

LIBERTY PARK NATURAL AREA  
MANAGEMENT PLAN

New Jersey Department of Environmental Protection  
Division of Parks and Forestry  
Office of Natural Lands Management  
CN 404  
Trenton, New Jersey 08625

Prepared by:  
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June, 1988

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GOVERNOR

RICHARD T. DEWLING  
COMMISSIONER

DEPARTMENT OF ENVIRONMENTAL PROTECTION  
DIVISION OF PARKS AND FORESTRY

MANAGEMENT PLAN FOR LIBERTY PARK NATURAL AREA

TAKE NOTICE that Richard T. Dewling, pursuant to the Natural Areas System Act, N.J.S.A. 13:1B-15.12a et seq., and N.J.A.C. 7:2-11.8, has adopted the recommendations of the Natural Areas Council regarding the management plan for Liberty Park Natural Area.

The Liberty Park Natural Area is located in Jersey City, Hudson County, on land that is owned by the Department of Environmental Protection and administered by the Division of Parks and Forestry through Liberty State Park. The purpose of the management plan is to identify specific long and short term management techniques which are necessary to achieve the designation objective of the Natural Area. For Liberty Park Natural Area, the designation objective is preservation of a salt marsh in upper New York Bay.

The Natural Areas Council reviewed the staff recommendations and public comments at their meeting on November 5, 1986. By unanimous resolution, the Natural Areas Council adopted recommendations for management and has submitted these recommendations in the form of a management plan to the Commissioner of the Department of Environmental Protection.

Copies of the adopted plan may be obtained from:

Department of Environmental Protection  
Division of Parks and Forestry  
Office of Natural Lands Management  
CN 404  
501 E. State St.  
Bldg., #5, 2nd Flr.  
Trenton, New Jersey 08625

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Date: 6/20/88

Richard T. Dewling for  
RICHARD T. DEWLING, Commissioner  
Department of Environmental Protection

LIBERTY PARK NATURAL AREA  
MANAGEMENT PLAN

ABSTRACT

The Liberty Park Natural Area became incorporated into the Natural Areas System in 1978. The Natural Area is located within Jersey City, Hudson County, and is within the Piedmont physiographic province. Approximately 60 acres of Liberty State Park was designated to the System primarily because it contains one of the last remnants of tidal marsh within the Hudson River Estuary and supports a variety of wildlife.

This management plan has been developed pursuant to N.J.A.C. 7:2-11.1 et seq. which mandates that such plans be prepared for all areas designated to the Natural Areas System. Management is aimed at prescribed uses and practices that will be allowed and implemented in order to maintain and, if practicable, enhance the natural features which the site contains.

The following is a summary of major management techniques recommended in this plan. Chapter III should be consulted for detailed information on prescribed management techniques.

Classification

The majority of Liberty Park Natural Area is classified as an Ecological Reserve, with upland developed areas being classified as Buffer.

Boundaries

The currently recognized natural area boundary shall remain. The toe of the seawall levee now under construction shall serve as the northern boundary.

Human Use

The Ecological Reserve shall be used for research and study by permit and for staff-led group tours. Unlimited access shall be permitted in the Buffer zone, which may be used for passive recreation, interpretation and research.

Motor vehicle use by authorized park personnel shall be permitted within the Buffer zone only.

### Man-made Features

Debris deposited in the natural area shall only be removed at the discretion of the Administering Agency and only if such activity shall not result in negative impact.

The three sculptures within the Buffer zone shall be removed by the Administering Agency as soon as possible. Only structures which contribute to the designation objective shall be considered for future placement in the Buffer zone.

### External Features

The Administrator of ONLM and the Natural Areas Council shall be provided with and comment on future park development plans to help prevent negative impacts to the natural area.

Results of studies by the Division of Hazardous Site Mitigation shall be provided to the Administrator of ONLM, and appropriate measures taken to protect the public and effectuate cleanup.

NATURAL AREAS COUNCIL

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This plan was written and prepared by Robert J. Cartica, Office of Natural Lands Management. The author wishes to extend special thanks to Frank Gallagher, Naturalist at Liberty State Park, whose personal knowledge and management expertise were invaluable to the preparation of this plan. In addition, a draft management plan prepared by Olga Boyko, a former naturalist at Liberty, proved extremely useful. Gratitude is also due to the following persons who contributed to the plan: The Natural Areas Council, Richard F. Barker, David Barskey, Russell A. Cookingham, James Gresavage, Brendan P. Grigis, Frank F. Guidotti, Hermia M. Lechner, Jerome J. McCabe, James D. Mortimer, Larry S. Miller, Jane Saks and Peter A. Straw.

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## INTRODUCTION

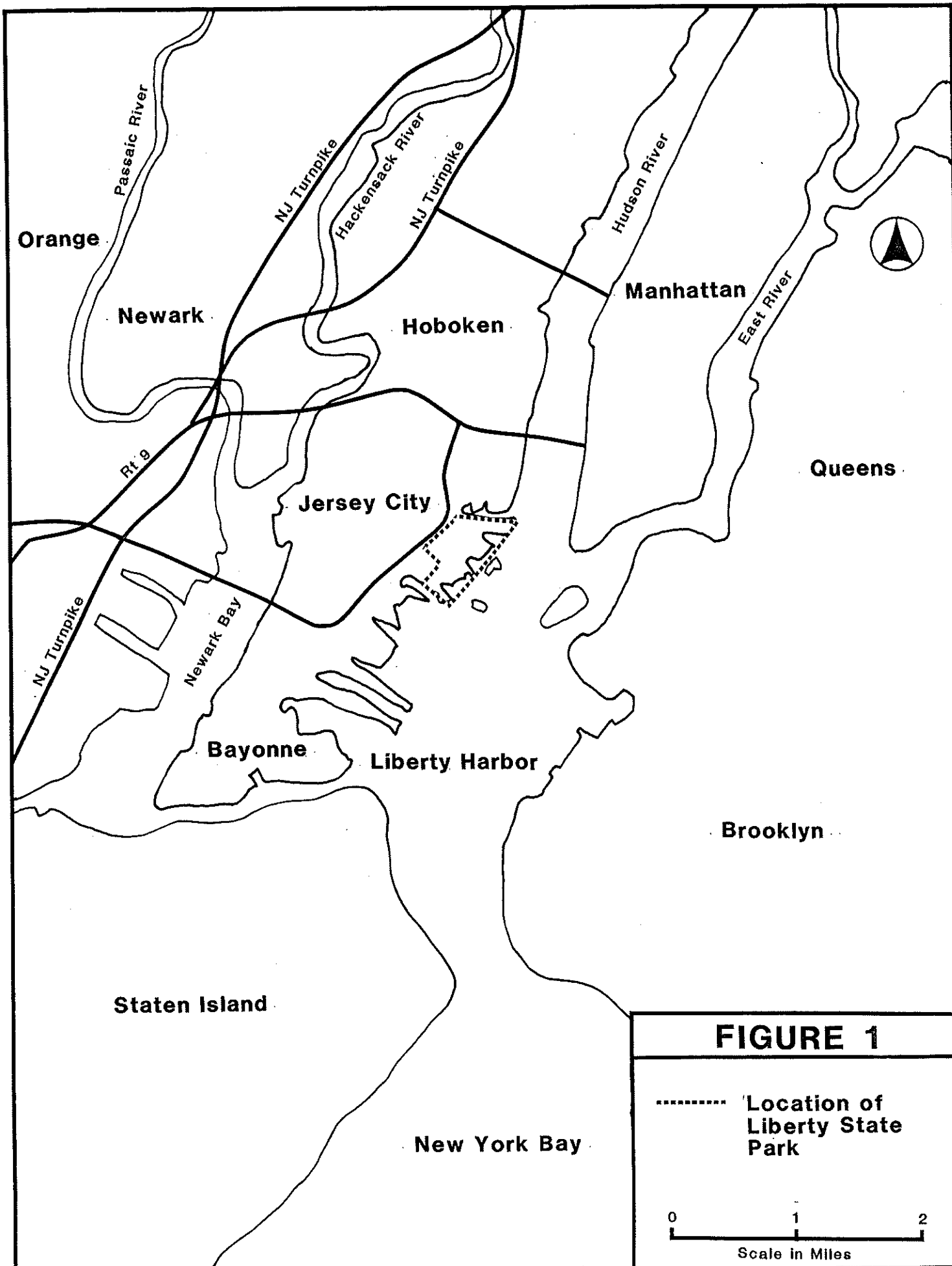
This management plan for the Liberty Park Natural Area will describe the natural resource features of this site and then prescribe uses and practices that will be allowed and implemented to maintain and, if practicable, enhance these features.

Creation of the Natural Areas System was mandated under the Natural Areas System Act of 1976 (N.J.S.A. 13:1B-15.12a et seq.). A "Natural Area" is defined as "an area of land or water, owned in fee simple, or easement, by the department, which has retained its natural character, although not necessarily completely undisturbed, or having rare or vanishing species of plant or animal life or having similar features of interest which are worthy of preservation for present and future residents of the State" (N.J.A.C. 7:2-11.3).

Liberty Park Natural Area is located within Jersey City, Hudson County, within the Piedmont physiographic province. Figure 1 indicates the general location of Liberty State Park within the New York metropolitan area. The current designated boundary of the natural area is indicated in Figure 2. The natural area is located within the southeastern section of Liberty State Park and encompasses 60 acres.

Located directly on the waterfront of Liberty Harbor (Upper New York Bay) and within one of the most heavily industrialized and developed sections of New Jersey, Liberty State Park has been much modified from its original condition. Once part of an extensive tidal flat, almost all of the park has been filled or otherwise modified (Boyko, 1980). Late in the 19th century the tract was filled for use as a railroad yard and terminal. Until recently, much of the undeveloped portion of today's State Park was overlain by railroad tracks and ties. The decline of the railroads earlier in this century made way for the development of industrial sites over large portions of this area. However, the ultimate development of this site into an urban park is most owing to the panoramic view it provides of the Hudson River, Liberty Harbor, New York City, Ellis Island and, in particular, the Statue of Liberty. Acquisition by the State began in the early 1970's at which time the area was in a highly deteriorated condition. At the time of acquisition, the land now designated as the natural area contained a dilapidated wharf and abandoned barges. Cleanup of the harbor area by the U.S. Army Corps of Engineers began in 1974. Liberty became part of the State Park System in 1976. In the early phases of park development many of the deteriorated structures were removed. Some were left because removal would have heavily impacted the marsh system. Renovation of the terrestrial area is still ongoing today. Approximately 60 acres of the park (total 1,100 acres), some of which contains natural brackish marsh

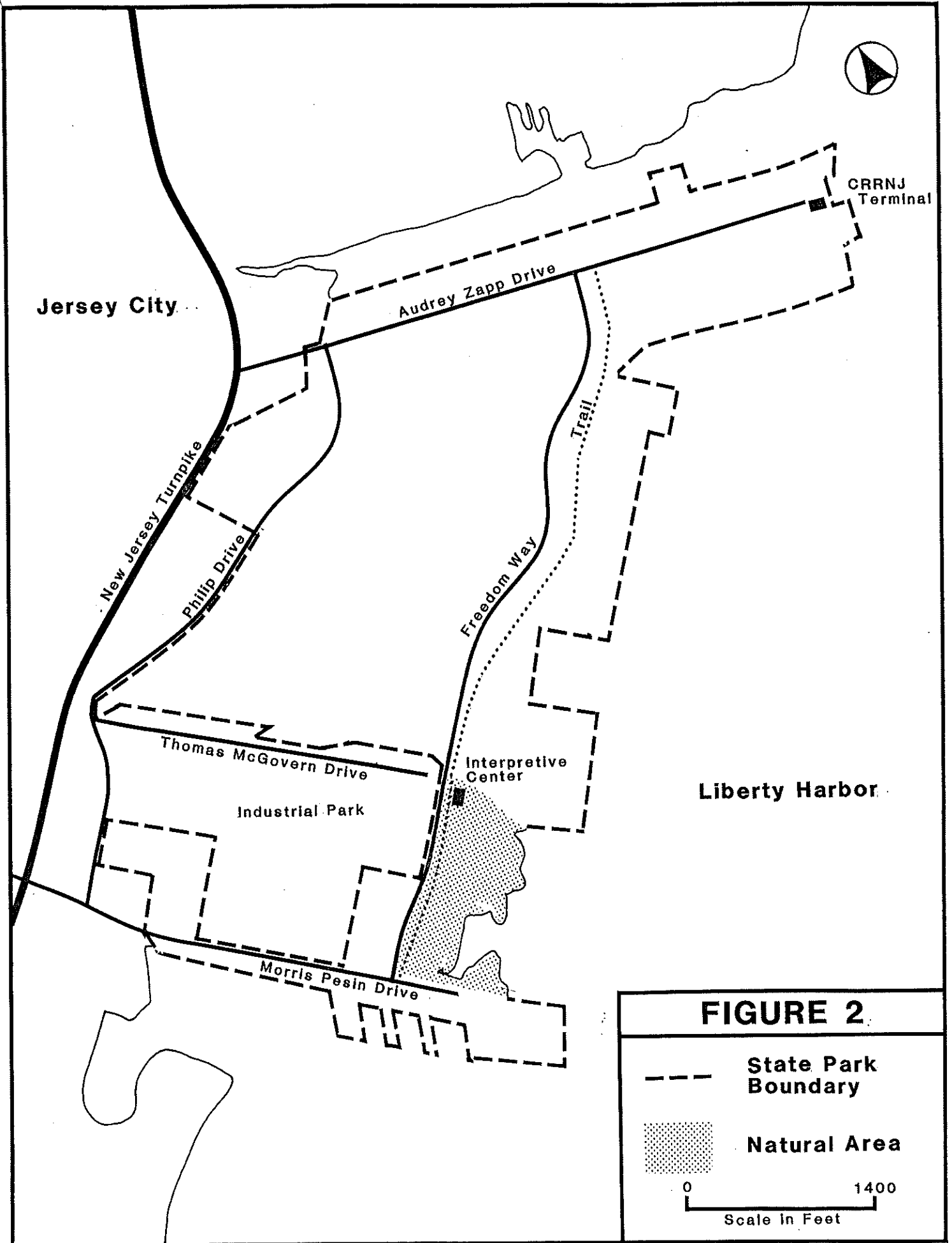




**FIGURE 1**

..... Location of Liberty State Park

0 1 2  
Scale in Miles



**FIGURE 2.**

--- State Park Boundary

■ Natural Area

0 1400  
Scale in Feet

vegetation, became part of the state Natural Areas System in 1978. The designation objective for this natural area under the Administrative Code includes "preservation of a salt marsh in upper New York Bay" (N.J.A.C. 7:2-11.12). The natural area actually contains one of the last remnants of tidal marsh within the Hudson River Estuary and supports a variety of wildlife. The Administrative Code also mandates the preparation of this management plan.

The Administering Agency for Liberty Park Natural Area is the Division of Parks and Forestry, State Park Service, through Liberty State Park. The Administering Agency shall be responsible for management of the natural area, including those physical actions and enforcement measures identified in this plan, in order to achieve the designation objective.

## SITE DESCRIPTION

### Topography and Geology

Topographic elevations range from zero (mean high water) to approximately 17 feet, the highest elevations occurring adjacent to Freedom Way (Fig. 2). Boyko (1980) maintains that two types of bedrock underly the state park because it lies on the boundary of two physiographic provinces: The Piedmont and the Manhattan Prong of the New England Upland. Piedmont bedrock consists of sandstones of the Stockton formation, Newark series, while mica schist and some gneiss comprise the Manhattan Prong. However most of Liberty is immediately underlain by glacial till deposits and man-deposited fill.

### Soils

The marsh zone is composed of organic silts of tidal zones and consists of gray and black clays. The soil is poorly drained and almost always is saturated.

### Surface Hydrology and Water Quality

The entire park drains into Liberty Harbor which borders the natural area to the east. Marsh sections within the natural area are flooded daily by tides, and drain via a few tidal creeks. According to the Boyko (1980) raw and primary-treated sewage and stormwater regularly enter Liberty Harbor. A sewage outfall exists within the state park adjacent to the natural area, and dissolved-oxygen content of the waters is generally lowest near such outfalls (Texas Instruments, Inc., 1976). However, this outfall shall soon be diverted to the Passaic Valley Sewage Treatment Plant (tentative date for diversion, July 1989) and, ultimately, Newark Bay, resulting in improved water quality.

### Vegetation

Vegetation of the state park has been described by Texas Instruments, Inc. (1976), although the only significant description of natural area vegetation is provided by Boyco (1980). Boyco's (1980) "primary area" approximates the current boundaries of the natural area. In general, only two habitats predominate. These include tidally affected salt marsh and higher zones unaffected by the tides. Figure 3 indicates distinct vegetation zones and was derived from an analysis of 1977 aerial photographs (N.J. Department of Environmental Protection, 1986) with field verification by Frank Gallaher (personal

communication). The following description was derived from Boyko (1980), New Jersey Department of Environmental Protection (1986), Texas Instruments, Inc. (1976), Park brochures and field observation by the author during September, 1986.

#### Salt Marsh

Areas adjacent to the waters edge which are inundated daily by the tides are vegetated almost entirely by salt marsh cordgrass (Spartina alterniflora), with orach (Atriplex sp.), glasswort (Salicornia sp.) and sea blite (Suaeda linearis) occasionally being found. In areas adjacent to the cordgrass inundated only during extreme high tides, salt meadow hay (S. patens), reed grass (Phragmites communis), salt marsh fleabane (Pluchea purpurascens) and the above mentioned species (with the exception of S. alterniflora) predominate. A small pure stand of S. patens occurs here. P. communis is generally found in pure stands.

This marsh represents one of the last remnants of its kind within the Hudson River Estuary. Despite the presence of abundant debris scattered throughout, its structure and diversity typifies this habitat type and suggest its current function as a viable ecological unit.

#### Upland Zone

Higher areas which are generally unaffected by the tides are mostly dominated by P. communis in pure stands. However, various other successional herbs and some tree species occur scattered throughout this area. Some of the more important species include bayberry (Myrica pensylvanica), Eastern cottonwood (Populus deltoides), wormwood (Artemisia sp.) seaside goldenrod (Solidago sempervirens), marsh elder (Iva frutescens), evening primrose (Oenothera biennis) and ragweed (Ambrosia artemisiifolia).

A nested plot analysis performed by Texas Instruments, Inc. (1976) indicated high importance values for winged sumac (Rhus copallinum), Eastern cottonwood, goldenrod species, reed grass, and other Gramineae. Additional old field species observed included broomsedge (Andropogon virginicus), thistle (Cirsium arvense) and bramble (Rubus sp.).

The above description of upland vegetation generally pertains to areas adjacent to the salt marsh and lying east of the nature path. The narrow zone between the nature path and east of Liberty Way (Fig. 3) is composed of native or exotic plantings chosen for their benefit in supporting wildlife. Examples include Russian olive (Eleagnus augustifolia), Japanese black pine (Pinus thunbergiana), beach plum (Prunus maritima), black chokeberry (Aronia melanocarpa), wrinkled rose (Rosa rugosa) and bayberry. In addition, a stand of quaking

aspen (Populus tremuloides) was planted east of the nature path as a windbreak.

### Wildlife

The most thorough study to date of wildlife in the natural area and surrounding environs within Liberty State Park was conducted by Texas Instruments, Inc. (1976) during 1975 and 1976. Herpetofauna, birds and mammals were surveyed at up to 4 stations in the natural area and up to 8 additional stations in the surrounding state park. Sampling of fish and invertebrates was also conducted in the open water and tidally affected zones.

Information in the following discussion was obtained from Texas Instruments, Inc. (1976), Boyko (1980) and Frank Gallagher (personal communication).

According to Texas Instruments, Inc. (1976), the most abundant mammals are the deer mouse (Peromyscus maniculatus) and eastern cottontail rabbit (Sylvilagus floridanus). However, since the deer mouse does not inhabit New Jersey, and because of their similarity, the white-footed mouse (Peromyscus leucopus) is most likely the rodent to which the Texas Instruments study refers (memorandum of Russell A. Cookingham). Much fewer numbers of the meadow vole (Microtus pennsylvanicus), Norway rat (Rattus norvegicus), muskrat (Ondatra zibethicus) and racoon (Procyon lotor) have been observed (Texas Instruments, Inc., 1976), although the meadow vole and Norway rat likely predominate the marsh (Russell A. Cookingham, personal communication).

The Fowler's toad (Bufo woodhouse fowleri), occurring throughout the state park but not in the tidal marsh, and one occurrence of the painted turtle (Chrysemys picta) are the only herptile species reported by Texas Instruments, Inc. (1976). Diamondback terrapin (Melanoclemys terrapin terrapin) have also recently been sighted within the natural area (Frank Gallagher, personal communication).

The natural area and surrounding environs exhibit both high diversity and numbers of birds. From September 1975 to June 1976, Texas Instruments, Inc. (1976) observed 97 species in the vicinity of Liberty State Park. Of these, over 50% are typically associated with aquatic habitats (marshes, shorelines and open water). Included are 21 species of waterfowl, the most abundant of which included canvasback (Aythya valisineria), greater scaup (A. marilla), bufflehead (Bucephala clangula), American widgeon (Anas americana), gadwall (A. strepera) and black duck (A. rubripes). For these six species, Texas Instruments Inc. (1976) recorded 10,476 individuals during the study period.

Drawing on the above study and her own personal observations, Boyko (1980) observed 50 species of birds within the general salt marsh habitat of the natural area and 137 species within the Liberty State Park area. Included are several state endangered and threatened species.

The current list of birds of Liberty State Park (Park Brochure, 1986) contains 200 species, 56 of which are resident species present throughout the year. The remaining species include migrants and occasional visitors. The list also includes nine species classified as endangered or threatened in New Jersey.

Liberty Park Natural Area provides one of the few tidal marshes left within the Hudson estuary and therefore represents valuable nesting, resting, and feeding space for resident and migratory species. The tidal marsh habitats are used by a multitude of bird species including ducks, harriers, red-winged blackbirds and egrets. At low tides, shorebirds such as the sandpipers and yellowlegs utilize the food resources of the exposed mud zones at the waters edge.

A recent list of fish species utilizing the open waters bordering the state park has been compiled by Boyko (1980) and includes 32 species. Field sampling surveys were also conducted in 1984 within the nearby Port Liberte project area (Dresdner Associates, Inc., 1984). Results of four days of sampling in spring and summer indicated 19 species. The Hudson River estuary is particularly important to over-wintering striped bass (Morone saxatilis), a recreationally and commercially valuable species which has declined dramatically along the Atlantic Seaboard (Russell A. Cookingham, personal communication). Two state threatened species, discussed below, are listed in the above studies.

The benthic community of intertidal and subtidal zones adjacent to the natural area and at other locations throughout the state park was sampled from August 1975 to June 1976 (Texas Instruments, Inc., 1976). Seventy taxa were reported. The two dominants included the polychaete worm Streblospio benedicti and tubificid worms, which collectively represented 88 percent of individuals. Species diversity and number of individuals was lowest surrounding a sewage outfall. However, at the shoreline of the natural area, increased nutrient flow from the vegetation is thought to be responsible for increased species diversity and number of individuals per square meter (Texas Instruments, Inc., 1976).

#### Endangered/Threatened Species

According to Boyko (1980) and the Park list of birds (Park Brochure, 1986), avian species classified as endangered in New Jersey by the Endangered and Nongame Species Program that have been observed within the natural area and bordering zones include the peregrine

falcon (Falco peregrinus), least tern (Sterna albifrons), black skimmer (Rynchops niger), pied-billed grebe (Podilymbus podiceps), northern harrier (Circus cyaneus) and short-eared owl (Asio flammeus). Threatened species include the osprey (Pandion haliaetus), great blue heron (Ardea herodias) and savannah sparrow (Passerculus sandwichensis).

In addition, two species of fish classified as threatened in New Jersey are reported by Boyko (1980) and include the American shad (Alosa sapidissima) and Atlantic tomcod (Microgadus tomcod).

No records exist for rare plant species collections within the natural area.

### Man-Made Features

Features of human origin include fill material which comprises most of the upland portions of the natural area, a large recently constructed Interpretive Center, a trail system, several benches along the trail, and a collection of outdoor sculptures interconnected by trails. Storm drains have been constructed along the trail system. In addition, the marsh and upland sections contain abundant debris. The natural area is surrounded by roads on three sides and exists within a highly urbanized environment.

In 1984, three sculptures were constructed within the dense stands of reed grass in the upland portion of the natural area. The sculptures were constructed from durable materials (concrete, bronze, etc.) and include a small scale city, a crevice with a small animal, and a fireplace on a knoll. Clearings in the reed grass were created for the sculptures which are interconnected by graveled trails.

The debris scattered throughout has either been dumped on-site or washed up from the bay. The amount is considerable and consists of both small and very large items including driftwood, tires, portions of boats, trucks, etc. At the very least, these materials present a visual intrusion to visitors.

### Features of Potential Impact

Liberty State Park is the most heavily used park in the state. The natural area, with its recently completed environmental center and trail system, also receives a large number of visitors. However, the lack of adequate trails and difficulty of foot travel within the tidal marsh zone generally discourages visitors from entering this more sensitive section. An occasional person scavenging for debris is reported. During periods of heavy park attendance, such as Independence Day (on July 4, 1986, 200,000 visitors were estimated), use of the natural area for picnicing and for viewing of fireworks



displays increases dramatically. It is likely that even occasional heavy pedestrian use of the tidal marsh could negatively impact this area.

Since park establishment, major improvements have included development of visitor areas along Morris Pesin Drive including a visitor center and Liberation Mounument, construction of the Interpretive Center and nature trail within the natural area, completion of Freedom Way from Morris Pesin Drive to Zapp Drive, and complete renovation of the C.N.J.R.R. terminal at the northern tip of the park. Much of the current area of the state park, including a large zone north of the natural area, remains undeveloped. This area, formerly covered with railroad tracks, now supports early old-field successional vegetation. The most recent plan, prepared by Wallace, Roberts and Todd (1983), expands on earlier plans for further park development and includes the following major developments in its master plan: Redesign of the main park entrance at exit 14B of the New Jersey Turnpike and creation of a new entrance, construction of a crescent shaped harborfront promenade connecting the Statue of Liberty overlook area with the C.N.J.R.R. complex, construction of a championship 18-hole golf course within the major portion of the undeveloped park area, and construction of a marina, aquarium, technology center, lodge and amphitheater. Should only a portion of this plan become realized, visitation would certainly soar.

At the time of this writing, construction had already begun on the harborfront promenade or seawall. This project includes construction of a levee from the seawall to the rear of the interpretive center. The toe of the levee approximates the currently accepted northern boundary of the natural area (Fig. 2). The levee will provide pedestrian access from the interpretive center to the promenade.

The natural area is subjected to pollutants from the air and, in particular, the waters of the Hudson River and Liberty Harbor. Texas Instruments, Inc. (1976) indicated two sewer outfalls from the park itself (one possibly arising from the natural area) and reported reductions in benthic fauna with proximity to the outfalls. Oil spills commonly occur within New York Bay and could negatively impact the natural area and its biota. In addition, the natural area contains debris which either was dumped there prior to park incorporation or has washed up from waters of the Bay.

The Division of Hazardous Site Mitigation has identified areas within Liberty Park containing hazardous materials based on a preliminary analysis of soil surface samples and visual signs of contamination (David Barskey, personal communication). Fill material, adjacent to the natural area and lying north of the seawall levee between the small pond and the bayshore, has been found to contain high chromium levels and residues of an as yet unidentified oil product on the site of the former MacCalister Tug and Barge operation.

The Department is now further examining this site. One fenced-in site outside the natural area but within the park contains dredge spoils. The entire park needs to be more fully examined to determine the extent of contamination and its impact on natural systems and human use.

## MANAGEMENT ISSUES AND TECHNIQUES

### Rules and Regulations

A portion of the Natural Areas System Rules (N.J.A.C. 7:2-11.1 et seq.) appears in Appendix A. An important function of these rules is to provide general interim management guidelines for all natural areas. An "interim management practice" means any use, activity or management conducted within a natural area prior to adoption of a management plan. Upon preparation of a management plan, interim management guidelines may continue or may be superceded by management techniques more appropriate to fulfill the designation objective of the natural area. The following analysis will outline management uses contrary or supplemental to existing rules. Appendix A should be consulted by managers for guidance on issues not covered below.

### Designation Objective and Classification

The designation objective for Liberty Park Natural Area includes "preservation of a representative salt marsh in Upper New York Bay and for educational purposes" and, at the time of rule preparation, the area was assigned an interim classification of Conservation Preserve (N.J.A.C. 7:2-11.12). This classification reflects an initial view that, in order to attain the designation objective, the majority of the natural area may be managed such that habitat manipulation is permissible in order to preserve a plant or animal species, community type or ecosystem. At the time of rule preparation, this classification was probably assigned because of the perceived need to remove debris and construct interpretive facilities in the natural area.

This area is part of the Natural Areas System for two reasons. First, Liberty contains one of the last remnants of natural tidal marsh within the Hudson River Estuary and as a result supports in particular large numbers of avian species and individuals. The fact that the natural area is such a small remnant within a heavily industrialized and populated area should in no way diminish its value as a functional system. On the contrary, its use by such large numbers of wildlife is predicated on the rarity of such quality open space within this portion of the state. Second, Liberty offers the tremendous numbers of park visitors the opportunity for interpretation of a natural tidal marsh ecosystem. For many users in the immediate vicinity of the park, the natural area provides one of the few opportunities to view such a functional system. Therefore the primary management objective will be to maintain and perhaps enhance this ecosystem while providing large numbers of the public with the opportunity for direct interpretation. However, as will be shown below, because little or no habitat manipulation will be required

throughout the majority of the natural area to attain this objective, the classification shall be changed from Conservation Preserve to Ecological Reserve. This indicates that throughout the majority of the area natural processes will be allowed to proceed with little or no habitat manipulation.

Following is an analysis of issues, problems and management activities which are directly required to achieve the objectives listed above. These topics are treated separately both for convenience and to accentuate their importance. However these issues should not be considered independent of each other. Techniques are based in part on consultation with appropriate agencies, individuals, and the Natural Areas Council, and are designed to adequately maintain and, if possible, enhance the quality of the natural area.

Throughout this section, the Division of Parks and Forestry, State Park Service, through Liberty State Park, shall serve as the Administering Agency, being responsible for effectuating the management techniques outlined in this plan.

## Boundaries

### Issues

1. Boundaries for the Liberty Park Natural area have never adequately been defined, although in the past the natural area has generally been recognized as that which is indicated in Figure 2. Thus, it is necessary to consider the adequacy of this boundary. Existing eastern and southern boundaries consist of the waters of New York Bay and developed zones along Morris Pesin Drive, respectively, which do not readily permit modification. The western boundary (Freedom Way) separates upland portions of the natural area from an active industrial park and additional developed park areas. The terminus of Thomas McGovern Drive and levee of the seawall now under construction approximates the northern boundary beyond which a small pond and undeveloped park areas exist. The general area between the pond and the bayshore is known to be contaminated by elevated chromium levels and an unidentified oil product (David Barskey, personal communication).
2. Included within the current recognized boundaries of the natural area are both the tidal marsh remnant and more upland filled zones on which structures (Interpretive Center, trail, sculptures) have been situated. At issue is whether this highly modified and partially developed zone warrants inclusion within the natural area boundaries, or whether a separate classification would be more appropriate for this zone. The classification must reflect the degree

of habitat manipulation permissible within a particular zone.

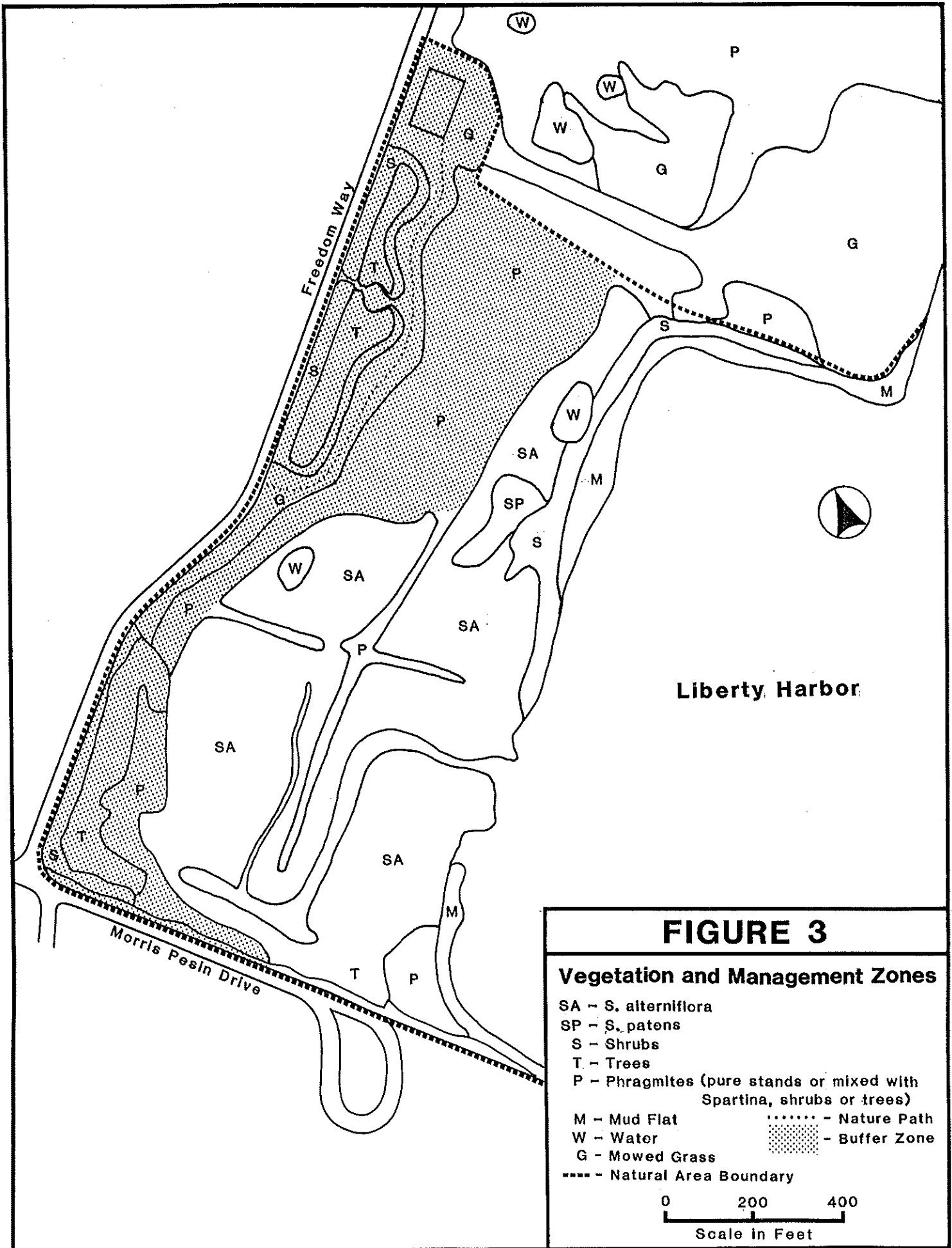
### Techniques

1. The currently recognized natural area boundary shall remain (Fig. 2). Expansion of the boundary to the east, south or west would be impossible or severely impractical. Inclusion of areas north of the seawall levee now under construction would necessitate incorporation of a contaminated toxic zone which may require extensive manipulation in the future. The levee of the seawall therefore provides a logical physical northern boundary.
2. Upland portions of the natural area shall remain as System land primarily due to the buffer capacity they provide to the natural tidal marsh and because of their value for interpretive use. Abrupt boundaries without adequate terrestrial buffers exist to both the north and south.
3. The natural area shall be classified into two management zones as indicated in Figure 3. The tidal marsh proper shall remain an Ecological Reserve, excluding habitat manipulation from this zone. Upland areas, generally devoid of characteristic salt marsh vegetation and coincident with higher topographic elevations (maximum elevation is about 17 feet), shall be classified as Buffer Zone. As stated in existing rules (Appendix A) buffers may occupy peripheral zones within the natural area and primarily serve to protect the Ecological Reserve.

### Human Use

#### Issues

1. The relatively natural tidal marsh and highly modified upland zones vastly differ in their tolerance to human use. Number of visitors and degree of trampling can have a marked impact on the productivity and subsequent function of salt marshes (including use by resident and migratory birds). Upland zones dominated by shrubby vegetation and reed grass will be much less affected by the same amount of impact. Extremely large numbers of visitors can be expected within the natural area with future park development. Consideration must be given to elevated use during periods of heavy park attendance.
2. Provision must be made for the interpretive use of at least a representative portion of the natural area.



3. Public recreational uses which currently occur include educational programs, hiking, birdwatching, botanizing, scavenging debris, etc. Types, volume and location of allowable uses must be specified.
4. Provision must be made to allow and encourage qualified researchers to gather needed data on this area and its biota.

#### Techniques

1. The area classified as Ecological Reserve which includes the tidal marsh proper (Fig. 3) shall be restricted to use for ecological research and study by those who have obtained a valid permit from the Administering Agency as well as for educational purposes. Permitted uses within this zone include staff-led group tours.
2. The area classified as Buffer which includes upland areas (Fig. 3) shall be open to the public for both interpretation and passive recreation purposes as well as research. Because of the close proximity of the salt marsh to the nature trail over much of its length (Fig. 3), it is anticipated that the vast majority of the public will use this trail for interpretation of the marsh system. This proximity allows for interpretation without impacting the sensitive marsh by foot travel or necessitating construction of an elevated walkway, and also protects the public from possible injury. Those interested in a closer examination of the salt marsh system can arrange for a staff-led group tour into the Ecological Reserve.
3. No physical barrier or signs shall be placed between these two use zones. However, restriction of the general public to the Buffer Zone shall be accomplished by prohibiting the placement of any trails and blocking entrance of any existing trails into the Ecological Reserve. There shall be no restriction on the volume of public use within the Buffer Zone.
4. Current recreational uses shall continue, with the exception of scavenging debris which could impact the natural system and endanger the public safety. Use of motor vehicles except by authorized park personnel is prohibited. All motor vehicle use within the Ecological Reserve is prohibited.
5. The existing rules (N.J.A.C. 7:2-11.10) shall remain effective concerning procedures for conducting research and collecting specimens in both Ecological Reserve and Buffer zones. Research activities may be conducted throughout the

year. Approval of such projects shall not jeopardize the integrity of the ecosystem.

6. Law enforcement patrols shall be conducted by the State Park Service to ensure compliance with the above management.

### Man-made Features

#### Issues

1. The interpretive center and trail system, located within the Buffer area near Freedom Way, are valuable features contributing to the interpretive goal of the natural area, and are consistent with existing rules on allowable structures within Buffer Zones (Appendix A).
2. The debris scattered throughout the natural area (in both Ecological Reserve and Buffer) is a significant eyesore which severely detracts from the natural character of the area. Removal of such debris presents an enormous task that would certainly be disruptive to tidal marsh function, particularly if conducted during nesting periods or spring vegetative growth. Debris will continue to be exchanged in tidally affected areas despite cleanup. The physical presence of these materials does not appear to negatively impact wetland function. Dock pilings remaining from previous cleanup activities serve an important function by providing suitable habitat for striped bass.
3. The three sculptures recently constructed within the Buffer zone, although probably exerting no negative impact on the function of this ecosystem, also conflict with this site's natural character and clearly send a confusing signal to the public as to the objectives of the Natural Areas System.

#### Techniques

1. Structures which contribute to the interpretive use of the natural area shall remain and continue to be encouraged within the Buffer Zone.
2. Dumped or washed up debris which can directly be viewed by visitors along the interpretive trail shall be removed by the Administering Agency, as long as the agency has determined that such activity shall not create an erosion condition or otherwise negatively impact the area or its biota. Additional debris, including any remaining anchored dock pilings, shall remain in place. Easily-moved debris may be removed at the discretion of the Administering Agency.



3. The three sculptures unnecessarily and significantly detract from the natural character of the area and shall be removed by the Administering Agency as soon as possible. Future structures proposed for the Buffer Zone must directly or indirectly contribute to the designation objective of the natural area.

## External Features

### Issues

1. The single most significant threat to the integrity of this system is the planned future development of the park. Impacts resulting from construction of the harborfront promenade, as envisioned in a recent plan (Wallace, Roberts and Todd, 1983), should be minimized. Placement of a proposed championship 18-hole golf course would necessitate drainage and application of herbicides and fertilizers which may become trapped in the highly absorbtive substrates of the marsh. A marsh as small as that of the natural area may not be able to adequately filter large quantities of such substances, should they enter the natural area. Development would increase visitation to the natural area year-round.
2. Fill material deposited adjacent to the natural area to the north is known to be contaminated with chromium and an unidentified oil product. Additional sites within the Park boundaries are thought to contain other contaminants. The extent, if any, of chromium or oil migration and contamination of the natural area is not currently known and warrants investigation (David Barskey, personal communication). To date, a comprehensive study of hazardous materials within and surrounding Liberty Park has not been conducted. The nature and location of such materials could necessitate use restrictions and require cleanup action within the natural area.
3. The natural area receives pollutants from both the air and the waters of Liberty Harbor. Water pollution resulting from sewage and oil spills could exert the greatest negative impact on marsh productivity and bird and waterfowl use.

### Techniques

1. Future development plans for Liberty State Park shall be provided to the Administrator, Office of Natural Lands Management, and to the Natural Areas Council for review and comment. Every effort shall be made by these groups to coordinate with appropriate park planning and development agencies in assuring that both direct and indirect impacts

on the natural area be avoided in any development plan. A priority will be to avoid any structures or activities that will interfere with tidal action within the natural area.

2. The results of future studies of the Liberty Park area by the Division of Hazardous Site Mitigation shall be made available to the Administrator, Office of Natural Lands Management, and the Natural Areas Council. Any contamination within the natural area, particularly areas open to the public, may result in closure until cleanup operations are completed. The Administering Agency shall take appropriate measures to prevent the public from straying into known contaminated zones just north of the natural area boundary.
3. The Administering Agency shall cooperate with appropriate authorities in monitoring and cleanup of oil spills and other periodic pollution events.

LITERATURE CITED

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- Texas Instruments, Inc. 1976. Liberty State Park ecological study: Final report. Consultant's report prepared for The Port Authority of New York and New Jersey.
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APPENDIX AINTERIM MANAGEMENT PRACTICES FOR NATURAL AREAS

From Natural Areas System Rules  
(N.J.A.C. 7:2-11.1 et seq.)

7:2-11.9 INTERIM MANAGEMENT PRACTICES

- (a) Interim management practices shall be implemented by the administering agency, provided that:
  - 1. The practice will have no direct or indirect adverse impact on natural features of concern;
  - 2. The administering agency notifies the secretary of the Council, in writing, no later than 30 days after initiating the practice;
  - 3. Approval of the Commissioner is not required by provision elsewhere in this subchapter; and
  - 4. The practice is consistent with terms of any conservation easement held by the Department.
- (b) Interim management practices which require the approval of the Commissioner shall first be submitted to the Council for its review and recommendation.
- (c) Upon finding that an interim management practice listed below at (e) or (f) would be detrimental to achieving a specific designation objective, the Council shall recommend to the Commissioner the substitution of a more appropriate interim management practice. Should the Commissioner concur with the recommendation of the Council, the Commissioner may approve substitution by a more appropriate interim management practice.
- (d) Where there are conflicts between general practices described below at (e) and practices specific to a natural area classification described below at (f), the latter shall apply.
- (e) The following interim management practices apply generally to all natural areas:
  - 1. Natural area boundaries shall be made clearly evident by posting signs at a maximum density of ten signs per mile; entrance points shall be posted to indicate to users that they are entering a natural area; boundary signs shall be of a standard size and format as approved by the Commissioner and provided by the Division;
  - 2. Boundary fences that are needed to protect the natural area may be installed provided the fence shall not have a

- detrimental effect on movement of wildlife, air circulation, or other natural conditions;
3. Vehicular access lanes may be maintained within a natural area but may not be enlarged in any manner except upon approval of the Commissioner.
  4. Existing firebreaks within a natural area may be maintained for safety purposes; temporary firebreaks made by mowing, raking, plowing or wetting, may be used in conjunction with prescribed burning for habitat management;
  5. Existing structures may be maintained in a natural area but may not be enlarged; new structures, of a temporary nature, may be constructed for research purposes in accordance with N.J.A.C. 7:2-11.10;
  6. No measures, such as cutting of grass, brush, or other vegetation, thinning of trees, opening of scenic vistas, or planting, shall be taken to alter natural processes or features for the purpose of enhancing the beauty or neatness of a natural area;
  7. Except as otherwise provided in this section, there shall be no introduction, removal or consumptive use of any material, product, or object to or from a natural area; prohibited activities include grazing by domestic animals, farming, gathering of plants or parts thereof, mining or quarrying, and dumping, burying, or spreading of garbage, trash, or other materials; structures or materials may be removed as follows:
    - i. Old interior fences may be removed, giving consideration to leaving posts to mark boundaries between former land uses;
    - ii. Rubbish or any other waste material may be removed; and
    - iii. Structures having no historic, scientific or habitat value may be demolished and removed unless such structures are deemed essential for administrative purposes;
  8. Water levels within a natural area shall not be altered except to restore water levels which have been altered due to a sudden natural phenomena or man-induced conditions off-site; routine repairs to existing water control structures may be undertaken but the structures may not be enlarged;
  9. All wildfires shall be brought under control as quickly as possible; after a fire within a natural area, there shall be no cleanup or replanting except as approved by the Commissioner to achieve the designation objective or for reasons of health and safety;

10. Prescribed burning, to eliminate safety hazards and to manage habitat, may be conducted upon review of a proposal for prescribed burning by the Council and approval by the Commissioner; use of vehicles and equipment shall be specified in the proposal for prescribed burning;
11. Erosion control within a natural area shall not be undertaken except to restore existing grades which have been altered due to a sudden natural phenomena or man-induced conditions within or beyond the natural area;
12. Habitat manipulation may be undertaken if preservation of a particular habitat type or species of native flora or fauna is included in the designation objective of the natural area and the prior approval of the Commissioner is obtainable;
13. Gypsy moth control activities may be implemented as an interim management practice after approval by the Commissioner; the Commissioner shall review a control plan only after the State Forester has determined that egg mass counts and prior year defoliation indicates that tree mortality will be severe without intervention; to the extent practicable, biological controls, rather than chemical means, shall be used to control gypsy moths;
14. There shall be no physical manipulation of a natural area or application of chemicals known as adulticides for the purpose of controlling mosquitos; the application of larvacides may be permitted in salt marshes only and only as follows:
  - i. The application of Bacillus thuringensis var. israeliensis (BTI) may be initiated by a mosquito control agency at any time; and
  - ii. The application of other larvacides may be initiated upon approval by the Commissioner of a specific plan submitted by a mosquito control agency; the plan shall identify the specific area where an application will be made, the types and amount of larvacide to be applied, the need for the application, and the reason why BTI cannot be used for this application;
15. Research activities and the collection of specimens may only be conducted in accordance with N.J.A.C. 7:2-11.10 and upon approval of the administering agency; and
16. Public use of natural areas shall be allowed only to the extent and in a manner that it will not impair natural features; the administering agency may restrict access and use as necessary to protect the natural area; the following are permissible public uses:
  - i. Hunting, trapping, and fishing are permitted in accordance with N.J.A.C. 7:25-5 and 7:25-6; except for the stocking of fish and game, habitats may not be

manipulated for the purpose of enhancing hunting, trapping, or fishing;

- ii. Occasional camping along trails, boating, and swimming may be permitted in specified locations of natural areas in accordance with N.J.A.C. 7:2-2, 7:2-5, 7:2-7, 7:2-8, and 7:25-2, and are further limited as follows:
  - (1) No permanent structures may be erected;
  - (2) No motorized methods of boating or camping are permitted;
  - (3) Trailside shelters of the type called lean-tos are permitted, but there may not be two such shelters within three miles of each other; and
- iii. Existing trails may be maintained, but not enlarged in any manner, by the administering agency to allow public use and prevent erosion, trampling of vegetation beyond the trails, and other deterioration as follows:
  - (1) New trails or enlargement of existing trails for interpretive purposes may be initiated subsequent to review of a plan by the Council and approval of that plan by the Commissioner;
  - (2) Rare plants may not be removed for the purpose of maintaining existing or constructing new trails; and
  - (3) To the extent possible, natural materials shall be used on and along trails; and
- iv. All pets shall be kept caged or leashed and under immediate control of the owner except that dogs used while legally hunting shall be exempt from the leashing requirement.

(f) The following interim management practices, unless superseded by an adopted management plan, apply to the appropriate specified natural area classifications:

- 1. Location markers identifying interpretation points of interest may be installed except within ecological reserves;
- 2. Trail blazes may be used within any natural area;
- 3. Existing vehicular access lanes may not be enlarged in any manner within an ecological reserve;
- 4. New vehicular access lanes may be constructed only within buffer areas and upon approval by the Commissioner;

5. New structures and enlargement of existing structures may be undertaken by the administering agency only within buffer areas, provided the structures directly or indirectly contribute to the designation objective;
6. The alteration of natural processes or features for the purpose of enhancing public use of the natural area may be conducted by the administering agency only within buffer areas; and
7. The following management practices shall not be permitted within ecological reserves:
  - i. New, existing, or temporary firebreaks;
  - ii. Construction of new trails;
  - iii. Alteration or restoration of water levels;
  - iv. Prescribed burning;
  - v. Erosion control measures;
  - vi. Gypsy moth control activities; and
  - vii. Manipulation of vegetation and wildlife habitats.