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C. Area 3: Municipal Golf Courses
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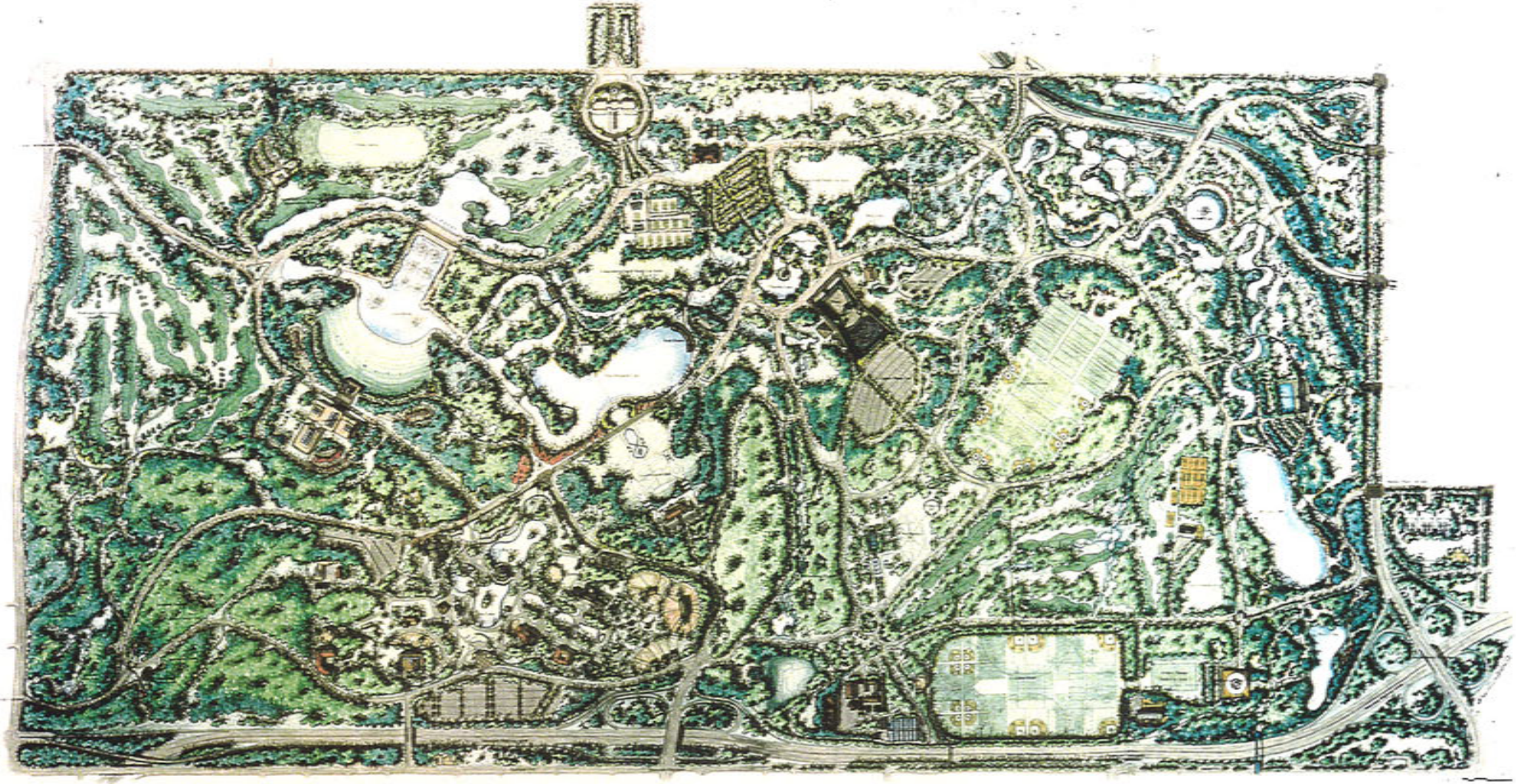
F. Area 6: Jefferson Lake - Bowl Lake - Science Center
G. Area 7: Parks Department - Aviation Field
H. Area 8: Central Fields - Triple A - Jewel Box



FOREST PARK MASTER PLAN

I. PASSIVE OPEN SPACE SYSTEM

A. Overview

B. Summary of Existing Conditions

C. Design Principle

D. Design Recommendations

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Passive Open Space Spine Character
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Natural Systems

I. PASSIVE OPEN SPACE SYSTEM

A. Overview

Passive open space is defined as the casual use areas throughout the park where one can picnic, view nature, stroll along a lagoon, or fly a kite. Forest Park's passive open space system includes forest settings, open grassy meadows, lakes and lagoons, linear green spaces, and a multitude of other landscapes throughout the Park. It surrounds and connects the Park's active space areas and cultural institutions and connects them to the neighborhoods which surround the Park.

In principle, Forest Park's passive open space system connects Kennedy Forest in the west to Bowl Lake in the east. Its character changes through the park's bottomlands from the Forsyth entrance to Bowl Lake and is physically defined by the park's uplands and bluff system. It is connected to upland land uses via the valley and intermittent tributary system. The passive open space system is comprised of landscapes, landmarks and water features with varying scale, character, seasonal quality, use, and visual drama.

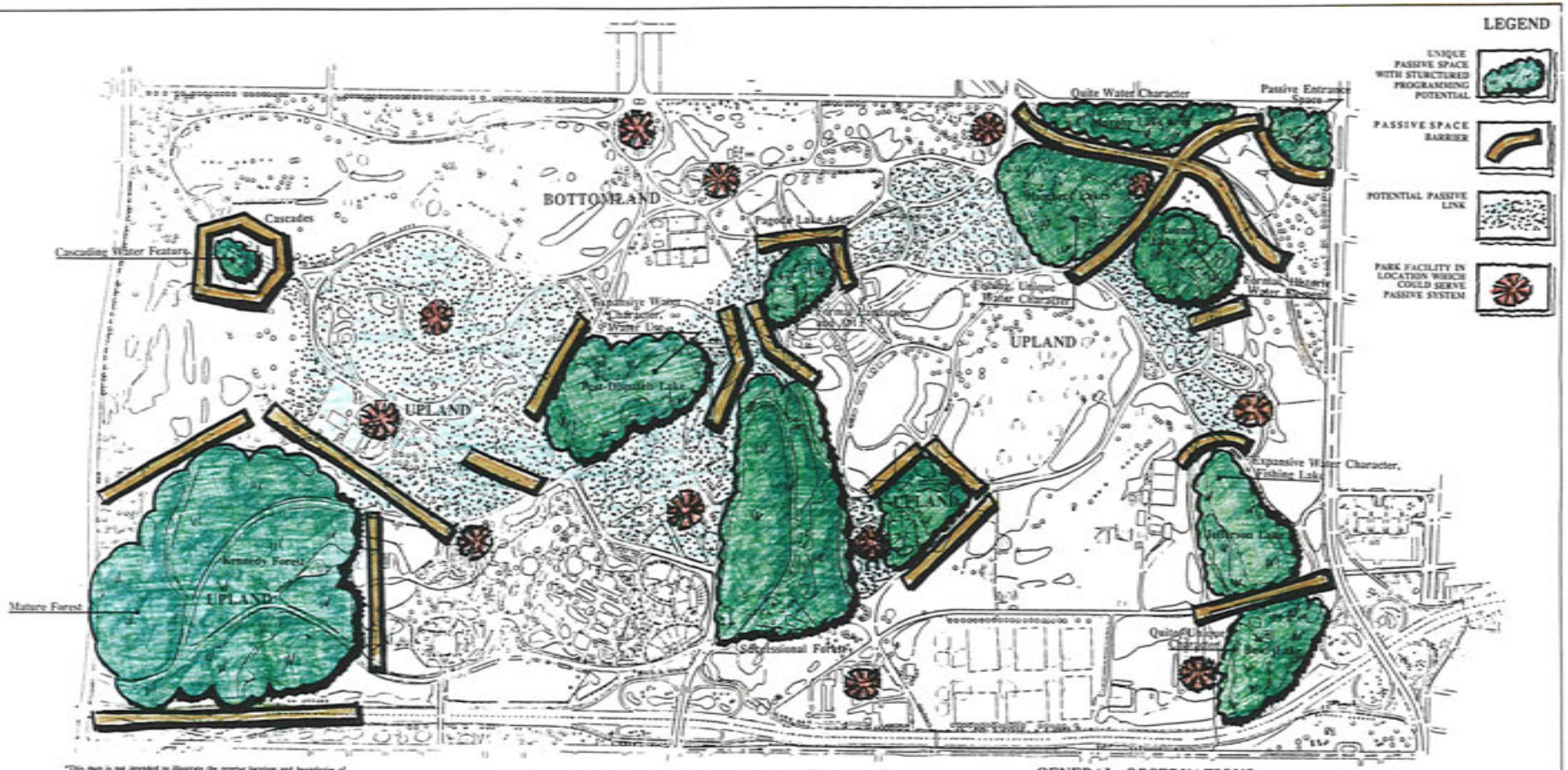
Movement is a critical component to any ecosystem, be it for humans, wildlife, water, or pollen. In order to allow free and hazard -free movement, barrier-free corridors are necessary. These corridors are critical to the use of park space both by humans, who wish to move about and experience the park via the path system, and by area wildlife which benefit from barrier-free corridors for migration and breeding. The passive open space system provides connections or corridors between the park's passive open spaces, its cultural institutions, and its active recreation.

In total, the passive open space system offers the potential for interactive programming between land uses and gives the park user access to the total park experience. Every effort should be made to develop and nurture partnerships with the Park's institutions that offer education programs on our natural resources (i.e., Zoo, Science Center) and with local nature and educational organizations whose members use the Park.

B. Summary of Existing Conditions

Existing fragmentation and barriers degrade the health of the Forest Park's vital natural systems. Fragmentation is detrimental to safe and convenient pedestrian movement, often creating dangerous road crossings, dead end paths, inaccessible spaces and isolated landscape elements. Fragmentation also can result in unhealthy environmental conditions, such as inbreeding, predation from aggressive exotic species, and a general lack of biodiversity. It is important to minimize this fragmentation to achieve an environmentally sound park, safe and enjoyable public recreation, including bike and pedestrian circulation, and improved wildlife habitat and migration corridors.

There are currently a few select sites used for events and picnics. These are sometimes over-used for a narrow range of outdoor activities and events. If conditions were improved in all open spaces, there would be a multitude of sites for year-round outdoor activities, reducing the burden on the existing sites and opening up vast opportunities for new and diverse outdoor experiences and events.



*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.

*Analysis by Design Team 1995

*Statistics from 7 city conservation study by Missouri Dept. of Conservation

- Wildlife, vegetation and humans exist in a mutually beneficial relationship.
  - -Wildlife is vegetation's natural pollinator and seed distributor when provided with corridors which allow movement through an ecosystem's many natural communities.
  - -Vegetation and its pollen and seed source provides food and cover for wildlife.
  - -Humans have the power to maintain or disrupt the natural balance. They also reap the benefits from a healthy ecosystem with improved air and water quality, reduced erosion and aesthetically pleasing natural settings.

GENERAL OBSERVATIONS

- Forest Park contains unique and potentially high quality passive green spaces which are fragmented and separated from other areas by physical infrastructure and land uses. An opportunity exists to link some of these passive spaces into a functional system.
- Structured programming in passive green spaces is the outdoor natural system's equivalent to cultural programming. There is generally a shortage of this programming which focuses on interpretive, educational and recreational experiences relating to the outdoors and natural systems.
- 67% of St. Louis area residents participate in birdwatching activities, 50% hike in the woods and 37% photograph nature. Opportunities for these activities close to home in Forest Park are limited.*
- First hand natural experiences, nature related recreation and environmental education opportunities have been reduced by a shrinking amount of forest and natural vegetation and the isolation of these areas.

1995 PASSIVE SPACE CHARACTER AND USE MAP

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"=400'

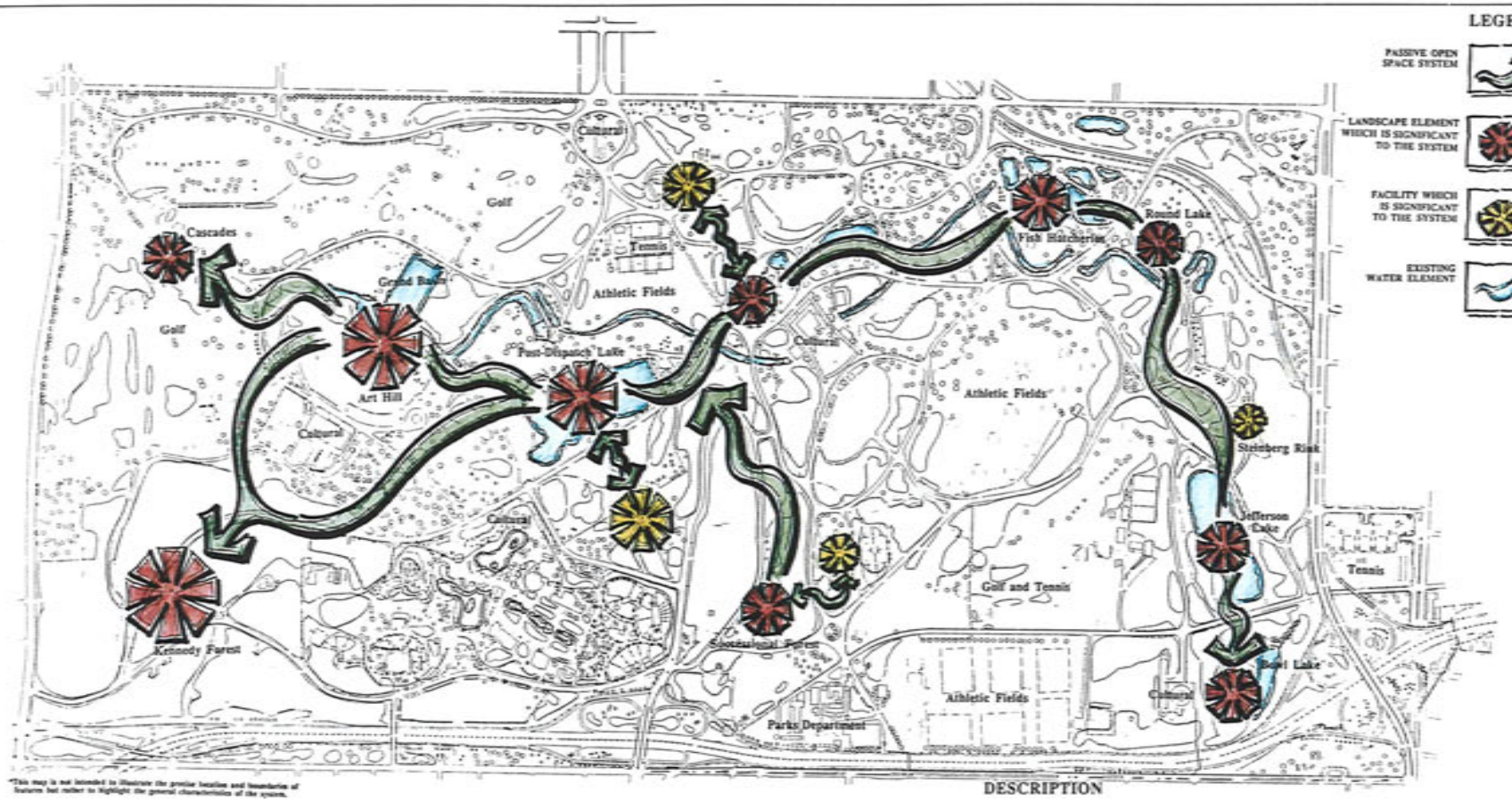
11 MARCH 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN



*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.

DESCRIPTION

- Creates actual and perceptual connections which unite Kennedy Forest with Art Hill, Grand Basin, Post Dispatch Lake and ultimately Bowl Lake via passive open space corridors which link existing green spaces with natural, tree lined passageways, water elements, view corridors and linking pathways/trails.
- Provides an internal connection for perimeter active and cultural land uses and unifies diverse and fragmented open spaces along its path.
- Could provide passive green spaces and connecting paths for structured educational, interpretive and recreational programming and unique natural and cultural resources which would allow park users to better understand and appreciate the park's natural resources.
- Could provide the locations for outdoor activities such as bird watching, hiking and nature photography which are popular with St. Louis area residents.
- Would improve air and water quality by reducing carbon dioxide levels, erosion and surface water runoff while increasing oxygen levels and filtering airborne pollution.

DESIGN PRINCIPLE

Create a Passive Open Space System

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"=400' 0 400 800 2000

11 MARCH 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN

C. Design Principle

Create a passive open space system.

D. Design Recommendations

1. General Approach

The Forest Park Master Plan creates a passive open space system that forms the base or framework for all other park activities. By design, it surrounds Forest Park's ZMD institutions, park and service facilities, and active recreation entities, and creates a mutually beneficial relationship between them. It utilizes the Park's existing topography and vegetative character to create a diverse natural experience which keeps in balance with built features such as buildings and roads. Integral features of the system are the linear connected water system and the park's path system which are interwoven throughout the passive open space system and can be used to connect the many diverse landscapes into a cohesive, unified whole.

Specific design recommendations include:

- Provide the park user with the opportunity to conveniently circulate between all of the park's amenities and benefit from a total park experience that recognizes all existing ZMD institutions, park and service facilities, and active recreation entities are connected to the passive open space system and each other.

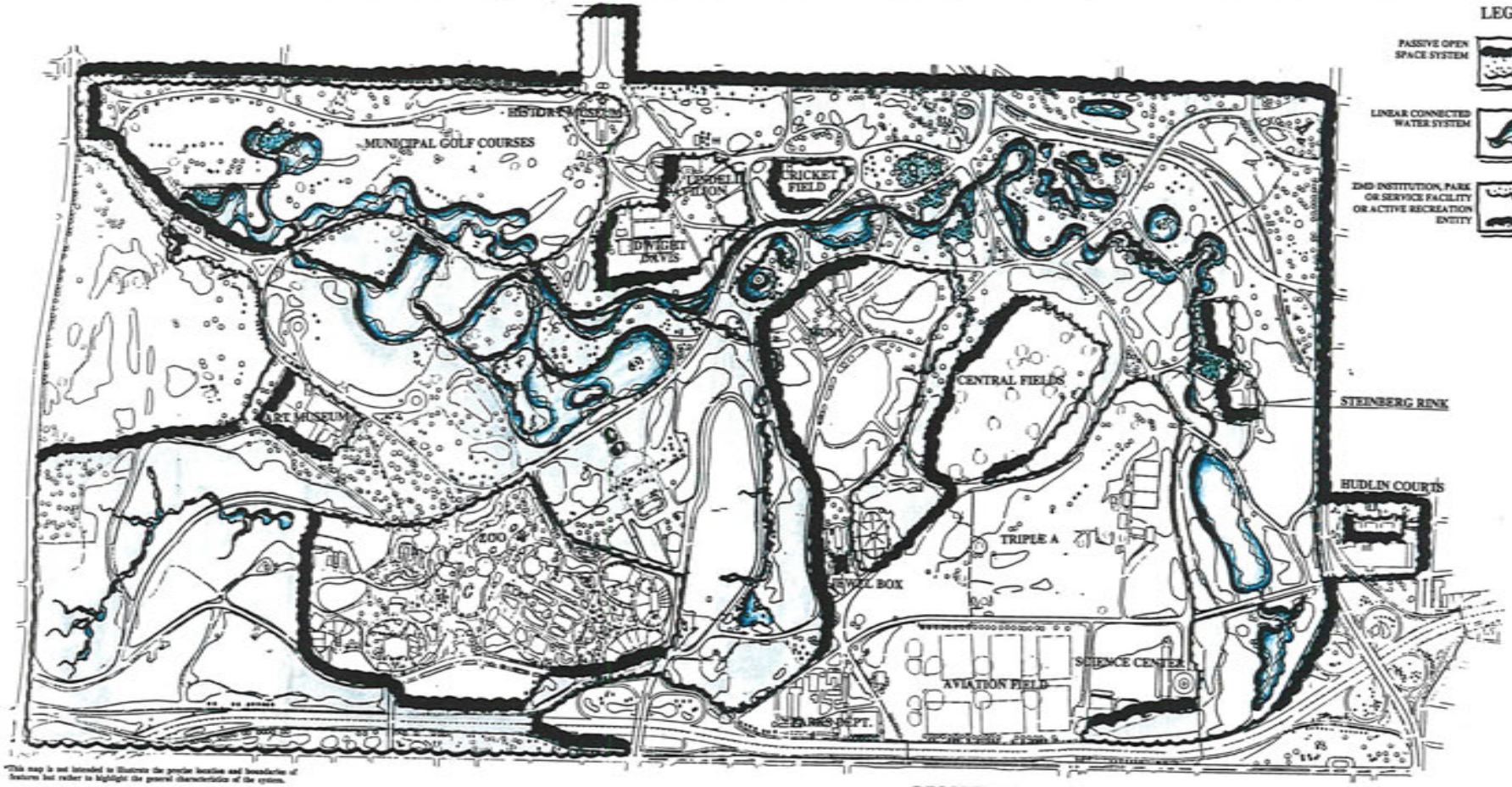
- Create a park-wide, linear connected water system as the connective thread that unifies the diverse qualities of the passive open space system.

- Create natural open space corridors as "outdoor classrooms" for educational and interpretive programming, offering first-hand opportunities to observe wildlife and plant species in their native element and interpret human impact on the corridor's natural systems.

- Create a variety of picnic grounds which vary in scale, character and usage based on surroundings and public demand.
  - Provide a range from small scale grounds with tables to large scale areas with shelters and open recreation space.
  - Provide a mix of forest settings and open, grassy, casual recreation areas.
  - Provide some grounds with formal shelters that are compatible with landscape setting and surrounding architectural character.

- Consider increased use of Forest Park's passive open space system for structured outdoor passive recreation which complements programming at existing ZMD institutions, park and service facilities, and active recreation entities.

- Utilize natural corridors to teach people about management practices that have been put in place to protect natural resources, such as no mowing, etc.



*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.

DESCRIPTION

- A cohesive passive open space system forms the "spine" of the park and creates a mutually beneficial relationship between Forest Park's passive recreational uses and its ZMD institutions, park and service facilities, active recreation entities.
- The park-wide, linear connected water system creates the connective thread that unifies the diverse qualities of the passive open space system.
- All of the existing ZMD institutions, park and service facilities, active recreation entities are attached to the passive open space system and are thus connected to each other via this park wide system. This provides the park user with the opportunity to conveniently circulate between all of the park's amenities and benefit from the total park experience in a single visit.
- Forest Park's passive open space system has the potential to provide structured outdoor passive recreation which complements programming at existing ZMD institutions, park and service facilities, active recreation entities.

CONCEPT DIAGRAM
Passive Open Space System

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 600' 0 600 1200 2400

May 24, 1995

CITY OF SAINT LOUIS
DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION
URBAN DESIGN

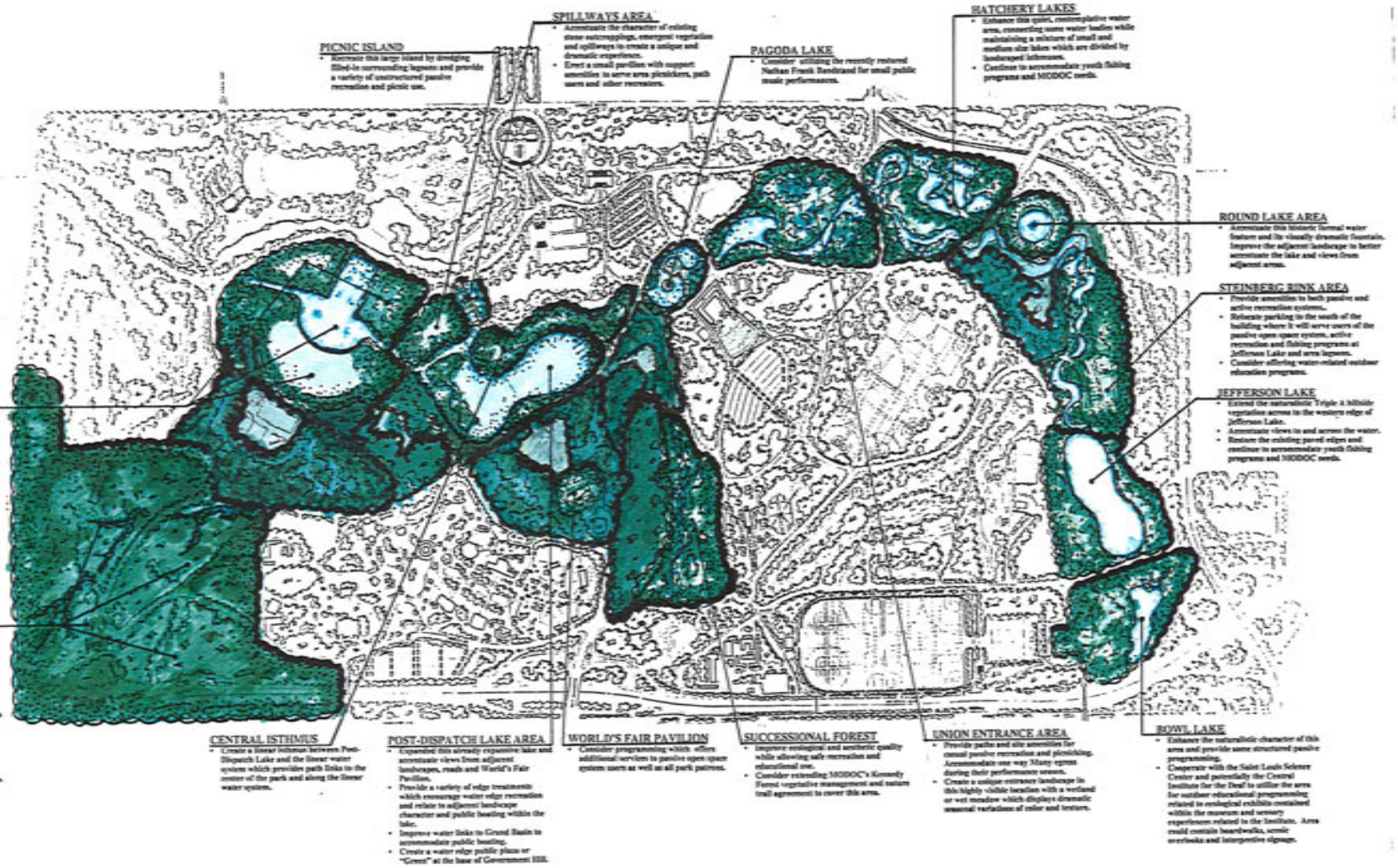
FOREST PARK MASTER PLAN

- Create passive open space corridors to:
  - Reduce erosion and provide sediment control.
  - Help cleanse air and water.
  - Utilize trees and other plants to remove CO_2, CO and other toxic pollutants from the atmosphere while producing a net return of O_2.
  - Provide climate moderation in terms of summer cooling, wind control, etc.
  - Provide wildlife habitat and safe migration corridors.
  - Provide pedestrian and bike circulation systems.

- Coordinate path design with passive space features to maximize public contact.

- Upgrade and expand service and support facilities/amenities throughout the park for passive space users, including:
  - Security stations with personnel or security telephones.
  - Attended public toilets, showers and lockers.
  - Bike parking.
  - Park information and maps.
  - First aid amenities or personnel at major facilities.

- Consider providing two nature centers:
  - One in Kennedy Forest, offering forest nature trails and hiking areas and doubling as a bike path/trail amenity center for general park users. An agreement exists between the City and MODOC to create and operate this facility.
  - One at the Hatcheries building or Steinberg Rink, providing not only urban youth fishing programs, but nature interpretation programs for the surrounding lowland, water related landscapes, and managed public fishing in select lakes and lagoons. This center could also serve as the starting for the area's existing tree walk.



Passive Space Recommendations

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE 1"= 400' 0 400 800

November 18, 1995

2. PASSIVE OPEN SPACE SYSTEM COMPONENTS

Elements of the passive open space system can be generally classified as follows:

The Passive Open Space Spine

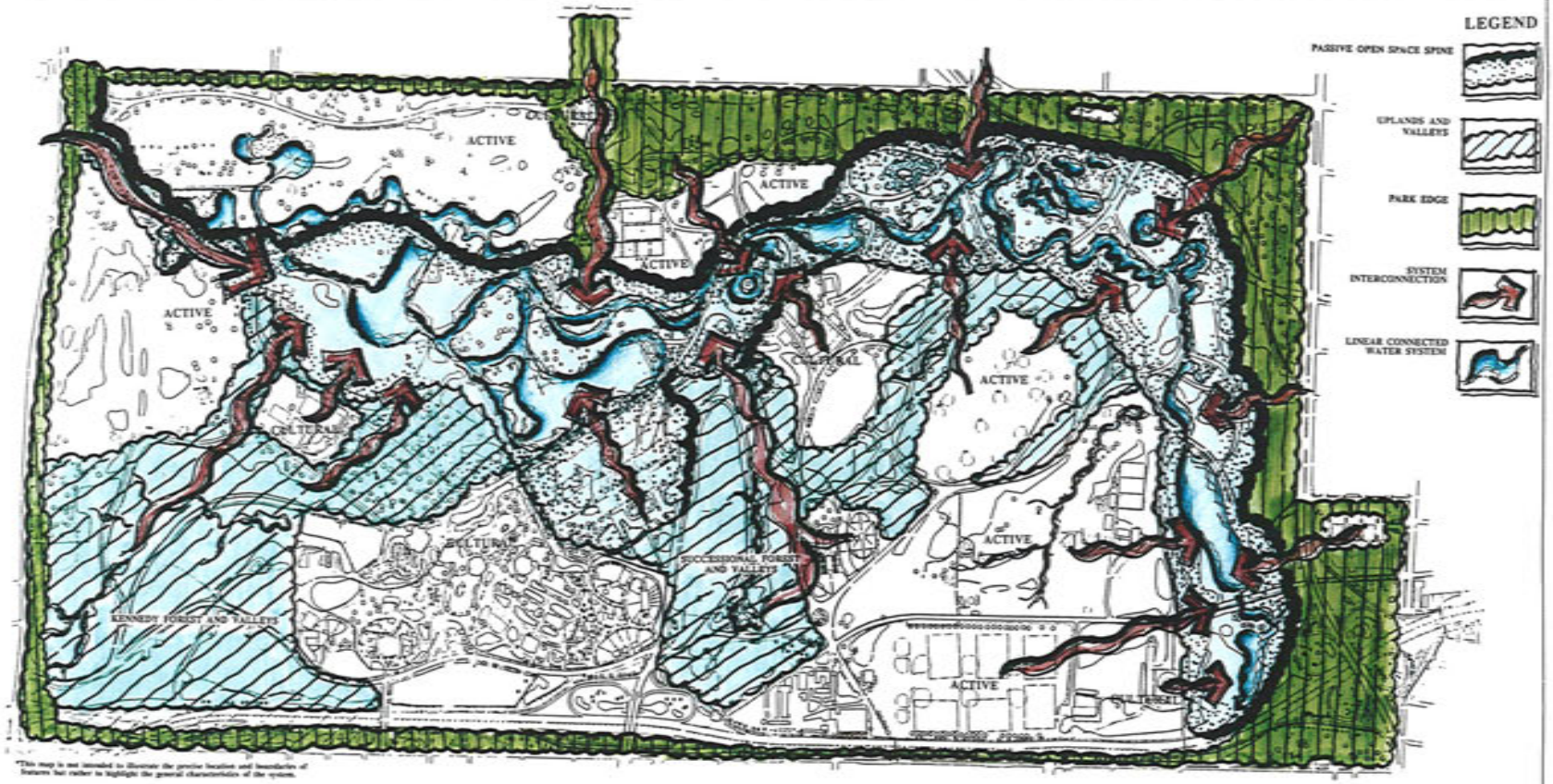
- The linear connected water system of lakes and lagoons
- The "Flat Nine" Municipal Golf Course edges
- Langenberg Field
- Cricket Field edges
- Connection to Missouri History Museum
- The Fish Hatchery Lakes
- Dwight Davis Tennis Center
- Steinberg Rink
- Connection to Saint Louis Zoo
- Art Hill
- Government Hill

The Uplands and Valley System

- Central Fields edges
- The Saint Louis Art Museum environs
- Kennedy Forest
- Successional Forest
- Triple A edges and valleys
- Cabanne House environs
- World's Fair Pavilion
- Saint Louis Science Center environs
- Murphy Lake
- The Muny environs
- The upland Municipal Golf Course edges and valleys

Park Edges

- Kingshighway edge
- Lindell edge
- Lindell Pavilion environs
- Skinker edge
- Oakland Ave edge
- Aviation Field edges



CONCEPT DIAGRAM

Passive Open Space System Components

DESCRIPTION

- Components of the passive open space system can be generally classified as part of the Passive Open Space Spine, the Uplands and Valleys or the Park Edges.
- The Passive Open Space Spine contains many diverse landscapes, landmarks and water features which vary in character based on site specific qualities. The linear connected water system acts as a connective, unifying element of this diverse system.

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"=400' 0 400 800 1600

June 6, 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN

PASSIVE OPEN SPACE SPINE

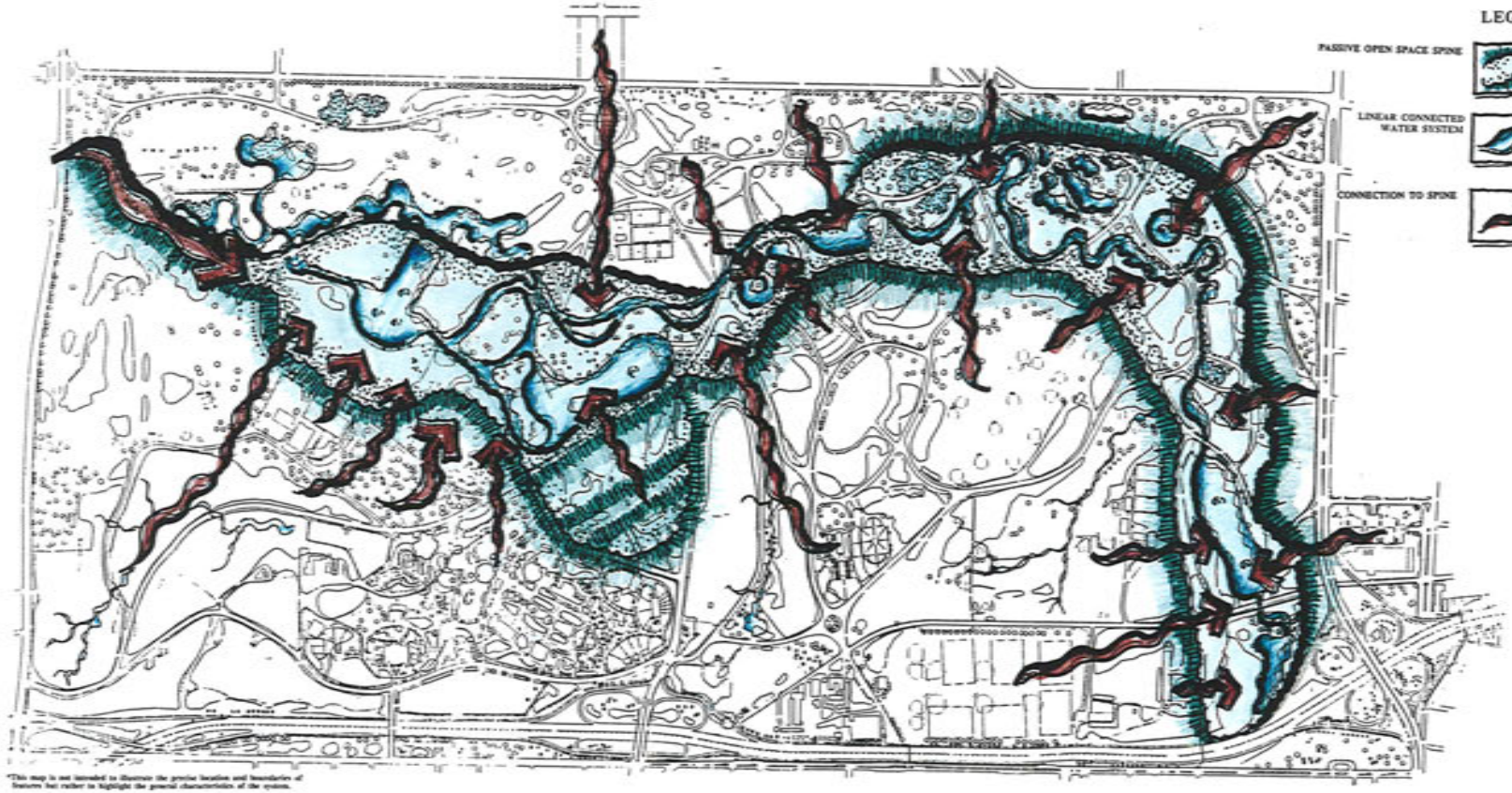
The "Passive Open Space Spine" is located in the Park's bottomlands and is physically defined by the rising topography of the bluff system. Both the bottomlands and bluffs follow the former route of River Des Peres prior to its burial in underground sewer tubes. The bottomlands and bluff systems contain many diverse landscapes, landmarks, and water features which vary in character based on site specific qualities. The linear connected water system acts as a connective, unifying element of this diverse system.

Specific design recommendations include:

- Accentuate the inherent qualities of the existing and historic bottomlands and bluff system which forms the "Passive Open Space Spine" of the park, connecting the diverse elements of the passive open space system as well as the park's active recreation entities, its cultural institutions, and its park facilities.

- Accentuate the spine's adjacent bluffs, uplands, and assorted landscapes, landmarks, and water features which heavily influence spatial character.

- Emphasize the linear connected water system's vital role in defining the character of most of the spine's spaces, influencing spatial character on a site specific level and unifying these diverse spaces on a park-wide level.



*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.

CONCEPT DIAGRAM
Passive Open Space Spine

DESCRIPTION

- The Bottomlands and Bluff System forms the "Passive Open Space Spine" of the park, connecting the diverse elements of the passive open space system as well as the park's active recreation entities, its cultural institutions and its park facilities.
- This "Passive Open Space Spine" is physically defined by the park's bluff system which follows the former route of River Des Peres prior to its burial in underground sewer tubes.
- The park's bluffs and valleys often function as transitional space between the Passive Open Space Spine and the upland passive open spaces and park edges.

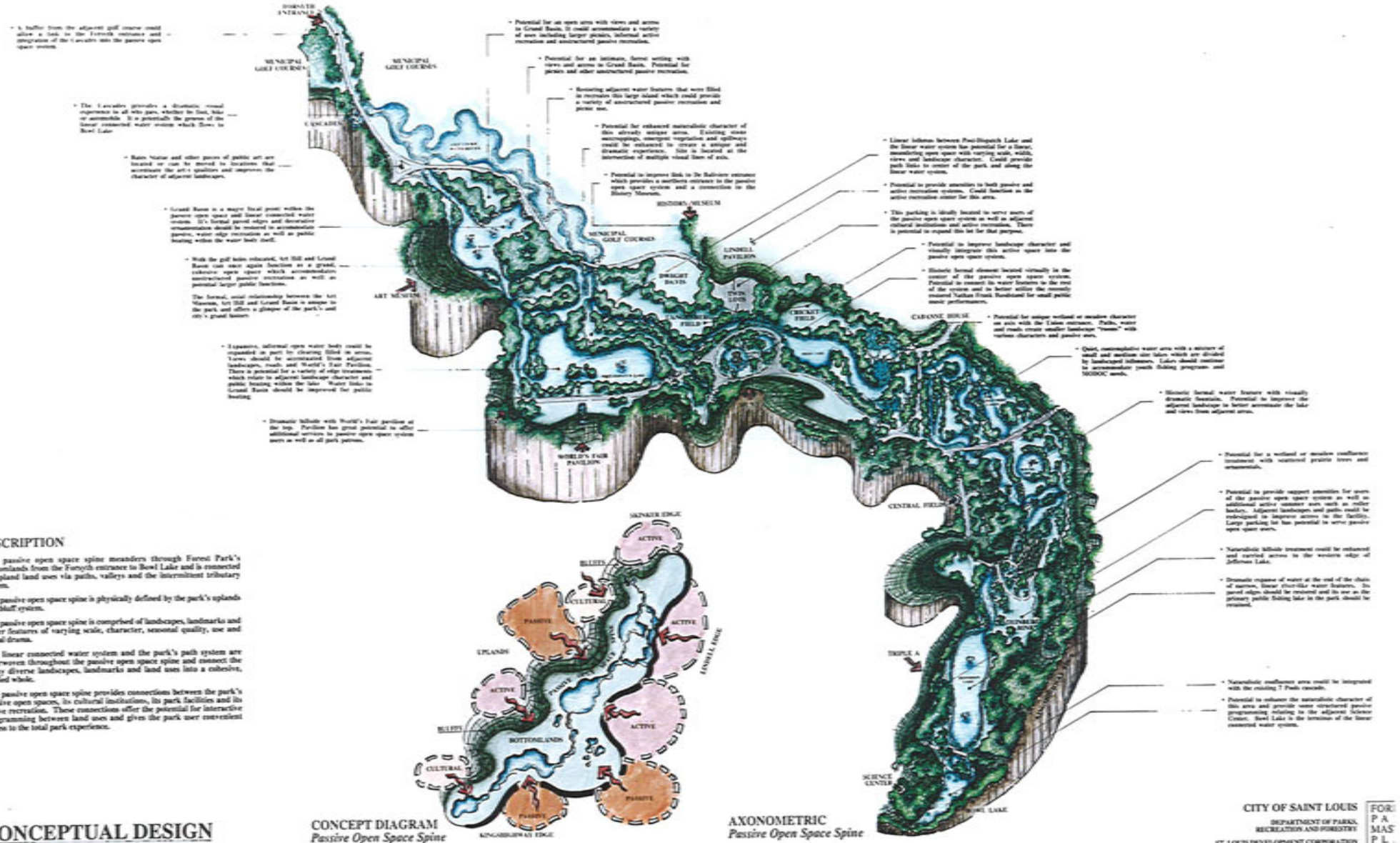
FOREST PARK MASTER PLAN
ST. LOUIS, MO

SCALE 1"=400' 0 400 800 1600

June 6, 1995

CITY OF SAINT LOUIS
DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION
URBAN DESIGN

FOREST PARK MASTER PLAN



DESCRIPTION

- The passive open space spine meanders through Forest Park's bottomlands from the Forsyth entrance to Bowl Lake and is connected to upland land uses via paths, valleys and the intermittent tributary system.
- The passive open space spine is physically defined by the park's uplands and bluff system.
- The passive open space spine is comprised of landscapes, landmarks and water features of varying scale, character, sensorial quality, use and visual drama.
- The linear connected water system and the park's path system are interwoven throughout the passive open space spine and connect the many diverse landscapes, landmarks and land uses into a cohesive, unified whole.
- The passive open space spine provides connections between the park's passive open spaces, its cultural institutions, its park facilities and its active recreation. These connections offer the potential for interactive programming between land uses and gives the park user convenient access to the total park experience.

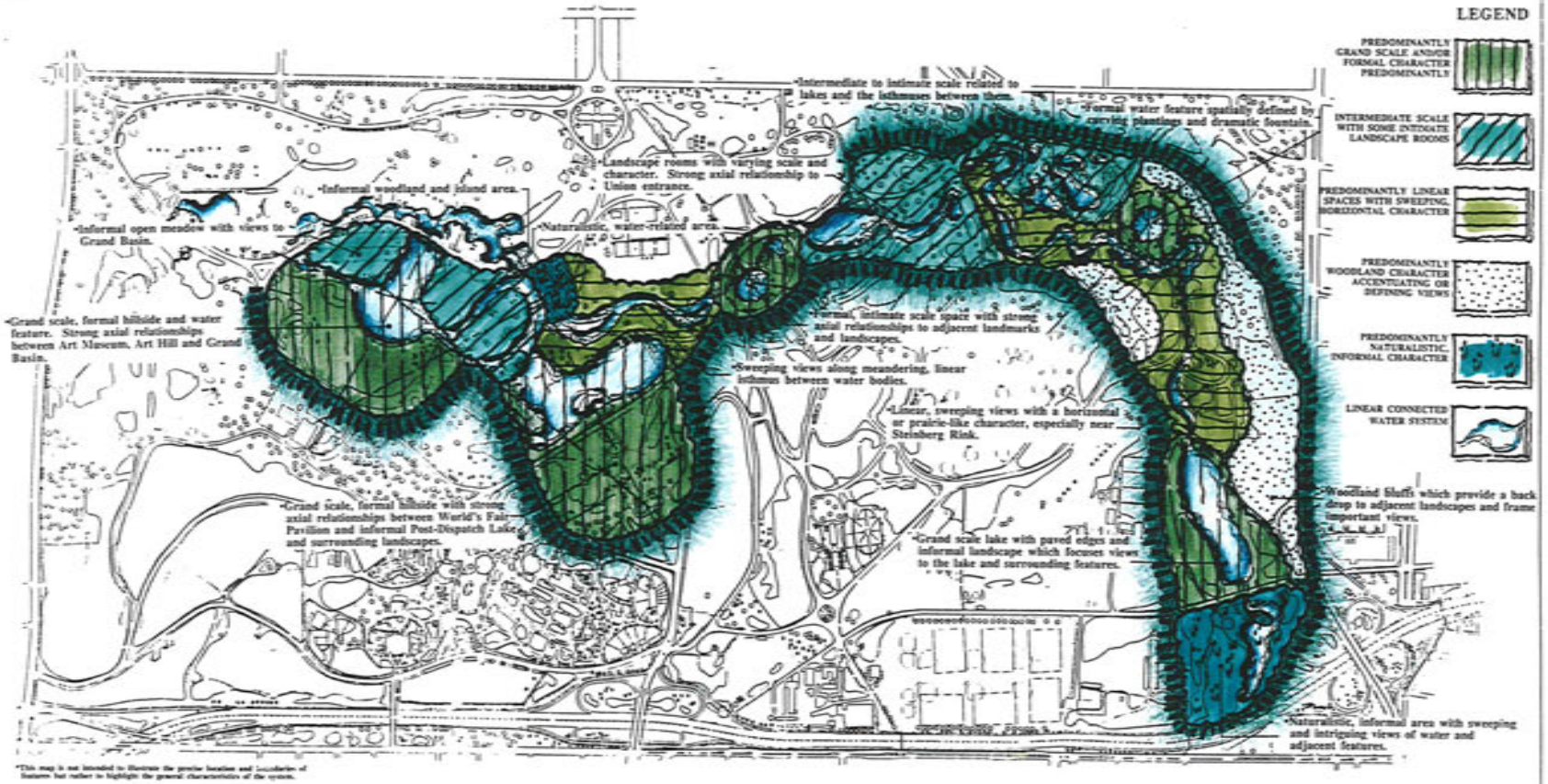
CONCEPTUAL DESIGN
Passive Open Space Spine

CONCEPT DIAGRAM
Passive Open Space Spine

AXONOMETRIC
Passive Open Space Spine

CITY OF SAINT LOUIS
DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION
URBAN DESIGN DEPARTMENT

FOR PARKS PLAN



*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.

DESCRIPTION

- The Passive Open Space Spine is comprised of many unique landscapes, landmarks and water features with varying scale and character.
- The linear connected water system plays an vital role in defining the character of most of the spine's spaces, influencing spatial character on a site specific level and unifying these diverse spaces on a park-wide level.
- Spatial character of the spine's landscapes, landmarks and water features is heavily influenced by features which are adjacent to the spine, such as bluffs and uplands.

CONCEPT DIAGRAM

Passive Open Space Spine Character

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"=400' 0 400 800

June 6, 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN

THE UPLANDS AND VALLEY SYSTEM

The bluffs are dramatic hillside landscapes, typically utilized for passive recreation and viewing. The Muny, which utilizes a bluff for its amphitheater seating, is the exception.

The uplands and valley system is typically more intensely programmed for active recreation and park facilities. The heavily wooded and naturalized Kennedy Forest and the Successional Forest, with their canopy tree and understory vegetation, tributaries, and steep slopes, are the two primary exceptions.

The majority of the park's existing picnic grounds are located in the uplands, primarily in Kennedy Forest.

Specific design recommendations include:

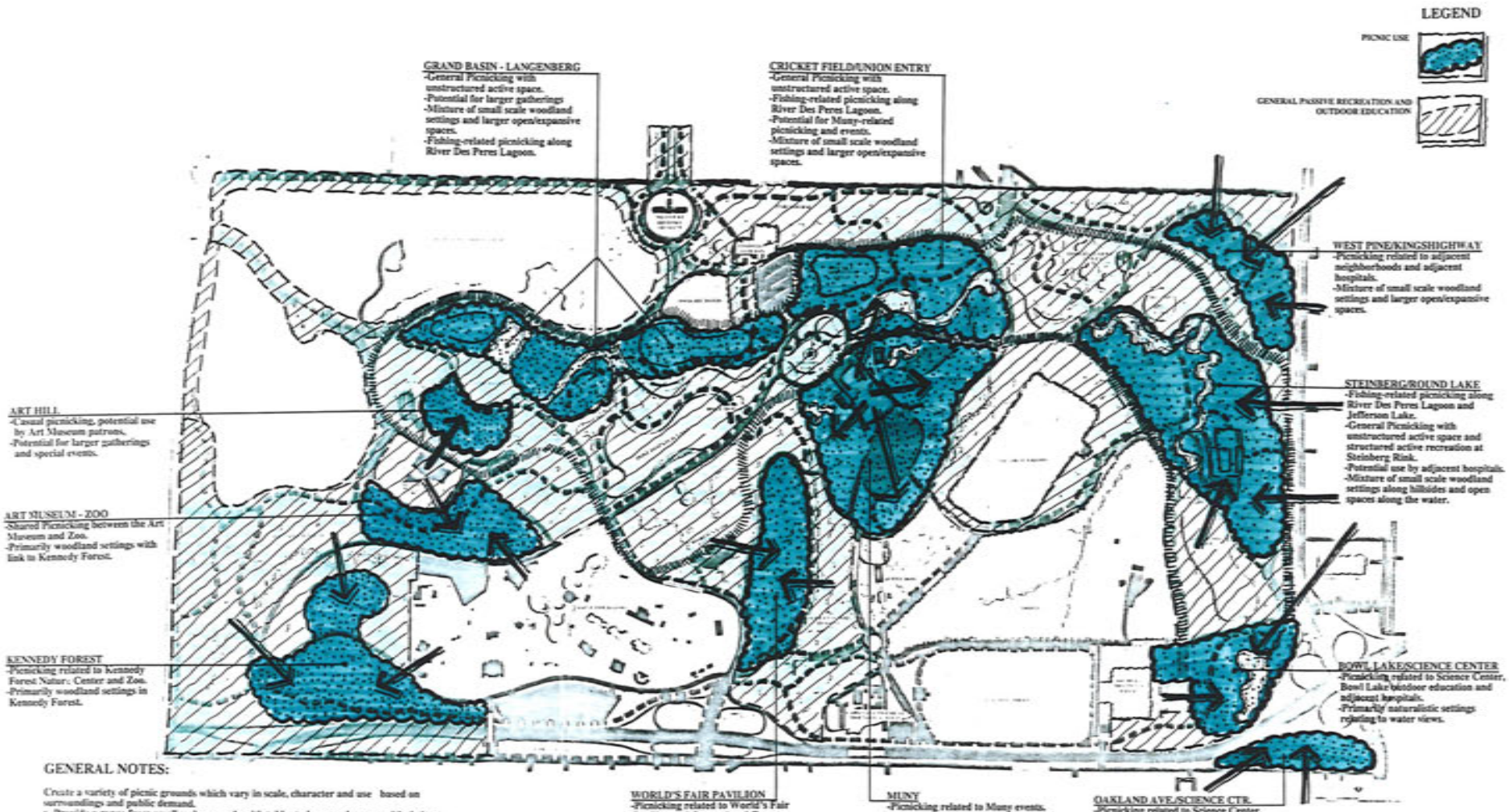
- Design the park's bluffs and valleys to function as transitional space between the Passive Open Space Spine and the upland passive open spaces and park edges.
- Encourage responsible upland programming and development which avoids steep slopes and valleys, delicate forest communities, unstable soils, and other physical limiting factors.
- Implement improvements at upland picnic grounds and other existing development which control soil compaction and subsequent erosion.
- Provide paths, overlooks, and seating areas which emphasize the dramatic views to and from the bluffs, uplands, and valleys.

PARK EDGES

The park edge system surrounds the park and provides neighborhood connections and recreation spaces.

Specific design recommendations include:

- Design park edges to improve neighborhood connections and passive use.
- Maintain existing and provide some new public amenities along park edges.
- Provide an appropriately wide buffer between active recreation and the residential edges adjacent to the park and allow casual passive recreation and gathering for area residents.
- Utilize the park edges for the majority of the dual path system (bike path with adjacent soft surface pedestrian/jogging path).



GENERAL NOTES:

Create a variety of picnic grounds which vary in scale, character and use based on surroundings and public demand.

- Provide a range from small scale grounds with tables to large scale areas with shelters and open recreation space.
- Provide a mix of forest settings and open grassy casual recreation areas.
- Provide some grounds with formal shelters and some without. Shelter design should be compatible with landscape setting and surrounding architectural character. (site specific unity with park-wide variety.)

Utilize natural open space corridors as "outdoor classrooms" for educational and interpretive programming. These corridors offer first hand opportunities to observe wildlife and plant species in their native element and interpret human impact on the corridor's natural systems.

Utilize natural corridors to offer opportunities to teach people about management practices that have been put in place to protect natural resources.(i.e., no mowing)

Consider increased use of Forest Park's passive open space system for structured outdoor passive recreation which complements programming at existing ZMD institutions, park and service facilities, active recreation entities.

Coordinate path design with passive space features to maximize public contact.

Upgrade existing and provide new service and support facilities/amenities throughout the park for passive space users. Provide the following where possible:

- Security stations with personnel or security telephones
- Attended public toilets, showers and lockers
- Bike parking
- Park information and maps
- First aid amenities (or personnel at major facilities)

Passive Space Use

E. Site Specific Recommendations

KENNEDY FOREST
- Improve aesthetic quality while allowing safe recreation and educational use.
- Support MODOC's plans to provide vegetative management and nature trail operation and supervision.
- Consider extending MODOC's agreement to cover the entire forest area.
- Provide a nature/trail center at/near the Government Drive/Wells Drive intersection, combining MODOC operational functions with support amenities for area bike and pedestrian path users.
- Create active and passive security measures to ensure public safety in isolated areas which are not accessed by public automobiles.
- Design paths to function as public trails as well as service and security access routes.

CASCADES
- Create a buffer from the adjacent golf course to create a link to the Forsyth entrance and integration of the Cascades into the passive open space system.
- Accentuate the Cascades as a dramatic visual experience to all who pass, whether by foot, bike or automobile.

ART HILL/GRAND BASIN AREA
- Relocate the area's five existing golf holes so Art Hill and Grand Basin can once again function as a grand, cohesive open space which accommodates unstructured passive recreation as well as potentially larger public functions.
- Accentuate the formal, axial relationship between the Art Museum, Art Hill, and Grand Basin, which is unique to the park and offers a glimpse of the park's and city's grand history.
- Utilize the areas to the east and west of Grand Basin for a variety of uses, including larger picnics, informal active recreation and unstructured passive recreation.

THE ISLAND
- Recreate this large island by dredging filled-in surrounding lagoons and provide a variety of unstructured passive recreation and picnic use.

SPILLWAYS AREA
- Accentuate the character of existing stone outcroppings, emergent vegetation and spillways to create a unique and dramatic experience.
- Erect a small pavilion with support amenities to serve area picnickers, path users, and other recreaters.

POST-DISPATCH LAKE AREA
- Expand the lake and accentuate views from adjacent landscapes, roads, and World's Fair Pavilion.
- Provide a variety of edge treatments which encourage water edge recreation and relate to adjacent landscape character and public boating within the lake.
- Improve water links to Grand Basin to accommodate public boating.
- Create a water edge public plaza or "Green" at the base of Government Hill.

WORLD'S FAIR PAVILION
- Consider programming which offers additional services to passive open space system users as well as all park patrons.

CENTRAL ISTHMUS
- Create a linear isthmus between Post-Dispatch Lake and the linear water system which provides path links to the center of the park and along the linear water system.

STEINBERG RINK AREA
- Provide amenities to both passive and active recreation systems.
- Relocate parking to the south of the building where it will serve users of the passive open space system, active recreation, and fishing programs at Jefferson Lake and area lagoons.
- Consider offering water-related outdoor education programs.
- Consider Steinberg Rink building as an education center for the open space spine.

PAGODA LAKE
- Consider utilizing the recently restored Nathan Frank Bandstand for small public music performances.

FISH HATCHERIES
- Enhance this quiet, contemplative water area, connecting some water bodies while maintaining a mixture of small and medium size lakes which are divided by landscaped isthmuses.
- Continue to accommodate youth fishing programs and MODOC needs.

UNION ENTRANCE AREA
- Provide paths and site amenities for casual passive recreation and picnicking.
- Accommodate one-way Muny egress during their performance season, if required.
- Create a unique entrance landscape in this highly visible location with a wetland or wet meadow which displays dramatic seasonal variations of color and texture.
- Restore the Union entrance bridge and ballustrades.

ROUND LAKE AREA
- Accentuate this historic formal water feature and its visually dramatic fountain.
- Improve the adjacent landscape to better accentuate the lake and views from adjacent areas.
- Upgrade the lake's edge treatment.

JEFFERSON LAKE
- Extend the naturalistic Triple A hillside vegetation across to the western edge of Jefferson Lake.
- Accentuate views to and across the water.
- Restore the existing paved edges and continue to accommodate youth fishing programs and MODOC needs.

BOWL LAKE

- Enhance the naturalistic character of this area and provide some structured passive programming.
- Cooperate with the Saint Louis Science Center and potentially the Central Institute for the Deaf to utilize the area for outdoor educational programming related to ecological exhibits contained within the museum and sensory experiences related to the Institute.

SUCCESSIONAL FOREST

- Improve ecological and aesthetic quality while allowing safe recreation and educational use.
- Consider extending MODOC's Kennedy Forest vegetative management and nature trail agreement to cover this area.

II. WATER AND SURFACE DRAINAGE SYSTEM

A. Overview

B. Summary of Existing Conditions
1. Regional Context
2. History
3. Existing conditions

C. Design Principle

D. Design Recommendations
1. General approach
2. Water character and spatial features
3. Functional requirements
4. Water quality control
5. Soil erosion control
6. Shorelines
7. Confluence areas or filtering marshes
8. Check Dams and Uplands Water Control Structures
9. Long-term options

E. Site Specific Recommendations

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1874 Surface Drainage
1995 Surface Drainage
1995 Water Quality
1995 Water Spatial Character and Use

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Linear Connected Water System
Water System and Passive Open Space Corridor
Water Use
Surface Drainage System Operation
Linear Connected Water System - Low Water Operation
Linear Connected Water System - High Water Operation
Major Subsurface Drainage Infrastructure
Water Quality and Erosion Control
Shoreline Treatments
Future Water System Improvements

A. Overview

Water has always been an important element of Forest Park and it will remain so under this Master Plan. The River Des Peres and its bottomlands, bluffs and uplands laid the foundation for today's park spatial and aesthetic character. Water defines and unifies the surrounding features. It is an essential element of the park's character and the park experience.

In designing recommendations for the park's water system, it is important to recognize that the ecological value of the park's land and water must be judged together. Water runs through and is a critical component to all spaces within the park's open space "spine." It defines the character of individual spaces and unifies the various landscapes. Water features can be seen as the "veins in the body of the landscape" and are vital components of that landscape.

The Master Plan includes a water restoration plan that is based on the natural topographical and existing spatial character of what was once a functioning natural river system. By returning the water in the park to where it naturally occurs, often where it was inappropriately removed, the Plan improves water quality, overall park drainage, and overall aesthetics.

B. Summary of Existing Conditions

1. Regional Context

Historically, Forest Park was part of a regional, naturally flowing river system known as the River Des Peres Watershed. Rainwater fell on the surrounding forests, savannahs, and shrub prairies of the area, providing needed moisture for the plants and animals. Excess water drained into the River Des Peres and finally into the Mississippi River.

2. History

Forest Park's original water system, the linear, meandering River Des Peres, was entombed in two underground concrete sewer tubes by 1930. The park's lakes are man-made features resulting from various periods of park design or during periodic flooding episodes.

3. Existing Conditions

- The existing water system is a spatially fragmented set of small lagoons or ponds that lacks visual as well as physical connection. Most of the water resources of the park are isolated, stagnant water bodies which have to be artificially supplied with city water to stay filled.

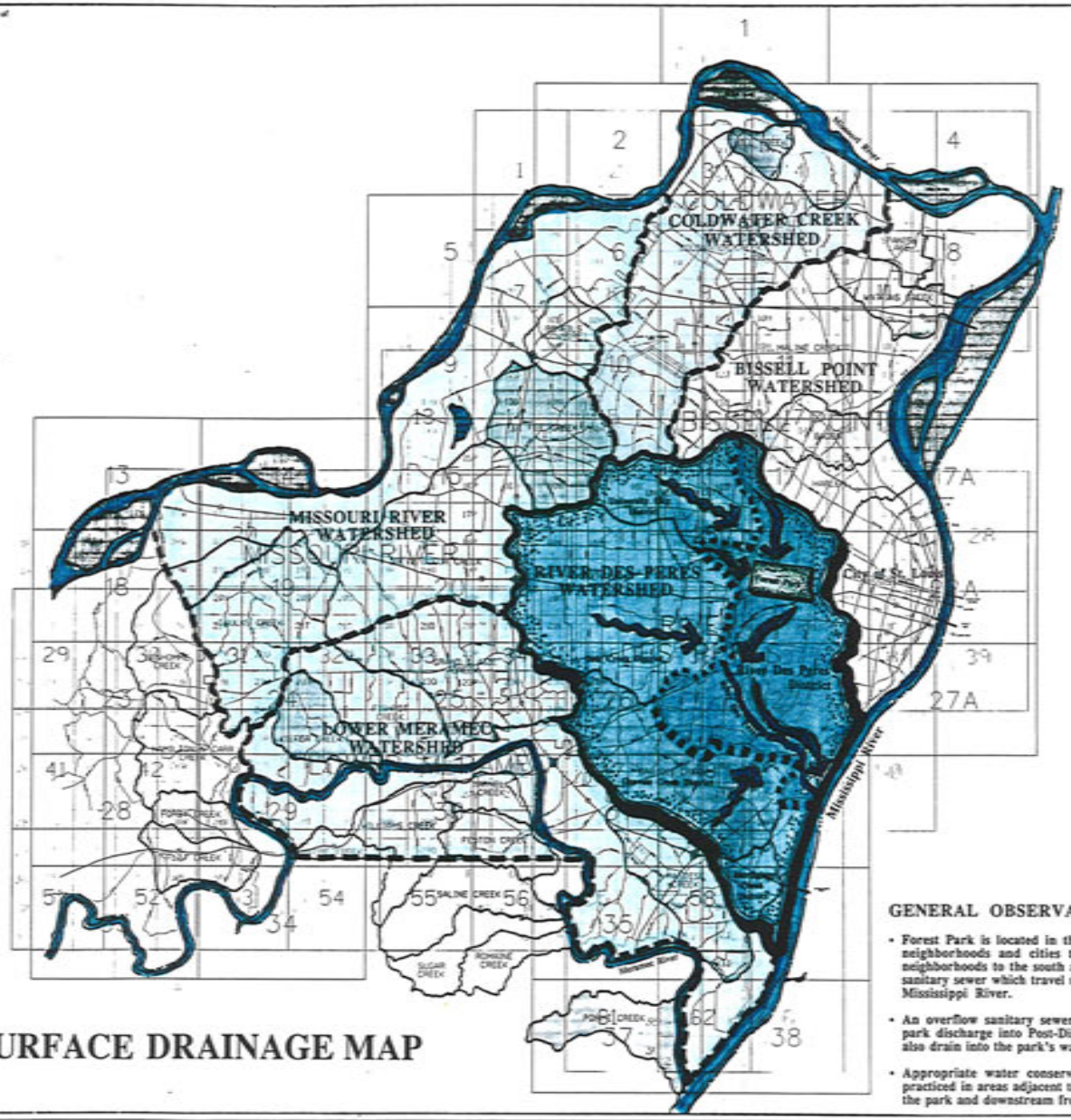
- The existing combination of surface drainage (lakes, ponds, lagoons, and tributaries) and subsurface infrastructure (sewers, catch basins) cannot adequately handle the park's drainage needs during typical and peak rainfall periods.

- Vegetation, which once absorbed much of the storm water runoff, has now been removed. Much of the present watershed is covered with grass, asphalt, or concrete. Water now runs quickly downhill to the lowlands of Forest Park. Ponding occurs in many areas.

*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.

*Flowmap supplied by Metropolitan Sewer District (MSD) 1992

*Analysis by Design Team 1992



REGIONAL SURFACE DRAINAGE MAP

GENERAL OBSERVATIONS

- Forest Park is located in the River Des Peres watershed which includes upstream neighborhoods and cities to the north and west of the park and downstream neighborhoods to the south and east. Much of this watershed drains into a regional sanitary sewer which travel underground through Forest Park and ultimately into the Mississippi River.
- An overflow sanitary sewer from the neighborhoods immediately south of Forest park discharge into Post-Dispatch Lake during heavy rainfall. Adjacent roadways also drain into the park's water system.
- Appropriate water conservation and stormwater management practices are not practiced in areas adjacent to and within the park. This impacts the water quality in the park and downstream from it.

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE 1"=400' 0 400 800 2000

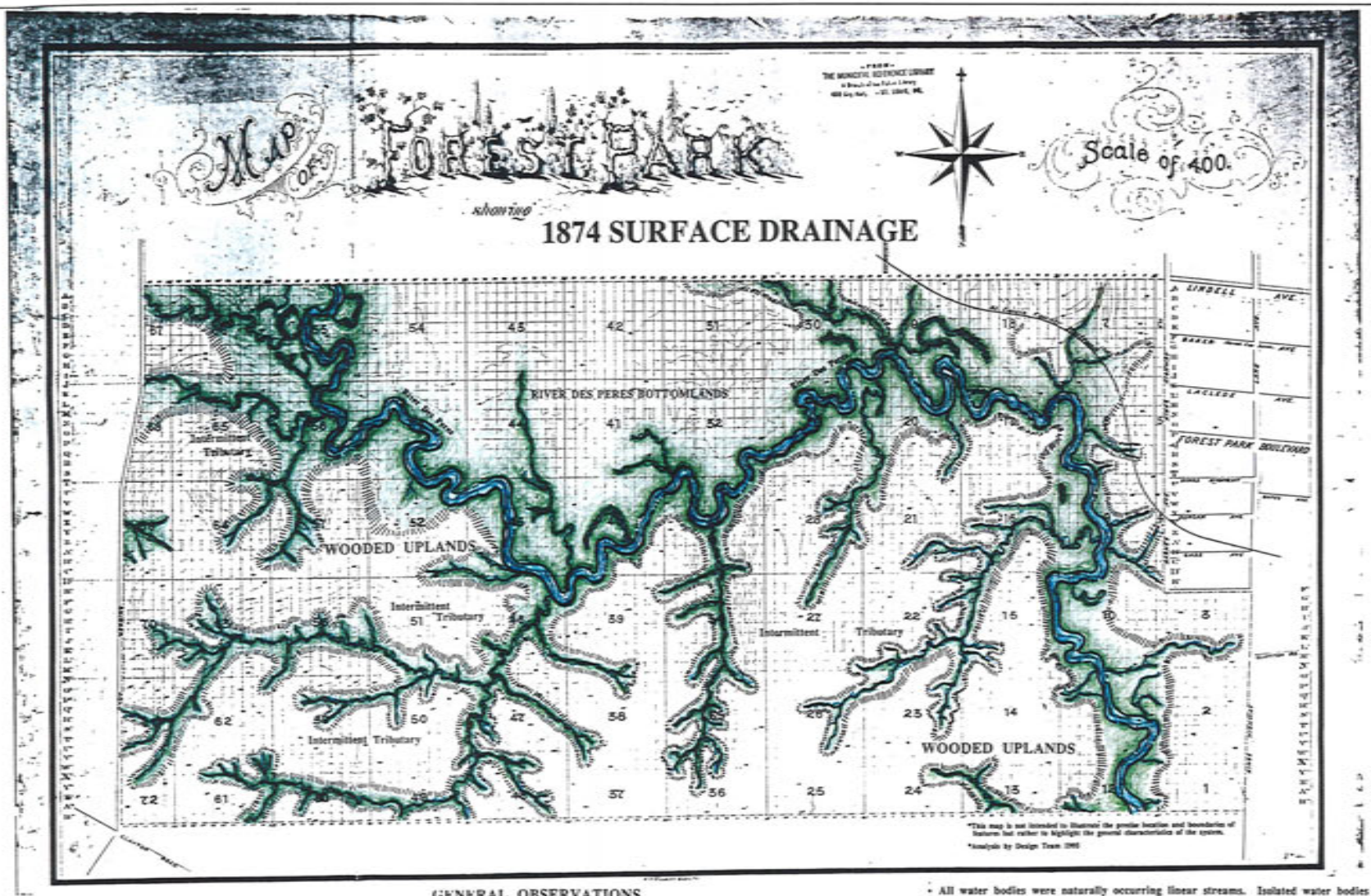
11 MARCH 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN



LEGEND

PRIMARY WATER ELEMENT

TRIBUTARY ELEMENT

GENERAL OBSERVATIONS

- The River Des Peres originally flowed through Forest Park on its way to the Mississippi River. It was fed by a series of intermittent tributaries which flowed down valleys from the uplands above. These tributaries only flowed when there was adequate rainfall.
- All water bodies were naturally occurring linear streams. Isolated water bodies occurred when droughts left only deep pools, in areas where ground water discharges kept the pools charged and in depressional areas that collected water.
- Flooding was a normal, periodic event.

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 400'

27 FEBRUARY 1995

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FOREST PARK MASTER PLAN

- River Des Peres, which once served as a conduit to the Mississippi, is confined to flowing through an underground tube.

- Water quality does not meet the Clean Waters Act. Based on periodic water tests conducted in the park in 1981 and "snapshot" water tests in 1995, the water resources of Forest Park are polluted.
  - ~ There is an odor problem at the overflow.
  - ~ Chlorine in the city water kills many aquatic invertebrate animals.
  - ~ Leaves and other nutrients which enter static waters quickly overload the system.
  - ~ Toxic algaecides are sprayed in the water.
  - ~ To maintain a manicured look and reduce maintenance, the banks are sprayed with herbicides, which further reduce the natural filtering process and accelerate bank soil erosion.
  - ~ Oil from automobiles and salt from deicing stress water inhabitants.
  - ~ Nutrients such as nitrogen, which are entering the lakes and ponds from point and non-point sources, are a major source of contamination.
    - Preventing the discharges from point sources, such as neighborhood sewage, from entering the park through the 72" combined sanitary sewer pipe at Post Dispatch Lake is critical.
    - Non-point sources of water pollution are harder to trace. They include road contaminants from faulty curbs, nutrients from golf course fertilizers, leaves blowing directly into lakes without being filtered by a strip of vegetation, soils eroding into the water without being filtered by vegetative strips along the banks, feces from dogs walked in the park, and from ducks and geese that are encouraged to use the park with closely mown grass and by misguided people who feed them.

- The current management practice is to spray the 5-foot edge of grass on the shoreline around water bodies with the herbicide Roundup. This practice reduces grass mowing along the shoreline, but it also kills all plant growth in this zone and results in an ugly brown ring throughout the Park.

C. Design Principle

Create a linear-connected water system.

*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.
*analysis by Design Team 1995

GENERAL OBSERVATIONS

- The primary surface water drainage system is a mix of lagoons which generally follow the original River Des Peres course and lakes which are the product of assorted physical plans including the original 1876 plan and 1904 World's Fair plan.
- During the 1904 World's Fair the River Des Peres was temporarily buried in wooden channels. In 1930, after a brief return to surface flow, it was buried in two 29' wide, 25' high concrete sewer pipes which roughly followed the river course.
- Remnants of the original River Des Peres tributary system still exist and generally follow the valley system unless valleys have been altered or removed. This tributary system no longer reaches the old channel (existing lakes and lagoons).
- The topographic character of the original River Des Peres floodplain or bottomlands is largely intact and subsequently ponds during heavy rains.
- Some of the park's lakes and lagoons have been filled over the years while others, such as the fish hatcheries, retain a physical design for a use that no longer exists.

1995 SURFACE DRAINAGE MAP

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 400' 0 400 800 1600

11 MARCH 1995

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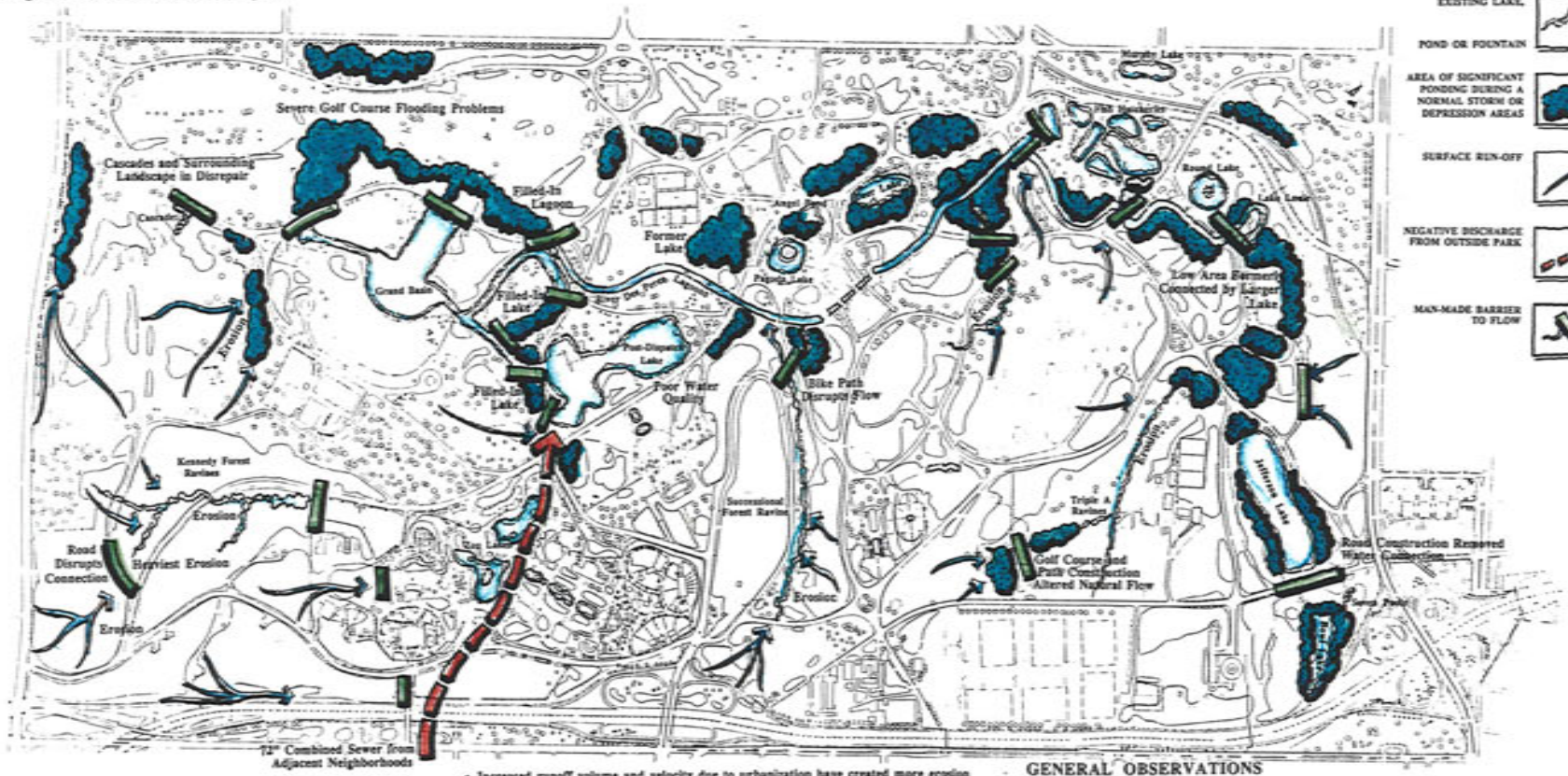
- Pesticides and other contaminants disrupt natural vegetation diversity necessary for a stable shoreline and emergent plant communities that provide biological balance by contributing food sources and means of nutrient uptake.



LEGEND

- EXISTING LAKE
- POND OR FOUNTAIN
- AREA OF SIGNIFICANT PONDING DURING A NORMAL STORM OR DEPRESSION AREAS
- SURFACE RUN-OFF
- NEGATIVE DISCHARGE FROM OUTSIDE PARK
- MAN-MADE BARRIER TO FLOW

- Increased runoff volume and velocity due to urbanization have created more erosion along wooded valleys and sparcely vegetated areas.
- Erosion has accelerated in wooded valleys where pipe discharges concentrated runoff that otherwise would have been more dispersed.
- Sediment from erosion in upland woodlands and wooded valleys has degraded water quality with an increase in the amount of suspended solids in all lagoons and lakes.

WATER QUALITY NOTES:
- Water fowl feces problems in all major park water features.
- Leaf litter along lagoons has raised nitrate levels in water bodies.
- Breaks in lagoon flow have resulted in stagnation in some location.
- A 72" diameter combined overflow sewer from the neighborhoods immediately south of the park discharges sanitary materials into Post-Dispatch Lake during heavy rains. This line also carries overflow from the Zoo waterfowl ponds into the lake.

GENERAL OBSERVATIONS

- The topography of the original River Des Peres floodplain is largely intact and subsequently ponds with normal rainfall. Flooding occurs in areas once occupied by water features but since filled-in.
- Roads, parking lots and paths often disrupt natural surface flow, resulting in stagnation in many locations. Many paved areas lack proper surface run-off control.
- Erosion is occurring where in woodland areas and along intermittent creek tributaries which have been cleared of natural edge vegetation.
- Park-related construction has left some water elements isolated from the rest of the system.
- Responsible water conservation and stormwater management practices are not practiced in areas adjacent and within the park.
- The existing water system lacks adequate water movement, aeration and nutrient filtration and surface vegetation to handle the run-off and concentrations of heavy metals and sedimentation from adjacent land uses.

EXISTING WATER QUALITY MAP

FOREST PARK MASTER PLAN
ST. LOUIS, MO

SCALE: 1"= 400'

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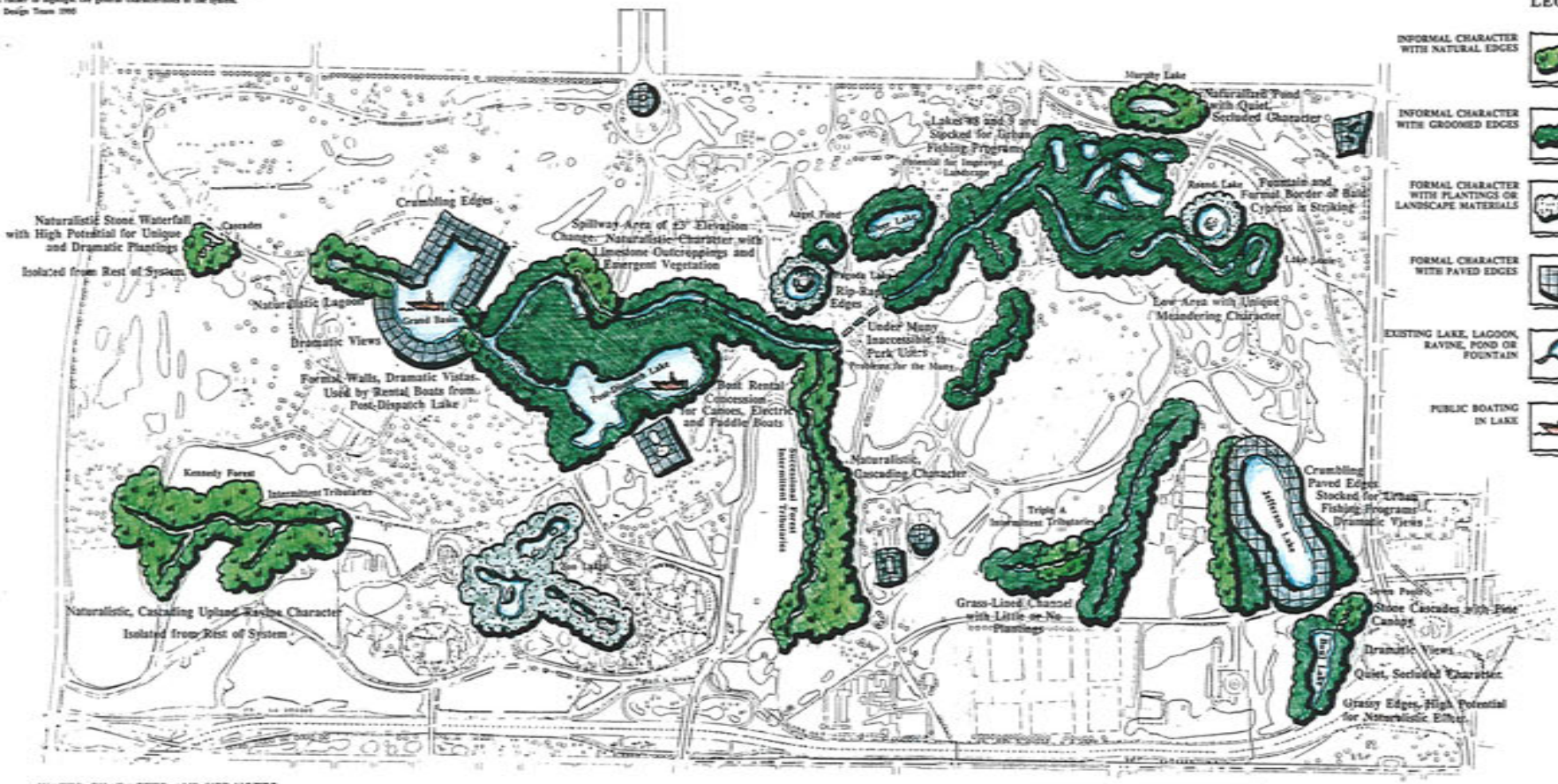
DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN

*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.
*Analysis by Design Team 1995



LEGEND

- INFORMAL CHARACTER WITH NATURAL EDGES
- INFORMAL CHARACTER WITH GROOMED EDGES
- FORMAL CHARACTER WITH PLANTINGS OR LANDSCAPE MATERIALS
- FORMAL CHARACTER WITH PAVED EDGES
- EXISTING LAKE, LAGOON, RAVINE, POND OR FOUNTAIN
- PUBLIC BOATING IN LAKE

WATER CHARACTER AND USE NOTES:

- Public fishing is allowed with State permit from the edges of all water bodies except the Fish Hatcheries.
- Boating is restricted to Post-Dispatch Lake and Grand Basin. Only canoes, electric and paddle boats rented from the Post-Dispatch Lake concession are allowed.

GENERAL OBSERVATIONS

- Forest Park's water system is a fragmented, linear, river-like system with a series of larger lakes and water features along its course. The lagoons roughly follow the original route of the River Des Peres.
- Most of the water system is channelized and grass-lined with little naturalistic ground vegetation along the edges.
- All of the formal paved water edges are crumbling and detract from visual character.
- Erosion and sedimentation is occurring along all water bodies, negatively affecting visual character and water quality.
- Fishing is a popular pastime for St. Louis area residents and opportunities exist to improve it within the park. Sediments currently threaten fish habitat and survival.

1995 WATER SPATIAL CHARACTER AND USE MAP

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 400'

11 MARCH 1995

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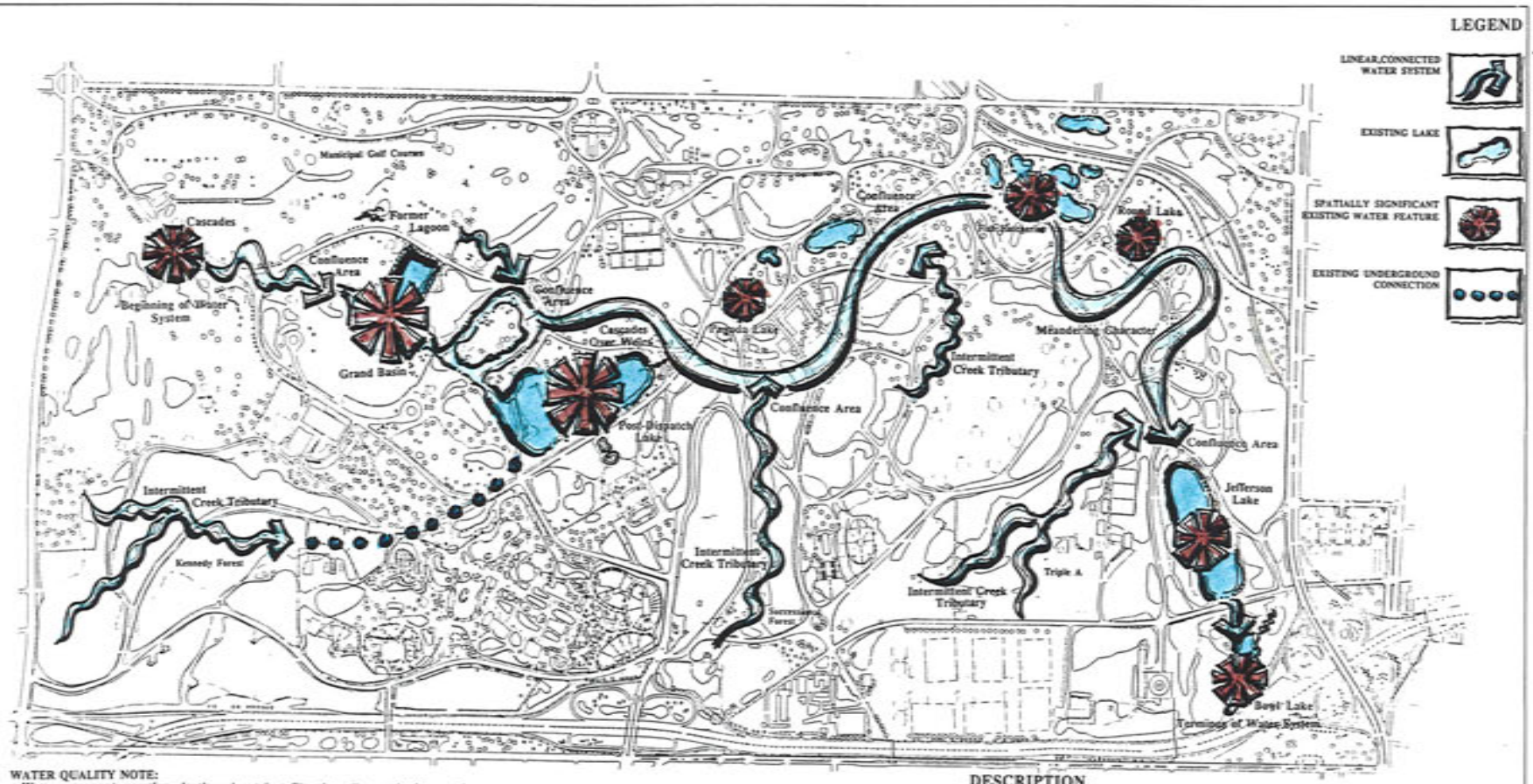
URBAN DESIGN

FOREST PARK MASTER PLAN



WATER QUALITY NOTE:

- Water movement, aeration, depth and nutrient filtration all must be increased to improve water quality. Upland erosion must also be controlled at the source to limit the amount of siltation.
- Runoff should be managed to maximize water use and reuse.

DESCRIPTION

- The park's water system should be redesigned to resemble its original linear river character which reconnects the existing, diverse water features.
- The linear water system should form a link from the Cascades to Bowl lake.
- The linear water system should be the unifying element which connects the park's diverse water features.
- The linear water system is fed by a series of intermittent creek tributaries which have unique characters of their own.
- The linear water system contains a series of unique confluence areas which act as transitional elements where diverse water features unite.
- The linear water system should increase the use of appropriate naturalistic edges which are compatible with adjacent land uses while maintaining important formal elements.

DESIGN PRINCIPLE

Connected, Linear Water System

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 400' 0 400 800 1600

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN

D. Design Recommendations

1. General Approach

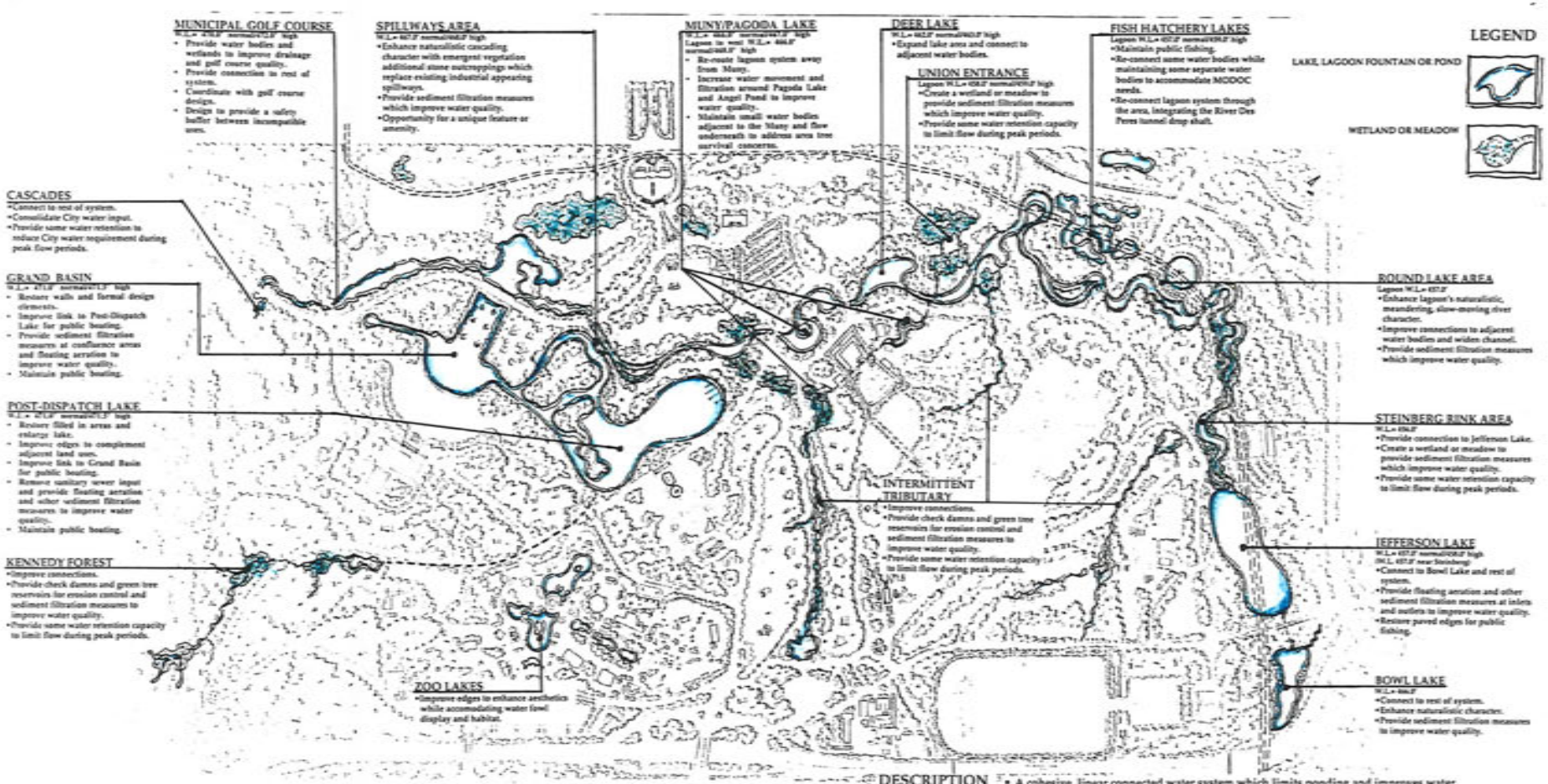
The recommendations presented here focus on one major objective: to rebuild and reconfigure the park's lakes and lagoons in a way that will recreate the positive qualities of the original river which occurred naturally in this area and which was long ago removed or buried. The resulting water system will provide more dramatic views and opportunities for passive recreation. Additional efforts will focus on improving the quality and livability of the water system, through pollution prevention and treatment, continual water movement, and reduced soil erosion. Long-term, consideration should be given to reestablishing the water links between Forest Park and the rest of the region via the River Des Peres.

The Master Plan's surface drainage system is designed to connect most of the Park's fragmented linear lagoons and larger lakes into a flowing, river-like water system which mimics the original linear, meandering River Des Peres route and includes a variety of water features with diverse and unique characters and uses. It will form a link from the Cascades to Bowl Lake. Ideally, it would also connect to the tributary system in Kennedy Woods. It will be fed by a series of intermittent tributaries and City water inputs, each containing its own unique character. Along its course will exist a series of unique confluence areas, which act as transitional elements where diverse water features unite, and where water cleansing occurs.

Functionally, it has been designed with flexibility to accommodate typical, low and heavy rainfall conditions. Water will flow from the Park's higher elevations in the northwest section to a low point near Steinberg Rink and Jefferson Lake. This represents a 16' change in elevation. As the water flows past edge vegetation, through confluence areas, down cascades, over spillways, and across small riffles, it is naturally filtered and aerated, improving overall water quality, park aesthetics and environmental health. Bubblers and fountains are used for additional aeration where needed. Wetlands and small upland water detention facilities are utilized to limit water flow during peak rainfall periods and slowly release it, reducing erosion and stream sedimentation. Existing depression areas, where ponding and erosion currently occur, are incorporated into the system. The system will continue to utilize the existing River Des Peres tunnel drop shaft, along with a new shaft at the low point near Steinberg Rink, to control water levels and water quality.

Aesthetically, the water system has been designed with a mix of grand scale lakes, sweeping bends, meandering linear lagoons, oxbows, wetlands, small ponds, and decorative fountains. There will be a variety of edge treatments ranging from naturalistic emergent vegetation to formal paved edge promenades. The water system will function as a unifying element of the passive open space system, accentuating land forms, views, and landmarks.

Water use will be determined on a site specific basis, including, but not limited to, public boating in Post-Dispatch Lake and Grand Basin, ecological education and wildlife viewing at Bowl Lake, Steinberg Rink area and along naturalistic lagoons, tributaries and ponds, organized public fishing in Jefferson Lake and the Hatcheries, and general passive use throughout the system. The water system design includes increased water connections for public boating, upgraded edge plantings for improved wildlife habitat, and aesthetics, boardwalks and viewing platforms to facilitate viewing and education and scattered deep water pockets to improve



DESCRIPTION

- A cohesive, linear connected water system which limits ponding and improves water quality, aesthetic quality of water features and adjacent land uses and improves environmental quality.
- A river-like water system which mimics the original linear, meandering River Des Peres and includes a variety of water features with diverse and unique characters and uses.
- A water system with increased water movement, aeration, sediment filtration and erosion control measures.
- A water system that accentuates the park's land forms, views and landmarks and acts as a unifying element of the passive open space system.
- A water system that is compatible with adjacent land uses and existing high quality landscapes and park features.

CONCEPT DESIGN PLAN

Linear Connected Water System

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 400' 0 400 800 1600

November 18, 1995

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DEPARTMENT OF PARKS, RECREATION AND FORESTRY

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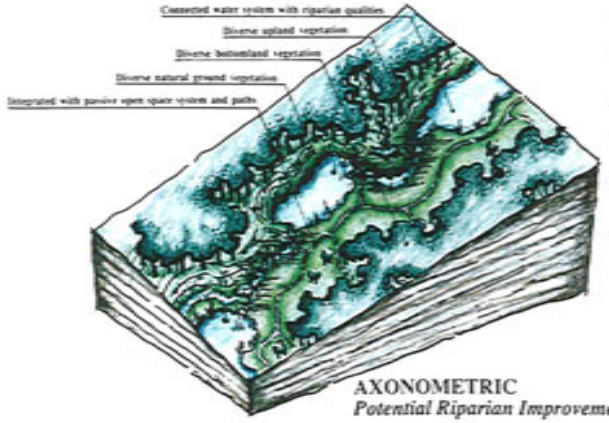
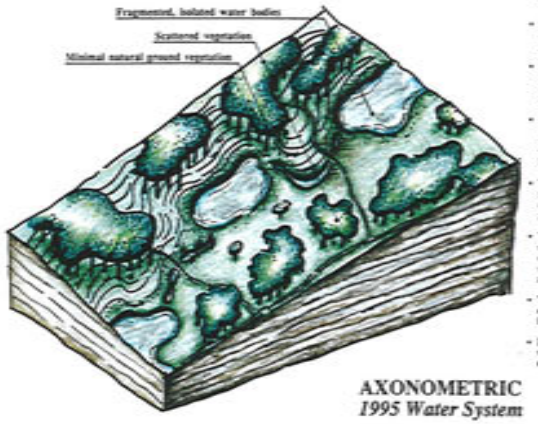


AXONOMETRIC
Potential Riparian Improvements

POTENTIAL IMPROVEMENTS

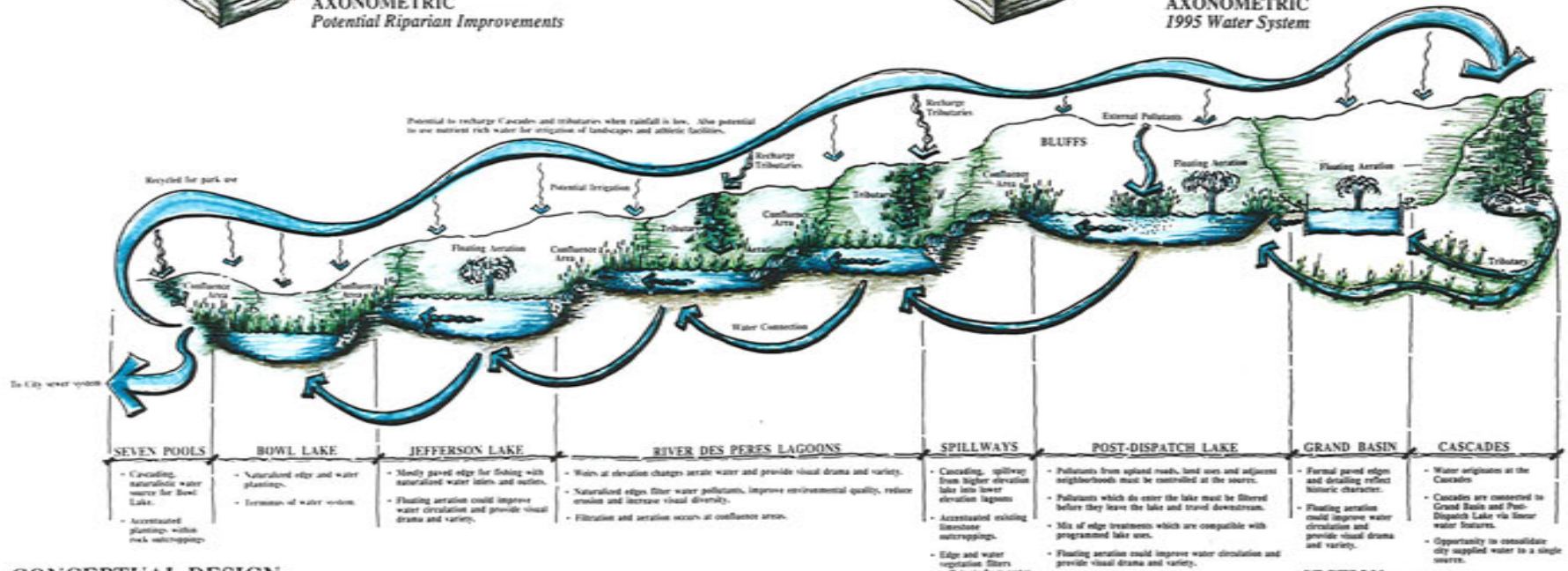
- Connected, linear water system with a riparian quality improves water and environmental quality while improving drainage.
- Cascades with natural edge plantings aerate water and filter pollutants before water and pollutants can travel downstream.
- Upland plantings can accentuate bluffs, protect slopes from erosion, and provide seasonal color and wildlife habitat.
- Bottomland plantings at lake and lagoon edges and transitions provide sediment filters, edge protection from erosion and wildlife habitat.
- Cascading effect of confluence/transitional areas and weirs aerates water and creates visual drama and variety.
- Bottomland plantings in former River Des Peres floodplain related to land forms and are better suited to the site for survival and long term health.
- Providing a coordinated system of water, land forms and passive open space system and paths increases recreational and aesthetic diversity for park users while providing numerous environmental benefits.



AXONOMETRIC
1995 Water System

EXISTING CONDITIONS

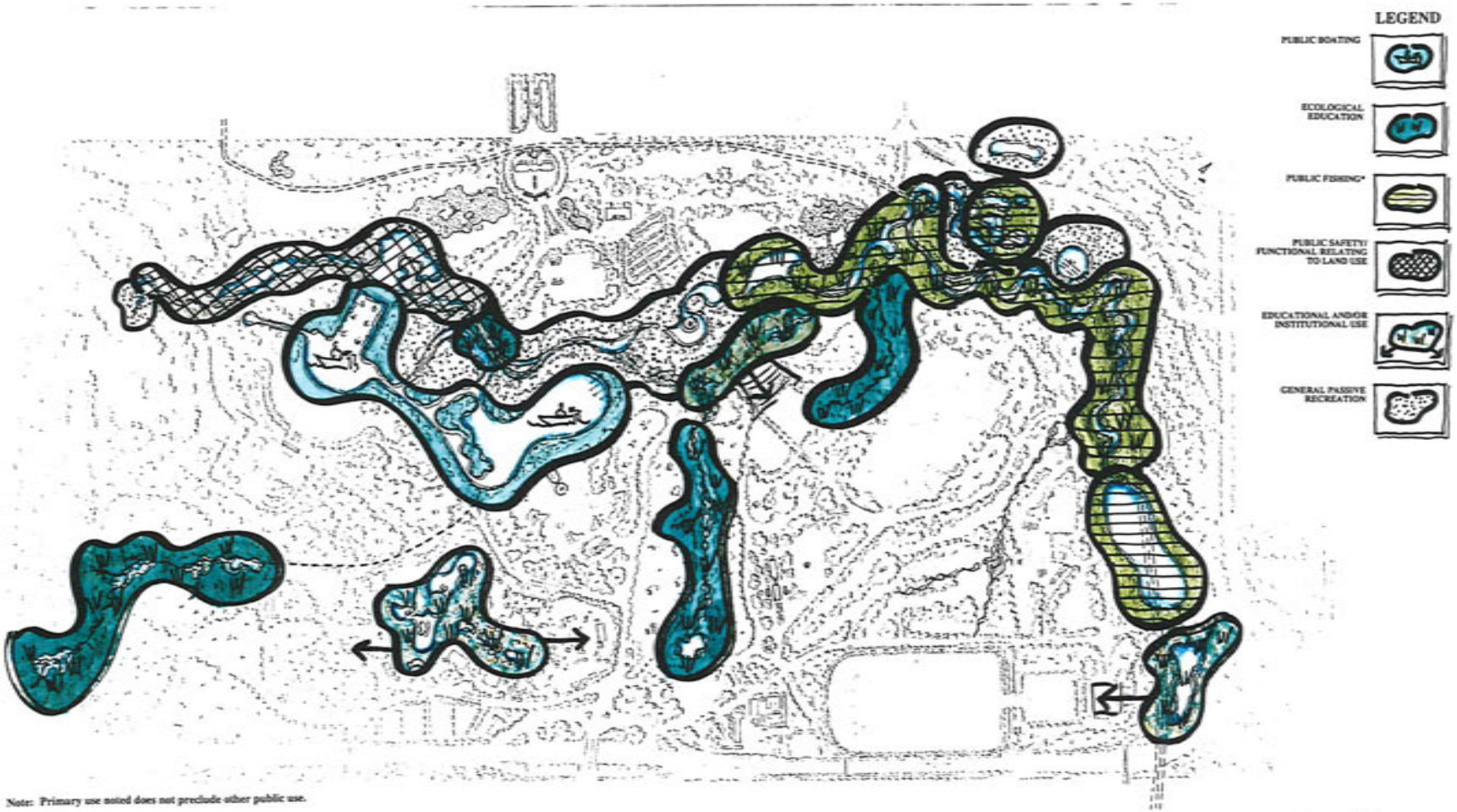
- Isolated and fragmented water bodies appear to function as a linear system but do not. Man made barriers impede surface water flow in valleys/tributaries.
- Appropriate water conservation and stormwater management are not practiced in and around the park.
- Road oil and salt, waterfowl and overflow sewage from adjacent neighborhoods degrade water quality. Poor water quality threatens fish habits and survival.
- Existing water bodies lack adequate water movement, aeration, filtration and surface vegetation which are all essential for proper water quality and the stability of adjacent landscapes.
- The combination of steep slopes, highly erodible soils and minimal natural ground vegetation exists in many areas of the park and poses potential erosion hazards.
- Today, most of the park is classified as developed land or mowed green space which offers little environmental benefit to humans or wildlife. Plantings are scattered and do not accentuate land forms.
- The vitality of the park's vegetative and wildlife communities is threatened by habitat fragmentation and lack of biodiversity.
- Passive open space and paths does not relate to water system and land forms and sometimes disrupts them.



CONCEPTUAL DESIGN
Water System and Passive Open Space Corridor

SECTION (Looking South from Lindell)
Potential Riparian Improvements

*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.



Note: Primary use noted does not preclude other public use.

*Hatchery Lakes are operated by the Missouri Dept. of Conservation for urban youth fishing program. This use precludes general public fishing due to operational needs.

CONCEPTUAL DIAGRAM
Water Use

FOREST PARK MASTER PLAN
ST. LOUIS, MO

SCALE 1"=400'

November 18, 1995

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DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN

winter fish survival, thereby increasing the potential for quality public fishing.

Looking to the future, this system is designed to be flexible with the ability to be modified to meet future clean water restrictions and reduced availability of city supplied water and downstream water treatment. The system could be reconfigured to form closed water loops which allow for water recycling or use for irrigation or other desired landscape uses.

2. Water Character and Spatial Features

- Design water bodies to reflect the flow dynamics and spatial qualities of a naturally occurring, meandering small river, accentuating features such as:
  - Oxbows
  - Width variations
  - Larger cascades
  - Sand bars and/or islands
  - Weathered outcroppings
  - Sweeping bends
  - Small riffles
  - Confluence areas and wetlands
  - Braided tributaries

- Design water features in sweeping curves and bends. Avoid straight lines and unnatural or tight curves unless part of a formally designed area. Provide a mixture of long and short views.

- Utilize the reflective properties of water features to add visual drama to surrounding landscapes, feature plantings, public art, and architecture.

- Accentuate naturally occurring water features, particularly in depressed areas which pond with normal rainfall and have no conflicting use.

- Utilize water features to define the spatial character and, where appropriate, the physical boundaries of a particular land use, such as the Municipal Golf Course.

- Utilize water for its audible qualities and its cooling properties, especially along paths, seating areas, and near park facilities.

- Emphasize the water system as a series of unique experiences with dramatic events and confluence areas along the way. Accentuate and highlight water "events," especially confluence areas and one-of-a-kind experiences or opportunities, such as:
  - The Cascades
  - Seven Pools
  - Post-Dispatch Lake
  - Round Lake
  - Bowl Lake
  - The Spillways
  - Grand Basin
  - Pagoda Lake
  - Jefferson Lake

- Create unique or special landscape treatments at cascades, weirs/riffles, spillways, and confluence areas which reflect surrounding landscape character, scale, and use.

- Design necessary retaining walls and edge structures to blend into surrounding landscapes, using native materials to create the impression of features created through natural processes.

- Emphasize the inextricable link between the park's water system and the passive open space spine.

- Locate new water features to minimize loss of healthy specimen trees, groves, other quality vegetation, and desirable land uses.

3. Functional Requirements

- Design and manage lakes and lagoons to be flexible, functioning as drains in times of flooding and retaining and improving landscape quality and wildlife diversity at all times.

- Implement a water system design that has the ability to reduce long-term maintenance and the need for other drainage and water input infrastructure.

- Increase overall ecological quality and alleviate problems downstream by holding and controlling flood waters.

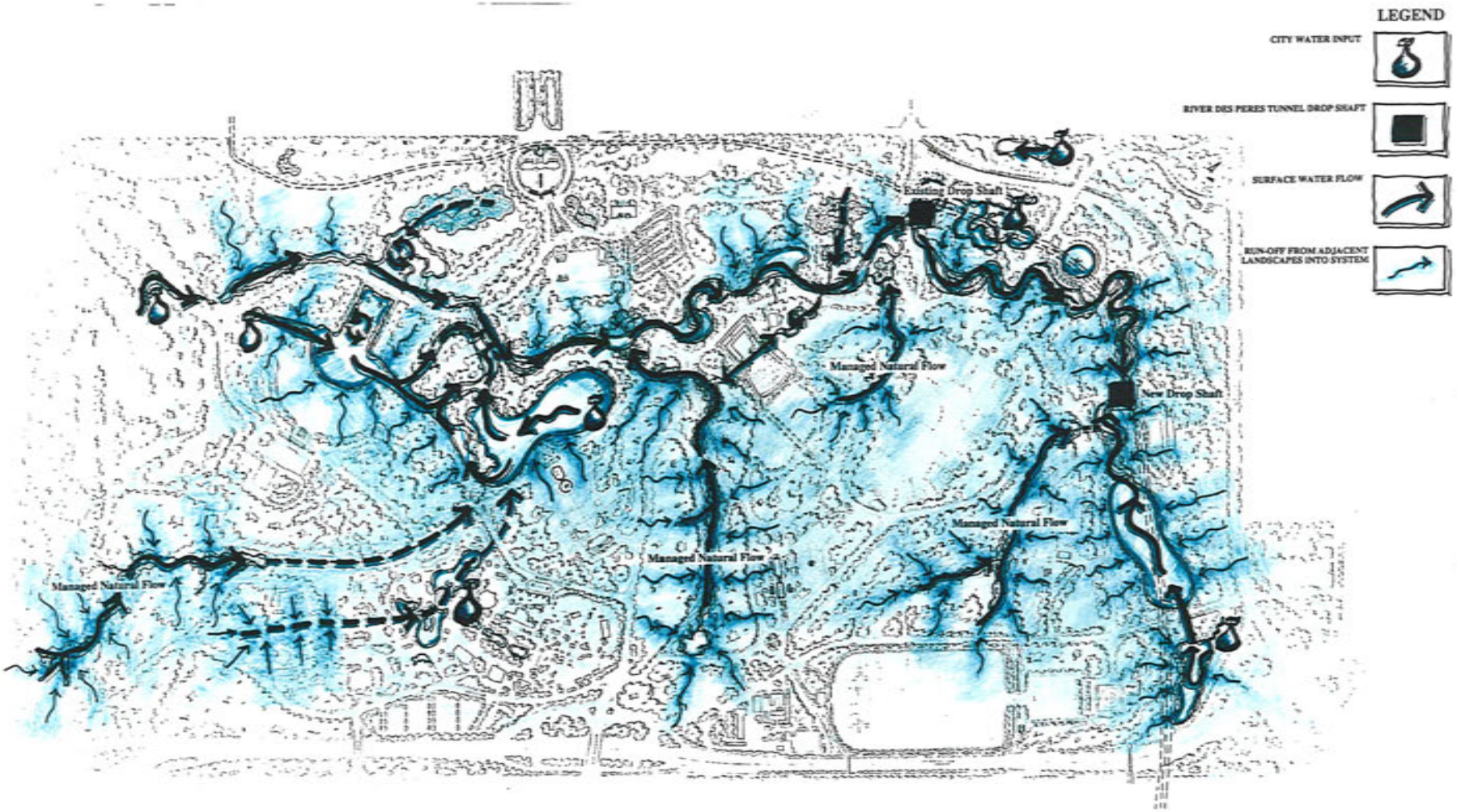
- Construct wetlands and/or wet meadows at key locations and confluence areas along the water system to provide the ability to limit the necessary size of water bodies on a daily basis while providing flood handling capacity, increased biodiversity, sediment filtration, and erosion control.

- Deepen and widen the lagoon system from Post Dispatch Lake to Jefferson Lake to offer more volume for natural cleansing of water pollutants, more biodiversity, and a much-desired fishery for city residents
  - Provide 3:1 slopes (top of bank to toe of bank) that have some natural functions and reduce water pollution
  - Dredge as necessary on a regular basis to maintain water quality, aquatic balance and designated water use.
  - Create a channel with an ideal average depth of 4 to 6 feet.
  - Create three deep-water pockets of up to 10 feet depth to avoid winter kill of fish in Deer Lake, the bend south of the fish hatcheries, and the stretch of lagoon from Round Lake to Steinberg Rink.
  - Construct aesthetically sensitive fishing platforms in areas where bank soil compaction is anticipated and near parking lots to allow access by fisherpeople who have disabilities.
  - Formulate an agreement with MODOC to stock and manage a bass/bluegill self-sustaining population in the lagoon between Deer Lake and the north end of Steinberg Rink

- Encourage maximum use of desirable surface water to charge the park's water bodies. Discourage unnecessary piping of water to city drainage infrastructure.

- Encourage removal of undesirable surface water from roadways, parking lots, maintenance areas, and animal yards to city drainage and water treatment infrastructure.

- Consider the following when designing islands in the spine or lagoon system, where deemed desirable and feasible:
  - Keep them narrow to avoid creating more waterfowl habitat and to keep the surrounding channel as deep as possible.
  - Construct them with an irregular configuration to create more underwater fish habitats.
  - Consider terraced, concrete or stone bulkheads on which plants can be stabilized or use vertical pilings concealed by vegetation such as weeping willows.



Surface Drainage System Operation

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE 1"=400'

November 18, 1995

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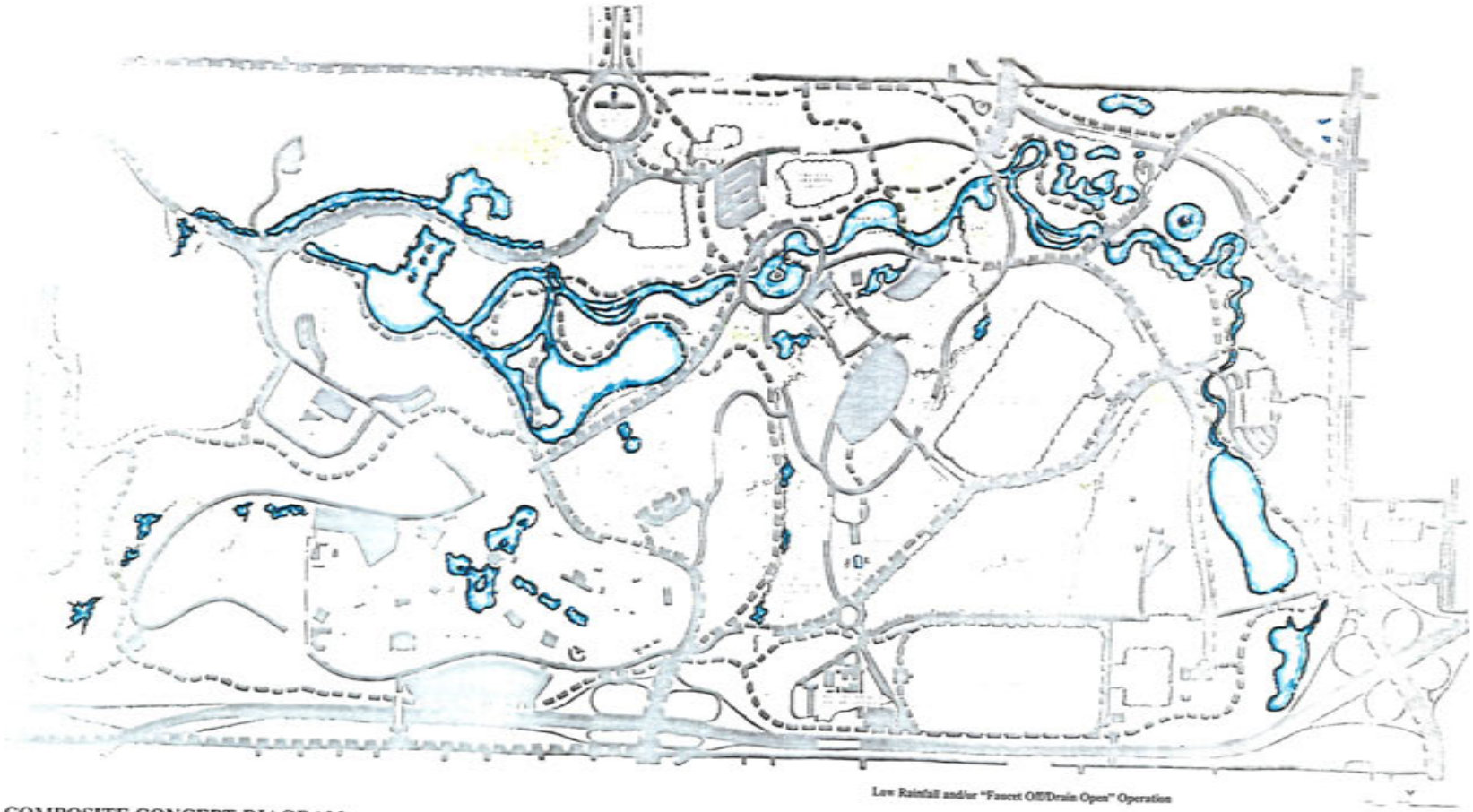
ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN



COMPOSITE CONCEPT DIAGRAM
Forest Park Master Plan

CONCEPTUAL DIAGRAM
Linear Connected Water System - Low Water Operation

COMPOSITE CONCEPT DIAGRAM
Forest Park Master Plan

CITY OF SAINT LOUIS | FOREST PARK MASTER PLAN

CONCEPTUAL DIAGRAM
Linear Connected Water System - High Water Operation

Note: Majority of roadways and parking lots to drain into RDP Tunnel, not surface drainage system.

Major Subsurface Drainage Infrastructure

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 600' 0 600 1200 2400

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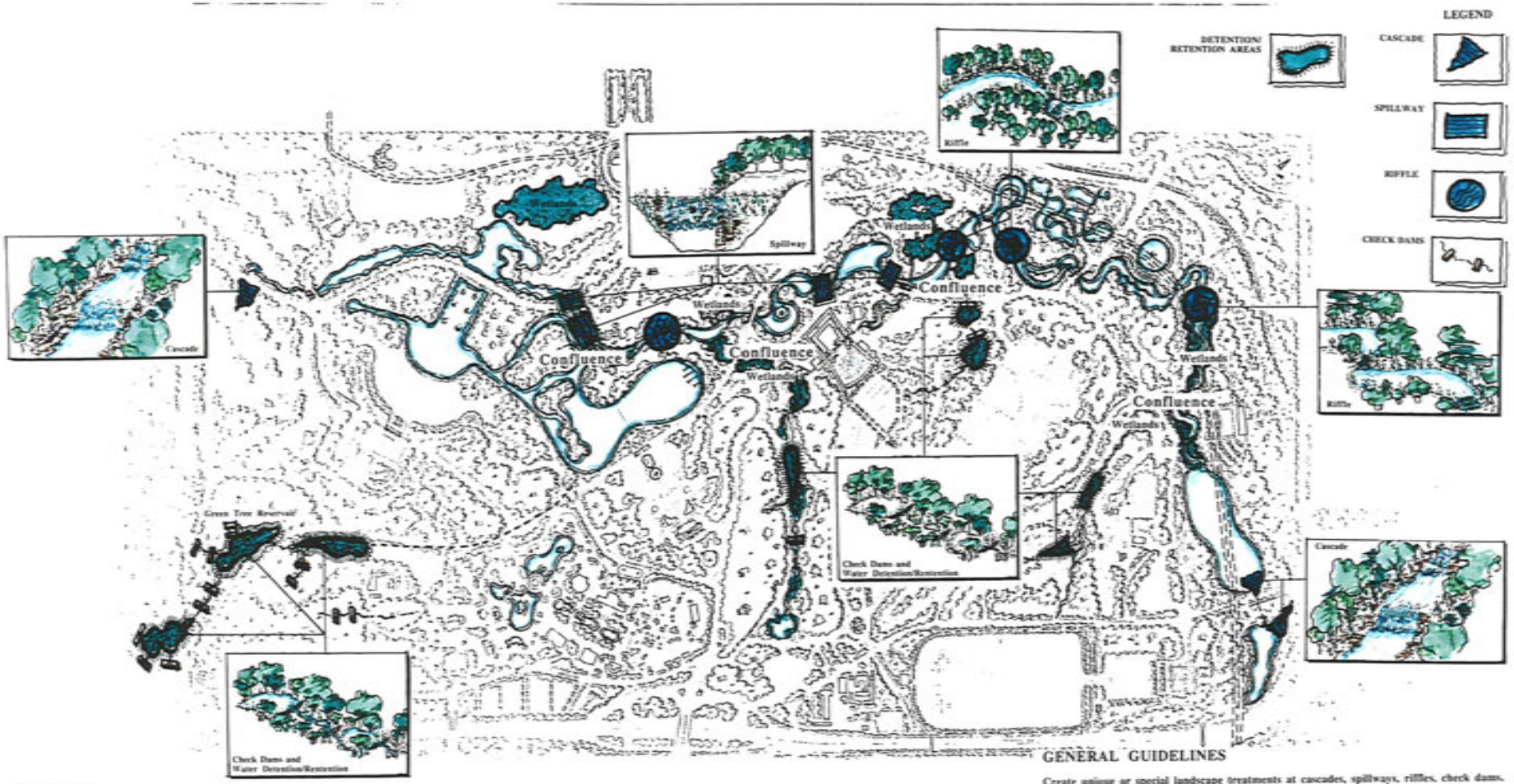
FOREST PARK MASTER PLAN

- Consider developing more fish habitats in the water near the base of the islands.

4. Water Quality Control

To make the park's water resources healthy again, efforts to combat water pollution can take two basic approaches — pollution prevention and pollution treatment/recycling. Economically and environmentally, pollution prevention is the preferred choice.

- To prevent water pollution:
  - Plant native species of vegetation to reduce the need for fertilizers and pesticides.
  - When fertilizer application is necessary, use only moderate amounts and use the proper kinds (organics, slow-release) during different seasons to promote absorption by targeted plants.
  - Do not use fertilizer on steeply sloped lands.
  - Minimize the use of pesticides by using integrated pest management whenever possible and avoiding broad spectrum pesticides.
  - Promote mass transit in the park to reduce vehicular and roadway pollutants.
  - Remove stormwater runoff from highways, streets and parking lots.
  - Establish and maintain confluence areas to filter out pollutants from tributaries entering the water spine.
  - Establish and maintain vegetative strips (riparian areas) around water bodies to filter out pollutants washed off the surrounding landscapes.
  - Discourage the current practice of mowing the grass very short, which stresses the plants, decreases groundwater recharge, and increases soil erosion.
  - Consider drilling a well to replenish the water spine rather than using chlorinated city water.
  - Allow only aluminum cans or refillable glass bottles in the park.
  - Develop and implement a plan to discourage waterfowl in the park by allowing vegetation to grow up, planting riparian areas, not building islands, creating access to existing islands for potential predators, and educating/fining people who feed them extensively.
  - Adopt pooper scooper laws to reduce pet feces contamination of water resources.
  - Establish and maintain a flow-through water system to reduce the likelihood of algal blooms and subsequent dependence on algaecides.
  - Inspect pipe fittings on underground and above ground storage fuel tanks regularly for leaks.
  - Stop discharges of raw sewage and other pollutants into Forest Park that result when sewer systems are overloaded by rainfall.
  - Stop stormwater runoff from "Dogtown," to remove many of the external sources of nutrients into the park's water system.
  - Establish and review/upgrade every three years procedures and compliance guidelines for the use of pesticides, algaecides, herbicides, fuels, deicing compounds, and other potentially harmful chemicals in Forest Park.
  - Maintain proper procedures and records in compliance with the Environmental Auditing Policy Statement of the EPA for pesticide use on golf courses.
  - Conduct proper training of golf course staff in the storage, mixing, applying, and disposal of pesticides.



DEFINITIONS

Cascades, Spillways, and Riffles
All are devices which provide water with a means to drop in elevation. A cascade is a major change of elevation (more than 5'), a spillway (or weir) is an intermediate drop (1' to 5') and a riffle is a rough area in the water caused by underwaterstar at surface structures. All three aerate the water.

Check Dams
Check dams are grade stabilization structures used in gully channels or ditches to control down-cutting and overall greater channel stability.

Detention and Retention Structures
Detention and retention structures are stormwater runoff control devices used to buffer the increase in runoff due to urbanization or to simply hold back some runoff water to reduce erosion and flooding. Detention structures are designed to allow small storms to pass through, but hold back a portion of runoff from large storm events. Detention structures are designed to drain completely within a matter of hours. Retention ponds are similar structures except they have a permanent pool of water.

Greenway Reservoir
Similar to both detention and retention structures, they are forest habitats that have been modified to allow for some water ponding to occur during the winter and early spring months of the year. From late spring to early fall, the area drains completely. During the remaining portion of the year the GTR may function like a retention pond.

GENERAL GUIDELINES

Create unique or special landscape treatments at cascades, spillways, riffles, check dams, detention/retention areas, wetlands and confluence areas which reflect surrounding landscape character, scale and use.

Improve water quality by constructing water retention and/or detention structures at higher elevations in the intermittent tributaries to trap sediments and debris.

Create wetlands in upper channels and adjacent to existing larger ponds and lagoons which trap sediments and filter nutrients from runoff water. Develop pockets of wetland flowers.

Increase aeration of lagoon system to more effectively break down nutrients/other potential pollutants and help to avoid summer kill of fish by developing a system of drop structures, fountains, and underwater aerators or diffuse bubblers.

Develop a water quality monitoring program and utilize this data to determine the success of implemented water design measures and necessary modifications in the future.

Water Quality and Erosion Control

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 400' 0 400 800 1600

November 18, 1995

CITY OF SAINT LOUIS
DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION
URBAN DESIGN

FOREST PARK MASTER PLAN

- To treat polluted waters:
  - Construct water retention and/or detention structures at higher elevations in the intermittent tributaries to trap sediments and debris currently flushing into the lakes and lagoons.
  - Create wetlands in upper channel reaches and adjacent to existing larger ponds and channels (lagoons) to trap sediments and filter nutrients from runoff water.
  - Develop isolated pockets of wetland flowers by planting them on level banks or in shallow water and preventing them from spreading by creating steep slopes and/or deep water on both sides.
  - Develop a system of drop structures, fountains, and underwater aerators or diffuse bubblers to increase aeration of lagoons, break down nutrients/other potential pollutants more effectively, and help avoid summer kill of fish.
  - Locate large bubblers in the three deep water pockets and matrices of "alligator" hose with fine holes where tributaries enter the lagoon at the confluence areas
  - Develop a program to monitor water quality by periodically taking and analyzing water samples and benthos samples using biological indicators such as aquatic arthropods to help indicate water quality.
  - Utilize testing data to determine the success of implemented water design measures and make necessary modifications in the future.

5. Soil Erosion Control

- Reduce soil erosion and improve soil resources through structural erosion control practices, vegetative plantings, and alteration of landscape maintenance operations.

  - Stabilize wooded valleys by creating retention and/or detention structures to slow down runoff water and provide grade control and through the use of lesser grade control structures, such as "check slots," weirs, and pipes, which reduce "down cutting" or channel deepening.
  - Reduce sheet erosion, create a more diverse plant community, and provide a denser protective cover on the soil surface by providing additional vegetative plantings, establishing transition zones along woodland fringes, and raising mowing heights/reducing mowing frequency in densely shaded areas.
  - Control minor rill and gully erosion with low, broad berms (diversions) with controlled outlet structures (riprapped channels or piped outlets) which protect down slope areas.
  - Establish new paved pathways to reduce soil compaction along heavily used footpaths.
  - Create natural barriers to keep pedestrian traffic in designated areas and provide stability to eroding areas.
  - Restore curbing and storm drain inlets to park roads to minimize concentrated flows from roads and paved surfaces and to help prevent rilling and gullying.
  - Stabilize shorelines with moist soil and emergent wetland plants to increase plant diversity and water nutrient usage and to reduce soil erosion along the banks.
  - Ensure that any reconstruction or new construction that increases the amount of impervious surfaces in the Park is appropriately designed to accommodate related increases in stormwater runoff that stresses the Park's water system and increases soil erosion.

6. Shorelines

The goal of this category will be to provide a green, semi-manicured bank that will not grow up with very tall vegetation.

- Apply edge and other landscape treatments which are most appropriate for each water body's designated use and aesthetic character:
  - Mown or paved edges for fishing, viewing, touching the water or other recreation from water edges.
  - Naturalistic emergent and understory plantings for wildlife habitat, passive viewing and to deter edge recreation, such as fishing and hiking.
  - Stone outcroppings, boardwalks or viewing platforms in naturalistic areas to facilitate water access and recreation while protecting delicate plant communities and/or shoreline treatments
  - Dramatic massings of plantings to accentuate curves or to hide areas beyond the curve, creating the image of a larger scale water body.
  - Specimen trees and massings at the end of an axis
  - Evergreen plantings in areas of high winter use, such as skating.

- Minimize the areas of smooth bank edge treatments which are free of plants and debris that may look attractive to some but are not well suited for aquatic wildlife and sediment filtration.

- Minimize concrete or channelized stream banks which are poor wildlife habitats, and speed up flood waters, increasing the potential for downstream flooding, scouring and erosion.

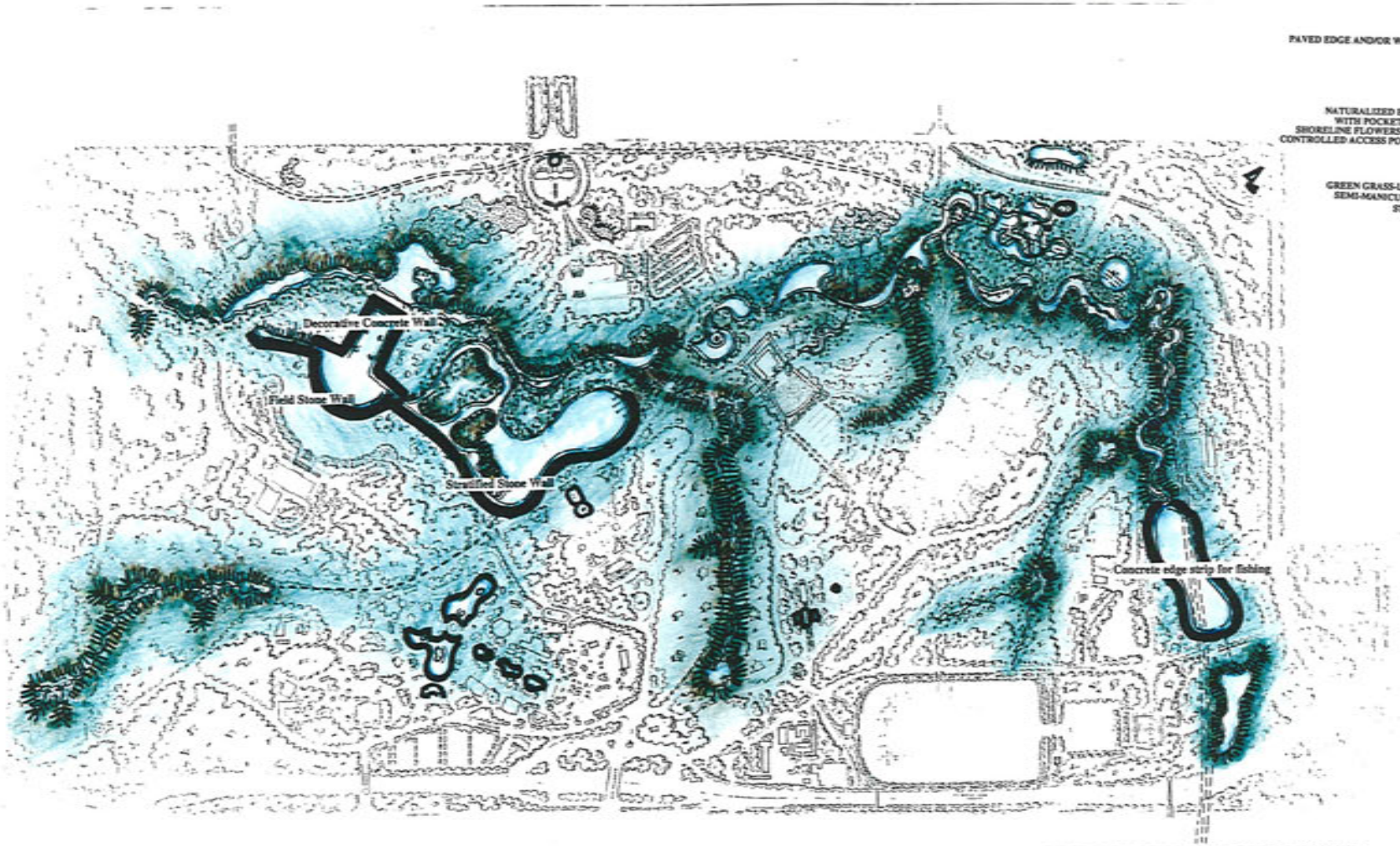
- Adhere to the following principles when designing shoreline treatments:
  - Select wetland species that will stabilize the shorelines and banks of the park's water bodies and filter solids and pollutants out of the park's water system
  - Select wetland plants that will tolerate a wide variety of urban conditions
  - Select plant species that will tolerate mowing, etc.
  - Emphasize planting of native vegetation
  - Select plants that increase spring flowering display for the park and provide a high aesthetic appeal (i.e., decorative foliage, fruit, etc.)
  - Avoid selecting plant species that are characteristically aggressive (i.e., spread rapidly by root suckers)
  - Increase the park biodiversity to reduce the chances for natural catastrophes caused by insects and diseases

- Provide a diversely planted shoreline along all water bodies in the park except the concrete wall banks of the Grand Basin, the Post-Dispatch Lake "Promenade" edge, and other banks where access to the water is important, such as for fishing the banks along Jefferson Lake.

- Utilize plants from the following species composition list in future shoreline designs:

  Green Grass-Like Semi-Manicured Strip
  - Frank's sedge (Carex frankii)
  - marsh spikerush (Eleocharis palustris)
  - tussock sedge (Carex scoparia)

  Pockets of Shoreline Flowers
  - arrowhead
  - iris (ex. blue flags Iris virginica & red-flag Iris fulva)



PARTIAL SHORELINE SPECIES COMPOSITION LIST

Green Grass-Like Semi Manicured Strip
- Franks sedge (carex frankii)
- Marsh spikerush (Eleocharis palustris)
- Tussock sedge (carex scoparia)

Pockets of Shoreline Flowers
- Arrowhead
- Cardinal Flower
- Iris (i.e. blue flags [Iris virginica] and red flag [Iris fulva])
- Monkey Flowers (i.e. Mimulus alatus and Mimulus ringens)
- Sweet Flag or calamus

Shoreline Treatments

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ST. LOUIS, MO

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November 18, 1995

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URBAN DESIGN

FOREST PARK MASTER PLAN

- monkey flowers (ex. Mimulus alatus & Mimulus ringens)
- sweet flag or calamus

7. Confluence Areas Or Filtering Marshes

The primary function of these confluence areas will be to improve the water quality of the flowing water system of the park. The plants, soil, and microorganisms found in these confluence areas filter out solids and break down water pollutants, thus improving the overall health of the park. Physically, these areas will generally be flat, with a slight gradient down to the lagoon. A berm will facilitate sediments and other pollutants to precipitate out before entering the lagoon. This berm will also temporarily pool some water.

- Adhere to the following principles when designing confluence areas or filtering marshes:
  - Select wetland species that will filter solids and pollutants out of the park's water system.
  - Select wetland plants that will tolerate a wide variety of urban conditions.
  - Select plant species that will tolerate mowing, burning, or temporary sediment banking to maximize management flexibility in the future.
  - Emphasize planting of native vegetation .
  - Select plants that increase spring flowering display for the park and provide a high aesthetic appeal (i.e., decorative foliage, fruit, etc.).
  - Avoid selecting plant species that are characteristically aggressive (i.e., spread rapidly by root suckers).
  - Increase the park biodiversity to reduce the chances for natural catastrophes caused by insects and diseases.

- Consider the following park locations for confluence areas or filtering marshes:
  - West of the Muny on the south bank of the lagoon and on Langenberg field area.
  - Near the junction of Union and Theater Drives east of the Muny.
  - On the 18-hole Municipal Golf Course southwest of the Missouri History Museum.
  - At the upper temporary pond on the Triple-A (9-hole) golf course.

- Utilize plants from the following species composition list in future confluence area designs (Organized according to soil moisture):

  Moist to Saturated Soil with No Standing Water
  - arrowhead; cinnamon fern
  - dark green bulrush (Scirpus atrovirens) (up to 5 feet tall)
  - fox sedge (Carex vulpinoidea)
  - Frank's sedge (Carex frankii)
  - iris (ex. blue flags Iris virginica & red-flag Iris fulva)
  - jewelweed or touch-me-nots
  - marsh spikerush (Eleocharis palustris)
  - monkey flowers (ex. Mimulus alatus & Mimulus ringens)
  - royal fern
  - sweet flag or calamus
  - switch grass (up to 5 feet tall)
  - tussock sedge (Carex stricta)
  - wool grass (Scirpus cyperinus) (up to 6 feet tall)

  Saturated to Wet Soil with Periodic or Permanent Standing Water
  - arrowhead

- dark green bulrush (Scirpus atrovirens) (up to 5 feet tall)
- fowl mannagrass
- fox sedge (Carex vulpinoidea)
- Frank's sedge (Carex frankii)
- iris (ex. blue flags Iris virginica & red-flag Iris fulva)
- marsh spikerush (Eleocharis palustris)
- monkey flowers (ex. Mimulus alatus & Mimulus ringens)
- pickerel weed (up to 5 feet tall)
- rice cutgrass (up to 5 feet tall)
- sweet flag or calamus
- tussock sedge (Carex stricta)
- water plantain; wild rice (up to 9 feet tall)
- wool grass (Scirpus cyperinus) (up to 6 feet tall)

8. Check Dams and Upland Water Control Structures

Water quality related planning for the lotic water spine of Forest Park requires that some consideration be given to stormwater runoff from adjacent upland areas. Of particular concern are the rate and method of delivery of the runoff water to the lakes and lagoon system. Under current conditions, stormwater is delivered to the water spine via stormwater sewers, wooded draws, and overland flows with few or no "checks" on flows or soil erosion in the draws. As part of the planning process, these water routing aspects were considered for possible improvement to enhance water quality, conserve water usage, and keep the lakes and lagoon system charged. Storm sewers are addressed in the infrastructure section of this document. This section is intended to provide some explanation and basic design considerations for check dams, detention and retention structures, and greentree reservoirs proposed for the wooded draws and Triple "A" Golf Course.

a. Check Dams

Check dams are grade stabilization structures used in gully channels or ditches to control down-cutting and ensure overall greater channel stability. Check dams are often utilized as a reasonably inexpensive method of managing erosion in areas where minimal impact on the land resources is desired. There are two general methods for locating these structures: 1) starting at the gully outlet and placing structures approximately 25-50 feet apart up the channel; or 2) placing a structure only at the headcuts or intermediary cuts in the channel. Headcuts are located where there are rather sudden 1-3 foot drops in the channel bed (sort of a small waterfall effect). Normally, headcuts are located at the upslope end of the gully and often somewhere between the ends of the gully.

There are several different types of structures to consider, depending on the level of control needed and the amount of area to be impacted. Examples of some possibilities are weirs, concrete or rock checkslots (flush or level with channel bed), rock dams shaped to be low in the center and curved downstream, and pipe or box culverts through paths or roads. The common feature of all these structures is the provision to allow water to pass over the structure and not around or under it.

b. Detention and Retention Structures

Detention and retention structures are stormwater runoff control devices used to buffer the increase in runoff due to urbanization or to simply hold back some runoff water to reduce erosion and flooding. Detention structures are designed to allow small storms to pass through, while holding back a portion of runoff from large storm events. Detention structures are designed to drain completely within a matter of hours. Retention ponds are similar structures, except they have a permanent pool of water. Typically, detention and retention ponds are on hillsides or small draws and not on large draws or streams.

c. Greentree Reservoir

Greentree reservoirs (GTR) in some aspects are similar to both detention and retention structures. GTRs are forest habitats that have been modified to allow for some water ponding to occur during the winter and early spring months of the year. From late spring to early fall, the area drains completely. During the remaining portion of the year the GTR may function like a retention pond. Special spillway consideration will be necessary to allow for altering water stages from no permanent water to a shallow, permanent pool while still providing for stormwater passage.

The principle benefits to a GTR are better mast production for wildlife, greater habitat diversity, better water quality, more water conservation, and less soil erosion.

Guidelines

- Install check dams to:
  - Reduce the velocity of stormwater runoff flows;
  - Control down-cutting in wooded draw channels (reduce gully erosion); and
  - Decrease sediment delivery to the lakes and lagoon system.

- Consider the following when designing and/or locating check dams:
  - Locate at headcuts and intermediary cuts in gullies or draw channels in Kennedy Forest and in the wooded draw between McKinley and Carr Lane Drives.
  - Construct these structures out of rot resistant wood, stone, rock, gabion, concrete, concrete rip rap bags (nylon reinforced paper bags of concrete ready-mix), cellular confinement systems (like Geo-web or comparable product), or similar materials.
  - Select materials to blend into the surroundings (make as natural looking as possible).
  - Install such that all channel flows pass through the structure and cannot get around it.
  - Make sure the downstream end or toe of the structure is stable.
  - Make sure the side walls or ends of the structure extends ten feet or more into stable soil on the banks of the channel.
  - Use non-woven geosynthetic fabrics behind and under the structure to prevent piping erosion through porous materials or through joints or seams in the structure.

- Install detention and retention structures to:
  - Reduce stormwater runoff flows;
  - Provide for extended draw down time of stored runoff water to reduce municipal water consumption for lake and lagoon recharge;
  - Reduce erosion in the wooded draws in Kennedy Forest and between McKinley and Carr Lane Drives;
  - Add new habitat and aesthetic features to Forest Park;
  - Filter sediment and debris from runoff water prior to entering lakes and lagoon system; and
  - Provide a for some groundwater recharge.

- Consider the following when designing and/or locating detention and retention structures :
  - Locate detention pond between fairways 4 and 5 in Triple "A" Golf Course.
  - Provide minimum 4-5 foot deep permanent pools in retention structures.
  - Discourage burrowing rodent activity in embankments by constructing berms and dams with 5:1 side slopes or rock riprap on the upstream face of the structure (the former preferred where possible).
  - Include staged outlet structures or spillways in retention to regulate water depth to allow for vegetation control or provide complete draw-down for maintenance purposes.
  - Design to allow for stored stormwater runoff to be drawn-down in as long a time period as possible (possibly up to 72 hours) after a rainfall event.
  - Provide spillway design to allow for sufficient free board needed to meet hydraulic requirements and safety guidelines.
  - Plan shoreline vegetation to meet aesthetic as well as erosion control functions in the golf course.
  - Provide a wet, flowering meadow planting in the detention structure between fairways 4 and 5.
  - Select vegetation from lists provided for lake and lagoon shoreline treatments and confluence area plantings to meet conditions and habitat needs for retention pond site(s) under consideration.

- Consider the following locations for detention and retention structures:
  - The wooded draw (valley) of Kennedy Forest.
  - In the draw between McKinley and Carr Lane Drives and in Triple "A" Golf Course.
  - West of Valley Drive and to the northwest of the intersection of Valley and Government Drive.
  - South of Government Drive and west of the Zoo's north parking lot.
  - South of the connecting drive between McKinley and Carr Lane Drives.
  - Between fairways 5, 8, and 9 in Triple "A" Golf Course.

- Install greentree reservoirs (GTR's) to:
  - Reduce stormwater runoff flows.
  - Reduce erosion in the wooded draws in Kennedy Forest.
  - Add new habitat and aesthetic feature to Forest Park.
  - Introduce additional tree species to Kennedy Forest.
  - Attract new wildlife species to Forest Park.
  - Filter sediment and debris from runoff water prior to entering lakes and lagoon system.
  - Provide for some groundwater recharge.

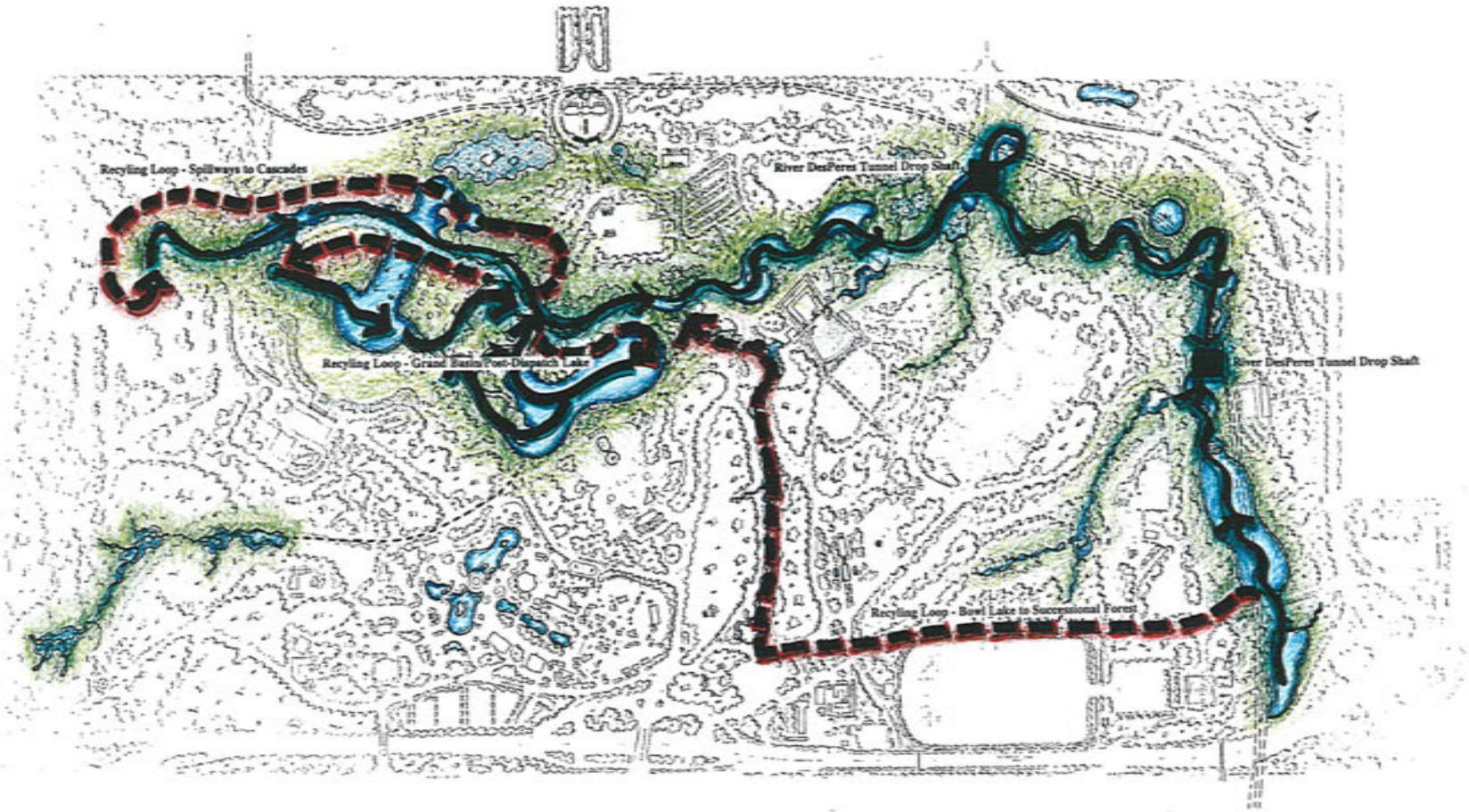
* Consider the following when designing and/or locating greentree reservoirs (GTR's):
  - Locate a GTR north of Government Drive at the road culvert pipe approximately near the middle of Kennedy Forest (consider designing the area planned as a retention structure to the west of Valley Drive as a GTR also).
  - Discourage burrowing rodent activity in the embankment by constructing any berm (or dam) that may be required with 5:1 side slopes or rock riprap (the former preferred if possible).
  - Redesign the culvert as a staged structure (Dos-ir valve) to allow for gradual flooding to the north of Government Drive for a period from October through early March.
  - Include staged outlet structures or spillways to regulate water depth or provide complete draw-down for maintenance purposes.
  - Provide spillway design to allow for sufficient free board needed to meet hydraulic requirements and safety guidelines.
  - Select vegetative species to tolerate the newly created wet condition and to replace trees that die (consult Missouri Department of Conservation for species selection).
  - Select herbaceous vegetation from lists provided for lake and lagoon shoreline treatments and confluence area plantings to meet conditions and habitat needs for the site.

9. Long-term Options

The following options should be considered to further improve the park's water system in the future:

1. Investigate the feasibility of recycling the water out of the lagoon system prior to its exiting through the two drop structures. Smaller recycling loops could be phased in for water reuse, thereby lessening demand for piped-in city water. These waters may be high in nutrients useful for other park purposes, such as golf course watering and fertilizing.

2. On a larger scale, utilize River Des Peres as a recreational/path link to the vast collection of city and county open space, eventually linking Forest Park with other city parks, the Mississippi River and Riverfront Trail, the Katy Trail and county parks.



Future Water System Improvements

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"=400'

November 18, 1995

CITY OF SAINT LOUIS

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URBAN DESIGN

FOREST PARK MASTER PLAN

E. Site Specific Recommendations

(W.L. = WATER LEVEL)

CASCADES

- Connect to the rest of the water system.
- Consolidate the area's city water input to this location.
- Provide some water retention capacity to reduce city water requirement during peak flow periods.

MUNICIPAL GOLF COURSE

W.L.= 470.0' normal/472.0' high

- Provide water bodies and wetlands to improve drainage and golf course quality.
- Connect to rest of water system.
- Coordinate with golf course design.
- Design to provide a safety buffer between golf course and other park uses.

GRAND BASIN

W.L.= 471.0' normal/471.5' high

- Restore walls and formal design elements.
- Improve link to Post-Dispatch Lake for public boating.
- Provide sediment filtration measures at confluence areas and aeration to improve water quality.
- Maintain public boating.

POST-DISPATCH LAKE

W.L.= 471.0' normal/471.5' high

- Restore filled in areas and enlarge lake.
- Improve edges to complement adjacent land uses.
- Improve link to Grand Basin for public boating.
- Remove sanitary sewer input and provide floating aeration and sediment filtration measures to improve water quality.
- Maintain public boating.

MUNY/PAGODA LAKE

W.L.= 466.0' normal/467.0' high.

Lagoon to west W.L.= 466.0' normal/468.0' high

- Provide additional lagoon system connecting Pagoda Lake and Angel Pond to increase water movement and filtration which improves water quality.
- Maintain small water bodies adjacent to the Muny and water flow underneath to address area tree survival concerns.
- Provide additional wetlands along Langenberg fields adjacent to the Twin Lots

FISH HATCHERY LAKES

Lagoon W.L.= 457.0' normal/459.0' high

- Maintain MODOC fishing clinics.
- Re-connect some water bodies while maintaining some separate water bodies to accommodate needs of fishing clinics.
- Re-connect lagoon system through the area, integrating the River Des Peres tunnel drop shaft.

DEER LAKE

W.L.= 462.0' normal/463.0' high

- Expand lake area and connect to adjacent water bodies.
- Provide some deep water pockets for winter fish survival

UNION ENTRANCE AREA
Lagoon W.L.= 458.0' normal/459.0' high
- Create a wetland or meadow to provide sediment filtration measures to improve water quality.
- Provide some water retention capacity to limit flow during peak periods.
- Provide some deeper water pockets for winter fish survival.
- Provide significant elevation change between lake and surrounding lagoons to deter upstream migration of certain fish species.

JEFFERSON LAKE
W.L.= 457.0' normal/458.0' high
(W.L. 457.0' near Steinberg)
- Connect to Bowl Lake and the rest of the water system.
- Provide aeration and sediment filtration measures at inlets and outlets to improve water quality.
- Restore paved edges for public fishing.

BOWL LAKE
W.L.= 466.0'
- Connect to rest of system via an underground pipe connection to Jefferson Lake.
- Enhance naturalistic character.
- Provide sediment filtration measures to improve water quality.
- Visually accentuate the Seven Pools.

STEINBERG RINK AREA
W.L.= 456.0'
- Provide a connection to Jefferson Lake.
- Create a wetland or wet meadow to provide sediment filtration measures to improve water quality.
- Provide some water retention capacity to limit flow during peak periods.

KENNEDY FOREST
- Improve connections to rest of water system.
- Provide check dams and green tree reservoirs for erosion control and sediment filtration measures to improve water quality.
- Provide some water retention capacity to limit flow during peak periods.

INTERMITTENT TRIBUTARIES (TYPICAL)
- Improve connections to rest of water system.
- Provide check dams and green tree reservoirs for erosion control and sediment filtration measures to improve water quality.
- Provide some water retention capacity to limit flow during peak periods.

ROUND LAKE AREA
Lagoon W.L.= 457.0'
- Maintain Round Lake.
- Enhance adjacent lagoon's naturalistic, meandering, slow-moving river character.
- Improve connections to adjacent water bodies and widen channel.
- Provide sediment filtration measures which improve water quality.

SPILLWAYS AREA
W.L.= 467.0' normal/468.0' high
- Enhance naturalistic cascading character with emergent vegetation.
- Replace existing spillways with additional, more attractive stone outcroppings.
- Provide sediment filtration measures to improve water quality.

- Pursue opportunity to include a unique feature or amenity in this area.

ZOO LAKES

- Improve edges to enhance aesthetics while accommodating water fowl display and habitat.
- Modify stormwater runoff from the Zoo to minimize nutrients from entering Post-Dispatch Lake.

III. LANDSCAPE AND SITE RELATIONSHIPS

A. Overview

B. Summary of Existing Conditions
1. Regional Context
2. History
3. Existing Conditions

C. Design Principles

D. Design Recommendations
1. General Approach
2. Typology of Landscapes
3. Plant Communities
4. Spatial Character and Quality
5. Public Use and Safety
6. Wildlife Habitats
7. Reforestation
8. Maintenance

E. Site Specific Recommendations

LIST OF DRAWINGS AND DIAGRAMS

ANALYSIS
1995 Regional Topography
1874 Topography
1874 Landscape
1995 Topography
1995 Slope
1995 Soils and Erosion
1995 Landscape Environmental Quality
1995 Wildlife Habitat Quality
1995 Spatial Character
1995 Views and Axis

DESIGN
Design Principle - Landforms Define Park Experience
Design Principle - Emphasize Site Relationships
Design Principle - Integrate Historically Significant Landmarks, Landscapes and Site Relationships
Landscape Recommendations
Vegetative Communities
Vegetative Community Section
Upland Vegetative Communities
Moist Bottomland Vegetative Communities
Wet Bottomland Vegetative Communities
Landscape Spatial Character

A. Overview

The landscape of Forest Park is representative of the region's landscape and topography which has been formed and altered over many years and supports the vast Mississippi River system. The River Des Peres once flowed above ground through Forest Park, but is now buried underground. Nevertheless, the river continues to have an impact on the park's spatial character. Its corridor has created a series of land forms that still define how the park is laid out and used. These land forms include:

- The historic flood plain of the River Des Peres.
- The low bottom lands in the northern and eastern sections of the park.
- The upland areas which drain into the bottom lands.
- The bluffs, which are transitional sloping hillsides between the bottom lands and uplands.
- The wooded valleys, which include some of the original intermittent tributaries of the River Des Peres which direct runoff water.

In developing a landscape design for the park, it is important to recognize these natural and historical land definitions and seek to enhance and highlight, rather than hide or try to overcome them. Historically, the major park facilities and architecture have been located and designed to accentuate or make use of the Park's topography. The spatial design of this plan seeks a balance between built and natural features and attempts to accentuate the inherent qualities of each. Views and axes between park facilities and landscapes were carefully analyzed and designed to attain maximum visual harmony. Site design, not independent landscape and architectural design, was stressed at all times.

Originally designed as an English Romantic park with open, flowing spaces and diverse environs, Forest Park today retains much of that character, especially in the eastern half of the park. Some features, however, have been modified to meet present day needs. This plan retains the original landscape character while introducing new midwestern or "Prairie Style" landscapes in appropriate locations throughout the park.

This design plan addresses both the formal and informal landscape features in the park, integrating them more closely to create "experiences" for the visitor that encourage park exploration. Using plantings, vistas, edge treatments, seasonal color, and other sensory qualities, the planners hope to return the park to its original design state: largely informal with occasional touches of dramatic formality.

The plan also addresses landscape issues from the perspective of public use and safety, maintenance of appropriate wildlife habitats, and ease and effectiveness of overall park maintenance.

B. Summary of Existing Conditions

1. Regional Context

Forest Park is the largest park in the region. While its topographic character is one of the primary spatial and aesthetic elements of the area, there is no predominant landscape "theme" in Forest Park.

Forest Park plays a significant role as a stop for migrating birds along the Mississippi River flyway.

2. History

Historically, the land that is now Forest Park was a transition area between upland forests south of River Des Peres and the shrubby bottom land with interspersed prairies to the north. This vegetative transition, along with the River Des Peres flood plain, created much of the spatial diversity that we see today.

Forest Park was originally designed as an English Romantic park with open, flowing spaces and diverse environs. Forest Park today retains much of that character, especially in the eastern half of the park. Many of the spaces envisioned in the original 1876 plan and 1904 World's Fair plan remain in some capacity, with a range of modified/contemporary uses. The park's topography is largely the result of the original configuration of River Des Peres prior to its burial into concrete sewer tubes.

3. Existing Conditions

Forest Park's landscape is aesthetically diverse, displaying a mix of grand meadows or grassy open spaces, intimate rooms, linear ribbons, formal open spaces and axes, aquatic and riparian environments, and naturalistic woodland and successional forest settings. However, much of the park lacks spatial definition and all-season visual drama. Without adequate amounts of habitat, "area sensitive" species suffer from inbreeding, roadside deaths and increased competition and predation from aggressive exotic species.

Most of the current tree planting, including the very positive memorial tree program, occurs in an ad-hoc manner with no coordinated plan to guide tree placement. Some of the park's plantings, in particular the conifers, are located in inappropriate locations in terms of site moisture, orientation, and use. Generally, the park is void of ornamental trees, shrubs, and diverse ground cover plantings which are necessary to provide healthy and diverse plant communities and aesthetic variety.

Forest Park contains numerous site relationships among its landscapes and its architecture. Major park facilities and architecture have historically been located and designed to accentuate or make use of the Park's topography. Dramatic views and axes between park facilities and landscapes were always stressed in past designs and many remain today.

*Basemap supplied by St. Louis County Dept. of Planning 1994

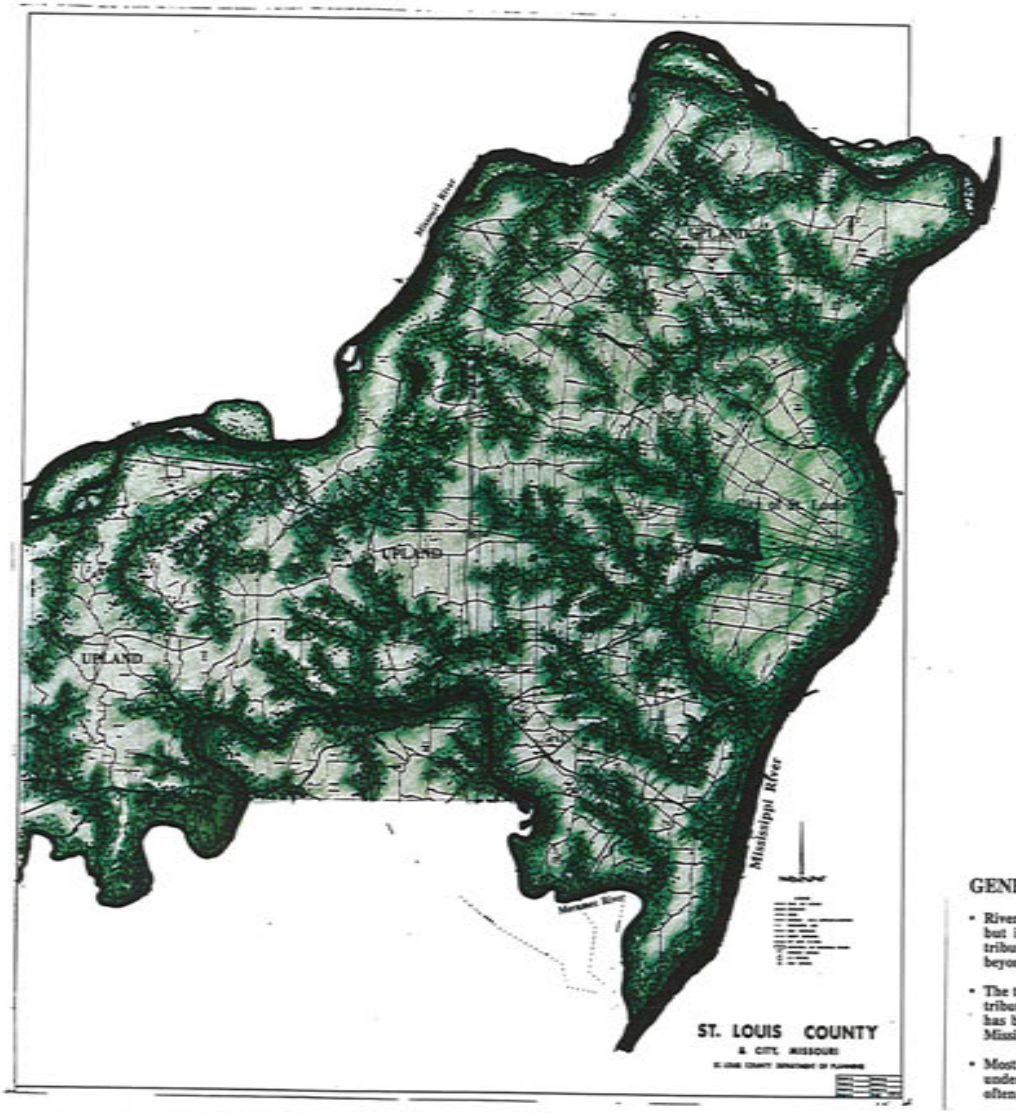
*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.

*Analysis by Design Team 1995

LEGEND

TRIBUTARY AND/OR VALLEY

UPLAND



1995 REGIONAL TOPOGRAPHY MAP

GENERAL OBSERVATIONS

- River Des Peres, which once flowed above ground through Forest Park but is now buried underground, is part of the Mississippi River tributary system and accommodates a watershed which extends well beyond the park's boundaries.
- The topographic character of Forest Park, including its uplands, bluffs, tributaries and valleys, is representative of a regional topography which has been formed and altered over many years and supports the vast Mississippi River tributary system.
- Most of the Mississippi River's tributary system has been diverted to underground infrastructure within the City of St. Louis boundaries but often retain characteristic topographic character.

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 400'

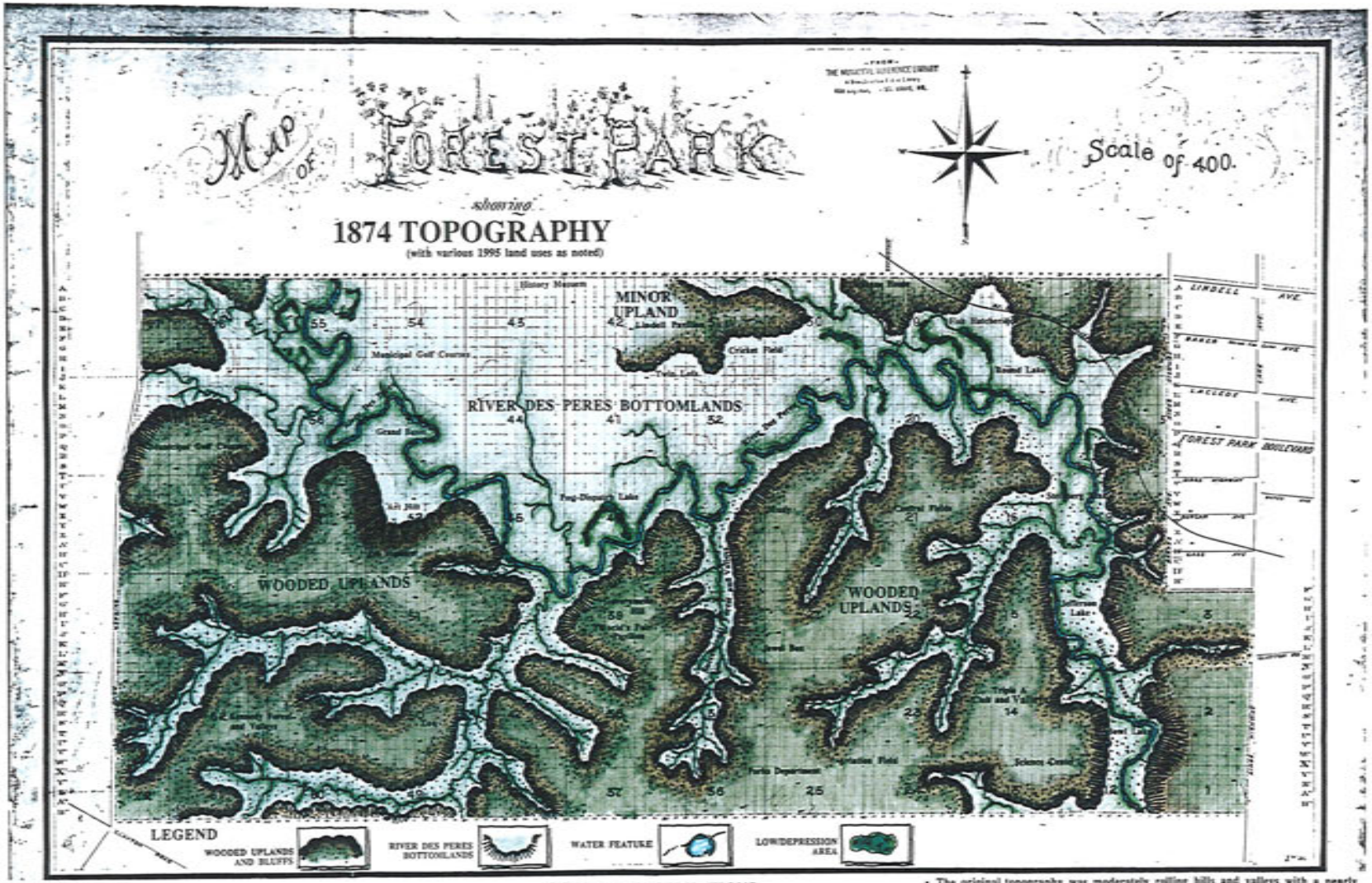
11 MARCH 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION
URBAN DESIGN

FOREST PARK MASTER PLAN



*Analysis by Design Team 1995
*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.

GENERAL OBSERVATIONS

- The original topography was moderately rolling hills and valleys with a nearly level to gently undulating bottom land or flood plain.

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"=400'

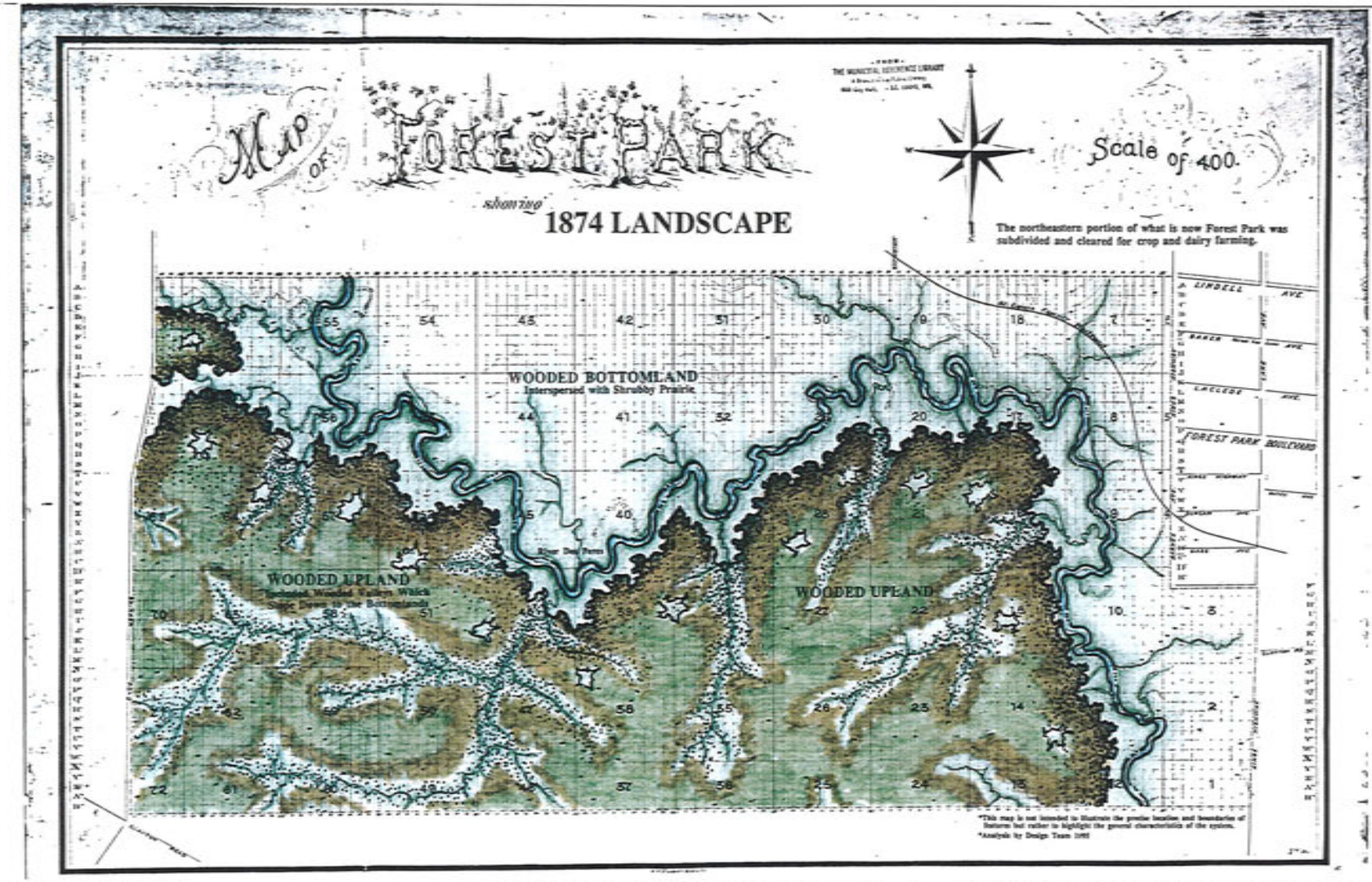
11 MARCH 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN



GENERAL OBSERVATIONS

- The city was approximately 40% forested and 60% prairie in pre-settlement time. The area east and north of Forest Park (the original River Des Peres Water Corridor) was primarily prairie while west and south of River Des Peres was woodland.
- The River Des Peres defined much of the vegetation and land forms at the time of Forest Park's creation.
- Internationally, for thousands of years, woodlands along the Mississippi River flyway have been used as a source of food and cover by migrating birds.
- Woodland vegetation was natural and adapted to the site (soils, slope and groundwater) and to the climate (temperature, rainfall, etc.).
- Woodland vegetation furnished habitat for many species of wildlife, a sediment filter, soil stabilization and a stormwater sponge.

FOREST PARK MASTER PLAN

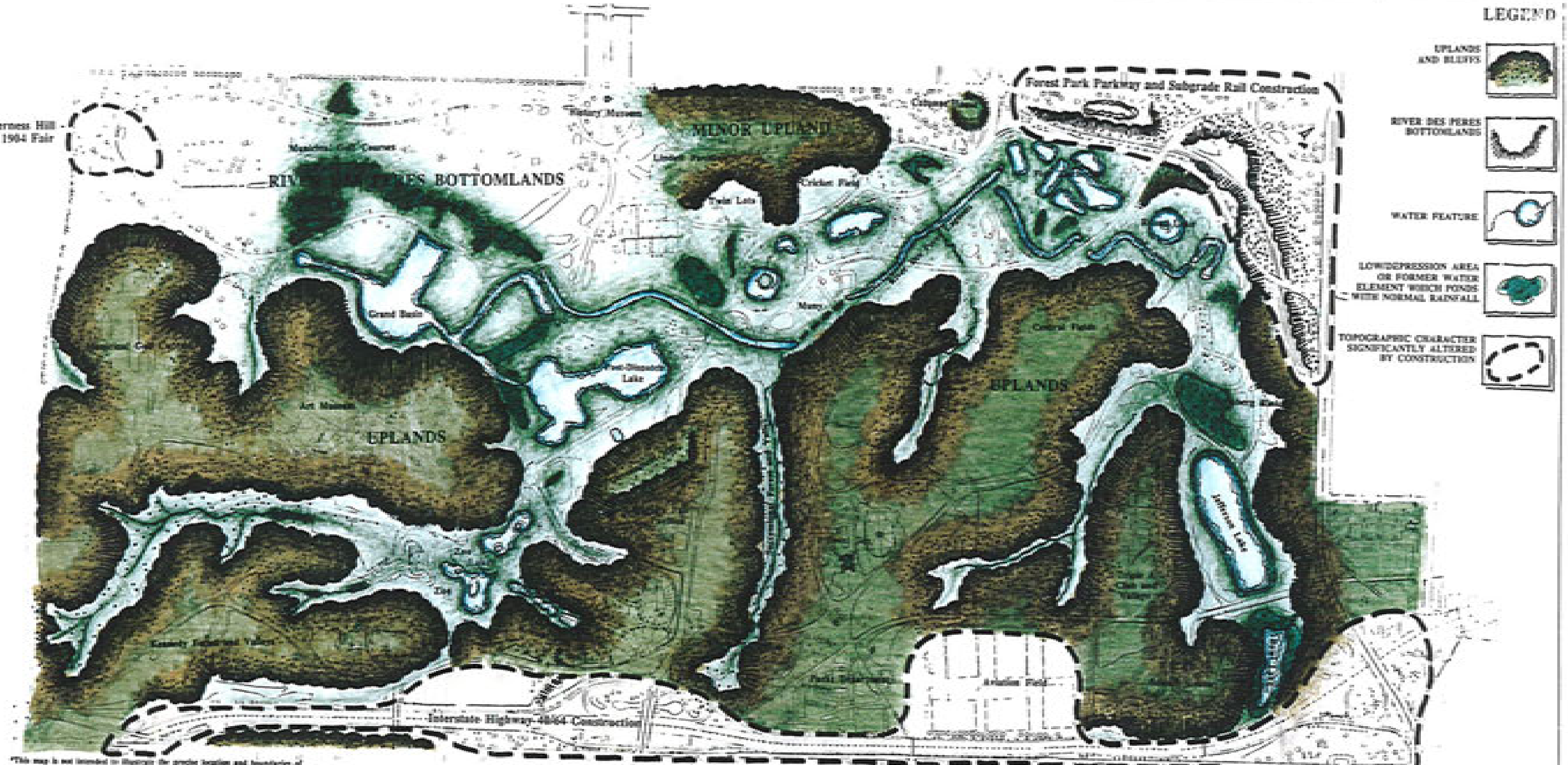
ST. LOUIS, MO

SCALE: 1"= 400' 0 400 800 1600

11 MARCH 1995

CITY OF SAINT LOUIS
DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION
URBAN DESIGN

FOREST PARK MASTER PLAN



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*Analysis by Design Team 1995

NOTE: An intermittent tributary is a surface drainage element which contains flowing surface water only if sufficient rainfall has occurred to "charge" the area's surface or groundwater systems.

GENERAL OBSERVATIONS

- Much of the park's original topographic character still remains and now supports a variety of contemporary land uses including active and passive recreation. Many of the uplands are no longer wooded due to these contemporary uses.
- Many of the park's roads and path are not designed or located to complement existing topography and land forms, resulting in erosion, divided spaces and poor landscape quality.
- Water tends to collect in depressional areas. Surface ponding often occurs in former river, lake and intermittent tributary locations which have been filled or diverted.
- Major construction efforts associated with the 1904 World's Fair, major transportation projects, changing land uses and other related park planning have altered the topographic character in various locations throughout the park.
- Art Hill basically retains the topographic character envisioned in the 1876 Plan except for minor grading on the north side to provide a smooth slope to Grand Basin.

1995 TOPOGRAPHY MAP

FOREST PARK MASTER PLAN
ST. LOUIS, MO

SCALE: 1"=400' 0 400 1600 2800

21 MARCH 1995

CITY OF SAINT LOUIS
DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION
URBAN DESIGN

FOREST PARK MASTER PLAN

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*Base Drawing Courtesy of Forest Park Forever & Arnold Arboretum Landscape Architects. Analysis by Design Team 1995

- Decreases in dense understory vegetation have led to increased soil erosion, particularly on slopes >5%. Dense tree lined slopes with short mowed grasses cannot "check" runoff flows as well as dense, natural understory vegetation or a properly maintained shade tolerant grass mix or ground cover for high foot traffic areas.

1995 SLOPE MAP

LEGEND

STEEP SLOPES OVER 10%

GENERAL OBSERVATIONS

- The most severe slopes in the park are remnants of the original bluff and wooded valley system associated with the original River Des Peres. With much of the diverse natural vegetation removed, they contain the most serious erosion problems in the park. This causes a series of problems including siltation of the park's surface water system.

- Steep slopes provide an opportunity for dramatic views, building siting and wildlife habitats however they are also potential erosion locations and must be carefully designed.

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE 1"= 400' 0 400 800 1600

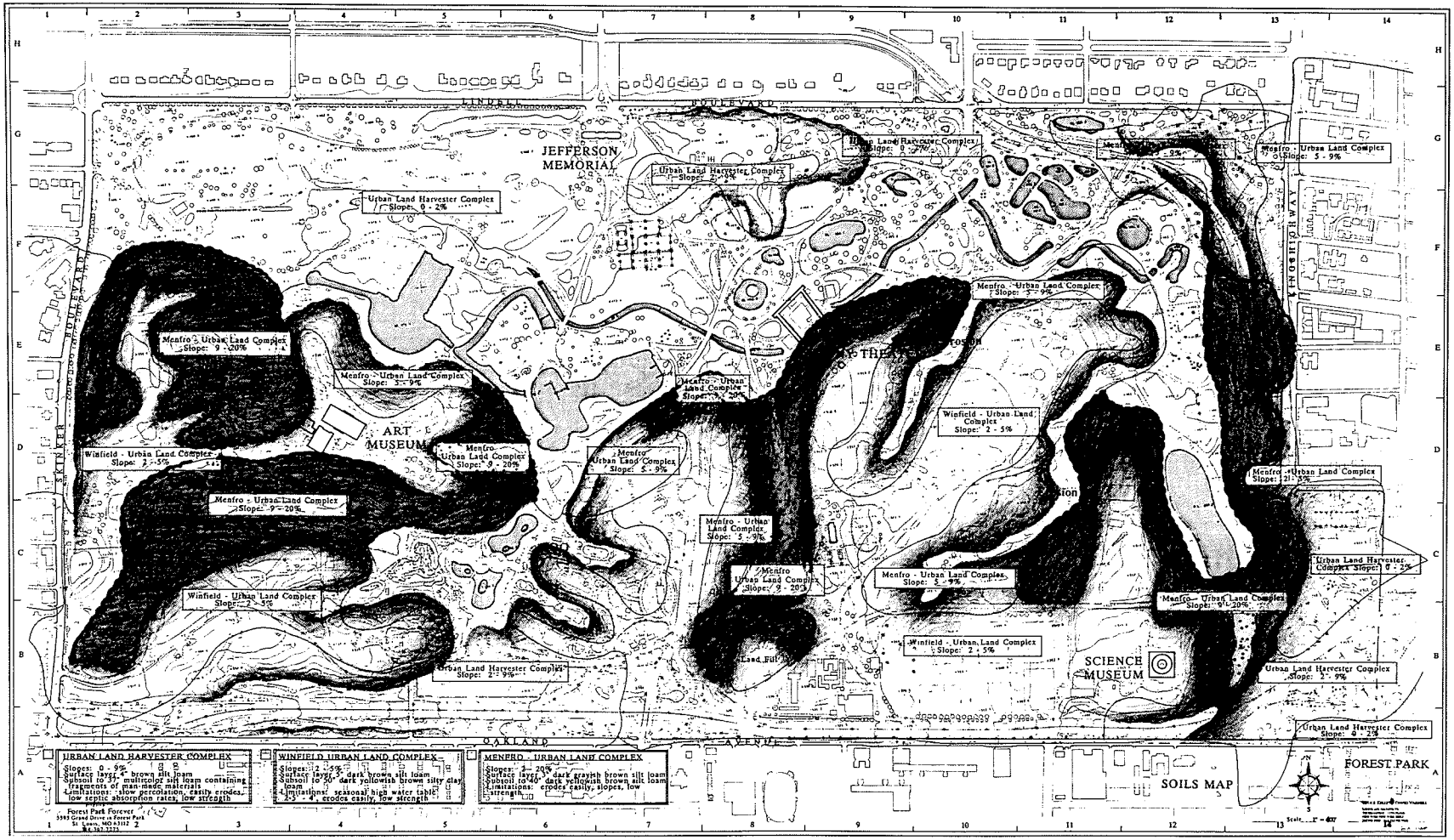
27 FEBRUARY 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN



- Steep slopes and water edges which lack proper vegetative stabilization pose the greatest danger of erosion and subsequent siltation of the water system. Much of Forest Park suffers from this condition.
- High foot traffic areas such as path fringes and desire line paths have left sparsely vegetated, compacted soils that are more vulnerable to erosion.

1995 SOILS AND EROSION MAP

LEGEND

COMBINATION OF STEEP SLOPES AND HIGHLY ERODABLE, UNSTABLE SOILS WHICH POSE POTENTIAL AND EXISTING EROSION PROBLEMS

GENERAL OBSERVATIONS

- Most of the park's steepest slopes also contain the most highly erodible and unstable soils. Soils found on upland ridges, side slopes and valleys are highly erodible. Stability decreases as slope steepness increases.
- The erosion potential from the combination of highly erodible, unstable soils and steep slopes has implications on land use and development, vegetation selection and infrastructure design and location.

*This map is not intended to illustrate the precise location and boundaries of features but rather to highlight the general characteristics of the system.

*Base Drawing Courtesy of Forest Park Forever & Kelly/Varnell Landscape Architects. Analysis by Design Team 1995

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 400' (0, 400, 1600, 2800)

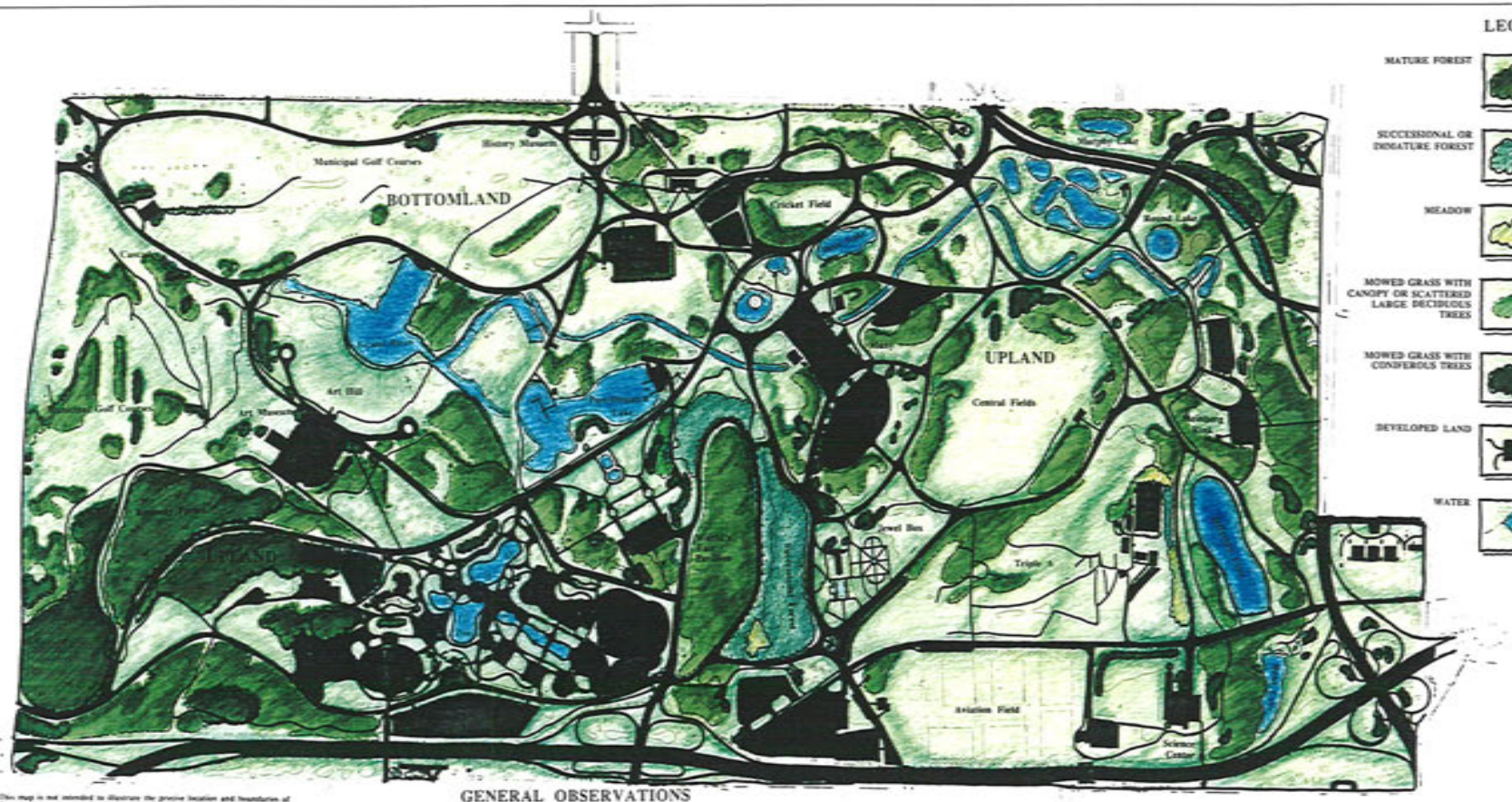
11 MARCH 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN



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*Analysis by Design Team 1995

1995 LANDSCAPE ENVIRONMENTAL QUALITY MAP

GENERAL OBSERVATIONS

- Roughly 90% of Forest Park is developed land or mowed green space which offers little wildlife value, does not help control soil erosion or stormwater runoff and provides minimal environmental benefit.
- The quality of Kennedy Forest suffers from past burning and logging and presently from trampling/soil compaction, a proliferation of aggressive exotic species which displace native vegetation, unnatural road intrusions that fragment the forest ecosystem and a general loss of biodiversity. The amount of true forest in the park (primarily Kennedy Forest) has been reduced from ±30% to ±6% (±80 acres).
- The importance of the natural landscape systems has not been established because these systems have generally not been inventoried, evaluated, stabilized or improved.
- Vegetative communities require space to grow and change. They need connections to the diverse seed and pollen source of other communities to remain healthy and diverse. The park's natural vegetation and wildlife communities are in danger of becoming inbred pockets of what was once a diverse and healthy natural system.
- The park's vegetative cover is classified as follows:

Mature Forest	*Characterized by four layers or categories of vegetation, dominated by many large canopy trees over 30' tall with scattered understory trees (10'-30' tall), scattered patches of shrubs (2'-10' tall) and unmowed ground layer characterized by spring ephemeral woodland wildflowers.*
Successional or Immature Forest	*Few scattered canopy trees over 20' tall, dominated by a mixture of young trees from 5'-10' tall and shrubs 2'-10' tall and unmowed ground layer of grass and/or herbaceous plants.*
Meadow	*Few scattered shrubs and young trees, dominated by unmowed ground layer primarily consisting of perennial and annual meadow flowers and herbaceous plants.*
Mowed Grass with Deciduous Trees	*Grass mowed/maintained at 6" or less, characterized by deciduous trees 20' or more in height with scattered trees and occasional canopy closure of more than 25%.*
Mowed Grass with Coniferous Trees	*Grass mowed/maintained at 6" or less, characterized by coniferous trees 20' or more in height with over 25% canopy closure.*
Developed Land	*Dominated by concrete, asphalt and other impervious surfaces. Scattered patches of flowers, shrubs and trees. Includes formalized plantings/gardens and foundation plantings along buildings and fences.*

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 400' 0 400 800 1600

11 MARCH 1995

CITY OF SAINT LOUIS
DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION
URBAN DESIGN

FOREST PARK MASTER PLAN

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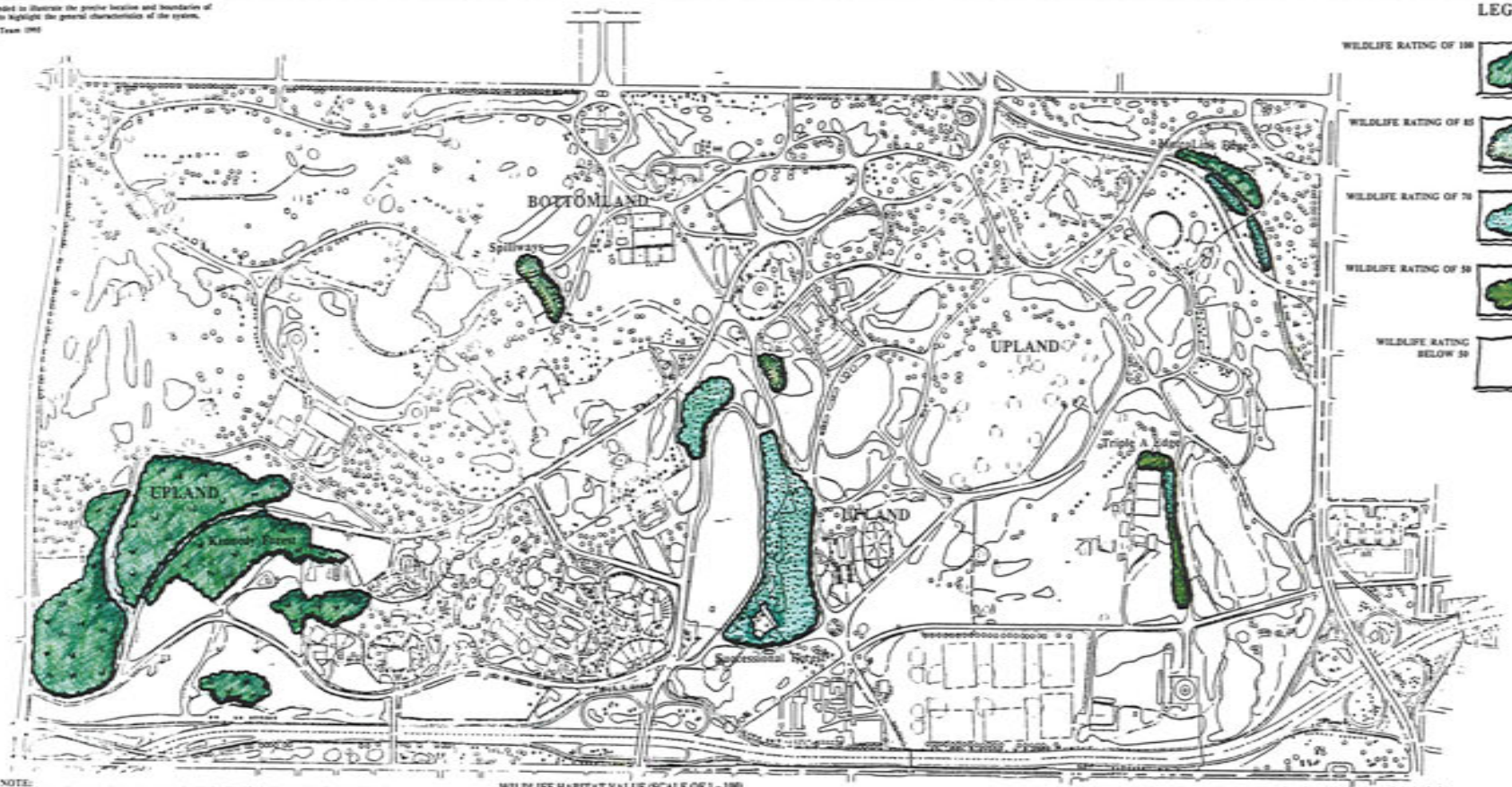

LEGEND

WILDLIFE RATING OF 100

WILDLIFE RATING OF 85

WILDLIFE RATING OF 70

WILDLIFE RATING OF 50

WILDLIFE RATING BELOW 50

NOTE:
The following rating system is based upon species biodiversity of vertebrates taken from the following sources --

1. Animal Habitat Relations Handbook published in March, 1986 by Missouri Dept. of Conservation (MODOC) and the USDA Forest Service Rolla Office.
2. Habitat Summary of Species Known to Occur in St. Louis County and the Natural Heritage Database administered by MODOC and downloaded March, 1994.
3. Survey of Fish Populations of Forest Park Lakes by Prof. Nevin Aspinwall of St. Louis University in Oct. 1988).
4. Personal observations and estimations by Design Team, 1995.

GENERAL OBSERVATIONS

The following wildlife habitat value numbers represent the relative diversity that various types of vegetation furnish to vertebrate wildlife species. (This system does not represent relative values of urban greenspace which are primarily based upon aesthetic interpretations which vary widely.)

WILDLIFE HABITAT VALUE (SCALE OF 1 - 100)

1 Developed landscape of buildings, etc. with possible nesting sites for pigeons and house sparrows.

5 Regularly mowed grasslands with foraging sites for geese, ducks and robins.

15 Lakes with mowed grass banks with limited habitats for fish, turtles and waterfowl.

25 Regularly mowed grass with large trees with over 25% canopy closure. Provides habitat for songbirds and other arboreal species.

50 Meadow dominated by annuals, some perennials and other herbaceous growth for small mammals, song birds, butterflies and other wildlife that feed on nectar and pollen.

70 Successional or immature upland forest dominated by shrubs and tree saplings. Provides a transitional mixture of shrubs and young tree habitats.

85 Marsh with moist/saturated soils and diverse mixture of emergent aquatic shores plants that provide breeding habitats for fish, frogs and turtles. Provides foraging habitat for herons, egrets, etc.

100 Mature upland forest with dense understory -- relatively high plant and animal diversity due to different layers of vegetation.

- Most of the park is classified in the lower value classifications of 1 and 5.
- The few areas which are classified in the upper values of 50 and 100 are not adequately connected to each other, resulting in habitat islands.
- Roughly 80% of St. Louis City is developed land and only 0.9% (±412 acres) is forested. Kennedy Forest is an oasis for migrating songbirds using the Mississippi River flyway.
- Overall, existing wildlife habitats have been degraded and fragmented within the park. Terrestrial wildlife species need vegetative corridors and linkages for daily and seasonal movement to maintain vitality.
- No comprehensive, year-long wildlife inventories of small mammals, amphibians and reptiles have been conducted in the park.
- Most of the water elements are classified as a 15, offering minimal fish and wildlife habitat. Closely mown grass around water resources compounds urban waterfowl problems such as geese and ducks and excludes egrets, herons, frogs, toads, turtles and other diverse and desirable wildlife which favor more natural vegetation.

1995 WILDLIFE HABITAT QUALITY MAP

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"=400' 0 400 800 1600

11 MARCH 1995

CITY OF SAINT LOUIS
DEPARTMENT OF PARKS, RECREATION AND FORESTRY
ST. LOUIS DEVELOPMENT CORPORATION
URBAN DESIGN

FOREST PARK MASTER PLAN

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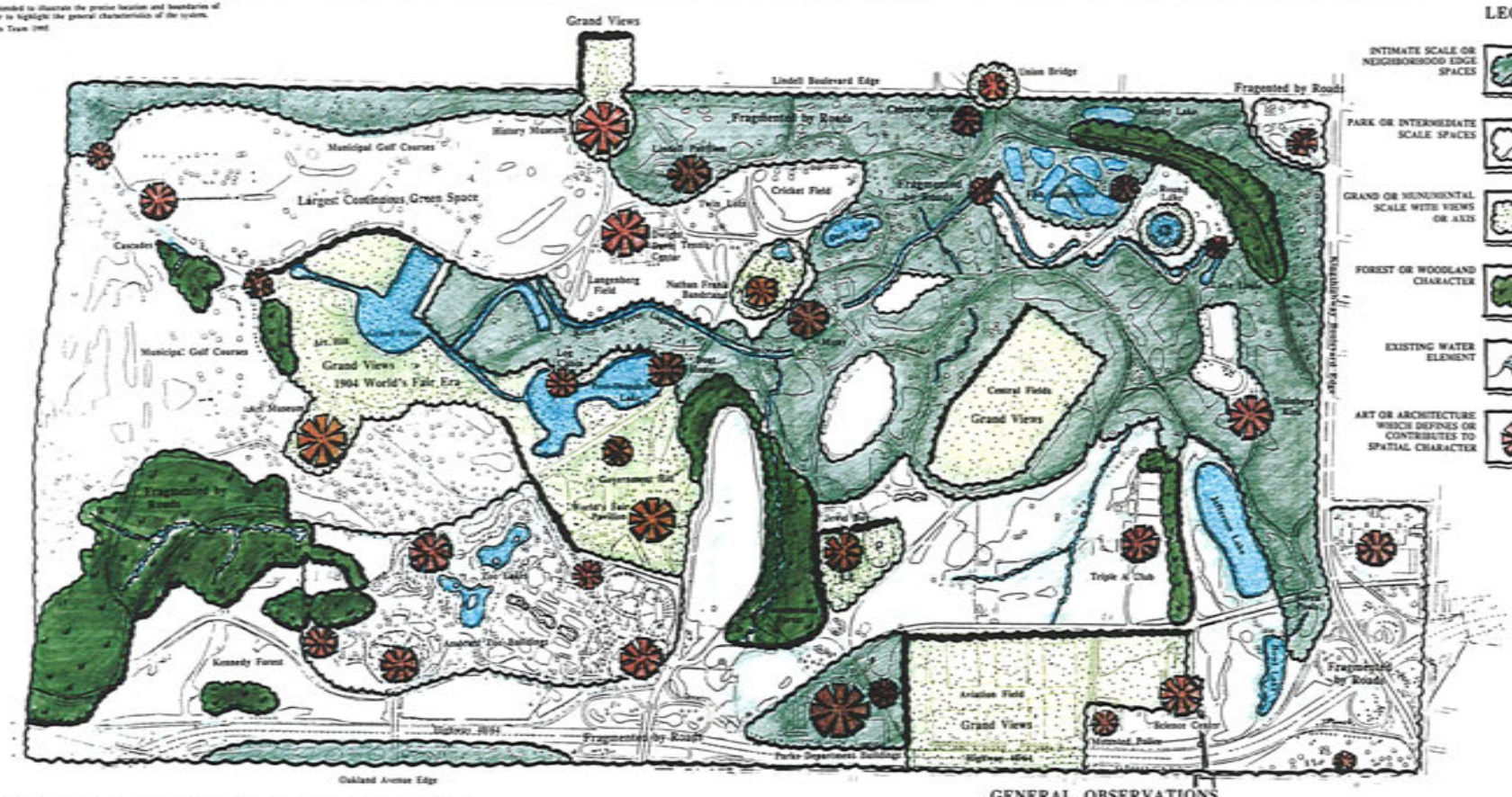
*Analysis by Design Team 1995



LEGEND

- INTIMATE SCALE OR NEIGHBORHOOD EDGE SPACES
- PARK OR INTERMEDIATE SCALE SPACES
- GRAND OR MONUMENTAL SCALE WITH VIEWS OR AXIS
- FOREST OR WOODLAND CHARACTER
- EXISTING WATER ELEMENT
- ART OR ARCHITECTURE WHICH DEFINES OR CONTRIBUTES TO SPATIAL CHARACTER

NOTE: The Zoo contains a mix of intimate and park scale spaces with a variety of contributing buildings and water elements. It also contains artificially created exhibit spaces which display character not seen elsewhere in the park.

GENERAL OBSERVATIONS

- Spatial diversity is adequate yet many of these spaces lack proper spatial definition or have been fragmented by roads, parking lots or improperly located paths.
- There are a number of largely intact grand spaces, some from the 1904 World's Fair era, which need to be enhanced.
- There are few large expanses of continuous green space outside of the golf courses.
- Water defines or contributes to the character and connects many diverse spaces.
- Art and Architecture defines or contributes to the character of many spaces and often receives its own character from surrounding landscapes and buildings.
- Many spaces either support or are the product of grand views and axis.
- There are many abrupt and awkward transitions between spaces of different character.

1995 SPATIAL CHARACTER MAP

FOREST PARK MASTER PLAN

ST. LOUIS, MO

SCALE: 1"= 600'

31 MARCH 1995

CITY OF SAINT LOUIS

DEPARTMENT OF PARKS, RECREATION AND FORESTRY

ST. LOUIS DEVELOPMENT CORPORATION URBAN DESIGN

FOREST PARK MASTER PLAN