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Eco-metropolis: tourism of the urban ecology

by

Patrick Michael Kraft

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ABSTRACT

Eco-metropolis: tourism of the urban ecology

by

Patrick Michael Kraft

In this era of “experience economy,” urban areas face increasing pressure to distinguish themselves in a world dominated by globalization. At the same time these same metropolitan areas struggle to cope with the imbalance of urban and natural systems that have resulted in the degradation of natural resources and an increase in pollution.

The metropolitan area of Houston covers 8,778 square miles, an area slightly smaller than the state of Massachusetts. Within the same area, eight different ecosystems converge in one of the most ecologically diverse landscapes in North America. The rises in pollution and destructive flooding within Houston are some of the many indicators of the imbalances within the urban ecology. A new interrelationship between both organizational systems must be addressed.

Eco-metropolis is the touristic investigation of strategies using both urban and natural systems of organization to create a unique territory of cohesive balance within the urban ecology of Houston.
ACKNOWLEDGEMENTS

To Albert for asking the difficult questions, the right questions, and the necessary questions.

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Eco-metropolis: tourism of the urban ecology

In this era of "experience economy," urban areas face increasing pressure to distinguish or "brand" themselves in a world dominated by globalization. At the same time these same metropolitan areas struggle to cope with the imbalance of urban and natural systems that have resulted in the degradation of natural resources and an increase in pollution. Eco-metropolis is the touristic investigation of strategies using both urban and natural systems of organization to create a unique territory of cohesive balance within the urban ecology of Houston.

The urban ecology is the interdependent relationship between the urban system and natural system of organization that make up today's sprawling metropolises. In the last half century, rapid urban sprawl of metropolitan regions has created an increased tension between the systems that make up the urban ecology. The increased tension is the result of urban systems overtaking large amounts of open space with
little regard for the surrounding natural ecosystems. This has resulted in the degradation of ecological habitats, processes, and resources. Aquatic systems in the path of urbanization, such as local watersheds, streams, wetlands, groundwater aquifers, and coastal waters have been widely polluted, littered, dredged, filled, paved over, channelized, armored, and otherwise abused. In the process, "nature's services", such as flood mitigation, water quality filtering, biotic habitat, nutrient uptake, soil formation and scenic amenity have been impaired or obliterated creating an extreme imbalance within the urban ecology.

During the same period tourism and leisure have become as important a component of the "good life" as material things such as cars, clothes, and household appliances. Tourism creates an awareness and experience of places and cultures outside our everyday lives. As a result of its popularity, the "experience economy" of tourism and leisure of today's global economy has become one of the world's most important economic sectors and has become a large influence on the organization of metropolitan areas.

The city of Houston is one of the largest cities in the US. The metropolitan area of Houston presents a "super-urban" metropolitan structure that is built on a kind of "placeless" sprawl. The metropolitan area of Houston covers eight counties and 8,778 square miles, an area slightly smaller than the state of Massachusetts. Within the same area, eight different ecosystems converge in one of the most ecologically diverse landscapes in North America. The rises in air and water pollution as well as destructive flooding within Houston are some of the many indicators of the imbalance within the urban ecology. The current imbalance of the urban and natural systems of organization within the metropolitan area of Houston is not sustainable and a new interrelationship between both organizational systems must be addressed. Eco-metropolis uses the methodologies of the tourism and leisure industry to create awareness of the imbalances within the urban ecology by creating a unique territory strategy of cohesive balance between the urban and natural systems of organization that make up the urban ecology of Houston.
trapped in tourism
Tourism and the tourist throughout time have been looked down upon by the intellectually elite. Claude Levi-Strauss writes simply, "Travel and travelers are two things I loathe." However, tourism represents a social, cultural and economic force that dominates the shape and functions of the world today.

Tourism according to the World Tourism Organization, or WTO is defined as the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business or other purposes.

In the last half century tourism, or mass tourism, has become one of the world’s most important economic sectors. Tourism and leisure have become as important a component of the "good life" as material things such as cars, clothes, and household appliances.¹ According the World Tourism Organization, or WTO, international tourism, measured in arrivals, between 1950 and 1992 expanded at an annual rate of 7.2 percent.² In 2002, the total number of international arrivals was 702 million and the WTO projects that total arrivals will exceed one bil-
l lion per year by 2010. During the same period, domestic tourism exceeded international tourist arrivals by a factor of ten to one. In 1990 only petroleum, petroleum products, and motor vehicles comprised a higher proportion of the value of world exports.

Tourism and the tourist site are rooted in the commodification and signification of authentic experiences and people and places. According to MacCannell, all tourists embody a quest for authenticity. Through this search a tourist attraction is produced. MacCannell defines a tourist attraction as “an empirical relationship between a tourist, a sight, and a marker (a piece of information about a sight).” MacCannell’s empirical relationship creates an inseparability of the attraction and its marker, or sign. This creates a paradox in the “constitutive role of representation for the object or attraction.” “The paradox, the dilemma of authenticity, is that to be experienced as authentic it must be marked as authentic, but when it is marked as authentic it is mediated, a sign of itself and hence not authentic in the sense of unspoiled.” Frow adds that, “any valued object is, minimally, a sign of itself, and hence- as with Basho’s ‘famous’ sites- resembles itself.” Thus, what tourist’s consider as experiencing the authentic (i.e. the Eiffel Tower) is merely a sign of itself.

One work that critiques this paradox and that of current methods in the tourist industry is Dillard and Scofidio’s “Tourisms: suitcase studies” (1991). “Tourisms: suitcase studies” is a traveling installation that “examines the spatial and temporal devices used in the production and sustenance of national narratives by the institution of tourism.” The installation comprises of 50 identical Samsonite suitcases that are displayed open. Each suitcase is a “case study” of a single tourist attraction in one of the fifty states. The fifty attractions are selected from two types of tourist sights: famous beds and battlefields. These attractions, the bed and the battlefield are irrevocably tied to their marker. If these attractions were not marked, a bed would be an ordinary bed and a battlefield is “virtually indistinguishable from a golf course.” This simple example reinforces the fact that the marker is as important as or more so than the actual attraction itself.
Today the tourist industry is reinforcing this notion by the commodification of places of "sightseeing" by offering amenities that the tourist will find familiar as well as creating attractions that are separated from their actual "place" creating what I will call the Global Tourist Economy. An example of the global tourist economy is the EPCOT Center at Walt Disney World in Florida. EPCOT center is a theme park that celebrates the different people and cultures of the world with a series of pavilions that are formed in the "spirit" of the respective nation.

Explore the world in a day. Sail away to the distant shores of nations and imaginations as you experience all that is possible on the planet and in the future.12

No longer is "place" associated with a particular attraction an important defining element in the global tourist economy. Attractions can be rooted from their respective origins, manipulated and replanted in a new form and place. In the case of EPCOT center, a person can visit Paris, Tokyo, and Rome in a single day amid the favorable climate of central Florida.

The ability to create uniqueness from a world that is increasingly becoming commodified is the primary challenge of urban centers looking to enter the tourism industry. The amount and degree at which urban space is dedicated towards the consumption of tourists has a drastic effect socially, culturally and physically on an urban space.

The metropolitan area of Houston presents an opportunity to map and create a matrix of urban tourism that overlaps and complements the existing urban, social and cultural structure of the city. Given Houston’s urban structure in what Albert Pope describes as a "superurban stage of development,"13 a unique structure of tourist space must be constructed and deployed throughout the city that does not fit directly within the current types of tourist cities defined by Fainstein and Judd. The goal is to create a matrix within the city that can be considered both "tourist" and "urban" space simultaneously creating a combined urban matrix within the existing fabric of the city.
8,778 square miles
Houston Growth

The city of Houston is one of the fastest growing cities in the United States. Formed on the banks of Buffalo Bayou, its shape is in large part defined by its historic relationship to the bayou.

Access to the waterway allowed Houston's industry and the city to thrive. For the first half of the century development was relatively compact, expanding out from the city center. Houston's designation as a primary port for petroleum based industry during World War II accounts for the scattered expansion to the east, along the bayou, on the map of 1950.

Houston today is almost 4 times larger than it was in 1950. Construction of the freeway system in the 1960s and few natural boundaries to limit growth prompted major expansion, predominantly residential, to the west. Today the metropolitan area of Houston covers eight counties and 8,778 square miles, an area slightly smaller than the state of Massachusetts.
Within the same area, according to Jim Blackburn and Charles Tapley, eight different ecosystems converge in one of the most ecologically diverse landscapes in North America. Each ecosystem is characterized by a unique topography, watershed and biodiversity. (For more information on the ecosystems, please refer to the ecosystem appendix.) Pressures from the rapid growth of the metropolis in the last 50 years are felt throughout the city, particularly on the Buffalo Bayou and of the ecosystems that it covers. This has resulted in increases in water and air pollution, and increases in flood damage along the bayou and throughout the city.

Houston area ecosystems

- post oak savannah
- prairie
- piney woods
- big thicket
- columbia bottomlands
- trinity bottomlands
- coastal wetlands
- bayou wilderness
Houston Land Use

The Buffalo Bayou runs through the heart of Houston and provides a typical cross section of land use across the city. Upstream of downtown, the majority of Houston's park and open space is located within Memorial Park on the banks of the Bayou. Residential neighborhoods are located across the bank from memorial park. Moving downstream to Allen’s Landing and downtown, parks and open space as well as residential neighborhoods become less frequent and become replaced by industry sites. Beginning at the turning basin and going several miles downstream is the Houston Ship Canal which is devoted to industry and shipping and devoid of park and open space.
Houston Ship Canal

The Houston ship canal has been a catalyst for growth in Harris County since the first journey of a steamship up the Buffalo Bayou in 1837. The journey ended at the new town of Houston founded by the Allen Brothers at the confluence of the Buffalo and White Oak Bayou. The confluence of the two Bayous created a natural wide basin for steamships to turn around to make the journey back to the Gulf of Mexico. In 1914, the bayou was widened only to the current turning basin moving the ship canal headwaters 8 miles downstream from its origin at Allens landing. This move subsequently cut off 8 miles of former ship canal from future shipping. Since 1914, the ship canal has been widened and deepened numerous times. With each successive dredging, industries and docks have moved farther and farther downstream to cater to larger and larger ships.

Currently the ship canal is 400 feet wide and 40 feet deep and stretches 50 miles from the Gulf of Mexico near Galveston to the turning basin. The newest docks, Barbours Cut and the newly proposed cargo dock Bayport Terminal have left the Bayou altogether and have been built on the shores of Galveston Bay. The latest plan for the ship canal occurred in 1996 when President Clinton signed into law the Water Resources Development Act of 1996, which paved the way for widening the canal to 520 feet and deepening the canal to 45 feet deep. However, the upper reaches of the ship canal near the turning basin cannot be widened any further because of existing infrastructure impeding the bayou’s widening. Today’s largest cargo ships are already too large to navigate the entire length of the ship canal and as ships continually get larger the upper reaches of the Houston ship canal are becoming obsolete.
what happens here when this is gone?
Site

The siting of this thesis is on the stretch of ship canal that is becoming obsolete and will slowly be vacated by the industry and shipping wharves that currently inhabit its banks. The site is bounded by the current headwaters of the ship canal at the turning basin and stretches to the confluence of the Buffalo and Sims Bayou just east of loop 610. The site is flanked by the residential neighborhoods of Magnolia Park on the south bank and Galena Park on the north bank.

The history of the site began in 1889 when Magnolia Park was laid out on the south bank of the buffalo bayou where the current turning basin is located. Created for public use, it formed the central attraction of the surrounding residential development, also named Magnolia Park. The magnolias were not a poetic conceit: they were indigenous to the park and thousands more were planted along the surrounding streets. The neighborhood was established in 1890 but grew quickest after 1911, when dredging for the ship canal began and the resulting spoil was hauled in and used as landfill. The completion of the Ship Channel in 1914 required a widening at the turning basin and additional land for wharves which destroyed the park. Since 1914, the land immediately surrounding the ship canal has been appropriated by wharves and industries manipulating the land and shoring up the banks of the bayou to create something that has become devoid of a natural setting of order.
houston linear park system
park and open space as a share of city land area

New York 27.3%  Los Angeles 10%  Chicago 8%

Houston 5.9%  Philadelphia 12.4%  Phoenix 12%

San Diego 17.4%  Dallas 10%  Detroit 6.6%

of the 25 most populated cities in the US, Houston ranks 19th
source: Trust for Public Land and Urban Land Institute

The city of Houston is the 4th largest city according to total population and is one of the largest in terms of square miles. However, despite it’s sprawl and extremely low density, Houston ranks 19th in park and open space as a share of city land area with 5.9%. The site is located at the confluence of four bayou systems and their respective linear park systems. The site as public open space can be used as an important connector to the linear park systems that spread throughout the city.
Travelers' Top Attractions 1999-2002

Below are the annual study results on the Travelers Top Attractions for 1999-2002. The study was conducted by D.K. Shifflet and Associates, Ltd., of Falls Church, Virginia. Surveys were taken from travelers to and within Texas in 2002. The survey is estimated to be reliable of plus or minus 1.33 points.

The study measured the number of visitors to Texas who visited various attractions on their 2002 leisure trips regarding trips taken more than 50 miles from their home. The number of trips to any one attraction was not a topic for the study. Visits to attractions by local residents are not included. The results reflect the percentage of visitors who visited the various attractions during 2002. The data provides the importance, in the minds of the visitors, of top attractions visited. This data will be used to guide advertising efforts.

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Despite its size, Houston attracts very little tourism. Houston contains only 4 attractions in the top 30 attractions within Texas. However, with the recent addition of the light rail, new baseball, basketball, and football venues, the expansion of the convention center and well as downtown redevelopment projects, Houston has jumped headfirst into the tourism industry. Despite these additions, urban tourism in Houston is still in its infancy. Touristic strategies and methodologies can be used to connect the site to the existing tourist infrastructure. The site can be used as a pavilion to inform the public of the characteristics of the metropolitan area of Houston.
site

- houston area 10 miles from site, considered day trippers
- houston area within 10 miles of site

day tripper range
The metropolitan area of Houston presents on opportunity to create a matrix of urban tourism that overlaps and complements the existing urban, social and cultural structure of the city. Given Houston’s urban structure in what Albert Pope describes as a “superurban stage of development,” a unique structure of tourist space must be constructed and deployed throughout the city that does not fit directly within the current types of tourist cities defined by Fainstein and Judd. With the intensity of sprawl prevalent within the metropolis form of Houston, the idea of the tourist itself must be reconceived.

Tourism according to the World Tourism Organization, or WTO is defined as the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business or other purposes. Traditionally that meant that tourists were individuals traveling to other cities other than their own. However, with the advent of the 21st century metropolis like Houston covering 8,778 square miles, the majority of one’s own city is as foreign to them as another city. Therefore a new definition of tourist must be used. Within the UK, a new term for tourism has been created, “day trippers/ excursionists.” Day trippers/excursionists are defined by the Office of Population, Censuses & Surveys as people:

- spending at least 3 hours away from home
- who have made a round trip of at least 20 miles
- undertaking a trip they do not normally make
- moving outside of the area of their normal daily journeys.

(OPCS, in the 1991 Census)

With the use of this term the site takes on more than a normal city park, it becomes a tourist site to Houstonians. The site is a tourist attraction of the relatively unknown unbalanced interrelationship between the urban and the natural. The site is a matrix of organizational systems within the city that can be considered both “tourist” and “urban” space simultaneously creating a combined urban matrix within the existing fabric of the city.
organizational systems
**system_mat**

The metropolitan area of Houston covers eight counties and 8,778 square miles, an area slightly smaller than the state of Massachusetts. Within the same area, eight different ecosystems converge in one of the most ecologically diverse landscapes in North America. Each ecosystem is characterized by a unique topography, watershed and biodiversity. These unique biological systems are used as ecological mats of organization for the site. As parcels become available over time, individual mats are deployed throughout the site in adjacencies found within the natural ecological framework. In time, the self organization of the mats will slowly change the mat shapes from a rectilinear urban parceling to a overlapping interacting natural state.

---

**Houston area ecosystems**

- post oak savannah
- prairie
- piney woods
- big thicket
- columbia bottomlands
- trinity bottomlands
- coastal wetlands
- bayou wilderness
system_mat

A landscape is composed of several types of landscape elements. Of these, the "mat" is the most extensive and most connected landscape type, and therefore plays the dominate role in the functioning of the landscape (i.e., flow of energy, materials, and species). The first consideration in differentiating patches from the matrix concerns their relative proportion and configuration, which vary widely from landscape to landscape.

A mat is defined by three criteria:
1. relative area - the area of the mat exceeds the total area of any other landscape element type present.
2. connectivity - the mat is more connected than any other landscape element type.
3. dynamics - the mat exerts a greater degree of control over landscape dynamics than any other landscape element type present.

Richard TT Foreman - Landscape Ecology

---

Fluctuation 1...

---

Nelumbo lutea Willd.
American Lotus

---

Boundary shape is not a hard edge, rather the shape is a thickened semi-permeable edge in constant flux providing significant interaction.

---

Figure 5.9 Concave and convex boundaries. (a) Element on left with concave boundaries, element on right with convex boundaries. (b) Dashed line indicates the new frontier as element on left spreads. (c) Dashed line indicates the new frontier as element on right spreads. (d) Over time, the concave margin of the spreading element on left becomes convex.
**system_patch**

Within the new urban ecology territory, programmatic elements are treated as ecological patches. The inherent properties of each program determine the deployment, shape, boundary condition and interaction of the patch within the ecological mats of the territory.

**Patch** - A nonlinear surface area differing in appearance from its surroundings. Patches vary widely in size, shape, type, heterogeneity, and boundary characteristics. In addition, patches in a landscape are plant and animal communities, that is, assemblages of species. However, some patches could be lifeless, or at least contain primarily microorganisms, and are then much more prominently characterized by the presence, for example, of rock, soil, pavement, or buildings.

Richard TT Foreman - Landscape Ecology, pp 83

**interior-to-edge effect on several ecological characteristics**

- high interior/edge ratio
- low interior/edge ratio

- length of border and interaction with matrix
- probability of barriers present within patch
- probability of habitat diversity within patch
- functioning as corridor for species movement
- species diversity (with habitat diversity constant)
patch amenity

% water

patch size

athletic field

aquarium

campground

community garden

golf course

market

nature center

observation station

pool/beach

recreation field

theater/ performance space

tour boat dock

% water
The amount of water as a share of total patch area that a patch amenity requires and or can accommodate.

patch size
A large planaristic patch such as a circle or square conveys mostly of interior, with a band of edge on the outer portion of the patch. An intermediate sized patch has a lower proportion of interior to edge. A small patch consists of entirely of edge.

size

patch edge

small

medium

large
A large isolated patch such as a circle or square consists mostly of interior, with a band of edge in the outer portion of the patch. A rectangular patch of the same area has proportionally less patch interior and more patch edge. Finally, a narrow patch of the same area may be all edge.

**Patch Shape**

**Mat Type**

4. Landscape is composed of several types of landscape elements. Of these, the mat is the most extensive and most connected landscape type, and therefore plays the dominant role in the functioning of the landscape; i.e., flow of energy, materials, and spaces. The first consideration in differentiating patches from the matrix concerns their relative proportion and configuration, which vary widely from landscape to landscape. A matrix is defined by three criteria:

1. Relative area: the area of the matrix exceeds the total area of any other landscape element type present.
2. Connectivity: the matrix is more connected than any other landscape element type.
3. Dynamics: the matrix exhibits a greater degree of control over landscape dynamics than any other landscape element type present.

**Boundary Condition**

The form and function principle (Thompson, 1961; Margules, 1967; Dorfman, 1960). The interaction between these objects (matrix and patch) is proportional to their common boundary surface. The rounded or compact form with minimal appendages, that is, with minimal perimeter-to-area ratio, is characteristic of systems with considerable interchanges of energy, material, or organisms with the surroundings. These fundamental principles relate the shapes of boundaries and landscape elements to their function, namely the flow in and out of the

1. **Low interaction**
2. **High interaction**
3. **Complex interaction**

**Athletic Field**

**Community Garden**

**Market**

**Nature Museum**

**Recreation Field**

**Golf Course**

**Observation Station**

**Theater/Performance Space**

**Market**

**Nature Museum**

**Golf Course**

**Observation Station**

**campground**

**Tour Boat Dock**

**Nature Museum**

**Golf Course**

**Aquarium**

**Observation Station**

**campground**

**Tour Boat Dock**

**Nature Museum**

**Pool/Beach**

**Aquarium**

**Golf Course**

**Observation Station**
system_thread

"Houston's port enjoys a competitive advantage from efficient inter-modal capabilities." - Port Authority of Houston

A 'mode' is a vehicle for mobility. Modal systems are a matrix of a particular transportation type. Each modal system has its own specific characteristics and parameters. At the interchange of modes is a 'node.' A node is an intersection of two modes of two modal lines and is thus a potential interchange. The port of Houston is one giant node of inter-modal interchange between shipping, rail, and trucking. The inter-modal system of movement and interchange is the basic framework of the landscape of the Port Authority. The existing landscape of the site is therefore constructed for the sole purpose of the transportation and manufacturing of goods and materials between modes of transportation.

inter-modal interchange

A thread, or corridor, is a narrow strip of land which differ from the matrix on either side. Corridors may be isolated strips, but are usually attached to a patch. Corridors may differ in origin, width, degree of connectivity, amount of curvilinearity, whether a stream is present, and whether they are interconnected to form a network. Linear features characterize all landscapes, but stand out especially in landscapes with major human influence.
_shipping path_intermodal interchange

TEU - twenty foot equivalent unit

Ship

maximum capacity: 4,000 TEU’s

speed: 29 mph

# of hours-week
Train
- Maximum capacity: 800 TEU's
- Speed: 60 mph

Truck
- Maximum capacity: 2 TEU's
- Speed: 60 mph
tour path_intermodal interchange

UET- urban eco-tourist

- tour boat

maximum capacity: 100 UET's

speed: 10 mph
foot traffic
maximum capacity: 1 UET's
speed: 5 mph

automobile
maximum capacity: 5 UET's
speed: 60 mph
site plan
site_systems

The site is composed of three systems of organization: mats, patches and threads. Together they create a territory that is both urban and natural in order.
site during phasing
scenarios
scenario_athletic_field

The athletic field is situated within the prairie mat adjacent to the roadway thread. The primarily flat terrain of the prairie is ideal for the program of a athletic field. The rigid dimensions of a soccer field however do not allow for a high ratio of interaction between programed patch and mat. The very edge of the program, the bleacher seating is the only opportunity of interaction within the boundary condition. The bleacher seating is shaped with mounding that blends with both the field and the surrounding prairie mat.

The field is used for the most part throughout the year by sporting events such as soccer. During a few weekends per year, the field hosts model airplane conventions and a hot air balloon festival.
### scenario_theater

The theater is situated within the piney woods mat along side the foot/bike path thread. The piney woods provides a natural exterior room with the canopy of the long leaf pine trees hovering eighty feet above the ground. The canopy provides an intimate setting for this small outdoor theater and performance space. Seating for the theater is terraced from the hillside deriving from the bowl like form of ancient greek amplitheaters. The amplitheater’s idealized form is altered to respond to the longleaf pines that inhabit the site. The result is a functioning theater and seating patch that still retains the inherent characteristics of the piney woods mat.

The site operates as a performance space during the day that hosts concerts, plays, and other impromptu performances. At night the site turns into a theater for the outdoor showing of films throughout the year.
### scenario_boat dock

The boat dock is situated within the trinity bottomlands mat and is a program that binds all three systems of organization. The trinity bottomlands are river valleys with a ridge hollow terrain. The hollows are flooded for a majority of the year. The form of the dock program follows the contours of the hollows to bridge from ridge to ridge allowing a dry right of way.

The dock is used as a transition point for the tour boat as well as a stop point for canoes and kayaks. The dock is also used by neighborhood fisherman.


**scenario_pool/beach**

The pool-beach is situated within the coastal wetland mat between the roadway and foot/bike path threads. The coastal wetland at first glance is a flat system with small sand bar islands. However, the small changes in the depth of water (reverse topography) has a large effect on the distribution of biomass. The pool program has the same characteristics, the depth of the water determines the pool usage. The pool has a large flexibility within its form, the base static unit being the lane of a lap pool. This flexibility allows the basic 8 lane lap pool to be pulled apart to maximize the boundary interaction blurring the line between mat and patch.

During the summer months, the program is used as a regional pool-beach attraction much like a water park. During the spring and fall periods, the function of the site changes to a observation platform for the season of migratory bird watching.
Notes


4. WTO, 1995a

5. Ibid


9. Frow pp. 130


11. Dillard and Scofidio pp. 218


Bibliography


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Rice University, GIS Center.


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Image credits

1.1 unknown

1.2 U.S Department of Transportation, Federal Highway Administration.

2.1 Duane Hanson, "Tourists II", 1988

2.2 Installation view at Walker Art Center, 1991

2.3 Darren Finck

3.1 Rice University, GIS Center

3.2 Port of Houston Authority, www.portofhouston.com

3.3 Postcard, SH Kress & Co. 1910

4.1 Maclean, Alex S.

4.2 Bayou City Research Project, Rice University

4.3 Port of Houston Authority
appendix_ecosystems

note: all plant information and images is taken from the NRCS Plant Database
Quercus stellata Wangenh.
post oak

Growth habit: Tree
Origin: Temperate
U.S. Native: Yes

Andropogon virginicus L.
broomedge bluestem

Growth habit: Grass
Origin: Temperate
U.S. Native: Yes

post oak savannah
Andropogon virginicus L.
broomseed bluestem

Group: Grasses
Family: Poaceae
Growth Habit: Grass
Deciduous: Perennial
U.S. Native: Native

Sorghastrum nutans (L.) Nash
Indiangrass

Group: Grasses
Family: Poaceae
Growth Habit: Grass
Deciduous: Perennial
U.S. Native: Native

Syringa americanus Lam.
American snowbell

Group: Deciduous
Family: Oleaceae
Growth Habit: Trees/Shrubs
Deciduous: Perennial
U.S. Native: Native

Tridens flavus (L.) A.S. Hitchc.
purpletop tridens

Group: Grasses
Family: Poaceae
Growth Habit: Grass
Deciduous: Perennial
U.S. Native: Native

Liatris scariosa Engelm. & Gray
sharp blazing star

Group: Deciduous
Family: Asteraceae
Growth Habit: Perennials
Deciduous: Perennial
U.S. Native: Native

Solidago odora Ait.
anise-scented goldenrod

Group: Deciduous
Family: Asteraceae
Growth Habit: Perennials
Deciduous: Perennial
U.S. Native: Native
Pinus palustris P. Mill.
longleaf pine

Pinus taeda L.
lobolly pine

Pinus echinata P. Mill.
shortleaf pine

Sarracenia L.
pitcher plant

piney woods
Pinus palustris P. Mill.
loblolly pine
- Group: Gymnosperm
- Family: Pinaceae
- Growth Habit: Tree
- Duration: Perennial
- U.S. Native: Native

Quercus michauxii Nutt.
swamp chestnut oak
- Group: Deciduous
- Family: Fagaceae
- Growth Habit: Tree
- Duration: Perennial
- U.S. Native: Native

Pinus taeda L.
lobolly pine
- Group: Gymnosperm
- Family: Pinaceae
- Growth Habit: Tree
- Duration: Perennial
- U.S. Native: Native

Cornus florida L.
flowering dogwood
- Group: Deciduous
- Family: Cornaceae
- Growth Habit: Tuck/Grub
- Duration: Perennial
- U.S. Native: Native

Morella cerifera (L.) Small
small wax myrtle
- Group: Deciduous
- Family: Myrtaceae
- Growth Habit: Tuck/Shrub
- Duration: Perennial
- U.S. Native: Native

Ilex opaca Ait.
American holly
- Group: Deciduous
- Family: Aquifoliaceae
- Growth Habit: Shrub
- Duration: Perennial
- U.S. Native: Native