

CLEVELAND METROPARKS LAKEFRONT MASTERSPLAN GREEN INFRASTRUCTURE OVERLAY



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GLOBAL SCALE

WATER

WATER QUALITY ISSUES - THE GREAT LAKES AND BEYOND

HABITAT

GLOBAL MIGRATION FLYWAY

ENERGY

ALTERNATIVE ENERGY

TRANSIT ALTERNATIVES

EMERGING TRENDS

REGIONAL SCALE

WATER

STORMWATER STRATEGY SUPPORTING REGIONAL WATER QUALITY INITIATIVES

HABITAT

LEVERAGING ASSETS AND CONNECTING FRAGMENTS

ENERGY

FINDING THE INTERSECTION OF NEED AND OPPORTUNITY

TRANSIT ALTERNATIVES

CONNECTING TO REGIONAL TRANSIT OPPORTUNITIES

SITE SCALE

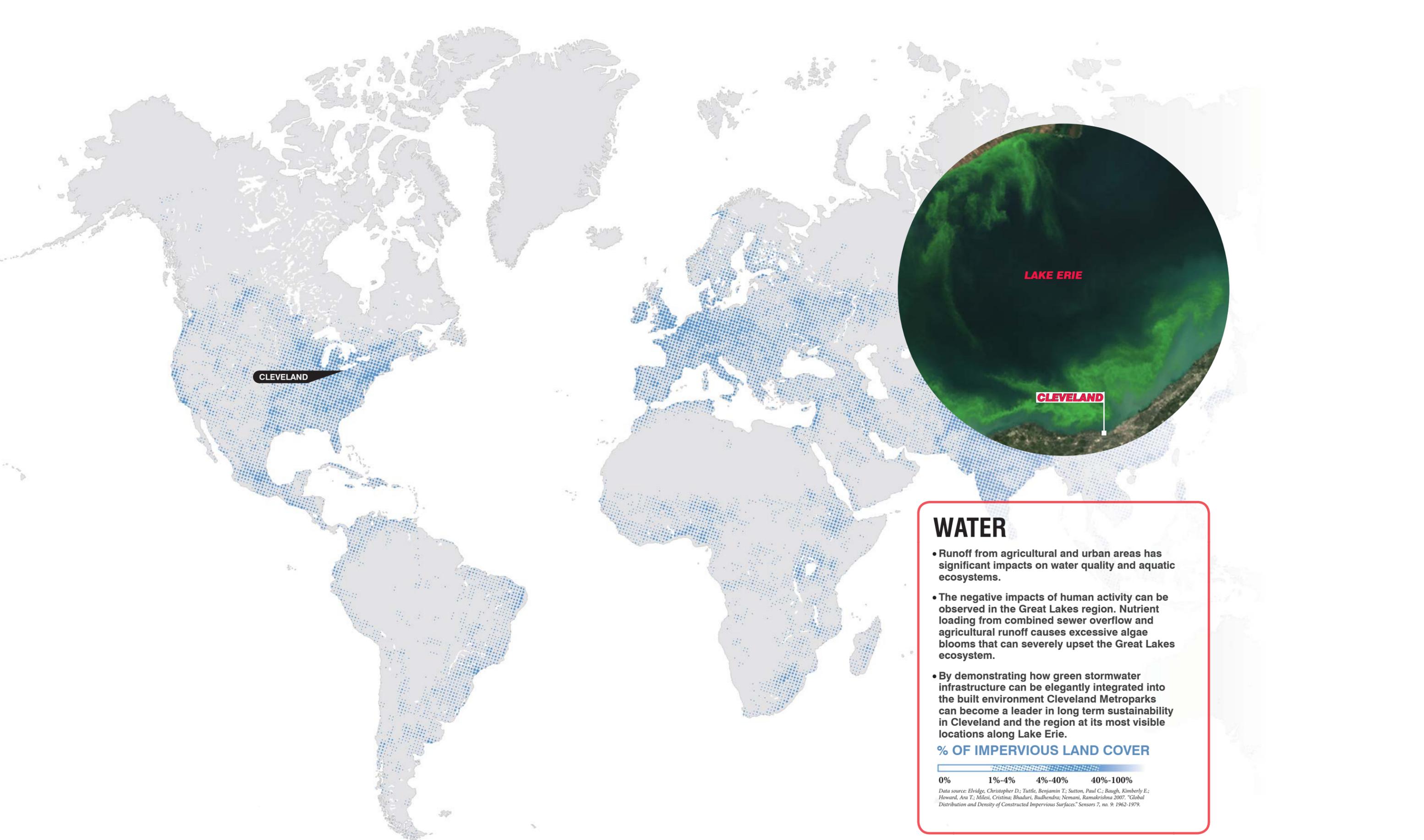
EDGEWATER

WHISKEY ISLAND AND WENDY PARK

E 55th PARK AND MARINA

NORTH GORDON PARK

EUCLID BEACH/VILLA ANGELA/WILDWOOD



CLEVELAND

LAKE ERIE

CLEVELAND

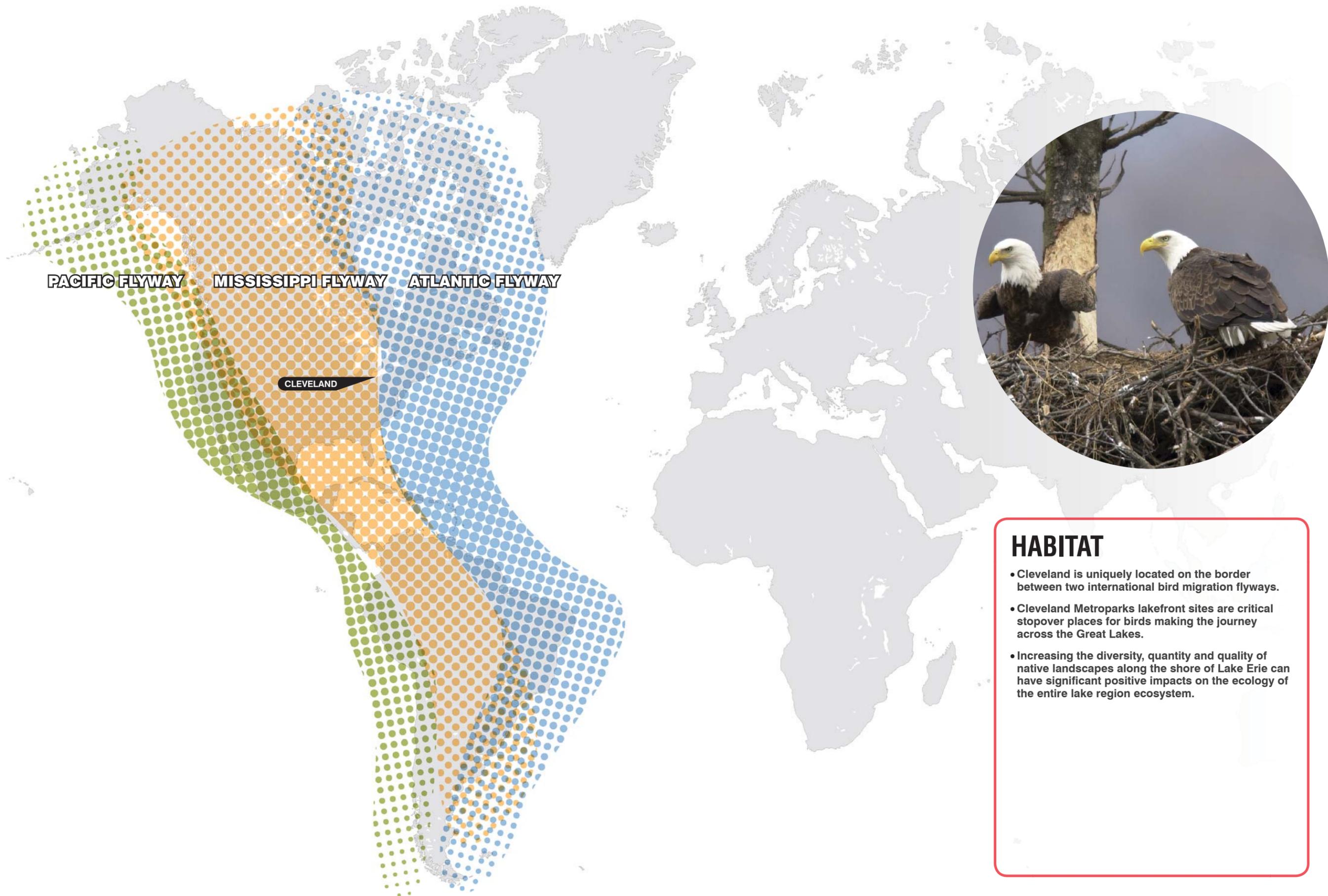
WATER

- Runoff from agricultural and urban areas has significant impacts on water quality and aquatic ecosystems.
- The negative impacts of human activity can be observed in the Great Lakes region. Nutrient loading from combined sewer overflow and agricultural runoff causes excessive algae blooms that can severely upset the Great Lakes ecosystem.
- By demonstrating how green stormwater infrastructure can be elegantly integrated into the built environment Cleveland Metroparks can become a leader in long term sustainability in Cleveland and the region at its most visible locations along Lake Erie.

% OF IMPERVIOUS LAND COVER

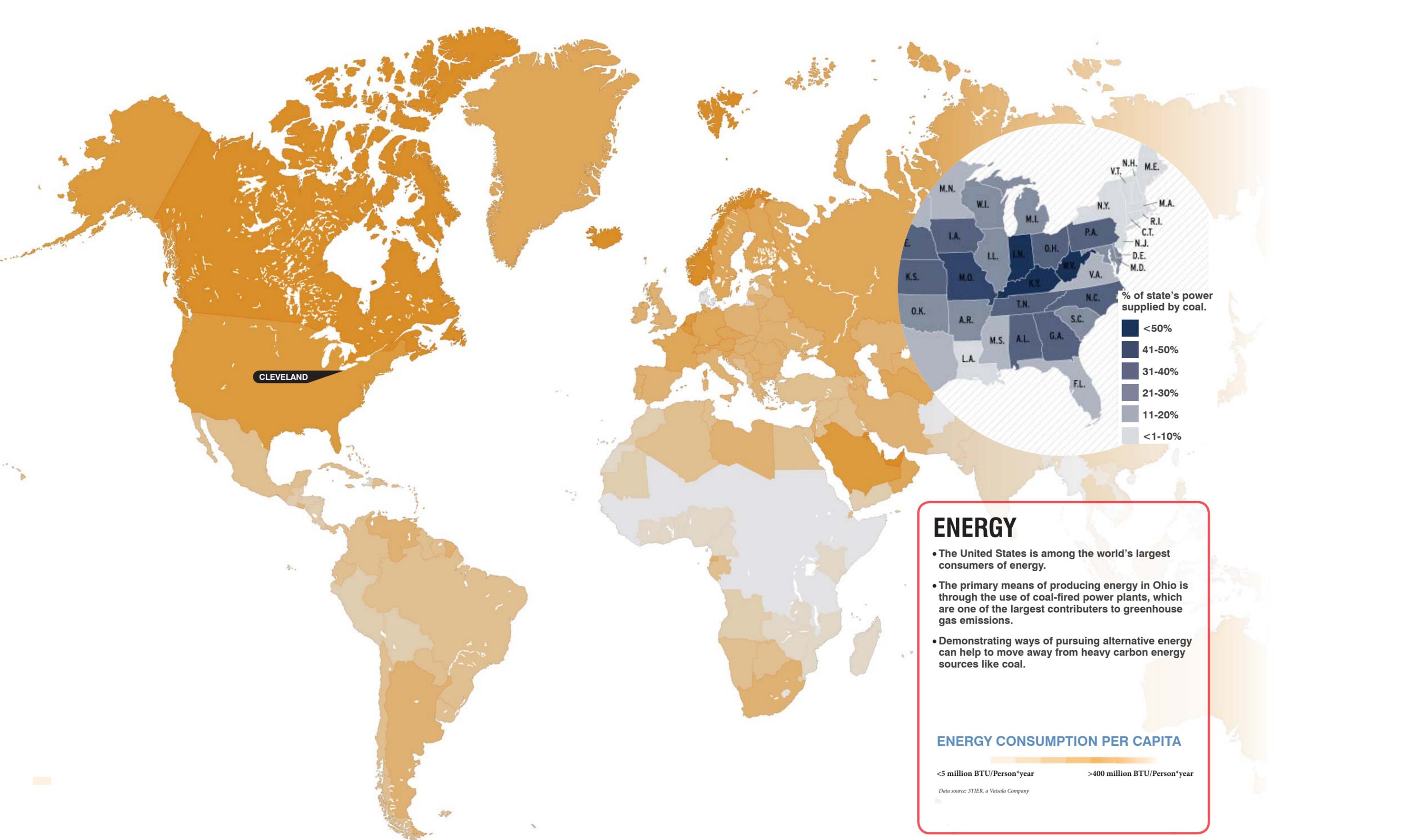


Data source: Elvidge, Christopher D.; Tuttle, Benjamin T.; Sutton, Paul C.; Baugh, Kimberly E.; Howard, Ara T.; Milesi, Cristina; Bhaduri, Buddhendu; Nemani, Ramakrishna 2007. "Global Distribution and Density of Constructed Impervious Surfaces." *Sensors* 7, no. 9: 1962-1979.

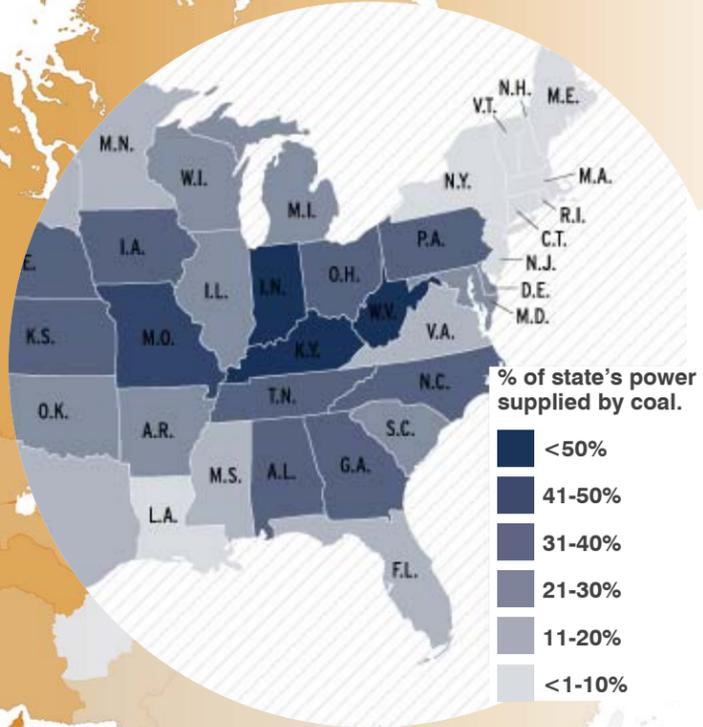


HABITAT

- Cleveland is uniquely located on the border between two international bird migration flyways.
- Cleveland Metroparks lakefront sites are critical stopover places for birds making the journey across the Great Lakes.
- Increasing the diversity, quantity and quality of native landscapes along the shore of Lake Erie can have significant positive impacts on the ecology of the entire lake region ecosystem.



CLEVELAND



ENERGY

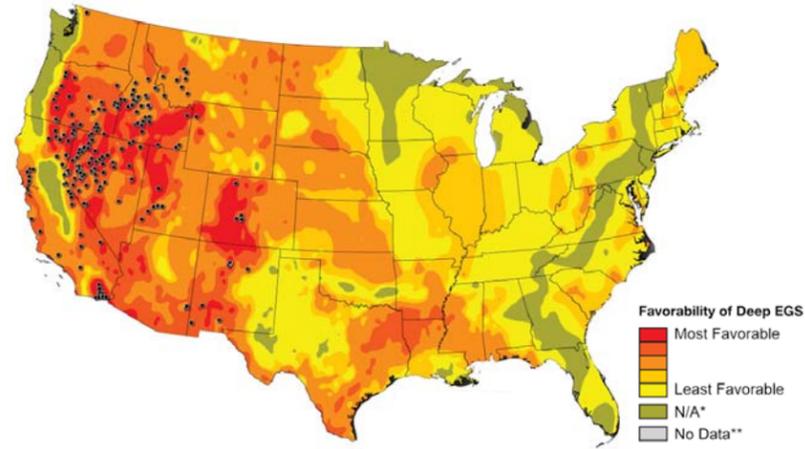
- The United States is among the world's largest consumers of energy.
- The primary means of producing energy in Ohio is through the use of coal-fired power plants, which are one of the largest contributors to greenhouse gas emissions.
- Demonstrating ways of pursuing alternative energy can help to move away from heavy carbon energy sources like coal.

ENERGY CONSUMPTION PER CAPITA

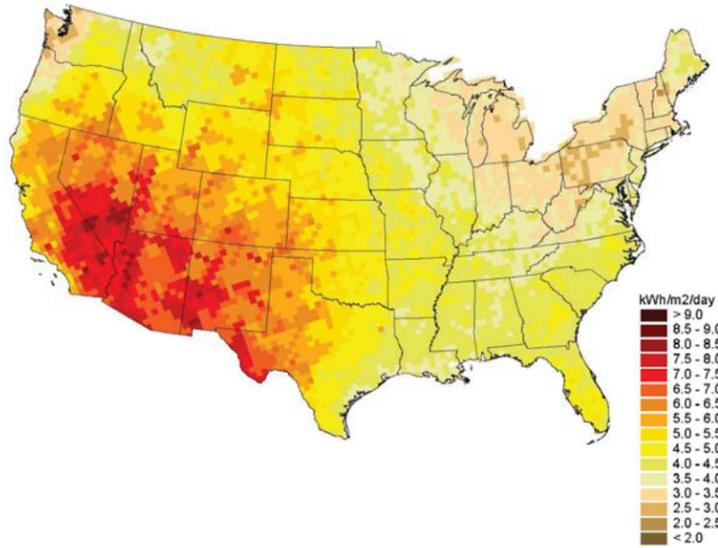


Data source: 3TIER, a Vaisala Company

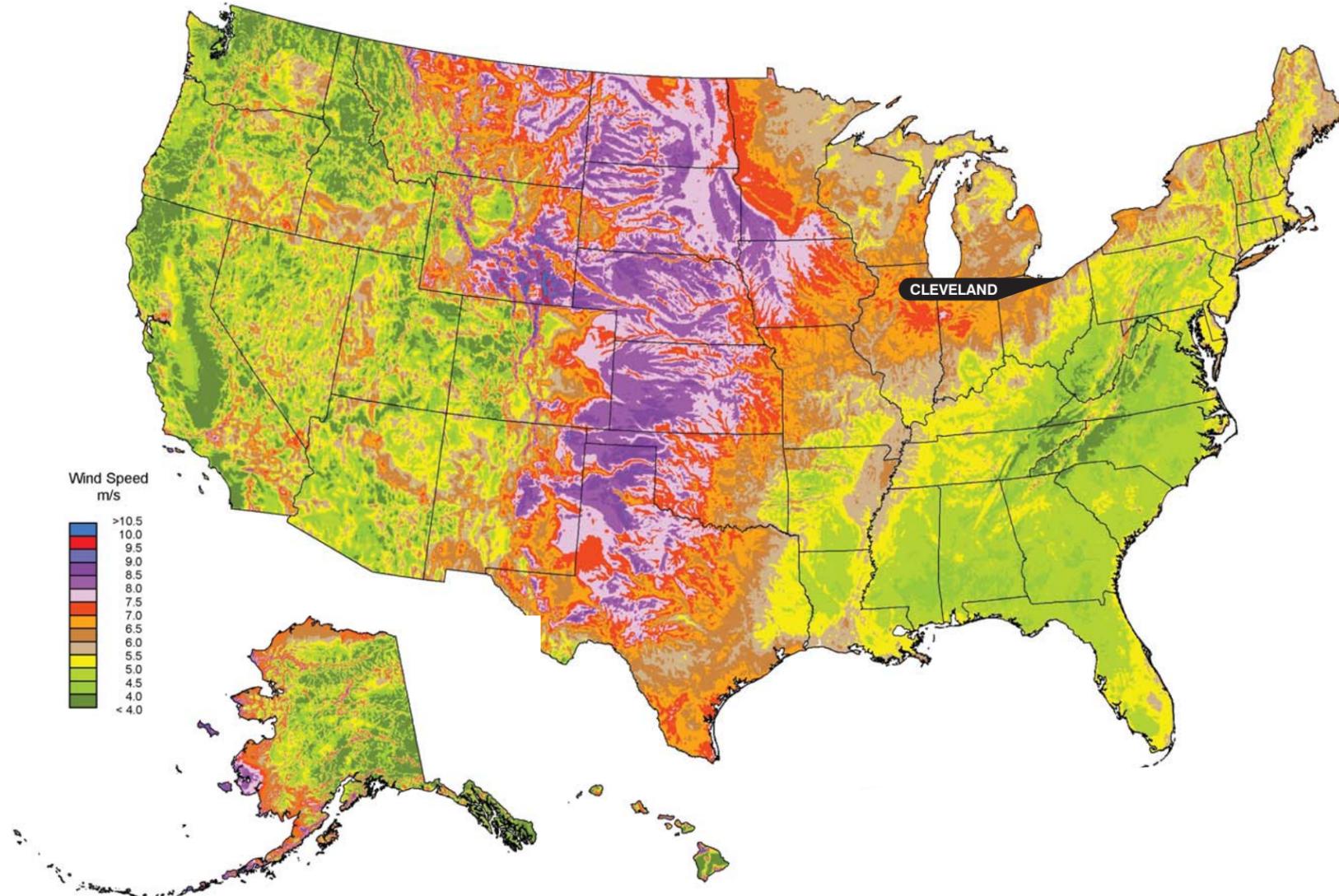
GEOHERMAL RESOURCES



DIRECT NORMAL SOLAR RADIATION



USA ANNUAL AVERAGE WIND SPEED AT 80M

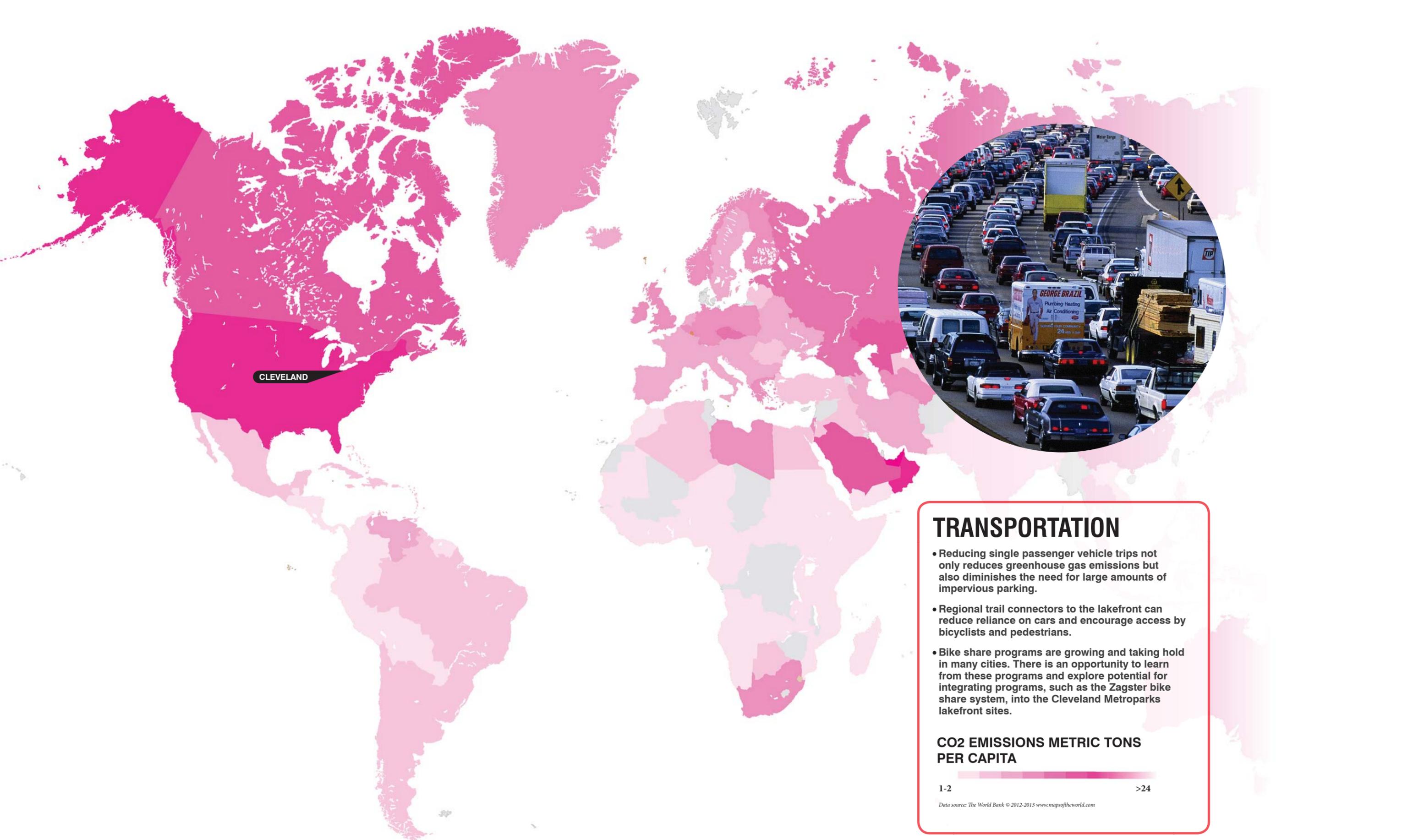


ENERGY

- Pursuing renewable energy is good practice anywhere in the world, however, different environmental factors render some methods more efficient than others.
- Solar and geothermal technologies may be marginally effective in Northern Ohio, however, Cleveland's location on the south side of Lake Erie puts the city in a unique position to capitalize on the strong winds at the water's edge.



Source: Wind resource estimates developed by AWS Truepower, LLC for windNavigator®. Web: <http://www.windnavigator.com> | <http://www.awstruepower.com>. Spatial resolution of wind resource data: 2.5 km. Projection: Albers Equal Area WGS84.



TRANSPORTATION

- Reducing single passenger vehicle trips not only reduces greenhouse gas emissions but also diminishes the need for large amounts of impervious parking.
- Regional trail connectors to the lakefront can reduce reliance on cars and encourage access by bicyclists and pedestrians.
- Bike share programs are growing and taking hold in many cities. There is an opportunity to learn from these programs and explore potential for integrating programs, such as the Zagster bike share system, into the Cleveland Metroparks lakefront sites.

CO2 EMISSIONS METRIC TONS PER CAPITA

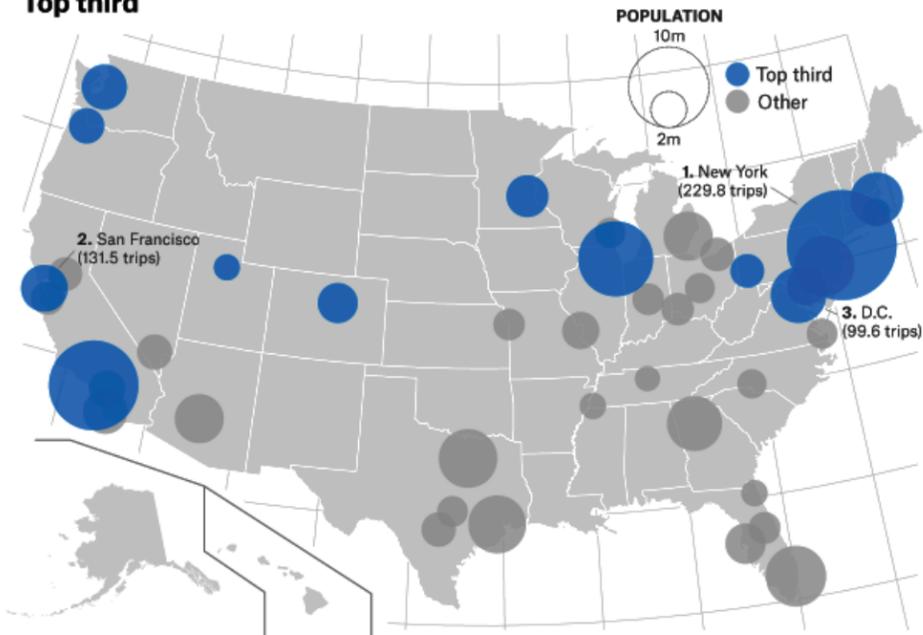


Data source: The World Bank © 2012-2013 www.mapsoftheworld.com

Public Transit Use in Large Cities

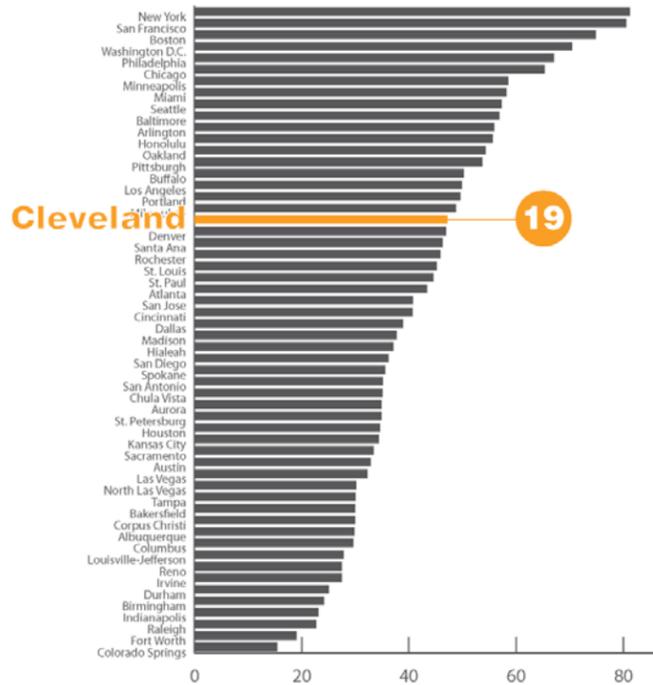
By 2013 trips per resident for 42 urbanized areas over 1 million residents

Top third



WALKSCORE PUBLIC TRANSIT RANKING

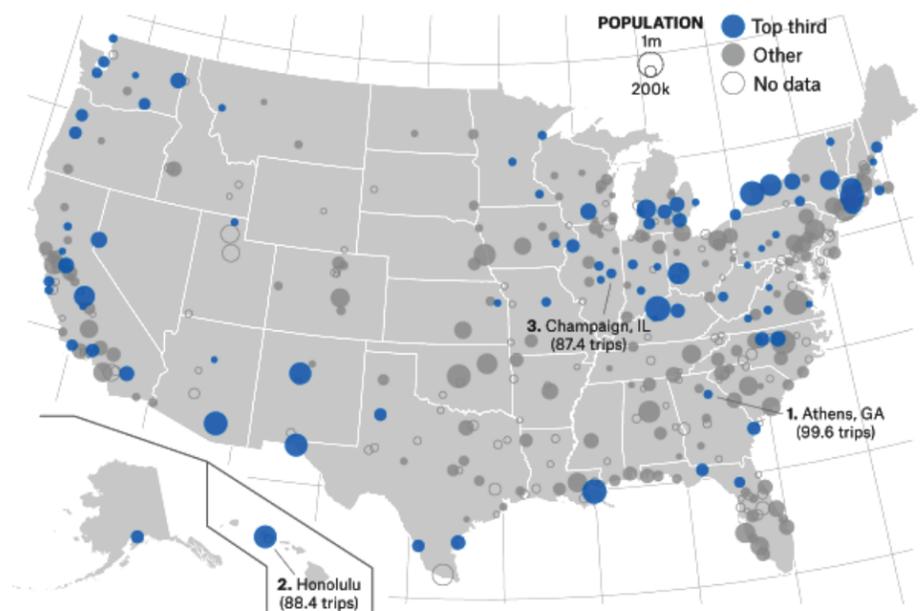
walkscore.com



Public Transit Use in Small Cities

By 2013 trips per resident for 248 urbanized areas between 65,000 and 1 million residents

Top third



2014 Transit Score® Rankings



PUBLIC TRANSPORTATION

- The Greater Cleveland Regional Transit Authority provides access to almost all areas of the city and county.
- Cleveland ranks relatively high in transit access among small cities, and is ranked in the top 20 of cities nationwide according to Walkscore.com.
- Cleveland Metroparks can capitalize on the existing public transit system by accommodating riders and reinforcing bike and pedestrian connections between transit stops, the regional trail network and the lakefront.

GREEN INFRASTRUCTURE OVERLAY GOALS

OLIN met with Cleveland Metroparks on October 24, 2014 for a sustainability goal-setting session. The purpose of the meeting was to establish Cleveland Metropark's aspirations for sustainability in the lakefront parks and to develop guiding principles to inform the master planning effort. The group explored sustainability and green infrastructure through the following lenses: water, habitat, energy, transit alternatives, materials and integrated environments (social and economic issues). The key points of the discussion are captured below and provide the framework for the Green Infrastructure Overlay document.

WATER

- Manage stormwater using green infrastructure solutions that improve park-like character.
- Acknowledge the unique amenity of lakeshore access for recreation and fishing.
- Provide access and amenities for non-boaters/anglers.
- Respect and improve water quality as an integral component of a successful lakefront plan for park improvements.
- Develop goals and strategies for stormwater management and potable water uses at the parks.
- Promote access, including access to the Cuyahoga River for fishing, kayaks and recreation.
- Strive for certification from the State of Ohio's Clean Marina Program at all boating facilities and apply best practices and public education at all locations, including boat ramps. <http://ohioseagrant.osu.edu/cleanmarinas/>

HABITAT

- Determine the correct "look and feel" of park open space and habitat areas. Develop landscape alternatives to current mown grass and sporadic shade trees.
- Enhance habitat value of existing forested areas.
- Promote the establishment of understory landscapes to enrich the parks' habitat value.
- Use native vegetation which promotes biodiversity and food supply for migrating animals.
- Understand the international, national, regional and local aspects of landscape's habitat value.
- Consider habitat in the parks as a unique and valuable resource to be protected, restored and enhanced.
- Reduce areas of mown lawn and parking areas. Develop richer landscape alternatives.
- Tell the story of landscape/habitat restoration and enhancement to park users.
- Remove non-native species and develop healthy natural resource communities throughout the lakefront parks over the next 100 years, including legacy tree plantings and forests.
- Use interpretive signage at habitat areas and stormwater best management practices. Take advantage of opportunities to encourage visitors to explore other Cleveland Metroparks reservations.

ENERGY

- The unique lakefront parks' microclimates should be understood and designs should be responsive to cold/wind/ice in the winter, while being cooler than the city in the summer.
- Minimize heat island build-up from dark surfaces (asphalt parking) and provide shade (tree canopy and structure).
- Demonstrate energy leadership within Cleveland by selectively integrating solar PVs and considering the use of wind turbines.
- Provide wifi connectivity for 21st Century park users.
- If wind power is to be incorporated, small scale wind turbines that are safe for birds should be used.
- Other alternative energy ideas include capturing wave action for energy and potentially geothermal, or a water-based version.
- Be sensitive to microclimate opportunities when designing facilities.

TRANSIT ALTERNATIVES

- Continue to expand the use of RTA buses for park access. Provide amenities to support bus use (shelters, walkways, etc).
- Explore water transit—for private recreation as well as water taxi.
- Promote bicycle facilities and add amenities—bike storage, enhanced trails, repair stations and "bike welcoming".
- Expand on the success of attracting pedestrians from nearby neighborhoods. Continue linking and connecting with pedestrian and multi-use trails and required bridge structures.
- Promote seamless park interconnections to minimize driving between adjacent facilities.
- Evaluate parking needs and the amount of existing parking. Establish and commit to alternatives.
- Distinguish between the need for permanent (paved) parking versus event/program parking. Consider "overflow" lots that are not paved to lessen stormwater and heat island impact.
- Evaluate opportunities for off-site shuttles.
- Work with ODOT to reduce impacts of adjacent freeways, minimize conflicts with vehicles and improve circulation within parks.

MATERIALS

- Consider durability of materials and their time-tested value. Avoid wholesale use of new untested materials.
- Consider environmental impact of materials production. Embodied energy/greenhouse gas emissions, toxicity etc.
- The harsh lakefront environment is unique and has to be factored into material choices.
- Design should develop a material vocabulary without repetition and/or "rubber stamping". Materials contribute to the character of the place. Example: current State Park look and feel.

INTEGRATED ENVIRONMENTS (SOCIAL AND ECONOMIC ISSUES)

- Attract new users and groups of constituents while accommodating existing park users.
- Invest equitably across the lakefront park system while recognizing unique assets of individual places.
- Design for programming and provide infrastructure to support intended uses.
- Commit resources to provide quality park maintenance.
- The focus of the Green Infrastructure Overlay effort is on the lakefront parks; however, Cleveland Metroparks has 23,079 acres in 48 communities. This effort should recognize the need to understand the current focus vs. the entire Cleveland Metroparks system.
- Stewardship of the lake, water and land should resonate throughout the design for the parks.
- Some parks will need to provide maximum flexibility, providing amenities for a wide variety of users, while some may be more focused on a narrow range of users (eg., marina).

WHISKEY ISLAND AND WENDY PARK

- Nearly 12% of the park is impervious surface.
- Large parking lots associated with the marina account for a great deal of runoff.
- The Cuyahoga River meets the lake at this site and therefore there are unique opportunities to improve both the riparian and lake edge.

EDGEWATER

- Over 14% of the park is impervious surface.
- Large parking lots adjacent to the beach account for a great deal of runoff.

NORTH GORDON PARK

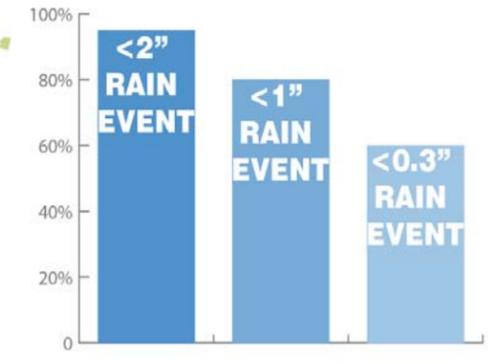
- Over 20% of the park is impervious surface.
- The Doan Brook runs directly to the site before being culverted as it moves through the adjacent Cleveland Lakefront Nature Preserve.
- The management center affords opportunity for public outreach and education.

E 55TH PARK AND MARINA

- Nearly 19% of the park is impervious surface.
- Large parking lots associated with the marina account for a great deal of runoff.
- Multiple outfalls from the combined sewer system are present on the site.

EUCLID BEACH / VILLA ANGELA / WILDWOOD

- Nearly 19% of the park is impervious surface.
- Large parking lots associated with the marina account for a great deal of runoff.
- CSO outfall at the beach creates health and safety issues.



WATER

- The lakefront parks have an overall average of 15% impervious surface. Most of this is due to large parking lots that serve marinas or beaches.
- Events under 2" of rainfall make up the vast majority of rain events. Incorporating small local interventions can capture and manage most of the volume from the impervious surface at the parks.
- Several of the parks are located where rivers and streams meet the lake and provide unique opportunities to reveal and interpret regional water quality initiatives.

LEGEND

- Combined Sewer Outfall (Orange circle)
- Watershed Boundary (Red line)
- Outside Combined Sewer Shed (Grey dashed line)

WHISKEY ISLAND AND WENDY PARK

- Two large woodlots and existing meadows create a primary destination for migratory birds.
- Lakefront edge conditions include beach, vegetated edge and rip-rap.
- Existing habitat should be maintained and strengthened by converting lawn areas to meadow, through strategic management of existing meadow to remove invasive species and woody plants and enhancing planting in the woodlots.

EDGEWATER

- The primary landscape types include sand beach, turf and parking.
- Lakefront edge conditions include beach, steep wooded bluff and rip-rap.
- Opportunities for habitat enhancement include vegetated sand dunes, converting lawn areas to meadow and understory planting in the wooded bluff.

NORTH GORDON PARK

- North Gordon Park is unique in its connection to a significant contiguous wooded area inland along the Doan Brook.
- The Cleveland Lakefront Nature Preserve has some areas of high ecological value but there are large stands of invasive plants.
- There is much to gain by enhancing the existing habitat assets and strengthening the connection to the Doan Brook corridor.

E 55TH PARK AND MARINA

- The primary landscape types are focused on marina activities and include turf and parking.
- Lakefront edge condition is primarily rip-rap.
- Opportunities for habitat enhancement include converting lawn areas to meadow and potentially re-vegetating some of the rip-rap edge.
- The marina cove creates a protected area with habitat potential.

EUCLID BEACH / VILLA ANGELA / WILDWOOD

- The primary landscape types include turf, trees with no understory and parking.
- Lakefront edge conditions include beach, vegetated edge and rip-rap.
- Opportunities for habitat enhancement include restoring the native woodland and riparian edge of Euclid Creek.

HABITAT

- Habitat in the metropolitan area is fragmented and frequently divided by roads, railways and dense urban areas.
- All of the lakefront parks have a role to play in enhancing the quality and quantity of wildlife habitat along the lakefront. Simple moves, including converting some areas of lawn to meadow, increasing canopy cover and re-vegetating rip-rap edges can have a significant cumulative effect on wildlife.
- Opportunities exist to build habitat connections between the lakefront parks.
- North Gordon Park and Euclid Beach have the greatest potential for creating large, contiguous parcels of land that contain a wide range of habitat types that connect to existing natural areas inland.

LEGEND

- Major Highway
- Arterial Road
- Rail Line
- Tree Cover

WHISKEY ISLAND AND WENDY PARK

- Support facilities for the marina could be partially powered by renewable energy.

EDGEWATER

- Facilities such as bathrooms and other small structures could potentially be powered in whole or in part by renewable energy.

NORTH GORDON PARK

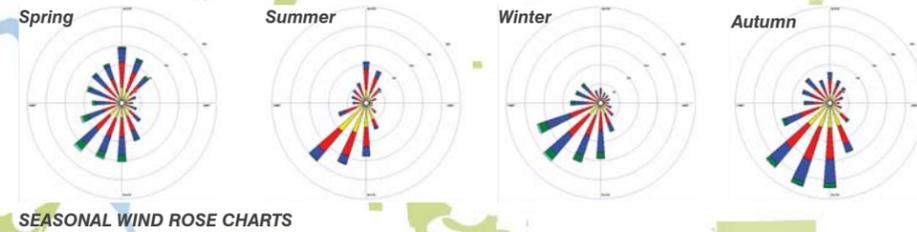
- Visitor and marina facilities could be partially powered by renewable energy.
- Visitor facilities at North Gordon Park afford opportunities to educate the public about renewable energy.

E 55TH PARK AND MARINA

- Support facilities for the marina could be partially powered by renewable energy.
- The breakwater for the marina presents an opportunity to incorporate bird safe wind turbines that could become an identifying feature of the marina and park.

EUCLID BEACH / VILLA ANGELA / WILDWOOD

- Visitor marina facilities could be partially powered by renewable energy.



ENERGY

- The primary resource for renewable energy in the region is wind power. Consistent wind speed of up to 9 meters/second off-shore makes wind a viable option.
- Wind direction is primarily from the southwest for most of the year.
- Incorporating renewable energy alternatives is valuable beyond the immediate resources being conserved. By demonstrating good environmental stewardship, Cleveland Metroparks can educate visitors and influence public opinion on the need for seeking energy alternatives.

LEGEND



WHISKEY ISLAND AND WENDY PARK

- This site is not readily accessible by public transit.
- The future Cleveland Foundation Centennial Trail will provide an important citywide connection.
- This site will be connected to Edgewater Park and the Route 55 bus line via proposed multi-use trails.
- Strengthening the links to public transit and bikeways may reduce car travel to this park.
- There is an opportunity to include water taxi service to the park.

EDGEWATER

- Edgewater is one of the most visited sites on the lakefront. Most visitors arrive by car, which creates significant demand for surface parking.
- The park is accessible by the Route 55 bus and by sidewalks to the Rapid Transit station.
- Robust multi-modal access for Edgewater should be considered to reduce parking demand.
- This park is a good candidate for bike share and would benefit from additional bike amenities.
- Existing tunnels provide strong neighborhood links. Improve wayfinding to and from the park to enhance the user experience.
- There is an opportunity to include water taxi service to the park.
- Existing tunnels provide linkages to neighborhoods to the south.

NORTH GORDON PARK

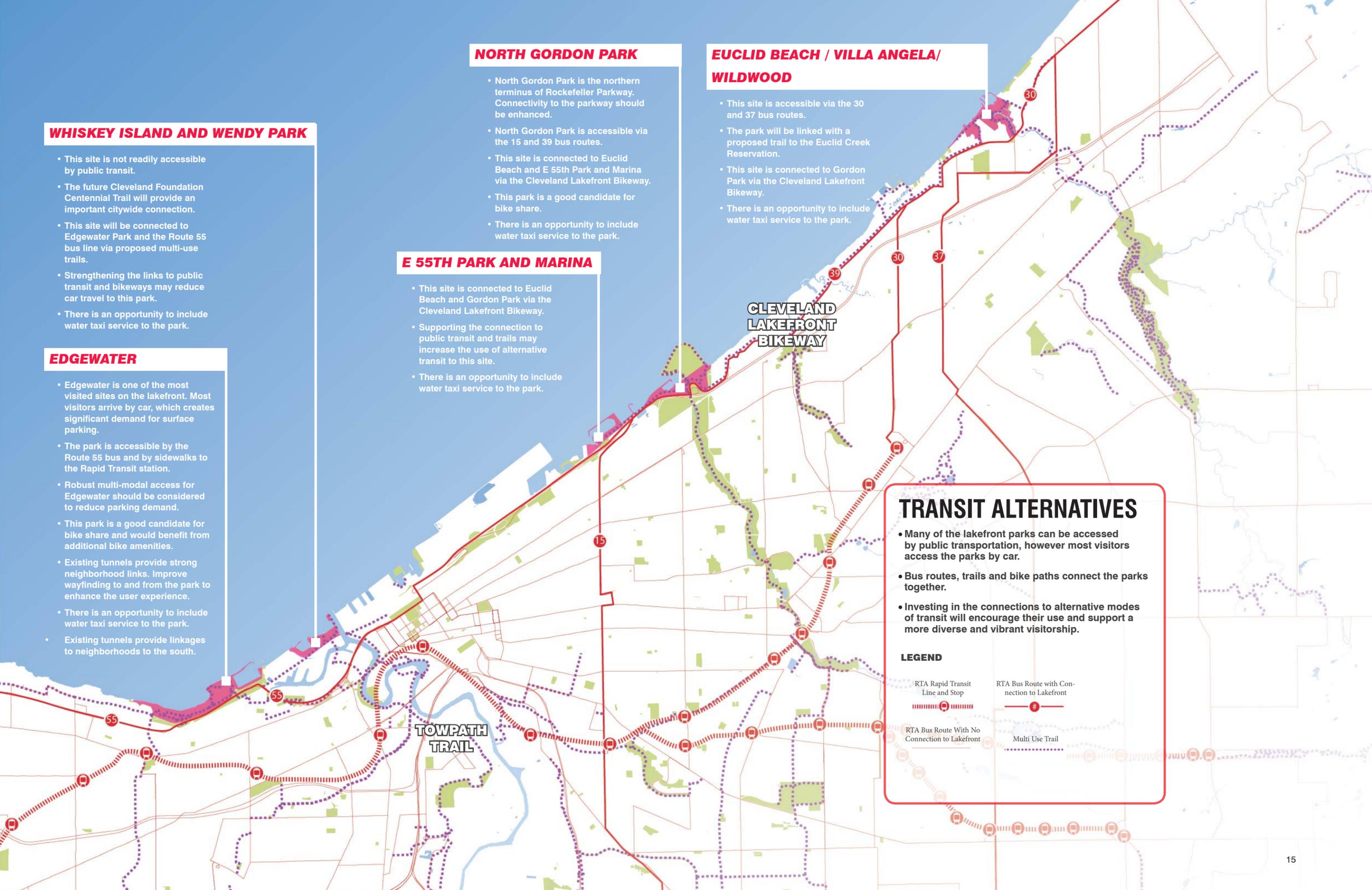
- North Gordon Park is the northern terminus of Rockefeller Parkway. Connectivity to the parkway should be enhanced.
- North Gordon Park is accessible via the 15 and 39 bus routes.
- This site is connected to Euclid Beach and E 55th Park and Marina via the Cleveland Lakefront Bikeway.
- This park is a good candidate for bike share.
- There is an opportunity to include water taxi service to the park.

E 55TH PARK AND MARINA

- This site is connected to Euclid Beach and Gordon Park via the Cleveland Lakefront Bikeway.
- Supporting the connection to public transit and trails may increase the use of alternative transit to this site.
- There is an opportunity to include water taxi service to the park.

EUCLID BEACH / VILLA ANGELA / WILDWOOD

- This site is accessible via the 30 and 37 bus routes.
- The park will be linked with a proposed trail to the Euclid Creek Reservation.
- This site is connected to Gordon Park via the Cleveland Lakefront Bikeway.
- There is an opportunity to include water taxi service to the park.



TRANSIT ALTERNATIVES

- Many of the lakefront parks can be accessed by public transportation, however most visitors access the parks by car.
- Bus routes, trails and bike paths connect the parks together.
- Investing in the connections to alternative modes of transit will encourage their use and support a more diverse and vibrant visitorship.

LEGEND

- RTA Rapid Transit Line and Stop
- RTA Bus Route with Connection to Lakefront
- RTA Bus Route With No Connection to Lakefront
- Multi Use Trail



LAKE ERIE

LAKE AVE

CLEVELAND MEMORIAL SHOREWAY (I-90)

CLEVELAND METROPARKS
EDGEWATER

0' 200' 400' 800'



GREEN INFRASTRUCTURE ELEMENTS KEY EDGEWATER

WATER

1 BIO-INFILTRATION SWALE

Bio-infiltration zones in parking medians capture, infiltrate and filter water from parking areas. These shallow vegetated depressions reduce runoff from paved surfaces and improve water quality. Bio-infiltration zones manage small rain events and are more effective and ecologically restorative than large stormwater basins alone.



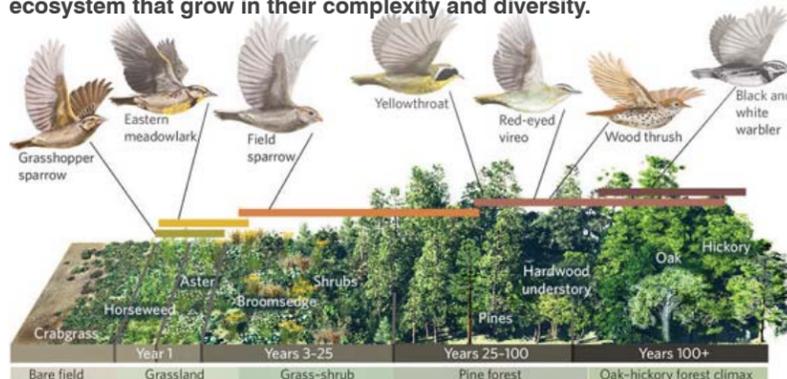
2 NATIVE MEADOW

Converting lawn areas to native meadow will transform the identity of the lakefront parks and greatly increase the habitat opportunity for a wide range of animals. Meadow habitat is currently missing in the lakefront parks and will support ecosystems that migratory birds and other animals depend on. Meadows are only mown once a year or once every other year and therefore reduce CO2 emissions associated with regular mowing required for lawns. Meadows can be implemented in any areas that are not regularly accessed by people including traffic islands and large unprogrammed expanses.



3 SUCCESSIONAL MEADOW

The successional meadow is the first step in the natural progression from a disturbed landscape to climax forest. Unlike the native meadow that is maintained as a plant community of grasses and forbs, the successional meadow will change over time, ultimately becoming a native hardwood forest. Each stage of succession hosts its own unique ecosystem that grow in their complexity and diversity.



HABITAT

4 RESTORED DUNES

Planted dunes are not only imperative for holding the bank and preventing beach loss from wind and wave action, but they provide important habitat for a wide variety of fauna. Dunes support ecosystems that provide food for migratory birds. By creating pockets that are sheltered from the wind, dunes also make beaches more comfortable places for people and can extend the period that a beach can be enjoyed throughout the year.



5 FOREST MANAGEMENT AREAS

Many of the forested areas within the lakefront parks are missing the native understory layers characteristic of healthy forest ecosystems. The herbaceous, shrub and understory tree layers create habitat for many species of animals. These lower forest layers also provide cover for the next generation of the forest and contribute to its longevity. Removing invasive species and replanting the native species that make up these layers will allow the lakefront parks to capitalize on the existing forest assets.



HABITAT

6 WIND POWER

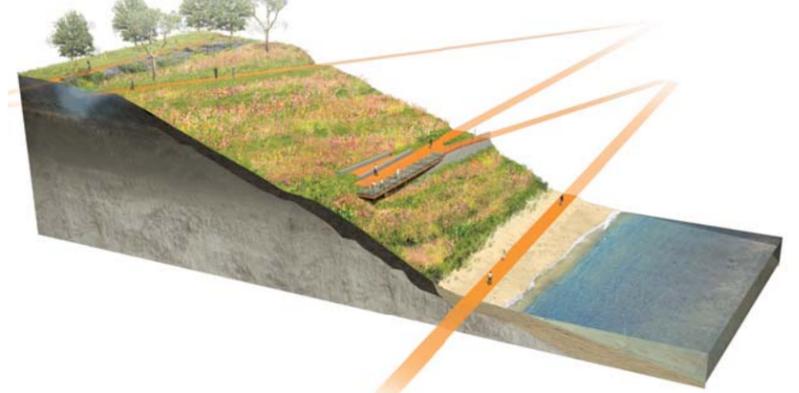
Wind turbines showcase environmental stewardship and provide a safe alternative energy source that can power site features such as lighting. Vertical axis turbines (like the one shown below) are safe for birds. At Edgewater small turbines can be incorporated along the lake edge and at the new lookout providing the park with a new energy source and an attractive sculptural element that shapes park identity as one of environmental stewardship.



ENERGY

7 BEACH ACCESS

The Edgewater Bluffs afford views of the lake and city; however, there is no accessible connection between the top of the bluff and the beach below. By providing an accessible trail with periodic overlook gathering nodes, the connection to the lake is strengthened and visitors are afforded a richer park experience.



9 REINFORCED EVENT LAWN AND PARKING LAWN

Reinforced lawns are supported by engineered soils that reduce compaction and promote a durable and flexible surface for high use areas. Reinforced lawns when coupled with adequate rest periods will be more resilient to traffic while preserving infiltration and reducing maintenance.

INTEGRATED ENVIRONMENTS

8 BIKE ACCESS

Bike storage areas and clearly delineated bike routes help create stronger connections to the city and provide healthy transit alternatives that diversify access to the park.



TRANSIT ALTERNATIVES

SUSTAINABILITY

Materials being considered for the lakefront parks should be evaluated with regard to durability, local availability, recycled content, renewable resources and embodied energy (carbon footprint). All materials used in the park should be able to withstand the conditions at the lake edge. Incorporating sustainable materials reduces the environmental footprint of the park and demonstrates good environmental stewardship to visitors.

MATERIALS

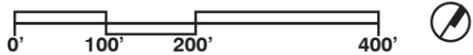
LAKE ERIE

CUYAHOGA RIVER

ED HAUSER WAY

CLEVELAND CENTENNIAL TRAIL

CLEVELAND METROPARKS
WHISKEY ISLAND AND WENDY PARK



GREEN INFRASTRUCTURE ELEMENTS KEY

WHISKEY ISLAND AND WENDY PARK

WATER

1 BIO-INFILTRATION SWALE

Bio-infiltration zones in parking medians capture, infiltrate and filter water from parking areas. These shallow vegetated depressions reduce runoff from paved surfaces and improve water quality. Bio-infiltration zones manage small rain events and are more effective and ecologically restorative than large stormwater basins alone.



HABITAT

4 FOREST MANAGEMENT AREAS

Many of the forested areas within the lakefront parks are missing the native understory layers characteristic of healthy forest ecosystems. The herbaceous, shrub and understory tree layers create habitat for many species of animals. These lower forest layers also provide cover for the next generation of the forest and contribute to its longevity. Removing invasive species and replanting the native species that make up these layers will allow the lakefront parks to capitalize on the existing forest assets.



TRANSIT ALTERNATIVES

6 BIKE ACCESS

Bike storage areas and clearly delineated bike routes help create stronger connections to the city and provide healthy transit alternatives that diversify access to the park.

WATER TAXI

The marina presents an opportunity to include water taxi service to the park.

MATERIALS

SUSTAINABILITY

Materials being considered for the lakefront parks should be evaluated with regard to durability, local availability, recycled content, renewable resources and embodied energy (carbon footprint). All materials used in the park should be able to withstand the conditions at the lake edge. Incorporating sustainable materials reduces the environmental footprint of the park and demonstrates good environmental stewardship to visitors.

HABITAT

2 NATIVE MEADOW

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ENERGY

5 WIND POWER

Wind turbines showcase environmental stewardship and provide a safe alternative energy source that can power site features such as lighting. Vertical axis turbines (like the one shown below) are safe for birds. At Wendy Park, small turbines can be incorporated near the volleyball courts and at new building to showcase renewable energy and highlight park destinations shaping, park identity as one of environmental stewardship.



3 LAKE EDGE HABITAT RESTORATION

A restored lake edge will re-establish a connection between the lake and adjacent woodland to strengthen biological richness. Planting steep slopes with native plant species will support the ecosystems that attract migratory birds and marine fauna.



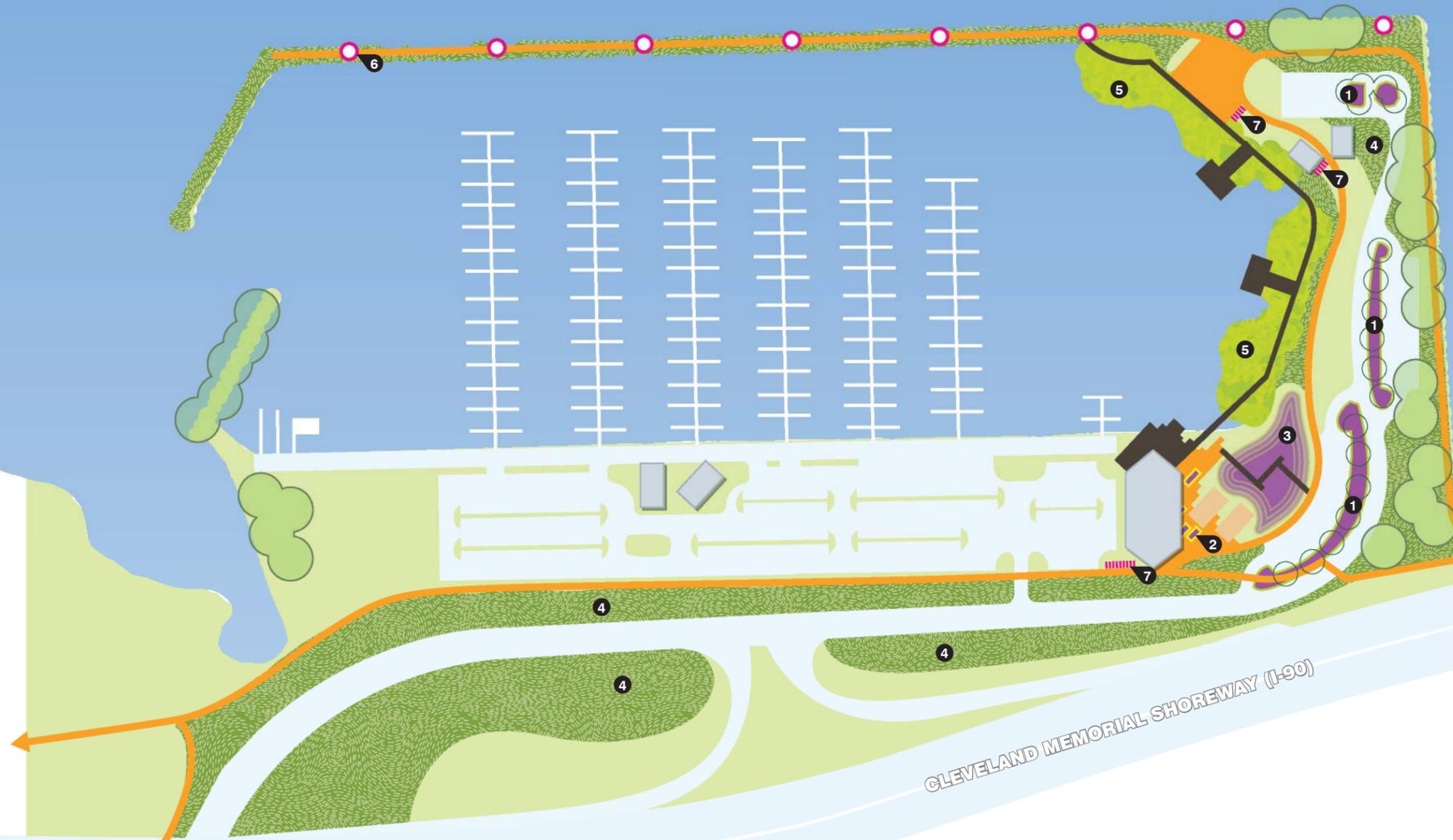
INTEGRATED ENVIRONMENTS

DIVERSIFY PARK AMENITIES

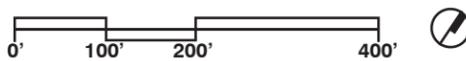
By introducing new amenities the lakefront parks will attract new users and accommodate new uses that will activate the parks year round. By improving the existing recreation facilities and introducing a new terraced amphitheater that capitalizes on the striking industrial views, Wendy Park will be transformed to a new destination along the lakefront.



LAKE ERIE



CLEVELAND METROPARKS
E 55th PARK AND MARINA



1 BIO-INFILTRATION SWALE

Bio-infiltration zones in parking medians capture, infiltrate and filter water from parking areas. These shallow vegetated depressions reduce runoff from paved surfaces and improve water quality. Bio-infiltration zones manage small rain events and are more effective and ecologically restorative than large stormwater basins alone.



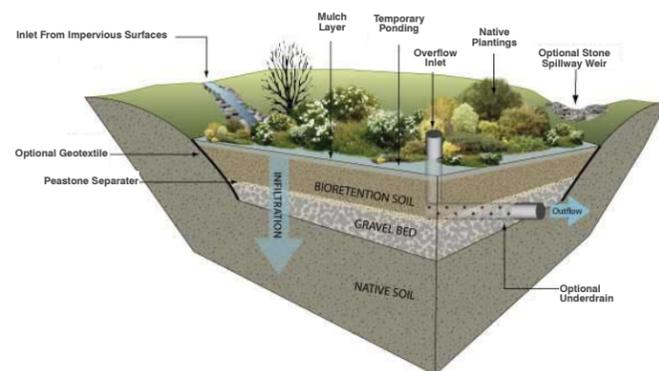
2 STORMWATER PLANTER

Downspouts from the restaurant building could be redirected via trench drains to stormwater planters in the plaza. These small planters filter runoff, improving water quality. Stormwater planters are a great example of green infrastructure as an attractive, interpretive amenity.



3 BIO-INFILTRATION MEADOW

As the last stop in the green stormwater infrastructure chain, this engineered depression receives, filters and infiltrates overflow from bio-infiltration swales and stormwater planters as well as overland runoff from adjacent impervious surfaces. A boardwalk highlights this element as a feature in the landscape.



4 NATIVE MEADOW

Converting lawn areas to native meadow will transform the identity of the lakefront parks and greatly increase the habitat opportunity for a wide range of animals. Meadow habitat is currently missing in the lakefront parks and will support ecosystems that migratory birds and other animals depend on. Meadows are only mown once a year or once every other year and therefore reduce CO2 emissions associated with regular mowing required for lawns. Meadows can be implemented in any areas that are not regularly accessed by people including traffic islands and large unprogrammed expanses.



5 LAKE EDGE HABITAT RESTORATION

The breakwater at the marina creates an opportunity to improve marine habitat through constructed or floating wetlands. A restored lake edge in place of the rip-rap will allow for biological richness that was not previously present. Aeration of the eastern edge of the marina can also enhance aquatic habitat in the winter months.



6 WIND POWER

Wind turbines showcase environmental stewardship and provide a safe alternative energy source that can power site features such as lighting. Vertical axis turbines (like the one shown below) are safe for birds. At E 55th Park and Marina, small turbines can be incorporated along northern edge of the park and out into the breakwater to provide a dramatic extension of the park's identity as one of environmental stewardship.



DIVERSIFY PARK AMENITIES

By introducing new amenities, the lakefront parks will attract new users and accommodate new uses that will activate the parks year round. By introducing recreational facilities, improved outdoor seating and enhanced landscape features the E 55th Park and Marina will be transformed to a new destination along the lakefront.



7 BIKE ACCESS

The E 55th Park and Marina will capitalize on its connection to the Cleveland Lakefront Bikeway which will encourage more visitors to access the park by bicycle.

WATER TAXI

The adjacent marina presents an ideal opportunity to include water taxi service to the park and restaurant.

SUSTAINABILITY

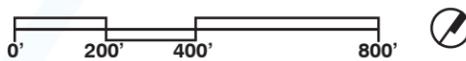
Materials being considered for the lakefront parks should be evaluated with regard to durability, local availability, recycled content, renewable resources and embodied energy (carbon footprint). All materials used in the park should be able to withstand the conditions at the lake edge. Incorporating sustainable materials reduces the environmental footprint of the park and demonstrates good environmental stewardship to visitors.

LAKE ERIE

CLEVELAND LAKEFRONT NATURE PRESERVE



CLEVELAND METROPARKS
NORTH GORDON PARK



GREEN INFRASTRUCTURE ELEMENTS KEY NORTH GORDON PARK

WATER

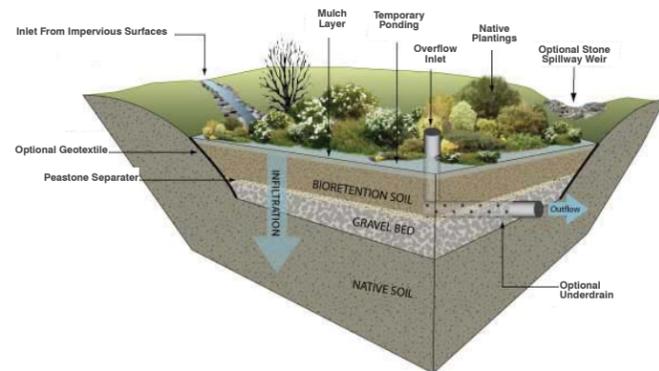
1 BIO-INFILTRATION SWALE

Bio-infiltration zones in parking medians capture, infiltrate and filter water from parking areas. These shallow vegetated depressions reduce runoff from paved surfaces and improve water quality. Bio-infiltration zones manage small rain events and are more effective and ecologically restorative than large stormwater basins alone.



2 BIO-INFILTRATION MEADOW

As the last stop in the green stormwater infrastructure chain, this engineered depression receives, filters and infiltrates overflow from bio-infiltration swales and stormwater planters as well as overland runoff from adjacent impervious surfaces.



3 NATIVE MEADOW

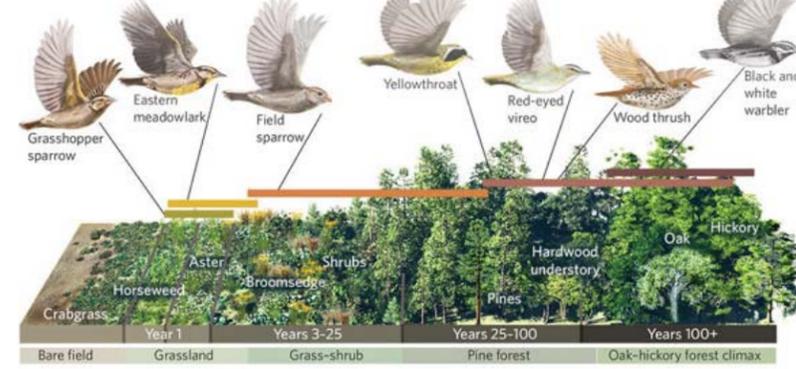
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HABITAT

4 SUCCESSIONAL MEADOW

The successional meadow is the first step in the natural progression from a disturbed landscape to climax forest. Unlike the native meadow that is maintained as a plant community of grasses and forbs, the successional meadow will change over time, ultimately becoming a native hardwood forest. Each stage of succession hosts its own unique ecosystem that grow in their complexity and diversity.



HABITAT

5 FOREST MANAGEMENT AREAS

Many of the forested areas within the lakefront parks are missing the native understory layers characteristic of healthy forest ecosystems. The herbaceous, shrub and understory tree layers create habitat for many species of animals. These lower forest layers also provide cover for the next generation of the forest and contribute to its longevity. Removing invasive species and replanting the native species that make up these layers will allow the lakefront parks to capitalize on the existing forest assets. Specific areas at North Gordon Park shall be managed as oak savanna.



6 WIND POWER

Wind turbines showcase environmental stewardship and provide a safe alternative energy source that can power site features such as lighting. Vertical axis turbines (like the one shown below) are safe for birds. At North Gordon Park small turbines can be incorporated along the north western edge to take advantage of strong winds off the unobstructed lake beyond. Turbines also reinforce the park's identity as one of environmental stewardship.



ENERGY

INTEGRATED ENVIRONMENTS

DIVERSIFY PARK AMENITIES

By introducing new amenities, the lakefront parks will attract new users and accommodate a wide variety of new uses that will activate the parks year round. By improving the existing facilities and introducing a new terraced seating that allows visitors to engage the water, North Gordon Park will be transformed to a new destination along the lakefront.



TRANSIT ALTERNATIVES

7 BIKE ACCESS

Bike storage areas and clearly delineated bike routes help create stronger connections to the city and provide healthy transit alternatives that diversify access to the park.

WATER TAXI

The adjacent yacht club presents the potential to include water taxi service to the park.

MATERIALS

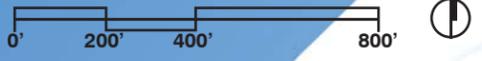
SUSTAINABILITY

Materials being considered for the lakefront parks should be evaluated with regard to durability, local availability, recycled content, renewable resources and embodied energy (carbon footprint). All materials used in the park should be able to withstand the conditions at the lake edge. Incorporating sustainable materials reduces the environmental footprint of the park and demonstrates good environmental stewardship to visitors.

LAKE ERIE



CLEVELAND METROPARKS
EUCLID BEACH, WILDWOOD AND VILLA ANGELA



GREEN INFRASTRUCTURE ELEMENTS KEY EUCLID BEACH, WILDWOOD AND VILLA ANGELA

WATER

1 BIO-INFILTRATION SWALE

Bio-infiltration zones in parking medians capture, infiltrate and filter water from parking areas. These shallow vegetated depressions reduce runoff from paved surfaces and improve water quality. Bio-infiltration zones manage small rain events and are more effective and ecologically restorative than large stormwater basins alone.



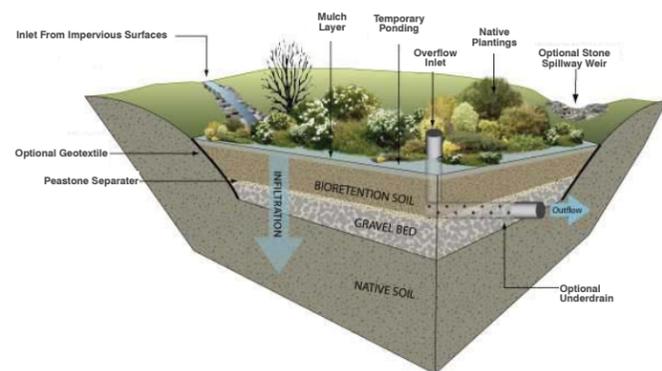
2 STORMWATER PLANTER

Downspouts from the building could be redirected via trench drains to stormwater planters in the plaza. These small planters filter runoff, improving water quality. Stormwater planters are a great example of green infrastructure as an attractive, interpretive amenity.



3 BIO-INFILTRATION MEADOW

As the last stop in the green stormwater infrastructure chain, this engineered depression receives, filters and infiltrates overflow from bio-infiltration swales and stormwater planters as well as overland runoff from adjacent impervious surfaces. A boardwalk highlights this element as a feature in the landscape.



HABITAT

4 NATIVE MEADOW

Converting lawn areas to native meadow will transform the identity of the lakefront parks and greatly increase the habitat opportunity for a wide range of animals. Meadow habitat is currently missing in the lakefront parks and will support ecosystems that migratory birds and other animals depend on. Meadows are only mown once a year or once every other year and therefore reduce CO2 emissions associated with regular mowing required for lawns. Meadows can be implemented in any areas that are not regularly accessed by people including traffic islands and large unprogrammed expanses.



5 RESTORED DUNES

Planted dunes are not only imperative for holding the bank and preventing beach loss from wind and wave action, but they provide important habitat for a wide variety of fauna. Dunes support ecosystems that provide food for migratory birds. By creating pockets that are sheltered from the wind, dunes also make beaches more comfortable places for people and can extend the period that a beach can be enjoyed throughout the year.



6 FOREST MANAGEMENT AREAS

Many of the forested areas within the lakefront parks are missing the native understory layers characteristic of healthy forest ecosystems. The herbaceous, shrub and understory tree layers create habitat for many species of animals. These lower forest layers also provide cover for the next generation of the forest and contribute to its longevity. Removing invasive species and replanting the native species that make up these layers will allow the lakefront parks to capitalize on the existing forest assets.



ENERGY

7 SOLAR POWER

Small photo-voltaic arrays can provide alternative energy to park buildings and showcase environmental stewardship.



INTEGRATED ENVIRONMENTS

DIVERSIFY PARK AMENITIES

By introducing new amenities, the lakefront parks will attract new users and accommodate new uses that will activate the parks year-round. By improving the existing facilities and introducing a new way to engage the water and other natural environments, Euclid Beach, Villa Angela and Wildwood will become a more widely used and appreciated lakefront asset.



TRANSIT ALTERNATIVES

8 BIKE ACCESS

Bike storage areas and clearly delineated bike routes help create stronger connections to the city and provide healthy transit alternatives that diversify access to the park.

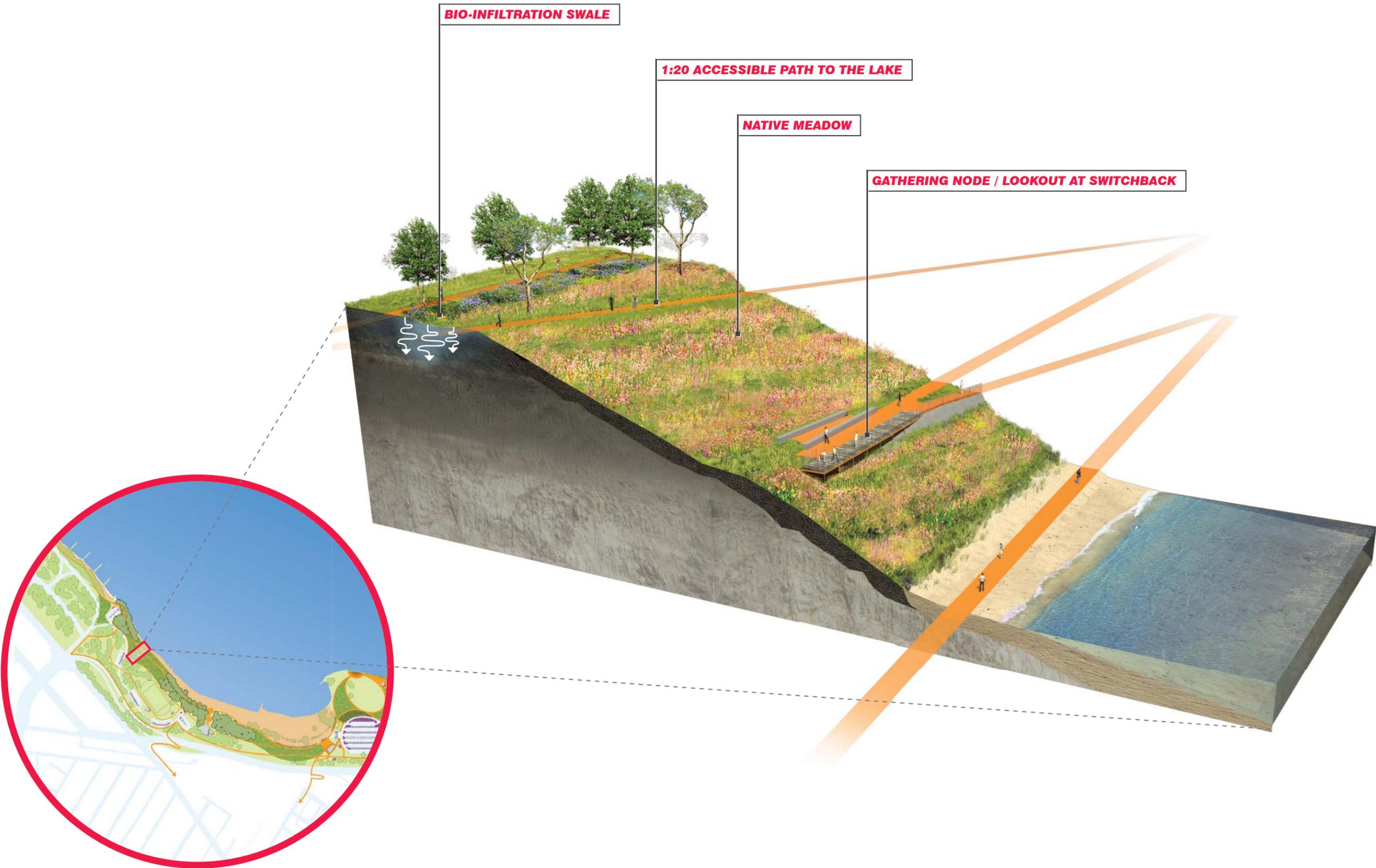
WATER TAXI

The adjacent marina presents an ideal opportunity to include water taxi service to the park.

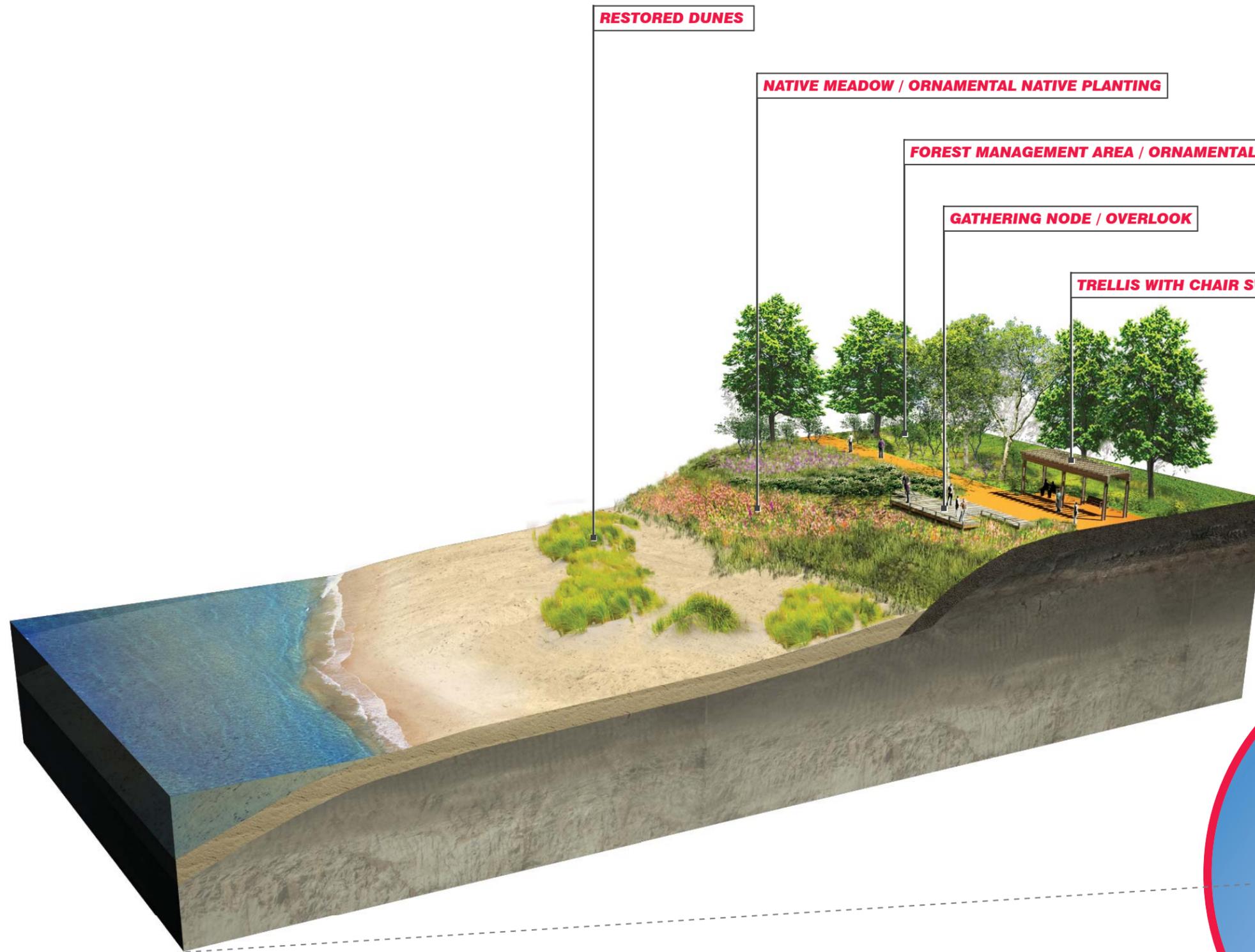
MATERIALS

SUSTAINABILITY

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EDGEWATER BLUFF



RESTORED DUNES

NATIVE MEADOW / ORNAMENTAL NATIVE PLANTING

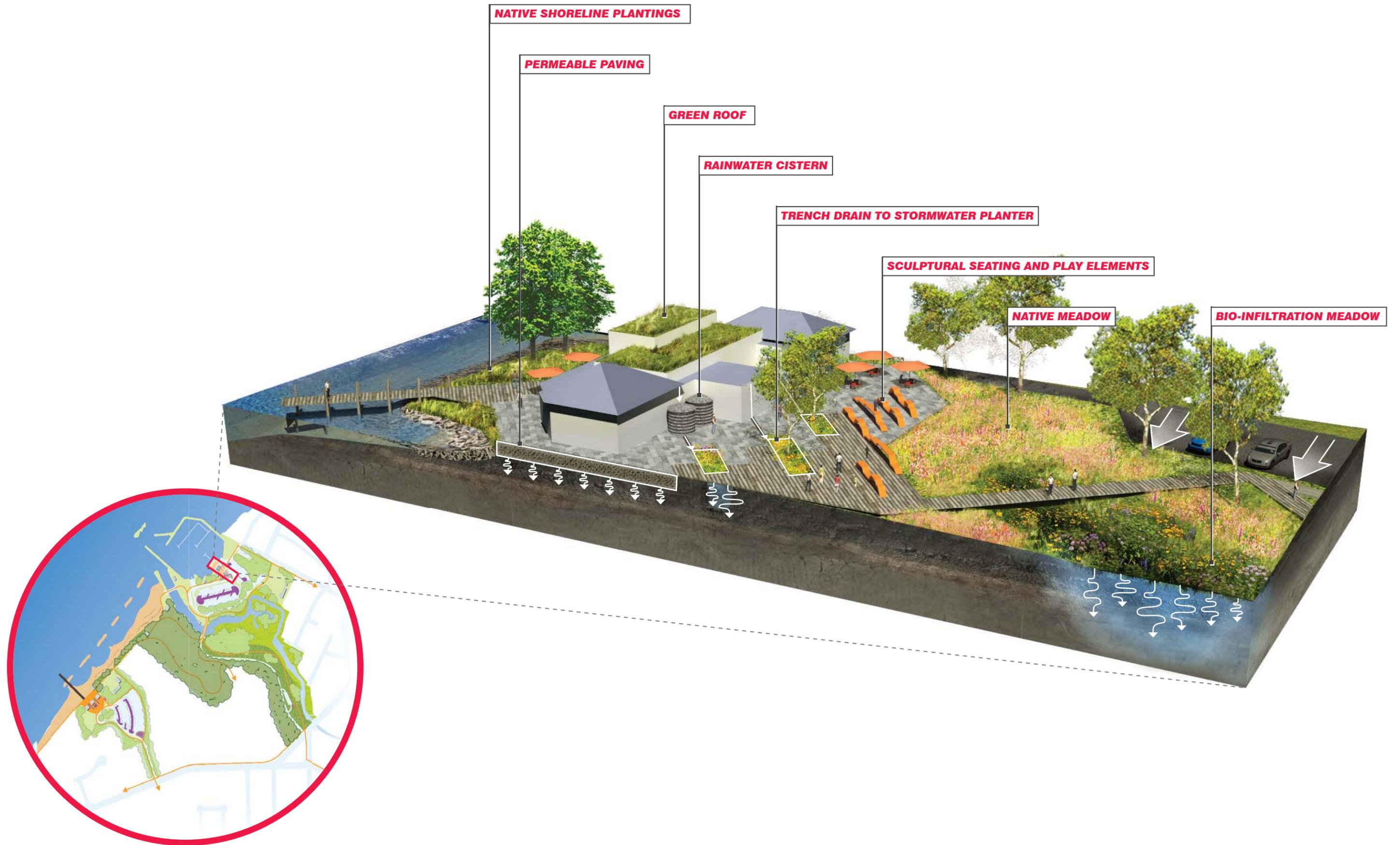
FOREST MANAGEMENT AREA / ORNAMENTAL UNDERSTORY PLANTING

GATHERING NODE / OVERLOOK

TRELLIS WITH CHAIR SWINGS

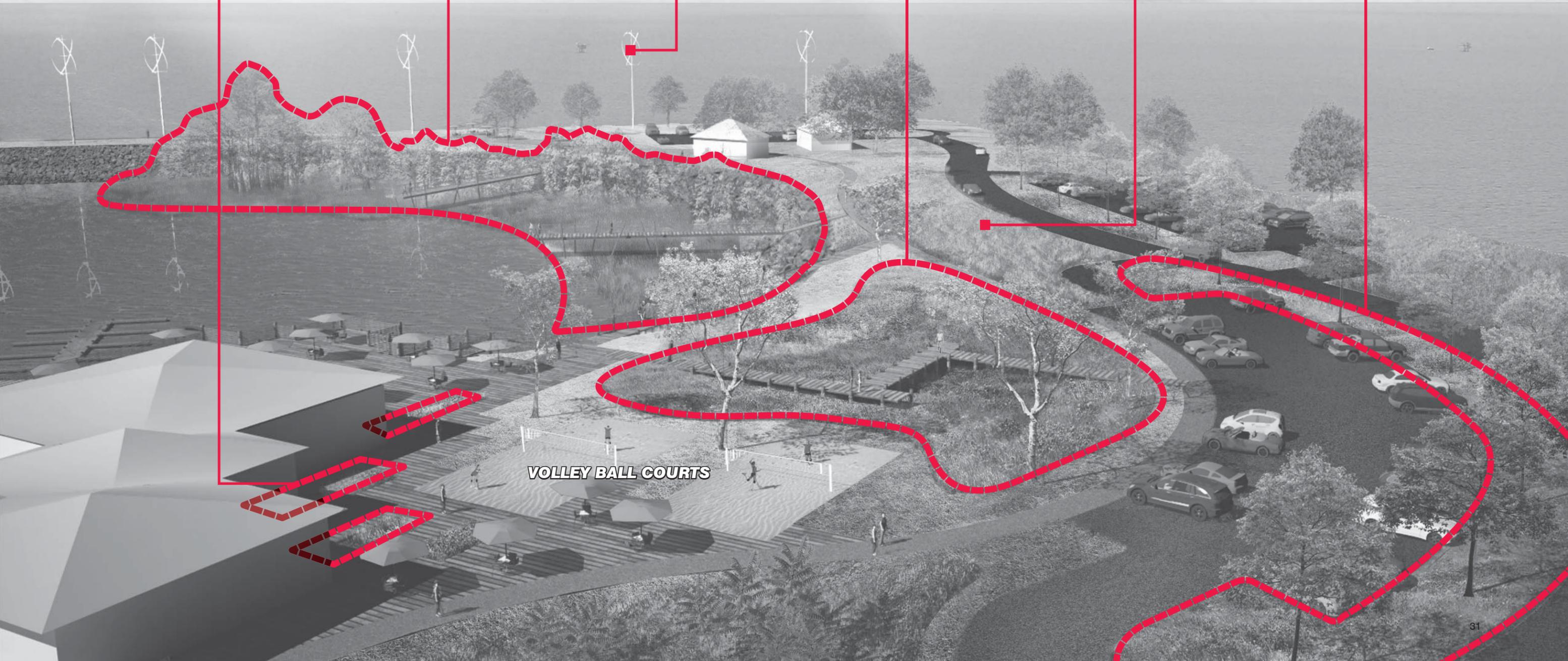
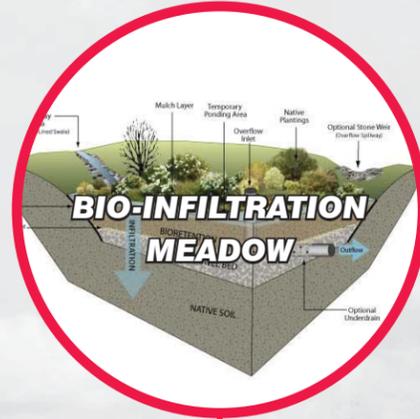


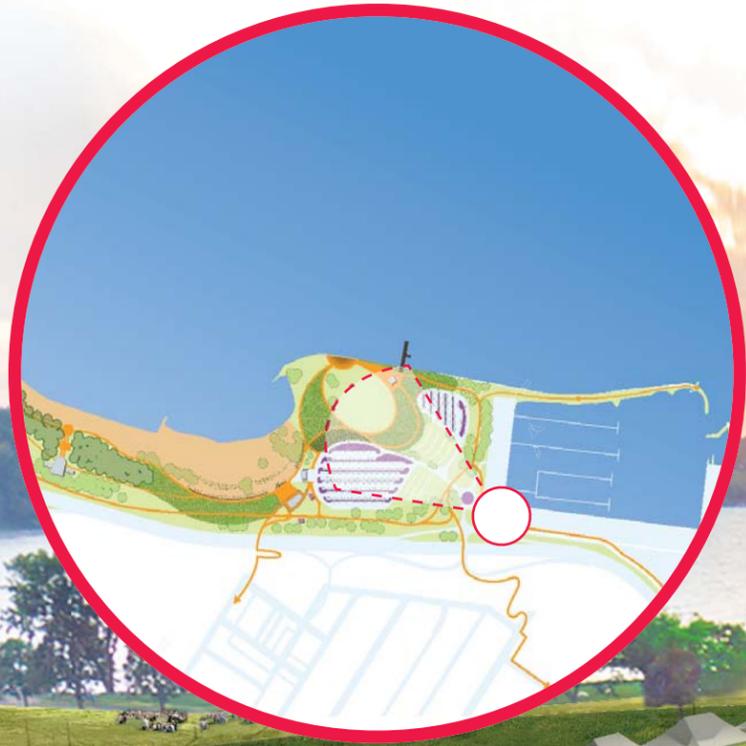
EUCLID BEACH





E 55 PARK AND MARINA





EDGEWATER LAWN



SUCCESSIONAL MEADOW



BIO-INFILTRATION SWALE



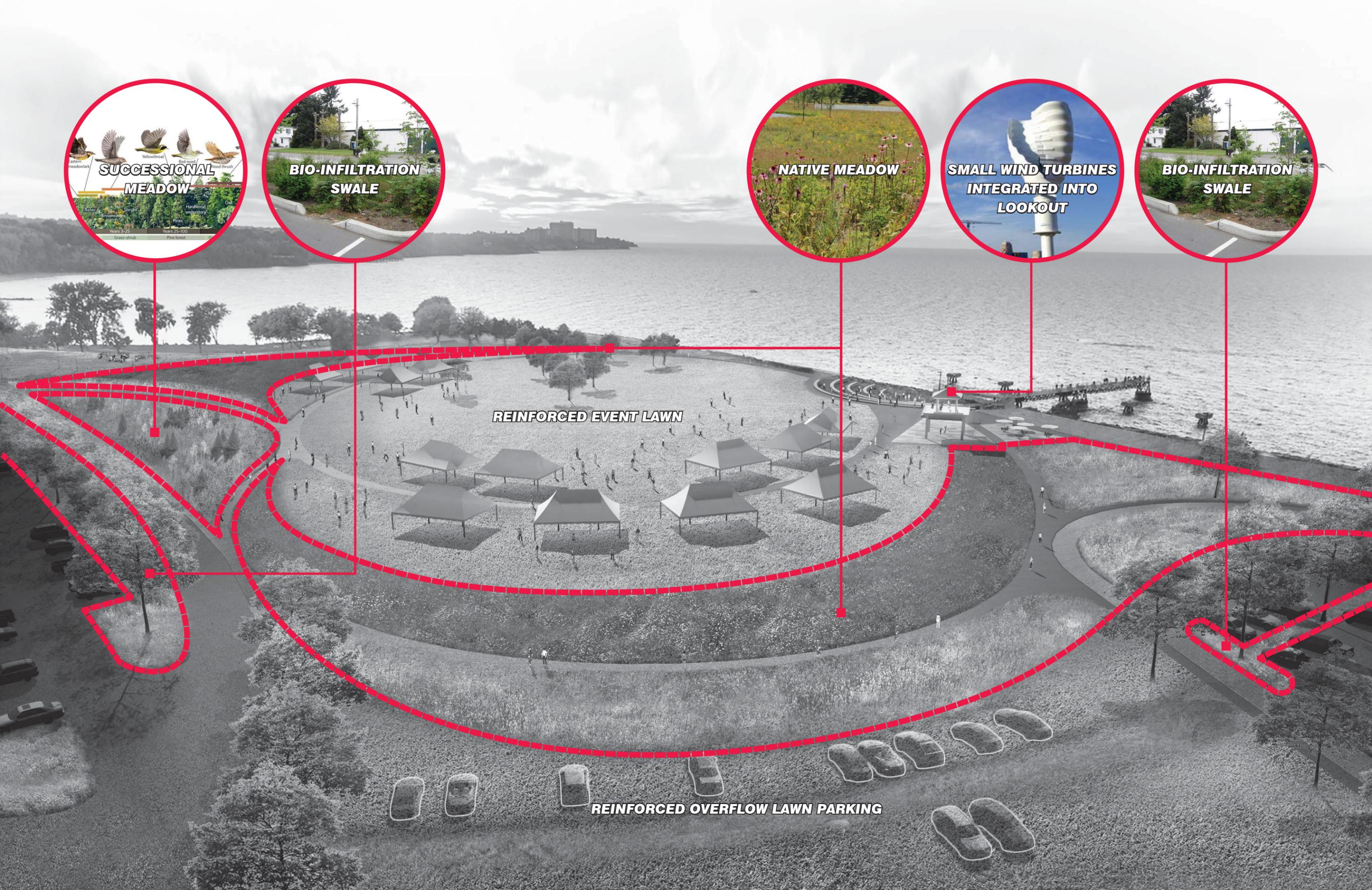
NATIVE MEADOW



SMALL WIND TURBINES INTEGRATED INTO LOOKOUT



BIO-INFILTRATION SWALE



REINFORCED EVENT LAWN

REINFORCED OVERFLOW LAWN PARKING

GREEN INFRASTRUCTURE ELEMENTS ORDER OF MAGNITUDE COST

General note: costs may be reduced depending on variables such as project size and/or ability to use in-house labor.

Item Description:	Quantity	U/M	Unit Cost	Sub-Total	Total
<i>Note</i>					
All totals include 20% Markup/Contingency except where noted					
HABITAT					
Successional Woodland					
Total:					
Seed only	1	/ SF	0.25	0.25	\$ 0.30 / SF
Plugs only (2'-0" Spacing)	1	/ SF	3	3.00	\$ 3.60 / SF
Plugs only (12" OC Spacing to prevent early weed intrusion)	1	/ SF	6.14	6.14	\$ 7.37 / SF
Plug and Seed Combination (70%Seed 30%Plugs)	1	/ SF	2.1	2.10	\$ 2.52 / SF
Plugs, Seed and Shrub and Tree Whips (Define Density)	1	/ SF	6.18	6.18	\$ 7.42 / SF
(Note: Method of planting depends on many variables including type of meadow, rate of establishment, initial maintenance, etc. Costs incl. site prep.)					
Meadow					
Total:					
Seed (incl. site prep)	1	/ SF	0.25	0.25	\$ 0.30 / SF
Plugs only (2'-0" Spacing)	1	/ SF	3	3.00	\$ 3.60 / SF
Plugs (12" OC Spacing to prevent early weed intrusion)	1	/ SF	6.14	6.14	\$ 7.37 / SF
Combination (70%Seed 30%Plugs - incl. site prep)	1	/ SF	2.1	2.10	\$ 2.52 / SF
(Note: Method of planting depends on many variables including type of meadow, rate of establishment, initial maintenance, etc)					
Native Plant Beds					
Native Plant Bed - 100 / SF					
Excavation/Grading/Prep	3	CY	15.00	45	
Planting Soils	1	CY	60.00	60	
Planting - Container Shrubs and Perennial Plugs	100	/ SF	2.50	250	
Subtotal				\$ 355.00	
Mark ups (10% Contingency + 10% P & OH)	20.00%			71.00	
TOTAL				\$ 426.00	\$ 4.26 / SF
Tree Planting					
Total:					
New Trees 3-4" Caliper	1	/ EA	800.00	800.00	\$ 960.00 / EA
Bio Infiltration Area Trees (small Caliper and Container)	1	/ EA	72.00	72.00	\$ 86.40 / EA
Restoration Trees (Bare Root Whips)	1	/ EA	15.00	15.00	\$ 18.00 / EA
Dune Restoration					
Dune Restoration	1	/ SF	3.50	3.50	
Subtotal				\$ 3.50	
Mark ups (10% Contingency + 10% P & OH)	20.00%			0.70	
TOTAL				\$ 4.20	\$ 4.20 / SF
Lake Edge Habitat Restoration - Naturalization of Shoreline					
Lake Edge Habitat Restoration	1	/ SF	5.00	5.00	
Subtotal				\$ 5.00	
Mark ups (10% Contingency + 10% P & OH)	20.00%			1.00	
TOTAL				\$ 6.00	\$ 6.00 / SF
(Note: Includes Site prep fine grading, plugs and shrub and tree whips. Excludes Rip Rap Removal, Permitting, Erosion and Sediment Controls)					
Constructed Wetland					
Constructed Wetland (Low - Replanting with limited edge modification)	1	/ SF	5	5.00	\$ 6.00 / SF
Constructed Wetland (High - Significant slope modification and stabilization)	1	/ SF	25	25.00	\$ 30.00 / SF
ENERGY					
Wind Energy:					
5 Wind Turbine System				\$ -	
Vertical Axis Wind Turbine w/ Inverter	5	Turbine	\$ 10,500	\$ 52,500.00	
Foundation per Turbine	5	Footing	\$ 3,000	\$ 15,000.00	
Base Electrical Infrastructure & Grid Tie back	1	75 to 100k			
Subtotal				\$ 67,500.00	\$ 75,000.00 \$ 100,000
Mark ups (10% Contingency + 10% P & OH)	20.00%			\$ 13,500.00	\$ 22,500.00 \$ 30,000
TOTAL				\$ 81,000.00	\$ 178,500.00 \$ 211,000 Range
Solar Energy:					
100Kilowatt Solar Panel System					
Roof-mounted Solar Panel System	1	100 Kilowatt	\$ 175,000	\$ 175,000.00	
Base Electrical Infrastructure & Grid Tie back	1	75 to 100k			
Subtotal				\$ 175,000.00	\$ 75,000.00 \$ 100,000
Mark ups (15% Contingency + 15% P & OH)	20.00%			\$ 35,000.00	\$ 22,500.00 \$ 30,000
TOTAL				\$ 210,000.00	\$ 307,500.00 \$ 340,000 Range
TRANSIT ALTERNATIVES					
Bike Shelter					
Bike Shelter (Dua-Guard Parachute 12x19')	1	/ EA	23000	23,000.00	\$ 27,600.00 / EA
Bike Rack (Dua-Guard 2200 Series)	26	/ EA	26	676.00	\$ 811.20 / EA

Item Description:	Quantity	U/M	Unit Cost	Sub-Total	Total
WATER					
Stormwater Planters					
Stormwater Planter - 100 / SF					
Demolish Paving, Improvements, Temp Protection	100	/ SF	3.00	300.00	
Relocate/Modify Utilities, Connect Storm as Req'd	100	/ SF	0.50	50.00	
Planting (excluding trees)	100	/ SF	6.00	600.00	
Excavation/Grading/Prep	12	CY	15.00	180.00	
Planting Soils	12	CY	60.00	720.00	
Gravel, Fabric, Drain Pipes	2	CY	50.00	75.00	
pipng	10	LF	2.50	25.00	
Concrete Curbs	50	LF	20.00	1,000.00	
Subtotal				\$ 2,950.00	
Mark ups (10% Contingency + 10% P & OH)	20.00%			590.00	
TOTAL				\$ 3,540.00	\$ 35.40 / SF
Bio-infiltration Areas					
Bio-infiltration Areas - 100 SF	100	/ SF			
Demolish Paving, Improvements, Temp Protection	100	/ SF	3.00	300.00	
Relocate/Modify Utilities, Connect Storm as Req'd	100	/ SF	1.00	100.00	
Excavation/Grading/Prep (12")	9	CY	15.00	135.00	
Planting Soils	9	CY	60.00	540.00	
Gravel, Fabric, Drain Pipes	2	CY	45.00	90.00	
Green Inlets/piping	40	LF	2.50	100.00	
Planting - Container Shrubs and Perennial Plugs	100	/ SF	6.00	600.00	
Subtotal				\$ 1,865.00	
Mark ups (10% Contingency + 10% P & OH)	20.00%			373.00	
TOTAL				\$ 2,238.00	\$ 22.38 / SF
Rainwater Cistern					
Rainwater Cistern: Corrugated Steel above grade tank					
Corrugated Tank	1	Tank	15,000.00	15,000.00	
Maintenance Cost for 1 Year	1	Tank	500.00	500.00	
Subtotal				\$ 20,500.00	
Mark ups (10% Contingency + 10% P & OH)	20.00%			4,100.00	
TOTAL				\$ 24,600.00	\$ 24,600.00 / EA
Soil Cells					
Soils Cells 100 / SF					
6" Precast Concrete Curb	40	LF	25.00	1,000.00	
Demolish Paving, Improvements, Temp Protection	100	/ SF	3.00	300.00	
Relocate/Modify Utilities, Connect Storm as Req'd	100	/ SF	2.00	200.00	
Excavation/Grading/Prep	12	CY	15.00	180.00	
Soil Cells	100	/ SF	28.00	2,800.00	
Gravel, Fabric, Drain Pipes	3	CY	50.00	150.00	
pipng	100	LS	2.50	250.00	
Subtotal				\$ 4,880.00	
Mark ups (10% Contingency + 10% P & OH)	20.00%			976.00	
TOTAL				\$ 5,856.00	\$ 58.56 / SF
Permeable Concrete Unit Pavers					
Unit Paver - Pedestrian - Permeable Concrete Paver System	1	/ SF			
Demolish Paving, Improvements, Temp Protection	1	/ SF	2.50	2.50	
Excavation/Grading/Prep	1	/ SF	1.00	1.00	
Permeable Concrete Paving, Base	1	/ SF	20.00	20.00	
Reset Manholes, Grates, Signs, Lights, Etc	1	/ SF	2.00	2.00	
Subtotal				\$ 25.50	
Mark ups (10% Contingency + 10% P & OH)	20.00%			5.10	
TOTAL				\$ 30.60	\$ 30.60 / SF
Permeable Asphalt Pavement					
Contiguous Paving - Vehicular - Permeable Asphalt System	1	/ SF			
Demolish Paving, Improvements, Temp Protection	1	/ SF	2.50	2.50	
Excavation/Grading/Prep	1	/ SF	1.25	1.25	
New Vehicular Pervious Paving, Base	1	/ SF	22.00	22.00	
Reset Manholes, Grates, Signs, Lights, Etc	1	/ SF	2.00	2.00	
Subtotal				\$ 27.75	
Mark ups (10% Contingency + 10% P & OH)	20.00%			5.55	
TOTAL				\$ 33.30	\$ 33.30 / SF

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