

DELAWARE AND RARITAN CANAL STATE PARK

Design Guide



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Design Guide



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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
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PREFACE

The Delaware and Raritan Canal State Park presents some very special problems for development. The Canal Park is sixty miles long, passing through cities, suburbs, and untouched natural areas. Further, development of the park is expected to occur over a very long time and will be carried out by many different agencies within and outside of the state government. This guide, therefore, is intended to provide design principles which will lend harmony to development of any part of the park, by any agency or group, at any time. It will be used by the Canal Commission in reviewing projects for improvement of the park or of its immediate surroundings.

The Design Guide was prepared by the Canal Commission staff with help from several sources. The Landscape Design Department of Rutgers University gave focus to the project by preparing a precursor to the present guide. The planning firm of Andropogon Associates wrote an outline which became the structure of the guide. Fritts Golden, of the design firm Rogers, Golden & Halpern, prepared several of the sections and critiqued the entire work. The guide was designed by Lorraine Giordano; photographs are by James Amon. Copies of the Design Guide may be obtained from the Canal Commission, P.O. Box 1390, Trenton, New Jersey 08625.

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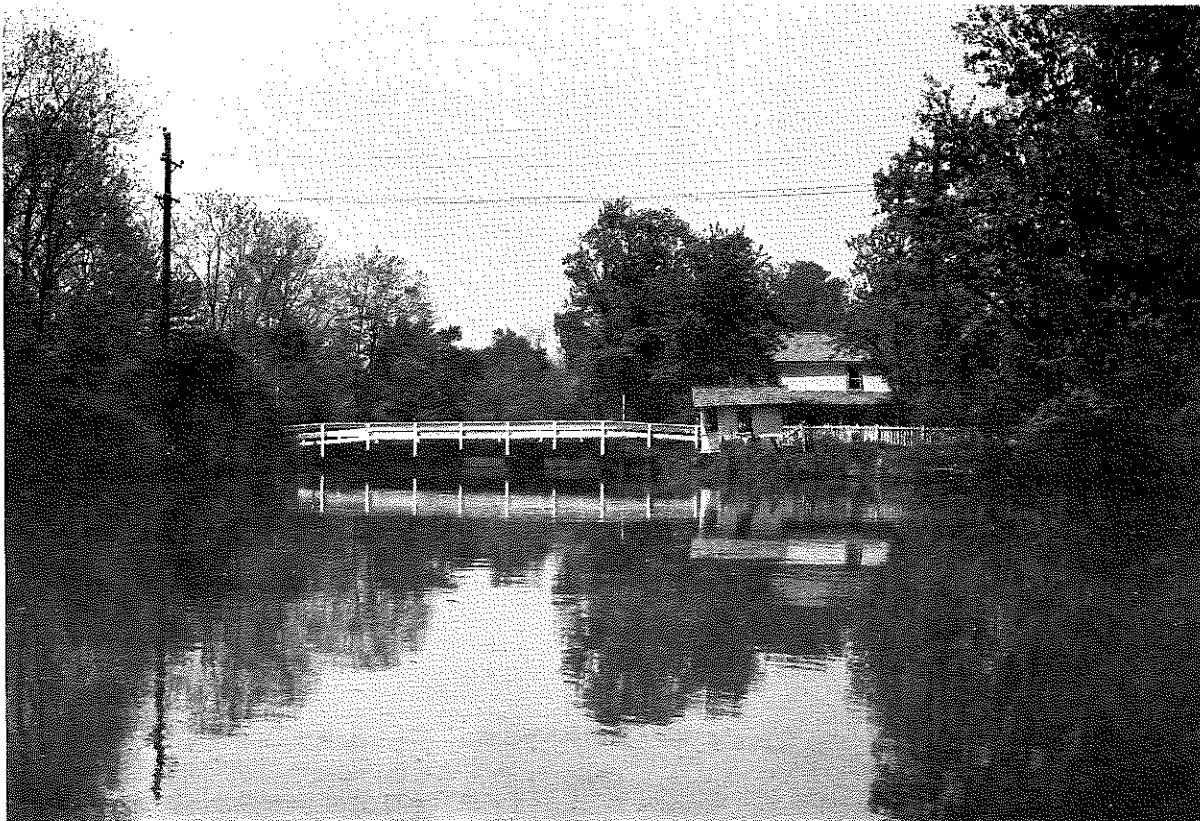
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I. PURPOSE AND USE OF THIS DESIGN GUIDE

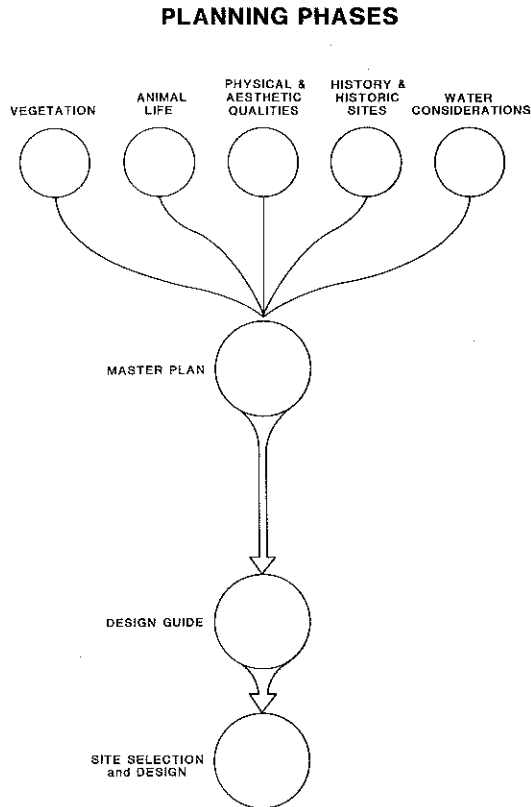
This guide is part of the ongoing planning process for the development and use of the Delaware and Raritan Canal Park. It is intended to provide definition to the goals for the Canal Park stated in the Master Plan, and to convey an image of the special qualities and ambience possessed by this unique park. If those people who effect the development and maintenance of the Canal Park can see that image—and add to it—then the park's potential can be realized.

This design guide outlines principles which are the basis for all site planning and design decisions for the Canal Park. It also gives examples of how those principles can be employed, but it is essential to view these examples as suggested solutions, not as the only way that a design problem can be solved. By not adopting rigid solutions we allow for a rich variety of specific designs within an orderly framework. Planning for the Canal Park is being done in phases, each of which are designed to come together in a comprehensive development plan. These planning phases are:

Inventory. Several studies, briefly described in Section IV of this design guide, establish a partial inventory of the Canal Park. In addition, the Master Plan contains a resource inventory which provides information on the components that comprise the Canal Park. A definitive inventory of something as large and evolutionary as the Canal Park can never be produced. A start or baseline has been made, however, and the Commission will continue to add to and update this information as the park evolves. This inventory is the basis for all planning for the park.



Blackwell's Mills



Evaluation and Program Development. It is not enough to just gather data about the Canal Park. That data must be evaluated and used in constructing a program to guide development of the park. The Canal Commission's Master Plan for the Canal Park points out that by evaluating the inventory data, the Canal Park can be divided into six environmental types: Urban, Suburban, Transportation, Rural, Natural, and Special Nodes. These environmental types are identifiably different, but are not totally separate. Together, they create the park's overall ambiance. The Master Plan's development program for the Canal Park then states the goals for the park and relates those goals to the environmental types, illustrating the different development needs of each environment. This program provides the framework that will guide individual site development, which is to be done in a manner such that each site will be integrated into the whole park.

Planning and Design. The Master Plan, inventory work, and evaluations which have preceded this design guide provide a basis for identifying demands which are and will be made on the Canal Park. This information, coupled with the principles outlined in this guide, allows for site selections, development plans, and designs which will harmonize with the park's environments and meet the long term goals for the Canal Park.

Actual design of each site will rely upon the master plan and the design guide but will be determined by the designers at the time of development. The master plan and design guide enable the Canal Commission to be a part of the design and review process in a constructive and non-arbitrary manner, as required by the legislative mandate of the Commission.

DELAWARE AND RARITAN CANAL STATE PARK

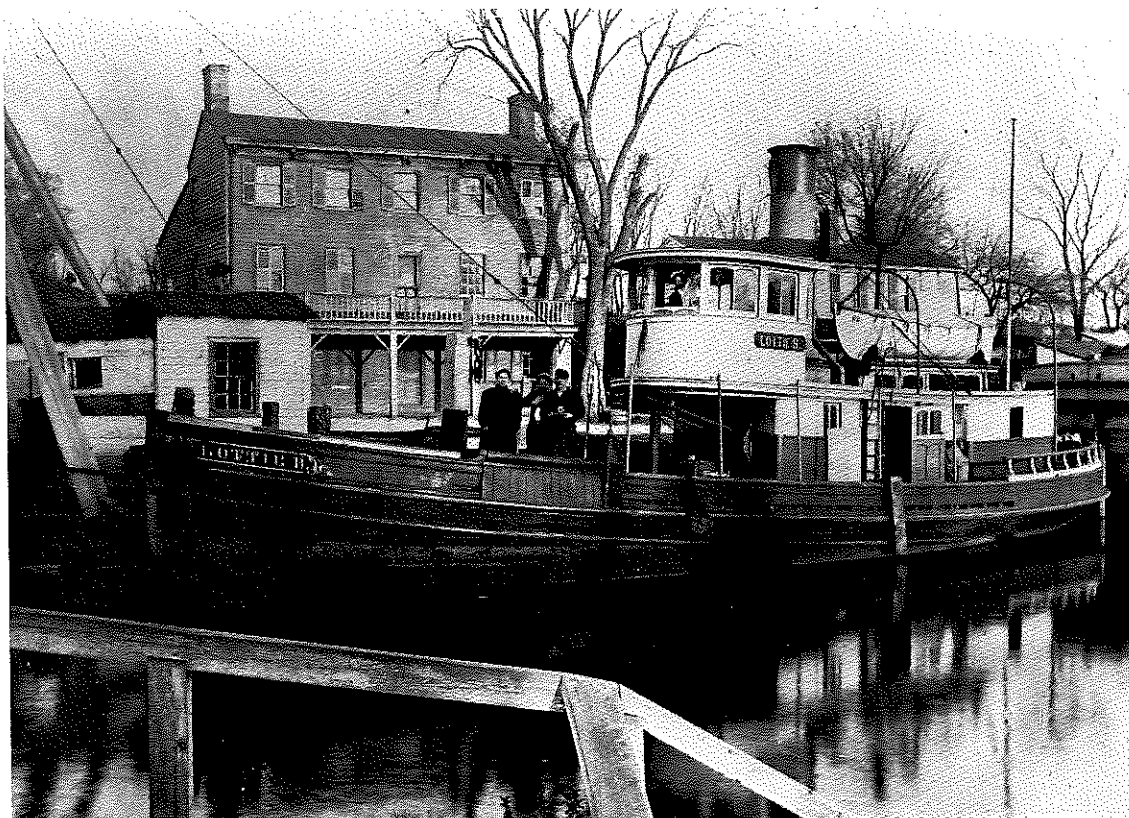
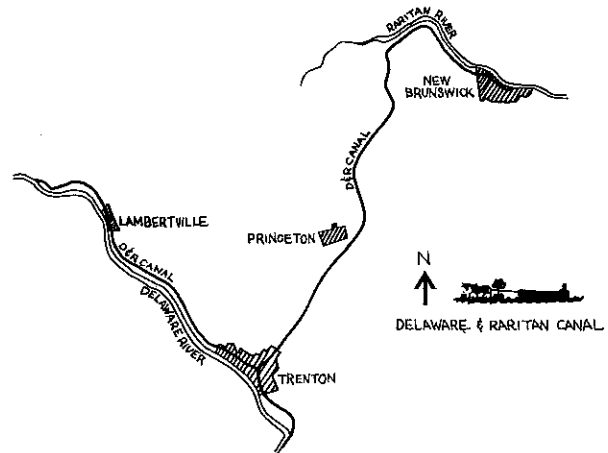
Master Plan



II. HISTORY OF THE CANAL

In June 1834, New Jersey Governor Peter Vroom and a party of dignitaries took a two-day ceremonial trip from Trenton to New Brunswick on the new Delaware and Raritan Canal. The Governor's delegation, which officially opened the canal, was met at every bridge and lock by crowds of cheering citizens. Their arrival was greeted by a twenty-four gun salute in New Brunswick, followed by a brass band-led parade through the city and a festive formal dinner. It had taken more than a decade for the State Legislature to grant a canal charter and it had taken almost four years for the laborers (mostly Irish immigrants) to hand-dig the sixty-six mile long canal.

Once opened, the D&R served for a century as one of America's busiest navigation canals. Its main function was to provide a link between New York and Philadelphia that was faster and less hazardous than the ocean route, yet cheaper than the railroads that were being built at the same time. The canal's path is across the narrow "waist" of the state. From its origin at the Delaware River near Bordentown it parallels the river into Trenton, from whence it continues northward along the Assunpink Creek, the Millstone River, and the Raritan River. It passes Princeton, Kingston, Griggstown, and South Bound Brook before it empties into the Raritan River at New Brunswick. Because it follows river valleys, the canal's route is surprisingly flat. Only seven locks were required to step up from Bordentown to Trenton and seven more to descend from Trenton to New Brunswick. To supply water to the canal, a feeder channel was built from the main canal in Trenton northwest twenty-two miles along the Delaware River to where it draws its water supply from the Delaware at Raven Rock. Shortly after it was opened, the feeder channel also became a busy navigation canal.



Alexander Road, Princeton. Photo courtesy of the Historical Society of Princeton

Delaware and Raritan Canal Park

Pennsylvania coal destined for New York furnaces was the main commodity carried on the D&R. In 1871, the peak year for total tonnage on the canal, 80% of the total was coal. The 1871 tonnage on the D&R was more than was shipped in any year on the longer and more widely known Erie Canal. Good times for the canal were short-lived, however. The D&R never showed a profit after 1892, as the railroads gradually took over almost all the shipping business. The canal stayed open, however, until the winter of 1932-33, when it was closed permanently to navigation.

Shortly after the canal was closed to navigation, the State of New Jersey took it over and, after restoring the feeder and the main canal from Trenton to New Brunswick, began to operate the canal as a source of raw water for farms, industry, and homes in central New Jersey. While it was operated as a source of water, it was also informally used as a recreation site for hikers, canoeists, and nature lovers. In response to increasing demands by concerned citizens, the State Legislature passed a bill in 1974 establishing the canal and the narrow band of state-owned land along its banks as a State Park.

III. THE CANAL'S ROLE IN NEW JERSEY LIFE

Examination of the canal's history shows that its economic impact on the State was minimal. Nearly all of the materials hauled on the waterway were going from Pennsylvania to New York. Trenton and New Brunswick benefited somewhat because they served as trans-shipment points and because they attracted some industry that relied upon the canal for transportation. Minor development also came at a few other spots along the canal's route, but nowhere can we find significant population or economic change in central New Jersey that is tied to the presence of the canal.

The cultural or social impact of the canal is hard to discern. The sense of connection with the outside world must have been increased by the canal; how else can we explain the otherwise land-locked community in Mercer County that called itself Port Mercer? Old photographs give evidence that the canal served from its earliest days as a swimming hole, a fishing and pleasure boating spot, and on Sundays as a promenade.

Paradoxically, the role of the canal in the life of central New Jersey is far more significant today than ever before. Almost one and a half million people have some amount of canal water in their home supply. Many industries depend on the canal water for cooling, and neighboring farms use it for irrigation. The use of the canal water and the inclusion of the waterway in a park assures that the primary benefit derived from it will be in New Jersey and not in neighboring states.

The Canal Park serves not only as a pleasant place for hiking or canoeing, but also as a major connector. It connects the rugged, hilly Piedmont part of the state with the flat Inner Coastal Plain, it connects the different vegetation and wildlife associated with these various environments, and it connects twentieth century New Jersey with its nineteenth-century past.



Smith's Mill near Stockton

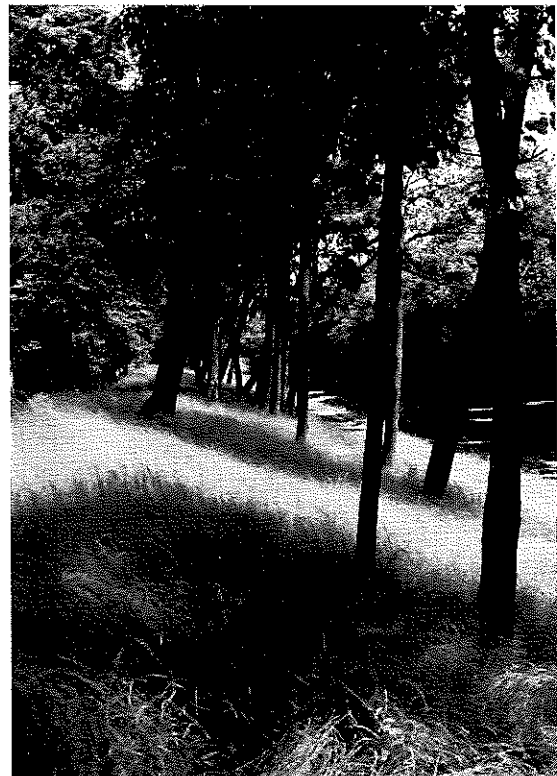
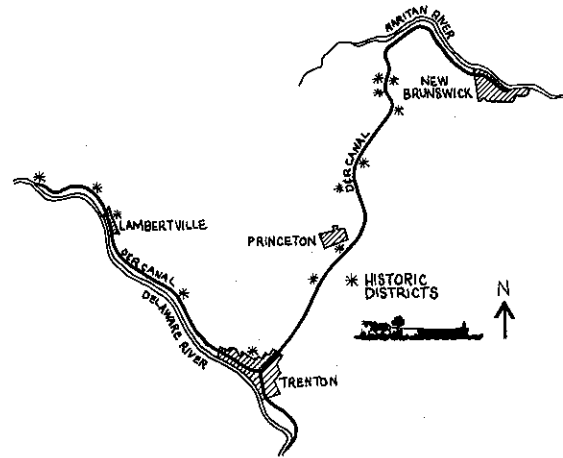
IV. REVIEW OF PREVIOUS CANAL PARK STUDIES

Park design must be based upon an understanding of the many qualities of the park which make it special and which establish its character. To facilitate this understanding, the Canal Commission has had several studies made of the Canal Park and its environs. The following is a list of those studies with a brief summary of their findings and recommendations. (They are all available for study in the Commission's office.)

Architectural history. In 1973, the canal and seventeen related structures--bridgetenders' houses, tollbooths, etc.--were placed on the State and Federal Registers as historic sites. Over thirty privately-owned structures that adjoin the park are also on the State Register, as are five adjacent or nearby historic districts. A study of the historic architectural qualities of the Canal Park was presented to the Commission in October, 1977; it reaches two principal conclusions. First, the special qualities possessed by the Canal Park as an example of nineteenth century engineering and architecture are created equally by the canal's surviving artifacts and by the relationship between the canal and its neighboring communities. Second, every important American architectural style from late eighteenth century to the present is represented by at least one structure of outstanding significance. It was recommended that the Commission carry out a detailed survey of the Canal Park's artifacts in order to be sure that valuable structures are recognized and appropriately dealt with in park development. It was also recommended that fourteen areas adjoining the park be surveyed and registered as historic districts. In August, 1979, the Commission began a project which will include a detailed survey of the Canal Park and nomination to the National Register of Historic Districts for nine of the fourteen communities.

Vegetation. Aside from the canal, the most dominant feature of the Canal Park is vegetation. The trees and shrubs--even the poison ivy--that line the canal banks are almost as important as the waterway itself in creating the park. In the Spring of 1977 the Canal Commission received a report on the vegetation in and adjoining the park. This report describes and maps twenty-eight segments of the Canal Park, each with a number of sub-segments based upon vegetation communities. These communities are described and attention is given to an assessment of community dynamics and management recommendations. By consulting this study, one can find what plants are present (at canopy, understory, shrub, and herb levels), and what the effects of these species are on park use. The study could also be turned around; by starting with a desired use, one could determine what native vegetation should be planted or encouraged. Perhaps the single most important recommendation in this study is that management practices will have to be introduced in order to preserve a diversity of vegetation communities. The park is principally a site of "disturbed soils," a place that reflects man's influence rather than natural evolution. By allowing "nature to take its course," the Canal Park is in danger of becoming a uniform series of similar woody thickets. Meadows must be mowed to keep the meadow flowers, and encouragement will have to be given to desired species.

Visual assessment. In connection with a study done to develop the Commission's land-use regulatory program, an analysis was made of the vistas from within the park to surrounding areas. One map was made which highlights the significant views from the park. A series of strip maps were also prepared which show the visual range from the park boundary.



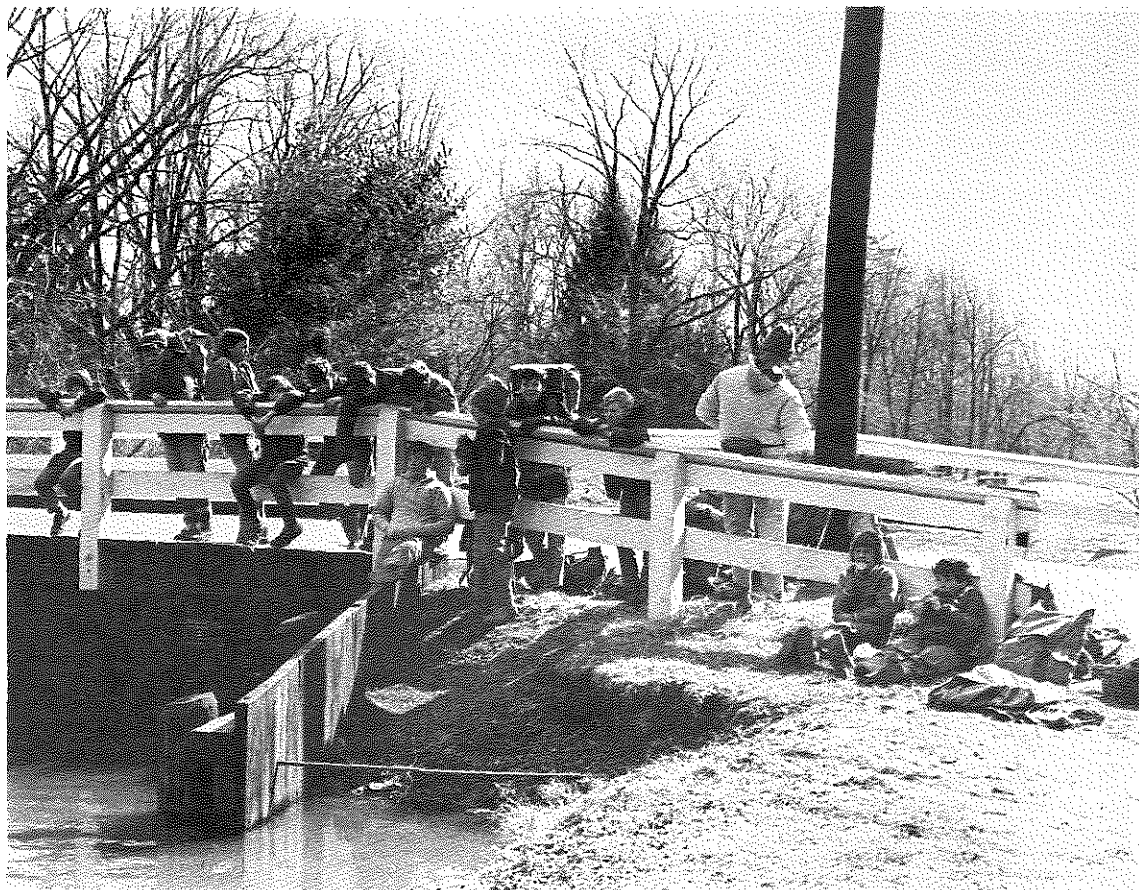
Lawrence Township near Port Mercer

Land use and municipal zoning. A number of studies have been made which give information about land use adjacent to the Canal Park: 1) the Commission has prepared composite zoning maps for all areas adjoining the park's borders; 2) a map shows built-up areas in the park region, along with roads, railroads, and points of access to the Canal Park; 3) master plans of all contiguous municipalities have been gathered, examined, and filed; and 4) a vegetation study shows the groundcover (including structures) of the land within the drainage area of the park. Specific recommendations cannot emerge from these kinds of studies, but an essential element in park development is that the development must be compatible with the surrounding area. Trying to establish a wilderness park, for example, would be impossible in an area that is densely developed with extensive road crossings of the canal, or in an area that is zoned for dense development.

Water quality and quantity. A comprehensive hydrologic analysis of the canal was completed in 1979. This study also included some basic data on the quality of the canal water. Further water quality assessment is an ongoing project.

Canal Park Master Plan. A master plan for the development of the Canal Park was adopted in May 1977. The master plan establishes goals for the park, delineates environmental types, and sets out the range of development appropriate for each type.

Specific design proposals for the Canal Park should rely upon the information in the above studies. The Commission expects any design to make use of these studies where appropriate or explain why the information was not used.



V. DESIGN PRINCIPLES

INTRODUCTION

The Delaware and Raritan Canal is a man-made structure; its straight reaches and regular width, its built-up embankments, the hand-laid stones lining the banks, the spillways and locks, and the culverts taking streams under the canal are all clear indications of the canal's manufacture. Yet the canal is thought of as part of a natural setting to such an extent that the Canal Park Law of 1974 even refers to wilderness areas within the park, implying that there are areas with absolutely no evidence of man's impact.

The harmony between the man-made features of the canal and its natural setting dominates the character of the Canal Park and should be understood and fostered in designs for park equipment. The experience of park users can be enriched if they understand this relationship. Planners for the park's development will be successful if they understand and work with the delicate balance to be struck between nature and the impact of man's hand.

The man-nature relationships in the park are made more complex because the canal passes through many different kinds of natural settings, and each setting has evoked its own way for man to build. The principal difference in the natural setting is that most of the main canal flows through the physiographic region known as the Inner Coastal Plain, which is quite flat, while most of the feeder courses the hilly Piedmont region. These regions have different profiles and they also support slightly different plant communities, which in turn support different wildlife communities. Distinct patterns of development in these two regions are also easily seen. The hilly Piedmont is sparsely populated and remains, except in pockets, mostly forest. The flat Inner Coastal Plains land is, by comparison, better for farming and easier to develop. Consequently it is more densely populated, both with towns and with a greater number of suburban homes and rural farms. The Inner Coastal Plain that is not developed--except in the floodplains of the rivers--is mostly open pasture or farm fields. The future development of the Canal Park should reflect the differences fostered by the physiographic changes.

Different architectural styles reflect different historical patterns in the two regions. The rich, flat lands were developed first, so the historic architecture here features Greek Revival or Federalist styles from the 18th and early 19th centuries. The thin, rocky Piedmont soils were turned to after the easier to farm soils were already occupied. The architecture of Stockton and Lambertville, therefore, is predominantly Victorian--from the late 19th or early 20th centuries.

In developing the Canal Park, the designer must be sensitive to historic antecedents in the surrounding areas and should employ design elements that are harmonious with the character of the site.

Another, more subtle example of the relationship between man and environment can be found along the canal where it enters a city. Especially in Trenton, where the canal has been enclosed by a fence, one can see vegetation patterns that show natural succession in an area that has been severely disturbed. Mexican Bamboo, the mulberry and sumac trees, are all hardy plants that can thrive in scraps of neglected, disturbed soil.



Trenton from the Hanover Street canal bridge

Their establishment is testimony to the fact that fixing up the canal in the city need not depend upon establishment of exotic, flowering, nursery-bought plants or the extensive use of concrete. Why create enormous maintenance problems when occasional mowing and selective cutting will allow handsome, maintenance-free native or naturalized plants to thrive?

The underlying theme of the design principles that follow is that **an understanding of the relationship between man and his environment is critical to the prosperity of man.** The Canal Park is a showplace for many of those relationships, both historic and present-day. New designs for the park must harmonize with the natural and man-made features that have been established over the century and a half of the canal's history. Development must maintain or enhance the Canal Park's emotional appeal, and not be unnecessarily elaborate or intrusive on the natural and historic character of the park.

None of the design principles in this guide relate to the need to operate and maintain the canal as a source of water. Consideration of that need is essential, but the purpose of this guide is to deal with the park uses of the canal. Information on the water supply issues can be obtained from the Department of Environmental Protection's Division of Water Resources or from the Canal Commission.

The design principles that follow are divided into two groups--those that apply to the Canal Park as a whole and those that apply to development for individual park uses. The general design principles should be read first before going on to the specific principles which relate to specific activities.

GENERAL DESIGN PRINCIPLES

General principles which outline the philosophic basis for Canal Park designs are:

1. The chief role of the Canal Park is to serve as a connector.
2. Development should respect and enhance the existing environment.
3. The introduction of new design elements should be limited.
4. Architectural and landscaping materials should be suitable for their intended use and appropriate for their intended site environment.
5. Daily maintenance and management of the Canal Park should reflect the guidelines set forth here for park development.
6. Any development in or immediately adjacent to the Canal Park becomes, in effect, a part of the park and should reflect the park's amenities.

These principles are elaborated below.

1. The chief role of the Canal Park is to serve as a connector. A fisherman finds a pleasant spot along the canal, unfolds his canvas chair, and settles down to pleasant daydreams and fishing. Most canal users, however, are on the move. Canoeists, joggers, hikers, horseback riders, and bicyclists move past the sedentary fisherman, all going somewhere. Sixty miles long and mostly only about a hundred feet wide, the park is a ribbon moving across central New Jersey. It can bring a strip of countryside into the city just as it can bring a canoeist from rural Hopewell into downtown Trenton. It connects the floodplain forests of the Assunpink with those of the Stony Brook, Millstone and Raritan Rivers. It connects the state park at Washington Crossing with Trenton's Cadwalader Park. It connects different people, as all respond to the compulsion to seek and enjoy natural settings. The canal also connects the 20th century with its 19th century heritage.

The most important point to be derived from this principle is that **if the Canal Park is to connect, it must remain unbroken.** If bridges cut off the continuity of the towpath or are so close to the waterline that canoeists cannot go under, the bridge stops the recreation connection. If development fills the open space surrounding the park, the corridor connecting between city and countryside is destroyed. If the canal's historic structures are destroyed or replaced, the connection with New Jersey's heritage is lost. These connections must remain intact and, where possible, be strengthened.

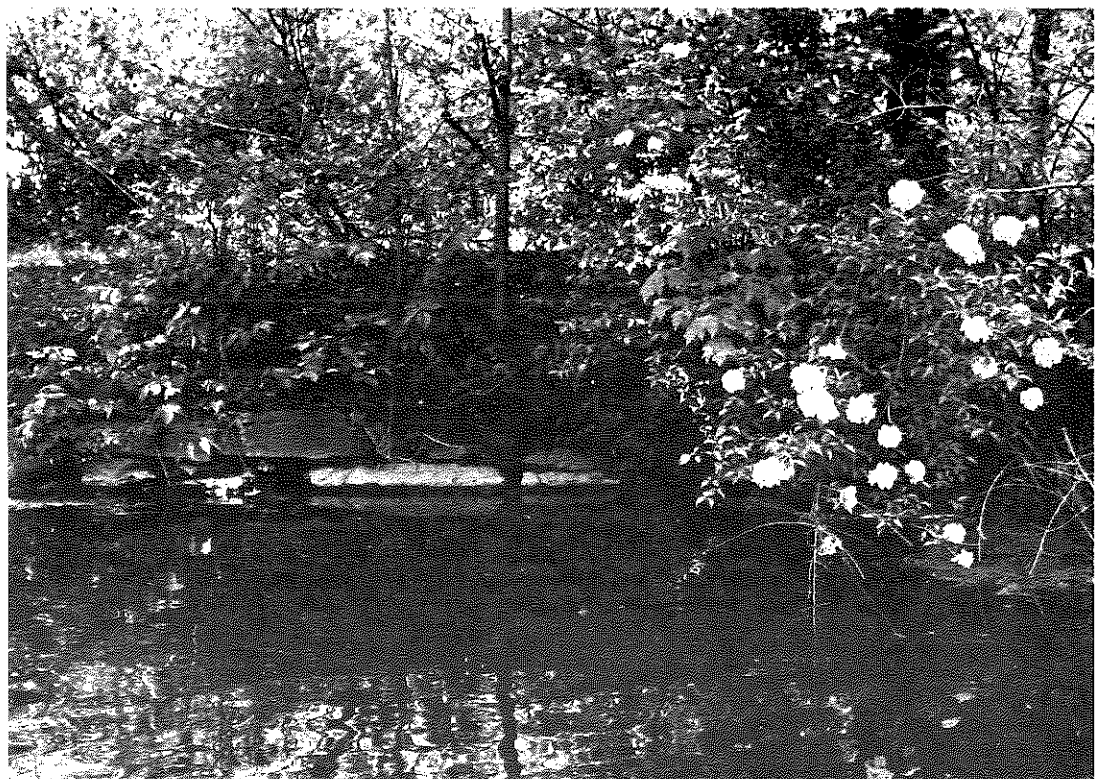
Before development in the park can take place, it is essential that the planner have a sense of what is being connected and how the proposed development fits into the whole park. The location of parking lots, access bridges, benches, or canoe docks should all adhere to this design principle.

Another important point derived from this principle is that **differences must be fostered or else there will be no need to connect things.** In some cases, differences in vegetation will naturally contrast with each other and provide a diversity of experiences. For example, a sunlit open meadow may provide relief from the shady enclosure of forested areas. In other cases, these contrasts must be provided by manipulating the vegetation. Similarly, areas should be provided that are suitable for activities of different scale. For instance, large-scale picnic areas are appropriate in some places, while intimate, informal spots for picnicking should be made available elsewhere.

2. Development should respect and enhance the existing environment. In the spring, families of mallard ducks are often seen on the canal within the City of Trenton. Ducklings swim in tight formation next to their mother while the father swims and flies all about, trying to lead people away from his family. The backdrop to this bucolic scene is often a narrow but dense curtain of trees and brush which creates a natural setting within the heart of the city.

Breeding ducks and dense thickets are delightful contributions to the rich fabric of the city, but they must not lead a planner to assume that the Trenton portion of the Canal Park can or should become a wilderness area. When it is in Trenton, the Canal Park is an urban park; it is a thin band of open space with water and trees that contrast with the surrounding development. **The goal of the planner must be to integrate adjacent elements within and near the park, not to isolate them.**

In the rural parts of Somerset County through which the canal flows, the Canal Park is a part of a large network of natural areas. Development of the park here should be quite different from Trenton. Rural or natural sections will have less intensive use, require fewer access points, and emphasize natural rather than man-made beauty.



The principle of enhancing the existing environment is also applicable on a smaller scale. Structures such as turning basins, cobblestone spillways, or arched stone culverts can be highlighted. Planners should look for special vistas from the park to be enhanced. This can be done with selective clearing of vegetation. The potential for connecting the park with municipal or county parks also must be realized. The Commission hopes that adjacent municipalities and counties will develop their own parks adjacent to the Canal Park and that they make the canal a focal point of activity.

It has already been noted that the man-made canal is often thought of as a natural waterway. The chief reason for this is that a hundred and fifty years have greatly softened the initial construction scars. But another important reason is that man's fabricating hand was lightly applied to this project. Materials were those readily available. The canal was constructed in a place and manner that required a minimum amount of special construction. Natural phenomena--most notably flat river floodways--were used to advantage rather than fought against. **New development must rely on the least intrusive means of achieving its ends in order to perpetuate the ambiguous image of the canal as being man-made yet natural.**

3. The introduction of new design elements should be limited. The stone rip-rapping that lines the canal was put in to protect the banks from the wake of steam tugs which replaced many of the barge-hauling mules. The tugs were allowed to speed along at 8 m.p.h.; thus the banks needed to be protected from erosion. The locks were engineering solutions to the problem of taking a boat up or down to accommodate the natural change in land elevation without a rapids or falls, which make a natural waterway impassable. The cobblestone spillways were constructed to maintain a constant water level in the canal by diverting excess water to neighboring streams. The locktender and bridgetender houses were built as simple structures which



allowed the canal workers to be ever ready for the passing barges. These and many other structures make the canal an outstanding example of 19th century engineering practice. As design elements, these features give the Canal Park its special character. When **new features must be introduced into the park they should rely upon historic design elements and solutions wherever possible.** This is not just a way of saying that the existing features should be saved, but also that they can suggest solutions to contemporary design problems.

Fishermen have frequented some spots along the canal to such an extent that these spots have become bare, resulting in erosion and bank slump. What better solution, then, than rebuilding the rip-rapping and perhaps even adding a patch of cobblestone or other suitable decking to the bank top? This is better than a concrete slab or attempting to deny use of the spot to fishermen.

Locketender or bridgetender houses can be used for park purposes. They can become information centers, community gathering points, or--as in Kingston--canoe rental spots. The Commission has already worked with the Bureau of Parks to develop canoe launching docks that can be made a part of the bridges crossing the canal. The bridges, themselves, are generally of a recognizable type and should be the starting point for design of other bridges or replacements when necessary.

Another important consideration limiting design elements is long-term maintenance. The more elements added to the park, the more there is to keep up and repair. This should not dissuade a designer from proposing needed elements, but the proposal must realistically deal with the longer term demands an element will make on the park administration.

4. Architectural and landscaping materials should be suitable for their intended use and appropriate for their intended site environment. The built and natural environments of the canal and its environs, and the canal's history, suggest limits on the materials which should be used in the park's development. Clearly, wood and stone are prime materials. Many people may have a vision of a Tudor half-timber building--a vision of the house that Shakespeare was born in--as the ideal structure for a park. Although thatched roof and white stucco between dark timber are widely recognized symbols of rustic architecture, they would be incongruous in a setting where Greek Revival or Federalist architecture predominate. Others, mindful of the potential for vandalism of public facilities, would argue that all toilets, picnic shelters, and even picnic benches should be made of steel and concrete and be bolted down. The use of concrete for picnic benches, although it may be appropriate in some circumstances, is obviously not appropriate for all parts of the park.

Of equal importance is the need to select landscaping materials that are appropriate for their use and their site. Trees are often planted to screen an undesirable structure. If, however, an inappropriate type of tree is selected, the result is likely to be that the screen is ineffective or is as undesirable as the structure. Scotch pine trees provide year-round dense foliage, but a row of Scotch pines in the Millstone River floodplain would be as out of place as a replica of Shakespeare's home used as a park information center in Lambertville.

*Griggstown*

It must be understood that this design principle does not mean that only one material can be used for one type of use. A picnic bench for an urban area is quite likely to be different from a picnic bench in a rural area, just as plants native to an urban lot are likely to be different from those in a floodplain forest.

5. Daily maintenance and management of the Canal Park should reflect the guidelines set forth for park development. If a sandbar develops in a section of the canal, one approach to the problem can be to cut down all the vegetation separating that part of the canal from the roadway so that a clam-shell can move up and down freely, dredging the canal. The job can still be done, albeit with somewhat more difficulty, by leaving any significant trees and working around them.

The decision to mow a meadow once a year means that it will remain an open meadow, filled with wild flowers. By ignoring it, the meadow will gradually evolve into a forest.

The space between the towpath and the canal can be treated in different ways. It can be cleared and regularly mowed, thereby restoring the historic profile. It can be selectively cleared to leave major trees which will shade the path and the water, as well as frame views onto or from the water. Or, it can be allowed to develop into a thick growth of trees, shrubs, vines, and grasses to separate the path from the water, emphasizing the tunnel-like experience for both pedestrians and canoeists.



In the past these decisions have been essentially dictated by the need to maintain and manage the canal as a waterway and water supply, yet such decisions are important to the character of the Canal Park as are the more formal decisions reached through the planning and design process. All decisions which have a significant impact on the Canal Park must be in harmony if the park is going to have a unified appearance.

6. Any development in or immediately adjacent to the Canal Park becomes, in effect, a part of the park and should reflect the park's amenities. An opportunity exists for the Canal Park and its neighbors to benefit from each other. The park provides open space and recreational amenities all along its length. Adjacent developments can benefit from and benefit the park by use of designs which are sensitive to its amenities.

*Lambertville*

A small shopping center, built a few years ago along Easton Avenue near the City of New Brunswick, failed to take the park into consideration in its design. Many things can cause a shopping center to fail, but if this development had recognized the neighboring canal and state park, and enhanced the park as part of the shopping experience, it may have been more successful. The buildings are only about a hundred feet from the Canal Park, but the view from the park is of a long concrete block wall, broken only by occasional loading docks or trash storage areas. The center has never had all of its stores rented, so it has been an aesthetic intrusion on a state park, a commercial failure, and a disappointing source of tax revenue for Franklin Township.

Aesthetic intrusion and drainage problems create an impact on the park that is as important as what is done within the park boundaries. In Ewing Township a small stream enters the canal after it has passed near a group of recently built townhouses and apartment buildings. The residential development was done with little concern for erosion problems generated by the construction and the stream has brought an enormous amount of silt into the canal. The silt is a pollutant which makes the canal look muddy, it covers aquatic vegetation needed by fish as a food source, and creates sandbars that restrict the canal's flow.

Because of problems of this nature, the Canal Commission has developed a review process to regulate development in order to minimize its harmful impact on the park. More information about this review program is available from the Commission. It can be noted here, however, that the review program is designed to protect the park as it is now and as it is planned in the Master Plan.



The Millstone River near Rocky Hill

SPECIFIC DESIGN PRINCIPLES

Water and Water's Edge



Boating

Canoeing in the canal is not a challenge. There are many streams in the area that demand experience and vigilance of canoeists, but the D&R is not one of them. Instead, the D&R offers serene pleasure. The canal has no rapids, the current is moderate, the tree-lined banks prevent a crosswind from being a serious opponent, and the straight path eliminates the need for sharp turns. Travelling with the current, one can glide effortlessly through the tunnel of green and blue, looking for a gull, or a family of ducks that live along the canal. It is possible to soundlessly sneak up on a mud turtle sunning himself on an overhanging branch, until this fearful creature scurries into the water when he discovers that he is watched. Only from the water can you get the full effect of the sunlight filtering through the trees, sparkling in patterns on the water, then reflecting to the underside of leaves which dance with the moving light.

Travelling by kayak, canoe, or small rowboat is not only an end in itself, it is also a good way to enjoy other activities. It is an excellent way to see the many historic structures and districts that adjoin the Canal Park. By boat, it is easy to reach little used parts of the park in order to have a secluded picnic. Fishing from a boat is another obvious connection between boating and other activities.

DESIGN CONSIDERATIONS

Water and Water's Edge

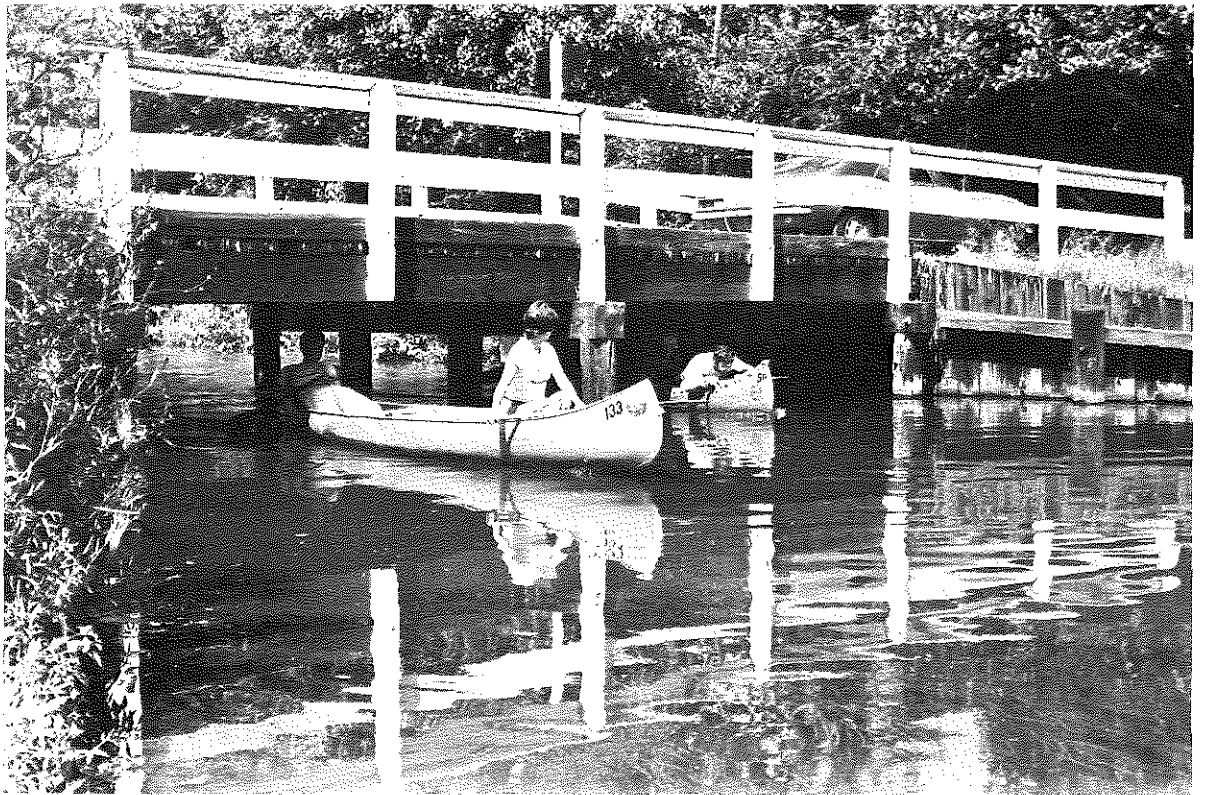
Boating

- provide adequate headroom at bridges
- keep waterway free of obstructions
- locate boating docks at access points and activity areas
- provide snubbing posts at appropriate points
- provide signs visible from water where appropriate (e.g. at historic sites, portages, rest areas)
- provide portage paths where appropriate
- provide steps at portage sites

At present there are four privately-operated businesses along the canal that rent boats by the hour. Such rental agencies are a way of allowing people who do not own boats to enjoy this activity. There is no need for the state to take up the boat livery business if it is properly and adequately done by private operators.

Docks must be placed along the entire length of the canal in order to make it easier for people to get into and out of canoes. Two types of docks have already been designed by the New Jersey Bureau of Parks and approved by the Canal Commission. (See Appendix A.) The first is designed to be built into the wooden fender that accompanies most of the bridges over the canal. The second can be constructed at any place along the canal where it would be used. In addition to access points where people will be starting or ending boat trips, this dock should be built at places where people will want to stop for a picnic, for camping, or to see a particularly interesting sight along the canal.

Bridges, pipes, or any other structures in or over the canal must accommodate the passage of small pleasure boats. Since 1934, when the canal was closed to commercial traffic, several bridges have been built which are too low for the passage of small boats. At some places pipelines cross the canal at a height that makes them obstacles to canoeists. A United States Geological Survey gauging station at Lower Ferry Road has structures in the canal that force boaters to make a short portage. Henceforth, all such structures must accommodate the use of the canal by recreational boaters.



Tributary or nearby parallel streams can also be used by boaters; proper development should be made to enhance their use. The Millstone River parallels the canal from Kingston to where it joins the Raritan River near Ten-Mile Lock, a distance of about fourteen miles. Except during periods of low flow, the Stony Brook, which is near the canal in Princeton, is navigable upstream for a long distance. Neither the Delaware nor Raritan Rivers are suitable for novice canoeists, but both are easily accessible. Several other nearby streams could also be used by people boating on the canal. In some cases all that is needed is a sign indicating the extent to which a tributary is navigable. In other cases a dock, a sign (for instance, indicating a portage of 300 feet to the Millstone River), some steps in the flood-guard embankment, and a path would be needed. By relating the canal to these other streams the boater has many options available and his experience can be greatly enriched.

Development of other facilities can enrich the boater's experience. We have already mentioned the need for docks at isolated picnic or camping areas. It is important to plan the development of these kinds of facilities in order to add to the activities available to boaters. Docks and snubbing posts should be available at historic sites, grocery stores (so the boaters can stop for soda or a snack), and ball fields.



Swan Creek spillway in Lambertville



DESIGN CONSIDERATIONS

Water and Water's Edge

Fishing

- provide flat spot for chairs at appropriate sites
- clear vines, and overhanging vegetation that could snag lines
- avoid power lines
- provide pedestrian walkway on bridges, wide enough to accommodate chairs and easy movement
- secure the canal's edge to provide safe footing
- protect canal banks from erosion

Fishing

On successive weekends in April and May, several thousand trout are stocked in the section of the canal that parallels the Delaware River. The trout, which are big enough to be kept when caught, are put there for spring fishing season since the canal water becomes too warm by August and its oxygen content is too low to support trout. During the stocking period there are fishermen all over the canal. They fish from bridges, from boats, from the banks, and they wear waders and stand in the canal to fish.

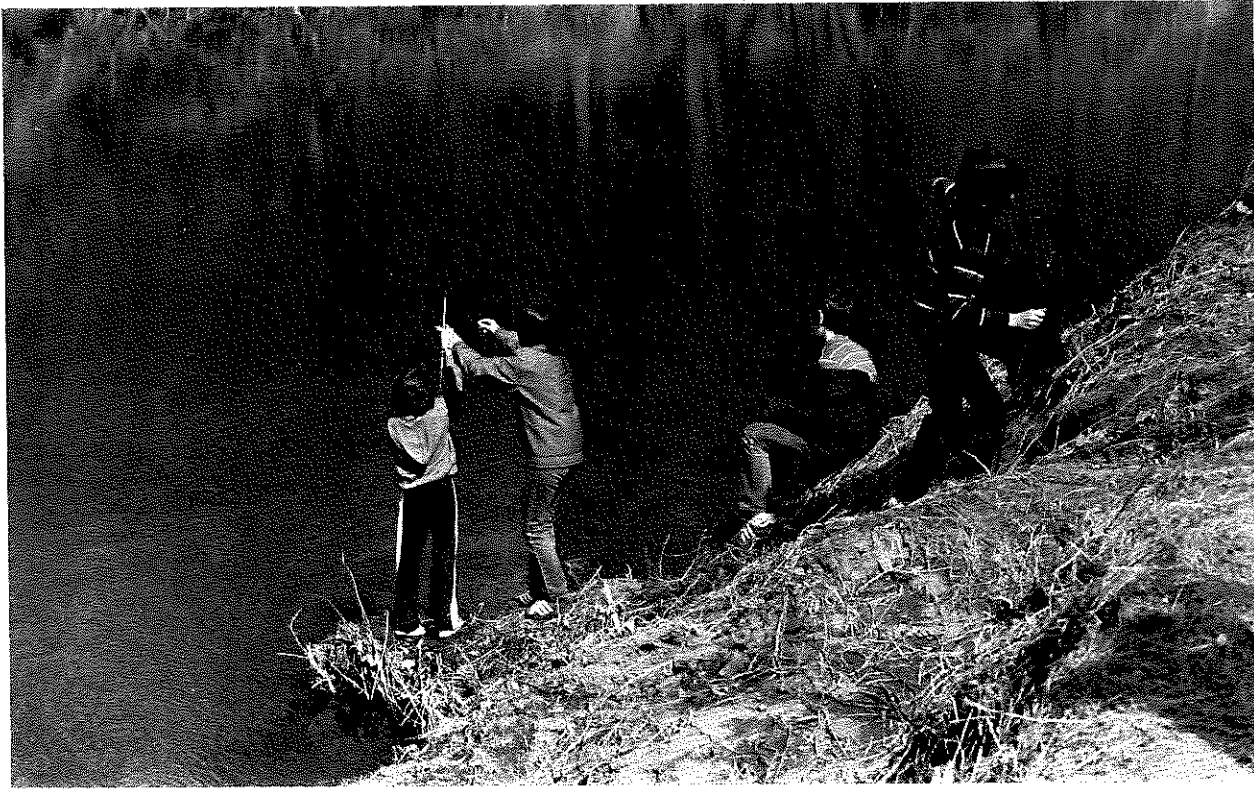
The rest of the year the fishermen are still working the canal, but the intensity has diminished. Their catch is mostly pan fish--bluegill, pumpkinseed, and other sunfish--with largemouth bass providing an occasional highlight. The experience of being along the canal seems to be a large part of their reason for being there, perhaps as important as actually catching fish.

Fishermen should be encouraged to use the Canal Park, not only because the canal should be a resource for people who want to fish, but also because the fishermen add to the ambiance of the park for other people who use it. People walking along the towpath often stop to say hello and inquire after a fisherman's luck. The fishermen provide a human contact and an extra element of interest. The fish, too, are important to the park for reasons beyond their ability to lure, and occasionally please, fishermen. Anyone who has enjoyed seeing a kingfisher or a heron along the canal must thank the fish for attracting these exciting birds. Further, who has not been stirred when the calm of the canal's surface is suddenly broken by the sound of a fish breaking water, then returning to the depths?

The canal must be a good habitat for fish. The quality of the water must be guarded and the oxygen content kept high, the channel deep, and the temperature low. Each of these requirements is of even greater importance in order to assure the best conditions for the use of the canal water for domestic consumption. Designs and construction activities must be carried out in strict accord with preservation of canal water quality.

Any future bridge should include a pedestrian walk suitable for people to fish from. High bridges, like the existing crossings by the interstate highways, would be excluded from this principle. All other bridges can, however, easily conform.

The space between the canal and the towpath should be cleared around access points and at selected spots along the entire length of the canal. Spots to put down a portable chair, or to stand and cast without getting tangled in vines and brush are all that are needed for fishing from the bank. At heavily used access points restoration of the rip-rapping should be done to retard erosion and slumping of the bank.



Paths and Trails



DESIGN CONSIDERATIONS

Paths and Trails

Walking, Hiking and Jogging
 provide adequate headroom
 allow adequate width for passing
 use smooth, relatively soft, but firm,
 surface materials
 vary sense of enclosure (both long and
 short stretches to accommodate
 users moving at different speeds)
 pay more attention to design details in
 areas of high use by casual walkers
 provide side trails to vary experience of
 user
 provide resting spots at appropriate in-
 tervals and at points of interest
 restore mileage markers

Walking, Hiking, and Jogging

On almost any summer weekend it would be easy to sit by the towpath in Rocky Hill and within a half hour see a group of determined Boy Scouts, walking sticks in hand, packs on their backs, and canteens, compasses, or eight-bladed knives hanging from their belts. In that same period it would be unusual not to see at least one long-legged, sinewy jogger trudging along, and an elderly couple or two strolling along--he with his hands clasped behind his back, she with a wild flower, a dried weed stalk, or a colorful leaf in her hand.

The canal towpath offers all of these people a very good place for their activities. It provides the opportunity to hike, jog, or walk on a path that is free of the sounds and smells of cars and trucks. There are trees for shade, mile markers to gauge distance, other people in the park for safety and companionship, and interesting views of natural and man-made surroundings.

All three of these activities are examples of pedestrian uses of the towpath, so there is a good reason to discuss their design principles together, but it must not be forgotten that there are important differences among them. They travel

different distances and at different speeds in a typical trip, and they are sensitive to different parts of the park. The walkers, travelling at a leisurely pace, are likely to notice the textural relationship between rough bark and a velvety patch of moss; they will see the deer print on the towpath or the careful workmanship that goes into a nicely built and thoughtfully sited bench. The jogger will notice few of these details, but will be acutely aware of the firm, level towpath. He will feel the variety of spaces as the towpath changes from a tunnel enclosed by trees and shrubs to an open space where the reflective quality of the water increases the sense of spaciousness.

The towpath is probably least well-suited for all but beginning hikers. It offers too little variety of direction and pitch for experienced hikers who enjoy climbing and working their way through obstacles. But for youngsters eager to "cover" several miles in the woods and to eat a picnic lunch with their equally weary chums, it is a fine hiking path.

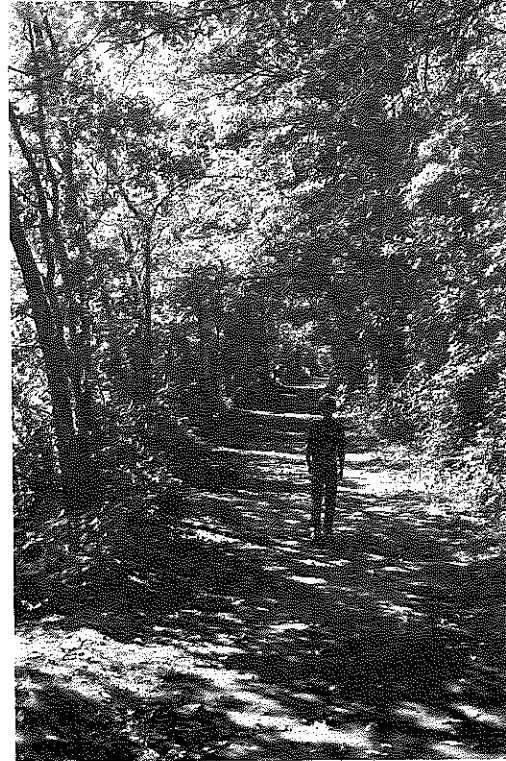
In areas where heavy use by casual walkers can be expected (in urban environments and the first few hundred yards from popular access points) great attention to the detailed aspects of maintenance and development is required. Landscaping, treatment of the canal's edge, and the construction of structures in these areas will be under the scrutiny of eyes that have the leisure to take in details. The details should, therefore, be attended to both by the designer and by the maintenance crew. Path surface materials should be resistant to wear in these areas.

Variety of enclosure is important for all pedestrian activities. Meadows adjoining the towpath should remain open; vistas from the path to nearby points of interest (either natural or man-made) should be maintained. Areas where trees and brush enclose the path are best if they are contrasted with other kinds of enclosure. The length of each type of enclosure is shorter for walkers than for joggers, so both short and long stretches of open areas or enclosed areas should be mixed.

The path surface should be smooth and relatively soft, but firm. This is the kind of surface that is best for jogging. At least in those areas where there is a significant use of the towpath by runners (such as in the Princeton area), consideration should be given to having a path surface which suits their needs.

Hikers should have opportunities to leave the towpath from time to time in order to have a varied experience. In the Millstone River Valley, where the park is relatively wide, paths should occasionally lead away from the canal through the floodplain to the river, then back to the towpath. The paths should be designed to highlight special features and provide access to various habitats and landforms to enrich the hiker's enjoyment and experience. Fragile areas should be accessible yet protected from disruption or damage.

The existing mileage markers are an excellent way of gauging distances - particularly for the pedestrian who must return on the same route - and should be replaced where missing. The existing markers are simple concrete obelisks and can easily be duplicated where they have disappeared.





DESIGN CONSIDERATIONS

Paths and Trails

Bicycling

- provide adequate headroom (at least 10')
- allow adequate width for passing (at least 8')
- use smooth, hard surface material, free of loose gravel
- vary sense of enclosure, considering speed of movement
- provide bike racks at appropriate locations
- develop trails for serious cyclists where demand exists
- design curve radii and gradients for moderate, safe speeds
- provide loop trails or connect with trails outside the Canal Park

Bicycling

Recreational bicycling is an increasingly popular way to combine outdoor pleasures. The speed of a leisurely-ridden bicycle is fast enough to allow the rider to enjoy movement and the wind, but it is slow enough for the rider to be generally aware of sights, sounds, or smells that surround him or her. It is also an excellent way of covering several miles with the energy that a walker would require for a single mile.

The towpath is level, straight, generally well-shaded, and away from automobile traffic. These qualities lend themselves to the use of the towpath for leisurely, pleasant, safe bicycle trips. For a bicyclist interested in covering great distances or in riding at high speeds, the towpath, at present, is not the right place. There are no long stretches of the towpath that are firm and smooth enough to satisfy a serious cyclist. It is anticipated that some sections of the towpath will be developed principally for cyclists.

Bicycle trip distances should be considered in order to provide goals for cyclists. It is not enough to simply take several miles of the towpath and improve the surface in order to encourage cycling. There must be a reason why a cyclist would want to take the route. Points of interest, picnic sites, lovely views, dense population centers, historic sites, or links with other bicycle trails can all be goals or stopping points along a bike route and should be considered in site selection and trail layout.

Variety can be added to the cyclist's trip by creating loop trails within the Canal Park or by connecting with trails outside the park. Cyclists like to go up and down hills (especially down), or to ride through varying environments. This variety can be achieved by keeping the towpath as the main trail and adding connecting trails wherever possible.





DESIGN CONSIDERATIONS

Paths and Trails

Horseback Riding

- provide adequate headroom
- allow adequate width for passing
- construct special trails where possible
- use stable, well-drained surface materials
- vary sense of enclosure, considering speed of movement
- provide hitching posts at activity areas
- provide for trailer parking at selected access points

Horseback Riding

The days of cowboys kissing their horses may have never existed except in the minds of Hollywood scriptwriters. The intimate communication between rider and horse is real, however. Riding in the Canal Park gives an opportunity for this communication to take place within an excellent setting. The trail is uninterrupted for long stretches, the setting is often secluded, and the natural sights and sounds harmonize with the rhythm of the ride.

Unfortunately, there are drawbacks to horseback riding on the towpath both for the path and for other park users, if not for the riders. Horses are not only strong and graceful, they are also heavy. If the path is soft from a recent rain, it can be terribly damaged by horses, making use of the towpath by bicyclists and joggers either difficult or impossible. Where a large number of horses are found, manure may prove to be a problem.

To avoid deterioration of the towpath as a result of horseback riding, specially constructed trails should be provided. Where possible, separate trails should be built to allow equestrian use of the park without disruption of the towpath.

Open Space**Picnicking**

Picnicking means different things to different people. For some, it means a gathering of a large crowd--the company picnic--with baseball games, egg tosses, lots of food, and plenty of room for everyone to pursue his own interests. Picnicking can also be a simple affair. It can be one or two people finding a small clearing where they can sit and enjoy a secluded meal. Or it can be a few tables and a couple of fireplaces at a spot with a lot of activity. Areas where boaters, hikers, fishermen, cyclists and history buffs come together are logical and pleasant places for picnicking. An example of this kind of place is the northern tip of Bull's Island, where one can sit and watch the speed boats on the Delaware River, the horseback riders, and bicyclists on the towpath of Pennsylvania's Delaware Canal across the river, and other picnickers, fishermen, and campers in the Canal Park.

The nature of the Canal Park presents limitations on the development of picnic facilities. Development for very large picnics would clearly be unsuitable. Sites for this kind of picnic have to be big and development should include many different kinds of recreational facilities that will not fit the Canal Park's linear nature. Many parts of the park are unsuitable for any type of picnicking. In those areas designated by the master plan as suburban or transportation environments, the park does not have the room or the aesthetic appeal conducive to picnicking. In the natural environments, as designated in the master plan, the only kind of picnicking that can be provided for is the occasional small clearing suitable for a meal that requires no cooking. Neither picnic benches nor fireplaces can be constructed in a natural environment.

DESIGN CONSIDERATIONS**Open Space**Picnicking**Natural Environment**

- provide small clearings
- create sense of enclosure
- highlight interesting views

Rural Environment

- use furniture appropriate to rural environment
- provide picnic tables
- provide fire places, considering fire hazard
- provide trash containers
- integrate picnicking with other park uses
- shield picnic area from auto traffic and parking
- vary amount of shade provided
- highlight interesting views

Urban Environment and Special Nodes

- use furniture appropriate to urban environment
- provide picnic tables
- provide fireplaces, considering fire hazard
- provide trash containers
- use sturdy, vandal-proof furniture
- relate design to other activities
- shield picnic area from auto traffic and parking
- vary amount of shade provided

The special nodes and urban environments are places where many activities are likely to come together and would, therefore, make ideal places for picnic facilities. Picnic tables in these places will become more than eating places. They will also be handy for the fishermen getting his gear in order, for the boater getting organized before or after a boat trip, for anyone who wants to be outdoors while reading or writing, or for those who simply want to sit in a pleasant spot.

Rural environments provide the best areas for the traditional collection of picnic benches, fireplaces, and sanitary facilities. Here the setting is natural enough to attract people for outdoor eating, but unlike the designated natural environments, there is no need to avoid evidence of man's intrusion on the land.

People eating and cooking in the Canal Park add an element of humanity that greatly increases the appeal of the park. The park becomes a living space as well as a space for recreation or nature study. Therefore, picnic areas should not be tucked away, but should be integrated into other park uses. The person who is eating becomes a vital part of the total park experience if the picnic areas are properly sited.



Many factors must be included in designing sites for picnic areas, including:

1. **A sense of place.** Picnic benches cannot simply be stuck on a site, but should be situated so that each one invites use and yet does not intrude on other picnickers.
2. **Mixture of sun and shade.** If several tables will be placed on a site, some should be in the sun and some in shade. This will accommodate different kinds of weather as well as preferences of people for sun or shade while they eat.
3. **Relationship to parking.** Casual picnics can, of course, rely upon back-packing to get the food to the area. If a more formal or extensive kind of picnicking is expected, however, parking areas must be near the picnic benches so that people can carry ice coolers, baby play pens, and charcoal bags from their cars to the tables.
4. **Need for toilets, picnic shelters, or other structures.** These kind of structures should, at all times, be kept to a minimum, but if they are needed, they must become part of the site plans.

The design of furniture (benches, tables, fireplaces, trash bins, etc.) should be appropriate for use and for the specific site. Sturdy furniture may be needed for urban or high-use environments, but may be out of place in rural environments. Rustic furniture, on the other hand, may be appropriate to a rural setting and incongruous with an urban environment.



DESIGN CONSIDERATIONS

Open Space

Camping

Rural Environment Only

- locate some sites far enough from access points to offer a challenge to users
- provide fireplaces
- provide level clearing for tents
- provide both sun and shade
- create a feeling of seclusion
- keep sites small to limit number of campers

Camping

The Canal Park cannot accommodate people camping in very large numbers. The campgrounds at Bull's Island have a few spaces that can accommodate recreational vehicles, and parts of the park in the Millstone River Valley could be developed to allow spots for a few hardy backpacking campers. Generally, however, the Canal Park is not a good place for people whose goal is rustic or wilderness camping, since it cannot support this activity well. Instead, camping should be an extension of the linear experience that the Canal Park offers. Campsites that serve canoeists or backpacking hikers would best promote the linear function of the park and so should be given priority over the development of more vehicle-dependent campsites.

Campsites should be small in area and cause minimal impact on the Canal Park environment. Aside from fireplaces and picnic benches, a level clearing with both sun and shade is all that is needed for this kind of camping. Sites should not be designed to accommodate large numbers of campers or the camping experience will not relate to the backpacking or canoeing experience.

Camping is appropriate only in rural environments. Camping in urban or suburban environments makes no sense and natural environments are not supposed to have recreational facilities. Rural environments, however, have many areas that are secluded enough for small campsites.



Field Games

Of greatest importance for all field games is the availability of an open space where things can happen. Two shirts can easily serve to mark the limits of a soccer goal. A flat stone can make an excellent home plate. A goal-line or out-of-bounds line can also be an imaginary line between two trees. Frisbees can be thrown or kites flown from a field without any markings.

Great care has been taken in this book and in the master plan to develop the concept of the Canal Park as a linear park. Highest priority is given development that enhances canoeing or towpath oriented uses. Like camping or picnicking, however, field games can enrich the linear experience that park users have sought. If an occasional field can be maintained near a picnic area, it would provide more alternatives for the hiker or canoeist. Furthermore, the people playing ball or tossing a frisbee would bring a dynamic scene to the park and provide an interesting diversion for hikers who have stopped to picnic or rest. In many cases, however, limited land availability precludes providing space for field games.

Open areas near picnic sites should be mowed regularly to accommodate informal field games. Scarce development money and energy should not be devoted to building courts, goals, backstops, or to maintaining boundary lines. However, open fields should be mowed regularly so that people can use them.

DESIGN CONSIDERATIONS

Open Space

Field Games

- locate near other activity areas (hiking, resting, picnicking)
- locate near access points
- give a sense of enclosure
- screen area from traffic noise
- screen area from adjacent buildings which could be damaged by stray balls, frisbees, etc.



DESIGN CONSIDERATIONS

Open Space

Nature Study

- use native or naturalized plant materials
- highlight areas of interest to students of nature
- optimize views of interesting natural features or other points of interest (e.g. geologic formations, unique plant communities)
- use plant materials that provide food and shelter for wildlife
- direct traffic away from areas sensitive to human activity (e.g. nest sites)
- maintain a diversity of habitats for plants and animals
- leave dead trees, brush, and other natural elements that may be home to wildlife

Nature Study

For some, the Canal Park offers fresh air, a change of scene, and new experiences. For others, it will open up a new perspective on living processes and man's relationship to the environment.

Understanding nature means understanding the interplay between man and nature as well as understanding what happens in an undisturbed hardwood forest. In a meadow that is mowed regularly, the relationships among plants, animals, and their environment are different from those of an undisturbed field. The edges of a mowed field demonstrate one kind of natural response, as does the growth in an undisturbed corner of land in the city, but in all these cases natural systems are at work. The possibilities for nature study in the Canal Park are great. The park passes through urban, suburban, rural, and natural environments. It also encompasses both Piedmont and Inner Coastal Plain physiographic domains which have different rocks, soils, and vegetation patterns. Its marshes, rocky hills, floodplain forests, and rolling pastures and fields are each home to distinctive plant and animal communities.

Minimal work would enable the Canal Park to meet its potential as a resource for nature study in Central New Jersey. Interpretive signs, for example, could show how some species are found throughout the park because they have a broad range of tolerance to environmental conditions while other species are found only in particular habitats in accordance with narrower environmental tolerance. For example, the purple loostrife that grows at the water's edge and the poison ivy that covers the banks are responding to environmental conditions which are the same in Hunterdon County as in downtown Trenton, while the sumac and Mexican bamboo that grow among the parked cars in Trenton are quite different from the sycamore and maple in Hunterdon's forests. Nor would it require much effort to show other differences; that the species on the edge of a clearing are

different from those in the center of a forest, or that floodplains support one kind of plant community while upland areas support another.

In developing nature study areas it is important to work with and highlight the given environment rather than try to create something uncharacteristic of the site. By analyzing the resources present on a site and bringing the park user and these resources together, an exciting outdoor learning opportunity can be offered. In the city it is important to illustrate how nature responds when man has changed the environment. Thinning, pruning, planting in urban areas should be done in such a way that native or naturalized species are able to flourish and be displayed at their best. This will provide examples which people may find applicable for use in their own urban gardens. It will also guarantee the least amount of maintenance and the greatest possibility for success. This principle also applies to the other environmental types.



Diversity of habitats should be maintained. The Canal Park should support as wide a variety of habitat types as possible. Meadows should be mowed annually in the fall, after seeds have developed, to prevent woody vegetation from becoming established. Old fields should be cleared every few years so they do not become forests. In this way, the park user will have the enjoyment of a wide range of natural phenomena.

Nature study should be a part of all other development activities. Any development will disrupt the existing plant community. Such changes can provide an opportunity to illustrate another facet of the complex relationship between man and nature. When a site is cleared, therefore, or a trail constructed, or when any development takes place, thought should be given to what can be illustrated as a result of the action. With any development, the designer should take full advantage of opportunities to interpret or display the environment.

Physical Elements and Materials**Landscaping**

Taken at its broadest, landscape is the vista or prospect that lies before the viewer. It is more than just vegetation; it includes not only plant materials, but also landforms, stones, water, and man-made features. All activities in the park occur within the context of a particular landscape and, indeed, become a part of the landscape.

The Canal Park is an attractive landscape. The principal role of any landscaping effort--whether maintenance, new plantings, earthworks, paving, trail development, fencing, or any other necessary elements--must be to maintain or improve the ambient qualities of the park.

Plant materials introduced to the park should be native to the region or not incongruous with existing vegetation. The great diversity of habitats within the park supports a range of plant communities--from aquatic and wetland types to drier upland types. It is anticipated that much of the park landscape will be simply left to evolve naturally. Where special activities are planned, undesirable views need to be screened, slopes stabilized, or other problems solved, native or naturalized plant materials are preferred. The intent is to avoid exotic plants which are difficult to maintain or which are not in character with the park. A list of suggested plant materials is available from the Commission.

The characteristics of plant materials must be carefully matched to the use to which they are put. Vegetation must be appropriate for the soil in which it is to be planted. Also, the plant material must have characteristics which are suitable for expected activities. Horseback riding cannot, for instance, be done in an area with low branches. Likewise, the characteristics of the plant material over its lifespan must be considered. Young trees may prove excellent for screening an eyesore, but as the trees mature they open up the understory, exposing views. The seasonal character of vegetation, as well as its growth rate, shape, shade qualities, longevity, color, and durability are among the characteristics which must be carefully weighed in selecting vegetation for a particular site and use.

Constructed landscape elements must harmonize with nearby features and with the park's character in general. Design solutions to particular problems may require use of minor earthworks, bollards, stone, and the like. These landscape elements must reflect the historic or natural character of the park. In a wooded area along the canal, use of wood or stone rather than steel and concrete may be advised in order to harmonize with other elements in the setting. Also, these landscape elements must not be overly ornate or over designed.

Special design solutions - either in construction or vegetation - may be required where the elevation of the canal is substantially different from its surroundings. Notwithstanding the relative flatness of the canal's course, there are many places where embankments parallel the canal or the rivers in the park. These are usually fairly steep and will require special attention where people will be crossing over them. For instance, at several portage points between the Millstone River and the canal, paths have been worn in the embankment and are eroding. Such crossover points will require paths which are built so as to maintain a stable, uneroded slope.

DESIGN CONSIDERATIONS

Physical Elements and Materials

Landscaping

- maintain or improve ambient qualities of the site
- use natural or naturalized plants or indigenous materials to:
 - stabilize slopes
 - provide shade/control temperature
 - direct wind or act as a windbreak
 - intercept precipitation
 - intercept dust and dirt/purify air
 - reduce noise
 - reduce glare
 - screen objectionable views
 - channel activity where desired
 - link or connect areas together
 - subdivide large public areas into smaller intimate areas
 - soften, enhance, or complement architectural elements
 - unify divergent elements
 - invite user to points of interest
 - serve as a backdrop
 - delimit edges of areas
 - articulate space
 - enclose spaces
 - enframe views
 - filter views
 - control privacy
 - provide sculptural elements, display of line, pattern, reflection, or silhouette
- match plant characteristics to their use, considering:
 - seasonal variation
 - growth rate
 - shape (columnar, broad and spreading, round or oval, horizontal)
 - shade qualities
 - longevity
 - texture
 - color
 - durability of vegetation
 - ultimate height
 - undesirable traits
- consider user's angle of view or approach and speed of movement
- remove vegetation when it will enhance views



DESIGN CONSIDERATIONS

Physical Elements and Materials

Park Furniture and Signs

- use vegetation and earth materials whenever possible
- use materials/forms which don't detract from the environment
- consider current and planned park activities
- use durable materials
- use vandal-proof construction techniques
- use materials appropriate to the setting
- use materials appropriate to the anticipated use
- use good design rather than signs when possible

Park Furniture and Signs

Park furniture is the term we apply to the equipment which is placed in the park for the enjoyment or comfort of the park's visitors. There is no clear distinction between a landscape element and furniture. Furniture, in fact, is a part of the park landscape.

Benches and tables are clearly "furniture," but we apply the design principles below to fencing, tire stops, trash receptacles, lighting, signs, and any other made object deliberately set into the park.

Park furniture ought not to conflict with the Canal Park's functions or character. The appearance and the positioning of furniture must adhere to this principle. In most cases, the furniture is to be an adjunct to or support an activity; it is not to be the focus of attention. Thus, benches should be placed where required, but should be of materials and in colors which do not detract from the surroundings.

The characteristics of the furniture and its siting must conform to the character of its location and to anticipated uses. In some ways this is a restatement of the first principle above, but it draws attention to the fact that the furniture must be designed and sited with many criteria in mind. These include: durability, conspicuousness, materials, and mobility. All furniture must be durable--able to withstand use and abuse and weather without becoming unsightly or dangerous. The materials used must be appropriate to the setting. Concrete bollards or tire stops in a parking area, for instance, are entirely inappropriate in an area which is wooded or rustic in nature. Very little park furniture should be mobile. Some benches and picnic tables may present possible exceptions, but most will not. Mobility in benches and tables must be weighed against the fact that they will be scattered and configured to suit an ever changing user population and will require constant retrieval. Also, light, moveable objects may have an unfortunate tendency to end up in the canal. Therefore furniture not attached to the ground should at least be sufficiently heavy to discourage easy movement.

Siting of furniture must take into account current and planned park activities. Landscaping and park furniture can be used together to create a host of environments. Private and communal uses can each be provided by the judicious placing of trees and other plants and by the proper siting of furniture (or, equally important, the deliberate absence of furniture). Semi-enclosed areas from which to observe the park and its users can be created in one area, while nearby larger open areas are available for groups who are actively using the park.

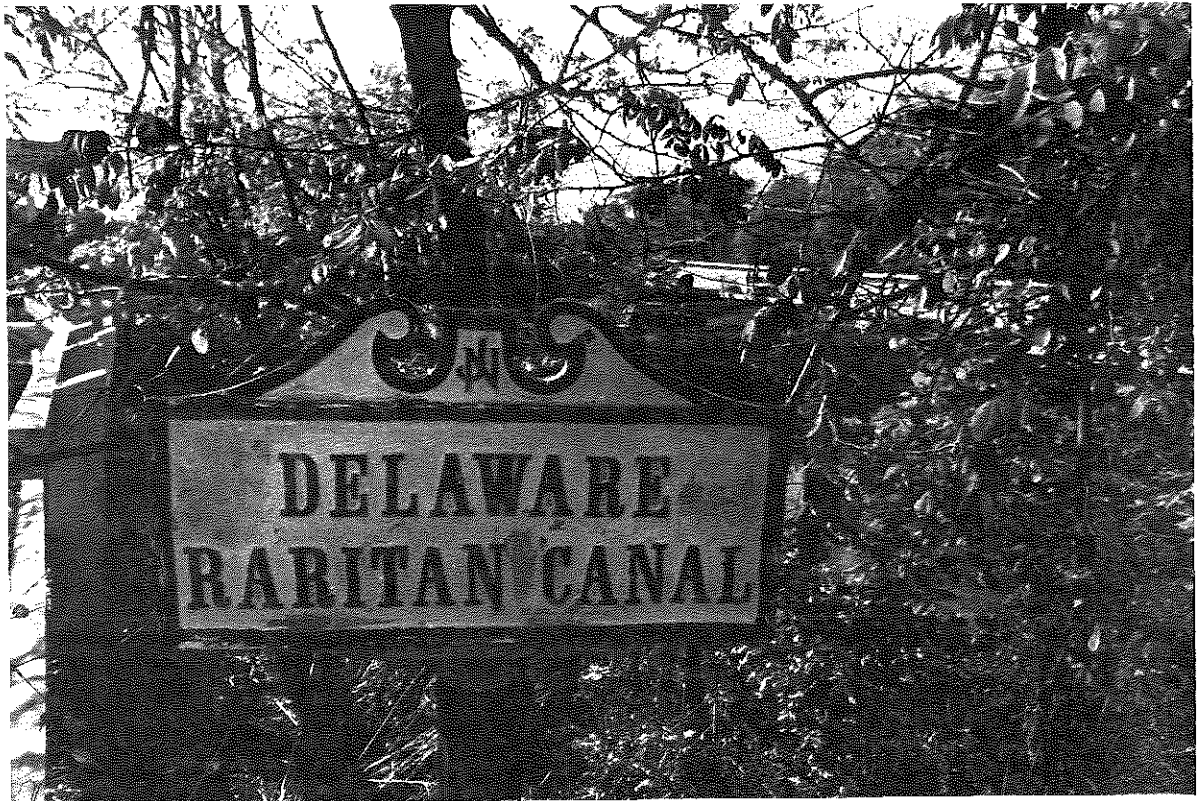


Blackwell's Mills

Lights, fences, gates, and barriers should be minimized. Except where needed for safety or to prevent intrusion or unacceptable access (usually by motor vehicles), furniture which is not directly used should be avoided. Alternative design solutions to problems should seek to use plants or earth materials. When this is not feasible, the materials to be used should be in keeping with the nature of the park. Thus, blackberry bushes may substitute for a fence, and a small earth berm act as a barrier to cars.

Signs should be kept to a minimum, be clustered where appropriate, be standardized, and be readily understood. Signs follow all the other design principles with regard to materials, durability, etc. In addition, they should be simple and direct and should avoid excess words or ornate lettering. If a site is designed properly for a use, it should not have to be labelled as well. A parking or picnic area should not require a labelling sign. Signs should give directions where there is possible confusion, as, for instance, where some activities are not permitted on a trail.

Graphic symbols are preferred over words. International symbols are sufficiently well known that they can be directly used in park signs without words. Signs throughout the park should be consistent in style and content.





Parking

Parking should be available in proportion to the amount of use at each entry point to the Canal Park. A wide range of parking options is available, including streetside parking, an odd place or two under a tree, informal parking areas or yards, and formal parking lots.

Given the linear nature of the park and the many roads which parallel it or form its boundaries, it is likely that people will park along its edge wherever they can find a wide spot on the shoulder of the road. To the extent that these parking spots do not present hazards and do not deteriorate from use, they will likely require no improving. If the volume of use is sufficiently high, an improved parking surface, protection for nearby trees, and trash receptacles may be called for. This can be determined on a case-by-case basis. Where more frequent and higher volume traffic is expected, as in the vicinity of active sporting areas, canoe launching points, or larger picnic areas, larger, better constructed parking will be required.

Parking should be as informal as possible, but take into account the level of recreational activity nearby and the demand for parking it will generate. One difficulty in designing parking is to deal with the tremendous variation in level of use. Winter parking demand will be much lower than summer demand; weekend and holiday use will be much greater than midweek. There is no intention that the parking facilities recreate a suburban mall's facilities. There are alternatives, especially in light of the inconstant demand for parking. The actual paved or gravelled area in high use areas can be relatively small, handling the typical daily need. Close by can be unpaved parking to accommodate weekend or overflow demand. This can be as simple as a grassed area which uses reinforced turf (an area of heavy gravel and topsoil) or porous block material which allows grass growth between its solid elements.

DESIGN CONSIDERATIONS

Physical Elements and Materials

Parking

- provide several small lots rather than a few large ones
- use surface materials suitable to intensity of use, restricting paving to high use areas
- use permeable paving, reinforced grass or waffle pavers for low use areas and overflow parking
- delimit edges with natural or naturalized plants or other indigenous materials
- protect trees from damage by cars
- shield parking area from other activity areas, but site parking area so user can easily see how to reach his/her destination
- provide shade whenever possible
- mark entrances and exits clearly

Parking area limits should be unobtrusive but definite. Where practical, the limits of a parking area should be indicated by design, not by furniture. For instance, trees and shrubs, small grassed embankments, or wooden bollards, can subtly mark the limits of an area without resorting to chain fences, wheel stops, or curbs.

Surface materials should be adequate to the demand placed upon them, but not excessive to the task. Parking areas of relatively high use will require a good foundation to keep from deteriorating, but the actual surface material should be asphalt only where snow removal is required in winter or use is very intense. Crushed stone, cinders, or gravel on a well packed and drained subgrade will be adequate in most places. In many instances, small parking areas or overflow parking can adequately be handled with reinforced (heavily gravelled) turf or with foundations made of block which is 50% solid and 50% voids in which grass can grow. Porous materials are preferred since they reduce runoff and are more in keeping with the park's character.

INTEGRATION OF DESIGN PRINCIPLES

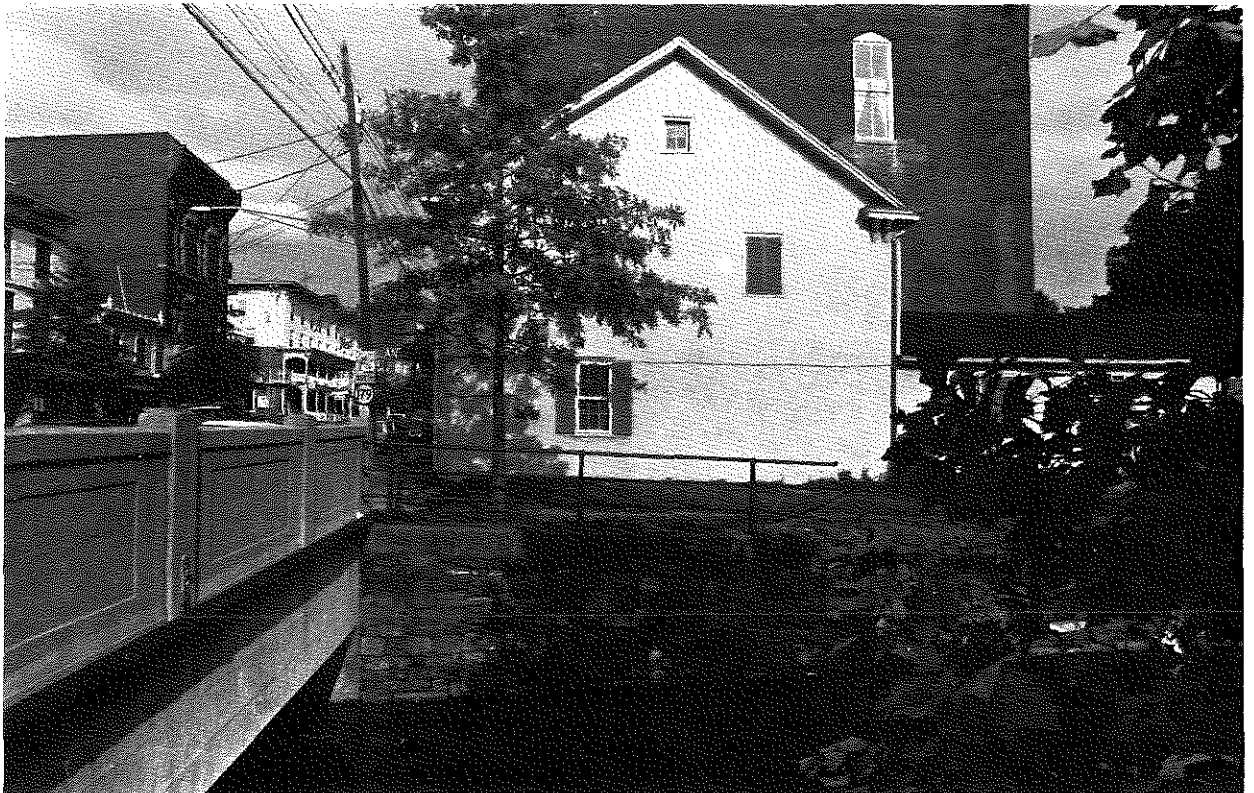
Each of the activities in the preceding section can be pursued on its own in the Canal Park. People can drive to the park for an afternoon of fishing, for a canoe trip, or to see historic structures in and along the Canal Park. But the Canal Park also presents an opportunity to combine a great variety of experiences because of its unique context. It would be possible to spend several days along the canal, enjoying historic and recreational sites of great variety. The variety of historic sites within the sixty mile-long canal corridor includes the City of Lambertville, which is a Victorian town that is nearly completely intact, and the handful of Federalist homes at Blackwell's Mills. The types of parks adjoining the canal is equally wide. They include Pennsylvania's Delaware Canal (just across the Delaware River from the D&R), the two Washington Crossing State Parks, Trenton's Cadwalader Park (designed by Frederick Law Olmstead), Lawrence Township's outdoor education center, Princeton's wildlife sanctuary, and Somerset County's excellent Colonial Park. Museums also abound in the Canal Park's vicinity: a nineteenth century mill is being restored for display in Stockton, the State museum in Trenton is one short block from the canal, Princeton University has an art museum and a museum of natural history, and the Blackwell's Mills canal house serves as a budding museum of canal memorabilia.



Blackwell's Mills

Who would not enjoy combining a Canal Park experience with visits to neighboring Victorian towns and Greek Revival rural communities, seeing museums, parks, and wildlife sanctuaries?

The integration of activities into an experience that is unique to the D&R is the vision that the Canal Commission has tried to evoke in this book. This vision can become a reality with careful design and surprisingly little effort. Designers, builders, and maintenance crews must care about the historic structures that comprise the canal, the abundant variety of ecosystems in the park, and the integration of each design element into a whole park. Canoe docks should not just be placed where cars can bring or fetch canoes. They must also provide access to picnic benches, camp sites, or historic structures that canoeists want to visit. Adjoining parks or streams must be pointed out with signs and made accessible from the tow path with pedestrian bridges. The tow path must serve all of the various uses that will be asked of it. By working with nature and encouraging a variety of natural phenomena the park's environment can be enriched. The urban areas must be carefully developed to encourage city dwellers to use the Canal Park locally and as a link to the surrounding countryside and to attract suburbanites to the city.



Lambertville

**APPENDIX A
APPROVED DESIGN SOLUTIONS**

The following are approved design solutions to problems. They are not intended to exclude other solutions; rather, they are presented to give a designer specific illustrations of the types of designs sought.

**GUIDELINES FOR MAINTENANCE AND/OR
REPLACEMENT OF D&R CANAL
EMBANKMENT STONE**

Goals

There are two goals for the hand-laid embankment stone. The functional goal is to stabilize the canal embankments: to protect against erosion, to prevent embankment slump, and to provide a canal embankment slope face that cannot be easily disturbed or vandalized. There is also an aesthetic goal: to use a treatment that is in harmony with the historic treatment of the canal bank. There is no feature of the canal which more consistently and forcefully speaks of its man-made 19th century origins than the hand-laid stone walls that line its banks from Bordentown to New Brunswick. By repairing these walls, or rebuilding them in an authentic manner, we are strengthening the value of this nationally-registered historic site.

General Specifications

1. Embankment preparation: As part of any construction, rehabilitation, or repair project which will disturb any embankment, all original stone should be stockpiled for re-use. Any original stone which can be retrieved from the water should be reclaimed with the use of hand tools. All trees should be removed from the embankment, stumps and roots grubbed to at least 12 inches below subgrade.

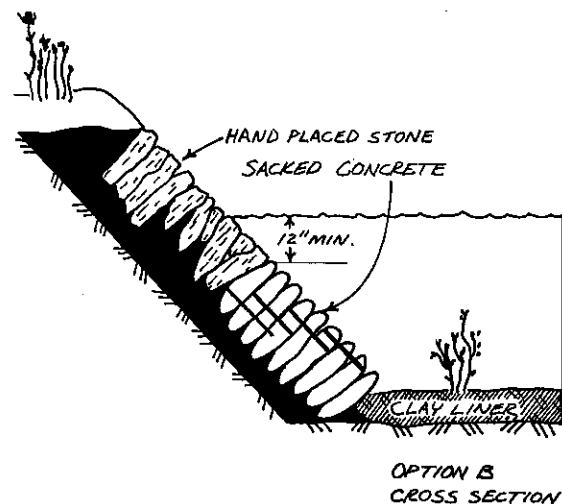
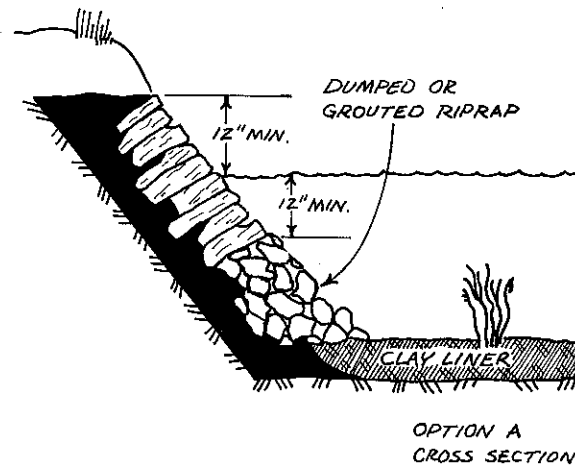
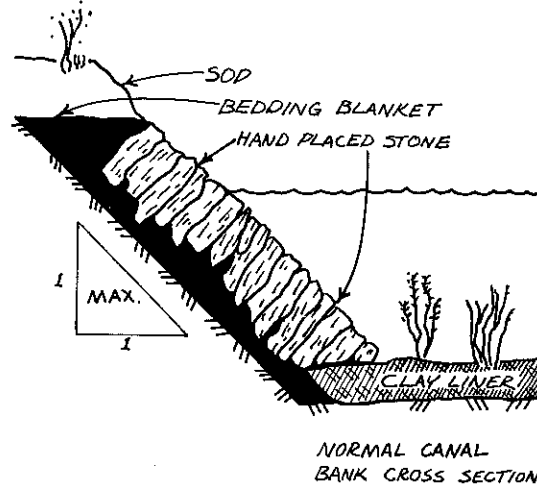
2. Stone: Several different kinds of stone were used in the original work; durable sandstone, shale, traprock, and granite can all be found in the existing walls. New embankment stone shall be a durable stone which is the proper shape and size. The stones should have relatively flat tops and bottoms and should present a generally rectangular face toward the canal. At least 90% of the stones shall be at least 12 inches in one dimension. A siliceous cemented sandstone from the Stockton Sandstone Formation is an ideal type of stone because it tends to break flat.

3. Construction: The stones should be placed by hand with the 12 inch axis going into the bank. At least 80% of the stones must also have an axis of at least 12 inches facing the canal. Larger stones shall be placed in the lower courses.

4. Option: Where structural conditions allow, the embankment stone slope protection can be hand-placed stone supported by either dumped rip rap, grouted rip rap, or filled concrete bags below the surface of the water, provided that its top elevation is at least 12" below the normal operating level of the canal as established by Water Supply Facilities, Division of Water Resources.

The rip rap or concrete bags shall have at least one dimension with a length of 6 to 12 inches. Typical cross sections are shown in the attached illustration.

Detailed specification may be obtained from the Water Supply Facilities, Division of Water Resources, who administer the operation of the D&R Canal water supply system.



GUIDELINES FOR SMALL BOATING DOCKS

Goals

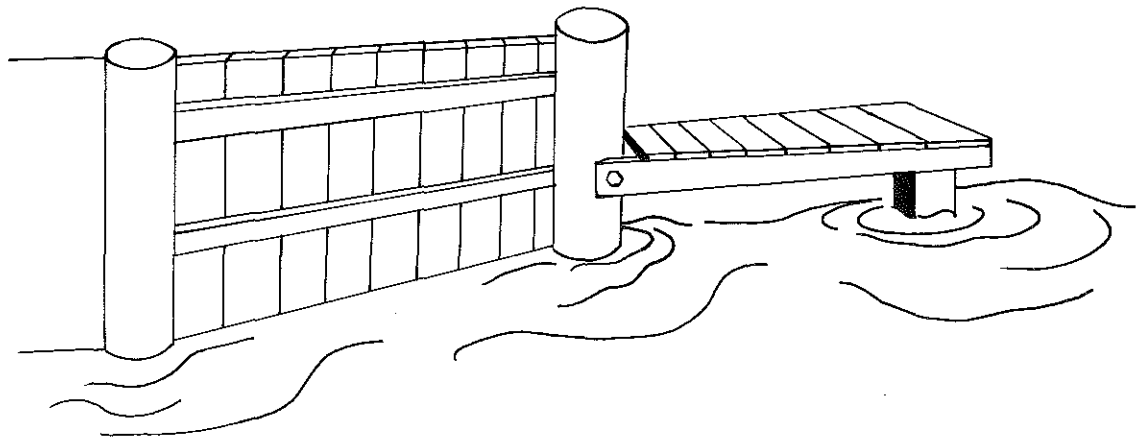
It is the goal of the Commission to provide safe, readily usable, unobtrusive, and easily constructed and maintained docking facilities.

General Specifications

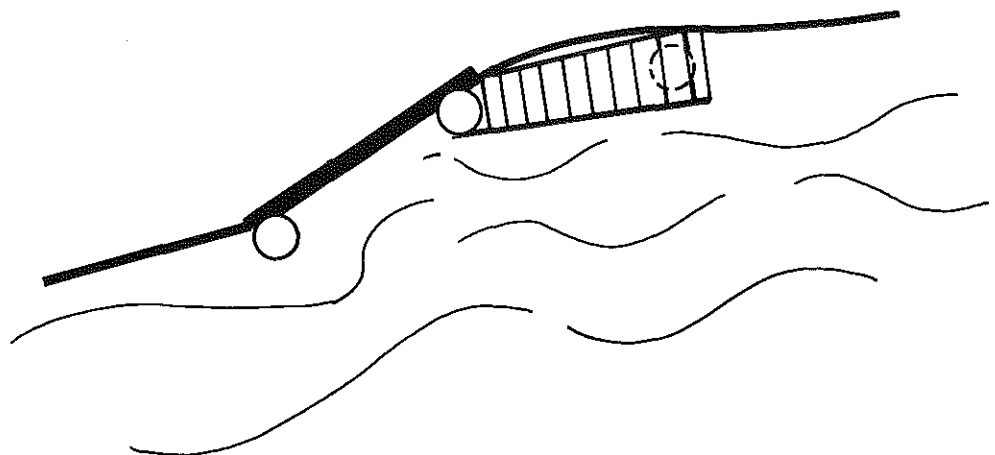
Two possible configurations for docks are shown. Design A is intended to be an extension of the wooden fenders which protect many of the bridges crossing the canal. It is simply a wooden platform constructed of 2x4 lumber, attached at one end to a fender piling and supported at the other by a new piling. Actual dimensions and configuration will depend on the installation site--including the position of existing pilings and the condition and slope of the bank.

Design B makes use of 6 railroad ties, configured as shown. A 2x4 lumber deck is cantilevered out from this base.

DESIGN A

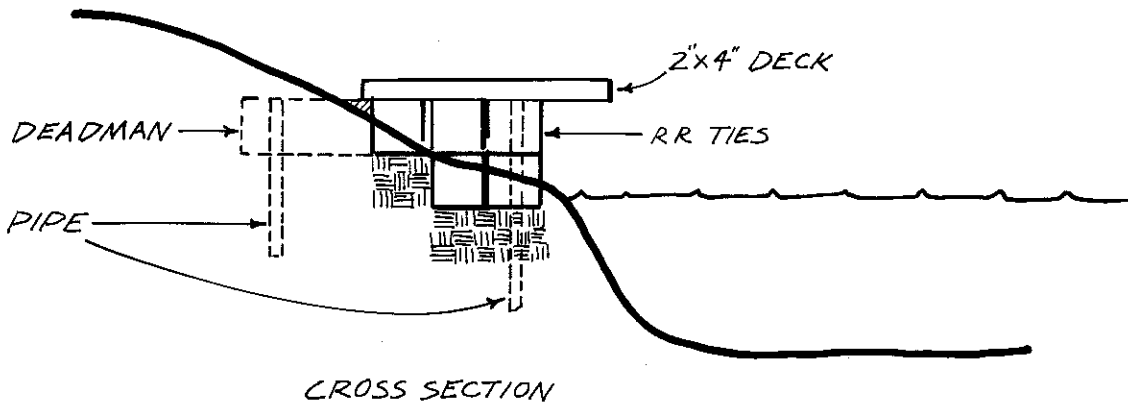


SIDE VIEW

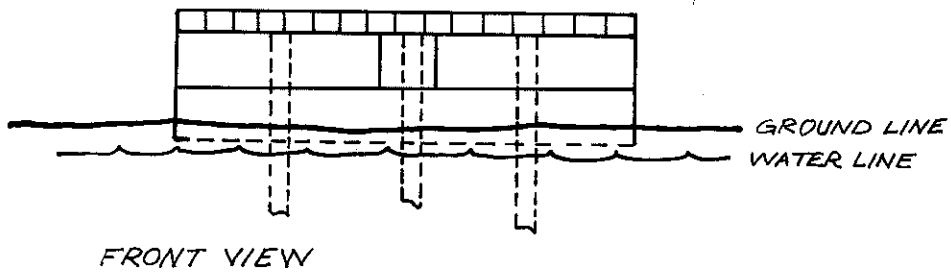


TOP VIEW

DESIGN B



CROSS SECTION



FRONT VIEW

