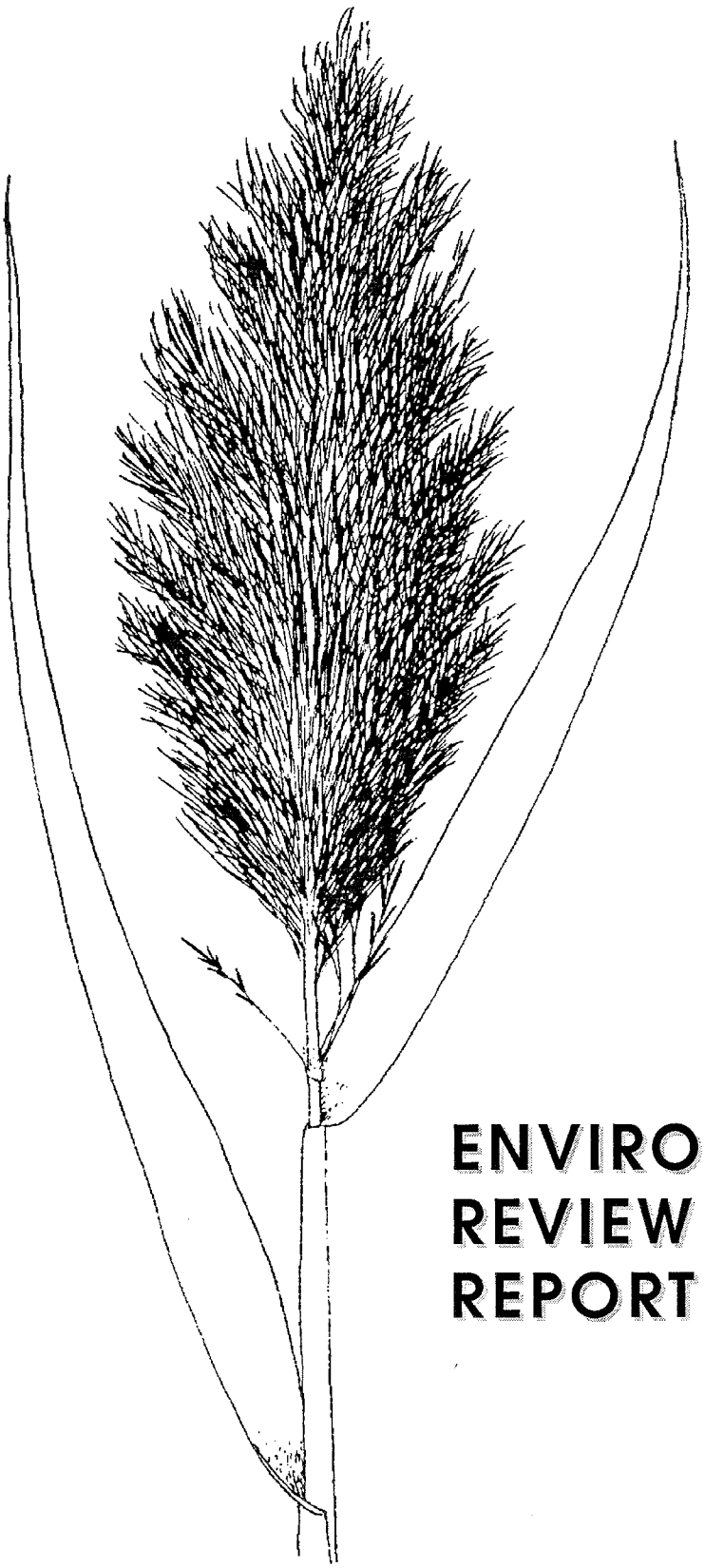
LAUREL LAKE



NATURAL RESOURCE INVENTORY

MANCHESTER, CONNECTICUT

NOVEMBER 1989

ENVIRONMENTAL REVIEW TEAM REPORT

Eastern Connecticut Resource Conservation and Development Area, Inc.

EASTERN CONNECTICUT ENVIRONMENTAL REVIEW TEAM

November 8, 1989

Dear ERT Report Recipient:

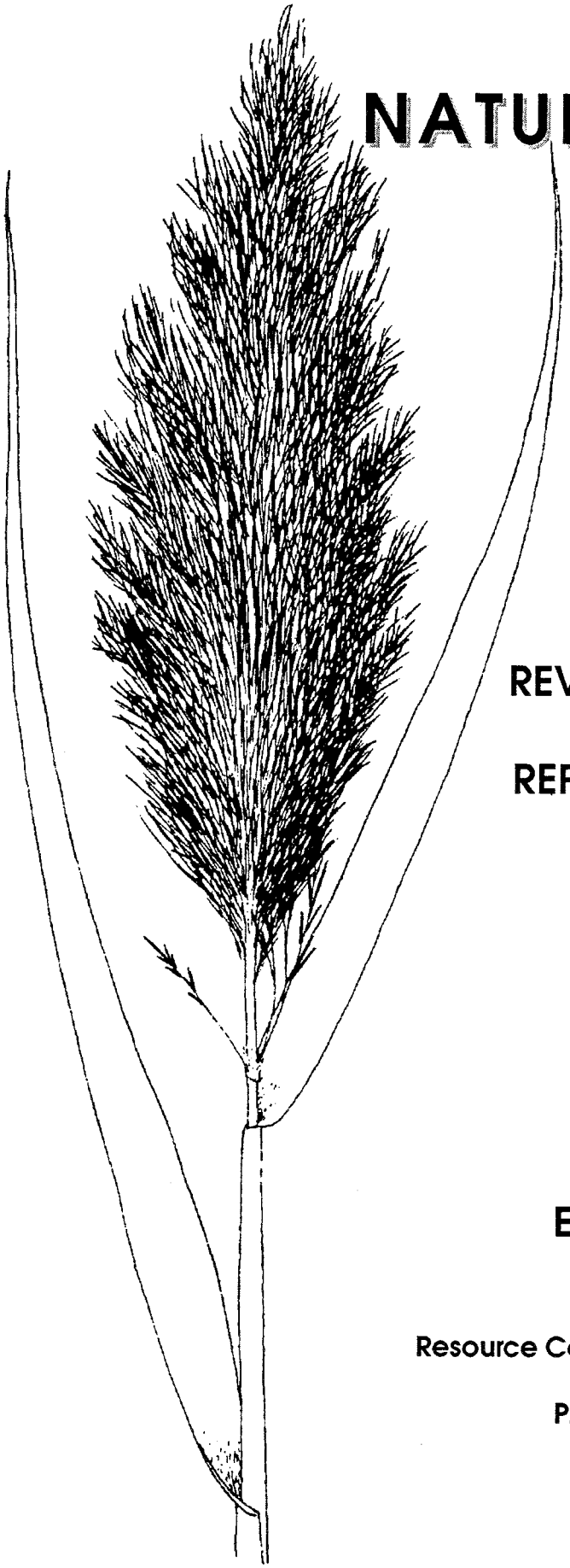
Enclosed is Chapter 6 - LAKE AND WATER QUALITY for the LAUREL LAKE NATURAL RESOURCE INVENTORY Environmental Review Team Report for Manchester, CT dated November 1989. This section was inadvertently left out from the final printing. I apologize for any inconvenience this may have caused you. If you have any questions please do not hesitate to call me.

Sincerely,

Elaine A. Sych, ERT Coordinator

Elaine A. Sych

Eastern Connecticut Resource Conservation and Development Area, Inc.
Environmental Review Team
P.O. Box 70, Route 154
Haddam, Connecticut 06438
(203) 345-3977



LAUREL LAKE NATURAL RESOURCE INVENTORY

MANCHESTER, CONNECTICUT

REVIEW DATE: AUGUST 22, 1989

REPORT DATE: NOVEMBER 1989

Eastern Connecticut
Environmental Review Team

Eastern Connecticut
Resource Conservation and Development Area, Inc.

P.O. Box 70, Haddam, Connecticut 06438

203-345-3977

ENVIRONMENTAL REVIEW TEAM REPORT
ON

LAUREL LAKE
NATURAL RESOURCE INVENTORY

MANCHESTER, CONNECTICUT

This report is an outgrowth of a request from the Manchester Conservation Commission to the Hartford County Soil and Water Conservation District (SWCD). The S&WCD referred this request to the Eastern Connecticut Resource Conservation and Development (RC&D) Area Executive Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The ERT met and field checked the site on Tuesday, August 22, 1989. Team members participating on this review included:

Nick Bellantoni	**State Archaeologist** **CT Museum of Natural History**
Steve Cote	**Soil Conservationist** **USDA - Soil Conservation Service**
Joe Hickey	**State Park Planner** **DEP - Bureau of Parks and Forests**
Charles Lee	**Environmental Analyst** **DEP - Water Compliance (Lakes Management)**
James Parda	**Forester** **DEP - Eastern District Headquarters**
Brian Murphy	**Fisheries Biologist** **DEP - Eastern District Headquarters**
Nancy Murray	**Biologist** **DEP - NRC (Natural Diversity Data Base)**
Paul Rothbart	**Wildlife Supervisor** **DEP - Eastern District Headquarters**

Carol Szymanski	**Regional Planner** **Capitol Region Council Of Governments**
Elaine Sych	**ERT Coordinator** **Eastern Connecticut R C & D Area, Inc.**
Bill Warzecha	**Geologist** **DEP - Natural Resources Center**

Prior to the review day, each Team member received a summary of the proposed project, a list of the town's concerns, a location map, a topographic map, and a soils map. During the field review the Team members were given additional information. The Team met with, and were accompanied by members of the Conservation Commission, the Town planning staff, and the consultants from an engineering firm and landscape architect firm. 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 designs 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 Town and landowner. This report identifies the existing resource base and evaluates its significance to the proposed development, and also suggests considerations that should be of concern to the developer and the Town. The results of this Team action are oriented toward the development of better environmental quality and the long-term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in making your decisions on this recreation area.

If you require additional information, please contact:

Elaine A. Sych
ERT Coordinator
Eastern Connecticut RC&D Area
P.O. Box 70
Haddam, Connecticut 06438
(203)345-3977

TABLE OF CONTENTS

TABLE OF MAPS AND DIAGRAMS

1. SETTING, LAND USE AND TOPOGRAPHY

The Laurel Lake site, about 120 acres in size, is located in eastern Manchester near its border with East Hartford. Most of the site comprises the former Laurel Lake bottom bed, which was breached at some point between 1965 and 1970. The Hockanum River, which was impounded to create Laurel Lake (prior to 1934) generally flows in a southwesterly to westerly direction to the western limits of the park. At the site's western limits, it flows in a northerly direction passing under I-84 and ultimately flowing into the Connecticut River.

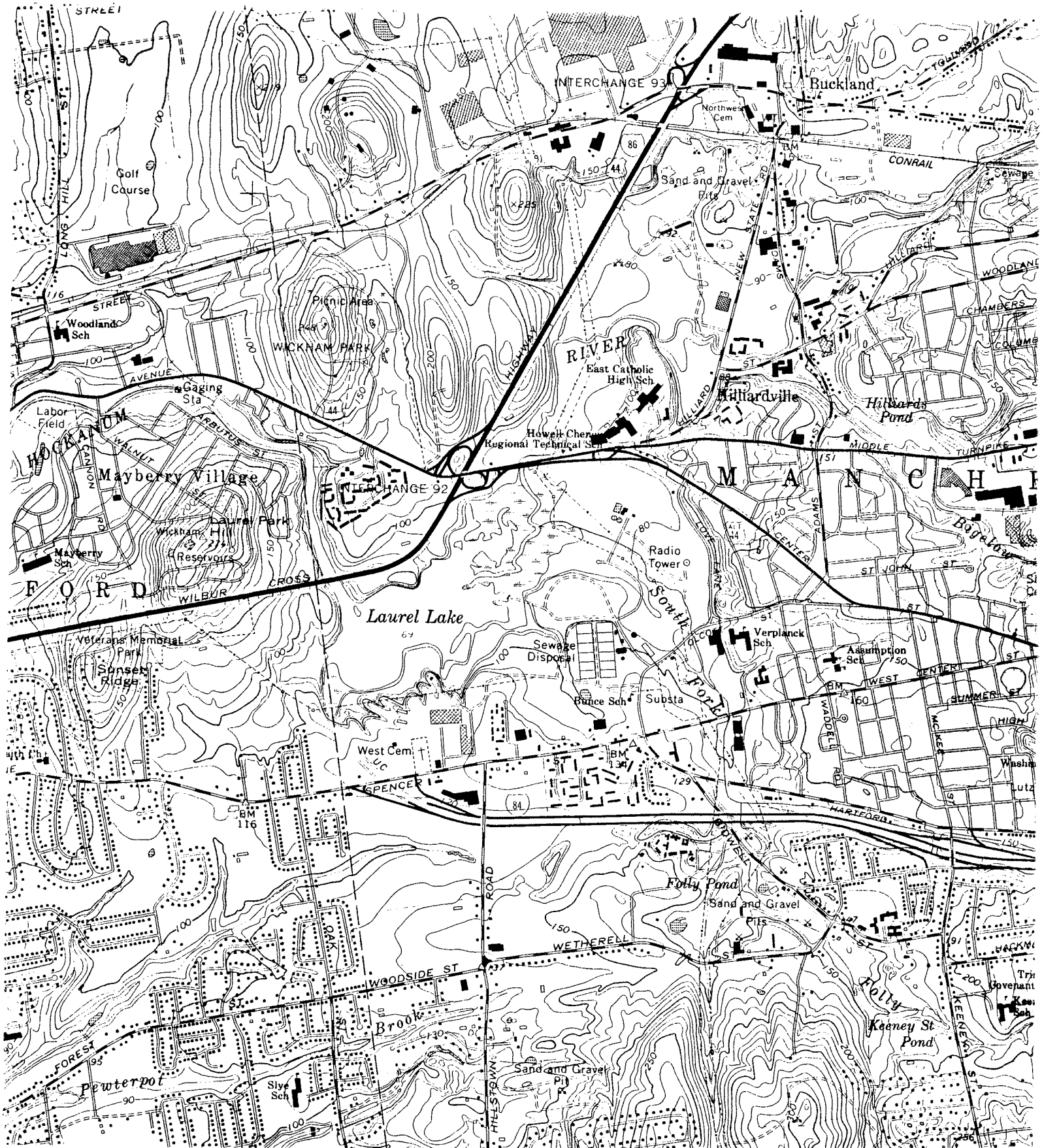
The site is bordered to the north by I-84 and Connecticut Routes 44 and 6 (Center Street), on the east by the Manchester sewage treatment plant, on the south by undeveloped, upland, alluvial land, and the Manchester landfill, and to the west by I-384. It is characterized largely by alluvial (swampy) land that is fringed at its outer boundaries by uplands on the north, south and west.

Land-uses in the area are characterized by mixed uses that include multi-family residential, single-family residential, commercial, and industrial.

The general topographic conditions on the site range from flat to steeply sloping. The majority of the site is flat and includes the Hockanum River floodplain. Steepest slopes occur on the north and south. They were created as a result of downcutting by the Hockanum River and/or by glaciofluvial action (kame terraces).

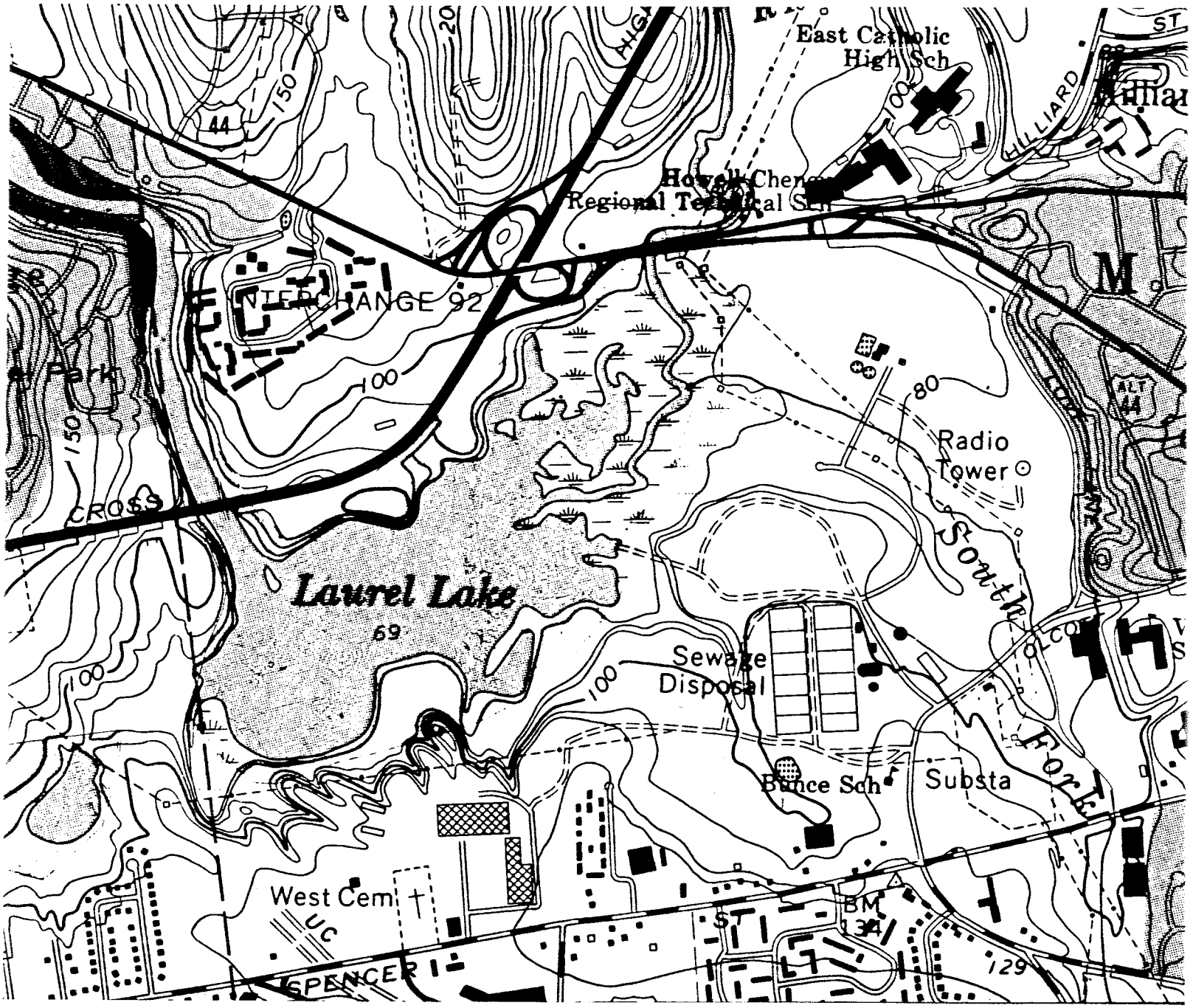
LOCATION MAP

Scale 1" = 2000'



TOPOGRAPHIC MAP

Scale 1" = 1000'



2. GEOLOGY

The Laurel Lake site is located in an area encompassed by the Manchester topographic quadrangle. A bedrock geologic map and surficial geologic map by Roger Colton (1965) have been prepared for the quadrangle and published by the U.S. Geological Survey. (Map QG-433)

Bedrock does not break the ground surface within the site. It is exposed in an I-84 road cut west of the site and is 13 feet below ground surface on the southeast flank of Sunset Ridge just west of the site. According to the map entitled Depth to Bedrock, Manchester Quadrangle, Connecticut, by Elinor H. Handman and Roger B. Colton (1973), the bedrock surface is deepest at the southern limits where it is between 150-200 feet. It is at or near ground surface southwest of the intersection of the Hockanum River and I-84.

Colton describes the bedrock underlying the site as Portland Arkose. It consists of reddish brown and gray arkosic siltstone, sandstone and conglomerates. The term arkose and arkosic mentioned above are used to describe the rock's mineral composition, primarily feldspar and quartz.

Portland Arkose consists of sediments that were deposited mainly by streams but occasionally in lakes during the Mesozoic geologic era. The rocks are approximately 170-180 million years old.

Because the bedrock surface lies at such great depths throughout the site, it should pose no major problems in terms of passive recreational uses.

The unconsolidated materials covering the site are of more recent vintage compared to the 170-180 million year old bedrock on which it rests. Most of these materials were deposited by glacier ice or meltwater streams. Evidence from other parts of the United States,

primarily the mid-west, indicates that glacial ice advanced southward from Canada several times during the last million years. Most of the glacial sediments in Connecticut appear to date from the most recent of these advances, which climaxed about 18,000 years ago. Till is the oldest sediment. Till was deposited directly from the surface of, within, and beneath the ice, mainly while the ice was continuing to move forward. As a result, the various grain sizes from clay to boulders are mixed together in a complex, irregular fashion. Till is not exposed on the ground surface within the site, but according to subsurface data it covers a relatively thin blanket over the bedrock surface beneath the site. (Map GQ-433, Colton)

Approximately 13,000-14,000 years ago, the ice from the most recent glaical advance had melted to northern Connecticut. Thinning at the margins resulted in the detachment of large blocks of ice, while continuing flow in the thicker ice to the north, produced more and more rock debris. The debris was carried forward by meltwater streams, which sorted it by grain size.

At some time during the period of glacial retreat, ice and sediment formed a blockage or dam in the Connecticut Valley in the vicinity of Rocky Hill. Water backed up from that blockage resulted in a lake of large proportions. The glacial lake has been given the name Glacial Lake Hitchcock. Meltwater entering the lake deposited sediment rapidly, building a series of coalescing deltas along the lake shore. Fine materials (clay, silt, and fine sand) were deposited on the lake bottom, often in a varved (alternating) sequence. Lake bottom sediments are not exposed on the ground surface but overlie the till mentioned earlier. A log of a boring southwest of the site indicates that the glacial lake deposits are about 56 feet thick in the area.

Another glacially deposited sediment found in the northern parts of the site are collapsed stratified drift. These deposits, which flank the shoreline of the ancient Glacial Lake Hitchcock, consist of pale yellowish-brown, grayish-red, or grayish orange-pink stratified sands and gravels. They average about 25 feet thick.

Finally, overlying the lake deposits on the site is a moderately thick blanket (as much as 20 feet) of water deposited materials called terrace deposits. The terrace deposits on the site consist of yellowish brown, well laminated sand, silt and clay which may be locally pebbly. They were carried forward over the "lake deposits" by meltwater streams during glacial retreat and cover the steeply sloping areas along the southern border of the site. *(See idealized geologic cross section of the site.)*

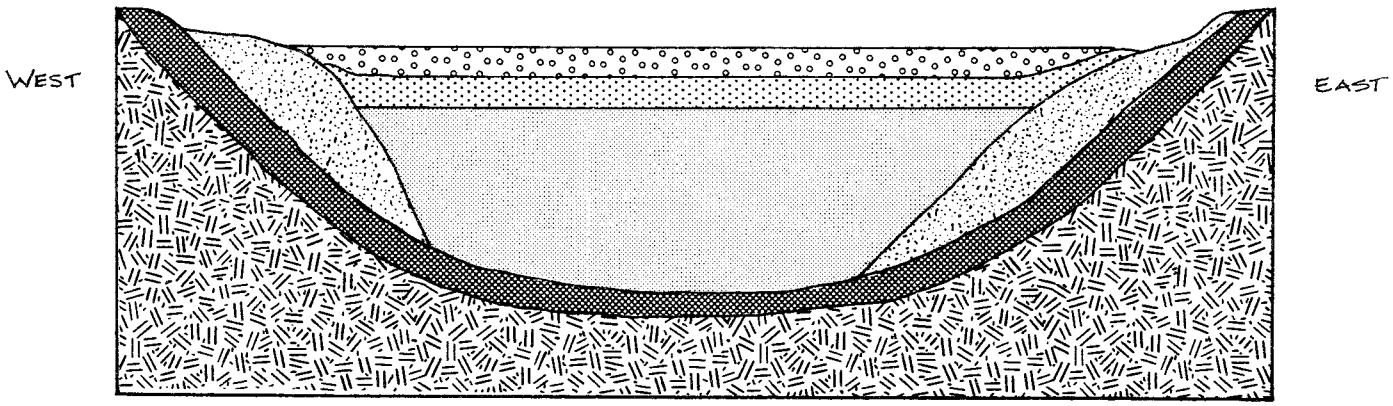
Alluvium, which covers the remainder of the site and which parallels the Hockanum River and Hop Brook, consists of light grayish-brown silt, sand and gravel. These are generally poorly drained soils that formed post-glacially. The water table lies within a few inches of the surface of the ground during most of the year.

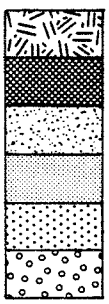
Garbage and refuse (artificial fill) has been placed over the geologic deposits on the southeast side of the site.

GEOLOGIC CROSS SECTION

Not to Scale

(A geologic cross section of the site might look like this)





Portland Formation
Glacial Till
Collasped Stratified Drift
Glacial Lake Deposits
Terrace Deposits
Alluvium and Swampy Deposits (HOCKANUM RIVER)

3. SOILS - LANDSCAPE LIMITATIONS AND CONSIDERATIONS FOR PASSIVE RECREATION

SOILS AND LANDSCAPE

The Old Laurel Lake landscape is dominated by nearly level, recently deposited alluvial soils on floodplains and steeper areas of water deposited sand and gravel on terraces and outwash plains. Passive recreational planning for trail development improvement or maintenance should be directed by considering soil-landscape limitations. Limitations for trails exist from both natural and man-made sources. In both situations, the major limiting concerns and considerations for passive recreation trails are discussed below.

1) Portions of the trail appear well within the 100 year flood zone of the Hockanum River and Hop Brook. Poorly or very poorly drained soils prone to flooding exist on this site, located primarily in the Northeast and Southwest corners of the lake bed. Limitations for trails in wetland areas subject to flooding may require special consideration of elevated bridges with uprights driven into suitable material *(see appendix)*. These bridges can also be designed to prevent the use of recreational vehicles. These structures may require special designs and Local, State and Federal permits requirements should be investigated

2) Trail segments exist at the base of the north slope of the landfill and eroded slope sediments have been deposited over the trail and into the Hockanum River. Unstable landfill slopes pose a continuing source of damage to the trail and river. Erosion control on landfill slopes can be accomplished by control of surface water away from erodible areas, installation of erosion control material controlling runoff on the slope in specially protected leak off channels and by the establishment of methane and drought resistant vegetation. Plant species such as birdsfoot trefoil, sweet

clover, red clover, tall fescue and annual and perenial rye have shown promise in soil stabilization and esthetic improvements on some landfill slopes. Assistance in landfill slope stabilization is available through the Hartford County Soil and Water Conservation District.

3) Cut banks along the Hockanum River are threatening to erode the trail and will conceivably erode at a rapid rate under highwater and increased flow conditions. Location of the trail on erosive terraces near existing river channel cutbanks could pose a threat to both the trail and hiker safety. Streambank stabilization projects could control undermining of the trail, however, these projects need to be engineered and can be an involved and costly undertaking. Proper location of the trail away from erosive cut bank areas may prove to be more cost effective and feasible.

4) Some existing trail sections are located on steep terraces. Future trail sections, if desired, on slopes of approximately 8% or greater may require special design considerations for soil erosion control. Wherever steep slopes are involved, consider consulting the Appalachian Mountain Club's Trail Building and Maintenance Guide or Department of Environmental Protection guidelines. AMC's Trail Guide should be available at camping supply stores.

OTHER CONSIDERATIONS

Prompt identification and correction of all soil erosion problems is an important component of trail maintenance, especially above nearby wetlands and watercourses and on steeper slopes. Site investigations revealed areas of disturbed soils north of the Hockanum River near the confluence of Hop Brook and near the south bank of Hop Brook below the waste treatment facility. Disturbances were mostly the addition of sandy, gravelly material and should not pose a major limitation to trails. Planning trails or improvements in the wetter and steeper areas may require special design to accomodate children, handicapped and elderly hikers. However, some of the more

negotiable and accessible trail areas may provide recreational opportunities without the higher cost and design requirements associated with the more difficult terrain and still allow use of the area by a larger segment of the community.

SUMMARY

The major soil-landscape limitations and major site considerations encountered for trail development, maintenance or improvements for passive recreation in the Laurel Lake area are:

-Existing trails cross sensitive wetland areas that are prone to flooding.

-Trail crossings may be necesary in these areas and will require special consideration in planning, design, environmental sensitivity and permit requirements.

-Trail segments are located below steep and unstabilized landfill slopes which have and may continue to deposit sediment onto the trail and into the HockanumRiver.

-Reduction of trail improvement and maintenance costs and control of sediment deposition in the river may require slope stabilization of the landfill.

-Trail sections also exist on erosive soils and cutbanks of the river.

-Trail longevity and hiker safety concerns may require relocation of portions of the trail or streambank stabilizationprojects.

-Areas with steep slopes exist and future trail system improvement and maintenance planning should incorporate limited trail lengths and soil erosion control practices.

SOILS MAP

Scale 1" = 1667'

4. RECREATIONAL POTENTIAL FROM A GEOLOGIC STANDPOINT

The site has high potential for passive recreational uses such as hiking, bird-watching, picnicking, and cross-country skiing. Because suitable flat, upland areas are limited, the site holds low potential for active recreational uses such as playing fields.

The site includes several natural features of importance such as **(1)** Hockanum River and South Fork Hockanum River (Hop Brook) and their respective floodplains; **(2)** a large wetland/floodplain system that has excellent ecological integrity and wildlife habitat; and **(3)** the presence of unconsolidated materials that were deposited in the former Glacial Lake Hitchcock. These important features offer a high potential for environmental (science) educational purposes as well as the passive recreational uses mentioned above. Some areas (wetland and floodplains) may be limited for passive recreational uses during wet periods. Also, the steeply sloping areas of the site are an obstacle for passive recreational uses. Hiking trails, 3-4 feet wide, should be laid out to fit the terrain with sustained grades of 10 feet or less. However, in steeply sloping areas, there may be an opportunity to construct a look-out deck that cantilever the slopes and provide panoramic views of the wetland/floodplain system.

5. WATER RESOURCES

The Laurel Park site lies entirely within the Hockanum River watershed area. At its point of outflow into the Connecticut River in East Hartford, the Hockanum River drains an area of 76.1 square miles or 45,824 acres. South Fork Hockanum River (Hop Brook) flows into the Hockanum River at the eastern end of the site.

The watercourses described above have been classified by the Connecticut Department of Environmental Protection as "C/Bc" water resources. This means the current classification is "C" and the State's ultimate goal is to upgrade the streamcourse to Class "Bc". A Class "C" water resource may be suitable for certain fish and wildlife habitat, recreational boating and certain industrial processes and cooling. In addition, these streamcoureses would have good aesthetic value. A Class "B" water resource would be suitable for the same uses mentioned above but would also include bathing and agricultural uses. The subscript 'c' means that the water would be suitable for cold water fisheries including spawning, growth and passage. The surface waters (Hockanum River and South Fork Hockanum River) are known to be degraded possibly by industrial cooling water discharges, landfill leachate, road salt storage facilities, industrial discharges, hydrocarbon spills, sewage treatment plant discharges, as well as other sources.

Except in the vicinity of the landfill, groundwater on the site is classified as GB. The groundwater classification near the landfill is GB/GC. A "GB" classification means the groundwaters are within highly urbanized areas that includes intense industrial activity and where public water is available. Since it has been degraded, groundwater may not be suitable for direct human consumption. The State's goal is to restore these groundwaters through cleanup action. The area designated as GB/GC, means that groundwater is presently contaminated largely by the pollutants noted above, and where certain hydrogeologic conditions exist which could be utilized as part of a waste treatment

process, e.g. landfill. Also, it is an area where development of a public water supply is unlikely due to low yield conditions.

Because of the large size of the wetland/floodplain system that encompasses the site, it has an important role in regulating streamflows. During periods of heavy rainfall or snow melt this area stores water temporarily releasing it more slowly than would otherwise be the case, and thereby reducing the peak flood flows in the Hockanum River and other downstream watercourses. This area helps to protect the quality of the surface water, because of its ability to trap sediment and retain nutrients. It also has high wildlife habitat value.

If there is a need for sanitary facilities or water supply, it is suggested that they be connected to municipal utilities that are widely available in the area. This would be preferred over developing an on-site water supply, in view of the groundwater quality (GB and GB/GC) for the area.

6. LAKE AND WATER QUALITY

The Hockanum River Linear Park includes the section of the river which was the formally dammed to create Laural Lake. However, the dam was breached between 1965 and 1970 and therefore Laurel Lake no longer exists. A Fishery Survey of Connecticut Lakes and Ponds - 1959, describes the 103 acre pond as being very productive due to industrial and domestic pollution. This report further states that increased fertility produces a dense algae bloom which reduces transparency to approximately one foot.

The water quality classification of this section of the Hockanum River is C/Bc. The classification of C/Bc indicates that the waterbody does not meet the water quality criteria for one or more of the designated uses due to pollution. The goal for the waterbody is B. The classification of B designates the use of a waterbody as suitable for recreation and wildlife as well as bathing and agicultural uses. A class B river may also receive industrial and municipal discharges of treated waste water. The subscript c means that the water would be suitable for cold water fisheries.

The Team was asked to consider the possibility of replacing the breached dam in the development of the Hockanum River Linear Park. Undoubtedly this project would require a great deal of evaluation and financial resources. Included in these considerations are the many sources of pollution which are affecting the Hockanum River and the effects the pond would have on the water quality of the river.

Among the sources of pollution are the Manchester and Vernon sewage treatment plants. Both plants discharge into the Hockanum River upstream from the proposed location of the pond. Although the Vernon sewage treatment plant is several miles upstream, the Manchester plant is located a short distance from the site. At this time both plants are undergoing upgrading of treatment capabilities.

However, even with this advance treatment, recreational use will be limited and swimming may not be desirable.

Along with the sewage treatment plants, nonpoint source pollution also affects the Hockanum River. This includes agricultural and urban runoff. These sources contribute road oil, sand, salts, nutrients, and floatable debris which will further deter use of the proposed pond.

In addition to the pollution generated from various sources within the watershed, the large size of the watershed will naturally increase eutrophication of the pond. The proposed impoundment would have a watershed to surface area ratio of (451/1). This indicates a very high potential of fertilization of the pond from water draining through the large watershed. This is evident from the reported condition of the pond prior to the breaching of the dam.

As described above, the water quality of the proposed pond would be degraded from the many sources of pollution which are in the Hockanum River Watershed. These accumulative effects will continue to degrade downstream water quality until sufficient mixing can occur. These water quality problems may be in direct conflict with DEP's efforts to upgrade the river to a class B waterbody.

The depth of the water table could also be changed if this impoundment is established. Therefore, analysis of this proposal should also address the impacts which could occur if the water table raises above the present level. This becomes an issue if the water table reaches critical areas of the Manchester Landfill.

These environmental considerations will require a lengthy process to obtain all the permits required to implement this project. Conditions of these permits may require costly engineering designs in order to reduce these impacts. Among the permits which may be required are local inland wetlands, DEP diversion permit, Army Corp. of Engineers 404, and possible environmental impact statements.

7. THE NATURAL DIVERSITY DATA BASE

The Data Base maps and files have been reviewed regarding the Laurel Lake Area. According to the information there are no Federal Endangered and Threatened Species or Connecticut "Species of Special Concern" that occur at or adjacent to the area in question.

Natural Diversity Data Base information includes all information regarding critical biologic 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. Consultation with the Data Base should not be substituted 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.

8. VEGETATION

This portion of the Hockanum River Linear Park trail system is approximately 3.4 miles long. The area along the trail is rich in vegetative diversity with plants ranging from early successional grasses to over-mature hardwood forests. Also included is a large marsh ecosystem offering a variety of plants and wildlife. The following is a list of some common shrub and early succession vegetation noted on site: golden rod, raspberry, black berry, red osier dogwood, nettle, multi-flora rose, grape, steeplebush, dewberry, swamp azalea, jewel weed, arrow wood, hornbeam, Virginia creeper, bullbriar, greenbriar, elderberry, spicebush, bittersweet and speckled alder. Common trees occurring include: red maple, white ash, American elm, apple, black locust, mulberry, American beech, grey birch, trembling aspen, black cherry, hemlock, white pine, sugar maple, silver maple, eastern cottonwood, boxelder, maple, willow, sumac, red, black, scarlet, white oaks, shagbark hickory and black birch.

This site is an excellent example of vegetative succession. Over 200 years of land change from grass fields to near climax forest occurs in one 2 hour walk. This would provide excellent educational opportunities through an interpretative trail. There is also a harvested area, a nearby land fill, sewage treatment plant and highway to show a variety of land uses as a comparison to one another. The trail has several overlooks and swamp vistas as points of interest for photographers and artists.

Because this is a fragile ecosystem only the most passive recreation should be allowed. This would include walking and possibly cross-country skiing. The present trail is about ±4 feet wide for most of the distance except through an area of phragmites and along the slopes of the upland woodlands where it narrows to a +1 foot wide path. Most of the trail is in good condition. Some areas should have wood chips or a more permanent stone or stonedust to cover roots and stubble. The wet area could have a board walk. Upland trails would probably be left alone rather than widened with cutting and filling which will injure roots.

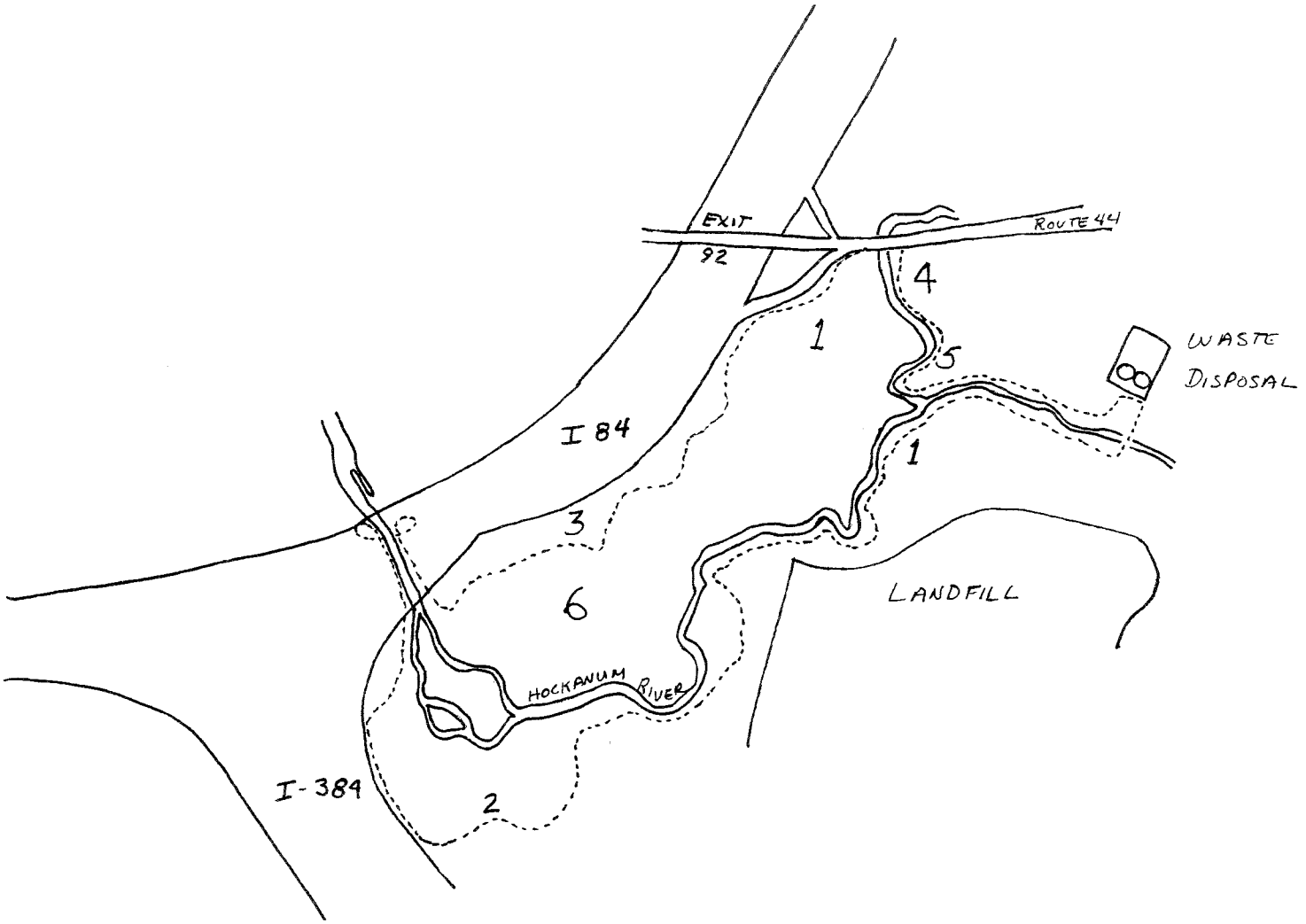
Seasonal maintenance to keep debris off the trail will be necessary. Trail mowing can occur as needed in summer.

The accompanying map indicates approximate trail location with notable vegetative changes. River bottom alluvial lowlands support a mixed hardwood forest of elm, ash, red maple, cottonwood and willow. This forest is more typical of the mid-Atlantic states south of New England. A transitional forest of red oak, black oak, white oak, American beech, black birch, sugar maple, red maple and white pine is representative of woodlands in central New England. A third district forest type occurs along the highway and includes sugar maple, American beech, birch and white pine. These northern hardwoods are typical of northern New England. Other vegetative types representing pasture/grasslands, old fields, hardwood swamp and open marsh can be identified on the ground in the event an interpretive trail is created. Representative areas of these types are designated on the map in their relative position.

The trail meanders through an area of good vegetative diversity representing several stages of vegetative succession. Several types of wildlife habitat are also represented. This diversity lends itself well to passive recreation and a simple interpretive trail. Local schools could use this area as a valuable outdoor education resource area. As long as usage is minimal adverse impact will remain low.

VEGETATIVE TYPE MAP

Scale 1" = 1000'



Laurel Lake Trail --------

TYPE 1 : Alluvial Mixed Hardwood
TYPE 2 : Northern Hardwoods
TYPE 3 : Transitional Hardwoods
TYPE 4 : Hardwood Swamp
TYPE 5 : Grassland
TYPE 6 : Open Marsh

9. WILDLIFE RESOURCES

The Laurel Lake site (±120 acres) is dominated by various wetland components (i.e. forested floodplain, river riparian, small open ponds, marsh dominated by cattail and phragmites). Other habitats include open field and mixed hardwood forest.

WETLANDS

The wetlands are comprised of forested floodplain, river riparian zone and extensive marsh land dominated by emergent vegetation with small scattered open water bodies.

Forested Floodplain consists of red maple, silver maple, cottonwood, aspen, black locust and scattered crab apples. Understory vegetation includes arrow wood, alder, viburnum, multiflora rose, greenbriar, bittersweet, mulberry, grape and hardwood saplings. Wildlife species utilizing such sites include raccoon, skunk, opposum, deer, grouse, squirrels, yellow warblers, cedar waxwings, bluejays, cardinals, tufted titmouse, flicker, house wren, goldfinch, rufcus-sided towhee and song sparrows.

The Hockanum River riparian zone vegetation includes red maple, silver maple, willow, alder, bamboo, grasses and sedges, stinging nettle, milkweed, crab apples, sumac, smartweeds, pokeweed, mullein and jewelweed. Wildlife frequenting such areas include deer, raccoon, skunk, mink, otter, beaver, muskrat, swallows, kingbirds, cedar waxwings, egrets, great blue herons and numerous other non-game species.

The last major wetland component is the large expanse of marsh. These sites are dominated by cattail and phragmites. Other vegetation includes pickerelweed, smartweed, rushes and sedges, bur-reed, buttonbush, purple loosestrife, goldenclub, mudplabtaub abd water-lily. Small open water bodies are scattered throughout this habitat type. Wildlife utilizing such sites include deer, raccoon, skunk, muskrat, beaver,

marsh wren, red-winged blackbirds, grackles, belted kingfishers, great blue heron, American egret, cedar waxwing, kingbird, yellow warbler, swallows, crows, mocking birds, cow birds, waterfowl and various amphibians and reptiles.

OPEN FIELD

This valuable habitat type consists of the powerline right-of-way. Vegetation includes scattered hardwoods (i.e. cherry, beech, oak, hickory and ash), viburnum, grape, alder, dogwood, arrow wood, wax myrtle, elderberry, pokeweed, goldenrod, ragweed, bittersweet, sumac, Queen Anne's Lace, trailing wildbean and grasses.

This vegetation provides food as well as structural diversity, creating cover for a great array of wildlife from mice and shrews to deer. Open field sites attract numerous insects, a major food item for wildlife species such as birds (i.e. grouse, turkey, kingbirds, waxwings, swallows) and small mammals including bats.

Wildlife utilizing this habitat type includes deer, fox, coyotes, raccoon, grouse, quail, turkey, woodcock, woodchuck, skunk, mourning dove, kestrel, red-tailed hawk, warblers, robins, rabbits, waxwings, swallows, kingbirds, bats, rodents, amphibians and reptiles, flickers and screech owls.

MIXED HARDWOOD FOREST

This upland site consists of red oak, black oak, ash, beech, black birch and scattered conifers. Understory vegetation includes poison ivy, club moss, grape, viburnum, honeysuckle, witch hazel, virginia creeper and hardwood regeneration.

Wildlife frequenting such sites include deer, fox, raccoon, gray squirrel, woodpeckers (hairy and downy), ovenbirds, scarlet tanangers, warblers, barred owls and various non-game species.

DISCUSSION

The Laurel Lake site is extremely valuable as a wetland system and the mix of other habitat types make it an excellent passive open area site to protect and enjoy the rich and diverse wildlife resources.

In a small but heavily developed and highly populated state like Connecticut, where available habitat continues to decline on a daily basis, it is critical to maintain and enhance all existing wildlife habitat. The following practices may help to maintain and/or improve habitat conditions.

Forest Guidelines

1. Increase forestland diversity by making small (1/4 - 1 acre) openings in an east to west direction (maximize sunlight). This will encourage fruit producing shrubs valuable to many wildlife species. The edges of the opening should gradually blend into the forested habitat (feathered edges).

2. Pile brush (6' - 8' high x 10' diameter) along edges of openings to create cover for birds and small mammals.

3. Encourage mast producing trees (oak, hickory, beech).

4. Leave 5 - 7 snags per acre for their food and nesting values.

5. Trees with vines (berry producers) should be encouraged.

6. Exceptionally tall trees are utilized by raptors as perching and nesting sites and should be encouraged.

7. Aspen clumps and apple trees should be released from overcrowding competition.

8. Planting of white pine seedlings within openings and as underplantings to increase the amount and distribution of conifer cover.

Open Field Guidelines

Early successional stage vegetation which is essential to many wildlife species, is limited in Connecticut. This habitat type (i.e. agricultural fields, pasture, old fields, powerline rights-of-ways) should be encouraged.

1. Fields should be cut every 1 - 3 years to maintain early successional stage vegetation. Cutting should be scheduled on a staggered basis and not prior to July 1 to avoid possible damage to nesting birds. A 15 foot wide border between fields and forestland should be established and maintained on a staggered basis every 3 - 5 years after July 1. This 15 foot zone provides an additional edge component to the site.

2. Placement of bluebird boxes along field edges.

It should be recognized that for optimum wildlife habitat potential a variety of successional stage vegetation must be encouraged. Proper maintenance of openings and field borders must be conducted. If neglected native vegetation will progress to less desirable stages, lowering the wildlife potential on the area.

Wetland Guidelines

1. Maintain a 100 foot wide buffer zone of natural vegetation around wetland/riparian areas to help filter and trap silt and sediments. These vegetated zones provide excellent wildlife cover and travel corridors.

2. Placement of wood duck boxes along marsh sites with nearby open water. Wildlife Bureau can provide written plans, wood duck ecology flyers and applications for wood duck box kits.

3. In most cases, natural marshes are of more value than constructed ponds and ditches because of vegetative composition, gentle sloping edges and shallow water depths (6" - 3'). However, due to the extensive encroachment of cattail and phragmites throughout the marsh pond and/or ditch construction along with vegetation control should be evaluated. The present vegetation encroachment is essentially choking the life from a large portion of the marsh rendering unsuitable for waterfowl, egrets, herons while encouraging red-winged blackbirds and grackles.

NATURAL HISTORY EDUCATION/TRAILS

Trails are the key to bringing people and wildlife together. They should be located to take advantage of terrain and existing habitat and conform to existing landscape textures. Effective trail planning and layout can enhance the learning and aesthetic aspects of outdoor recreation by providing easy access to varied habitats. A nature trail which includes informational signs provides insight into the ecology of an area. The information provided helps the general public appreciate a particular animal, plant or habitat and its ecological value.

Some guidelines to follow when developing a trail system:

- Know the characteristics of the property and plan the layout so that the trail passes by or through a variety of habitat types.

- Make sure the trail is safe as well as exciting. If feasible, a portion of the trail system should be made accessible to the handicapped.

- Follow a closed-loop design, beginning and ending at the same point.

- Avoid long, straight stretches. Trails with curves and bends are longer, add an element of surprise and anticipation, and seem more natural. Straight stretches should not exceed 100 feet.

- The trail system should be well marked and accompanied by an informational pamphlet. This will allow interested individuals, not just organized groups, to have an educational opportunity. If management practices are conducted (i.e. openings, plantings, bluebird boxes) they should be discussed. The major wildlife topics to emphasize should be the value to wildlife of vegetation types/succession and wetland areas.

10. FISH RESOURCES

SITE DESCRIPTION

The Laurel Lake area is one of the largest undeveloped tracts of land in the town of Manchester. As a result, it presents a unique opportunity for a "natural" area immediately adjacent to land being utilized for industrial development. Its proximity to familiar highways and buildings should make it an extremely valuable learning center for the urban public.

The site (120 acres) is surrounded by several major roads including two interstates, a landfill and a sewage treatment facility. As the site has been returned to its natural condition as a lowland marsh, the primary water resource is now the Hockanum River instead of the former Laurel Lake. The Hockanum is typical of Connecticut River floodplain tributaries in that it flows through flat terrain and meanders extensively.

Streams of this type are characterized by very fine bed materials including fine sands and silts. In more rapidly flowing areas bottom types may include coarser gravels and pebbles. Habitat is usually limited to pools and runs (water depth >1.0 feet). In this reach of the Hockanum, very flat topography has led to moderate siltation (3"-15"). While this level of siltation would be considered excessive in other riparian habitats, it is not abnormal for a lowland wetland.

The area has already been designated as part of the Hockanum River Linear Park containing approximately 3.4 miles of hiking trails.

AQUATIC RESOURCES

The Hockanum River supports a rich diversity of resident fish and invertebrates. The stream was electrofished on September 6, 1989 with the following species being identified:

Fish:

Bridled shiner	Swamp darter	Tessellated darter
Redbreast sunfish	Pumpkinseed sunfish	American eel
Brown bullhead	Golden shiner	White sucker
Common Carp	Bluegill sunfish	Largemouth bass
Blacknose dace	Longnose dace	

Invertebrates:

Crayfish	Aquatic insects

The diversity is indicative of an extremely fertile environment which is not common in Connecticut streams.

Physical and Chemical Characteristics of the River:

Flow - 2.5 cfs

Color - light brown transparency - moderate water temperature - 65oF.

pH - 6.8 (near neutral)

Conductivity- 227 uHOs (excessively high for a stream in eastern Connecticut and indicative of high fertility)

Dissolved Oxygen - 9.0 ppm (typical for streams)

Vegetation:

The area abounds with rooted aquatic and emergent vegetation as well as terrestrial grasses. This vegetative complex is typical of a highly fertile wetland environment.

POTENTIAL

The river and its surrounding wetland could serve as valuable ecological study areas for middle and secondary school students. The variety of fish and plant species could provide many opportunities for

wildlife identification. As previously stated, the value of the site is actually enhanced by its proximity to industrially developed areas.

Expansion of the trail system to include a raised catwalk which leads the public through the tall grasses and along the river could immeasurably improve the educational capabilities of the site.

RECOMMENDATION

Expand the nature trail system and develop the wetland as an educational center for students and the general public as well.

11. PLANNING REVIEW

STATE PARK PLANNER COMMENTS

The area basically consists of a sizeable pocket of poorly-drained floodplain/wetland along the Hockanum River, surrounded by an edging of well-drained glaciofluvial soils. Major highways border the area on the north and west, with a municipal landfill-sewage treatment plant complex found in its eastern edge.

Much of the site formerly was occupied by Laurel Lake, a shallow and presumably rather eutrophic water body. However, rather than repair an inadequate dam, the owners removed the dam, causing the lake to revert to a wetland. The potential of the two major land types can be summarized as follows:

1. ***Floodplain*** - Serves a useful purpose in regulating flows along the river and perhaps also in filtering out pollutants in a stream with limited dilution capability. Also serves as a sizeable area of green open space in an increasingly urbanized section of the state and may have some potential as waterfowl habitat. The river itself should be at least seasonally canoeable and could serve as a means of access to the wetland for environmental education purposes. It may also have limited potential for fishing.

2. ***Upland*** - The surrounding areas of upland largely serve as a fringe framing and protecting the floodplain wetland. A hiking trail/nature trail would seem to be the sole recreational potential of most of this area, excepting the landfill-sewage treatment plant complex. Depending upon the existence or not of possible environmental hazards, the landfill area conceivably could receive some future passive recreational use.

Summary - The Laurel Lake site basically should be managed as an area of passive open space, providing a green oasis and serving a number of environmental functions as discussed above. The recreational potential of the site is very limited.

REGIONAL PLANNER COMMENTS

The Laurel Lake are in Manchester is best utilized for passive recreation as an oasis in the midst of a busy urban setting. With some modifications, the existing trail along the Hockanum River could serve as an attractive asset to the surrounding community.

Old growth trees on the site should be preserved to maintain a visual barrier from the physical attributes of the landscape which detract from the scenic value of the trail, such as the highway and the landfill.

Signage

Signage along the trail itself could be installed to identify rare and interesting plant and wildlife species.

Parking

Safely accessible parking areas need to be developed and established for easy access to the trail. Existing parking facilities at Cheney Technical School can be developed to meet parking demands and a crosswalk could be installed on Middle Turnpike to reach the site.

Surfacing

Surfaces for hiking and walking are often left as natural as possible. If bicycling is encouraged, a more solid and compact surface such as asphalt will be required, adding to the overall expense of the project.

Trails

The width of the trail would have to be increased as well to accommodate bicyclists. On the average, the width of a walking/hiking trail would be 4-15 feet (depending upon the site and usage); an additional 3-4 feet would be required to permit passage for bicyclists. Motorized bikes should be discouraged from using the trail since this activity would conflict with the primary use of the trail by hikers and walkers. A height clearance of 8 - 10 feet should be provided.

Grade

Surface water can erode the path; grading will, therefore, be necessary at crucial points to divert standing water. 5-10% grade is average for good drainage. If possible, parts of the existing trail should be re-routed to avoid areas identified as wetlands. Disturbance of wetland areas should be kept to a minimum in developing the trail. Haybales or silt fencing should be properly installed and maintained throughout the life of any construction activity to avoid pollution of natural areas.

Other

Once the trail has been fully developed, regular maintenance will be necessary such as the clearing of debris, brush and vegetation. Trash containers could be provided at the trail entrance for hiker trash.

Some basic regulations should be developed in order to promote the safety and enjoyment of those who use the trail. These need not be complex, but should be posted at the entrance to the trail in full view of the users.

12. ARCHAEOLOGICAL REVIEW

To assist the Town of Manchester in compiling information of significant resources in the Laurel Lake area, the Office of State Archaeology provides this listing of archaeological sites in the surrounding area. Site descriptions are given below, however, specific site location information is withheld. The vandalism of the state's archaeological resources is a concern. Information is provided to give an idea of the cultural resources the town should consider.

Two prehistoric/early historic sites have been discovered in the area. Both represent large Podunk Indian villages along the Hockanum River and Laurel Lake. The archaeological importance of sites like these rests in the information provided on historic Indian settlement patterns as well as in providing models for the investigation of agricultural communities of Native Americans. Artifacts recovered include stone mortars for grinding corn, ceramic pot sherds from cooking vessels, flint and quartz spear and arrow points, adzes and axes for woodworking, and hoes for planting.

Historic resources include the West Cemetery on Spencer Street. Two Indian burials are located here, supposedly representing the interments of two Podunk Indians murdered during the early historic period.

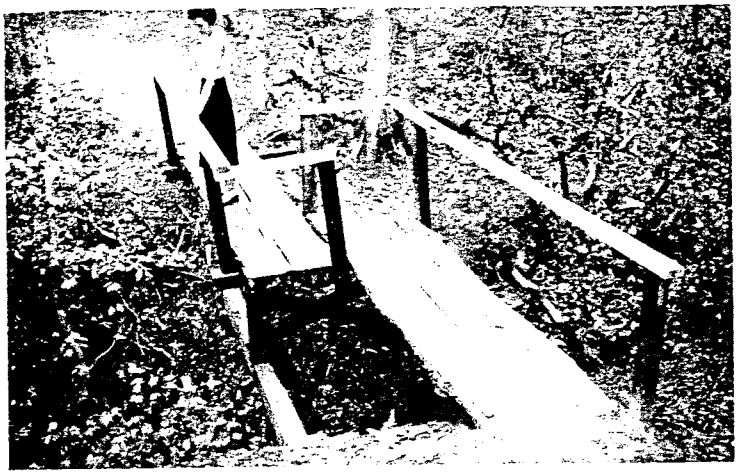
In addition, highlands surrounding the Laurel Lake have yielded a series of small aboriginal campsites in both the towns of East Hartford and Manchester.

Further information on the cultural resources of this area are on file at the Office of State Archaeology and the Connecticut Historical Commission.

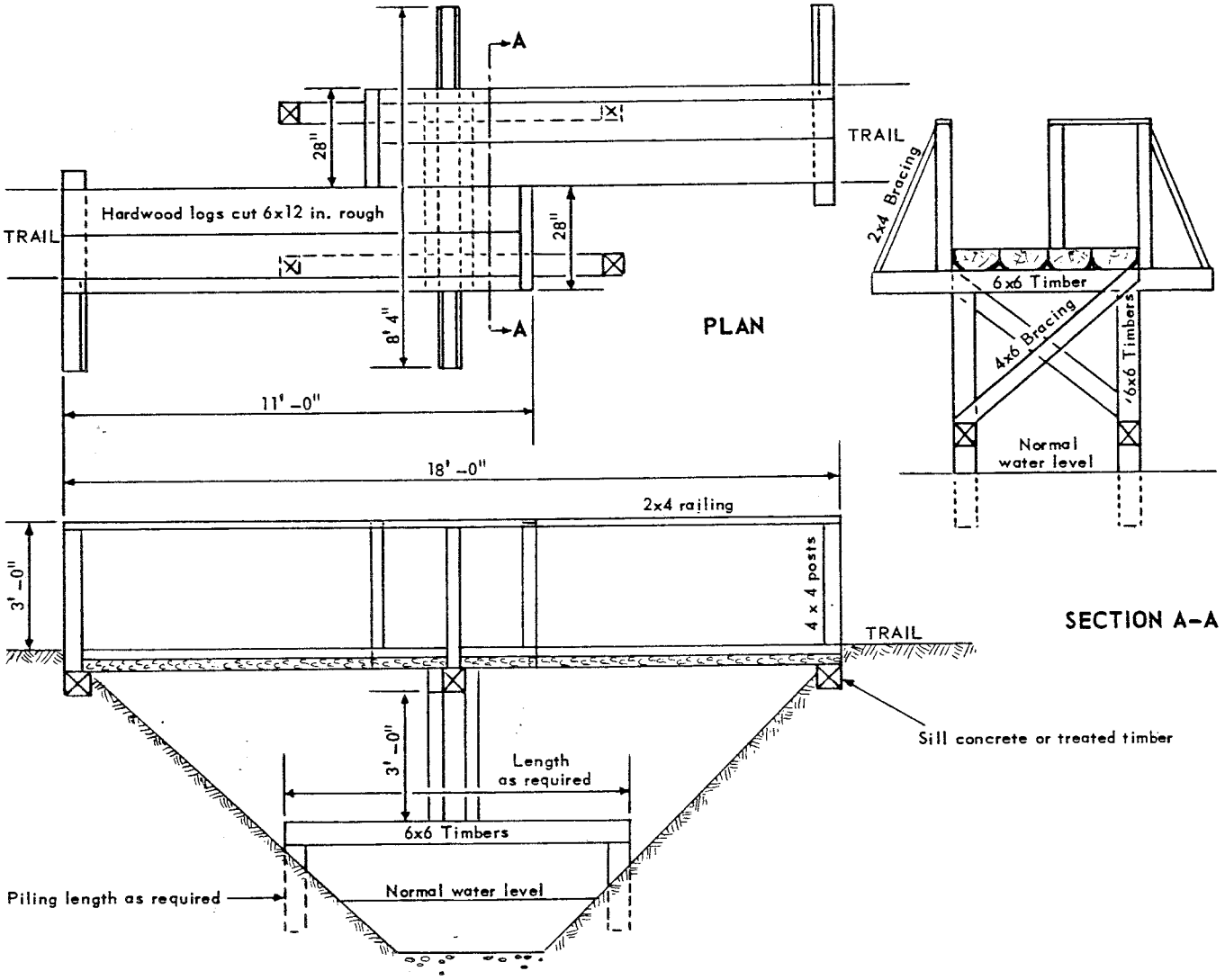
13. APPENDIX

A footbridge offering several distinct advantages. Designed and constructed primarily to discourage equestrians and cyclists from using foot trails, this bridge has a certain charm of its own which many trail users find delightful.

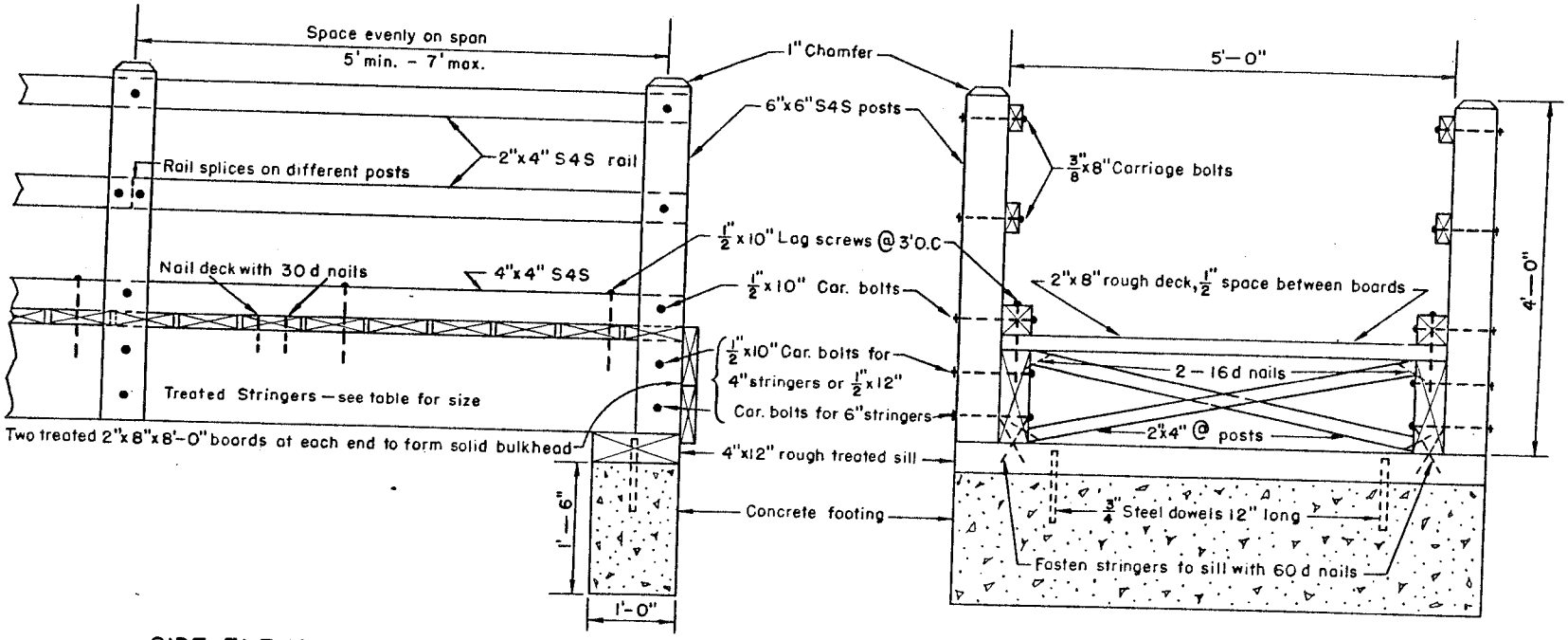
The center joist is supported by posts on stringers spanning the creek at appropriate elevation above the surface. This eliminates mud sills and piles in the stream proper and allows an unobstructed flow. Concrete or timber sills may be substituted for the piles in the bank if slope gradient permits; concrete sills may also be used in place of timber under the bank ends of the deck. For longer spans, A–bracing should be extended downward at appropriate angle on each side of the center joist, or A–bracing may be substituted for the stringers and posts if terrain permits. Railing throughout, or on either side, is optional. All timber should be pressure treated for long life.



APPENDIX 1



SCS-492 7-63	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE
FOOT BRIDGE	
FROM DESIGN VOLUMES OF THE PARK PRACTICE PROGRAM NATIONAL CONFERENCE ON STATE PARKS DESIGN SHEET NO. B-3126	



SIDE ELEVATION

END ELEVATION

NOTE

All carriage bolts have washers under nuts.
All lag screws have washers under heads.
All bolts, nails, etc. are galvanized.

STRINGER TABLE

SPAN	STRINGERS
20'	4"x14"
24'	4"x16"
28'	6"x14"
32'	6"x16"
36'	6"x18"
40'	6"x22"

SCS-REC-107
3-71

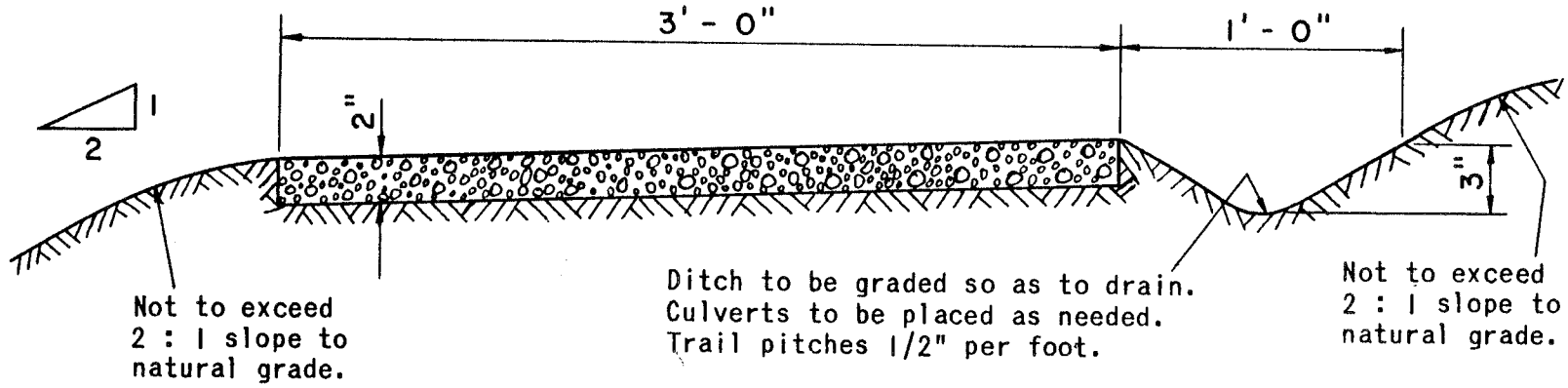
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FOOT BRIDGE

FROM ORIGINAL DESIGN BY
OREGON STATE PARKS AND RECREATION DIVISION

NOTE: Unsuitable material should be excavated and the trail filled with aggregate not exceeding 1" in diameter. Depth of filled aggregate may vary from 0" to 6" according to the soil and its trafficability. In very wet areas artificial walkways or raised embankments may be needed.

Width of trail may be increased in accord with traffic load.



SCS-REC-110
3-71

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

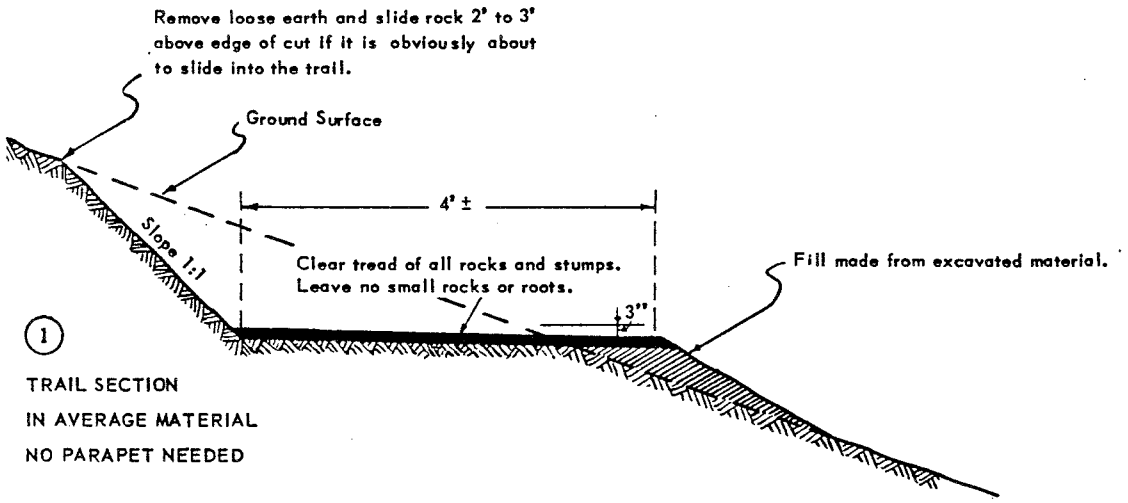
TYPICAL TRAIL SECTION

FROM ORIGINAL DESIGN BY
NEVADA STATE PARK SYSTEM

The trail will normally be 4'-0" wide. This tread width is neither a maximum nor minimum, however, and should not be construed to be a standard to strive for. The width will vary according to the locality, terrain, and the amount and type of use a trail will receive. Heavily used trails and those which may be used periodically for maintenance and emergency vehicles may be considerably wider than four feet. Trails intended for foot travel only and back country or wilderness trails may be less than this. Care should be exercised in the determination of the width and alignment.

The slope of the cut will vary according to the hardness of the ground on which the trail is constructed. Any part or all of the width may be carried on a wall built of large stones, the supporting ground being benched as necessary to afford a stable foundation.

When necessary to retain material on steep slopes, a dry random rubble wall may be built along the down-hill side of the trail. When crossing talus slopes, it may also be necessary to construct a suitable dry random rubble wall on the up hill side to retain slide material above the trail. Surface of trail on talus slopes should be covered with dirt or other material.



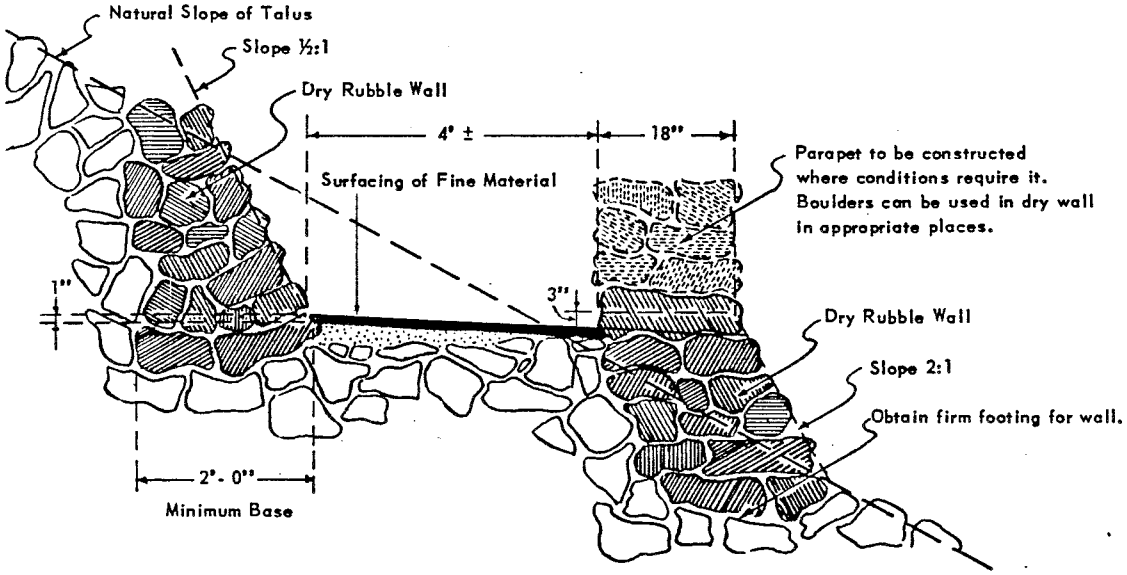
(1)

TRAIL SECTION
IN AVERAGE MATERIAL
NO PARAPET NEEDED

(2)

TRAIL SECTION ACROSS
TALUS SLOPE

Note: Provide tread by building out rather than by removing material from inner bank.



UNITED STATES DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE The Park Practice Program		TRAIL CONSTRUCTION
NATIONAL CONFERENCE ON STATE PARKS	AMERICAN INSTITUTE OF PARK EXECUTIVES	Contributed by
DATE November 1963	PLATE 339 B	NATIONAL PARK SERVICE
INDEX B-3105	CONTROL S-0831-B	U.S. Department of the Interior

Recreation Trails

I. TRAIL LOCATION:

1. General Layout - Design trails around trees and large boulders. A curbed trail is much more interesting than a straight one. It saves trees too.

2. Marking the Route - Mark trails in the spring or fall when leaves are off. Tie red flagging securely to living trees along the trail centerline. (Space flags every 100 feet.)

3. Trail Slope - We suggest that you follow the recommendations below when laying out the slope of the trail:

0-4% slopes-recommended for most recreation trails where possible.
5-8% slopes- limit sections of trail on these slopes to no more than 500'.
9-15% slopes- if it is necessary to run sections of trail on these slopes, limit to distances under 200'.
16% or greater- steps and handrails suggested.
(A 5% slope indicates that the trail rises 5' for every 100' in distance traveled.

II. TRAIL CLEARING

1. We suggest spring or early fall for trail clearing.
2. Clear brush at ground level, 2 feet on each side of trail centerline. Clear overhead branches to well above head level (8'). Cut branches off flush with main stem.
3. Use a herbicide on cut stems on ground the same day to help prevent sprouting. Contact the Hartford County Extension Service for recommendations.
4. Stack cut brush in piles 3 feet high and 5 - 7 feet square some distance back from the trail. These will serve as wildlife cover.

III. TRAIL SURFACE

1. Remove stones from trail surface.

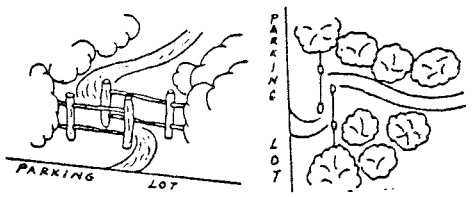
2. Where steep slopes are encountered or where small watercourses intersect the trail, we suggest that you consult the APPALACHIAN MOUNTAIN CLUB'S TRAIL BUILDING AND MAINTENANCE GUIDE. This book explains soil erosion control practices for trails.

3. The following table lists materials for the trail surface.-

SOIL CONDITIONS	NATURAL SOIL GROUPS	SUGGESTIONS FOR TRAIL SURFACE
DRY SOILS- Loamy, well drained soils	A1a, A1b, A1c, A1d, A1e, B1a, B1b, B1c, B1d, B1e, C1a, C1b, C1c, C1d, C1e, D1, D2, E1, G1	Low-Moderate Use Trails - Leave Natural Forest Litter Heavy Use Trails or Very Sandy soils - Pave Trail surface with wood chips, pave 3" deep and 30" wide. (5 cu.yds. will cover 200' of trail)
SEASONAL HIGH WATERTABLE - soils with a high watertable Fall - Spring only	A2, B2a, B2b, C2a, C2b	Pave trail surface with wood chips or other porous material. This will allow trail use during the wet seasons of the year. Pave 4" deep and 30" wide.
WETLANDS- Soils with a high water table all year long. No flooding.	A3a, B3a, C3a, G3a	Build small wooden bridges where trail crosses these soil conditions. The AMC Trail Building Guide includes some very good illustrations.
WETLANDS- Soils with a high water table all year long - Subject to Flooding	A3b, B3b, C3b, E3x, E3b, F1, F2, G3b	Elevated wooden bridges will be necessary to prevent wood from floating away when water rises. Up rights should be driven into the soil down to a solid base. These require special designs

IV. TRAIL MAINTENANCE:

1. All branches within the trail walkway should be pruned annually. May suggested.
2. Place new woodchips on trail where trail shows signs of wear.
3. Check wooden walkways for damage and safety.
4. Identify and correct all soil erosion problems promptly.
5. If trail shows signs of use by motorcycles, etc., they can be excluded by using simple gates. See diagram at right.



REFERENCE: We suggest the use of the APPALACHIAN MOUNTAIN CLUB'S TRAIL BUILDING AND MAINTENANCE GUIDE. This guide book has very good illustrations for trail signs and markers and erosion control practices. It is available at most camping supply stores.

ABOUT THE TEAM

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a varety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, foresters, soil specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area — an 86 town region.

The services of the Team are available as a public service at no cost to Connecticut towns.

PURPOSE OF THE TEAM

The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, landfills, commercial and industrial developments, sand and gravel excavations, elderly housing, recreation/open space projects, watershed studies and resource inventories.

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 project site and highlighting opportunities and limitations for the proposed land use.

REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected official of a municipality or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the chairman of your local Soil and Water Conservation District and the ERT Coordinator. A request form should be completely filled out and should include the required materials. When this request is approved by the local Soil and Water Conservation District and the Eastern Connecticut RC&D Executive Council, the Team will undertake the review on a priority basis.

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 203-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.