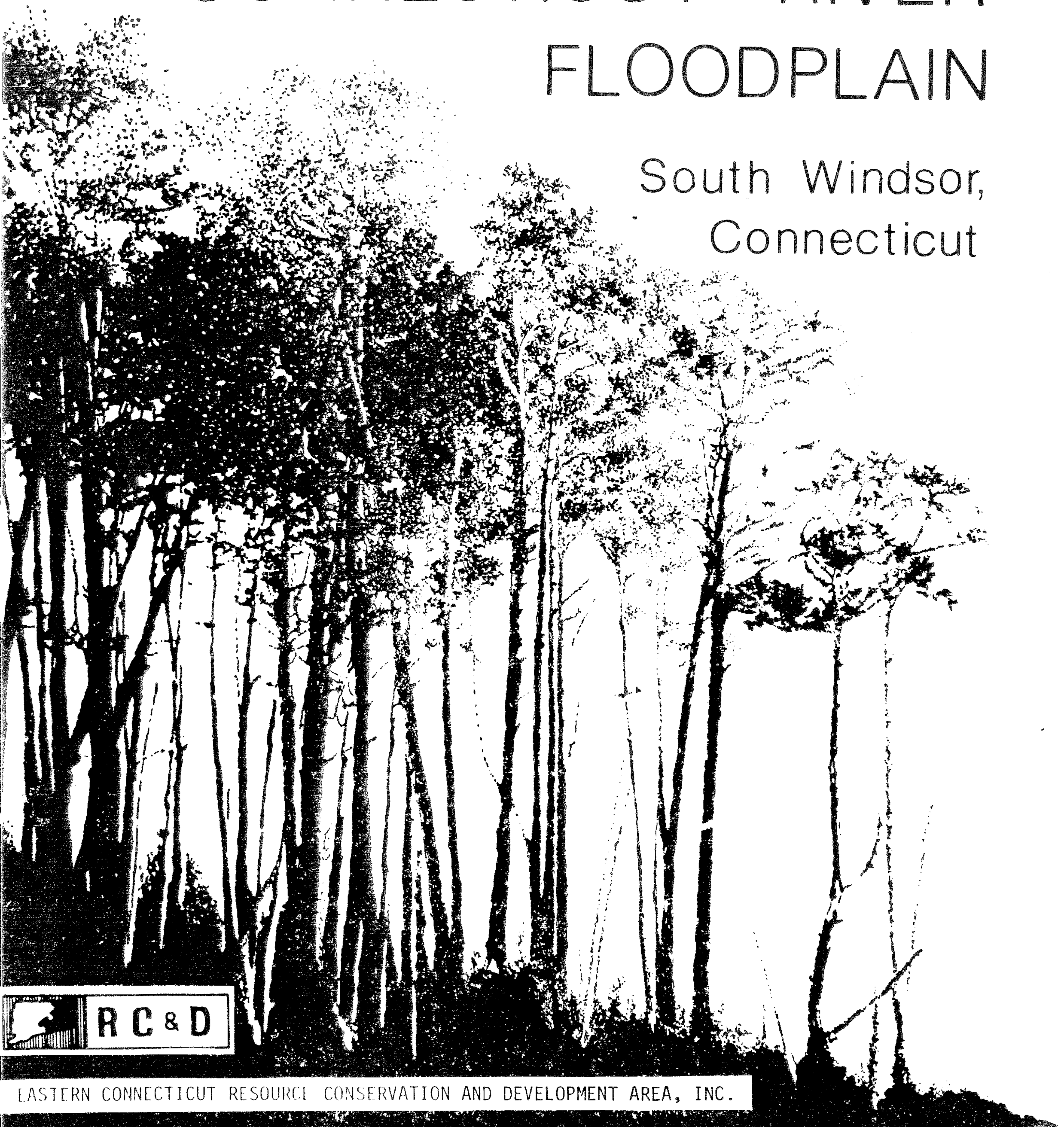
Environmental Review Team Report

CONNECTICUT RIVER FLOODPLAIN

South Windsor, Connecticut



RC&D

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Environmental Review Team
Report

CONNECTICUT RIVER FLOODPLAIN

South Windsor, Connecticut

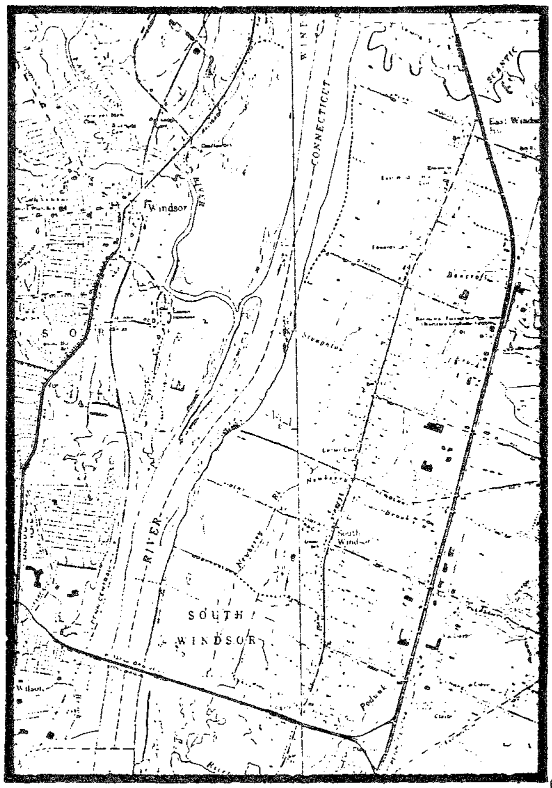
June 1985

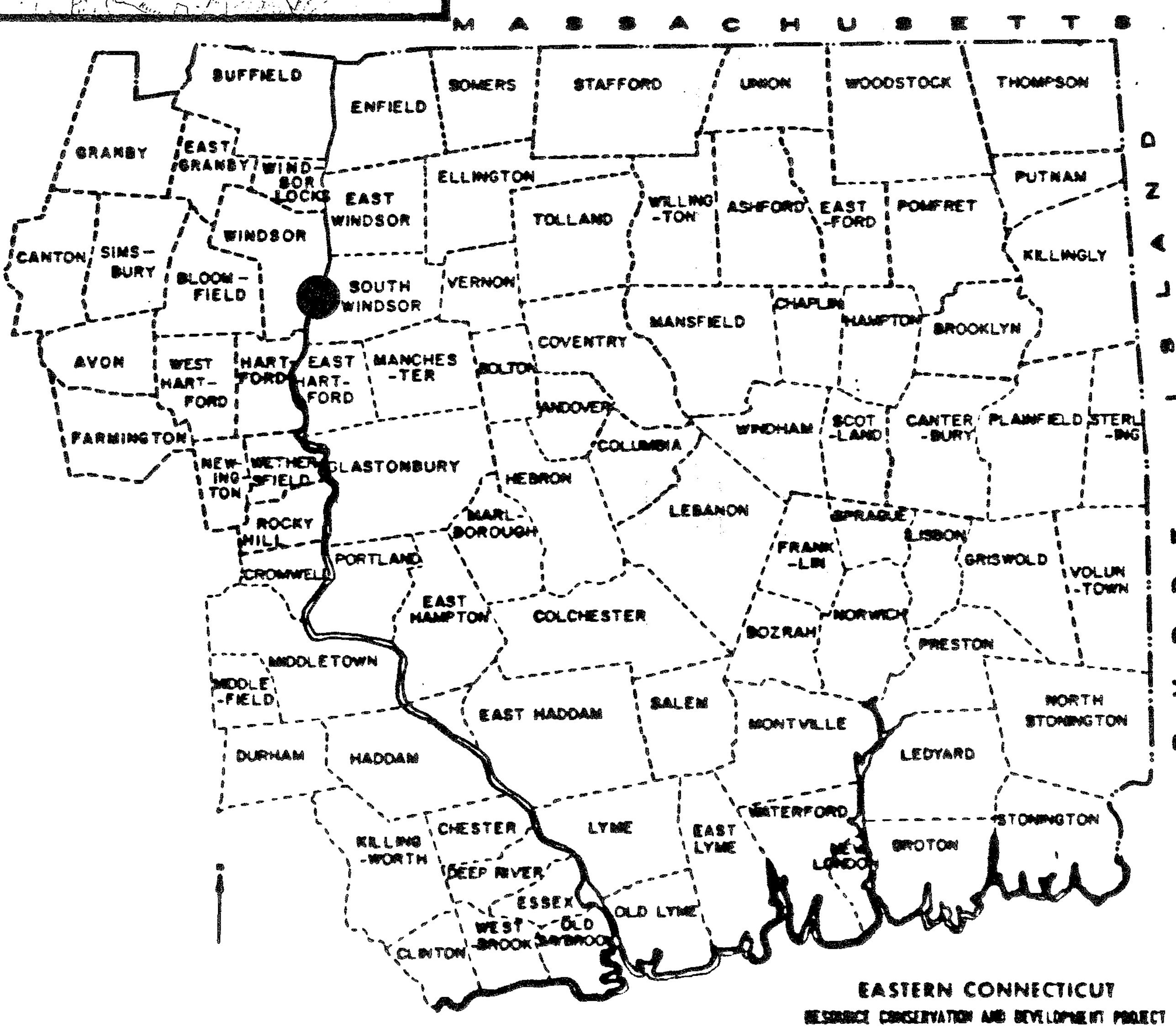
Eastern Connecticut Resource Conservation & Development Area
Environmental Review Team
PO Box 198
Brooklyn, Connecticut 06234

Location of Study Site

CONNECTICUT RIVER FLOODPLAIN

SOUTH WINDSOR, CONNECTICUT





EASTERN CONNECTICUT
RESOURCE CONSERVATION AND DEVELOPMENT PROJECT

ENVIRONMENTAL REVIEW TEAM REPORT
ON
CONNECTICUT RIVER FLOODPLAIN
SOUTH WINDSOR, CONNECTICUT

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

The soils of the site were mapped by a soil scientist from the United States Department of Agriculture, Soil Conservation Service (SCS). Reproductions of the soil survey map, a table of soils limitations for certain land uses and a topographic map showing property boundaries were distributed to all Team members prior to their review of the site.

The ERT that field checked the site consisted of the following personnel: Rob Cochran, Soil Conservationist, Soil Conservation Service (SCS); Bill Warzecha, Geologist, Connecticut Department of Environmental Protection (DEP); Jim Parda, Forester, DEP; John Rook, Wildlife Biologist, DEP; Chuck Phillips, Fisheries Biologist, DEP; Ken Metzler, Plant Ecologist, DEP; and Jeanne Shelburn, ERT Coordinator, Eastern Connecticut RC&D Area.

The Team met and field checked the site on Thursday, September 1, 1983. Reports from each contributing Team member were sent to the ERT Coordinator for review and summarization for the final report.

This report is not meant to compete with private consultants by supplying site designs or detailed solutions to development problems. 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 of South Windsor. The results of this Team action are oriented toward the development of a better environmental quality and the long-term economics of the land use.

The Eastern Connecticut RC&D Area Committee hopes that this report will be of value and assistance in making any decisions regarding this particular site.

If you require any additional information, please contact Ms. Jeanne Shelburn, Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, Route 205, Box 198, Brooklyn, Connecticut 06234, 774-1253.

INTRODUCTION

The Eastern Connecticut Environmental Review Team was asked to prepare a natural resource inventory for the floodplain of the Connecticut River within the Town of South Windsor. The Town intends to use this information in future planning for the floodplain area and possible purchase of some of these lands for recreational purposes.

The Connecticut River, flowing from southern Quebec to Long Island Sound, is the largest river in New England. It drains approximately 29,100 km^2 and with an average discharge of 560 m^3/sec supplies more than one-half the freshwater input into Long Island Sound. The drainage area is relatively long and narrow (approximately 450 km long, 95 km wide), mostly hilly, and more than 70 percent forested (Bane, 1970). From northern Massachusetts through central Connecticut, the river flows through a broad interior lowland. Here the floodplain reaches its greatest development.

The flooding history of the Connecticut River can be traced from 1683 (Thomson et al., 1964), and since 1896 there are excellent records on river level fluctuations at Hartford, Connecticut. This provides an opportunity to correlate vegetation boundaries with long term river level data, to determine flooding frequency and duration for plant communities and to relate sudden changes in vegetation with unusual flooding events.

Almost all of the higher portions of the floodplain have been cleared and very little of the natural vegetation presently remains. The lower floodplain has also not escaped the effects of agriculture and urbanization but enough of the marshes and forests are left to show the natural vegetation patterns. Nichols (1915) described the general features of the Connecticut River floodplain with a discussion of the forest vegetation on the low floodplain.

The most striking features of the floodplain forests are the sharp contrasts in species dominance and the floristic composition of the ground vegetation and the dramatic year to year variation in floristic composition, and indeed, the entire appearance of the vegetation. Both are especially obvious on the lower portions of the floodplain.

The Connecticut River is an early spring flooding river (Hoyt & Langbein, 1955) with fall flooding not uncommon. In most years, heavy snow accumulates in the upper reaches of the basin, and spring thaws, often in comination with heavy rains, contribute to annual floods. In the late summer and early fall, flooding is frequently caused by heavy precipitation associated with equinoctial tropical storms. This has resulted in the greatest floods on record. Excessive precipitation sometimes occurs during summer months with major floods recorded in June 1952, July 1972, and August 1955.

During periods of low flow, the Connecticut River is subject to tidal fluctuation with the upper limit of tidal influence corresponding to the bedrock riffles on the northern boundary of the study area. The maximum tidal amplitude in Hartford is approximately 30 cm.

Spring flooding often occurs well into the vegetative season with trees in full bud standing in several meters of flood water. Flood duration is generally longest in the spring with peak flows occurring between March 15 and May 15. By late May, flood waters have generally receded, and much of the floodplain has drained leaving only sloughs, backmarshes, and other depressions filled with water from the previous flood. In contrast, flooding during other periods of the year is of relatively short duration with the exception of ponded areas, which are filled again to spring levels.

The floodplain topography is controlled by the river. Erosion and deposition are the two principal processes with the degradation of the river channel and banks supplying the material for deposition both in the channel and on the floodplain further downstream. Floodplain deposits are of two types: point bars and overbank deposits (Fisk, 1947; Jahns, 1947; Wolman & Leopold, 1957; Nunnally, 1967).

Point bars or deposits of lateral accretion are confined to the channel, especially on the inside of laterally migrating or meandering rivers. The deposition of successive point bars often forms a floodplain with a ridge and swale topography. The succession of these "scroll bars" over the floodplain surface represents the history of a meandering river (Hickin, 1974); since the ridges and swales have different flooding regimes, they often support distinct bands of vegetation that parallel the river channel.

Overbank deposits, causing vertical acretion, are laid down during floods. Differential deposition of sediments with distance from the channel and decreasing stream velocity results in the formation of natural levees, raised above the lower floodplain and consisting of coarse textured soils. Although significant overbank deposits of silt were observed following two record-breaking floods on the Connecticut River (Jahns, 1947), these deposits generally constitute only a small part of the floodplain (Wolman & Leopold, 1957).

Along the Connecticut River, erosional and depositional features are well-represented with steep cut banks, point bars, and scroll bars recording the history of lateral channel migration. Oxbow-lakes and remnants of more ancient channels can also be found with meander cut-offs described and dates by Holland & Burk (1982) for the floodplain in Massachusetts and by Fling (1930) for the floodplain in the vicinity of Hartford. Natural levees parallel many of the straighter channels and terracing caused by base-level changes gives a broad step-like appearance to the surface of the floodplain.

The Team discusses all natural resource aspects of the study site in detail in the following sections of this report. Additional cultural information can be obtained from the Connecticut Historical Commission (566-3005) and the Capitol Region Council of Governments (522-2217).

ENVIRONMENTAL ASSESSMENT

TOPOGRAPHY

The review site which is bordered to the west by the Connecticut River and to the east by Main Street, is primarily floodplain. The extreme eastern boundary of the study site is characterized by a terrace which rises approximately 20 feet above the floodplain. The topography of both the floodplain and tableland of the terrace is relatively flat.

Elevations throughout the site rise from mean sea level along the Connecticut River to approximately 42 feet above mean sea level along Main Street.

At least four perennial watercourses traverse the site en route to the Connecticut River. A large wetland area occupies the central portion of the study site.

GEOLOGY

The study site is located in an area encompassed by both the Manchester and Hartford (North) topographic quadrangles. Geologic maps, which include surficial and bedrock geologic information for each quadrangle have been prepared by Roger B. Colton (Map GQ-433, 1965) and R. V. Cushman (Map GQ-223, 1963), respectively. Bedrock appears to be deeply buried by unconsolidated materials (overburden) throughout the study site. Nevertheless, both geologists classify the rock unit, based on surrounding outcrops, as the Portland formation. It consists of a reddish-brown and gray arkosic (feldspar-rich) siltstone, sandstone and conglomerates.

Based on logs of test holes drilled by the Connecticut Department of Transportation and well completion reports for nearby drilled wells, depth to bedrock ranges from an average of about 80 feet below land surface along the western boundary of the site to approximately 124 feet below land surface along the eastern boundary (Source: Connecticut Resources Bulletin #25).

The distribution of surfical deposits which are those overlying bedrock throughout the site, as adapted from maps GQ-223 and GQ-433, is shown in an accompanying illustration. As shown in the illustration, four types of deposits are found within the site: glacial lake sediments, stream terrace deposits, floodplain alluvium and swamp deposits.

The lake sediments, which were deposited in the northern section of the review area consists of laminated clayey silt and sand grading downward into varved clay and silt. The term "varved" refers to a small or thin layers of sediment, i.e., clay and silt which were deposited by meltwater streams into a glacial lake within one year's time. The glacial varves normally consist of alternating light and dark layers. The light layers represent sand and silt deposited by rapid flowing meltwater streams during the warmer summer months whereas dark layers, generally fine grained, clayey organic material, represent sediments deposited in a quiet lake during the winter months when miltwater streams were ice bound and barely flowing. The glacial lake, in which the sediments were deposited, was created during the last glacial period (12,000-13,000 years ago) when chunks of glacier ice dammed the present Connecticut River Valley. Depth of this material ranges from zero to 150 feet.

The stream terrace deposits occur along the eastern boundary of the study site. They consist of well laminated sand, silt, clay and some gravel. These materials were deposited on top of the lake sediments following the disappearance of glacial ice from the area.

Recent floodplain alluvium, which predominates throughout the site, consists of laminated silt and sand in areas flooded by the Connecticut River. These deposits may be up to 40 feet thick in the areas they cover and is underlain by varved silts and clays.

Lastly, swamp sediments overlie the alluvial deposits throughout the centered portions of the review site. These deposits consist of a grayish brown peat, muck, silt, sand and clay and are commonly two feet thick. They are designated on the soils map as Limerick and Saco soils.

HYDROLOGY

The extreme western section of the review site lies entirely within the watershed of the Connecticut River. The remainder of land reviewed, lies within the watershed of various watercourses, namely the Scantic River, Stoughton Brook, Newberry Brook and the Podunk River. All of these watercourses ultimately empty into the Connecticut River. An accompanying illustration identifies the watershed within the review site and also shows direction of surface runoff.

As indicated by this illustration, much of the site lies within the floodplain of the Connecticut River. According to a local resident, portions as far east as Main Street have been flooded during heavy rainstorms. The U.S. Department of Housing and Urban Development has issued Flood Boundary and Floodway Maps for the Town of South Windsor. A flood boundary map of the site, adapted from the HUD studies, is included in this report. The "floodway" is defined as the area of land bordering a river or other watercourse that must be kept free of encroachment in order to assure that the 100-year flood levels would not be raised significantly (more than a foot). Also, included in the accompanying map are additional areas which would be inundated by the 100 and 500 year flood. A 100-year flood is a flood with a one chance in 100 or 1% chance of occurring during any given year. This does not mean that a flood of this magnitude will occur only one time in 100 years, but that the probability of occurrence remains the same each year, regardless of what happened the year before. A 500 year flood is a flood which would have .2% chance of occurring. Any development within these areas should be strongly discouraged by the Town.

WATER SUPPLY

There does not appear to be any substantial high yielding groundwater source within the study site. In general, the most productive aquifers in the state are thick, coarse grained stratified drift deposits. Conversely, the deposits underlying the site are mostly fine grained and, therefore, are not nearly as productive as the coarse grained material. Nevertheless, bedrock is capable of supplying small to moderate yields to individual wells. If the town wished to drill a well within this study site, in the future, the bedrock should be an adequate source. If a well is drilled, it is recommended that it be located as far away as possible from the Connecticut River and at a relatively high point on the site. Preferably, it should be located outside of an area which is subject or prone to flooding.

SOILS

The soils in this area as mapped on the Hartford County Soil Survey are:

AfA	Agawam fine sandy loam, 0 to 3 percent slopes
AfB	Agawam fine sandy loam, 3 to 8 percent slopes
AgB	Agawam very fine sandy loam, 3 to 8 percent slopes
Am	Alluvial Land
BxB	Buxton silt loam, 3 to 8 percent slopes
EnB	Elmwood sandy loam, 3 to 8 percent slopes
HaA	Hadley silt loam, 0 to 3 percent slopes
LmA	Limerick silt loam, 0 to 3 percent slopes
OnA	Ondawa sandy loam, 0 to 3 percent slopes
SaA	Saco sandy loam, 0 to 3 percent slopes
SbA	Saco silt loam, 0 to 3 percent slopes
WvB	Windsor loamy fine sand, 3 to 8 percent slopes
WwA	Winooski silt loam, 0 to 3 percent slopes

The Agawam, Buxton, Elmwood, Hadley, Ondawa, Windsor and Winooski series soils are considered prime farmland soils. These soils have the soil quality, growing season and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. Also, the Agawam, Hadley and Windsor soils are well drained to excessively drained soils with a depth to the water table of greater than 6 feet. The Buston, Elmwood and Winooski are moderately well drained soils with a depth to the water table ususally between 1.5 and 3.0 feet. The Saco and Limerick soils are very poorly drained and poorly drained soils, respectively. The water table is at or near the surface on these soils most of the year.

The area has extensive acreage of inland wetland soils. The soils are designated as inland wetland because they are either poorly drained, very poorly drained or floodplain soils. Those soils designated as inland wetlands are: Hadley, Winooski, Alluvial Land, Saco, Ondawa and Limerick soils. It should be noted that it is possible to have a well drained, prime farmland soil which is an inland wetland. An example is the Ondawa soil which is designated as an inland wetland because it is a floodplain soil.

Presently, the majority of this area is open land which is being used as cropland, hayland or wildlife land. The wooded areas are wildlife habitat. The continued use of this area as an agricultural land base for the Town is one which should be considered. The prime farmland qualities, location of the land and size of the area are characteristics which provide for continued use of the area as an excellent agricultural land base. Passive recreation and wildlife habitat uses of the land which are compatible with the agricultural use. As areas of prime farmland soils decrease in availability the value of an area of this size and quality increases.

WILDLIFE

The majority of this site is currently used as farmland. A strip of hardwood forest borders the river along most of the property in South Windsor. Sections of woodlands are interspersed with farmland, the largest woodland area being in the more southerly portion of the floodplain. An inland wetland is located in the central portion of the area.

Wildlife Habitats

(Forestland) Much of this area provides a buffer zone between the river and the agricultural land. Maple, oak, ash, and hickory are trees included in this mixed hardwood forest. Spacing of the trees varies from area to area. Many irregularly shaped wolf trees are found. The majority of the woodlands have thick understories consisting of: dogwoods, ferns, maple, oak, sasafrass, pokeberry, and vines such as grape and bittersweet. Inlets from the Connecticut River occur in some places; the water levels of these inlets vary seasonally. Waterfowl are attracted to these areas; both banks of the inlets provide cover. This appears to be a good wildlife area due to the abundance of food and cover.

(Wetlands) The centrally located marsh is an attractive waterfowl area. Ash, hickory, maple, willow, and poplars such as aspen and cottonwood are found. Grape vines are abundant. A brook, which flows year round, exists in the area. Food and nesting cover is provided for waterfowl and other wild life species. Wood duck nesting boxes have been erected.

Recommendations

Most of the woodlands provide good wildlife habitat. The only cutting that would be recommended is where the canopy is so thick that it prevents penetration of sunlight, thereby limiting understory development. A selective cut would be the most useful in such an area.

Planting wildlife foods in old fields near the marsh would be advantages for wildlife. In addition, creating an "edge effect" in fields, including agricultural fields, would be beneficial. An edge effect is a gradual conversion from field to forest by providing a brushy, grassy border. This can be done by leaving a 10 foot strip of the field uncut along the edge and by thinning trees 10 feet into the forest, allowing brushy release. The grassy edge should be cut every 2 or 3 years and the brushy edge every 5 years to keep it at this stage.

Good access exists by means of dirt roads and trails. Observation points, complete with interpretive trails markers, at specific habitat areas would be beneficial for conservation/education purposes. For example, a look out point over the marsh with an interpretive marker explaining the value of wetlands and pointing out the plant and animal species found.

FISHERIES

The Connecticut River represents one of the most significant freshwater fishery resources in New England. Some of the species present in the river adjacent to South Windsor include northern pike, largemouth bass, smallmouth bass, white catfish, white perch, yellow perch, calico bass, golden shiner, spottail shiner, carp, white sucker, common sunfish, bluegill sunfish and American eel. The shortnosed sturgeon, an endangered species, also is found in this section of the river, identifying this section as one of a very few areas of the Connecticut River in which these uncommon fish have found suitable habitat.

Seasonally, additional fish inhabit the river during spawning runs. These include American shad, blueback herring, alewives, sea lamprey and small numbers of Atlantic salmon and sea run trout.

The floodplain includes the Scantic and Podunk Rivers both of which are stocked by the State with trout. Each of these rivers is reported to have small spawning runs of brook and/or brown trout below its dams each fall. Additionally, there is a large run of white suckers and herring each year to these systems. Smaller runs of the same species might be expected in Bancroft, Newberry and Stoughton Brooks. Other species present in most of the streams as full time residents would be expected to include fallfish, dace and other minnows.

Despite its fish species diversity and abundance, the Connecticut River remains largely untapped as a fishery resource. Much of the problem can be related to the River's unsavory reputation, which in recent years, with the advent of sewage treatment, has been unfounded. Presently, the fish species which draw the most attention from anglers are catfish, perch, northern pike and largemouth bass with some fishing for carp and a small commercial fishery for American eels.

The Connecticut River south of Middletown additionally has commercial shad and white perch fisheries. In terms of South Windosr's window to the Connecticut, the greatest angling effort seems concentrated from the Vibert Street launch south past the Bissell Bridge to the town line.

In order to provide better fishing access, areas receiving the most fishing pressure should be identified (i.e., Bissell Bridge, Vibert Street ramp) and improved to allow for vehicle parking. Areas which show similar "fishability" but very limited access should also be identified. One of the major difficulties in providing improved access will be the river's flow regimes. The fluctuation between spring high flows and summer lows would make installation of angling piers or docks a difficult proposition. It may be that the only feasible access improvement will be through provision of more road access to the existing riverside footpaths.

VEGETATION

The floodplain vegetation can be conveniently divided into: (1) forests on the high floodplain; (2) forest on the low floodplain; and (3) marshes and herbaceous riverbank vegetation.

This description of the plant communities will focus on the forest vegetation of the low floodplain. The plant communities of the high floodplain and those without tree cover will be defined very briefly with respect to major physiognomical and floristic characteristics.

High Floodplain Forests

The high floodplain forests are floristically and ecologically very similar to the Acer saccharum-Fraxinus americana forests on fertile, upland soils (Damman and Kershner, 1977). They represent the richest expression of these Acer-Fraxinus forests and show the closest floristic similarity with the forest vegetation of deep soils on moist lower slopes in basalt and limestone areas. They have the following species in common with the floodplain forest: Tilia americana, Ulmus americana, Staphylea trifolia, Carya cordiformis, Carex sprengelii, Asarum canadense, Dicentra cucullata, Menispermum canadense, and Hydrophyllum virginianum, but lack Piatanus occidentalis and Acer negundo which are often abundant in the floodplain. Some of this vegetation occurs on prime agricultural land and only small fragments of this forest type remain. Too few data are available to subdivide these forests and they are simply referred to as high floodplain forest.

Low Floodplain Forests

These occupy the regularly flooded parts of the floodplain and include sloughs which are water-filled for most or all of the vegetative season. These sloughs are not occupied by a marsh vegetation because of shading by the canopies of trees surrounding them.

The vegetation of these forests is differentiated from that of the high floodplain and upland forests by the dominance of Acer saccharinum and the common occurrence of Populus deltoides, Sicyos angulatus, Echinocystis lobata, Cuscuta gronovii, Vitis riparia and Arisaema dracontium. Acer negundo occurs sporadically on the low floodplain study area but is a reliable and abundant differential species in the calcareous floodplain of the Housatonic River and farther west. Although this species is included as a differential for the low floodplain, it appears to have a preference for coarser textured soils and is often abundant on the high floodplain.

Ecologically, there is a clear distinction between the Acer saccharinum-Populus deltoides forests on riverbanks and levees and the virtually pure Acer saccharinum stands of the inner portions of the floodplain. However, a floristic distinction between these two major units cannot be easily made. Physiognomically, the low floodplain forests can be separated into those with a well-developed, often luxuriant, herb layer and those with a generally sparse ground cover that varies greatly in its development from year to year.

Eupatorium rugosum - Acer saccharinum Community

This is an Acer saccharinum forest with an admixture of Populus deltoides and Ulmus rubram. Eupatorium rugosum, Ambrosia trifida, Elymus riparius, Utica gracilis, Parthenocissus quinquefolia and Solidago canadensis differentiate this community from all other Acer saccharinum forests, and it shares Amphicarpa bracteate, Tovara virginica and other species with the Onoclea - Acer saccharinum community. Laportea canadensis, Phteretis pensylvanica and Rhus radicans are always present here and other species reach their optimal development in both this community and the Onclea - Acer community.

The Eupatorium - Acer community occurs on levees, scroll bars, and other relatively coarse textured deposits (sandy loams to loams) near the river channel that are well-drained during most of the vegetative season. Laportea canadensis, 1 meter tall or over, completely dominates the ground vegetation on high levees and stable scroll bars with active sedimentation.

Populus deltoides - Acer saccharinum Community

This is a Populus deltoides forest with Acer saccharinum often occurring as a low tree under the Populus canopy. The herbaceous cover is generally sparse, Leersia virginica is always present. Boehmeria cylindrica, Laportea canadensis, Pteris pensylvanica and Rhus radicans are frequent, but otherwise differential species of the low floodplain are poorly represented. Populus deltoides, although found sporadically throughout the low floodplain reaches it optimal here; and with distance from the river channel is often mixed with large Acer saccharinum trees.

This community occurs on low levees with active sedimentation which are above the river level for most of the vegetative season. Mechanical damage by swift flood waters and the accumulation of sediments prevents the development of a closed ground vegetation.

Salix nigra Riverbank Community

This community occurs most commonly as a narrow band between the river and the Populus deltoides - Acer saccharum forests. It can also be found on point bars with active sedimentation and on the downstream portion of nigrating islands above the summer water level.

Along this part of the Connecticut River the Salix community covers very little area and is mostly found as a narrow interrupted ribbon, often less than 1 meter wide, on the river bank. Salix nigra is the dominant low tree and shrub. The ground cover is affected greatly by the adjacent vegetation but is generally weedy and highly variable. Summer annuals such as Panicum dichotomiflorum, Echinochloa crusgalli, Sicyos angulatus and several Bidens and Polygonum species, common in the riverbank vegetation, often dominate the ground vegetation. However, the dominant species and the development of the herbaceous layer generally varies from year to year.

Onoclea sensibilis - Acer saccharinum Community

This is a Acer saccharinum forest with an occasional Populus deltoides tree. Ulmus rubra and Fraxinus pensylvanicus occur commonly as low trees and some shrubs occur scattered in these stands. Most characteristic for this community is the fern covered forest floor. It is further distinguished from all other low floodplain forests by the presence of Lysimachia ciliata, Smilax herbacea, and Geum canadense.

This community has a wide ecological amplitude with flood duration affecting the floristic composition of the ground cover. In its typical expression, Onoclea sensibilis dominates the forest floor completely. A floristically impoverished variant occurs in the lower part of its elevational range; shrubs are absent here. The Pteretis pensylvanica variant occupies the highest ridges in the inner flood plain. Pteretis pensylvanica is the dominant species in the ground vegetation and within the lower floodplain, Panicum clandestinum is restricted to this variant.

The Onoclea - Acer community covers a large part of the inner floodplain. It occurs on sites that drain rapidly after floods that receive little sediment, mainly silt.

Boehmeria cylindrica - Acer Community

This is an Acer saccharinum forest in which Boehmeria cylindrica either forms a luxuriant ground cover or is a prominent species in the herb layer. It is the wettest of the three Acer saccharinum forests with a well-developed herbaceous ground cover. Pilea pumila, Cuscata gronovii, Onoclea sensibilis, Lycopus virginicus, Bidens frondosa and Impatiens capensis cover little surface but are usually present. Leersia virginica is always abundant as it is in most of the lower floodplain.

Three variants can be recognized: (1) Onoclea sensibilis variant with an open Boehmeria cylindrica cover in which clumps of Onoclea sensibilis occur regularly.

Laportea canadensis and Rhus radicans occur sporadically here, but are absent in the two other variants. This variant occupies extensive parts of the inner floodplain and occupies the upper or driest range of the Boehmeria - Acer community. (2) Leersia virginica variant in which Leersia is the dominant species on the forest floor. Onoclea sensibilis occurs irregularly. This variant occupies the lower or wettest part of the range of the Boehmeria - Acer community. (3) Boehmerica cylindrica variant is dominated completely by a dense, 70 cm high, ground cover of Boehmeria cylindrica, lacks the species of differential species group a, and Onoclea sensibilis occurs sporadically and is poorly developed. This variant occupies a well-defined zone immediately below the Onoclea sensibilis - Acer community on the border of undrained sloughs of the inner floodplain.

Acer saccharinum seedling Community

This is the wettest and floristically most impoverished community of the forested floodplain. Trees do not occur within this community, but the site is heavily shaded by the overhanging canopy of trees growing on adjacent higher soils. Acer saccharinum seedings can occur in large numbers and grow for several years, but water ponded on these sites after summer floods eventually kills them. During most years, however, the abundance of maple seedlings is a characteristic feature of the community.

The ground cover is usually very open but cover and height of the herb layer depends greatly on the flooding regime during any one year. Leersia virginica, Bidens frondosa, Impatiens capensis and seedlings of Boehmeria cylindrica are always present. Arisaema dracontium is most common in this and the Boehmeria - Acer community, but is is cut back drastically during years with summer flooding. Ricrocarpos natans and Lemna minor are usually present on the muddy soil. Seeds of many species accumulate here with floating debris resulting from the presence of seedlings of a wide variety of plants from Quercus rubra to garden vegetables.

This community occurs in undrained sloughs and depressions in which flood waters are ponded. The vegetation is highly variable in composition and height. During summers without flooding, a facies dominated by Pilea pumila develops along the upper border of this community.

Floodplain Marshes and Herbaceous Riverbank Vegetation

Pilea pumila marshes occupy sites with a permanently high water table because they occur along the river edge or in coves with tidal influence, in oxbows and sloughs that have permanent standing water, or in backmarshes that receive drainage from the adjacent upland. In contrast, herbaceous riverbank vegetation occupies sandy beaches and shores adjacent to the river channel but above the influence of normal summer low water levels. For the purpose of this study, only three vegetation types will be recognized here.

(1) Sagittaria latifolia community. This is a tidal herbaceous community occurring along the river channel or in inlets and coves connected to the river. Along the river, this community generally has a sparse vegetation cover of Sagittaria latifolia and Lindernia dubia. However, in protected inlets and coves with a greater expanse of tidal mud, a dense growth of annual grasses such as

Zizania aquatica and Leersia oryzoides can dominate the vegetation. The Saggitaria community occupies very little area within the study area and is better expressed in lower portions of the Connecticut River where the tidal influence and availability of habitat are more widespread.

(2) Peltandra virginica - Cyperus strigosus community. This is a herbaceous marsh community that develops in broad low-lying swales along the large meanders in the study area. These marshes occur close to the river channel, have a low point of entry for flood waters and therefore are flooded quite frequently. After the floods recede, water is trapped in these swales and the semi-permanently flooded water regime and their broad sunlit area stimulates the development of an emergent marsh vegetation, often dominated by Peltandra virginica. Although these marshes can vary in both species composition and abundance, the more common associates include Sagittatia latifolia, Cyperus strigosus, Leersia oryzoides, Lindermia dubia, and Ludwigia palustris.

(3) Echinochloa - Panicum dichotomiflorum community. This is a highly variable community that occurs on low riverbanks and shores above the influence of the normal summer river level. Summer annuals such as Euchinochloa pungens, E. crusgalli, Panicum dichotomiflorum, Polygonum pensylvanicum, P. lapathifolium, Xanthium pensylvanicum, Eragrostis hypnoides, Gnaphalium uliginosum, Mullugo verticillata, and several Bidens species predominate. The floristic composition can be quite variable from year to year with the timing and duration of floods and the available seed source having a pronounced influence on the nature of the vegetation. Salix nigra and Populus deltoides seedlings can also be an important component of this community and in some areas can dominate the vegetation. The Echinochloa - Panicum community is transitional to the Salix nigra community on low levees and point bars.

The Effect of River Water Levels on the Vegetation

The frequency, duration and timing of flooding are the predominant factors controlling the vegetation pattern in the lower floodplain. In late April or May, spring floods inundate the entire area, but during the summer months most of the floodplain is well darined. Because the spring floods coincide with the flowering period of the spring flora in Connecticut, spring ephemerals are conspicuously absent from the lower floodplain of the Connecticut River. In interpreting the vegetation pattern of the floodplain, a clear distinction has to be made between sites which drain freely into the Connecticut River and those in which river water becomes entrapped. Water levels in the former fluctuate with the level of the Connecticut River; whereas the latter, once flooded, remain inundated for long periods after the flood waters have receded.

In the freely drained parts of the floodplain, the start of the vegetative season depends on the timing of the spring floods. Thus, the development of the ground vegetation is controlled by the snow melt in Vermont and New Hampshire rather than by the spring temperatures in Connecticut. This does not apply to the trees; Acer saccharinum is often in full flower when only the tree crowns are above the flood waters.

In the sloughs and depressions in which flood waters are trapped, the ground vegetation does not develop until water evapotranspiration and percolation lower the water level and the soil surface is exposed. In these areas the effective vegetative season, as far as the ground vegetation is concerned, becomes shorter with increasing water depth.

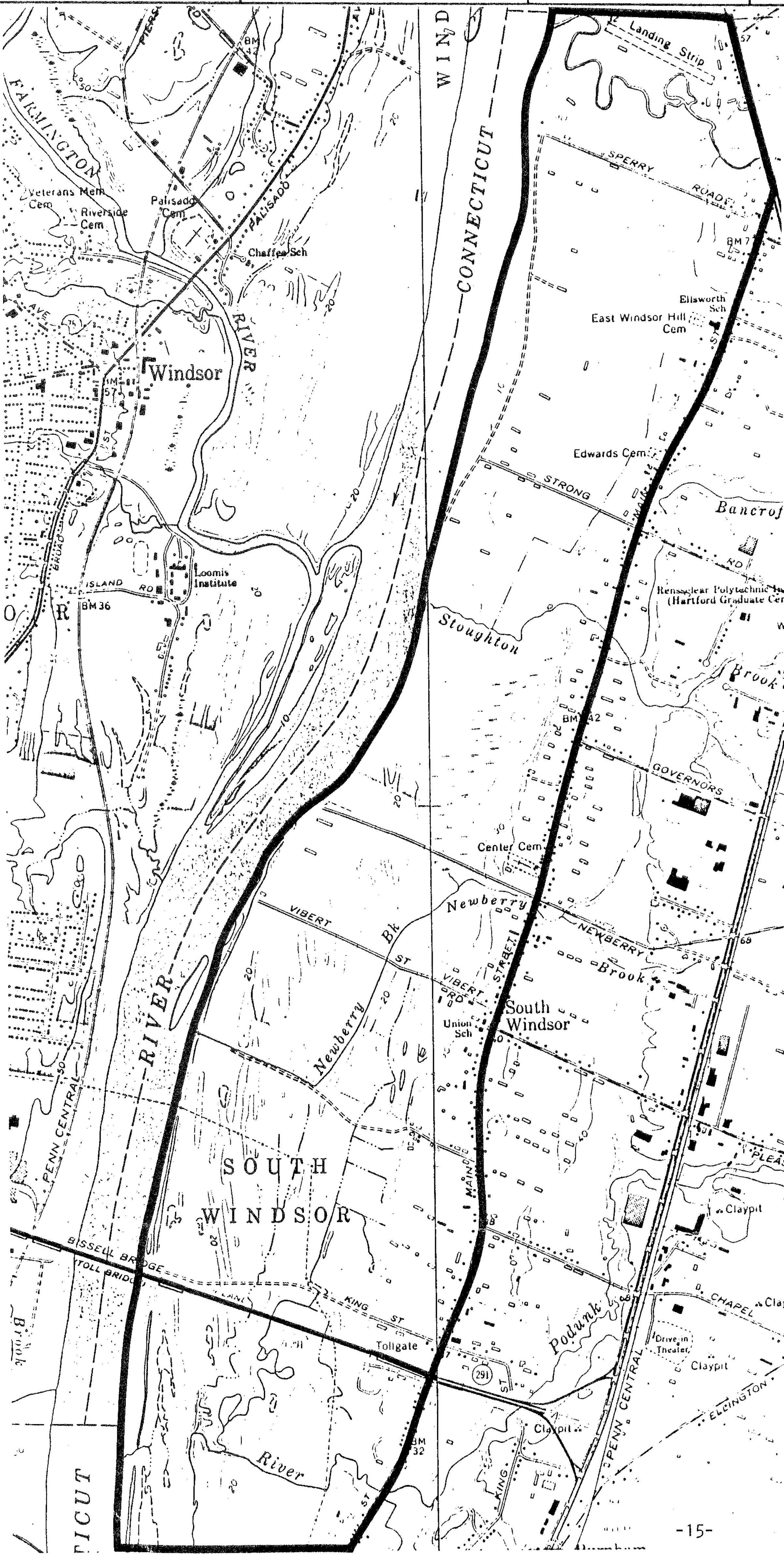
Summer floods occur in some years. Characteristically, they peak for very short periods and the river returns rapidly to regular summer level. These floods cause some physical damage to the fully developed plants and deposit mud on foliage and stems. In the freely drained parts of the floodplain the damaging effect of these summer floods is limited, and it hardly affects the floristic composition of the vegetation. However, in the undrained sloughs and depressions, the effect of the summer floods is disastrous. Here water levels return to their early spring level and the vegetation remains flooded for weeks or months. Consequently, the plants rot away, and when the water finally disappears, they have to start again as seedlings or from the left over resources in their underground parts. During years with summer floods many sites remain inundated for the remainder of the summer. On sites that do dry out, annuals will occur in much smaller numbers, and often flower when less than 10 cm high, whereas most perennials will be poorly developed and will not flower at all that season. Such events and their timing have a profound effect on the vegetation of these parts of the floodplain, and dramatic differences can be seen from year to year.

Topography

Site Boundary

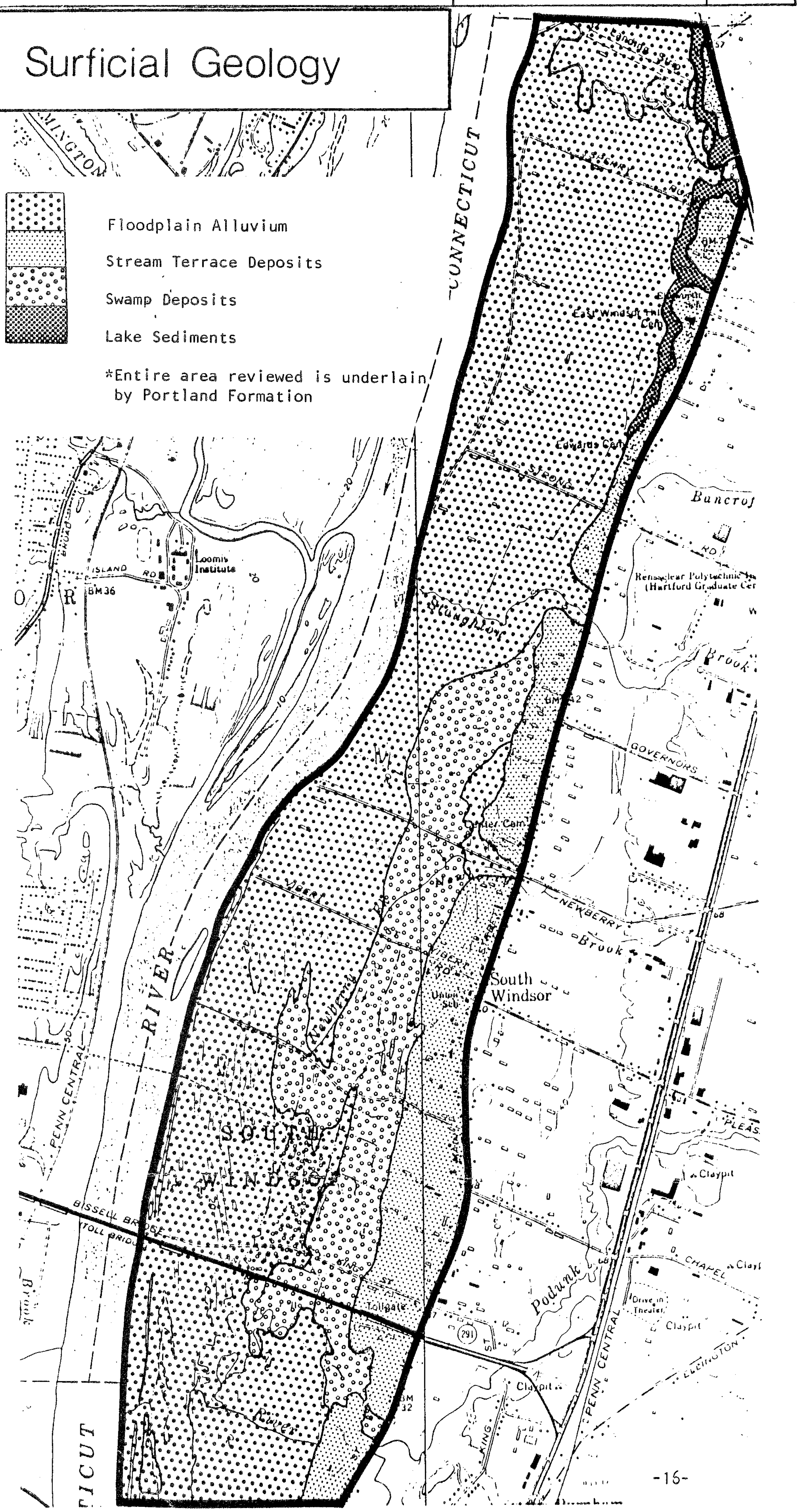
0 2000' scale

N

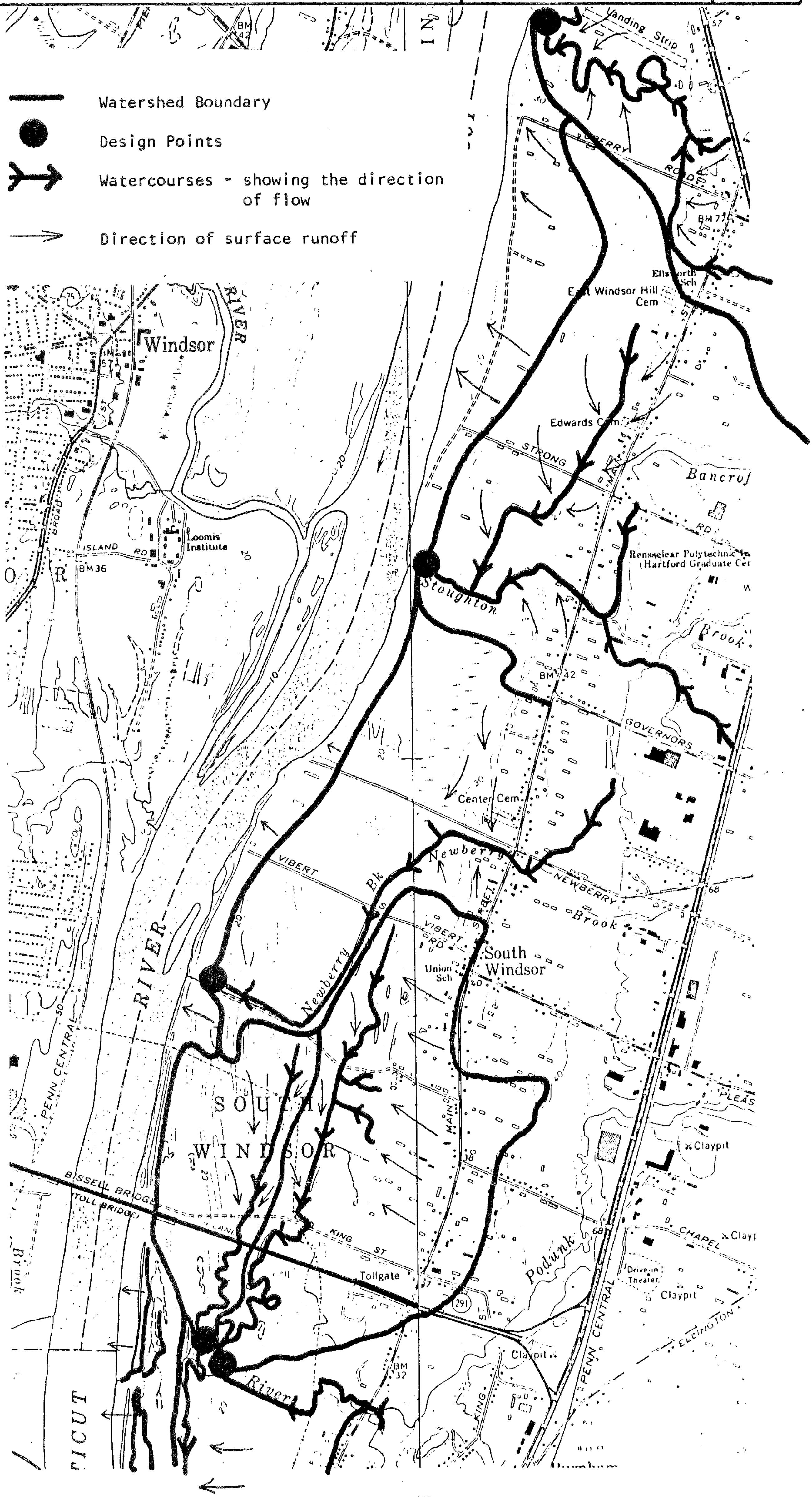


Bedrock Geology

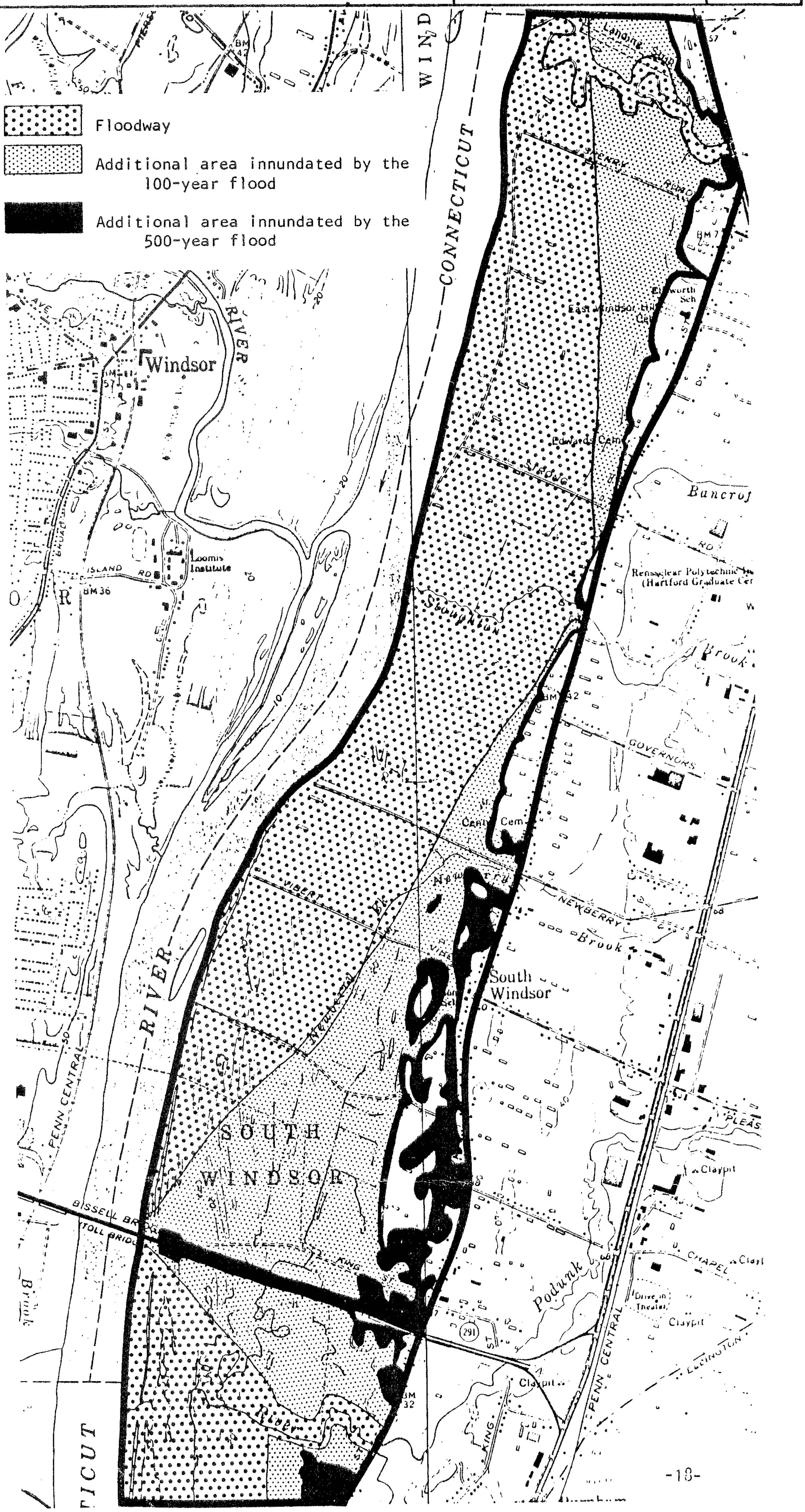
Surficial Geology



Drainage Areas



Flood Zones



C
2000'
scale
N
Floodway
Additional area innundated by the 100-year flood
Additional area innundated by the 500-year flood
CONNECTICUT
RIVER
Windsor
Loomis Institute
ISLAND RD
SOUTH WINDSOR
South Windsor
PENN CENTRAL
BISSELL BR
TOLL BRIDGE
Podunk
Bancroft
Rensselaer Polytechnic Inst (Hartford Graduate Ctr
GOVERNORS
NEWBERRY
Brook
Stoughton
Edwards Cem
East Windsor Hill Cem
PLEAS
CHAPEL
KING

Soils

0 — 1320'
scale

N

Appendix

Figure 1. Map of the study area (shaded) and its location within the Connecticut River Basin (insert). The broken line indicates part of the flood plain lost to urban development.

Figure 2. Maximum, mean, and minimum heights of the Connecticut River at Hartford, 1908-1957. Data are from the Greater Hartford Flood Commission, Hartford, Connecticut. The dates in the graph indicate years in which maximum gauge heights were reached; the level of the July 1973 flood is also shown.

Figure 3. Relationship between elevation, flood duration, and distribution of plant communities on the Connecticut River flood plain. The water level duration curve at left shows the percentage of the year that the river is at or above a certain level based on the period 1896-1942. The upper and lower limits of each plant community are shown on the right. These levels can be traced to the duration curve to find the period of inundation. Flood duration data were supplied by the Greater Hartford Flood Commission.

Figure 4. Recurrence interval of annual floods of the Connecticut River at Hartford. Data for annual floods are based on maximum and historic flood levels calculated by the U.S. Geological Survey for the period 1863-1982. Data for the summer period are based on 7 AM readings from the U.S. Weather Bureau and the U.S. Geological Survey for the period 1905-1982. Recurrence intervals were calculated following the guidelines of the Water Resources Council (1981).

Figure 5. Probability of summer flooding of the Connecticut River at Hartford. Each curve shows the percentage of years, during the period 1905-1982, in which a certain gauge height was reached at least once for the period May 15 - September 15 and each of the periods May 15-31, June, July, Agust, and September 1-15. Note that as the summer progresses, the probability of summer flooding decreases. Data are based on 7 AM readings supplied by the U.S. Weather service and the U.S. Geological Survey.

Figure 6. Toposequence of plant communities on the Connecticut River flood plain showing a profile through a stable meander scroll (A), a low levee and a portion of the inner flood plain (B), and the vegetation zonation on ridges and sloughs in the inner flood plain (C). In sequence C, note the expanded vertical scale and the different lower level of the *Onoclea-Acer* community on opposite sides of the ridge.

Figure 7. Potential distribution of vegetation of the Connecticut River flood plain near Hartford. The mapping is based on field observations, the correlation of the vegetation with different soil types, and air photo interpretation. Almost all of the upper flood plain has been cleared for agriculture with most of the low flood plain presently forested.

FIGURE 1

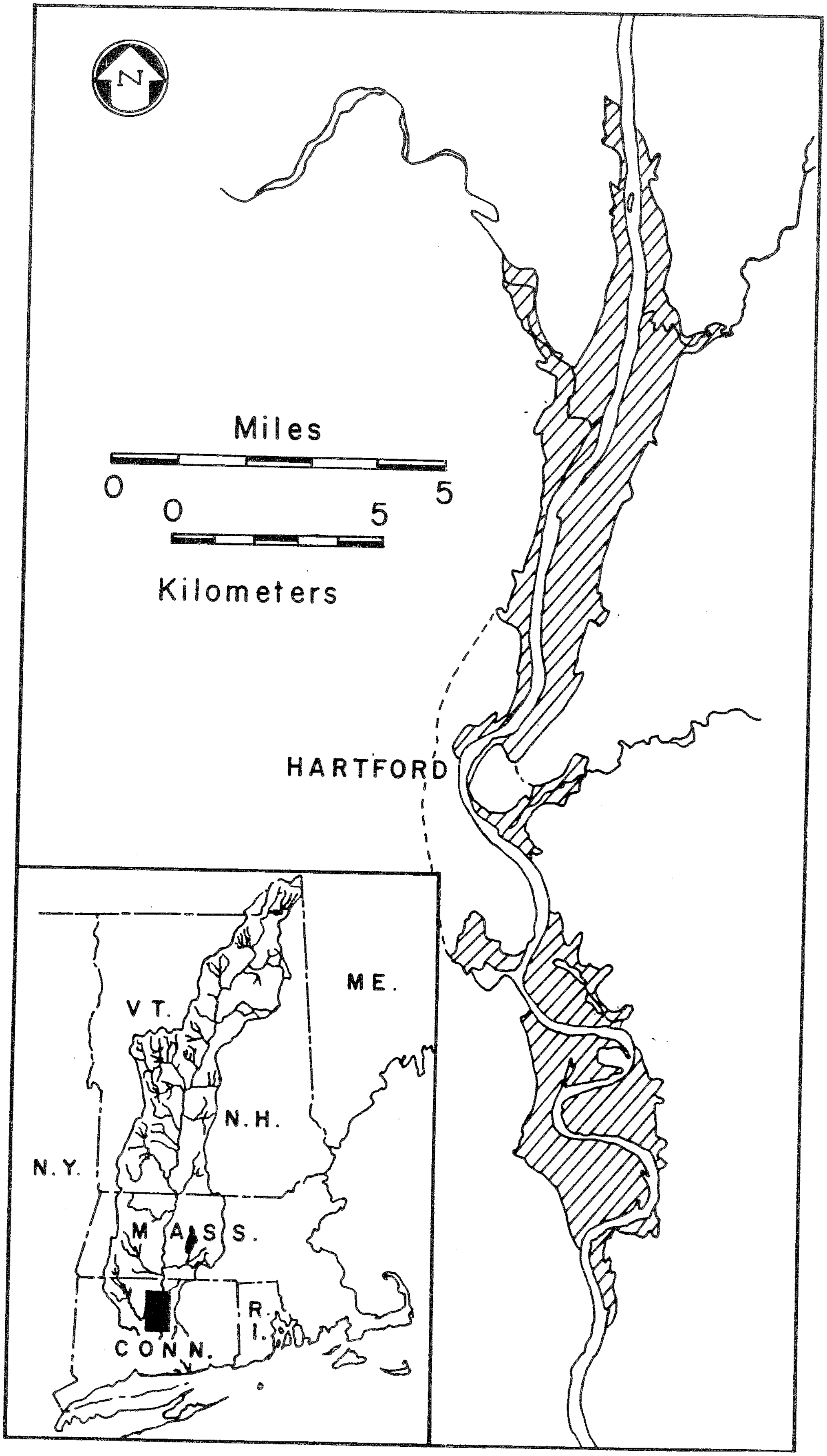


FIGURE 2

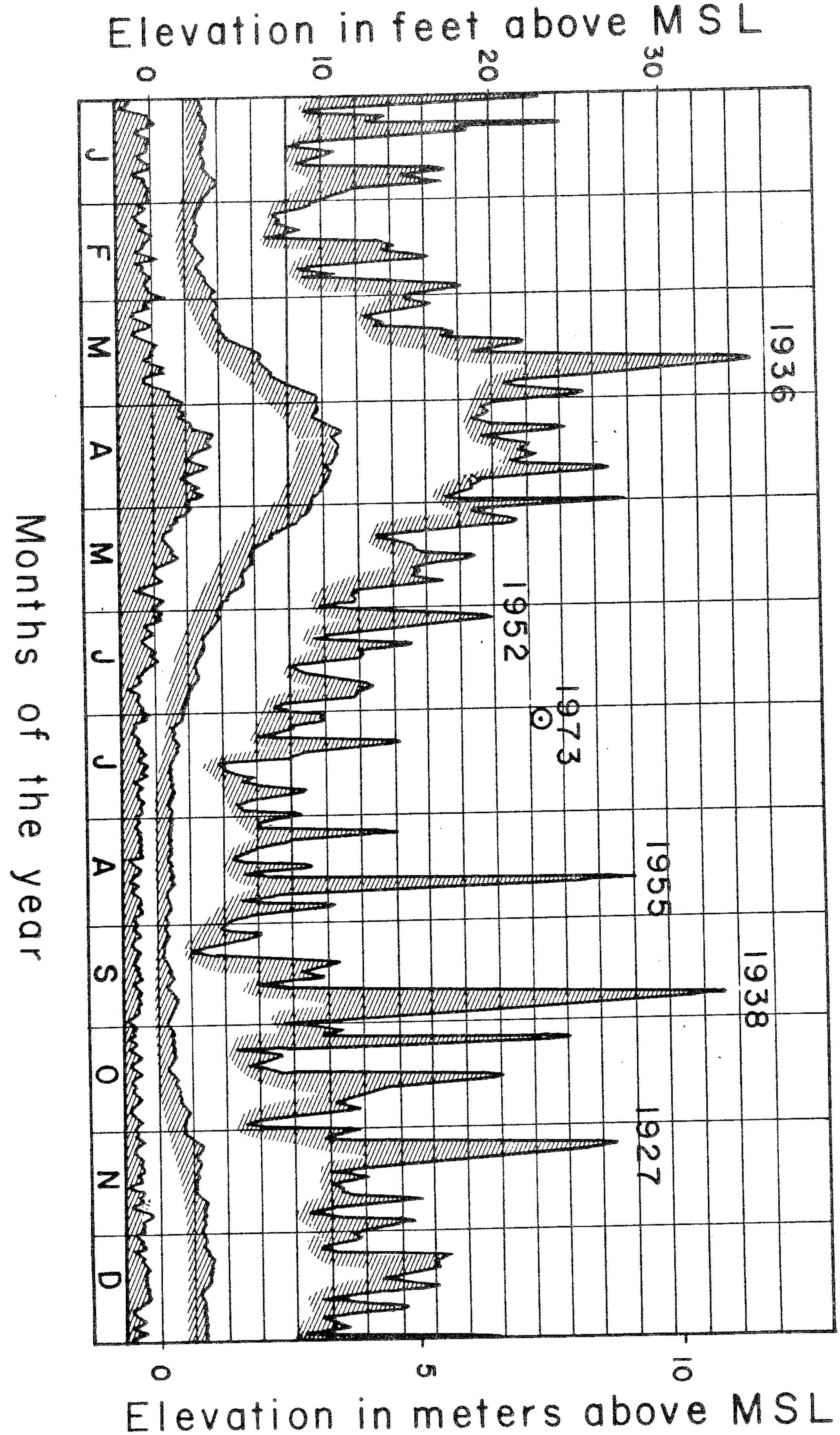
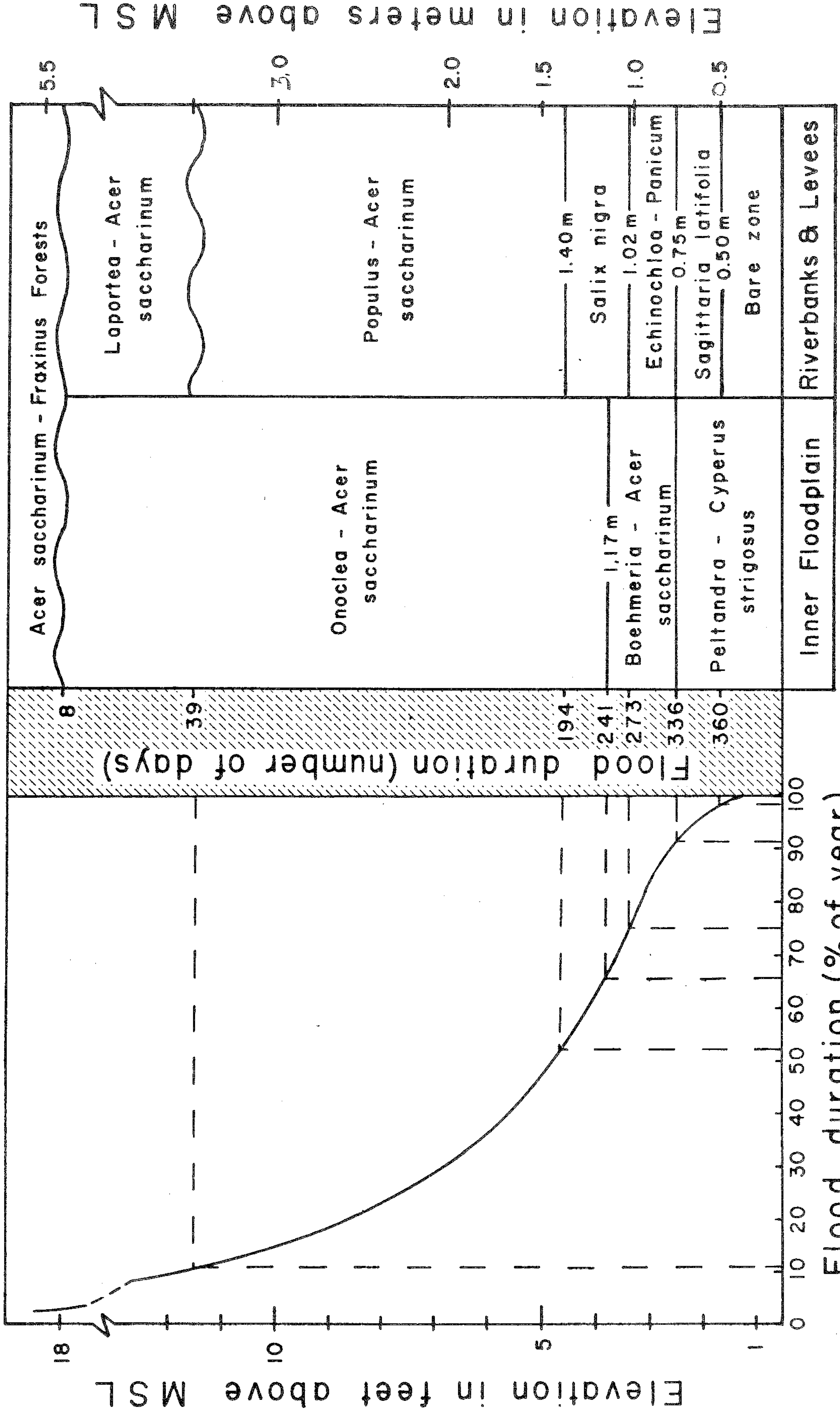

Elevation in feet above MSL
0
10
20
30
J
F
M
A
M
J
J
A
S
O
N
D
Months of the year
1936
1952
1973
1955
1938
1927
0
5
10
Elevation in meters above MSL

FIGURE 3



Elevation in meters above M S L
5.5
3.0
2.0
1.5
1.0
0.5
Acer saccharinum - Fraxinus Forests
Laportea - Acer saccharinum
Populus - Acer saccharinum
1.40 m
Salix nigra
1.02 m
Echinochloa - Panicum
0.75 m
Sagittaria latifolia
0.50 m
Bare zone
Riverbanks & Levees
Onoclea - Acer saccharinum
1.17 m
Boehmeria - Acer saccharinum
Peltandra - Cyperus strigosus
Inner Floodplain
8
39
194
241
273
336
360
Flood duration (number of days)
0
10
20
30
40
50
60
70
80
90
100
Flood duration (% of year)
18
10
5
1
Elevation in feet above M S L

FIGURE 4

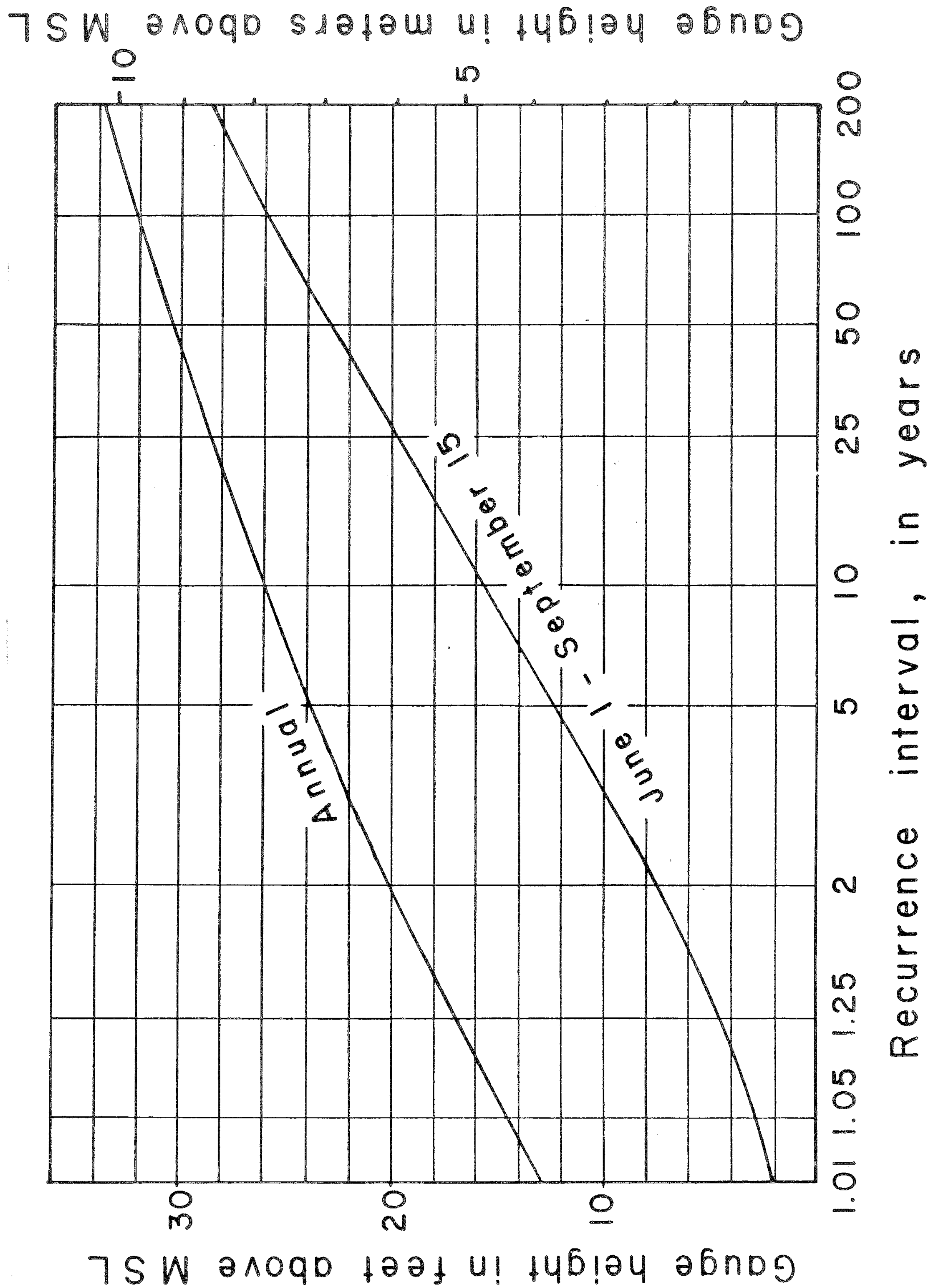

Gauge height in meters above M S L
10
5
200
100
50
25
10
5
2
1.25
1.05
1.01
Recurrence interval, in years
Annual
June 1 - September 15
30
20
10
Gauge height in feet above M S L

FIGURE 5

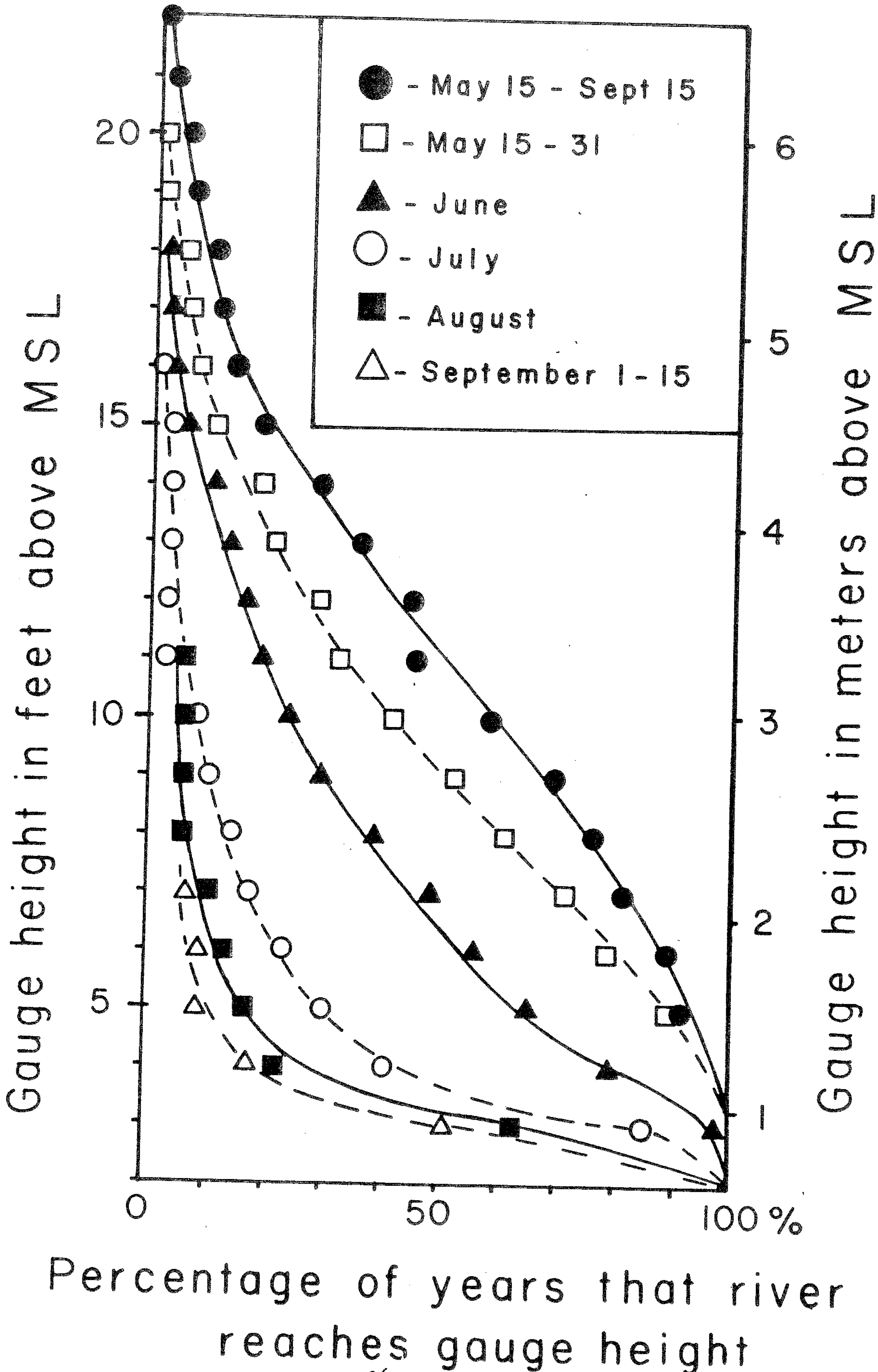

- May 15 - Sept 15
- May 15 - 31
- June
- July
- August
- September 1 - 15
Gauge height in feet above MSL
Gauge height in meters above MSL
20
15
10
5
6
5
4
3
2
1
0
50
100 %
Percentage of years that river reaches gauge height

FIGURE 6

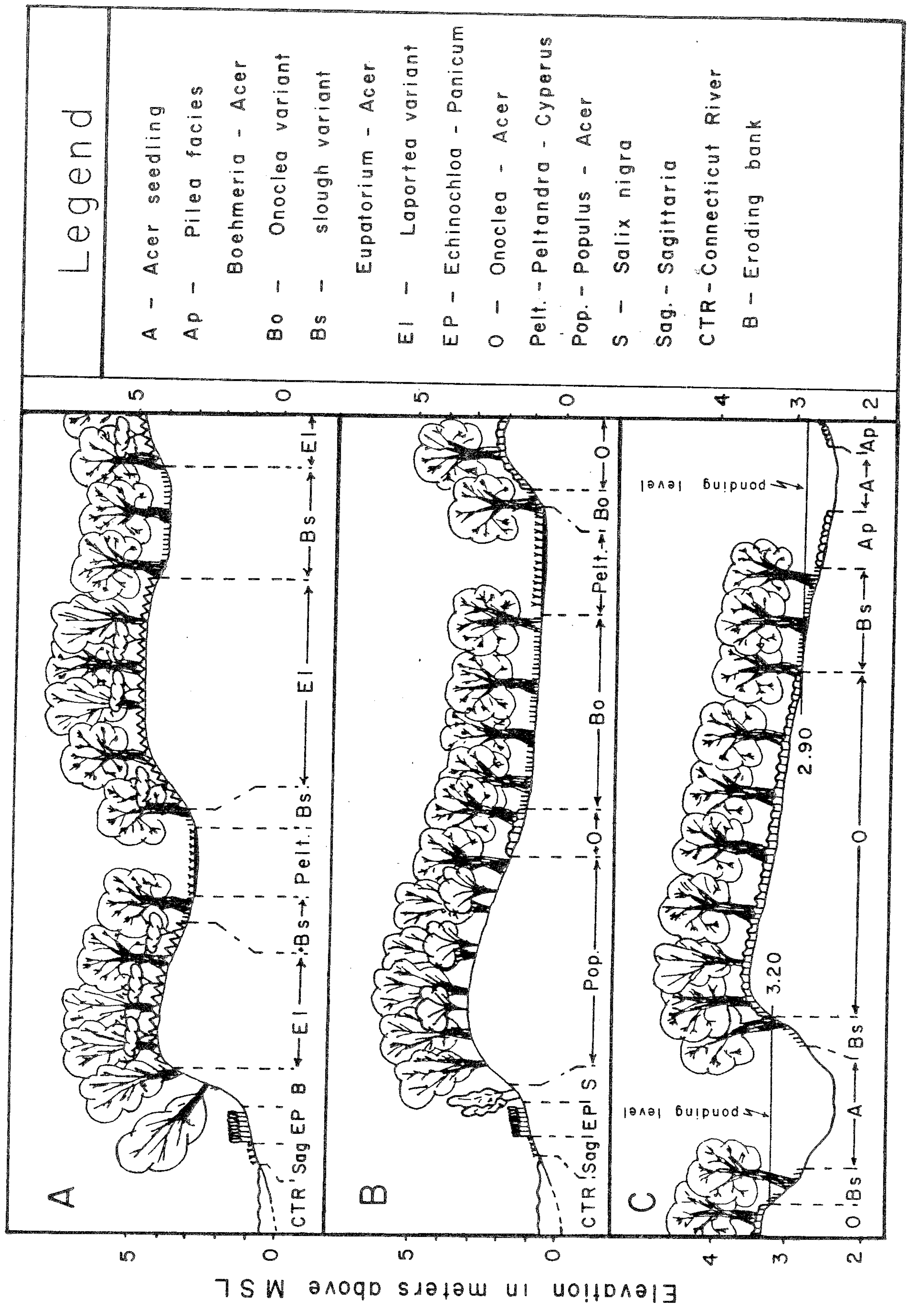
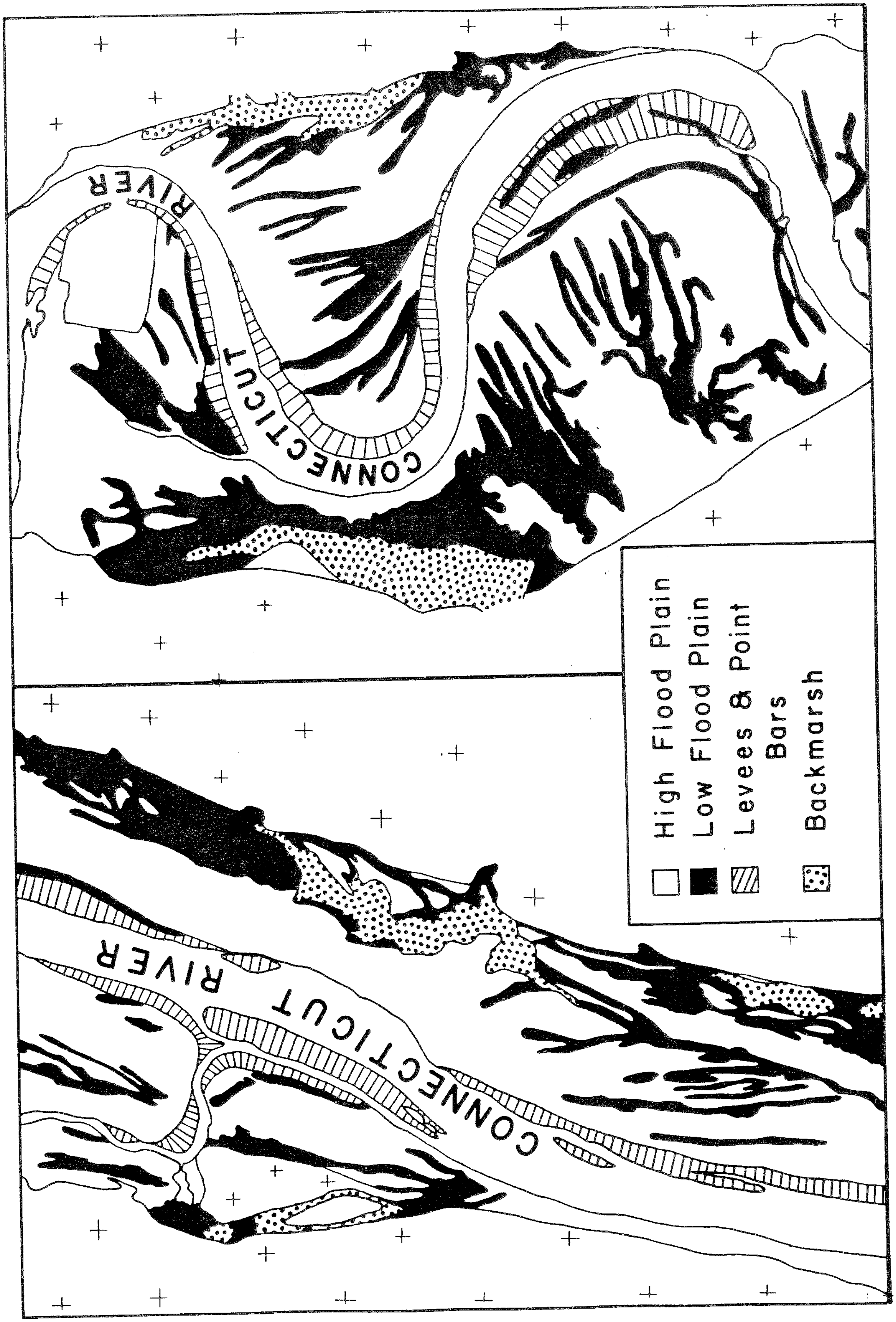

Legend
A - Acer seedling
Ap - Pilea facies
Boehmeria - Acer
Bo - Onoclea variant
Bs - slough variant
Eupatorium - Acer
El - Laportea variant
EP - Echinochloa - Panicum
O - Onoclea - Acer
Pelt. - Peltandra - Cyperus
Pop. - Populus - Acer
S - Salix nigra
Sag. - Sagittaria
CTR - Connecticut River
B - Eroding bank
A
CTR Sag EP B El Bs Pelt. Bs El Bs El
B
CTR Sag EP S Pop. O Bo Pelt. Bo O
C
O Bs A Bs O Bs Ap A Ap
ponding level
ponding level
3.20
2.90
Elevation in meters above M S L
5
0
5
0
4
3
2

FIGURE 7



CONNECTICUT RIVER
CONNECTICUT RIVER
High Flood Plain
Low Flood Plain
Levees & Point Bars
Backmarsh

About the Team

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a variety of federal, state, and regional agencies. Specialists on the Team include geologists, biologists, foresters, climatologists, soil scientists, landscape architects, archeologists, recreation specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area.

The Team is 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 activitis. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, sanitary landfills, commercial and industrial developments, sand and gravel operations, 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 officials 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. This request letter should include a summary of the proposed project, a location map of the project site, written permission from the landowner allowing the Team to enter the property for purposes of review, and a statement identifying the specific areas of concern the Team should address. 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 regarding the Environmental Review Team, please contact Jeanne Shelburn (774-1253), Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, P.O. Box 198, Brooklyn, Connecticut 06234.