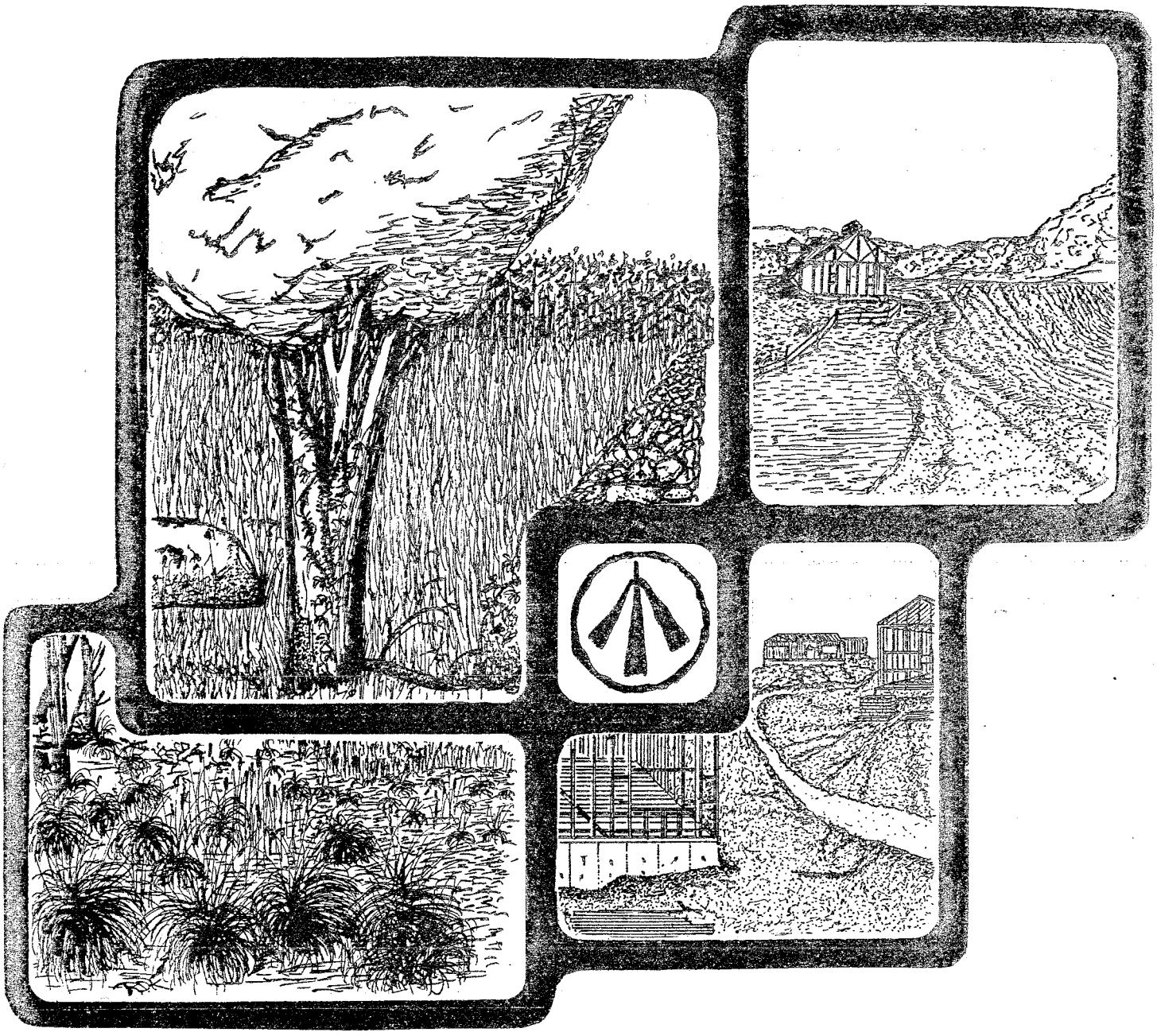
ENVIRONMENTAL REVIEW TEAM REPORT



LILLINONAH WOODS

BROOKFIELD, CONNECTICUT

KING'S MARK
RESOURCE CONSERVATION & DEVELOPMENT AREA

KING'S MARK
ENVIRONMENTAL REVIEW TEAM REPORT

LILLINONAH WOODS

BROOKFIELD, CONNECTICUT

AUGUST, 1982

King's Mark Resource Conservation and Development Area
Environmental Review Team
Sackett Hill Road
Warren, Connecticut 06754

ACKNOWLEDGMENTS

The King's Mark Environmental Review Team operates through the cooperative effort of a number of agencies and organizations including:

Federal Agencies
U.S.D.A. Soil Conservation Service

State Agencies
Department of Environmental Protection
Department of Health
University of Connecticut Cooperative Extension Service

Local Groups and Agencies
Litchfield County Soil and Water Conservation District
New Haven County Soil and Water Conservation District
Hartford County Soil and Water Conservation District
Fairfield County Soil and Water Conservation District
Northwestern Connecticut Regional Planning Agency
Valley Regional Planning Agency
Central Naugatuck Valley Regional Planning Agency
Housatonic Valley Council of Elected Officials
Southwestern Regional Planning Agency
Greater Bridgeport Regional Planning Agency
Regional Planning Agency of South Central Connecticut
Central Connecticut Regional Planning Agency
Capitol Regional Council of Governments
American Indian Archaeological Institute
Housatonic Valley Association

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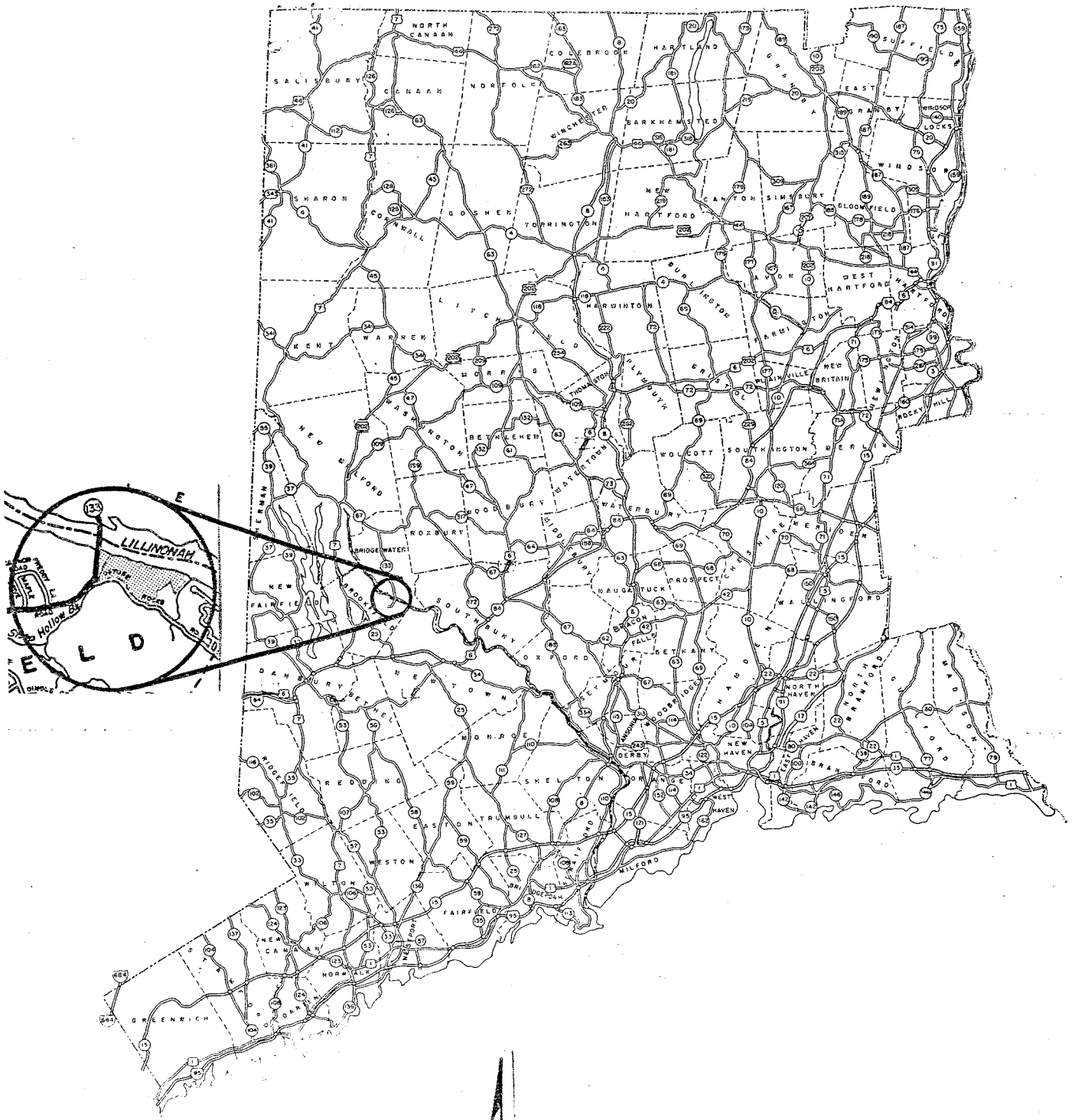


ENVIRONMENTAL REVIEW TEAM REPORT
ON
LILLINONAH WOODS
BROOKFIELD, CT

I. INTRODUCTION

The Brookfield Conservation Commission requested the King's Mark Environmental Review Team to perform an environmental study of Lillinonah Woods. This 67 acre parcel is located along the northeastern border of town, just south of Lake Lillinonah. Access to the site is available from the west off Route 133 and from the south off Obtuse Rocks Road.

As shown in Figure 1, the land is characterized by moderate to steep slopes. The land is mostly wooded and is presently undeveloped. Surrounding land use is predominantly large lot residential.

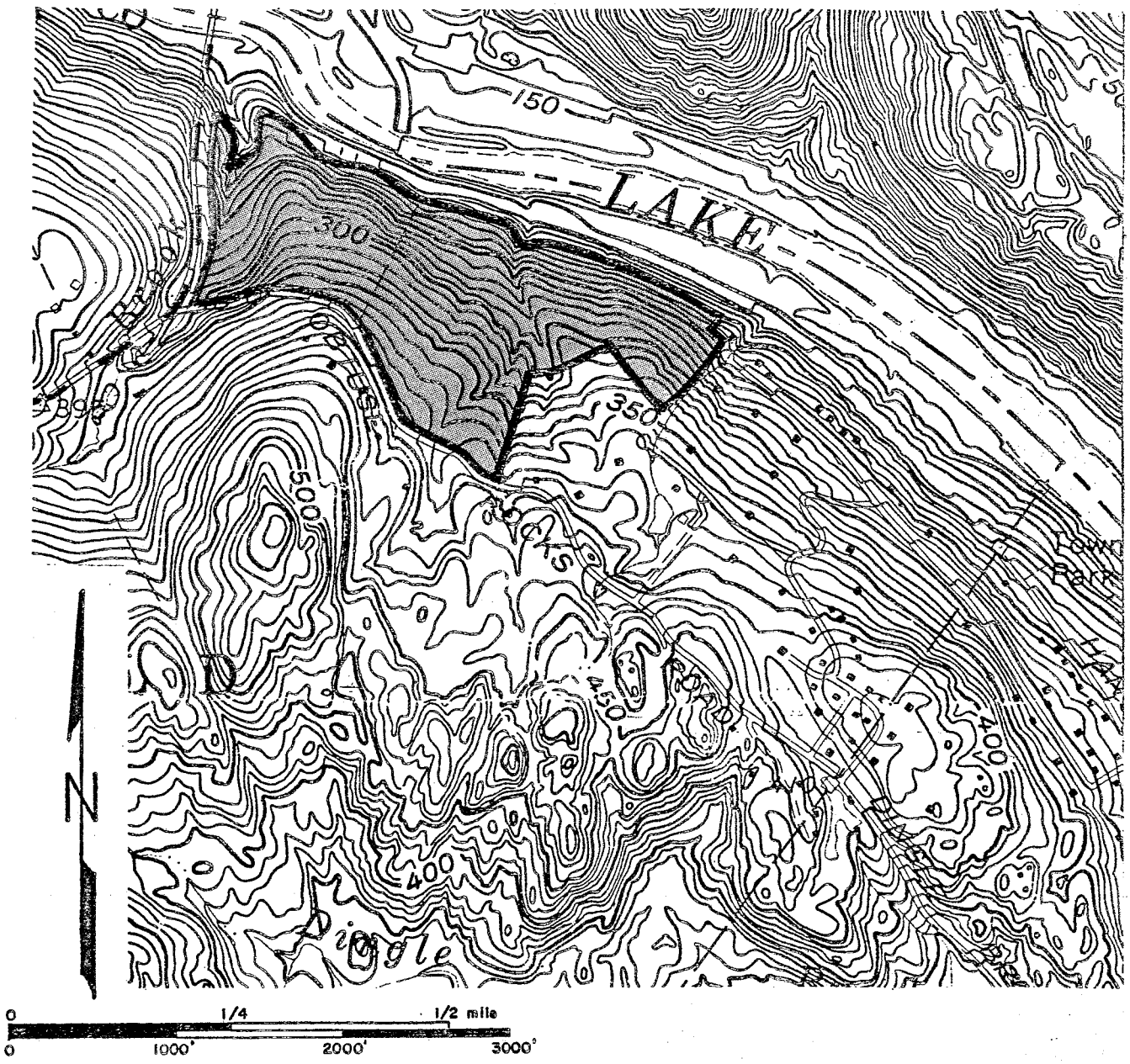
Lillinonah Woods is owned by the Town of Brookfield. The Town Conservation Commission is interested in improving the property for recreational use while preserving its natural beauty. The ERT was asked to assist the Commission in better understanding the property. Specifically, the Team was asked to identify the natural resource base of the property, and to discuss the opportunities of the site for forest management, wildlife habitat management, and recreational development. The King's Mark Exeuctive Committee considered the Town's request, and approved the project for review by the Team.

The ERT met and field reviewed the site on June 16, 1982. Team members participating on this review included:

Brant Burz	Wildlife Biologist	Conn. Department of Environmental Protection
Bob Orciari	Fishery Biologist	Conn. Department of Environmental Protection
Don Smith	Forester	Conn. Department of Environmental Protection
Carl Stamm	Recreation Specialist	Conn. Department of Environmental Protection
Dave Thompson	District Conservationist	U.S.D.A. Soil Conservation Service
Mike Zizka	Geohydrologist	Conn. Department of Environmental Protection

FIGURE 1

TOPOGRAPHIC MAP



SCALE: 1" = 1000'

Prior to the review day, each team member was provided with a summary of the proposed study, a checklist of concerns to address, a soils map, a topographic map, and a soils limitation chart. The day of the field review, team members met with representatives from the Town Conservation Commission and walked the property. Following the field review, individual reports were prepared by each team member and forwarded to the ERT Coordinator for compilation and editing into this final report.

This report presents the team's findings. The report identifies the natural resource base of the property and discusses opportunities and limitations for land management. All conclusions and final decisions with regards to future land use rest with the Town of Brookfield. It is hope the information contained in this report will assist the town in making environmentally sound decisions. If any additional information is required, please contact Richard Lynn (868-7342), Environmental Review Team Coordinator, King's Mark RC&D Area, Sackett Hill Road, Warren, Connecticut 06754.

* * * * *

II. NATURAL HISTORY

A review of aerial photographs from 1941 to 1976 indicates that Lillinonah Woods has changed considerably over the past 40 years. As shown in Figure 2, the land has changed from predominently open fields in 1941 to mostly wooded land today. Below is a brief description of each map shown in Figure 2.

A. 1941 - Approximate acreage east of old Route 133 is 70 acres.

Old Route 133, now the access road to the recreation area, paralleled the river prior to crossing into Bridgewater. Long, narrow flat meadows flanked the river, and Hanover Road extended from Dinglebrook Lane to Route 133 at the bridge.

At this time fifty-two acres of this property were being farmed. Only eighteen acres were wooded. Field boundaries were clearly delineated by tree-lined stone walls. The river at the point of crossing was two hundred feet wide, but the river averaged three hundred feet.

B. 1963 - Approximate acreage 66 acres.

The river has become Lake Lillinonah and is now eleven hundred feet wide where Route 133 used to cross. The old road bed is now forty-eight feet under water. The previous river bank elevation was about 130', the normal water level of the lake is now 198'.

Eleven acres of this property, mostly level meadow land, were inundated by the lake, but about eight acres were gained in between old and new Route 133.

The land, in the meantime, has been abandoned and reverted to brush. Only some twenty-three acres remains open. Woodland acreage has grown to forty-three.

Lillinonah Drive has been improved to the eastern boundary and residential building has started along Obtuse Rocks Road.

C. 1976 - Approximate acreage is unchanged.

Only one acre remains open at the terminus of the access to the recreation area. The remainder of the property has completed the successional cycle, and is now maturing under nature's direction.

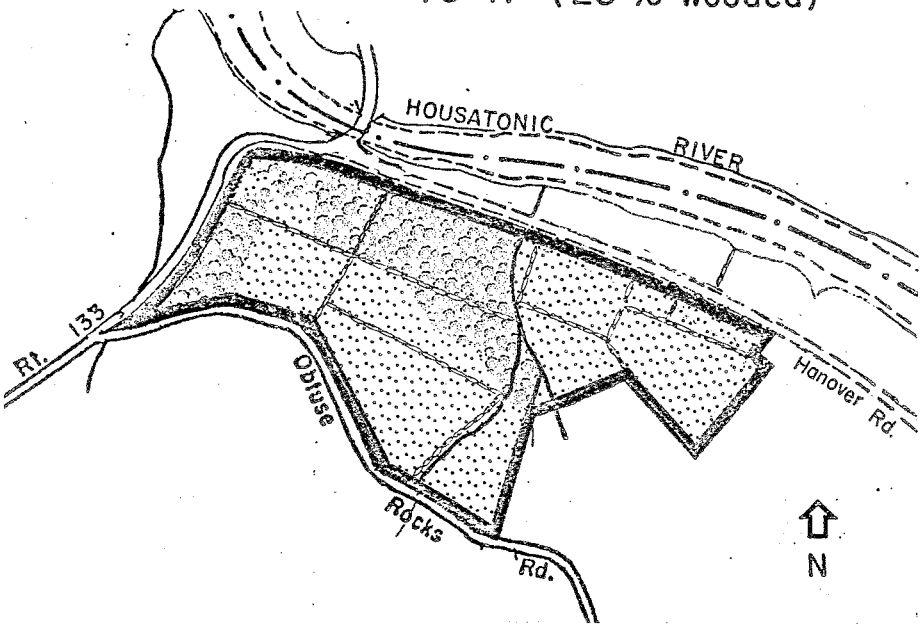
III. GEOLOGY

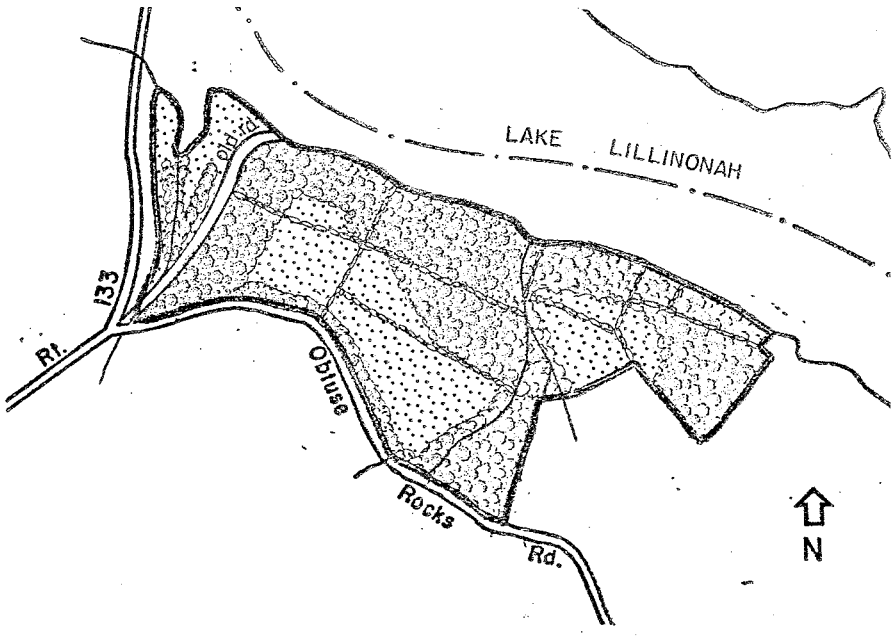
The geological makeup of the site is simple: bedrock is overlain by a glacial sediment known as till. Although the details may differ from place to place, the two basic units are present in all parts of the site.

The Team encountered no significant bedrock outcrops on the parcel. Relatively small outcrops may be found in the bottoms of some streamcourses, particularly Fred Beers Brook, which flows along the western boundary of the site.

FIGURE 2

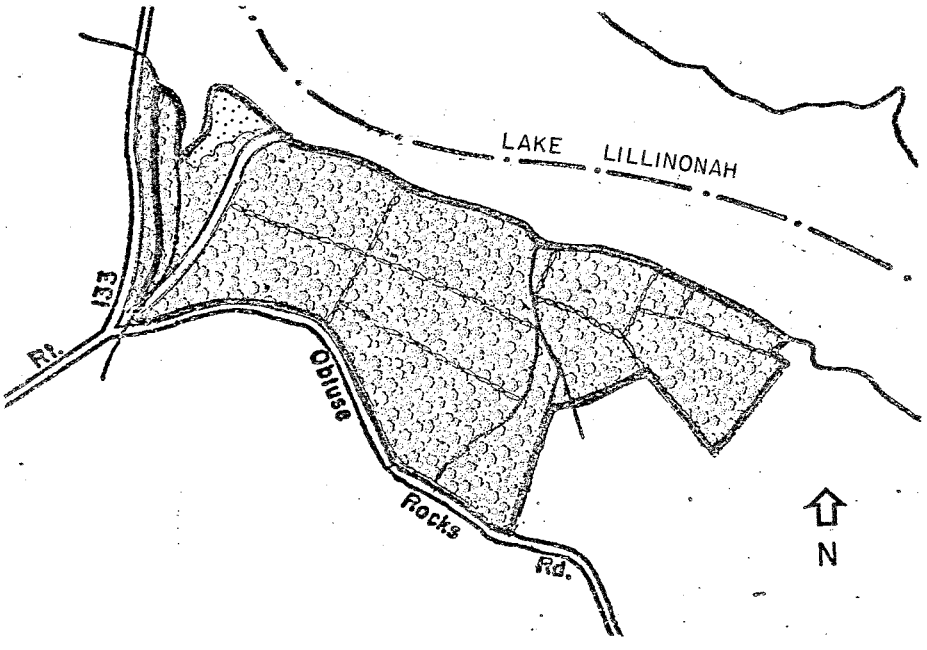
Land Use Changes
1941 - 1976

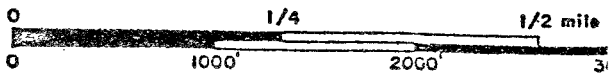




LEGEND

- Tree lined stone walls
- Streams
- Wooded land
- Open fields





SCALE: 1" = 1000'

FIGURE 3

Areas Most Likely To Contain Shallow Till Soils

SCALE: 1" = 1000'

Connecticut Geological and Natural History Survey Quadrangle Report No. 33, which was prepared by R. S. Stanley and K. G. Caldwell and which included a bedrock geologic map of the Newtown topographic quadrangle, indicates that three principal rock types underlie the property. The most extensive type is described as a light brown to gray, slightly rusty to nonrusty, medium-grained, muscovite-biotite-quartz-plagioclase schist with prominent porphyroblasts of garnet-staurolite, and kyanite. A"schist" is a metamorphic rock (a rock altered by high temperatures or pressures in the earth's crust) in which elongate or flaky minerals have been strongly aligned, giving the rock a slabby or thinly layered structure. The hyphenated terms preceding the word "schist" in the rock name are the most abundant mineral components in order of increasing percentage. The term "porphyroblast" refers to a relatively large mineral grain set among a matrix of smaller grains in a metamorphic rock.

The second rock type underlying the site is described as a black to dark gray, medium-grained amphibolite. "Amphibolite" is a term given to rocks which are composed primarily of minerals of the amphibole group, especially hornblende.

The third rock type underlying the property is described as a light-colored, slightly rusty, fine-grained calc-silicate gneiss or granulite. A "gneiss" is a metamorphic rock in which thin bands of aligned elongate or flaky minerals alternate with layers of more rounded mineral grains. A "granulite" is a metamorphic rock composed largely of rounded mineral grains with little or no structural alignment. The third rock unit, as described, is commonly associated with rusty-weathering, fine-grained, mica-quartz schist.

The differences among the three major rock types have been described above primarily for the purpose of thoroughness in the natural resources inventory. The differences should have little if any influence on the potential of the property for various uses. The rocks have no significant, known economic value although the garnets in the schist unit have been abundant enough in some other areas in the region to make mining for abrasive materials worthwhile.

The till overlying bedrock on the site consists of a non-sorted mixture of sand, silt, clay, gravel, and boulders. These materials were collected, transported, and redeposited by an ice sheet as it moved through the region more than 12,000 years ago. Where the till is less than five feet thick, it is commonly sandy, very stony, and loose. Where the till is more than five feet thick, the upper few feet are commonly sandy, as already described, but the lower portion of the deposit is frequently siltier and tightly compact. In most places, the bedrock is likely to be more than five feet below the surface, but there is no test-pit data to confirm this belief. Figure 3 shows the portions of the site that, without more information, seem most likely to contain shallow till deposits.

The presence of bedrock or compact till at shallow depths impedes subsurface drainage. The soils map (see Appendix) suggests that high-water table problems may be moderate to severe on a seasonal basis virtually throughout the site. These limitations can be overcome but only at added expense. Shallow soils may also mean that blasting would be required in order to create a suitable grade for playing fields, if these were desired. Both shallow soils and seasonal wetness will be more of a hindrance to active recreational development than to passive recreational uses; of the two problems, wetness is much more likely to be an encountered limitation.

IV. HYDROLOGY

Drainage from the site flows north into Lake Lillinonah, which forms the northern boundary of the parcel. The "lake" is a narrow impoundment of Housatonic River. One permanent stream, Fred Beers Brook, flows along the western boundary of the site. Several intermittent streams also pass through the property. These streams form narrow, attractive gullies as they approach the lake. One of the stream courses was partially filled in with boulders, allowing the stream to disappear and reappear in a particularly attractive manner. The problem with regard to the streams is that access to them is difficult. A well-beaten path exists along the edge of the lake, but the path is on steep and occasionally precarious terrain.

Lake Lillinonah is certainly one of the most aesthetically pleasing aspects of the property. The present parking area in the northwestern portion of the site and the open area just west of it afford the best views of the lake. This good vantage, however, has resulted in some litter problems as unauthorized groups have congregated for picnics or parties. The quality of the water in the lake is questionable. Connecticut Water Resources Bulletin No. 21, a publication released in 1972, indicated that this stretch of Housatonic River had a relatively high dissolved solids concentration (maximum observed low-flow concentration of 151-200 milligrams per liter). The river was obviously carrying a great deal of suspended sediment on the day of the field review, as indicated by the brownish color of the water. This did not prevent a group of youths from some unauthorized swimming on that day however.

Any development of the property that requires the clearing of vegetation or the creation of impermeable surfaces will increase the amount of runoff flowing from the site during periods of rainfall. Clearing, in itself, should not cause serious problems. If impermeable surfaces are created, however, efforts should be made to direct the runoff in a manner that will not cause additional gullying on the steep slopes of the parcel.

High groundwater levels may be a hindrance for particular types of development, such as the installation of a subsurface septic system. Appropriate engineering techniques may solve any such problems however.

V. WATER SUPPLY

If a water supply is desired for the property, bedrock will be the only suitable aquifer. Bedrock is typically capable of supplying small but reliable yields to wells drilled 200 feet or less into the rock. Of the bedrock-based wells surveyed for Connecticut Water Resources Bulletin No. 21, 90 percent yielded 2 gallons per minute or more, 70 percent yielded 4 gpm or more, 30 percent yielded 13 gpm or more, and 2 percent yielded 80 gpm or more. In many cases, a small yield can be made adequate by storage capacity, provided either in the well shaft or in accessory tanks.

Water quality should be generally good. The rusty color of some of the local bedrock suggests that high iron or manganese concentrations may be found in the water. Several filters are available to remove these elements from the water.

VI. SOILS

A Soils Map of the Lillinonah Woods Property is presented in the Appendix of this report. The Appendix also contains a Soils Limitation Chart and a list of soil descriptions. By comparing the soils map with the chart and the description, the suitability of a particular area for alternative land uses can be determined.

As noted in the Soils Limitation Chart, the major soil limitations for recreational use of this property are wetness and slope. On-site investigation indicate however that the land is highly suitable for creating an attractive trail network with perhaps a few camp and picnic areas.

VII. VEGETATION

As shown in the accompanying stand map, nine differing vegetative types exist on the property.

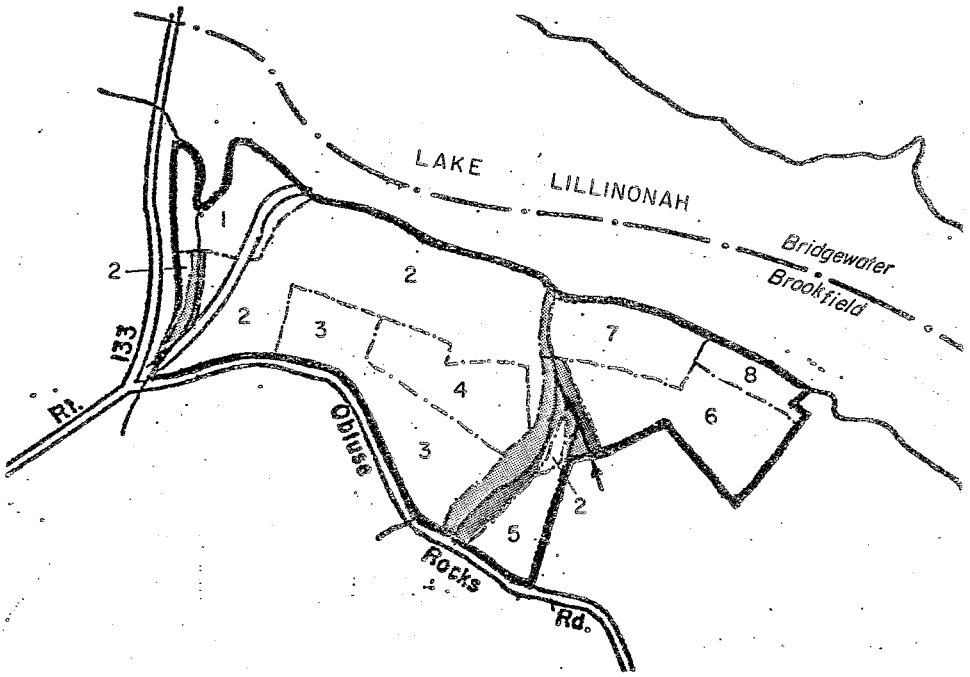
TYPE 1. Open recreation area, 2.8 acres. This type, located in the northwest corner of the parcel, is composed primarily of an open field with clumps and margins of shrubs, sapling size red maple, aspen, cherry, red cedar, red and white oaks, and occasional ash and American sycamore. The shrub species in this area consist primarily of multiflora rose, gray stemmed dogwood, staghorn sumac, and scattered highbush blueberry. Herbacious vegetation observed included: alfalfa, wild parsnip, hawkweed, various grasses, fragmides, yarrow, wild madder, strawberry, cleavers, tower mustard, buttercup, common speedwell, Jack-in-pulpit, daisy and milkweed.

If desired, this area could be planted with a mixture of white pine and European larch. The planting would increase vegetative density, improve both the available wildlife cover and aesthetic quality, and will yield forest products in the future. With no maintenance or planting this area will be overtaken with the tree and shrub species mentioned above.

TYPE 2. Mixed hardwoods, 22.9 acres. This area represents the best growing site of the parcel. Occupying an L-shape along the northern shore and western end of the property, this area is occupied by good quality pole to sawlog sized red oak, sugar maple, yellow poplar, black birch, and red maple with a fair representation of white ash and hickory. Stocking levels vary somewhat throughout the stand, but the stand is basically fully stocked. The understory here is fairly open and is composed of spice bush, iron wood, maple-leaved viburnum, witch hazel, and hardwood tree seedlings. Ground cover observed included multi-flora rose, baneberry, black raspberry, cinnamon fern, barberry, Christmas fern, grape vines, sensitive fern, interrupted fern, Virginia creeper, poison ivy, winged euonymous and striped pipsissewa. The trees in this stand are becoming crowded and as a result are beginning to decline in health and vigor. An intermediate harvest combined with an understory thinning would reduce competition between residual trees and result in a healthier, more vigorous stand.

FIGURE 4

Vegetation Type Map



LEGEND

- Road
- Stand Boundary
- Watercourse
- Intermittent watercours

VEGETATION TYPE DESCRIPTION

TYPE 1 Open Area, 2.8 acres

TYPE 2 Mixed Hardwood, pole to sawlog size, fully stocked, 22.9 acres

TYPE 3 Mixed Hardwood, sapling to pole size, understocked, 11.5 acres

TYPE 4 Mixed Hardwood, pole size, medium stocked, 6.5 acres

TYPE 5 Reverting Field, 3.4 acres

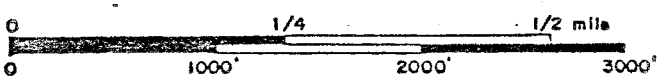
TYPE 6 Old Pasture, 12.7 acres

TYPE 7 Mixed Hardwood, 3.1 acres, sapling to pole size, overstocked, 3.1 acres

TYPE 8 Mixed Hardwood, sapling size, overstocked, 1.7 acres

Watercourse bounds, 2.4 acres

Seedling size = Trees less than 1 inch in diameter at 4½ feet above the ground (d.b.h.)
Sapling size = Trees 1 to 5 inches in d.b.h.
Pole size = Trees 5 to 11 inches in d.b.h
Sawlog size = Trees 11 inches and greater in d.b.h.



SCALE: 1" = 1000'

It is stongly recommended that the services of a private forester be employed in the design, implementation, and management of this harvest. Ideally whatever sawtimber material which is to be harvested should be removed first and a cordwood cleanup operation would follow. Care should be exercised to minimize erosion from access trails and these trails should be smoothed and seeded at the end of operations.

TYPE 3. Mixed Hardwoods, 11.5 acres. This area of medium quality, sapling to pole sized yellow poplar, white ash, red oak, black birch, red maple, cherry, and hickory is under-stocked, as it is in transition from a cedar covered field to woodland. The understory here is composed of red cedar of declining vigor, blue beech, scattered flowering dogwood, black cherry seedlings, slippery elm, red maple, and a good representation of sugar maple. Ground cover seen the day of the field review included celandine, wild geranium, cinquefoil, sarsaparilla, lily of valley, ground pine, barberry, huckleberry and winterberry.

The vegetation in this stand is basically healthy and no management other than the release of the healthier red cedar, yellow poplar and sugar maple, is needed at this time.

TYPE 4. Mixed Hardwoods, 6.5 acres. The species composition of this area is identical to that of type 3, however the trees are primarily of pole size. This area is another reverting field, however it is substantially older than type 3 and therefore the transitional species such as red cedar, dogwood, and cherry are far fewer in number and the understory is less dense. Although the area appears much less crowded than type 3, the crowns of the trees here have closed and are now beginning a competition for sunlight as the roots compete for moisture and nutrients. A sanitation thinning here would be in order, to remove the least desirable stems and cull material. This will have a beneficial effect on the residual stems and should yield a healthier stand overall.

TYPE 5. Reverting Field, 3.4 acres. This area is understocked with sapling to pole sized black cherry, apple, red oak, ash, and gray birch. Shrub species present include, highbush blueberry, smooth and staghorn sumac, multiflora rose, barberry and grey stemmed dogwood. The ground cover is made up of grasses, golden rod, poison ivy, huckleberry, dewberry, mountain mist and some jewelweed. There is an area in the northeast portion of this stand which has been invaded by a thick sapling-size growth of red oak and ash, with red and sugar maples and black birch intermixed.

TYPE 6. Old Pasture, 12.7 acres. This old pasture has been fairly recently abandoned and is understocked with low quality red and white oaks, red cedar, and red maple of pole size. A substantial amount of land here is open and occupied by shrub species similar to type 5. As the vegetation present here is young and basically healthy, no management work is needed at this time.

TYPE 7. Mixed Hardwoods, 3.1 acres. Pole and large sapling size yellow poplar and red maple are overstocked on this stand. The understory here is sparse due to the density of the crown cover, but occasional patches of sugar maple reproduction and scattered barberry can be found. The ground cover here is suffering from a lack of light as well and acres of bare earth are interspersed

with Christmas fern and poison ivy. Patches of lily of the valley were observed the day of the field review along with an occasional sarsaparilla, Solomon's seal and round lobed hepatica. A fuelwood thinning here would release the dominant trees while allowing more sunlight to reach the forest floor and stimulate reproduction and ground cover.

TYPE 8. Mixed Hardwoods, 1.7 acres. This area's species composition is identical with that of Type 7, but the overstory is composed of primarily saplings with scattered poles. Density here is even greater than Type 7 and very little understory or ground cover exists. A thinning here at the same time as in Type 7 would have very beneficial results.

Wetland Areas - 2.4 acres. This is the streambank and wetland areas associated with the watercourses of the area. Stocking here is very similar to that of the surrounding types although the understory and ground cover run to more distinctly wetland species (skunk cabbage, false hellebore). No management other than sanitation work is recommended for these areas.

VIII. WILDLIFE

Lillinonah Woods may be divided into three major wildlife habitat types. These include openland/brushland (± 18 acres corresponding to vegetation types 1, 5, and 6 in Figure 4), wetland (± 3 acres) and forestland (± 46 acres).

Evaluating the existing habitat and management potential of a small site such as Lillinonah Woods is difficult without specific management goals or consideration of the surrounding lands. This is especially true when considering species such as turkeys--which may range in a ± 30 square mile area to meet their seasonal needs, or ruffed grouse which utilize ± 100 acres for their home range.

In the opinion of the Team's wildlife biologist, however, this property can best be managed if efforts are taken to create and maintain an overall upland wildlife management area. This can be accomplished by implementing the following:

1) Create and maintain a couple of long, irregular shaped openings of 2 to 4 acres in size. Forest stands 1, 5, and 6 are most suitable for the creation of such openings. These openings should be maintained by mowing every 3 - 5 years.

2) Encourage existing food and cover species such as vines, snag/den trees, blueberry bushes and apple trees,

3) Pile brush along "edges" of openings for rabbits and other small mammals (6-8 brush piles/acre should be adequate).

4) Create a "feather edge" between the open field and the bordering forest stands of 20 to 25 feet. This will encourage shrubby vegetation growth which is valuable to wildlife. A cordwood cutting scheme could be used to open up this feather edge.

5) Bluebird boxes could be constructed at the edges of the openings.

In addition to the above suggested openings, creating smaller 1/2 acre clearings within the forestland would also be desirable. It should be recogized that for optimum wildlife management, a variety of successional stage vegetation should be encouraged.

Ideal wildlife habitats are composed of:

1) 2% of the land mass in permanent grass-legume plots.

2) 5% in permanent openings maintained to encourage early successional native vegetation.

3) 10% of the land in cover species such as young growth conifer patches.

4) The forestland component which should be managed with three-fourths of the property in even-aged, and one-fourth in uneven-aged stands.

Under this ideal plan, 1½ acres of land should be devoted to a permanent grass legume plot, 3½ acres should be maintained as openland, 6½ acres should be planted to conifers, and the rest of the property managed as mixed hardwood forest.

When cutting any cordwood or sawtimber, efforts should be made to:

1) leave a minimum of 5 to 7 snag or den trees per acre for cavity nesting wildlife,

2) leave vines where possible as a food supply for wildlife,

3) encourage apple and other fruit trees by removing the surrounding and overcrowding trees. Following this release cut, wait one year to allow for tree vigor, then prune and fertilize.

4) "mast trees" (those producing nuts) such as oaks, beech and hickory could be encouraged.

Mature sawtimber-size mast trees are the nut/food producers for wildlife such as squirrels, deer, turkeys, grouse and others.

5) Aspen clumps could be established and managed for a diversity of age classes. Aspen produces excellent habitat for ruffed grouse and woodcock.

The wetland habitat found on this site is satisfactory as is. When cordwood or sawtimber cutting, a buffer strip of 100' could be left to help stablize the soils in this area.

During the review day, a grouse, a great horned owl, a chipmunk, a ruffous sided towhee, and numerous other songbirds were observed. Raccoon tracks, and deer brouse (moderate) were also observed.

Additional wildlife that might utilize this property, either seasonally or year round, include pheasants, turkeys, fox, woodcock, pileated woodpeckers, and squirrels along with many other avian and terrestrial species.

It should be noted that once a diversity of wildlife habitats is provided, maintenance is required. Without proper maintenance of newly established areas (mowing, etc.) later successional vegetation species will take over, thus decreasing the diversity of the habitat.

Consideration should be given to contacting the sportmans' club affiliated with this property for help in increasing wildlife potentials. Along with vegetation management, hunting and trapping are beneficial management tools which should be considered on this site.

IX. FISHERIES

A wide variety of fish species are present in Lake Lillinonah. White perch is the most abundant species. Other abundant species are yellow perch, smallmouth bass, black crappie, white catfish, brown bullhead, rock bass, redbreasted sunfish, white sucker and alewives. Common species are largemouth bass, bluegill sunfish, common sunfish, golden shiner, goldfish and carp. Northern pike, yellow bullhead, and brown trout are scarce. Trout are found in Lake Lillinonah during late fall to early spring and originate from the lake's stocked tributaries. Northern pike are not known to reproduce naturally in Lake Lillinonah, but enter the lake by moving down the Shepaug-Bantam Rivers from Bantam Lake, Litchfield-Morris.

Lake Lillinonah is noted for its good to excellent largemouth and smallmouth bass fishing. Fishing for black crappies is also excellent. White perch, sunfish, bullheads, and catfish generally provide good fishing. Only incidental catches of pike and trout are made.

The property's lake frontage should be valuable, since there are relatively few accessible shore areas to fish from on the Lake. Fishing along the shore of Lillinonah Woods should be good for sunfish, bullheads and catfish.

Presently, fish in Lake Lillinonah are contaminated by varying amounts of polychlorinated biphenyls or PCB's. PCB's are a family of chlorinated hydrocarbons, which in the past had a wide use in electrical transformers and many other products. They are persistent chemicals, which in high concentrations are known to cause liver, kidney, and skin disorders. PCB's are also a suspected carcinogen in humans. The State Department of Health Services has determined that eating fish containing PCB's is probably not completely safe at any level and has issued a warning against eating fish from the Housatonic River, from the Massachussetts border, through Lake Lillinonah to the Stevenson Dam of Lake Zoar. However, "catch and release" fishing provides substantial recreational opportunities, particularly for bass anglers. In fact bass fishing tournaments are quite common on Lake Lillinonah.

There are other characterisitics of Lake Lillinonah which tend to detract from the quality of fishing. The Lake is highly enriched with plant nutrients and heavy blooms of blue green algae are common during the summer. The Lake also undergoes fluctuations in water level due to electrical power generating operations at its Shepaug Dam. Floating logs and other debris are common on

the lake, especially after the water level has been raised. Even with these problems, Lake Lillinonah has remained an important and popular fisheries resource.

X. RECREATION POTENTIAL

Lillinonah Woods presently offers two basic recreational areas. The northwestern corner of the property is presently being used for active recreational pursuits such as swimming, fishing, boating, large group picnicking and partying. The remainder of the property offers a more natural and bucolic setting suitable for hiking, birdwatching, and nature study. It is recommended that the existing natural area remain as one. If the town is interested in encouraging, or at least tolerating, the active recreational use of the northwest corner, then provisions should be made for periodic maintenance of this area. This should include litter clean up, and repair of the access road for safety reasons. Consideration might also be given to constructing a picnic shelter in this area. If current use of the northwest corner is not desired, then consideration should be given to closing old Route 133 to vehicular traffic. This will serve to discourage, though probably not eliminate, the current use of the area.

The diversity of vegetation types at Lillinonah Woods enhances the passive recreation and nature study potential of the property. As shown in Figure 5, a series of loop trails could be constructed on the property. Clearing and maintaining such trails would permit easy access to the interior of the tract and facilitate birdwatching, nature study, hiking, cross country skiing, and primitive camping.

The presence of the Lake and a number of intermittent streams and stonewalls further enhance the attractiveness of the site. One point, shown in Figure 5, is particularly attractive.

The conceptual trail network shown in Figure 5 provides a series of loops and offers a variety of hiking experiences. The longest loop trail is about 1½ miles in length. Modifications of the trail network shown in Figure 5 may be desirable to further enhance the use of the site. In any event, all trails should be planned so that slopes are not excessive to reduce erosion hazards. Water bars can be placed periodically along sloping trails to divert runoff water away from the trails to a more stable soil area. An erosion and sediment control plan should be prepared and followed during trail construction to protect nearby streams and wetlands and the lake, from sediment deposition. The Fairfield County Conservation District is available (743-5453) to provide assistance in erosion and sediment control planning and in trail design and construction.

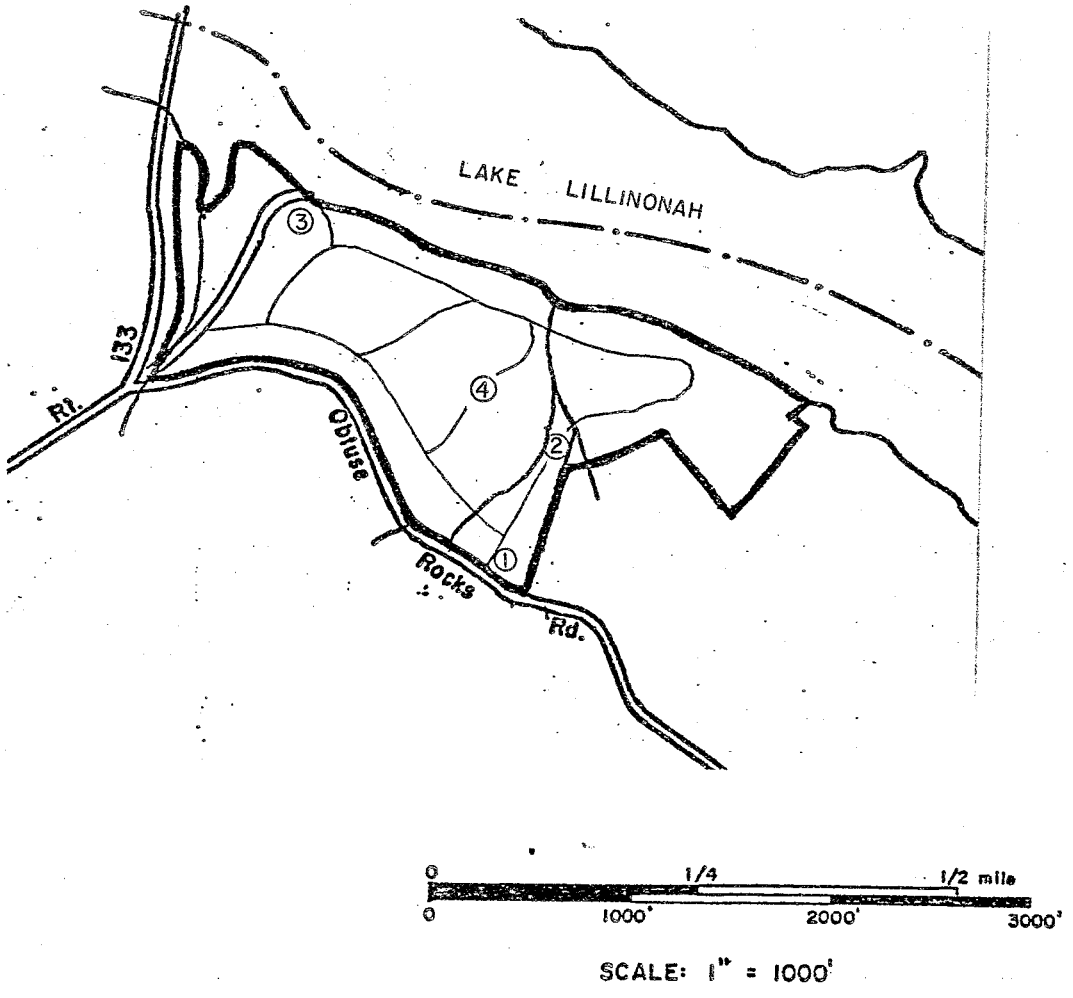
The following guidelines should be followed in trail design and construction.

1. A general plan showing the approximate line, grade and width of trails and erosion and sediment control measures should be prepared.

2. All trees, shrubs and fallen timber should be removed for a distance of 2 feet each side of the trail centerline. Stumps should be cut close to the ground. All protruding limbs should also be removed

FIGURE 5

RECREATION POTENTIAL



KEY

——— SUGGESTED TRAILS (schematic)

(1) Access for passive recreational use (hiking, birdwatching, nature study)

(2) Highly scenic point

(3) Access for more active recreational use (fishing, swimming, boating, picnicking)

(4) Primitive camping area

for a distance of 2 feet each side of the trail centerline. Where other than foot traffic is planned, protruding limbs should be removed to a height of 10 feet. Limbs removed should be cut off as close to the trunk as possible.

3. All undesirable material such as soil high in organic matter, stumps and large stones should be removed from the tread area of the trail.

4. All grading should be to the lines shown on the plan. All culverts, bridges, turnouts, handrails, grade dips and erosion control measures should be installed as shown on the plan.

5. The trail surface should be finished to a uniform firm surface and be free of loose material.

A typical trail section is shown in the Appendix of this report.

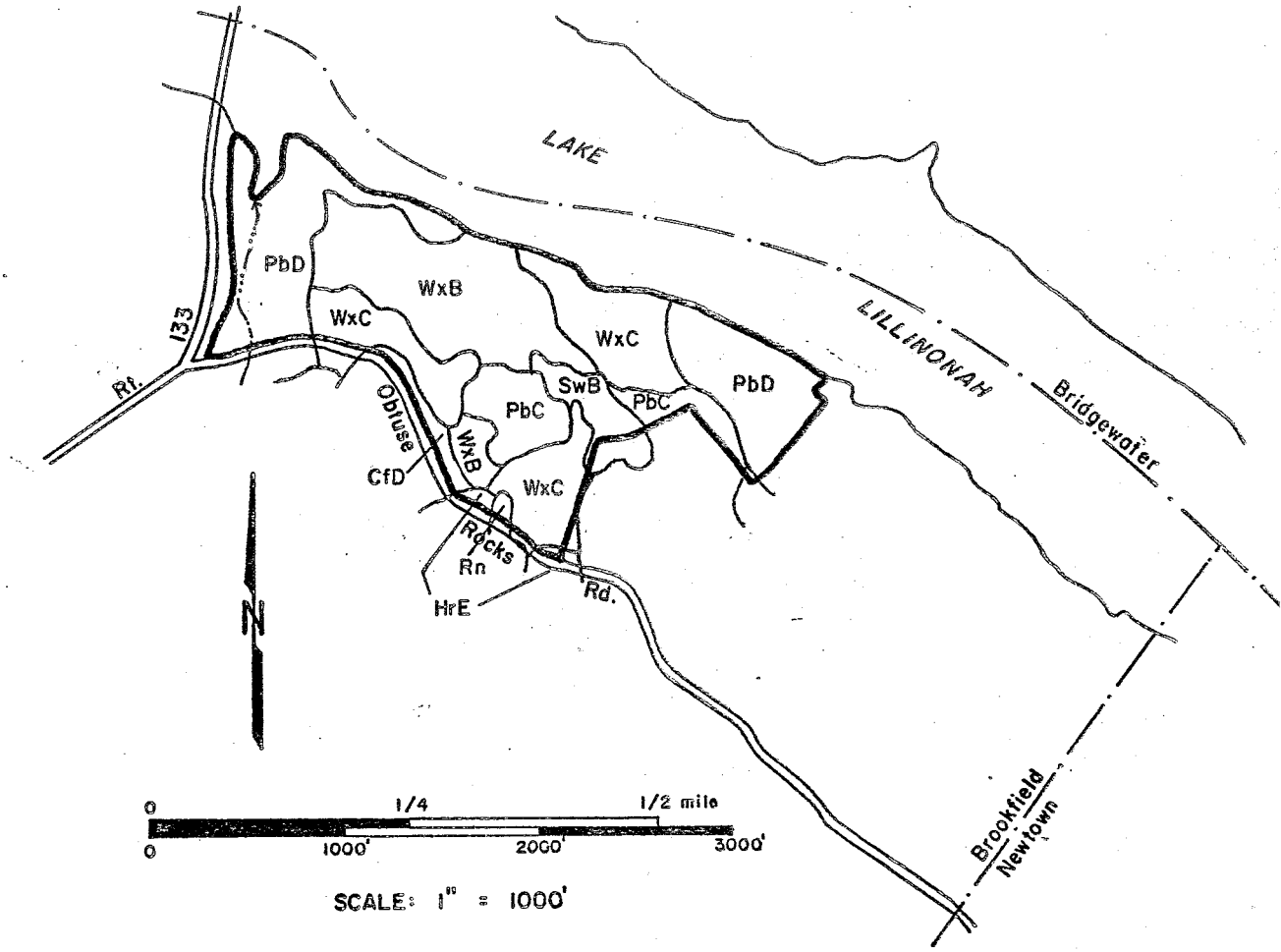
Lillinonah Woods has potential for youth group camping. Groups such as the Boy Scouts, Girl Scouts, 4-H, and school groups could all benefit from the use of this site. Prior to permitting such use however, the specific location of such use and the responsibility for maintenance and control of the function should be addressed and agreed upon by all concerned parties. Figure 5 shows one area that is suitable for developing a primitive camping area. Perhaps the youth groups who would benefit from use of the site could assist the Conservation Commission in establishing trails on the site and laying out the camping areas.

There is good potential for enhancing the use and enjoyment of this property. The diversity of vegetation in particular lends itself to outdoor classroom study. The Conservation Commission is encouraged to take an active part in planning and coordinating the use of the property.

* * * * *

XI. APPENDIX

SOILS MAP



* ADAPTED FROM FAIRFIELD COUNTY SOIL SURVEY, U.S.D.A. - S.C.S.

SOILS LIMITATION CHART - LILLINONAH WOODS, BROOKFIELD, CT

MAP SYMBOL	SOIL NAME	CAMP AREAS	PICNIC AREAS	PLAYGROUNDS	PATHS & TRAILS
PbD	Paxton fine sandy loam, 15 to 25 percent slopes	Severe; Slope	Severe; Slope	Severe; Slope	Moderate; Slope
WxB	Woodbridge fine sandy loam, 3 to 8 percent slopes	Moderate; Percs slowly	Slight	Moderate; Slope, Percs slowly, Wetness	Slight
WxC	Woodbridge fine sandy loam, 8 to 15 percent slopes	Moderate; Percs slowly	Moderate; Slope	Severe; Slope	Slight
CfD	Charlton fine sandy loam, 15 to 25 percent slopes	Severe; Slope	Severe; Slope	Severe; Slope	Moderate; Slope
PbC	Paxton fine sandy loam, 8 to 15 percent slopes	Moderate; Slope	Moderate; Slope	Severe; Slope	Slight
Rn	Ridgebury, Leicester, and Whitman extremely stony fine sandy loams	Severe; Wetness, Large stones	Severe; Wetness, Large stones	Severe; Wetness, Large stones	Severe; Wetness, Large stones
HrE	Hollis-Rock outcrop-Charlton complex, 15 to 45 percent slopes	Severe; Slope	Severe; Slope	Severe; Slope	Severe; Slope
SwB	Sutton very stony fine sandy loam, 3 to 8 percent slopes	Moderate; Large stones	Slight	Moderate; Slope, Large stones, Wetness	Moderate; Large stones

EXPLANATION OF RATING SYSTEM:

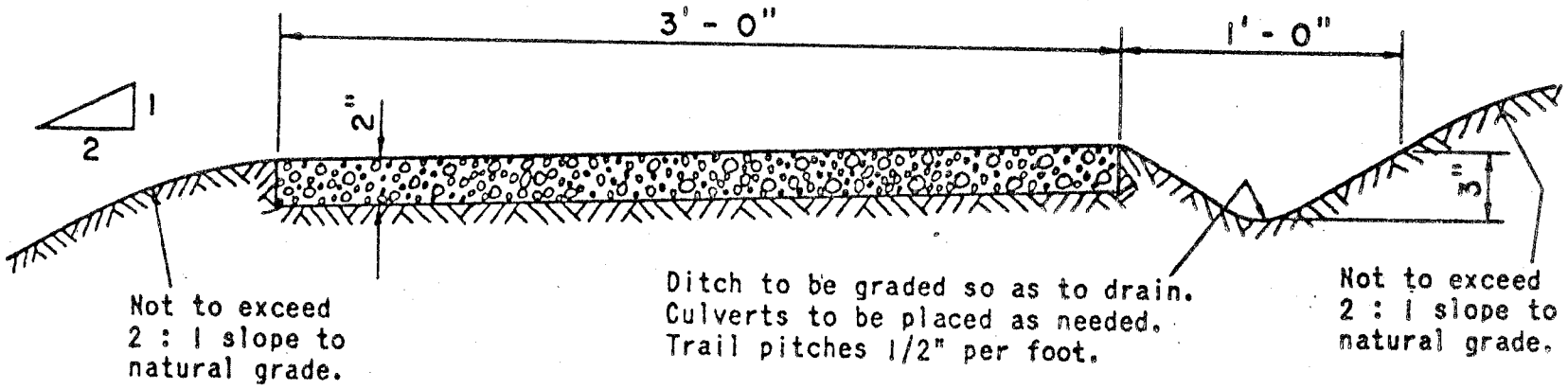
SLIGHT LIMITATION: indicates that any property of the soil affecting use of the soil is relatively unimportant and can be overcome at little expense.

MODERATE LIMITATION: indicates that any property of the soil affecting use can be overcome at a somewhat higher expense.

SEVERE LIMITATION: indicates that the use of the soil is seriously limited by hazards or restrictions that require extensive and costly measures to overcome.

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

CfD -- CHARTON FINE SANDY LOAM, 15 to 25 percent slopes.

This moderately steep, well drained soil is on hills and ridges.

Typically, the surface layer is very dark brown fine sandy loam 6 inches thick. The subsoil is strong brown and yellowish brown fine sandy loam 23 inches thick. The substratum is light olive brown gravelly sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of somewhat excessively drained Hollis soils and well drained Paxton soils and small areas of soils with bedrock at a depth of 20 to 40 inches. Included areas make up about 15 percent of this map unit.

The permeability of this Charlton soil is moderate or moderately rapid. Runoff is rapid, and available water capacity is moderate. It is very strongly acid to medium acid.

Urban. Costly measures are required to overcome severe limitations because of slope and stoniness in developing these soils for urban use.

Recreation. These soils have severe limitations for picnic areas, camp sites, and play areas.

Wildlife. Habitat requirements of openland wildlife species can be established, improved, or maintained but slope and stoniness make it very difficult to plant grain, grasses, and legumes. These are few or no soil limitations that affect the development or maintenance of woodland wildlife habitat. It is impractical to develop wetland wildlife habitat on these soils.

Woodland. These soils have fair productivity for wood crops. Competition from hardwoods is a problem when managing for pine, spruce, or larch on the soils underlain by loamy till (like Charlton). Equipment operation is difficult because of steep slopes. Attention to erosion control measures is important on skid trails and roads.

HrE -- HOLLIS-ROCK OUTCROP-CHARLTON COMPLEX, 15 to 45 percent slopes

This complex consists of moderately steep to very steep soils on hills and ridges. They have an undulating topography marked with exposed bedrock, a few narrow drainageways, and a few small, wet depressions. Stones and boulders cover 1 to 5 percent of the surface.

The complex is about 40 percent somewhat excessively drained Hollis soils, 25 percent exposed bedrock, 20 percent well drained Charlton soils, and 15 percent other soils. The Hollis and Charlton soils and the areas of exposed bedrock are so intermingled that it was not practical to map them separately.

Typically, the Hollis soils have a surface layer of very dark grayish brown fine sandy loam 3 inches thick. The subsoil is dark brown and dark yellowish brown gravelly fine sandy loam and fine sandy loam that extends to bedrock at a depth of 17 inches.

Typically, the Charlton soils have a surface layer of very dark brown fine sandy loam 4 inches thick. The subsoil is trong brown and yellowish brown fine sandy loam 25 inches thick. The substratum is light olive brown gravelly sandy loam to a depth of 60 inches or more.

Included with this complex in mapping are small areas of moderately well drained Sutton and Woodbridge soils, poorly drained Leicester soils, and very poorly drained Adrian soils. Also included are small areas of soils with bedrock at a depth of 20 to 40 inches. A few small areas have slopes of as much as 90 percent, and in a few areas stones and boulders cover more than 5 percent of the surface.

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

The major limitations of this complex are slope, the shallow depth to bedrock in the Hollis soils, the stones on the surface, and the areas of exposed bedrock.

Recreation. Picnic areas and camp sites are extremely difficult to develop.

Wildlife. The habitat requirements of woodland wildlife species can be established, improved, or maintained on these soils but the rockiness and steep slopes present severe limitations. Habitat management will be difficult and expensive and results may be unsatisfactory. It is impractical to develop openland or wetland habitat on these soils.

Woodland. The productivity of this land is poor for wood crops. Equipment operation is extremely difficutl because of numerous rock outcrops and steep slopes. Seedling survival and windthrow of trees are problems.

Cropland. These soils are not suitable for the production of cultivated crops.

PbC -- PAXTON FINE SANDY LOAM, 8 to 15 percent slopes.

This sloping, well drained soil is on drumlins and hills.

Typically, this soil has a surface layer of dark brown fine sandy loam 9 inches thick. The subsoil is brown fine sandy loam 22 inches thick. The substratum is very firm, 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. It is very strongly acid to slightly acid.

Urban. The design and construction of septage effluent absorption fields that function satisfactorily are very difficult because of the hardpan. Slopes above 8 percent add further difficulty and problems in design and site selection for absorption fields.

Conditions are favorable for excavation of basements of homes on soils with slopes less than 8 percent. Slopes above 8 percent are a moderate limitation; however, the steeper slopes present opportunities for a wider choice of architectural design. Stability of footings is not a problem, but measures such as footing drains are needed to prevent seepage into basements.

Soil conditions are favorable for the establishment and maintenance of grass, trees, and shrubs. The stony soils and slopes above 8 percent add difficulty in landscaping.

Difficulty in constructing streets and parking lots ranges from slight on level areas, to moderate on 3 to 8 percent slopes, to severe on slopes above 8 percent. The hazard of frost heaving because of water accumulation above the hardpan requires special consideration. Also soil slippage on road cuts is a hazard during set seasons.

Recreation. These soils are favorable for picnic areas and camp sites. The level soils have few limitations for play areas, but limitations for this use are greater on the steeper slopes and stony soils.

Wildlife. These soils are well suited for the dependable growth of a wide variety of desirable openland and woodland wildlife food and cover plants. Habitat for woodland wildlife species is easily established, improved, or maintained. On the stony soils and slopes above 8 percent it is difficult to establish grain, grasses, and legumes for openland wildlife. It is impractical to develop wetland wildlife habitat on these soils.

Woodland. These soils have good productivity for wood crops. Both hardwoods and conifers are well suited. Competition from hardwoods is a serious problem when managing for pine, spruce, or larch. Hardwoods to favor on these soils are red oak, white ask, and sugar maple.

PbD -- PAXTON FINE SANDY LOAM, 15 to 25 percent slopes.

This moderately steep, well drained soil is on drumlins and hills. The areas are commonly long and narrow and mostly range from 5 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, grayish brown gravelly sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of somewhat excessively drained Hollis soils, well drained Charlton and Stockbridge soils, and moderately well drained Georgia and Woodbridge soils. Also included are a few small areas of soils with slopes of more than 25 percent. 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 rapid, and available water capacity is moderate.

Urban. Costly measures are required to overcome the severe limitations imposed by steep slopes, stoniness, and hardpan in developing these areas for urban uses.

Recreation. The soils have severe limitations for picnic areas, camp sites, and play areas.

Wildlife. Habitat requirements of openland wildlife species can be established, improved, or maintained but slope and stoniness make it very difficult to plant grain, grasses, and legumes. There are few or no soil limitations that affect the development or maintenance of woodlands wildlife habitat. It is impractical to develop wetland wildlife habitat on these soils.

Woodland. These soils have good productivity for wood crops. Both hardwoods and confiers are well suited. Competition from hardwoods is a serious problem when managing for pine, spruce, or larch. Hardwoods to favor on these soils are red oak, white ask, and sugar maple. Equipment operation is difficult because of steep slopes and stoniness. Attention to erosion control measures is important on skid trails and roads.

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. Slopes range from 0 to 8 percent but are dominantly less than 3 percent.

The mapped acreage of this unit is about 35 percent Ridgebury soils, 30 percent Leicester soils, 20 percent Whitman soils, and 15 percent other soils. The soils were mapped together because they have no major differences in use and management. Some areas of this unit contain only one of the major soils, and some contain two or three.

Typically, the Ridgebury soils have a surface layer of very dark grayish brown fine sandy loam 4 inches thick. The subsoil is brown and light brownish gray, mottled fine sandy loam 14 inches thick. The substratum is grayish brown and dark yellowish brown, mottled fine sandy loam to a depth of 60 inches or more.

Typically, the Leicester soils have a surface layer of black fine sandy loam 4 inches thick. The subsoil is brown, mottled fine sandy loam and gravelly fine sandy loam 25 inches thick. The substratum is olive brown, mottled gravelly fine sandy loam to a depth of 60 inches or more.

Typically, the Whitman soils have a surface layer of very dark gray fine sandy loam 8 inches thick. The subsoil is 16 inches thick. The upper 10 inches is dark grayish brown gravelly fine sandy loam. The lower 6 inches is grayish brown, mottled fine sandy loam. The substratum is very firm, grayish brown, mottled gravelly fine sandy loam to a depth of 60 inches or more.

Included with this unit in mapping are small areas of moderately well drained Woodbridge and Scarboro soils. Also included are small areas where stones and boulders cover less than 5 percent of the surface or more than 35 percent and small areas that have slopes of more than 8 percent.

The major soils in this unit have a seasonal high watertable 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 are very strongly acid to slightly acid.

The high watertable, ponding, and the stones and boulders on the surface limit these soils.

Recreation. These soils have severe limitations for picnic areas, camp sites, and play areas but have potential for conservation uses and environmental enhancement. Pond sites are found in these areas, but difficulty of construction increases with the degree of stoniness.

Wildlife. These poorly drained soils are not suited for the production of openland or woodland wildlife habitat. Dependable growth of desirable food and cover plants is limited by their wetness. Habitat for wetland wildlife can be developed, improved, or maintained on these soils, but stoniness imposes difficulties in constructing water impoundments.

Woodland. Productivity for wood crops ranges from fair to poor. Stoniness and wetlness pose severe problems in the use of equipment. Because of wetness, there are severe problems in the survival of tree deedlings, the windthrow of trees, and competition from other plants.

Cropland. With drainage the soils cleared of stones are suitable for the production of silage corn and adapted hay crops. The stoniness and wetness of the soils make them unsuitable for agricultural crops.

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 sides of hills and ridges. Stones and boulders cover 1 to 5 percent of the surface.

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.

Urban. The water table limits successful operation of septage effluent absorption fields unless special measures are used such as drainage and land fill. The very stony soils present problems during installation.

During wet periods the water table is a problem in construction of homes with basements. Measures such as footing drains are necessary to prevent seepage into basements. The very stony soils add difficulty in excavation.

Soil conditions are favorable for the establishment of grass, trees, and shrubs. The very stony soils add difficulty in landscaping.

The high water table is a moderate problem in the design, construction, and maintenance of streets and parking lots. Stone removal during construction is a severe problem on the very stony soils.

Recreation. During the main season of use, the nonstony soils with less than 3 percent slope are favorable for picnic areas and camp sites. Drainage is needed to overcome the seasonal water table on playing fields for intensive use and to extend the period of picnicking and camping. The limitations for play areas increase on the steeper slopes and stonier soils.

Wildlife. These soils are well suited for the dependable growth of a wide variety of desirable openland and woodland wildlife food and cover plants. Habitat requirement of openland wildlife species can be established, improved, or maintained but the stony and very stony soils are more difficult to manage. There are few or no soil limitations that affect the development or maintenance of woodland wildlife habitat. It is extremely difficult and expensive to develop wetland wildlife habitat on these soils.

Woodland. These soils have fair productivity for wood crops. Competition from hardwoods is a problem when managing for pine, spruce, or larch. Hardwoods to favor on these soils are red oak, white ash, and sugar maple. Equipment operation is difficult on the very stony soils.

WxB -- WOODBRIDGE FINE SANDY LOAM, 3 to 8 percent slopes.

This gently sloping, moderately well-drained soil is on drumlins and hills.

Typically, this soil has a surface layer of very dark grayish brown fine sandy loam 8 inches thick. The subsoil is yellowish brown fine sandy loam 24 inches thick that is mottled in the lower part. The substratum is firm, grayish 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 Paxton and Stockbridge soils, moderately well-drained Georgia and Sutton soils, and poorly drained Ridgebury soils. Included areas make up about 15 percent of this map unit.

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

Urban. The design and installation of septage effluent absorption fields that function satisfactorily are very difficult because of the hardpan and seasonal high watertable. Installation of disposal systems is more difficult on the very stony soils.

During wet periods the watertable is a problem in construction of homes with basements. Measures such as drainage are needed to prevent seepage into basements. The very stony soils add difficulty in excavation.

Soil conditions are favorable for the establishment and maintenance of grass, trees, and shrubs. The very stony soils and soils with slopes above 8 percent cause problems in landscaping.

The very stony soils and soils with slopes above 8 percent present severe problems in the design and construction of streets and parking lots. The hazard of frost heaving because of watertable and hardpan must be given special consideration in design and construction. Soil slippage on raod cuts is a severe hazard during wet seasons.

Recreation. During the main season of use, the nonstony soils with less than 3 percent slope are favorable for picnic areas and camp sites. Drainage is needed to overcome the seasonal watertable on playing fields for intensive use and to extend the period of picnicking and camping. The limitations for recreational use increase on the steeper and more stony soils.

Wildlife. Habitat requirements of openland wildlife species can be established, improved, or maintained but stoniness adds difficulty in management. There are few or no soil limitations that affect the development or maintenance of woodland wildlife habitat. It is extremely difficult and expensive to develop wetland wildlife habitat on these soils.

Woodland. These soils have good productivity for wood crops. Both hardwoods and conifers are well suited. Competition from hardwoods is a serious problem when managing for pine, spruce, or larch. Hardwoods to favor on these soils are red oak, white ash, and sugar maple. Equipment operation is difficult on the stonysoils.

WxB -- WOODBRIDGE FINE SANDY LOAM, 3 to 8 percent slopes.

Cropland. The soils cleared of stones are suited to the production of adapted legumes and grasses, late vegetables, and small fruits. With drainage these soils are also suitable for the production of alfalfa, corn, orchards, and early vegetables. Erosion is a hazard on these soils and on the steeper slopes intensive surface water control measures are needed.

WxC -- WOODBRIDGE FINE SANDY LOAM, 8 to 15 percent slopes.

This sloping, moderately well drained soil is on drumlins and hills.

Typically, this soil has a surface layer of very dark grayish brown fine sandy loam 8 inches thick. The subsoil is yellowish brown fine sandy loam 24 inches thick that is mottled in the lower part. The substratum is firm and brittle, grayish 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 Paxton and Stockbridge soils, moderately well drained Georgia soils, and poorly drained Ridgebury soils. Included areas make up about 10 percent this map unit.

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

Urban. The design and installation of septage effluent absorption fields that function satisfactorily are very difficult because of the hardpan and seasonal high watertable. Installation of disposal systems is more difficult on the very stony soils.

During wet periods the watertable is a problem in construction of homes with basements. Measures such as drainage are needed to prevent seepage into basements. The very stony soils add difficulty in excavation.

Soil conditions are favorable for the establishment and maintenance of grass, trees, and shrubs. The very stony soils and soils with slopes above 8 percent cause problems in landscaping.

The very stony soils and soils with slopes above 8 percent present severe problems in the design and construction of streets and parking lots. The hazard of frost heaving because of watertable and hardpan must be given special consideration in design and construction. Soil slippage on road cuts is a severe hazard during wet seasons.

Recreation. During the main season of use, the nonstony soils with less than 3 percent slope are favorable for picnic areas and camp sites. Drainage is needed to overcome the seasonal watertable on playing fields for intensive use and to extend the period of picnicking and camping. The limitations for recreational use increase on the steeper and more stony soils.

Wildlife. Habitat requirements of openland wildlife species can be established, improved, or maintained but stoniness adds difficulty in management. There are few or no soil limitations that affect the development or maintenance of woodland wildlife habitat. It is extremely difficult and expensive to develop wetland wildlife habitat on these soils.