest from the lower reservoir travels slightly over a half a mile to the Naugatuck River. This in turn flows just a matter of a few hundred yards before it has a confluence with the Housatonic River main stem.

The balance of the non-open water wetlands that this proposal potentially impacts can be described as streams passing through forested areas on their way down slope to either of the two water bodies.

The proposal has done a good job of avoiding wetland impacts. While one or two locations fall within the 50 foot wetland setback, due to the nature of the typically intermittent forested streamcourses, with appropriate vegetative cover to act as buffers and filter strips, impacts should be nearly nonexistent to these wetlands.

The wetland impacts of this proposal can be minimized as has been seen by many of the efforts of this proposal. However, future use of the area for recreation, that is, more fields in future years, must be addressed. These two fields fit in and the closer they are to the neighboring dwellings the less segmentation there will be to the remaining open space area of the park.

Additional fields in future years could begin to impact beyond the ability of the land to be forgiving.

The city should consider and discuss what type of winter use will occur on the site. Will there be any winter plowing of the roadway? It would seem appropriate if there was no plowing thereby not loosening the gravel from the roads and encouraging dirt and sediment piles at the side of the road with the resulting sediment runoff.

Issues

- Sedimentation from the existing drainage swale off Academy Hill Road into the lower reservoir is the largest existing wetland impact. The swale is rough in texture being made up of riprap with the bottom lined with leaves and sticks at the time of the Team's visit. These factors serve well the issue of energy dissipation as the water moves down hill from the road to the water. The start of the swale at Academy Hill Road is at +300 feet and the surface of the water is at +277 feet. The swale is about 400 feet in length and thus the water moves down roughly a six percent slope. It carries with it a burden of what appears to be road sand and deposits it into the lower reservoir where it forms a delta. The DEP Fisheries staff is available for additional assistance on how to best address this concern.

- There is no precedent for the proposed 250 setback of the field from the residential area. 250 feet is the proposal, albeit arbitrary, to remove the closest portion of the fields from the nearest residence. In fact, as proposed, the nearest corner of the field is more than 400 feet from the nearest dwelling unit. This leaves the more northern of the two fields closer to the upper reservoir (300 feet) than to homes. The proximity to the reservoir could be decreased with the moving of the proposed fields closer to the homes. As stated at the ERT meeting, 250 feet was an arbitrary distance. Certainly being moved closer to the houses (a more typical 150+ feet) and pivoting the south field so that it is more or less perpendicular to the north field would allow for less fragmentation of the area has a whole. Visual vegetation barriers could be planted along house lines-of-sight and could be used to the advantage by making the plantings wildlife friendly.

- The issue of sedimentation into the water bodies during construction should be closely considered. Sedimentation barriers should be in place as would be spelled out by a sediment and erosion control plan incorporating the latest recommendations as put forth in the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control.[1] Completed construction should see the slopes of the fields and parking areas well vegetated with grasses and shrubs acting as buffers and filters to prevent sediments from reaching the reservoir waters.

- The proposed wetland road crossing at the time of the visit passed over a dry streambed lined with leaves. This is typical of the streambeds that dissect the property. The proposal has done well to avoid impacts to wetlands as a whole and the minimal impact on the intermittent watercourse here is a sign of that intent. In fact, the positioning of the fields as proposed has avoided the watercourse that was most active at the time of the field visit. This is located north of the fields and was flowing two to three feet wide with clear water over a sand and small stone (up to two inches in diameter) bottom. Any future planning or redesign should respect the setbacks and buffers for this watercourse.

- The road into the parking and field area is proposed to be gravel. The narrow profile of the gravel road and permitting the trees to encroach upon the road

[1] Available at the DEP Store in Hartford, 424-3555.

side as closely as the city's regulations allow will minimize its impact on the immediate area. Roads like this are typically unobtrusive since they serve as just a pass through area to the areas of actual activity.

- Consideration should be given to the irrigation system regarding the use of reservoir water instead of city water. This is a reasonable use of the water resources at hand and based on the discussions of algal blooms in summer could become part of what should be an overall management plan for these water bodies. The DEP (Lakes Management Unit 860-424-3716) can assist in the planning/discussion of these uses, especially when it comes to lowering the reservoir water levels in springtime to allow for both spring runoff and to decrease the reported downstream flooding.

Stormwater Management Review

Stormwater Permitting

Since the construction involves the disturbance of over five acres, Connecticut's General Permit for the Discharge of Stormwater and Dewatering Wastewaters ("the Permit" will cover the project. The Permit requires that the site register with the Department of Environmental Protection (CTDEP) at least 30 days before the start of construction. The registrant must also prepare, submit and keep on site during the construction project a Stormwater Pollution Control Plan ("the Plan"). Due to the size and potential impacts on natural resources of this project, the Department has recommended to the developer that the Plan be submitted 90 days prior to the start of construction. If the Department finds that the Plan is inadequate, Connecticut General Statutes Section 22a-430b and Permit Section 7(c) allow the Commissioner to require an individual permit, a process that could delay approval of the project for several months. In order to prevent this and to ensure adequate review time, the Department has requested early submittal of the Plan.

Please note that while this review is based primarily on the Permit, many of the erosion and sedimentation issues are included in the Connecticut Guidelines for Soil Erosion and Sediment Control (the "guidelines"), and are issues that must be dealt with on a local level before being included in the Plan. It should also be noted that the permit requires compliance with the guidelines. The developer must register for the Permit, and the contractor and nay subcontractors involved in grading must sign the contractor certification statement in the Permit. Any registration submitted by anyone other than the developer will be rejected.

The Plan must include a site map as described in Section 6(b)(6)(A) of the Permit and a copy of the erosion and sedimentation (E&S) control plan for the site. This plan and site map must include specifics on controls that will be used during each phase of construction. Specific site maps and controls must be described in the Plan, as well as construction details for each control used. The Permit requires that the plan shall ensure and demonstrate compliance with the guidelines.

Due to the amount of soil disturbance, one oaf the best ways to minimize erosion potential is to phase construction in order to minimize unstable areas. However, due to the balance of cuts and fills, phasing in some areas will be extremely difficult. The Plan must be flexible to account for adjustment of controls as necessary in order to meet field conditions. At a minimum, the Plan must include interior controls appropriate to different phases of construction. The plan should identify areas where stock piling of soil will occur and detail the type of erosion controls that will be used during the cut and fill portion of the project.

This project has steep slopes and numerous wetland areas to be protected, which will make ongoing inspections and adjustments of controls a critical aspect of this project. The Permit (Section 6(b)(6)(D)) requires inspections of all areas at least once every seven calendar days and after every storm of 0.1 inches or greater. The Plan must also give the inspector the authority to require additional control measures if the inspector finds them necessary, and should note the qualifications of personnel doing the inspections. In addition, the Plan must include monthly inspections of stabilized areas for at least three months *following* stabilization.

Due to the size of the project and the variability and complexity of controls potentially needed, a full time erosion and sediment control inspector, approved by the Department, may be required by the Department during construction.

Section 6(b)(6)(C)(ii) of the Permit requires the Plan to address dewatering wastewaters, which this site may generate. Specific details for construction control during installation of all wetland crossings must be provided.

Particular attention must be paid to the construction in the area of the site which has very steep slopes. Soil type and the location of the water table must be considered when cutting and filling of slopes during the construction process. Also, when the cutting and filling portion of the project is conducted please ensure that the tops of the slopes are stabilized with berms or other means that comply with the guidelines. It may be necessary to evaluate the use of foundation drains in this area. The Department recommends erosion control matting for slopes greater than 3 to 1.

Post Construction Stormwater Treatment

The submitted plans give only a minimal amount of discussion with regard to post-construction stormwater treatment. The permit (Section 6(b)(6)(C)(iii) requires that the plan include a design for post-construction stormwater treatment of 80% of total suspended solids from the stormwater discharge shall be used in designing and installing stormwater management measures. Such measures may include but are not limited to: stormwater detention structures (including wet ponds); stormwater retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff on-site; vegetated buffer strips; sediment removal chambers or structures; and sequential systems (which combine several practices). Swirl concentrators are effective at removing sediment, but they require a long-term maintenance commitment from the city greater than that required for a basin once it is fully grown-in and stabilized. If an in-ground, "black-box" solution is used, swirl-concentrator technology is a minimum requirement. Some newer generation swirl concentrators also incorporate filtration systems to address other pollutant issues, but these also require long-term maintenance plans.

Erosion and Sediment Control Notes

The Permit stabilization requirements include the following: where construction activities have permanently ceased or temporarily been suspended for more than seven days or where final grades are reached in any portion of the site, stabilization practices shall be implemented within three days.

Minimization of disturbed areas and prompt stabilization will be key aspects to avoidance of pollution from this project.

Other Issues

The diversion swale along Academy Hill Road must be designed to manage the additional (calculated) runoff and in accordance with the guidelines. At present it cannot handle the runoff it receives and has not been maintained properly.

The Department is concerned about continuing maintenance of a gravel road to access the site both during and post-construction.

This section touches on some of the major issues concerning the project and does not constitute a complete review of the project for permitting purposes.

Aquatic Resources Review

(NOTE: The Team fisheries biologist visited the site on July 11, 2002 with members of the Derby Open Space Commission. His assessment and recommendations are based upon that site visit.)

Site Description

Two significant waterbodies are found within the 144 acre Witek Park these being, Ansonia Reservoir (Upper Reservoir, ±30 surface acres) and Derby Reservoir (Lower Reservoir, ±9 surface acres) Both waterbodies were created by impounding an unnamed tributary to the Naugatuck River to provide water supply for the Birmingham Water Company. The 11. 2 acres of the park proposed for development of two soccer fields drain toward Derby Reservoir. Therefore, the aquatic resource evaluation and impact assessment will focus on this impoundment.

Bathymetric information for Derby Reservoir is currently unavailable. Based upon site conditions, it is presumed that the impoundment is shallow with maximum water depths likely less than 15 feet. The eastern shoreline of Derby Reservoir is steeply sided with the remainder of the shore having a more gradual slope. Overflow from Ansonia Reservoir enters along the north-west shore; intermittent drainages enter from points along the eastern and northern shore. It is reported that the Birmingham Water Company maintained a conduit system which allowed for a controlled release of water from Ansonia reservoir to Derby reservoir. Reportedly the water releases were to provide a means of improving water quality conditions in Derby reservoir during low precipitation periods of the summer months.

The Birmingham Water Company maintained the land around Ansonia Reservoir and Derby Reservoir as forest to enhance and protect water quality.

Dense growths of conifers, hardwoods and woody shrubs continue to predominate as vegetation around the impoundments. Submergent vegetation is sparse in Derby Reservoir however, the impoundment is reportedly prone to excessive blooms of unicellular algae and filamentous algae during the summer months. Physical habitat in Derby Reservoir is comprised of water depth, aquatic vegetation and fallen or overhanging shoreline vegetation.

The Department of Environmental Protection classifies Derby Reservoir as *Class AA* surface waters. Designated uses for surface water of this classification are existing or potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other purposes.

Aquatic Habitats and Resources

With a shallow water depth, moderate aquatic plant growth, and recurring algal blooms, Derby Reservoir can be classified as a warm-water resource. Formal surveys have never been conducted to evaluate the resident fish population. The impoundment is anticipated to support bluegill (*Lepomis macrochirus*), largemouth bass *(Micropterus salmoides)*, golden shiner *(Notemigonus crysoleucas)*, and brown bullhead *(ameiurus nebulosus)*. These fish species are common to warm-water lakes and ponds in Connecticut.

It is reported that trout had been liberated into Derby Reservoir for a spring fishing tournament. Year-round trout survival is not anticipated given diminished water quality conditions of the summer months.

Impacts

- **Riparian Buffers:** Plot plans depict the soccer fields and associated parking lots and access road will occur several hundred feet east of Derby Reservoir. An undisturbed buffer of vegetation will remain between the developed site and the impoundment. Vegetated buffers of this width should adequately serve as a "filter" to prevent sediments, nutrients, fertilizers and other non-point source pollutants originating on developed upland areas from entry into Derby Reservoir. Such non-point source pollutants can degrade habitat and water quality. Please refer to the attached documentation presenting Inland Fisheries Division Policy and position regarding vegetated riparian buffers for additional information (see Appendix C).

- **Stormwater Runoff:** While a vegetated buffer will remain between Derby Reservoir and the proposed soccer fields site, stormwater runoff from the access road and three parking areas (totaling 125 parking spaces) will be discharged to Derby Reservoir either as overland flow or into intermittent tributary streams. The access road and parking areas will create a significant amount of impervious surface. Studies conducted in Maryland demonstrate that on sites with 35-50% impervious coverage, 35% of fallen precipitation is lost to evapotranspiration, 20% to shallow soil infiltration, 15% to deep soil infiltration and 30% to off-site runoff. In comparison, precipitation falling on sites with a natural ground conclude with losses of 40% to evapotranspiration, 25% to shallow soil infiltration, 25% to deep soil infiltration and 10% to off-site runoff.

  Of concern with the alteration of the hydrologic cycle specific to the soccer field site in Witek Park are the potential loss of groundwater recharge and the quality and quantity of stormwater runoff to Derby Reservoir. On sites maintained with significant amounts of natural ground cover, a considerable percentage of fallen precipitation infiltrates into the soil and contributes to groundwater recharge. Ground water is part of the local water table which is connected to surface waters such as Derby Reservoir. The local water table provides seepage to the impoundment during dry periods and maintains a base water surface elevation essential to biological and habitat integrity. A significant reduction or loss of groundwater recharge can lead to lowering of the water table and a reduction of water surface elevation of the impoundment during extended dry weather periods.

Based upon published studies, it can be estimated that roughly 25-30% of the precipitation falling on impervious surfaces of the soccer field site has the potential to result in off-site runoff to Derby Reservoir. Materials that accumulate on paved surfaces during dry periods can be washed into the impoundment by rainfall runoff. Petroleum products, heavy metals, sand and salt are the most common of the pollutants originating from impervious surfaces such as parking areas and roadways. Although the discharge of these materials may not directly contribute to episodic kills of aquatic life because of dilution in stormwater, the continued discharge over time is anticipated to degrade habitat and water quality. This will ultimately diminish the ability of Derby reservoir to support a diverse aquatic species assemblage.

The land use change resulting from development of the proposed soccer field site in Witek Park may not only promote localized impacts to Derby Reservoir but may also contribute to the cumulative impacts associated with urbanization on a watershed-wide scale in the Derby Reservoir drainage basin. It is reported that the unnamed stream outletting Derby Reservoir is prone to frequent flooding. Stormwater runoff from increased impervious surface adjacent to the impoundment can contribute to flooding farther downstream.

- **Water Withdrawals**: Irrigation of the soccer fields will be required for turf maintenance. Alternatives for an irrigation water supply are drafting water from Ansonia Reservoir or using municipal water. Surface water overflow from Ansonia Reservoir presently discharges to Derby Reservoir. This water flow is critical to the removal (by dilution and/or flushing) of nutrients in Derby Reservoir. Dissolved nutrients in the impoundment promote the algal blooms which reportedly occur on an annual basis in Derby Reservoir. The diversion of water from Ansonia Reservoir for irrigation can result in a decrease of the frequency or volume flow available for nutrient dissipation in Derby Reservoir. This will likely result in more frequent or intense algal blooms which will ultimately degrade water quality.

Recommendations

The following measures are recommended for incorporation into the design of the proposed soccer fields in Witek Park in an effort to eliminate the potential impacts to Derby Reservoir and to the unnamed stream outletting the impoundment.

- The two soccer fields should be located farther to the west of their currently proposed location. The three parking lots should then be located east of the soccer fields.
- The access road to the parking lots should be kept to the most minimal width allowed by local regulation.
- The access road and parking lots should be constructed of gravel or a permeable pavement to allow precipitation to infiltrate into the soil.
- Stormwater from the access road and parking lots should be directed by sheet flow to vegetated swales rather than be collected in a piped drainage system.
- Grass lined swales should be constructed around the soccer field perimeters to collect stormwater which may be laden with fertilizer.

- Investigate the feasibility of using water from Derby Reservoir for soccer field irrigation. The nutrient enriched water of the impoundment may negate the need to apply turf fertilizer. In conjunction with water withdrawal from Derby Reservoir, the conduit interconnection from Ansonia Reservoir should be repaired to working order. The combination of withdrawing nutrient enriched water coupled with the inflow of higher quality water from Ansonia Reservoir should improve aquatic habitat conditions in Derby Reservoir.
- Establish comprehensive erosion and sediment control plans with mitigative measures (detention-infiltration/water quality basins, haybales, silt fence, etc.) to be installed prior to and maintained through all phases of site development. Land clearing and other disturbance should be kept to a minimum with all disturbed areas being protected from storm events and be restabilized in a timely manner.

Literature Reviewed

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Wildlife Habitat Review

General Background

The 144 acre Witek Park owned by the City of Derby provides diverse wildlife habitat in a rapidly urbanizing area. This section will review the potential impact to the wildlife resource given the proposed development of soccer fields and associated changes to Witek Park and will also make recommedations for reducing wildlife impacts.

Wildlife Observations / Site Inspection

Wildlife observed utilizing the property during site visit on December 17, 2002 were: American robin *(Turdus migratorius)*, blue jay *(Cyanocitta cristata)*, American crow *(Corvus brachyrynchos)*, carolina wren *(Thryothorus ludovidicianus)*, white-throated sparrow *(Zonotrichia leucophrys)*, blackcapped chickadee *(Parus atricapillus)*, downy woodpecker *(Picoides pubescens)*, mourning dove *(Zenaida macroura)*, red-tailed hawk *(Buteo jamaicensis)*, gray squirrel *(Sciurus caroliniana)* and white-tailed deer *(Odocoilius virginiana)*. A more detailed wildlife census of the property during the four seasons of the year would reveal additional wildlife use of the property. The wildlife utilizing the property are a reflection of the diversity in the plant communities and their proximity to each other.

Current Conditions

The City of Derby is only about 33 percent forested (see Figure 8), which is much lower than the statewide figure of 59 percent forested conditions. The Witek Park property represents a significant portion of Derby's forested environments. The diversity in wildlife is directly linked to the diversity of habitat located in Derby.

Figure 8. Derby's Land Use and Land Cover

1996 data from Department of Environmental Protection's Geographic Information Systems Unit, 79 Elm Street, Hartford, CT.

Derby 3,472.07 acres = 5.43 square miles

Land Use/Land Cover Category	Acreage	Percent
Impervious Surfaces	177.57	5.11
Residential High Density	192.18	5.54
Residential Medium Density	814.53	23.46
Roof Surfaces	5.86	0.17
Road Pavement	8.01	0.23
Major Roads	228.97	6.59
Grass Turf/Hay/Pasture	314.92	9.07
Soil/Corn	8.45	0.24
Corn/Grass	3.56	0.10
Forest (Deciduous)	1,042.39	30.02
Forest (Coniferous)	43.26	1.25
Forest (Wetland)	63.86	1.84
Water (Deep)	223.55	6.44
Water (Shallow)	98.15	2.83
Land (Barren)	170.39	4.91
Soil (Bare)	68.31	1.97
Marsh (Hi-Coast)	8.10	0.23

Wildlife Resource

Wildlife are considered a natural resource. In the United States, wildlife belong to the public and are held in the public trust by governmental agencies. Historically, Connecticut's 3.2 million acres had a period of deforestation during colonial times and by the mid 1800's over 75 percent of the land was pasture or field. As socioeconomic conditions changed, farms were abandoned and reforestation occurred leading to 59 percent of Connecticut being forested today. Much of the wildlife resource has recovered dramatically during the reforestation period, however the effects of urbanization on wildlife from development is increasing. Today, development and fragmentation are two of the leading causes of habitat loss and habitat degradation in Connecticut.

Wildlife-Related Impacts Regarding the Development of Soccer Fields

The development of soccer fields and parking requires landscaping, removal of forest cover, grading, and shaping of the land to create suitable conditions for fields and parking areas.

- **Wildlife Impact #1 - Forest Fragmentation and Shrinking Forest Size.** Forest fragmentation and shrinking forest sizes due to human development are considered major wildlife conservation issues in northeastern United States. There are several scientific studies in wildlife ecology that indicate a strong relationship between small forests and high human use leads to declining function as meaningful reserves for area-sensitive (wildlife that require larger unbroken parcels) wildlife (Bond 1957, Levenson 1981, Hohne 1981, Whitcomb et al. 1981, Askins et al. 1987). The impact is best described or understood from a landscape-level perspective. As forested land is removed, remaining forests are smaller and further fragmented. Some species of wildlife (interior forest species) such as wood thrushes *(Hylocichla mustelina)*, red-eyed vireos *(Vireo olivaceus)*, and ovenbirds *(Seiurus aurocapillus)* require large, unbroken forests to maintain breeding habitats. Also, as forest habitat sizes shrink, they are less viable as breeding places for interior forest birds and an increase in predation and parasitism of nests occurs (Blake and Karr 1985). With only 33 percent of Derby being forested, Witek Park represents a significant portion of the forested area.

- **Reducing Impact #1. Find a more prudent and feasible alternative to the current design and location of fields.**

- **A -** Keep fields and parking areas on the edges of Witek Park rather than inside the forest. Keeping the forest clearing, roads and parking lots on the edges of the forest reduces the fragmentation effects to wildlife.
- **B -** Find other land in Derby which is already fragmented. Locating ball fields in areas already developed reduces impacts by keeping it away from natural areas such as Witek Park.

- **Wildlife Impact #2 - Conversion of Forested Habitat to Mowed Grass / Field** Conversion of forested habitat to mowed grass conditions will alter the type and number of wildlife species using the area. The wildlife species that are likely to benefit from the open and mowed habitat are generalists. Generalists are very adaptable species such as American robins, crows, bluejays, and northern cardinals. This particular development will also benefit birds such as Canada geese which congregate in large numbers, feed on turf grass, and leave large volumes of feces on the turf and in nearby waterbodies. Canada geese would be expected to increase locally and nuisance issues are likely to increase. Other detrimental wildlife species that will increase with open and mowed habitats are non-native European Starlings *(Sturnus vulgaris)* and house sparrows *(Passer domesticus)* which compete with native cavity nesters such as eastern Bluebirds(*Sialia sialis)* and woodpeckers. Brown headed cowbirds *(Molothrus ater)* will also increase and parasitize nests of other birds especially interior forest songbirds.

- **Impact # 3 - Substantial Cutting/Filling and Increased Runoff.** The existing proposal shows a significant cutting and filling to create the parking lot and soccer fields. Because of the steeper grades, cutting and filling is required by the current proposal. Increased runoff from the development can be expected which can alter water quality in down gradient areas. Altering the land using significant cutting and filling can increase negative impacts to wildlife especially reptiles and amphibians that use microhabitats such as seeps, rocks, and other parts of a natural forested environment.

- **Reducing Impact #3.**
    - **A -** Locate and place fields and parking lots on more level property.
    - **B -** Prevent potential runoff by locating parking further away from the Park's reservoir.
    - **C -** Keep the development footprint small. Maintain natural vegetation as much as possible along the edges. Currently, a large expansive natural area is being altered.
    - **D -** Replant site with native vegetation along parking lot and field edges . Recommended plantings should include native plantings such as Northern bayberry *(Myrica pensylvanica),* black chokeberry *(Aronia melanocarpa),* arrowwood viburnum *(Viburnum lentago),* highbush blueberry *(Vaccinium corymbosum),* shadbush *(Amelanchier canadensis),* pasture juniper *(Juniperus communis),* pin cherry *(Prunus pensylvanica),* red cedar *(Juniperus virginiana),* Pin oak *(Quercus palustris),* and Red maple *(Acer rubrum).* **(These plants are already existing in the area of development.)**

Discussion

With over 80 percent of Connecticut's land being privately owned, habitats are being divided into smaller and more isolated parcels. Land that is in public ownership has the opportunity to be managed for wildlife for the long term. In contrast, private land usually changes ownership and is not usually managed for wildlife for the long term. The proposed development by the City of Derby will alter and reduce the size of forested habitat on city-owned land. As forests continue to shrink, city-owned forests will increase in value and importance for wildlife habitat and refugia. Retention of natural areas and reducing fragmentation effects to wildlife will depend on the prudent development of city-owned property. Careful planning and consideration of wildlife habitat issues will ensure the perpetuity of healthy and diverse wildlife populations for the public to enjoy in Derby. Fragmentation and alteration of interior forest will reduce the quantity and quality wildlife of Witek Park, especially interior forest songbirds. Increases in populations of several nuisance wildlife such as geese, starlings, and house sparrows can be expected with the current development proposal.

The educalional and scientific value of Witek Park should be considered for the residents and students of Derby. Many towns and cities in Connecticut are establishing nature-based recreation and trails to help educate their populace regarding local ecology and natural history. Witek Park has excellent potential to be a valuable outdoor classroom for scientific study and/or provide nature-based recreation.

Conclusion

Forests are valuable for a variety of reasons including the provision of wildlife habitat. Reduction of forest size and fragmentation incrementally occurs throughout the landscape and has direct and indirect effects to wildlife, as mentioned earlier. Building soccer facilities along the edges of forested areas rather than inside the forest is less detrimental to wildlife. Placement of recreational fields in more urbanized parts of Derby would have less negative effects on wildlife. Derby town officials need to decide whether or not there are more prudent and feasible alternatives to removing forest cover and fragmenting a ecologically diverse town park to build soccer fields and parking. This report has innumerated several potential wildlife impacts and made recommendations for reducing those impacts.

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The Natural Diversity Data Base

The Natural Diversity Data Base maps and files regarding the project area have been reviewed. According to our information, there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species that occur at the site in question. However, our information indicates that a State Special Concern Species *Gavia immer* (common loon) may have used the Ansonia Reservoir during the 1950's. The 1950's records do not include many details and are unsupported. This bird species is now considered a historic nester in Connecticut.

Currently we do not have any documented records of common loons nesting in the state. However, despite a lack of nesting pairs, adult common loons continue to summer on several larger lakes in the state, especially in northwestern Connecticut. But usually, reports of summering loons actually turn out to misidentifications of mergansers. This species is considered an uncommon winter visitor and most reports of adult loons are simply traveling through our state.

Potential breeding sites include large bodies of water such as Barkhamsted and Nepaug Reservoirs in Litchfield County. This species requires large lakes or reservoirs with no shoreline development and highly restricted public access (no boating). Common loons prefer to nest in remote sections of these large water bodies and may not tolerate human disturbance.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

Archaeological Review

A review of the State of Connecticut Archaeological Site Files and Maps show four (4) prehistoric Native American campsites dating to over 4,000 years ago, as well as the Carpenter Farm Site, an 18th century farmstead, located immediately to the south of the proposed project area. The Office of State Archaeology (OAS) considers the lands associated with the Ansonia Reservoir system as highly sensitive to pre-Contact and historic archaeological sites. In addition, the OAS has a report prepared for the Derby and Ansonia Conservation Commissions in 1979 by the American Indian Archaeological Institute that identifies Indian burials as located in the area of the reservoir.

The prehistoric Indian sites represent the encampments of hunters-gatherers utilizing the natural resources of the interior wetlands. Inland brook systems draining into the Naugatuck River would have provided excellent areas to hunt wild game and gather vegetable products. These sites probably represented Family groupings of 30-40 people moving on a seasonal basis. The Carpenter Farm consists of a cellar hole, barn foundation, outbuildings, well, and associated earthen dam. While these structural features are located immediately south of the project area, the distribution of historic artifacts and features may extend into the reservoir property. Taken together, these sites represent a limited cultural resource that can provide important information on human adaptation and history in the Derby/Ansonia area.

Previous archaeological surveys in the area for the construction of Ansonia High School revealed archaeological sites of importance. These sites were identified and mitigated during the planning process. The OAS strongly recommends a similar archaeological survey and preservation plan for the athletic field development. All survey work should be conducted in accordance with the Connecticut Historical Commission's *Environmental Review Primer for*

Connecticut's Archaeological Resources, and, should be accomplished prior to any construction activities. The Office of State Archaeology is prepared to offer any technical assistance in conducting the recommended survey. They can provide a list of consultants qualified to conduct the survey.

The Office of State Archaeology would be pleased to work with your commission and the City of Derby in the preservation and conservation of the archaeological resources in the proposed project area.

Park Planner Review

The challenge at Witek Park is to balance a number of valid planning and environmental objectives including: (a) protection and maintenance of existing and potential potable water resources, (b) protection of areas of significant scenic character, and (c) provision of needed outdoor recreation facilities.

Protection of drinking water sources will become an increasingly important goal of society, as demand increases with an increasing population. Although the so-called Ansonia-Derby reservoirs were abandoned and sold by the Birmingham Water Company, water quality reportedly remains satisfactory for domestic use and therefore they have potential as a standby reserve in times of acute and sustained drought as experienced in the mid-1960's. To maintain this potential for possible need by future generations, development should be limited to those activities or facilities which are compatible with this objective and specifically which do not negatively impact water quality in terms of pollution or siltation.

Protection of areas of scenic beauty is another valid conservation goal in maintaining a region's uniqueness and quality of life. This is particularly true of the densely settled Derby-Ansonia area, where major local assets such as Witek Park and Osbornedale State Park act as attractive counterpoints to their urban surroundings. Therefore, maintaining a maximum degree of the natural open space character of Witek Park should be a priority.

In addition, providing sufficient outdoor recreational facilities is a major need for every community, especially with the growing popularity of both youth and adult sports such as softball, soccer and football. Because of overuse, many existing facilities are inadequate to meet the need, requiring consideration of additional sites as is currently the case in Derby.

Recommendations

This reviewer feels that the uniqueness of the Witek Park property within Derby suggests management primarily as low intensity use open space, which would also accomplish the objective of protecting possible future water supply usage. Appropriate activities would include hiking on a well designed system of foot trails, catch and release fishing, and provision of several roadside parking areas as recommended by the Derby Conservation Commission in 1998. Picnic areas adjacent to the parking areas may be acceptable, but the potential as nocturnal party locations should be considered as well as the likelihood of vandalism of picnic tables, etc.

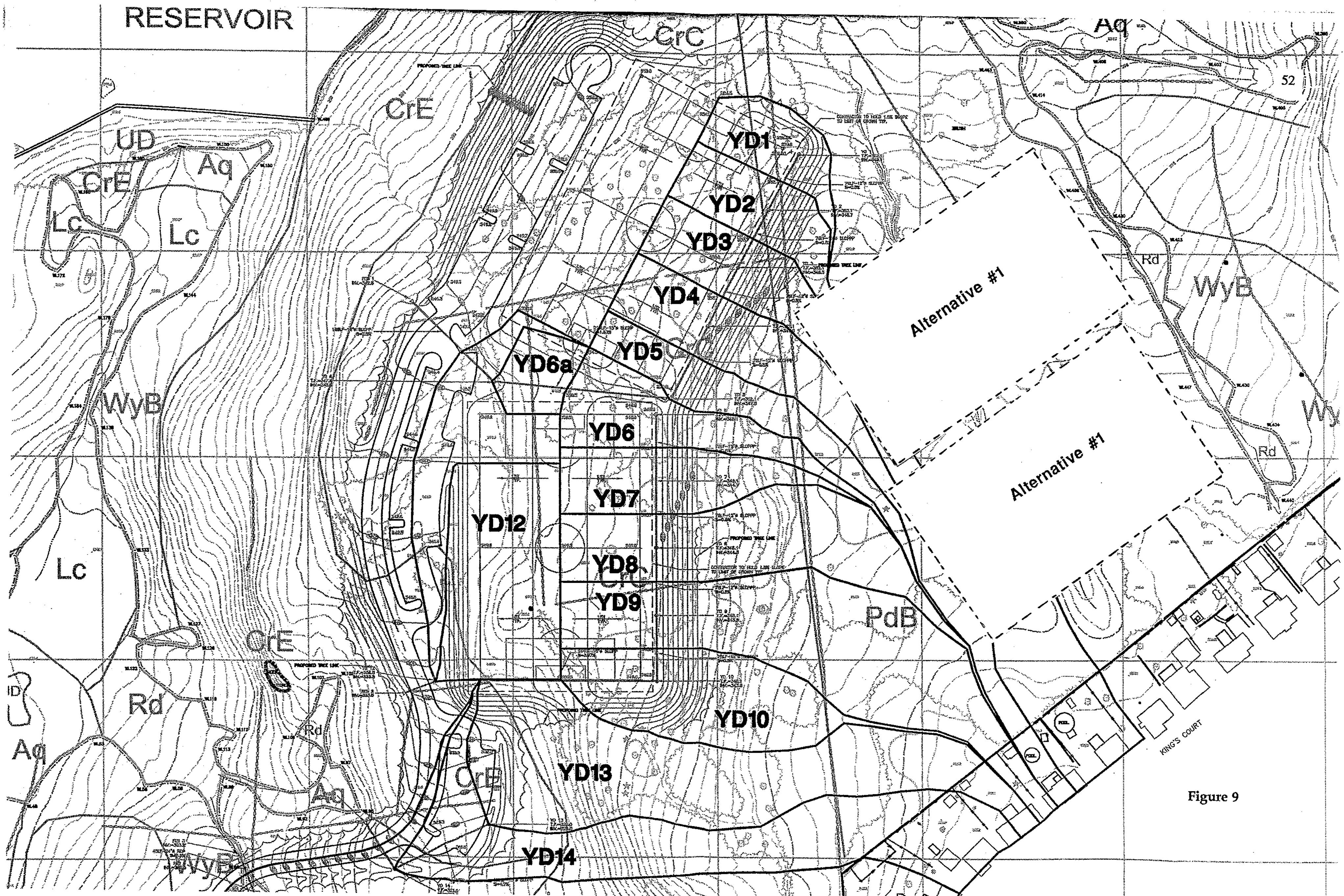
Lastly the potential inclusion of two soccer fields with an access road and related parking in Witek Park must be addressed. Ideally these needed facilities should be located elsewhere within the community to avoid unnecessary impact on the park. However, in the absence of being able to review the Derby Recreation Study Master Plan Report, this reviewer cannot determine whether other, perhaps more viable alternatives are available or were considered.

In the event that there are no other alternatives to this proposed development within Witek Park and if a political decision is made to pursue such action, the proposed plan must be considered. The proposed road location is acceptable and minimizes wetland impact. The soccer field siting will involve some cutting and filling, but reportedly would be engineered to prevent any siltation damage to the two reservoirs and would not exacerbate existing periodic flooding problems downstream of the reservoirs, south of Witek Park.

However, this reviewer wonders why the area east of the proposed soccer field locations was not considered, as it contains the most level portion of the park and therefore appears to require the least site preparation and cost. Several speculative alternative concepts are offered (as located tentatively on Figures 9 and 10) both of which include the 100 foot buffer to residential areas recommended by the Derby Conservation Commission.

1. Figure 10 would involve two northwest-southeast running fields on either side of the storm drainage ditch and parallel with it. Admittedly the western field would impact a stonewall along its western periphery.
2. Figure 9 would involve piping the storm drainage ditch which is not a natural streamcourse or wetlands and allow two parallel northeast-southwest running fields. The design would allow maximum use of the most level acreage in the park and avoid impact on the stone wall mentioned in alternative above.

Nevertheless, without detailed site analysis including needed revision to current road and parking proposals, the comparative costs of these concepts vis-à-vis the existing plan are unclear.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KING'S COURT

Figure 9

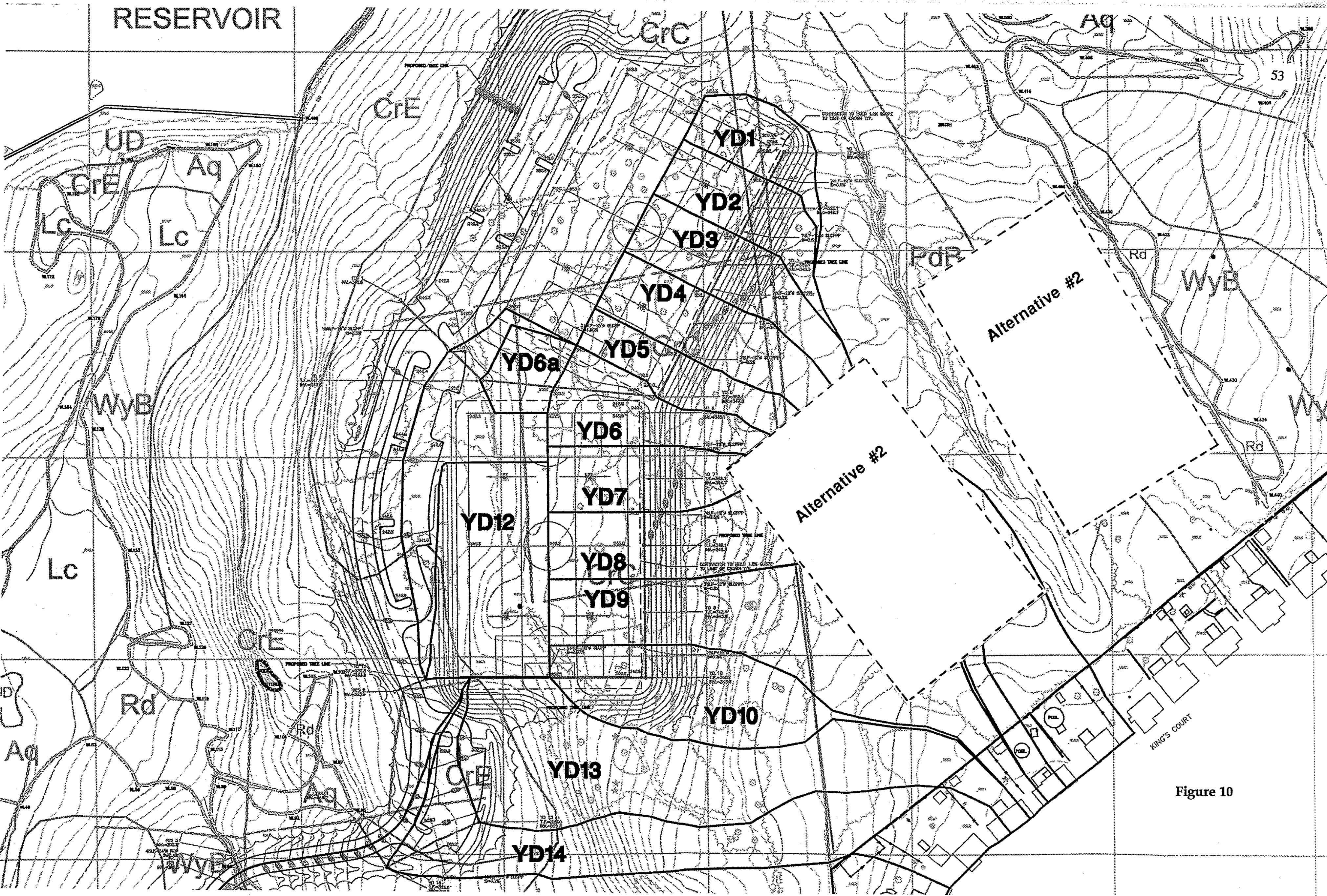
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Figure 10

Planning Review

Regional Open Space Plan (1971)

The Valley Regional Planning Agency's _Open Space Plan_ in 1971 called for a regional state park (within 0-30 years) at the site of the Ansonia-Derby Reservoirs if compatible with water supply needs. [The applicant's Witek Park Field Improvements are located on the portion of the Ansonia-Derby Reservoirs within Derby]. The primary use proposed in the 1971 _Plan_ was to be for active and passive recreation, conservation, scenic preservation and community enhancement. Additional open space in the vicinity was proposed at Bradley School within 0-5 years (an additional 10 acres for playground and playlot facilities), for Lower Marshall Lane (five acres for playlot, playground, and sitting park) and for East Derby, the City Landfill Site was proposed for a community park (40 acres) and playlot, playground, and sitting park (5 acres) with the landfill to be continued and gradually made available for public recreation.

Over time, the needs have changed, and both Ansonia and Derby have chosen different directions. Ansonia chose to purchase and use its portion of the Reservoir site for its new high school. The City of Derby, having purchased its portion of the Reservoir site (and other sites in the vicinity not having been purchased) has decided to locate two soccer fields in Witek Park. Few have questioned the need for the additional soccer fields.

Planning & Zoning Issues (General):

Derby's _2002 Plan of Conservation & Development,_ proposed in March, 2002, and adopted in July, 2002, contains specific goals to protect water quality in the future by identifying and analyzing land use that impacts water quality. The *Plan* identifies elements that should be used in both land use regulations and site review standards to minimize runoff, and protect watershed lands. Furthermore, priorities for open space preservation call for protecting important resources and maximizing recreational benefits to the community. The value of the overall open space system, for example, could be enhanced by a system of open spaces interconnected with trails. The protection of natural resources such as water bodies and wetlands and streams can be targeted as important areas to preserve.

> "The most effective tool a community can have to preserve open space is a well thought out Open Space Plan. In Derby, such a plan should identify all existing open space and vacant land in the city and identify desirable locations for open space and necessary connections. Strategies should also be identified to obtain open space by purchase, donation, and obtaining rights or ways or easements.
>
> Such a plan can also help resolve other issues. For example, there has been a debate in Derby about whether Witek Park should accommodate recreation fields and facilities. The most promising way to resolve issues like these is to undertake a master planning process for all open space and recreational facilities in Derby. While some facilities may be entirely dedicated to active sports, other areas might be dedicated to passive activities, and still other areas might be appropriate for both. The Derby Open Space Commission and Parks and Recreation Commission should coordinate this effort to ensure the community has adequate recreation facilities and preserves desired open space. These do not have to be mutually exclusive goals."[1]

In June 2002, the City of Derby Planning and Zoning Commission proposed to amend Section 195-23 Open Space (OS) Zone in which Witek Park is located in order to clarify both the purposes of the zone as well as the special exception uses. The proposed designation of the Open Space Zone is <u>to limit</u> (in lieu of to discourage) any development of buildings on the sites. Special exception uses were proposed to include <u>active recreation uses and public recreation facilities</u> in addition to public buildings of municipal, state or federal governments. The change was approved in July at the close of the public hearing. The City's action set the stage for the application before the Derby Inland Wetlands Commission.

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[1] *2002 Plan of Conservation & Development, Derby, CT*, prepared for the Derby Planning & Zoning Commission by Planimetrics (Avon, CT), pp. 18-19.

While the _2002 Plan of Conservation & Development_ may have stated the ideal, the City's action may be regarded as a practical compromise in order to meet the needs.

Flooding and Irrigation Issues

In the 1984 King's Mark Report, it was stated that the total capacity of Upper Derby Hill Reservoir and Lower Derby Hill Reservoir was approximately 63.7 million gallons and 22.8 million gallons respectively. Based on water company data, approximately 121.26 million gallons of water was drawn out of the Lower Derby Hill Reservoir in 1981 for public water supply use. Based on the estimated irrigation demand for turf management, a total of 4.8 million gallons of water would be needed to satisfy annual irrigation demands. Accordingly, there would appear to be ample supply of water from the reservoir to meet the estimated irrigation demand, other things being equal. Much of the Inland Wetland Commission concerns were about the additional land that would be disturbed, however, the disturbance could be limited to what is necessary for a vehicular backhoe to install the 21/2 -inch line (rather than using manual methods) and to replace the existing pedestrian pathway. Presently, the proposed alternative irrigation plan from the reservoir would eliminate an existing pathway, and does nothing to replace it. With the savings it may be possible to construct a handicapped accessible pedestrian pathway from one of the parking lots as a follow up to the construction thereby meeting both open space and recreation needs. Furthermore, this will make the proposed development less of an isolated development within the park and help it blend in more with the overall park.

In addition, since the reservoirs no longer serve as public drinking water, downstream dangers from flooding have increased. In concert with inland wetlands responsibility to deter and inhibit the danger of flooding, ways to reduce downstream flooding need increased attention. In addition to resolving the Commission's differences regarding irrigation demand from the reservoir, there may be potential for exploring how the project site could help detain peak storm flows. Perhaps the hydrologist who wrote the hydrology and hydraulics report could explain why the project site does not lend itself for detaining peak storm flows, and that other means could be more productive.

Parking Lot Issue

A related issue concerns the size of the proposed parking lots. No study was made of parking use at Derby's existing soccer fields. However, the proposed parking lots appear sufficient to be used for soccer tournaments.

Appendix A

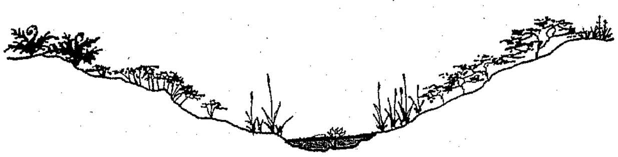
Crossings

There are a number of methods which may be used to address a wetlands or stream crossing. Each involves different costs or benefits; the value of the wetland and the cost of adopting the more protective crossing method are factors in deciding which alternative is prudent. Impacts to the site to consider include:

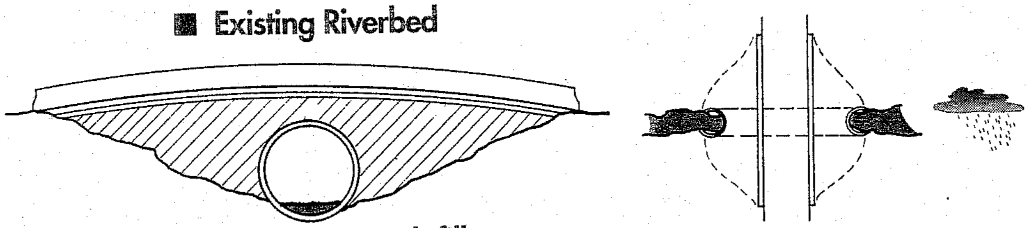
- Extent of disturbance (clearing, excavation, filling, staging)
- Rates of discharge/hydrologic considerations
- Fish passage/aquatic values
- Wildlife passage/riparian habitat
- Recreational or other significant riparian values

Overhead view showing areas of proposed fill

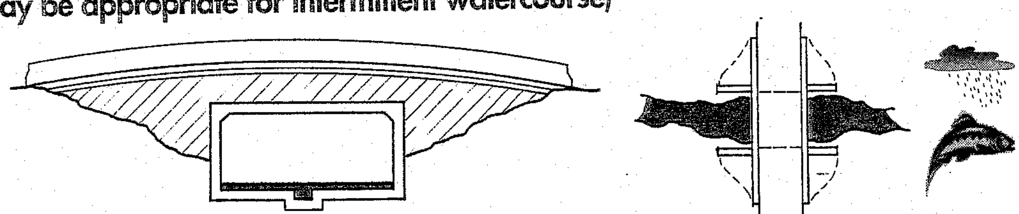
The trade-off: resource value ( ) vs. disturbance( )



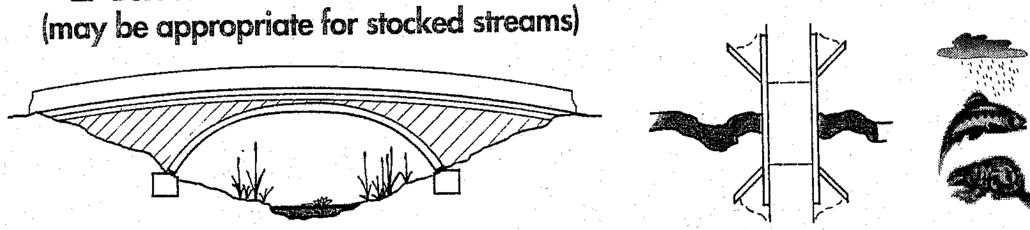
■ Existing Riverbed



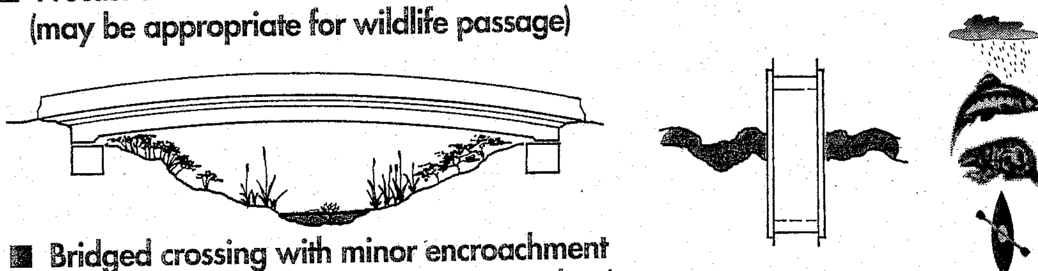
■ Piped crossing with fill
(may be appropriate for intermittent watercourse)



■ Box culvert with low flow channel
(may be appropriate for stocked streams)



■ Precast arch with abutments in watercourse
(may be appropriate for wildlife passage)



■ Bridged crossing with minor encroachment
(may be appropriate to protect riparian values)

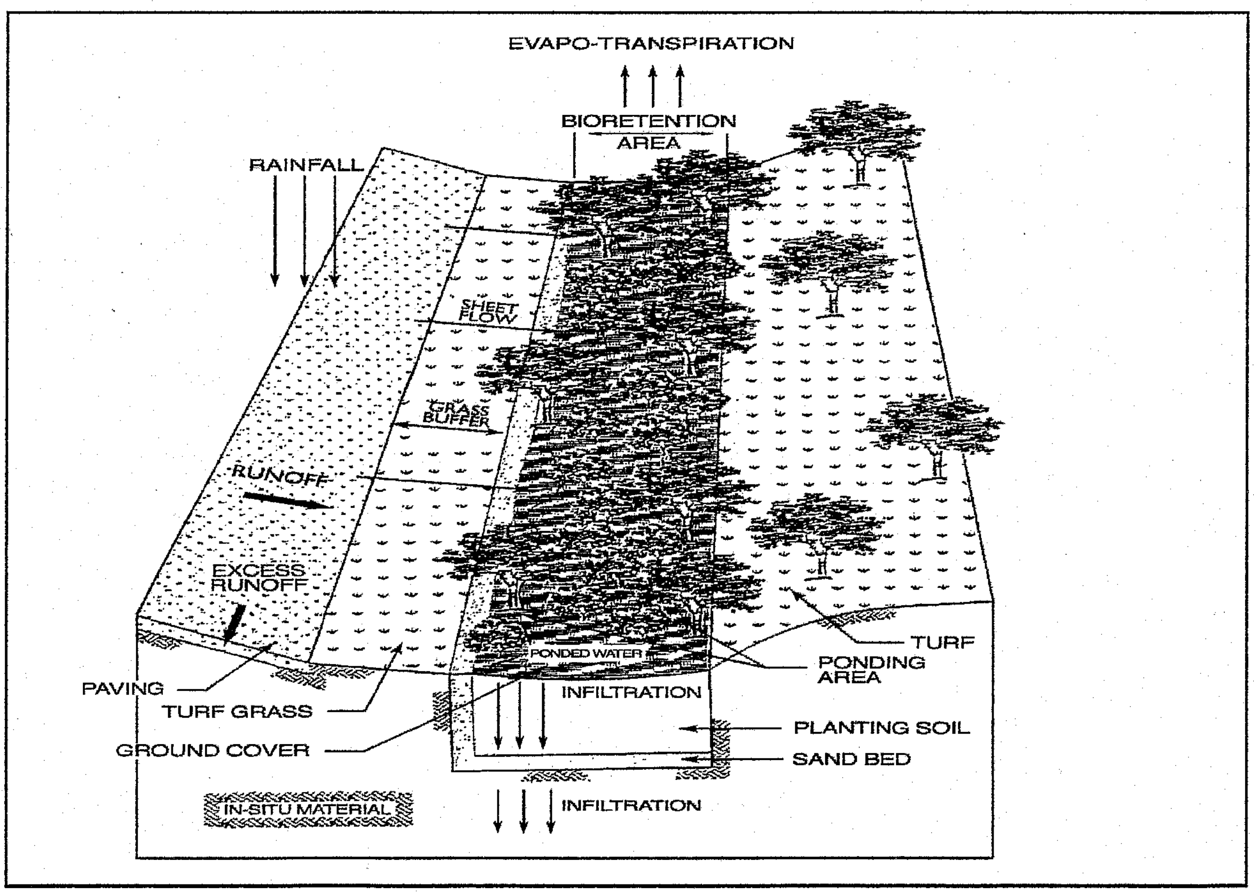
Appendix B

United States Environmental Protection Agency | Office of Water Washington, D.C. | EPA 832-F-99-012 September 1999

Storm Water Technology Fact Sheet
Bioretention

DESCRIPTION

Bioretention is a best management practice (BMP) developed in the early 1990's by the Prince George's County, MD, Department of Environmental Resources (PGDER). Bioretention utilizes soils and both woody and herbaceous plants to remove pollutants from storm water runoff. As shown in Figure 1, runoff is conveyed as sheet flow to the treatment area, which consists of a grass buffer strip, sand bed, ponding area, organic layer or mulch layer, planting soil, and plants. Runoff passes first over or through a sand bed, which slows the runoff's velocity, distributes it evenly along the length of the ponding area, which consists of a surface organic layer and/or ground cover and the underlying planting soil. The ponding area is graded, its center depressed. Water is ponded to a depth of 15 centimeters (6 inches) and gradually infiltrates the bioretention area or is



Source: PGDER, 1993.

FIGURE 1 BIORETENTION AREA

evapotranspired. The bioretention area is graded to divert excess runoff away from itself. Stored water in the bioretention area planting soil exfiltrates over a period of days into the underlying soils.

The basic bioretention design shown in Figure 1 can be modified to accommodate more specific needs. The City of Alexandria, VA, has modified the bioretention BMP design to include an underdrain within the sand bed to collect the infiltrated water and discharge it to a downstream sewer system. This modification was required because impervious subsoils and marine clays prevented complete infiltration in the soil system. This modified design makes the bioretention area act more as a filter that discharges treated water than as an infiltration device. Design modifications are also being reviewed that will potentially include both aerobic and anaerobic zones in the treatment area. The anaerobic zone will promote denitrification.

APPLICABILITY

Bioretention typically treats storm water that has run over impervious surfaces at commercial, residential, and industrial areas. For example, bioretention is an ideal storm water management BMP for median strips, parking lot islands, and swales. These areas can be designed or modified so that runoff is either diverted directly into the bioretention area or conveyed into the bioretention area by a curb and gutter collection system. Bioretention is usually best used upland from inlets that receive sheet flow from graded areas and at areas that will be excavated. The site must be graded in a manner that minimizes erosive conditions as sheet flow is conveyed to the treatment area, maximizing treatment effectiveness. Construction of bioretention areas is best suited to sites where grading or excavation will occur in any case so that the bioretention area can be readily incorporated into the site plan without further environmental damage. Bioretention should be used in stabilized drainage areas to minimize sediment loading in the treatment area. As with all BMPs, a maintenance plan must be developed.

Bioretention has been used as a storm water BMP since 1992. In addition to Prince George's County and Alexandria, bioretention has been used successfully at urban and suburban areas in Montgomery County, MD; Baltimore County, MD; Chesterfield County, VA; Prince William County, VA; Smith Mountain Lake State Park, VA; and Cary, NC.

ADVANTAGES AND DISADVANTAGES

Bioretention is not an appropriate BMP at locations where the water table is within 1.8 meters (6 feet) of the ground surface and where the surrounding soil stratum is unstable. In cold climates the soil may freeze, preventing runoff from infiltrating into the planting soil. The BMP is also not recommended for areas with slopes greater than 20 percent, or where mature tree removal would be required. Clogging may be a problem, particularly if the BMP receives runoff with high sediment loads.

Bioretention provides storm water treatment that enhances the quality of downstream water bodies. Runoff is temporarily stored in the BMP and released over a period of four days to the receiving water. The BMP is also able to provide shade and wind breaks, absorb noise, and improve an area's landscape.

DESIGN CRITERIA

Design details have been specified by the Prince George's County DER in a document entitled *Design Manual for the Use of Bioretention in Storm Water Management* (PGDER, 1993). The specifications were developed after extensive research on soil adsorption capacities and rates, water balance, plant pollutant removal potential, plant adsorption capacities and rates, and maintenance requirements. A case study was performed using the specifications at three commercial sites and one residential site in Prince George's County, Maryland.

Each of the components of the bioretention area is designed to perform a specific function. The grass buffer strip reduces incoming runoff velocity and filters particulates from the runoff. The sand bed also reduces the velocity, filters particulates, and spreads flow over the length of the bioretention area. Aeration and drainage of the planting soil are provided by the 0.5 meter (18 inch) deep sand bed. The ponding area provides a temporary storage location for runoff prior to its evaporation or infiltration. Some particulates not filtered out by the grass filter strip or the sand bed settle within the ponding area.

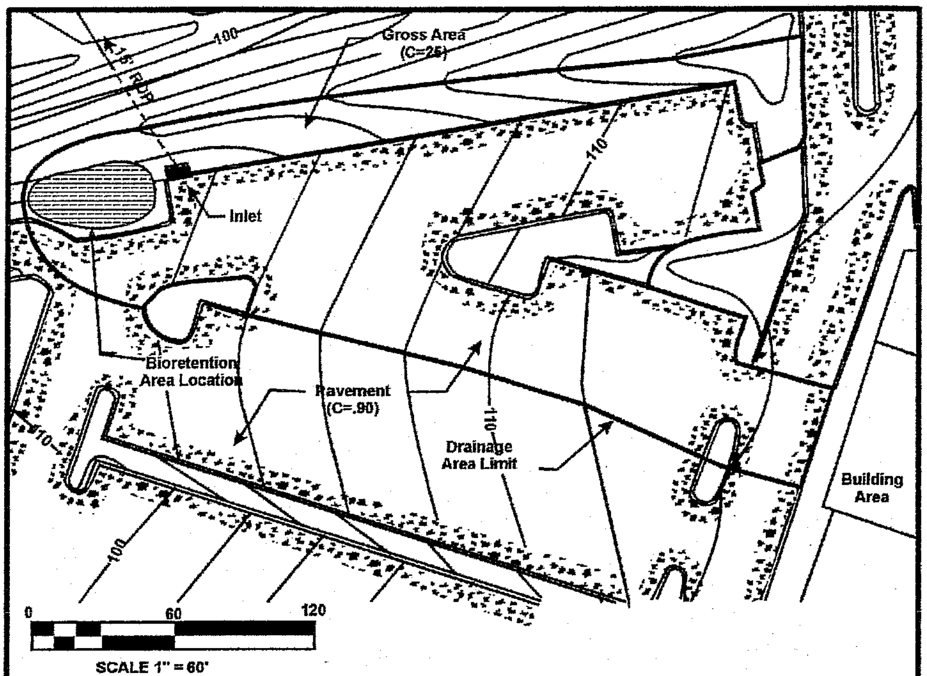
The organic or mulch layer also filters pollutants and provides an environment conducive to the growth of microorganisms, which degrade petroleum-based products and other organic material. This layer acts in a similar way to the leaf litter in a forest and prevents the erosion and drying of underlying soils. Planted ground cover reduces the potential for erosion as well, slightly more effectively than mulch. The maximum sheet flow velocity prior to erosive conditions is 0.3 meters per second (1 foot per second) for planted ground cover and 0.9 meters per second (3 feet per second) for mulch.

The clay in the planting soil provides adsorption sites for hydrocarbons, heavy metals, nutrients and other pollutants. Storm water storage is also provided by the voids in the planting soil. The stored water and nutrients in the water and soil are then available to the plants for uptake.

The layout of the bioretention area is determined after site constraints such as location of utilities, underlying soils, existing vegetation, and drainage are considered. Sites with loamy sand soils are especially appropriate for bioretention because the excavated soil can be backfilled and used as the planting soil, thus eliminating the cost of importing planting soil. An unstable surrounding soil stratum (e.g., Marlboro Clay) and soils with a clay content greater than 25 percent may preclude the use of bioretention, as would a site with slopes greater than 20 percent or a site with mature trees that would be removed during construction of the BMP. Bioretention can be designed to be off-line or on-line of the existing drainage system. The "first flush" of runoff is diverted to the off-line system. The first flush of runoff is the initial runoff volume that typically contains higher pollutant concentrations than those in the extended runoff period. On-line systems capture the first flush but that volume of water will likely be washed out by subsequent runoff resulting in a release of the captured pollutants. The size of the drainage area for one bioretention area should be between 0.1 and 0.4 hectares (0.25 and 1.0 acres). Multiple bioretention areas may be required for larger drainage areas. The maximum drainage area for one bioretention area is determined by the amount of sheet flow generated by a 10-year storm. Flows greater than 141 liters per second (5 cubic feet per second) may potentially erode stabilized areas. In Maryland, such a flow generally occurs with a 10-year storm at one-acre commercial or residential sites. The designer should determine the potential for erosive conditions at the site.

The size of the bioretention area is a function of the drainage area and the runoff generated from the area. The size should be 5 to 7 percent of the drainage area multiplied by the rational method runoff coefficient, "c," determined for the site. The 5 percent specification applies to a bioretention area that includes a sand bed; 7 percent to an area without one. An example of sizing a facility is shown in Figure 2. For this discussion, sizing specifications are based on 1.3 to 1.8 centimeters (0.5 to 0.7 inches) of precipitation over a 6-hour period (the mean storm event for the Baltimore-Washington area), infiltrating into the bioretention area. Other areas with different mean storm events will need to account for the difference in the design of the BMP. Recommended minimum dimensions of the bioretention area are 4.6 meters (15 feet) wide by 12.2 meters (40 feet) in length. The minimum width allows enough space for a dense, randomly-distributed area of trees and shrubs to become established that replicates a natural forest and creates a microclimate. This enables the bioretention area to tolerate the effects of heat stress, acid rain, runoff pollutants, and insect and disease infestations which landscaped areas in urban settings typically are unable to tolerate. The preferred width is 7.6 meters (25 feet), with a length of twice the width. Any facilities wider than 6.1 meters (20 feet) should be twice as long as they are wide. This length requirement promotes the distribution of flow and decreases the chances of concentrated flow.

The maximum recommended ponding depth of the bioretention area is 15 centimeters (6 inches). This



PLAN VIEW

BIORETENTION AREA
SIZING COMPUTATION

DEVELOPMENT	AREA SQ. FT.	"C" FACTOR	C X AREA
PAVEMENT	23,800	0.90	21,400
GRASS	10,100	0.25	2,500
TOTALS	33,900		23,900

BIOTENTION AREA SIZE

1. **With Sand Bed (5% Sum of C x Area)**
   = 05 x 23,900 = 1,195 OR SAY 1,200 sq. ft.
2. **Without Sand Bed (7% Sum of C x Area)**
   = 07 x 23,900 = 1,1673 OR SAY 1,700 sq. ft.

*** SEE CHAPTER IV. PRINCE GEORGES COUNTYSTORMWATER MANAGEMENT MANUAL**

Source: PGDER, 1993.

FIGURE 2 BIORETENTION AREA SIZING

depth provides for adequate storage and prevents water from standing for excessive periods of time. Because of some plants' water intolerance, water left to stand for longer than four days restricts the type of plants that can be used. Further, mosquitoes and other insects may start to breed if water is standing for longer than four days.

The appropriate planting soil should be backfilled into the excavated bioretention area. Planting soils should be sandy loam, loamy sand, or loam texture with a clay content ranging from 10 to 25 percent. The soil should have infiltration rates greater than 1.25 centimeters (0.5 inches) per hour, which is typical of sandy loams, loamy sands, or loams. Silt loams and clay loams generally have rates of less than 0.68 centimeters (0.27 inches) per hour. The pH of the soil should be between 5.5 and 6.5. Within this pH range, pollutants (e.g., organic nitrogen and phosphorus) can be adsorbed by the soil and microbial activity can flourish. Other requirements for the planting soil are a 1.5 to 3 percent organic content and a maximum 500 ppm concentration of soluble salts. In addition, criteria for magnesium, phosphorus, and potassium are 39.2 kilograms per acre (35 pounds per acre), 112 kilograms per acre (100 pounds per acre), and 95.2 kilograms per acre (85 pounds per acre), respectively. Soil tests should be performed for every 382 cubic meters (500 cubic yards) of planting soil, with the exception of pH and organic content tests, which are required only once per bioretention area.

Planting soil should be 10.1 centimeters (4 inches) deeper than the bottom of the largest root ball and 1.2 meters (4 feet) altogether. This depth will provide adequate soil for the plants' root systems to become established and prevent plant damage due to severe wind. A soil depth of 1.2 meters (4 feet) also provides adequate moisture capacity. To obtain the recommended depth, most sites will require excavation. Planting soil depths of greater than 1.2 meters (4 feet) may require additional construction practices (e.g., shoring measures). Planting soil should be placed in 18 inches or greater lifts and lightly compacted until the desired depth is reached. The bioretention area should be vegetated to resemble a terrestrial forest community ecosystem, which is dominated by understory trees (high canopy trees may be destroyed during maintenance) and has discrete soil zones as well as a mature canopy and a distinct sub-canopy of understory trees, a shrub layer, and herbaceous ground covers. Three species each of both trees and shrubs are recommended to be planted at a rate of 2500 trees and shrubs per hectare (1000 per acre). For example, a 4.6 meter (15 foot) by 12.2 meter (40 foot) bioretention area (55.75 square meters or 600 square feet) would require 14 trees and shrubs. The shrub-to-tree ratio should be 2:1 to 3:1. On average, the trees should be spaced 3.65 meters (12 feet) apart and the shrubs should be spaced 2.4 meters (8 feet) apart. In the metropolitan Washington, D.C., area, trees and shrubs should be planted from mid-March through the end of June or from mid-September through mid-November. Planting periods in other areas of the U.S. will vary. Vegetation should be watered at the end of each day for fourteen days following its planting.

Native species that are tolerant to pollutant loads and varying wet and dry conditions should be used in the bioretention area. These species can be determined from several published sources, including *Native Trees, Shrubs, and Vines for Urban and Rural America* (Hightshoe, 1988). The designer should assess aesthetics, site layout, and maintenance requirements when selecting plant species. Adjacent non-native invasive species should be identified and the designer should take measures (e.g., provide a soil breach) to eliminate the threat of these species invading the bioretention area. Regional landscaping manuals should be consulted to ensure that the planting of the bioretention area meets the landscaping requirements established by the local authorities.

The optimal placement of vegetation within the bioretention area should be evaluated by the designers. Plants should be placed at irregular intervals to replicate a natural forest. Shade and shelter from the wind will be provided to the bioretention area if the designer places the trees on the perimeter of the area. Trees and shrubs can be sheltered from damaging flows if they are placed away from the path of the incoming runoff. Species that are more tolerant to cold winds (e.g., evergreens) should be placed in windier areas of the site.

After the trees and shrubs are placed, the ground cover and/or mulch should be established. Ground cover such as grasses or legumes can be planted during the spring of the year. Mulch should be placed immediately after trees and shrubs are planted. Five to 7.6 cm (2 to 3 inches) of commercially-available fine shredded hardwood mulch or shredded hardwood chips should be applied to the bioretention area to protect from erosion. Mulch depths should be kept below 7.6 centimeters (3 inches) because more would interfere with the cycling of carbon dioxide and oxygen between the soil and the atmosphere. The mulch should be aged for at least six months (one year is optimal), and applied uniformly over the site.

PERFORMANCE

Bioretention removes storm water pollutants through physical and biological processes, including adsorption, filtration, plant uptake, microbial activity, decomposition, sedimentation and volatilization. Adsorption is the process whereby particulate pollutants attach to soil (e.g., clay) or vegetation surfaces. Adequate contact time between the surface and pollutant must be provided for in the design of the system for this removal process to occur. Therefore, the infiltration rate of the soils must not exceed those specified in the design criteria or pollutant removal may decrease. Pollutants removed by adsorption include metals, phosphorus, and some hydrocarbons. Filtration occurs as runoff passes through the bioretention area media, such as the sand bed, ground cover and planting soil. The media trap particulate matter and allow water to pass through. The filtering effectiveness of the bioretention area may decrease over time. Common particulates removed from storm water include particulate organic matter, phosphorus, and suspended solids. Biological processes that occur in wetlands result in pollutant uptake by plants and microorganisms in the soil. Plant growth is sustained by the uptake of nutrients from the soils, with woody plants locking up these nutrients through the seasons. Microbial activity within the soil also contributes to the removal of nitrogen and organic matter. Nitrogen is removed by nitrifying and denitrifying bacteria, while aerobic bacteria are responsible for the decomposition of the organic matter (e.g., petroleum). Microbial processes require oxygen and can result in depleted oxygen levels if the bioretention area is not adequately aerated.

Sedimentation occurs in the swale or ponding area as the velocity slows and solids fall out of suspension.

Volatilization also plays a role in pollutant removal. Pollutants such as oils and hydrocarbons can be removed from the wetland via evaporation or by aerosol formation under windy conditions. The removal effectiveness of bioretention has been studied during field and laboratory studies conducted by the University of Maryland (Davis et al, 1998). During these experiments, synthetic storm water runoff was pumped through several laboratory and field bioretention areas to simulate typical storm events in Prince George's County, MD. Removal rates for heavy metals an nutrients are shown in Table 1. As shown, the BMP removed between 93 and 98 percent of metals, between 68 and 80 percent of TKN and between 70 and 83 percent of total phosphorus. For all of the pollutants analyzed, results of the laboratory study were similar to those of field experiments. Doubling or halving the influent pollutant levels had little effect on the effluent pollutants levels (Davis et al, 1998). For other parameters, results from the performance studies for infiltration BMPs, which are similar to bioretention, can be used to estimate bioretention's performance. These removal rates are also shown in Table 1. As shown, the BMP could potentially achieve greater than 90 percent removal rates for total suspended solids, organics, and bacteria. The microbial activity and plant uptake occurring in the bioretention area will likely result in higher removal rates than those determined for infiltration BMPs.

TABLE 1 LABORATORY AND ESTIMATED BIORETENTION

Pollutant	Removal Rate
Total Phosphorus	70%-83% [1]
Metals (Cu, Zn, Pb)	93%-98% [1]
TKN	68%-80% [1]
Total Suspended Solids	90% [2]
Organics	90% [2]
Bacteria	90% [2]

Source: [1]Davis et al. (1998)
[2]PGDER (1993)

OPERATION AND MAINTENANCE

Recommended maintenance for a bioretention area includes inspection and repair or replacement of the treatment area components. Trees and shrubs should be inspected twice per year to evaluate their health and remove any dead or severely diseased vegetation. Diseased vegetation should be treated as necessary using preventative and low-toxic measures to the extent possible. Pruning and weeding may also be necessary to maintain the treatment area's appearance. Mulch replacement is recommended when erosion is evident or when the site begins to look unattractive. Spot mulching may be adequate when there are random void areas; however, once every two to three years the entire area may require mulch replacement. This should be done during the spring. The old mulch should be removed before the new mulch is distributed. Old mulch should be disposed of properly.

The application of an alkaline product, such as limestone, is recommended one to two times per year to counteract soil acidity resulting from slightly acidic precipitation and runoff. Before the limestone is applied, the soils and organic layer should be tested to determine the pH and therefore the quantity of limestone required. When levels of pollutants reach toxic levels which impair plant growth and the effectiveness of the BMP, soil replacement may be required (PGDER, 1993).

COSTS

Construction cost estimates for a bioretention area are slightly greater than those for the required landscaping for a new development. Recently-constructed 37.16 square meter (400 square foot) bioretention areas in Prince George's County, MD cost approximately $500. These units are rather small and their cost is low. The cost estimate includes the cost for excavating 0.6 to 1 meters (2 to 3 feet) and vegetating the site with 1 to 2 trees and 3 to 5 shrubs. The estimate does not include the cost for the planting soil, which increases the cost for a bioretention area. Retrofitting a site typically costs more, averaging $6,500 per bioretention area. The higher costs are attributed to the demolition of existing concrete, asphalt, and existing structures and the replacement of fill material with planting soil. The costs of retrofitting a commercial site in Maryland (Kettering Development) with 15 bioretention areas were estimated at $111,600.

The use of bioretention can decrease the cost for storm water conveyance systems at a site. A medical office building in Maryland was able to reduce the required amount of storm drain pipe from 243.8 meters (800 feet) to 70.1 meters (230 feet) with the use of bioretention. The drainage pipe costs were reduced by $24,000, or 50 percent of the total drainage cost for the site (PGDER, 1993). Landscaping costs that would be required at a development regardless of the installation of the bioretention area should also be considered when determining the net cost of the BMP.

The operation and maintenance costs for a bioretention facility will be comparable to those of typical landscaping required for a site. Costs beyond the normal landscaping fees will include the cost for testing the soils and may include costs for a sand bed and planting soil.

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Appendix C

DEPARTMENT OF ENVIRONMENTAL PROTECTION

INLAND FISHERIES DIVISION

POLICY STATEMENT

RIPARIAN CORRIDOR PROTECTION

I. INTRODUCTION, GOALS, AND OBJECTIVE

Alteration and exploitation of riparian corridors in Connecticut is a common event that significantly degrades stream water quality and quantity. Inasmuch as riparian ecosystems play a critical role in maintaining aquatic resource productivity and diversity, the Inland Fisheries Division (Division) recognizes that rigorous efforts are required to preserve, protect, and restore these valuable resources. Consequently, a riparian corridor protection policy has been developed to achieve the following goals and objective:

Goals

Maintain Biologically Diverse Stream and Riparian Ecosystems, and

Maintain and Improve Stream Water Quality and Water Quantity.

Objective

Establish Uniform Riparian Corridor Buffer Zone Guidelines.

II. DEFINITIONS

For the purpose of implementing a statewide riparian corridor protection policy, the following definitions are established:

Riparian Corridor: A land area contiguous with and parallel to an intermittent or perennial stream.

Buffer Zone: An undisturbed, naturally vegetated area adjacent to or contained within a riparian corridor that serves to attenuate the effects of development.

Perennial Stream: A stream that maintains a constant perceptible flow of water within its channel throughout the year.

Intermittent Stream: A stream that flows only in direct response to precipitation or which is seasonally dry.

III. RIPARIAN FUNCTION

Naturally vegetated riparian ecosystems perform a variety of unique functions essential to a healthy instream aquatic environment. The delineation and importance of riparian functions are herein described. Vegetated riparian ecosystems:

* Naturally filter sediments, nutrients, fertilizers, and other nonpoint source pollutants from overland runoff.

* Maintain stream water temperatures suitable for spawning, egg and fry incubation, and rearing of resident finfish.

* Stabilize stream banks and stream channels thereby reducing instream erosion and aquatic habitat degradation.

* Supply large woody debris to streams providing critical instream habitat features for aquatic organisms.

* Provide a substantial food source for aquatic insects which represent a significant proportion of food for resident finfish.

* Serve as a reservoir, storing surplus runoff for gradual release into streams during summer and early fall base flow periods.

IV. RIPARIAN CORRIDOR BUFFER ZONE GUIDELINES

Recognizing the critical roles of riparian corridors, the Division provides buffer zone guidelines that are designed to bring uniformity and consistency to environmental review. The guidelines are simple, effective, and easy to administer. The following standard setting procedure should be used to calculate buffer zone widths.

Perennial Stream: A buffer zone 100 feet in width should be maintained along each side.

Intermittent Stream: A buffer zone 50 feet in width should be maintained along each side.

Buffer zone boundaries should be measured from either, (1) edge of riparian inland wetland as determined by Connecticut inland wetland soil delineation methods or (2) in the absence of a riparian wetland, the edge of the stream bank based on bank-full flow conditions.

The riparian corridor buffer zone should be retained in a naturally vegetated and undisturbed condition. All activities that pose a significant pollution threat to the stream ecosystem should be prohibited.

Where the Division policy is not in consonance with local regulations and policies regarding riparian corridor buffer zone widths and allowable development uses within these areas, local authorities should be encouraged to adopt the more restrictive regulations and policies.

12\13\91
Date

James C. Moulton
Acting Director

POSITION STATEMENT
UTILIZATION OF 100 FOOT BUFFER ZONES TO PROTECT RIPARIAN AREAS IN CONNECTICUT

BY
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I. INTRODUCTION

One tenet of the Inland Fisheries Division Policy on Riparian Corridor Protection is the utilization of a 100 foot buffer zone as a minimum setback along perennial streams. The adoption of such a policy is sure to be controversial. Laymen, developers and natural resource professionals alike will ask questions such as: Why was a standard setting method adopted? What's magical about 100 feet? Will 100 feet be sufficiently protective, or will it be overly protective? In response, this paper outlines the ramifications of adopting a riparian corridor policy including the use of a 100 foot buffer zone.

II. STANDARD SETTING VERSUS SITE SPECIFIC BUFFER ZONES

There are two approaches for determining buffer zone width; standard setting and site specific. Standard setting methods define an area extending from the streambank edge or highwater mark to some landward fixed point boundary. Site specific methods utilize formulas that incorporate and consider special site specific land characteristics, hence, the calculation of a variable width buffer zone. In both case, buffers are employed to define an area in which development is prohibited or limited.

A major advantage of standard setting methods is that they are easy to delineate and administer, thereby improving the consistency and quality of environmental assessments. Furthermore, valuable staff time would not be required to determine site specific buffer zones along each and every watercourse of concern.

The exact width of a buffer zone required for riparian corridor protection is widely disputed (Bottom et al. 1985 and Brinson et al. 1981). Buffer width recommendations found in the literature vary from as little as 25 feet to as great as 300 feet (Palfrey et al. 1982). The 100 foot buffer is widely accepted in Connecticut having been adopted by numerous inland wetland and conservation commissions as an appropriate minimum setback regulation for streambelts. In addition, Division staff have been recommending the utilization of the 100 foot buffer zone to protect streambelts since the early 1980's. Scientific research has not been generated to dispute the adequacy of utilizing 100 foot buffer zones to protect Connecticut's riparian corridors. In fact, to ensure that riparian functions are not significantly altered, recent scientific information points towards maintaining buffer zones that would be at a minimum, 100 feet in width (see section III).

Site specific methods define buffer widths according to the character and sensitivity of adjacent streamside lands. These buffer widths, also referred to as "floating buffers," consider physical site characteristics such as slope, soil type, and vegetative cover. The advantage of site specific methods is that buffer widths are designed using site characteristics and not an arbitrary predetermined width. Unfortunately, there is no "one" universally accepted formula or model and none have been developed for use in Connecticut. Most formulas are based on the degree to which sediment can be removed or filtered by natural vegetation, thus, the primary useage is sediment control. Other weaknesses of site specific techniques are (1) all areas must be evaluated on a case-by case basis and, (2) the subjectivity of different techniques (i.e. if the evaluation technique is inadequate, the buffer width will also be inadequate).

Additionally, these formulas only concentrate on one specific riparian function at a time and do not take into account multiple riparian functions, especially those of inland fisheries values as discussed in Section III. Consequently, site specific formulas approach riparian function on a single dimension rather than taking a more realistic, holistic approach.

In the absence of a scientific model to determine buffer widths suitable to protect Connecticut's riparian corridors, the utilization of a standard setting method is environmentally and politically prudent.

III. RIPARIAN FUNCTION

To assess the efficacy of a 100 foot buffer zone, the literature was searched to identify studies which have applied a quantitative approach to buffer width determination. Literature was searched for studies which both support and dispute the 100 foot zone. The following is a summary "by riparian function" of quantitative studies which assess buffer widths.

Sediment Control

Width, slope and vegetation have been cited as important factors in determining effectiveness of buffer zones as sediment filters (Karr and Schlosser 1977). Wong and McCuen (1981), who developed and applied a mathematical model to a 47 acre watershed, found that a 150 foot zone along a 3% slope reduced sediment transport to streams by 90%. Mannering and Johnson (1974) passed sediment laden water through a 49.2 foot strip of bluegrass and found that 54% of sediment was removed from the water. Trimble and Sartz (1957) developed recommendations as to width of buffer areas between logging roads and streams to reduce sediment load. They determined a minimum strip of 50 feet was required on level land with the width increasing 4 feet for each 1% slope increase. Buffer widths as determined by Trimble and Sartz (1957) have been characterized as evaluated guesses rather than empirically defined widths (Karr and Schlosser 1977). Rodgers et al. (1976) state that slopes greater than 10% are too steep to allow any significant detention of runoff and sediment regardless of buffer width. After a critical review of the literature, Karr and Schlosser (1977) determined that the size and type of vegetative buffer strip needed to remove a given fraction of the overland sediment load cannot be universally quantified. Existing literature does suggest that 100 foot riparian buffers will assist with sediment entrapment, although efficacy will vary according to site conditions.

Temperature Control

Brown and Brazier (1973) evaluated the efficacy of buffer widths required to ameliorate stream water temperature change. They concluded that angular canopy density (ACD), a measure of the ability of vegetation to provide shading, is the only buffer area parameter correlated with temperature control. Results show that maximum angular canopy density or maximum shading ability is reached within a width of 80 feet. Study sites were 9 small mountain streams in Oregon that contained a conifer riparian vegetative complex. Whether or not maximum angular canopy density is reached within 80 feet in a typical Connecticut deciduous forest riparian zone is doubtful. Tree height in Connecticut riparian zones is smaller than in Oregon (Scarpino, personal communication), therefore buffers greater than 80 feet in width would be required for temperature maintenance in Connecticut.

Nutrient Removal

Nutrient enrichment is caused by phosphorous and nitrogen transport from, among other things, fertilized lands and underground septic systems. Most research on nutrient enrichment has focused on overland surface flow. Karr and Schlosser (1977) report that 88% of all nitrogen and 96% of all phosphorous reaching watercourses in "agricultural watersheds" were found to be attached to sediment particles; thus, successful nutrient removal can be accomplished through successful sediment removal. There are conflicting reports on the ability of buffer widths to remove nutrients with most research being tested on grass plots. Butler et al. (1974) as cited by Karr and Schlosser (1977) found that a 150 foot buffer width of reed canary grass with a 6% slope caused reductions in phosphate and nitrate concentrations of between 0–20%. Wilson and Lehman (1966) as cited by Karr and Schlosser (1977) in a study of effluent applied to 300 m grass plots found that nitrogen and phosphorous concentrations were reduced 4 and 6%, respectively. Studies on subsurface runoff as cited in Clark (1977) found high concentrations of nitrates at 100 feet from septic systems with unacceptable levels at 150 feet. Clark (1977) recommended that a 300 foot setback be used whenever possible, with a 150 setback considered adequate to avoid nitrate pollution. Environmental Perspective Newsletter (1991) states that experts who commonly work with the 100 foot buffer zone set by the Massachusetts Wetlands Protection Act are increasingly finding that it is insufficient since many pollutants routinely travel distances far greater than 100 feet with nitrate–nitrogen derived from septic systems moving distances of greater than 1000 feet. Research indicates that the adoption of 100 foot buffer widths for Connecticut riparian zones will assist with the nutrient assimilation; albeit, complete removal of all nutrients may not be achieved.

Large Woody Debris

The input of large woody debris (LWD) to streams from riparian zones, defined as fallen trees greater than 3 m in length and 10 cm in diameter has been recently heralded as extremely critical to stream habitat diversity as well as stream channel maintenance. Research on large woody debris input has mainly been accomplished in the Pacific Northwest in relation to timber harvests. Murphy and Koski (1989) in a study of seven Alaskan watersheds determined that almost all (99%) identified sources of LWD were within 100 feet of the streambank. Bottom et al. 1983 as cited by Budd et al. (1987) confirm that in Oregon most woody structure in streams is derived from within 100 feet of the bank. Based on research done within old–growth forests, the Alaska region of the National Marine Fisheries Service, recognizing the importance of LWD to salmonid habitat, issued a policy statement in 1988 advocating the protection of riparian habitat through the retention of buffer strips not less than 100 feet in width (Murphy and Koski 1989). All research findings support the use of a 100 foot buffer zone in Connecticut for large woody debris input.

Food Supply

Erman et al. (1977) conducted an evaluation of logging impacts and subsequent sediment input to 62 streams in California. Benthic invertebrate populations (the primary food source of stream fishes) in streams with no riparian buffer strips were compared to populations in streams with buffer widths of up to 100 feet. Results showed that buffer strips less than 100 feet in width were ineffective as protective measures for invertebrate populations since sediment input reduced overall diversity of benthic invertebrates. Buffer strips greater than 100 feet in width afforded protection equivalent to conditions observed in unlogged streams. The ultimate significance of these findings is that fish growth and survival may be directly impacted along streams with inadequate sized riparian buffer zones. All research supports the feasibility of implementing a 100 foot buffer zone in Connecticut to maintain aquatic food supplies.

Streamflow Maintenance

The importance of riparian ecosystems in terms of streamflow maintenance has been widely recognized (Bottom et al. 1985). In Connecticut, riparian zones comprised of wetlands are of major importance in the hydrologic regime. Riparian wetlands store surplus flood waters thus dampening stream discharge fluctuations. Peak flood flows are then gradually released reducing the severity of downstream flooding. Some riparian wetlands also act as important groundwater discharge or recharge areas. Groundwater discharge to streams during drier seasonal conditions is termed low flow augmentation. The survival of fish communities, especially coldwater salmonid populations is highly dependent upon low flow augmentation (Bottom et al. 1985). Research, although documenting the importance of riparian zones as areas critical to streamflow maintenance, has not investigated specific riparian buffer widths required to provide the most effective storage and release of stream flows.

IV. OTHER POLICY CONSIDERATIONS

Measurement Determination

The proposed policy states that buffer zone boundaries should be measured from either the edge of the riparian inland wetland as determined by Connecticut inland wetland soil delineation methods or in the absence of a riparian wetland, the edge of the streambank based on bank-full flow conditions. This boundary demarcation is absolutely necessary to ensure that all riparian wetlands are protected. For example, if all measurements were to start from the perennial stream edge and extend landward for a distance of 100 feet, many riparian zones that contain expansive wetlands greater than 100 feet in width would be left unprotected.

Also, since boundary demarcation includes wetland delineation, the ultimate width of the buffer will vary according to site specific features. Consequently, buffer width determination as stated by Division policy is a "hybridization" of both standard setting and site specific methods. This hybridization of methods is advantageous since it acknowledges the sensitivity of streamside wetlands.

Home Rule

Where the Division policy is not in consonance with local regulations and policies regarding riparian corridor buffer zone widths, local authorities would be encouraged to adopt the more restrictive regulations and policies. This feature incorporates flexibility to acknowledge the importance of local "home rule" regulations or policies already in accepted practice. Conversely, towns and cities without accepted policies and regulations could choose to enact the Division policy.

Allowable Uses in Buffer Zones

The Division policy states that "the riparian corridor buffer zone should be retained in a naturally vegetated and undisturbed condition and that all activities that pose a significant pollution threat to the stream ecosystem should be prohibited." In essence, the buffer zone becomes an area where no development should be allowed. For this policy to be effective, there should be no exceptions, a blanket restriction of all uses would be recommended. Further clarification and more precise definitions of allowable uses will, however, be required in the future if the policy evolves into a departmental regulation.

Recently, the Connecticut Supreme Court has ruled that local agencies can prohibit specific development within buffer zones. The *Lizotte v. Conservation Commission of the Town of Somers, 216 Conn.320 (1990)* decision ruled that the construction or maintenance of any septic system, tank, leach field, dry well, chemical waste disposal system, manure storage area or other pollution source within 150 feet of the nearest edge of a watercourse or inland wetland's seasonal high water level can be prohibited (Wetlands Watch 1990). If this decision is a precursor of the future, Connecticut courts will continue to the support the use of buffers, especially those which restrict or prohibit detrimental activities.

V. CONCLUSIONS

The following actions are required to preserve, protect, and restore Connecticut's riparian corridors:

1. The Inland Fisheries Division needs to adopt and implement the proposed policy so that staff can use it as a guideline to assist cities, towns, developers and private landowners with making sound land use decisions. This policy will act to solidify a collective position concerning riparian corridor protection.

2. While the proposed policy in its "current form," represents a recommendation from the CTDEP Inland Fisheries Division, the ultimate goal of the Division should be to progressively implement this policy as either a CTDEP regulation or State of Connecticut statute.

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About the Team

The King's Mark Environmental Review Team (ERT) is a group of environmental professionals drawn together from a variety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, soil scientists, foresters, climatologists and landscape architects, recreational specialists, engineers and planners. The ERT operates with state funding under the aegis of the King's Mark Resource Conservation and Development (RC&D) Area - an 83 town area serving western Connecticut.

As a public service activity, the Team is available to serve towns within the King's Mark RC&D Area - *free of charge*.

Purpose of the Environmental Review Team

The Environmental Review Team is available to assist towns in the review of sites proposed for major land use activities or natural resource inventories for critical areas. For example, the ERT has been involved in the review of a wide range of significant land use activities including subdivisions, sanitary landfills, commercial and industrial developments and recreation/open space projects.

Reviews are conducted in the interest of providing information and analysis that will assist towns and developers in environmentally sound decision making. This is done through identifying the natural resource base of the site and highlighting opportunities and limitations for the proposed land use.

Requesting an Environmental Review

Environmental reviews may be requested by the chief elected official of a municipality or the chairman of an administrative agency such as planning and zoning, conservation or inland wetlands. Environmental Review Request Forms are available at your local Soil and Water Conservation District and through the King's Mark ERT Coordinator. This request form must include a summary of the proposed project, a location map of the project site, written permission from the landowner/developer allowing the Team to enter the property for the purposes of a review and a statement identifying the specific areas of concern the Team members should investigate. When this request is reviewed by the local Soil and Water Conservation District and approved by the King's Mark RC&D Executive Council, the Team will undertake the review. At present, the ERT can undertake approximately two reviews per month depending on scheduling and Team member availability.

For additional information regarding the Environmental Review Team, please contact the King's Mark ERT Coordinator, Connecticut Environmental Review Team, P.O. Box 70, Haddam, CT 06438. The telephone number is 860-345-3977.