

2014

Jackson Park Section 506 Great Lakes Fishery & Ecosystem Restoration Study

Draft Detailed Project Report & Environmental Assessment

Alternative Formulation Briefing Document - BackCheck



Chicago, Cook
County, Illinois

Chicago District USACE
Chicago Park District
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EXECUTIVE SUMMARY

This report presents the results of an ecosystem restoration feasibility study for Jackson Park located in the City of Chicago, Cook County, Illinois. This Feasibility Report presents the assessment of ecological conditions and potential plans to restore important migratory bird, fish and wildlife habitat within a highly urbanized environment. This report gathered historic and current site conditions, and forecasts future without and future with project conditions for Jackson Park. This report also provides a recommended plan for restoring habitat at Jackson Park.

The Chicago Park District (CPD) holds many city parks within the Chicago City limits, many in which have portions dedicated to natural habitats that exemplify the Chicago Region. The CPD has in turn requested that the Chicago District, US Army Corps of Engineers (USACE) initiate a study under the Section 506 Great Lakes Fishery and Ecosystem Restoration (GLFER) authority to ascertain the feasibility of restoring important migratory bird, fish and wildlife habitat within the natural area portions of Jackson Park. This report has evaluated the feasibility and environmental effects of restoring geomorphic features and palustrine and riparian plant communities. The scope of this study addresses the issues of impaired geomorphology, absence of native plant communities, invasive species, fire suppression, poor connectivity, rare wetland communities, and poor native species richness.

Jackson Park is located in Chicago, Illinois along the western coast of Lake Michigan. The park resides between 56th Street to the north and 67th Street to the south. The eastern boundary is Lake Shore Dr. and Lake Michigan and to the west Stony Island Ave. The study area consists of various natural area parcels of land that total about 155.1-acres, all of which are owned by the Chicago Park District within Jackson Park. The natural area patches have the potential to provide pond, fringe marsh, sedge meadow, savanna and woodland habitat.

One crucial component that is important to ecosystem integrity and integrates both aquatic and riparian or buffer habitat is native plant community richness and structure. Historically, Chicago's shoreline was floristically lush with vast expanses of species rich and structurally diverse wetlands. While restoring wetlands in Chicago to their historical conditions is unlikely in many cases, converting small expanses of land into structurally diverse wetlands and buffering plant communities will provide critical habitat for a number of organisms. These patches of wetland and buffering plant communities would serve as an important refuge for migrant and resident bird species, as well as a variety of aquatic organisms (fish, amphibians, aquatic insects, etc.). The main problems at Jackson Park are as follows:

- Unnatural hydrogeomorphic conditions that promote invasive species success
- Fragmentation of inter and intra site habitat patches
- Absence of submergent aquatic beds (macrophytes/hydrophytes)
- Absence of species rich coastal plant communities
- Absence of rare and sensitive coastal plant and animal species
- Lack of critical habitat for locally endangered and rare fauna
- Lack of migratory bird resting and forage habitats

To address the noted ecosystem problems at Jackson Park, fifteen (15) measures, including the No Action measure, were input into the IWR-Planning Suite in terms of costs and benefits. Vernal Pool (VP) restoration was dependent on restoring Sedge Meadow (SM) and Oak Savanna/Woodland (OSW) habitats. Fish Community Separator (FF), Invasive Fish Species Removal (FIR), Mudpuppy Habitat (MH) and Native Species Reintroduction (FNS) were dependent on restoring Pond (P) habitat. All plant community habitat restorations (P), (EI), (NI), (FM), (SM) and (OSW) were dependent on Invasive Species Removal (IPR). Patches of Sedge Meadow (SM), Fringe Marsh (FM) and Savanna/Woodland (OSW) were dependent on

Geomorphic Contouring (GC). New Island (NI) plant community was dependent on New Island Creation (NIC). Based on these inputs and criteria, the IWR-Planning software generated 66 alternative combinations for ecosystem restoration. These alternative combinations were analyzed with the IWR Planning Suite Cost Effective & Incremental Cost Analysis.

The cost effectiveness analysis was used to ensure that certain options would be screened out if they produced the same amount or less output at a greater cost than other options with a lesser cost. Sixty six (66) alternative combinations were analyzed for cost effectiveness. Of these, seventeen (17) cost effective combinations were identified, which is inclusive of the six (6) Best Buy Plans. The No Action plan is always deemed cost effective and a Best Buy Plan. Forty-nine (49) alternative combinations were screened out as non-cost effective.

An incremental cost analysis was performed on the five (5) Best Buy Plans identified from the cost effectiveness analysis:

Alternative 1 – No Action Plan

Alternative 2 – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction

Alternative 3 – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland

Alternative 4 – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland, (FM) Fringe Marsh

Alternative 5 – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland, (FM) Fringe Marsh, (NIC) New Island Creation, (NI) New Island

The objective of the incremental cost analysis is to assist in determining whether the additional output provided by each successive plan is worth the additional cost. The alternative plan(s) that qualified for further consideration were further assessed in order to identify whether the benefits are worth the Federal investment. The effects include a measure of how well the plan(s) achieve the planning objectives, benefits and costs. The supportive facts include the reality of the ecosystem outputs; significance of the ecosystem outputs; completeness, acceptability, effectiveness and efficiency of the potential plan, and any associated risks or uncertainties that may affect or result from the potential plan.

The plan that reasonably maximizes net National Ecosystem Restoration benefits and is consistent with the Federal objective, authorities and policies, is identified as the NER/Preferred Plan. The NER/Preferred Plan was determined to be Alternative 4. When selecting a single alternative plan for recommendation from those that have been considered, the criteria used to select the NER plan include all the evaluation criteria discussed above. Selecting the NER plan requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes environmental benefits while passing tests of cost

effectiveness and incremental cost analyses, significance of outputs, acceptability, completeness, efficiency, and effectiveness.

An Environmental Assessment was completed for the proposed habitat restoration at Jackson Park, Chicago, Illinois. The Environmental Assessment has found that there would be no adverse affects, resulting from implementation of the NER/Preferred Plan. A 30-day Public Review period was held from 11 April 2014 to 12 May 2014. Agency and public review comments will be addressed as they are received with pertinent comments incorporated into the document.

All significant aspects of the problems and opportunities as they relate to the Jackson Park study area's resource problems have been considered. Those aspects include environmental, social, cultural, and economic effects, as well as engineering feasibility. The National Ecosystem Restoration (NER) Plan is Alternative 4, which consists of restoring native plant and fauna communities within Jackson Park. The NER plan has a Fully Funded Cost of approximately [REDACTED]. This plan provides 640.1 net average annual habitat units over 155.1-acres of the park.

**JACKSON PARK
CHICAGO, ILLINOIS**

DETAILED PROJECT REPORT & ENVIRONMENTAL ASSESSMENT

March 2014

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List of Acronyms

DO	Dissolved Oxygen
DPR	Detailed Project Report
EOP	Environmental Operating Principals
FCSA	Feasibility Cost Sharing Agreement
FONSI	Finding of No Significant Impact
FWOP	Future Without Project Conditions
GIS	Geographic Information System
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
NEPA	National Environmental Policy Act
PMP	Project Management Plan
SHPO	State Historic Preservation Office
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WRDA	Water Resources Development Act

CHAPTER 1 – Introduction

1.1 Report Structure

This report presents the results of an ecosystem restoration feasibility study for Jackson Park located in the City of Chicago, Cook County, Illinois. This Detailed Project Report presents the assessment of ecological conditions and potential plans to restore important migratory bird, fish and wildlife habitat within a highly urbanized environment. This report gathered historic and current site conditions, and forecasts future without and future with project conditions for Jackson Park. This report also provides a recommended plan for restoring habitat at Jackson Park.

The report contains the following chapters and appendices:

Chapter 1 – Introduction: introduces the project and provides a description of the study area and a summary of relevant studies and projects completed

Chapter 2 – Inventory of Study Area and Forecasting: contains an inventory or description of the study area which includes an assessment of pertinent historic, current and future without project conditions

Chapter 3 – Problems and Opportunities: discusses the problems within the study area, potential opportunities to remedy them, a study goal, restoration objectives and limiting constraints

Chapter 4 – Plan Formulation and Evaluation: discusses how plans have been formulated, presents the cost effectiveness and ecological benefits of each alternative, and discusses the evaluation process used to identify the National Ecosystem Restoration (NER) plan and select a recommended plan

Chapter 5 – Environmental Assessment: provides a description of potential impacts, both negative and positive, to cultural, ecological and physical resources within the surrounding environment and their significance.

Chapter 6 – Plan Implementation: discusses construction sequencing, monitoring and adaptive management, project costs and cost sharing responsibilities

Chapter 7 – Recommendation: provides the District Commander’s recommendation for implementation of an ecosystem restoration plan

Appendix A: Compliance, Coordination & Information

Appendix B: Civil Design

Appendix C: Cost Engineering

Appendix D: Hazardous, Toxic and Radioactive Waste

Appendix E: Real Estate

Appendix F: Monitoring Plan

1.2 Study Authority

GREAT LAKES FISHERY & ECOSYSTEM RESTORATION (SECTION 506 WRDA 2000, as amended)

- (a) *Findings - Congress finds that—*
- (1) *the Great Lakes comprise a nationally and internationally significant fishery and ecosystem;*
 - (2) *the Great Lakes fishery and ecosystem should be developed and enhanced in a coordinated manner; and*
 - (3) *the Great Lakes fishery and ecosystem provides a diversity of opportunities, experiences, and beneficial uses.*
- (b) *Definitions - In this section, the following definitions apply:*
- (1) *Great Lake*
 - (A) *In general- The term “Great Lake” means Lake Superior, Lake Michigan, Lake Huron (including Lake St. Clair), Lake Erie, and Lake Ontario (including the St. Lawrence River to the 45th parallel of latitude).*
 - (B) *Inclusions- The term “Great Lake” includes any connecting channel, historically connected tributary, and basin of a lake specified in subparagraph (A).*
 - (2) *Great Lakes Commission- The term “Great Lakes Commission” means the Great Lakes Commission established by the Great Lakes Basin Compact (82 Stat. 414).*
 - (3) *Great Lakes Fishery Commission- The term “Great Lakes Fishery Commission” has the meaning given the term “Commission” in section 931 of Title 16.*
 - (4) *Great Lakes State- The term “Great Lakes State” means each of the States of Illinois, Indiana, Michigan, Minnesota, Ohio, Pennsylvania, New York, and Wisconsin.*
- (c) *Great Lakes fishery and ecosystem restoration*
- (1) *Support plan*
 - (A) *In general- Not later than 1 year after December 11, 2000, the Secretary shall develop a plan for activities of the Corps of Engineers that support the management of Great Lakes fisheries.*
 - (B) *Use of existing documents- To the maximum extent practicable, the plan shall make use of and incorporate documents that relate to the Great Lakes and are in existence on December 11, 2000, such as lakewide management plans and remedial action plans.*
 - (C) *Cooperation- The Secretary shall develop the plan in cooperation with—*
 - (i) *the signatories to the Joint Strategic Plan for Management of the Great Lakes Fisheries; and*
 - (ii) *other affected interests.*
 - (2) *Reconnaissance studies- Before planning, designing, or constructing a project under paragraph (3), the Secretary shall carry out a reconnaissance study—*
 - (A) *to identify methods of restoring the fishery, ecosystem, and beneficial uses of the Great Lakes; and*
 - (B) *to determine whether planning of a project under paragraph (3) should proceed.*
 - (3) *Projects- The Secretary shall plan, design, and construct projects to support the restoration of the fishery, ecosystem, and beneficial uses of the Great Lakes.*
 - (4) *Evaluation program*
 - (A) *In general- The Secretary shall develop a program to evaluate the success of the projects carried out under paragraph (3) in meeting fishery and ecosystem restoration goals.*
 - (B) *Studies- Evaluations under subparagraph (A) shall be conducted in consultation with the Great Lakes Fishery Commission and appropriate Federal, State, and local agencies.*
- (d) *Cooperative agreements- In carrying out this section, the Secretary may enter into a cooperative agreement with the Great Lakes Commission or any other agency established to facilitate active State participation in management of the Great Lakes.*
- (e) *Relationship to other Great Lakes activities- No activity under this section shall affect the date of*

- completion of any other activity relating to the Great Lakes that is authorized under other law.*
- (f) *Cost sharing*
- (1) *Development of plan- The Federal share of the cost of development of the plan under subsection (c)(1) of this section shall be 65 percent.*
 - (2) *Project planning, design, construction, and evaluation- Except for reconnaissance studies, the Federal share of the cost of planning, design, construction, and evaluation of a project under paragraph (3) or (4) of subsection (c) of this section shall be 65 percent.*
 - (3) *Non-Federal share*
 - (A) *Credit for land, easements, and rights-of-way- The Secretary shall credit the non-Federal interest for the value of any land, easement, right-of-way, dredged material disposal area, or relocation provided for carrying out a project under subsection (c)(3) of this section.*
 - (B) *Form- The non-Federal interest may provide up to 100 percent of the non-Federal share required under paragraphs (1) and (2) in the form of services, materials, supplies, or other in-kind contributions.*
 - (4) *Operation and maintenance- The operation, maintenance, repair, rehabilitation, and replacement of projects carried out under this section shall be a non-Federal responsibility.*
 - (5) *Non-Federal interests- In accordance with section 1962d-5b of this title, for any project carried out under this section, a non-Federal interest may include a private interest and a nonprofit entity.*
- (g) *Authorization of appropriations*
- (1) *Development of plan- There is authorized to be appropriated for development of the plan under subsection (c)(1) of this section \$300,000.*
 - (2) *Other activities- There is authorized to be appropriated to carry out paragraphs (2) and (3) of subsection (c) of this section \$100,000,000.*

1.3 Study Purpose

The Detailed Project Report (DPR) demonstrates whether or not a project is warranted for Federal participation based on a feasibility level assessment of estimated costs, potential benefits, and possible environmental impacts of various alternatives, all of which follow USACE planning and policy guidelines. The main purpose of the DPR is to recommend a plan, including consideration of the No Action Plan, for ecological restoration of various areas within Jackson Park. By restoring aquatic and buffering habitats and addressing invasive species issues, this project would provide essential habitat for fish, migratory birds, reptiles and amphibians within a highly urbanized area. If an alternative is found to be worth the investment, the next steps include the signing of a Project Partnership Agreement (PPA) and development of a contract set of Plans and Specifications (P&S). The non-Federal sponsor is the Chicago Park District (CPD).

1.4 Study Background

The Chicago Park District holds many city parks within the Chicago City limits, many in which have portions dedicated to natural habitats that exemplify the Chicago Region. The CPD has in turn requested that the Chicago District, US Army Corps of Engineers (USACE) initiate a study under the Section 506 WRDA 2000, Great Lakes Fishery and Ecosystem Restoration (GLFER) authority to ascertain the feasibility of restoring important migratory bird, fish and wildlife habitat within the natural area portions of Jackson Park. This report has evaluated the feasibility and environmental effects of restoring geomorphic features and palustrine and riparian plant communities. The scope of this study addresses the issues of impaired geomorphology, absence of native plant communities, invasive species, fire suppression, poor connectivity, rare wetland communities, and poor native species richness.

Jackson Park is located in Chicago, Illinois along the western coast of Lake Michigan (**Figure 1**). The park resides between 56th Street to the north and 67th Street to the south. The eastern boundary is Lake Shore Dr. and Lake Michigan and to the west Stony Island Ave. The study area consists of various natural area parcels, all of which are owned by the Chicago Park District within Jackson Park (**Figure 2**). The natural area patches have the potential to provide pond, fringe marsh, sedge meadow, savanna and woodland habitat. The study area in rust color is the area being considered for ecological restoration.



Figure 1: Location of Study Area within the Chicago Region



Figure 2: Vicinity Map of the Jackson Park Showing Study Area

1.5 Prior Studies & Projects

This section summarizes the studies, reports and nearby projects that were already completed on Jackson Park prior to the initiation of this study.

1.5.1 Reports & Studies

- φ South Lakefront Framework Plan, Phase 2 Jackson Park and South Shore Cultural Center

The CPD authorized framework plans for three historic parks: Jackson, Washington and South Shore Cultural Center, all that have Fredrick Law Olmsted design considerations. In an effort to define the changing needs of these parks, to provide a plan to enhance each of the parks' commitments to serving the neighboring communities and to preserve the intended historic character, the CPD developed the Framework Plan for Jackson Park and South Shore Cultural Center. A team of consultants, led by JJR, worked with Chicago residents, community supporters and the CPD to develop a long-range plan for each of the parks, building on the Jackson Park Guidelines of 1996. Through 10 public meetings, 13 focus groups, numerous steering committee meetings and community presentations, a collaborative plan was developed to address each park's issues. The purpose of the Framework Plan was to outline recommendations that will guide land use and management over the next 10-years for Jackson Park and the South Shore Cultural Center. Intended as a living, working document, the Framework Plan is a starting point for a long term process of change that will enhance and preserve the park's character, as well as anticipate future needs. The CPD is now at point under the Framework Plan to begin implementation of improvements.

- φ Lagoon Fisheries Surveys 2012, Illinois Department of Natural Resources.

Provides data on the existing fish community within the Jackson Park lagoons. Two surveys were completed, one in October 2012 and one in November 2012. Total effort includes 4.25-hrs of electrofishing and 1,400-yds of gill/trammel net. Most species present are nonnative, invasive and not indicative of a Lake Michigan coastal pond community. See Section [2.3.3 Fishes](#).

1.5.2 Existing Federal Projects

63rd Street Dune and Fish Habitat Section 506 – This project was implemented by the USACE and Chicago Park District under the Section 506 WRDA 2000 (as amended) Great Lakes Fishery & Ecosystem Restoration authority. The project is currently in the monitoring phase and is showing great success within the restored lake and dune areas. This project would benefit from additional naturalized habitats connecting to and surrounding the site.

CHAPTER 2 – STUDY AREA INVENTORY & FORECASTING

This step of the planning process is to develop an inventory and forecast of critical resources (physical, demographic, economic, social, etc.) relevant to the problems and opportunities under consideration in the planning area. This information is used to define and characterize the problems and opportunities. A quantitative and qualitative description of these resources is made, for both current and future conditions, and is used to define existing and future without-project conditions. Existing conditions are those at the time the study is conducted. The forecast of the future without-project condition reflects the conditions expected during the period of analysis. The future without-project condition provides the basis from which alternative plans are formulated and impacts are assessed. Since impact assessment is the basis for plan evaluation, comparison and selection, clear definition and full documentation of the without-project condition are essential. Gathering information about historic and existing conditions requires an inventory. Gathering information about potential future conditions requires forecasts, which should be made for selected years over the period of analysis to indicate how changes in economic and other conditions are likely to have an impact on problems and opportunities. Information gathering and forecasts will most likely continue throughout the planning process. As such, Chapter 2 contains the following:

- An inventory of relevant historic conditions;
- An inventory of relevant current conditions and the studies that have been completed to identify those conditions; and
- A forecast of future without-project conditions.

2.1 Historic Conditions & Considerations

A detailed history of Jackson Park is provided in Appendix A. It is important to note that the historic designs and designer's intents are in harmony with restoring natural geomorphic and native plant communities within the park's natural areas. Preliminary coordination with the State Historic Preservation Office and the CPD's historical experts are in concurrence with these concepts and fully support the restoration of ecosystem features that would incidentally restore and polish the historical magnificence of this beautiful park.

2.1.1 A Comparison of Historical Plans to Current Design

The last Jackson Park plan designed by Olmsted is the 1895 plan, although subsequent plans are very similar to his design because designers after him wanted to maintain his ideas. The 1895 plan on file at the CPD is useful because it also shows the planting plans designed by Olmsted. For the most part, Jackson Park today looks similar to Olmsted's 1895 plan in terms of the placement of lagoons, open fields, and areas heavily planted with trees and shrubs. Daniel Burnham described Olmsted's landscape style as always including lakes, wooded slopes, and lawns, so it is important to keep these features of the landscape at Jackson Park in order to maintain the Olmsted character. Also, trees line all fields, lagoons, paths, and streets in Jackson Park today, which is congruent with Olmsted's vision in 1895. Out of all the historical plans of Jackson Park on file at the Chicago Park District, the 1905 plan compares best to how Jackson Park looks today (**Plate 1**). Although Olmsted himself was not alive to develop this plan, it was based on Olmsted's previous plans and vision for the park. Noticeable differences between historical plans and current layout of Jackson Park are shown in **Table 1**:

Table 1: Summary of Historical to Current Jackson Park Design Features

	1895 Plan	1905 Plan	Current Aerial
Open fields on east side of park are...	Tennis lawns	Golf Links	Driving range, tennis courts, and Bobolink Meadow
Circular field in SW corner is...	Ball field	Majority is golf links, northern section is ball and tennis field	Same as 1905 except golf course is designed as corridors separated by rows of trees
Connectivity of waterways	All lagoons are connected	Lagoons and harbors all connected	Lagoons not connected to harbors
Two waterways in SE corner	E water is South Haven; W water is Middle and South Lagoon	E water is Yacht Harbor; W water is South Lagoon; Area that is Middle Lagoon in 1895 plan is a field	E and W water are both harbors; Area that is Middle Lagoon in 1895 plan is land (parking lots and fields)
Thin island just south of Wooded Island...	Exists	Exists and called Hunters Island	Does not exist; land further south extends closer to Wooded Island
Circle feature leading into Midway Plaisance is...	East End Basin (waterway connecting West lagoon to Midway Canal)	Land with features unspecified	Land with circle garden feature

2.1.2 Historical Planting Plans

Lists of historical planting plans for Jackson Park that include planting lists that would be useful for restoring the native landscape exist and are archived by the CPD. These were reviewed for applicability to this ecosystem restoration study, and species would be used if they are native to the region and are not considered invasive and injurious species. The 1896 planting list is included in Appendix A. These plans/lists can all be found on file at the CPD:

<u>File Name</u>	<u>Description</u>
0019-0005-1936	1936 Rose Garden Planting Plan
0019-0004-1943	1943 Rose Garden Plan
0019-0014-9999	Key to Botanical Names – Rose Garden – Wooded Island
0019-0069-1937	1937 Iris Garden Planting Plan
0019-0008-1936	1936 Planting Plan
0019-0042-1937	1937 Wooded Island Planting Plan

2.1.3 Wooded Island

The majority of Wooded Island has been designated as the Paul Douglas Nature Sanctuary due to the importance of its woodland, prairie, and shrubland as bird habitat. Bird watchers love Wooded Island because as many as 250 different species of birds can be spotted there. Each spring and fall millions of birds migrating along the shore of Lake Michigan stop at the nature sanctuary looking for food, shelter and a place to rest before continuing on their migration route. Visitors to Wooded Island can also see a variety of plant life and possibly a beaver, muskrat, or turtle along the water's edge.

The island is located on sixteen acres of what once were a glacial lake plain containing sand ridges and marshes. In 1869, the renowned designers of New York's Central Park, Frederick Law Olmsted and Calvert Vaux, were hired to lay out the 1055-acre South Park- which included what became known as

Washington and Jackson parks and the Midway Plaisance. Olmsted completed a second plan for Jackson Park in preparation for the 1893 World's Columbian Exposition. Olmsted's vision for the fair included carving the original dune peninsula into the Wooded Island. Much of the surrounding area was dredged (sand) and filled creating the island sanctuary that exists today. When laying out the fair, Olmsted wanted the island to be regarded as a "nature sanctuary", a place to escape the hustle and bustle of the big event. The site of the old rose garden from the 1893 World's Columbian Exposition is located in the fenced off section in the southern half of the island and intended by the CPD and local birding groups to be oak savanna, woodland and prairie habitat for migratory birds.

Wooded Island has benefitted from some minor restoration work in the past few years, as the CPD, volunteers and other partners have worked to develop a restoration strategy that was formed in 2007. The strategy laid out the groundwork to control and reduce invasive species, while re-establishing native plants and creating an herbaceous understory. Stewardship activities at the site are ongoing and coordination with these groups is intended as part of the planning process.

2.1.4 Japanese/Osaka Garden

In 1980, an effort to rehabilitate the Japanese Garden on the Wooded Island represented the beginnings of a new appreciation for Jackson Park's historic features. In the years following the destruction of the Ho-o-den Japanese pavilion in 1946, the Japanese Garden, had fallen into a state of disrepair. In 1980, the CPD and Chicago Department of Planning jointly applied for funds to reconstruct the Japanese Garden from the Illinois Department of Conservation. Through that agency two federal grants were secured. Mr. Kaneji Domoto of New Rochelle, New York was commissioned to work with the Chicago Park District landscape design staff to develop a plan for a new Japanese Garden. A new waterfall was constructed and the shoreline was reconfigured. The plan included a variety of plantings of Japanese character, a new circular path system, a "Moon Bridge" and a stepping stone bridge. The only remaining element of the historic WPA garden was the Kasuga lantern (located outside the entrance gate). Several other Japanese style granite lanterns were also included in the new garden. The Japanese Garden was formally dedicated in 1981. The Japanese Garden was renamed the Osaka Garden in 1992 to commemorate the 20th anniversary of Chicago and Osaka as members in the Partner City program and their new status as Sister Cities. In 1994, a new formal entry gate was designed by Kobayashi & Associates of Seattle and hand-crafted by John Okumura of Chicago. The Chicago Park District replanted the Japanese Garden in 1995. This study is not including or considering the Osaka Garden for any ecological restoration.

2.1.5 Bobolink Meadow

Bobolink Meadow's prairie restoration has been ongoing since 1989, making it one of the older efforts in Chicago's parks. It was built on the 1893 World's Fair grounds, in an area which was turned into a public golf course shortly after the exhibition, and then leased by the U.S. Army for its Nike missile base (1956–1971). It lies today along the edge of Jackson Park Lagoon, across from the Paul H. Douglas Nature Sanctuary. Nodding wild onion blooms in early summer, and by July, the delicate pink blossoms of obedient plant are abundant. In the late summer and fall, various species of goldenrods and asters make a colorful spectacle. Butterflies and dragonflies are common sights. North of Bobolink Meadow is Bobolink Woods, small woodland that provides a shady transition from prairie to parking lot. This study is not including Bobolink Meadow within the scope of ecological restoration. There would be no Federal involvement in this Nature Sanctuary due to contamination issues stemming from past use as a NIKE Missile site.

2.2 Physical Resources

2.2.1 Geology, Glacial Stratigraphy and Soils

Geology & Glacial Stratigraphy

The underlying regional bedrock is Silurian-age dolomite, most likely of the Niagaran Series. This rock resulted from marine deposition when all of northeastern Illinois and much of the neighboring Great Lakes region was the floor of a tropical sea from about 440 to 410 million years ago. This formation is the foundations for Great Lakes alvars and reefs.

Jackson Park lies over the Dolton Member of the Equality Formation. This member is dominantly sand, but contains pockets of silt, pebbly sand and gravels. Pebbly sand is the dominant material found at Jackson Park as indicated by Willman 1971¹, which was confirmed by USACE staff members on 15 October 2013 by taking several hand borings at various points throughout the study area. This member primarily consists of shore and shallow-water lake deposits, mostly manifested as low ridges, beaches, bars and spits.

Soils

Jackson Park's location on the shoreline of Lake Michigan most likely precluded the development of soils due to the constant shifting of lacustrine and Dolton Member sands. The park was constructed by sculpting the underlying pebbly sands and covering the surface with 12 to 18" of clayey topsoil, which is in good condition for native plants (**Photo 1**).



Photo 1: Sample Core Taken in October 2013 Showing Top Soil and Sand

¹ Willman 1971

2.2.2 Sediment Quality

The sediment of the South Lagoon is pure lake sands and gravels. The sediment of the East and West Lagoons is basically the same as the upland areas; except the layer of top soil is muck that was naturally formed over the sands. The lagoons were then filled with water. Natural deposition of decaying plant and animal matter also has become part of the top layer of sediment. Several cores were taken in October 2013 in the pond and confirm this condition (**Photo 2**).



Photo 2: Typical Gray Sandy Clay Overlay by Natural Muck Found in Lagoons October 2013

2.2.3 Water Quality

The 2010 Illinois Integrated Water Quality Report and Section 303(d) List indicated Jackson Park lagoon in Illinois rated as "fully supporting" aquatic life use. The Lagoons have the same rating as Lake Michigan, which is "not supported" fish consumption due to contamination from mercury and PCBs due to aerial deposition. Jackson Park lagoon was "not assessed" for Primary and Secondary Contact and Aesthetic Quality. Water quality data was collected in Jackson Park from 1989 through 2013. Testing for specific pollutants occurred from 1989 through 2004. This data shows levels of Chloride, Chlorophyll, Phosphorus, Total Suspended Solids which are elevated from the Illinois General Use State Standards. Testing for clarity, pH, temperature, and dissolved oxygen began in 2006 through 2013. These measurements show to be within standard range in comparison with the Illinois General Use State

Standards. Phosphorus was also measured from 2006 through 2010. Phosphorus levels remain elevated within Jackson Park Lake lagoon, most likely due to bioturbation and the lack of aquatic beds².

2.2.4 HTRW Investigation

A HTRW investigation was conducted for Jackson Park and based on a database search, HTRW reports for adjacent properties, reports from USACE Louisville District, review of additional existing information, and a site visit.

Review of the database search identified a leaking underground storage tank (LUST) incident located at 6401 South Richards Drive, which is on the proposed project site. The LUST incident has been identified as an unleaded gas leak which was reported in 1990. The tank operator is listed as the Southern Shore Yacht Club. The latest correspondence was sent to the Southern Shore Yacht Club in April 2009 and the Illinois EPA has not received a response as of January 14, 2014. The extent of contamination associated with the LUST incident is unknown, but due to the proximity of the Southern Shore Yacht Club to the South Lagoon, including the South lagoon which may have been impacted by the LUST, the South Lagoon is not recommended for restoration potential in this study.

The former Nike C-41 Launch and Housing Area was located in Jackson Park, west of Lakeshore Drive near 62nd Street in an area known as Bobolink Meadow. Bobolink Meadow is located within the proposed project limits. USACE Louisville District has conducted several investigations in the Nike C-41 area including geophysical surveys, a Preliminary Assessment recommending a Site Inspection two areas of concern, and a Remedial Investigation at the site to address data gaps generated in the Site Investigation. In the Final Remedial Investigation Report, the USACE Louisville District identified three isolated locations with PAHs above background concentrations in soil at the former Nike C-41 and recommended soil removal in these locations. The 13 August 2013 Project Closeout Summary Report states that the presence of PAHs, SVOCs, and metals in the soils and sediment were potential residual components of fill activities conducted at the site before and after DoD operation; there was no confirmed release from operations at the former Nike C-41 Jackson Park Site. The area of concern was reported to the IEPA PRP program for review, and the project was recommended for closeout in the DERP-FUDS Program. The organization responsible for the recommended removal is undetermined and as such, this area is not recommended for restoration potential in this study.

After the Bobolink Meadow soil contamination and the LUST incident issues are resolved, a future project could be developed in the two areas. No additional concerns were identified within the proposed project location.

2.2.5 Hydrology

Lake Michigan controls ground water elevations at Jackson Park and primarily maintains water levels; however, to ensure the lagoons do not dry up when Lake Michigan is in a lower cycle, a horseshoe concrete weir prevents water from dropping enough to dry out the lagoons (**Photo 3**). There is also a sluice gate structure that prevents the backflow from Lake Michigan into the lagoons when the lake is in a high water cycle (**Photo 4**). Water inputs into the Jackson park lagoons are also derived from overland pervious and impervious surfaces around the park.

² Crivelli 1983, Parkos et al 2003



Photo 3: Horseshoe Weir Control Structure



Photo 4: Lake Michigan Backflow Sluice Gate

2.3 Ecological Resources

This section presents the current conditions for those ecological/biological resources that would be affected by this project. Impertinent resource discussion is avoided in an effort to streamline the plan formulation process. All plant inventory sheets and Floristic Quality Assessment results are provided in Appendix A.

2.3.1 Existing Plant Communities

Pond

The Jackson Park manmade East and West Lagoons and the golf course waterway are classified as Pond community for this study. The existing pond communities are characterized by shallow water absent of aquatic macrophyte beds. Although these lagoons are manmade, they do mimic coastal ponds in geomorphology and substrate materials, such as the Grand Mere Lakes in Berrien County, Michigan. The absence of aquatic macrophyte beds is most likely due to the absence of a native seed bank and/or predation by Common Carp and Canada Geese.

Existing Islands

The existing islands (**Photo 5**) located within the lagoon at Jackson Park are characterized as overall having low quality species that include but are not limited to Tree-of-Heaven, Garlic-Mustard, Canadian Thistle, Queen Anne's Lace, Glossy False Buckthorn, Reed Canary Grass, Common Reed, Kentucky Blue Grass, European Buckthorn, Squill, Staghorn Sumac, and Tall Goldenrod. Some higher quality native species that occur on the islands include Nodding Burr-Marigold, Three-Lobe Beggarticks, Great Blue Lobelia, Wand Panic Grass, Culver's-Root and Nanny-Berry. There are two (2) acres of existing islands located within the study area, which were formed as part of the 1905 Jackson Park design.



Photo 5: Existing Islands with Staghorn Sumac and Weedy Understory

Fringe Marsh

Marsh communities are characterized as having water at or near the surface during most of the growing season and dominated by herbaceous vegetation. There are a few acres of existing marsh-like patches identified within the project area, but for the most part absent from the pond fringes (**Photo 6**). Marshes

would typically be found adjacent to or intermingled with wet prairie and sedge meadows. Most species currently within the study area are non-native and invasive along the shoreline including Annual Ragweed, Lamb's-Quarters, Canadian Thistle, Reed Canary Grass, Common Reed, Catnip, Spearmint, Japanese Bristle Grass, and Highbush-Cranberry. Native species richness is low with opportunistic, mostly annual/biennial hydrophytic species occupying a thin area along some pond fringes such as Devil's-Pitchfork, Spotted Touch-Me-Not, and Mild Water-Pepper.



Photo 6: Absence of Fringing Hemi Marsh Community along Pond Banks

Savanna/Woodland

Savanna and open woodland communities are typically a mix of woodland and grassland species, described as an intermediate community type between closed canopy woodland and open prairie (**Photo 7**). Features that are characteristic of savannas include open-canopied structures dominated by a few species of oak and a diverse, fire-dependent understory with forbs, grasses, and shrubs which exhibit a varying degree of tolerance to different light intensities. Impacts to savanna and open woodland communities include habitat fragmentation and fire suppression, which have caused a shift in species composition within this community type. The absence of a natural fire regime has allowed woody growth to crowd out the herbaceous cover and change the structure and composition of savanna and open woodland communities to more of a typical forest community (**Photo 8**). Most of the savanna and open woodlands within the study area are heavily degraded with a dense understory of invasive shrubs including Highbush-Cranberry and European Buckthorn. Other weedy and/or non native species include Ash-Leaf Maple, Norway Maple, Silver Maple, Horse Chestnut, Tree-of-Heaven, Garlic-Mustard, Beggar's-Lice, White Mulberry, Amur Cork Tree, White Poplar, and Tall Goldenrod. More conservative native species are scattered throughout this habitat type as well, and include Nodding Onion, Red Columbine, Canadian Milk-Vetch, Pennsylvania Sedge, American Hazelnut, Dwarf Honeysuckle, Eastern Wahoo, Sweet-Scented Joe-Pye-Weed, Rough Gayfeather, Short's Aster, Common Hoptree, Northern White Oak, Burr Oak, Pin Oak and Smooth Blue American-Aster.



Photo 7: Woodland Area Showing Lack of Native Herbaceous Understory.



Photo 8: Remnant Burr Oak to be Preserved on Wooded Island

2.3.2 Aquatic Macroinvertebrates

Macroinvertebrate surveys have not been conducted in the waters within Jackson Park; however several studies in Southern Lake Michigan have been done. Garza and Whitman of the United States Geological Survey investigated macroinvertebrate assemblages of Southern Lake Michigan and observed macroinvertebrates from forty taxa. Approximately 81% of the observed taxa consisted of *Chaetogaster diastrophus* and Nematoda. Nalepa et al. (1998) also conducted surveys throughout Southern Lake Michigan that encompasses areas adjacent to the City of Chicago. Their study identified three main groups of macroinvertebrates including *Diporeia* (Amphipoda), Oligochaeta (worms), and Sphaeriidae (bivalves). It is likely that water within Jackson Park has species of macroinvertebrates similar to the composition described in the aforementioned studies.

2.3.3 Fishes

All fish collections within a 1.5-mile radius of the Jackson Park Lagoons were queried from the Fishes of Chicago Region Database. Seventy-nine (79) collections were made between 1895 and 2004 which reveal that about 46 native fish species could or have occurred within the Jackson Park South Lagoon, which is connected with Lake Michigan (**Table 2**). Nonnative fishes include *Alosa pseudoharengus* (alewife), *Carassius auratus* (goldfish), *Ctenopharyngodon idella* (grass carp), *Salmo trutta* (European brown trout), *Cyprinus carpio* (common carp), *Gambusia affinis* (mosquito fish), *Neogobius melanostomus* (round goby), *Oncorhynchus mykiss* (steelhead), *Oncorhynchus tshawytscha* (Chinook salmon), *Osmerus mordax* (rainbow smelt), and *Gasterostueus aculeatus* (threespine stickleback).

Table 2: Native Fishes collected between 1895 & 2004

Species	Common name	Status	Species	Common name	Status
<i>Ichthyomyzon unicuspis</i>	silver lamprey	Ext	<i>Ameiurus nebulosus</i>	brown bullhead	R
<i>Amia calva</i>	bowfin	C	<i>Noturus gyrinus</i>	tadpole madtom	C
<i>Notemigonus crysoleucas</i>	golden shiner	C	<i>Coregonus artedi</i>	lake herring	R
<i>Hybognathus hankinsoni</i>	brassy minnow	Ext	<i>Coregonus hoyi</i>	bloater	R
<i>Pimephales notatus</i>	bluntnose minnow	C	<i>Esox americanus</i>	grass pickerel	C
<i>Pimephales promelas</i>	fathead minnow	C	<i>Esox lucius</i>	northern pike	C
<i>Rhinichthys cataractae</i>	longnose dace	C	<i>Percopsis omiscomaycus</i>	trout perch	R
<i>Cyprinella spiloptera</i>	spotfin shiner	C	<i>Fundulus diaphanus</i>	banded killifish	T
<i>Notropis atherinoides</i>	emerald shiner	C	<i>Cottus bairdii</i>	mottled sculpin	R
<i>Notropis heterolepis</i>	blacknose shiner	R	<i>Ambloplites rupestris</i>	rock bass	C
<i>Notropis hudsonius</i>	spottail shiner	C	<i>Pomoxis annularis</i>	white crappie	C
<i>Notropis stramineus</i>	sand shiner	C	<i>Pomoxis nigromaculatus</i>	black crappie	C
<i>Ictiobus bubalus</i>	smallmouth buffalo	R	<i>Micropterus salmoides</i>	largemouth bass	C
<i>Ictiobus cyprinellus</i>	bigmouth buffalo	R	<i>Micropterus dolomieu</i>	smallmouth bass	C
<i>Ictiobus niger</i>	black buffalo	R	<i>Lepomis cyanellus</i>	green sunfish	C
<i>Carpiodes cyprinus</i>	quillback	R	<i>Lepomis gibbosus</i>	pumpkinseed	C
<i>Moxostoma anisurum</i>	silver redhorse	R	<i>Lepomis gulosus</i>	warmouth	R
<i>Moxostoma macrolepidotum</i>	shorthead readdhorse	R	<i>Lepomis macrochirus</i>	bluegill	C
<i>Catostomus catostomus</i>	longnose sucker	T	<i>Lepomis peltastes</i>	longear sunfish	R
<i>Catostomus commersonii</i>	white sucker	C	<i>Perca flavescens</i>	yellow perch	C
<i>Erimyzon sucetta</i>	lake chubsucker	R	<i>Etheostoma nigrum</i>	Johnny darter	R
<i>Ameiurus melas</i>	black bullhead	C	<i>Percina caprodes</i>	logperch	R
<i>Ameiurus natalis</i>	yellow bullhead	C	<i>Aplodinotus grunniens</i>	freshwater drum	C

Ext = extirpated; T = state threatened; R = rare for Lake Michigan; C = common

A specific ichthyofaunal inventory was completed by the Illinois DNR for the East and West Lagoons. Two surveys were completed, one in October 2012 and one in November 2012. Most species identified

are nonnative, invasive and/or not indicative of a Lake Michigan coastal pond community (**Table 3**). Native species present indicative of a coastal pond community include brown bullhead, pumpkinseed, black crappie and golden shiner.

Table 3: Fishes Inventory within Jackson Park in October and November of 2012.

	10/10/2012		11/1/2012		Total
	EF	Netting	EF	Netting	
Black Bullhead	2		43	1	46
Black Crappie	58		97		155
Bluegill	254		94		348
Bluntnose Minnow			4		4
Brown Bullhead	20			1	21
Bullhead Minnow*	6				6
Channel Catfish	3		1	1	5
Common Carp	29	47	44	38	158
Fathead Minnow			2		2
Gizzard Shad < 6 in.	457		340		797
Gizzard Shad > 6 in.			272		272
Golden Shiner	7		17		24
Goldfish			1		1
Grass Carp	1	1		3	5
Green Sunfish	31		4		35
Hybrid Sunfish	4				4
Largemouth Bass	68	1	79	1	149
Pumpkinseed	12		27		39
White Crappie			1		1
Total	952	49	1026	45	2072

*uncertain record, possibly transferred by bait bucket if actually present since Bullhead Minnow is a species that inhabits large rivers.

2.3.4 Reptiles & Amphibians

Reptiles and amphibians that may be present in the area include the American bullfrog (*Lithobates catesbeianus*), American toad (*Bufo americanus*), painted turtle (*Chrysemys picta*), and the garter snake (*Thamnophis sirtalis*). The area may also support populations of the state threatened salamander known as the mudpuppy (*Necturus maculosus*). These salamanders spend their entire life underwater, foraging rocky shoals for crayfish.

2.3.5 Birds

Nearly 300 species of resident and migratory birds have been observed in the Chicagoland area and the Jackson Park study area resides within a band of important state natural areas and parks that span Lake/Cook County, Illinois. These natural areas serve as a crucial foraging and breeding grounds along the Lake Michigan flyway, which is an important migration route for many songbirds. The coast of Lake Michigan provides a visual north-south sight line, which the birds have evolved to follow as they undergo migration. During the migration periods, March to May and September to mid-October, more than five

million song birds are believed to traverse this flyway, which is a notable fraction of the continents total. Jackson Park also contains Bobolink Prairie (see 2.1.4) which was established in 1982 in hopes of attracting the rare bird to the study area.

2.3.6 Mammals

Common mammals that are adaptive to urban landscapes may occur within the project boundaries. These species include raccoon (*Procyon lotor*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), cottontail rabbit (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), and opossum (*Didelphis virginiana*). With close proximity to Lake Michigan, muskrat (*Ondatra zibethicus*) and the North American beaver (*Castor canadensis*) are also possible within the study area.

2.3.7 Threatened and Endangered Species

Federally-listed Threatened, Endangered, Proposed and Candidate Species were reviewed for the project area by the Chicago District (<http://www.fws.gov/midwest/endangered/section7/index.html>). The following federally listed species, status and their critical habitats are identified by the USFWS as occurring within Cook County:

- Piping plover (*Charadrius melodus*) – Endangered – Wide, open, sandy beaches with very little grass or other vegetation
- Eastern massasauga (*Sistrurus catenatus*) – Candidate – Graminoid dominated plant communities (fens, sedge meadows, peat lands, wet prairies, open woodlands, and shrublands)
- Hine’s emerald dragonfly (*Somatochlora hineana*) – Endangered – Spring fed wetlands, wet meadows and marshes
- Eastern prairie fringed orchid (*Platanthaera leucophaea*) – Threatened – Moderate to high quality wetlands, sedge meadow, marsh, and mesic to wet prairie.
- Leafy-prairie clover (*Dalea foliosa*) – Endangered – Prairie remnants on thin soil over limestone
- Mead’s milkweed (*Asclepias meadii*) – Threatened – Late successional tallgrass prairie, tallgrass prairie converted to hay meadow, and glades or barrens with thin soil
- Prairie bush clover (*Lespedeza leptostachya*) – Threatened – Dry to mesic prairies with gravelly soil

Based on the information listed above and site assessments, federally endangered and threatened species or their critical habitats do not occur within the study area. The study team has coordinated with the U.S. Fish & Wildlife Service and expects concurrence with USACE’s determination of “no effects”.

The Illinois Natural Heritage Database shows the following protected resources may be in the vicinity of the project location: Peregrine Falcon (*Falco peregrinus*).

2.4 Cultural & Architectural Environment

2.4.1 Archaeological & Historical Properties

Jackson Park is listed on the National Register of Historic Places (listed 1972) as an historic landscape. Jackson Park was originally designed in the 1870s, but was little improved until 1890 when Frederick Law Olmsted laid out the World’s Columbian Exposition on the site. The general landscape of the fair including the East and West lagoons, Wooded Island, and the Osaka Japanese Garden, remains fairly intact. The only remaining structure surviving from the fair is the Fine Arts Building, now the Museum of Science and Industry. The design of Jackson Park was later modified somewhat by Daniel Burnham as

part of his Plan of Chicago in 1910. Jackson Park was added to the National Register of Historic Places in 1972. In the 1950s and 60s a Nike Missile Site was located within Jackson Park.

The National Register of Historic Places has 321 listings located within the City of Chicago. These include 270 structures and 51 historic districts. Except for Jackson Park itself, none of these are within the project area. Directly to the north of Jackson Park is the Hyde Park-Kenwood Historic District (listed in 1975 and subsequently enlarged in 1984 and 1986). South of Jackson Park is the South Shore Country Club (listed in 1975). A number of individual listed properties are also located within the University of Chicago and other surrounding neighborhoods near the project area.

Chicago maintains its own list of City Landmarks totaling 256 individual structures and 48 historic districts. Many of these landmarks are also on the National Register of Historic Places. One Chicago City Landmark within Jackson Park, but outside of the project area, is the Museum of Science and Industry (landmarked in 1995). South of Jackson Park is the Jackson Park Highlands Historical District (landmarked in 1989).

The project locale consists of an historic park landscape. Jackson Park was created through heavily landscape modification that included grading, blading and filling to create the historic park landscape. No intact archaeological deposits are present.

Summary of Native American Coordination

The following Native American tribes were contacted by letter regarding the proposed ecosystem restoration project at Jackson Park. Tribes contacted by letter regarding Jackson Park included Kickapoo Tribe of Oklahoma, Kickapoo of Kansas, Miami Tribe of Oklahoma, Citizen Potawatomi Nation, Forest County Potawatomi Executive Council, Nottawaseppi Huron Potawatomi Tribal Office, Hannahville Potawatomi Comm., Council, Pokagon Band of Band of Potawatomi Indians, and the Miami Nation in Indiana. The Kickapoo Tribe of Oklahoma provided a Letter of No Objection dated 30 October 2013; however, they indicated that they be notified in the event of the discovery of intact cultural features or deposits. Mailing list and coordination letters are provided in Appendix A.

Summary of Olmsted Consultation & Compliance

Because Jackson Park is listed on the National Register of Historic Places as an Olmsted designed park, it has been advantageous for the Chicago District to work closely with the Illinois Historic Preservation Agency to ensure that the parks integrity is maintained. Consultations with the Illinois Historic Preservation Agency (IHPA) have been ongoing since the Jackson Park Ecosystem Restoration Project was conceived (letter of December 12, 2012). Early consultations with the IHPA began at the conceptual level of the project (Letter dated March 1, 2013). Staff from the IHPA participated in a site visit at Jackson Park on April 16, 2013 and where they expressed support for the project (letter of April 26, 2013). Approval of the preliminary plans for the Jackson Park restoration was received from the IHPA (letter of November 14, 2013). A progress report was presented to the IHPA (email of November 21, 2013) and acknowledged in a response from them dated (January 31, 2014). A second update that included notification of the Chicago park Districts hiring of an Olmsted expert Landscape architect was sent to IHPA on February 25t, 2014. Consultations continue to insure that this project is a success.

2.4.2 Land Use History

The Jackson Park area was settled by farmers primarily from New York and Pennsylvania in the early 1820s. The area remained farmland until the 1850s when the Illinois Central Railroad was constructed through the area. Taking advantage of the proximity to Chicago and the new rail road connection, a

speculator named Paul Cornell developed the area into an upscale housing development he named Hyde Park. The area prospered as a bedroom community until it was annexed by Chicago in 1889. The newly created University of Chicago found a home in Hyde Park in 1890. The 1893 World Columbian Exposition was held just to the south of Hyde Park. The former exposition site, including the Midway Plaisance, was turned into Jackson Park as part of Daniel Burnham's Plan of Chicago. The extensive parks combined with ready access to the Lake Michigan lakefront made the area a popular resort in the 1930s. Development of the area went through periods of decline and renewal. The Hyde Park and Kenwood neighborhoods to the north of Jackson Park are dominated by the University of Chicago.

2.4.3 Social Setting

Chicago is located in northeastern Illinois at the southwestern tip of Lake Michigan. It straddles the continental divide between the Great Lakes and Mississippi River watersheds. Chicago is the third most populous city in the United States with an ethnically and racially diverse population of approximately 2.6 million people. Median household income for the City of Chicago is \$43, 650 (2010), and the median home cost is \$238,567 (2010). Surrounding communities include Evanston, Oak Park, Cicero, and Evergreen Park.

2.4.4 Recreation

The Chicago Park District provides facilities for a variety of recreational activities at Jackson Park. Softball and soccer fields are present. The historic Jackson Park Golf Course opened in 1893 as the first public golf course in the United States. Jackson Park is also home to two recreational boating harbors. The Jackson Park Inner Harbor has 150 slips, is restricted to motor boats, and is home to the Southern Shore Yacht Club. The Jackson Park Outer Harbor has 192 slips and is home to the Jackson Park Yacht Club. The nearby 63rd Street Beach provides Lake Michigan access for swimming. Located within Jackson Park is Wooded Island. The island is home to the Osaka Japanese Garden. A nature sanctuary on Wooded Island is popular with bird watchers and hikers. Also within Jackson Park are picnic areas and hiking trails.

2.5 Habitat Quality Forecasting

The purpose of this study was to identify problems and solutions to address the altered and degraded ecosystem of Jackson Park. The PDT assessed measures that would improve the quality and increase the quantity of viable habitat within the project area. To determine if a project would be successful in providing increased ecosystem benefits, USACE used ecological indices that appropriately reflected the system of interest. Quality is measured in non-monetary units called Habitat Units that are averaged across the project's life, Average Annual Habitat Units. Habitat Units are a comparative method to 1) quantitatively measure current and FWOP conditions, and 2) quantitatively capture future improvements to habitat resultant of proposed restoration measures.

The level of habitat suitability, which takes into account the structure of the ecosystem, is calculated by developing a Habitat Suitability Index (HSI). The HSI is an algebraic function that uses various habitat structure indicators. Community based indices were employed since the aim is to restore the system as a whole; whereas species specific indices may preclude habitat requisites for the multitude of other species. One HSI that has been certified by the USACE's Center of Expertise for Ecosystem Restoration, the Floristic Quality Assessment, was used to quantify existing ecological conditions, future without project conditions and future with project conditions for the Jackson Park study area since plants are the secondary driver to ecosystem biodiversity. Plant communities are the most indicative for a project such as this since they a) respond to hydrogeomorphic conditions and b) provide structure, food, and cover for

all fish & wildlife, in most cases directly and in some indirectly. This also was the only HSI used to avoid double counting of habitat benefits.

Plant Communities Assessment

The Floristic Quality Assessment (FQA) is based on the Chicago Region’s floristic coefficients of conservatism developed by Swink and Wilhelm (1979) and was approved for regional use by the USACE Ecosystem Planning Center of Expertise (ECO-PCX). The FQA will capture the effects of various future scenarios on the quality of the plant community. Regarding the FQA, the determination of “quality” with respect to plant assemblages has been the subject of much discussion and development in Illinois since the mid 1970’s and more recently, throughout the U.S. and Canada. Quality, as used in this study, is essentially an assessment of the degree to which native plant species to a region are present within a defined area of land. Vegetation, which can be a mix of native and non-native species, reflects long-term natural area stability and/or complexity and this pattern is the basis for the integration of the concept of floristic quality indicating overall system quality. Plants are exceptional indicators of short and long-term disturbance in terms of changes to the geomorphology, soils and/or hydrology of an area. Out of the approximately 2,500 plant species known to occur in the Chicago Region, around one-third were not present before European colonization. Non-native species did not evolve within the same environmental conditions as native species, although their persistence indicates a certain degree of naturalization to the area. Numerically describing the quality of an area using vegetation reflects the level of disturbance to the biological integrity of the site. In the Chicago Region, there is one commonly used approach that attempts to describe plant community quality with a simple numerical metric, which is the Floristic Quality Assessment.

FQA was designed for use as an all inclusive method, not just a method to identify high quality sites. The FQA was originally developed for the Chicago Region, but has since been developed for the whole state of Illinois and for regions and states throughout North America. This method has been extensively studied and shows great promise as a quick and easily understood method of assessing the quality of plant communities in any situation, either urban or an undisturbed remnant setting. The Floristic Quality Index is calculated using FQA Equation 1. Baseline floristic quality was surveyed in fall 2012 and spring 2013, which will serve as a comparison for predictions of changes to the plant community based on alternative future scenarios. The prediction of the biological response will be in terms of acknowledging that a plant’s habitat – water/soil/substrate – is important to the sustainability of reestablished plant communities, and in turn those animal species that are dependent upon them.

FQA Equation 1:

$$FQI = \bar{C}\sqrt{N}$$

Where:

- FQI = Floristic Quality Index
- \bar{C} = Sum of the Coefficient of Conservatism / # of Native Species
- N = Total # of Native Species

2.6 Future Without-Project Conditions

Jackson Park was once a naturally sandy dune system along the coast of Lake Michigan, probably with some portions of it underneath Lake Michigan waters. As described above in the Historic and Current conditions discussion, Jackson Park was ultimately transformed from this natural habitat type to a public

park; however, the designs implemented by Olmsted was that of a naturalistic setting to encourage nature within the city limits of Chicago. The CPD currently maintains both the active and passive recreational portions of the Jackson Park as seen today according to their master plans and protocols. These activities would continue, as foreseen, perpetually into the future without a Federal restoration project. There are no plans or indication of other groups restoring the Jackson Park passive areas to a more naturalistic state as well; however maintenance of the current habitat patches such as Bobolink Meadow would be just enough to maintain the current state. That being the case, the existing conditions (ExHSI) will be the Future Without-Project Conditions (FWOP), since without a Federal project the CPD would continue to maintain the small patches of habitat without expanding them since they have minimal opportunity for these types of projects solely within their own agency. Also, there are a few habitat types that are degraded to an end point in terms of floristic structure and native diversity, such as pond, fringe marsh and sedge meadow. Also, climate change would be negligible for the most part during the 50-year period of analysis. Although there is a potential for average global temperatures to increase, and weather to become flashier, droughty periods with singular high rainfall events, the key to coping with these conditions to have a highly diverse (heterogeneous genotypes) plant communities established so that they can ebb and wan with the changing climate patters, just as they would do natural under natural selection pressures. The FWOP conditions for Jackson Park does not poses a highly diverse native plant community, so if something were to affect the handful of Eurasian plants that dominate the site, there is a potential for complete biological collapse. **Table 4** and **Figure 3** presents the results of the project specific floristic inventory and forecast utilizing the Floristic Quality Assessment as presented in the previous section. **Plate 2** provides the calculation sheet for the FWOP Average Annual HSI and Average Annual Habitat Units (AAHUs). Floristic Quality Assessment sheets and species lists are provided in **Appendix A**. This analysis shows that the current and FWOP conditions for native plant communities, which are the basis for fish and wildlife habitat, are considered ruderal and weedy due to the lack of native conservative plant species indicative of healthy native habitats. Therefore, there is great opportunity for improving the ecosystem at Jackson Park.

Table 4: FWOP Average Annual Habitat Suitability Index Scores and Habitat Units

Description	Habitat Types	Acres	ExHSI	AAHSI	HUs	AAHUs
Current Conditions	Pond	17.7	0		0.0	
	Existing Island	2.0	1.42		2.8	
	New Island	1.3	0		0.0	
	Fringe Marsh	20.0	1.78		35.6	
	Sedge Meadow	2.3	1.56		3.6	
	OS/Woodland	113.1	2.43		274.8	
No Action / FWOP	Pond	17.7	0	0		0.0
	Existing Island	2.0	1.42	1.42		2.8
	New Island	1.3	0	0		0.0
	Fringe Marsh	20.0	1.78	1.78		35.6
	Sedge Meadow	2.3	1.56	1.56		3.6
	OS/Woodland	113.1	2.43	2.43		274.8

Note: The FWOP line for the pond habitat is covered by the New Island line since they are the same value.

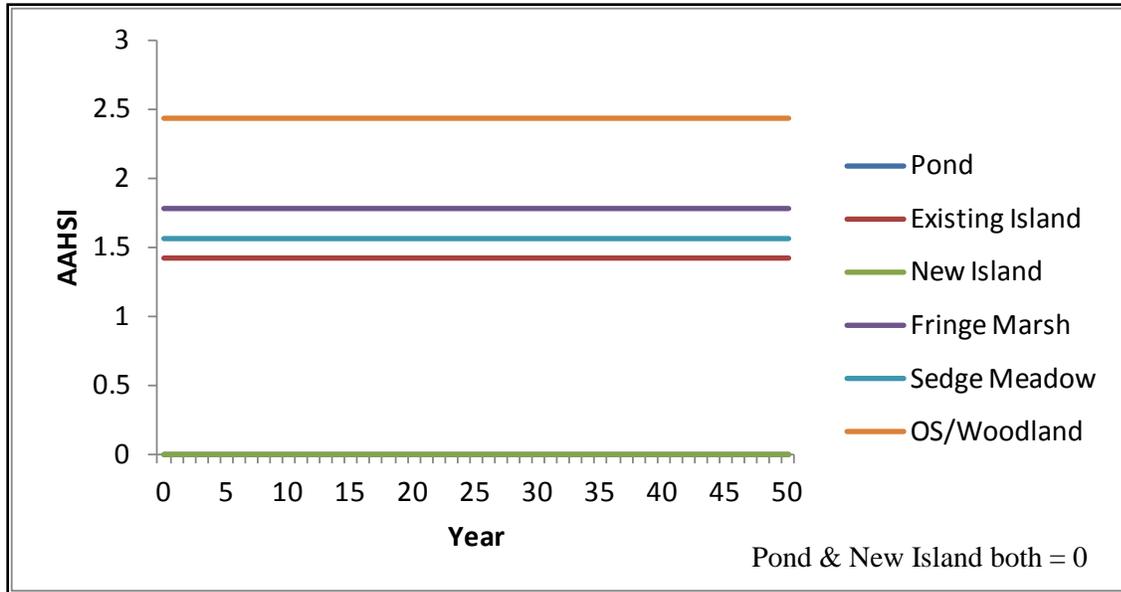


Figure 3: FWOP Average Annual Habitat Type Benefit Prediction for Jackson Park

CHAPTER 3 – Problems & Opportunities

This chapter provides a description of identified problems within the study area along with opportunities for improvement. It also outlines the overall project goal along with a list of planning objectives and constraints.

3.1 Problems and Opportunities

The Great Lakes maintain 20% of the world's freshwater and are important for social, economic, and ecological values throughout the region. However, these values can be lost when the integrity of the system begins to decline. The current trend of the Great Lake's ecosystem is that of decline. Anthropogenic modifications to the system have subsequently caused habitat degradation, fragmentation, pollution and invasive species issues, all of which are intertwined. As a result, ecosystem diversity and clean water have become more of a concern. These trending problems can be lessened and ultimately reversed via physical and institutional efforts. The Jackson Park study provides a look at opportunity to provide restored acres of wetland, fish and wildlife habitat and important migratory bird habitat.

3.1.1 Study Area Problems

One crucial component that is important to ecosystem integrity and integrates both aquatic and riparian or buffer habitat is native plant community richness and structure. Historically, Chicago's shoreline was floristically lush with vast expanses of species rich and structurally diverse wetlands. While restoring wetlands in Chicago to their historical conditions is unlikely in many cases, converting small expanses of land into structurally diverse wetlands and buffering plant communities will provide critical habitat for a number of organisms. These patches of wetland and buffering plant communities would serve as an important refuge for migrant and resident bird species, as well as a variety of aquatic organisms (fish, amphibians, aquatic insects, etc.). The main problems at Jackson Park are as follows:

- Unnatural hydrogeomorphic conditions that promote invasive species success
- Fragmentation of inter and intra site habitat patches
- Absence of submergent aquatic beds (macrophytes/hydrophytes)
- Absence of species rich coastal plant communities
- Absence of rare and sensitive coastal plant and animal species
- Lack of critical habitat for locally endangered and rare fauna
- Lack of migratory bird resting and forage habitats

The alteration, fragmentation, and finally loss, of natural habitats are the major causes of the increasingly rapid decline in overall biotic diversity on Earth³. To solve such problems one must consider not only the dynamics of the target species or process, but also the changes in the biotic and abiotic surroundings⁴. Urban areas can harbor diverse ecosystems ranging from semi-natural habitats to wastelands, parks and other highly human-influenced biotopes with their associated species assemblages⁵. Although ecological processes in cities are the same as in rural areas, some of them, such as invasion by alien species are more prevalent in urban than in rural conditions⁶. Parks, remnants of natural habitats and other green areas are

³ Burgess & Sharpe 1981; Harris 1984; Saunders et al. 1987

⁴ Per Angelstam 1992

⁵ Niemelä 1999

⁶ Niemelä 1999

important for preserving biodiversity in urban areas⁷. Okinger et al investigated the relative importance of habitat type and connectivity for butterfly species richness in the city of Malmö, Sweden and compared species richness and composition in the urban habitats with that in the surrounding agricultural landscape. This study highlights the importance of the urban landscape composition for species richness in urban habitats, but also demonstrates clearly that urban habitats, especially those characterized by an early-successional stage, can be of relatively high conservation value in regions dominated by intensive human land use⁸.

Fernández-Juricic & Jokimäki reviewed the different approaches to studying birds in urban landscapes and identify the importance of the habitat island ecological theory as a research framework for the management and conservation of urban birds. Based on two comprehensive studies conducted at urban parks in Spain (Madrid) and Finland (Oulu and Rovaniemi), several different points related to bird conservation in urban landscapes are presented: “a) urban parks are important biodiversity hotspots in cities; b) fragmentation conditions have the same deleterious effects to urban birds as in other fragmented landscapes; c) park size accounts for species accumulation in urban parks; d) urban parks of 25–85 acres would contain most of the species recorded in cities; e) wooded streets can increase urban landscape connectivity by providing alternative habitat for feeding and nesting during the breeding season.” Because increasing the size of parks is difficult in cities, enhancement of habitat diversity and resource availability for birds within parks appears to be a straightforward way of increasing urban bird diversity⁹.

Donnelly & Marzluff found that larger habitat patches contained richer and less evenly distributed bird communities than smaller habitat patches. It was also found that the greater the habitat diversity, habitat patches would support additional species, some of which were rare. Native forest species were least abundant and synanthropic species (pigeons, house sparrows, rats, common carp) most abundant in urban landscapes, where exotic ground and shrub vegetation was most common. Therefore, control of exotic vegetation may benefit native songbird populations.

The destruction of submerged vegetation by common carp was tested in a marsh of the Camargue, southern France by Crivelli¹⁰. After 71 days, a strong negative relationship was found between the biomass of carp and the amount of aquatic vegetation present in the enclosures. The results are compared with similar studies in the United States¹¹. Parkos et al (2003) examined the effects of adult common carp on shallow aquatic ecosystems and compared the effects with those of a native benthic fish, channel catfish (Ictaluridae). Common carp was positively related to total phosphorus, turbidity, suspended solids, and zooplankton biomass, and negatively related to macrophyte and macroinvertebrate abundance. Suspended solids in the carp treatments consisted primarily of inorganic particles. Carp were either positively or negatively related to phytoplankton, depending on zooplankton abundance. Channel catfish was positively related to total phosphorus concentrations and altered zooplankton composition, but did not affect turbidity, suspended solids, macroinvertebrates, and macrophytes.

3.1.2 Opportunities

Humans fragment and alter landscapes to the detriment of fish and wildlife, especially birds. Marzluff & Ewing¹² review the effects of urbanization on birds inhabiting nearby native habitats and suggest how

⁷ Okinger et al (2009)

⁸ Okinger et al 2009

⁹ Fernández-Juricic & Jokimäki 2001

¹⁰ Crivelli 1983

¹¹ Parkos et al 2003

¹² Marzluff & Ewing (2001)

restoration ecologists can minimize these effects. This study suggests that the severity of the effects of fragmentation is determined by (a) the natural disturbance regime, (b) the similarity of the anthropogenic matrix to the natural matrix, and (c) the persistence of the anthropogenic change. As a result, urbanization is likely to produce greater effects of fragmentation than either agriculture or timber harvest. Marzluff & Ewing emphasize the importance of maintaining, restoring and monitoring species reproduction, survivorship, and dispersal:

Restoration ecologists, land managers, and urban planners can help maintain native birds in fragmented landscapes by a combination of short- and long-term actions designed to restore ecological function (not just shape and structure) to fragments, including: (1) maintaining native vegetation, deadwood, and other nesting structures in the fragment, (2) managing the landscape surrounding the fragment (matrix), not just the fragment, (3) making the matrix more like the native habitat fragments, (4) increasing the foliage height diversity within fragments, (5) designing buffers that reduce penetration of undesirable agents from the matrix, (6) recognizing that human activity is not compatible with interior conditions, (7) actively managing mammal populations in fragments, (8) discouraging open lawn on public and private property, (9) providing statutory recognition of the value of complexes of small wetlands, (10) integrating urban parks into the native habitat system, (11) anticipating urbanization and seeking creative ways to increase native habitat and manage it collectively, (12) reducing the growing effects of urbanization on once remote natural areas, (13) realizing that fragments may be best suited to conserve only a few species, (14) developing monitoring programs that measure fitness, and (15) developing a new educational paradigm¹³.

Also, wetlands can be used in a cost-effective manner to treat nutrient-rich water for release to freshwater ecosystems (Jackson Park Lagoons to Lake Michigan). Hu et al treated eutrophic water hydroponically with the freshwater macrophyte, *Ipomoea aquatica* Swamp Cabbage. After a 48-h exposure to the plant, chemical oxygen demand (COD), biochemical oxygen demand (BOD5), total suspended solids (TSS) and chlorophyll a (Chla) in the effluent were reduced by 84.5, 88.5, 91.1, and 68.8%, respectively, and the removal of nutrients (total nitrogen and total phosphorus) varied between 41.5 and 75.5%. The results of this study indicate that native marsh and plant community reestablishment within nutrient-rich, eutrophic water can be an effective, low-cost technique to restore shallow pond and lake communities¹⁴, and when coupled with rough fish removal¹⁵ would dramatically shift aquatic communities to a more natural, healthy state.

Jackson Park Wetland Hydrology

Currently, there are areas of degraded wetland and riparian areas due to hydrogeomorphic alteration. Based on various areas in most need for geomorphic manipulations within the site, the intent of the non-Federal sponsor, and the expertise of the USACE in reestablishing localized hydrology, great opportunity exists to manipulate geomorphology to successfully reestablish an acceptable hydrology for native plant communities. The Eugene Field Section 206 is an example of opportunity gained by geomorphic manipulation within an urban setting for hydrology exposure, which is now providing aquatic habitat for crayfish, frogs, turtles, great blue herons, green heron, egret, and a multitude of dragonflies and aquatic insects. This CPD park was once a marsh, then drained and filled in, then turned into a park, then sculpted to reestablish hydrogeomorphic characteristics, and finally returned to resemble its former wetland morphology (**Photo 9**). The opportunity seized was to express the hydrology by manipulating

¹³ Marzluff & Ewing 2001

¹⁴ Hu et al 2004

¹⁵ Crivelli 1983, Parkos et al 2003

geomorphology to restore the proper water depths and periodicity for various marsh, wet savanna and meadow patches. These same opportunities exist within the Jackson Park study area.



Photo 9: Eugene Field Park Hydrogeomorphic Wetland Restoration

Jackson Park Invasive Species Domination

Currently, there are areas of degraded native plant communities and completely changed plant communities (ruderal) due to domination by both non-native and native invasive species. Based on the intent of the non-Federal sponsor, Federal Objectives for the control and eradication of invasive species and the expertise of the Chicago District, USACE in eradicating and containing invasive species, great opportunity exists to eliminate or reduce invasive plant species in order to successfully reestablish native plant community species richness and structure. As example of opportunity gained by the eradication of invasive species, the Calumet Prairie and the Little Calumet Riparian Section 506 projects are now indicative of the native plant communities that naturally once occurred at these sites. These two projects simply removed all of the non-native and invasive plant species from Calumet Prairie (wet sand prairie) (**Photo 10**) to both restore hydrology and provide native plant species the opportunity to reclaim the landscape.



Photo 10: Calumet Prairie - Native sedges (*Carex* spp.) and marsh marigolds emerging following invasive species removal adjacent to areas where invasive shrubs and trees have not yet been removed

3.2 Goals, Objectives and Constraints

3.2.1 Goal

The goal of this study is to determine a cost effective and ecologically beneficial plan, while considering No Action, which would restore self-sustaining native plant communities within Jackson Park.

3.2.2 Objectives

Federal Ecosystem Objectives

The Federal objective of water and related land resources planning is to contribute to national economic and/or ecosystem development in accordance with national environmental statutes, applicable executive orders, and other Federal planning requirements and policies. The use of the term “Federal objective” should be distinguished from planning/study objectives, which are more specific in terms of expected or desired outputs whereas the Federal objective is considered more of a National goal. Water and related land resources project plans shall be formulated to alleviate problems and take advantage of opportunities in ways that contribute to study objectives and to the Federal objective. Contributions to national improvements are increases in the net value of the national output of goods, services and ecosystem integrity. Contributions to the Federal objective include increases in the net value of those goods, services and ecosystems that are or are not marketable.

Restoration of the Nation’s environment is achieved when damage to the environment is reversed, lessened, eliminated or avoided and important cultural and natural aspects of our nation’s heritage are preserved. The objectives and requirements of applicable laws and executive orders are considered throughout the planning process in order to meet the Federal objective. The following laws and executive orders that specifically provided guidance for this study are not limited to, but include:

- φ Endangered Species Act of 1973, as amended (16 USC 1531 et seq.)

- φ Fish and Wildlife Coordination Act, as amended (16 USC 661)
- φ Migratory Bird Treaty Act of 1918, as amended (16 USC 703 et seq.)
- φ Responsibilities of Federal Agencies to Protect Migratory Birds (E.O. 13186)
- φ Clean Water Act of 1977, as amended (33 USC. 1251 et seq.)
- φ National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.)
- φ Invasive Species (E.O. 13112)
- φ Nonindigenous Aquatic Nuisance Prevention & Control Act of 1990, as amended (16 U.S.C. 4701 et seq.)
- φ National Invasive Species Act of 1996 (Public Law 104 – 332)
- φ Protection of Wetlands (E.O. 11990)
- φ Protection and Enhancement of Environmental Quality (E.O. 11514)
- φ Protection and Restoration of the Great Lakes (E.O. 13340)
- φ Floodplain Management (E.O. 11988)
- φ Preparing the United States for the Impacts of Climate Change (E.O. 13653)

Responsibilities of Federal Agencies to Protect Migratory Birds (E.O. 13186)

Migratory birds are of great ecological and economic value to this country and to other countries. They contribute to biological diversity and bring tremendous enjoyment to millions of Americans who study, watch, feed, or hunt these birds throughout the United States and other countries. The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. Such conventions include the Convention for the Protection of Migratory Birds with Great Britain on behalf of Canada 1916, the Convention for the Protection of Migratory Birds and Game Mammals-Mexico 1936, the Convention for the Protection of Birds and Their Environment- Japan 1972, and the Convention for the Conservation of Migratory Birds and Their Environment-Union of Soviet Socialist Republics 1978.

These migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats, and through the Migratory Bird Treaty Act (Act), the United States has implemented these migratory bird conventions with respect to the United States. This Executive Order directs executive departments and agencies to take certain actions to further implement the Act(....)

(g) "Federal agency" means an executive department or agency, but does not include independent establishments as defined by 5 U.S.C. 104.

(h) "Action" means a program, activity, project, official policy (such as a rule or regulation), or formal plan directly carried out by a Federal agency. Each Federal agency will further define what the term "action" means with respect to its own authorities and what programs should be included in the agency-specific Memoranda of Understanding required by this order. Actions delegated to or assumed by nonfederal entities, or carried out by nonfederal entities with Federal assistance, are not subject to this order. Such actions, however, continue to be subject to the Migratory Bird Treaty Act.

The Jackson Park restoration project has great potential to provide critical migratory bird habitat as identified by the Field Museum of Natural History, Chicago Audubon Society, the Jackson Park Advisory Council and other local naturalist and birding groups.

GLFER Authority Ecosystem Objectives

Based upon the authorizing legislation and the desires of the fishery management community, the objective of the Great Lakes Fishery and Ecosystem Restoration Program is to provide ecosystem and

fishery managers, and others interested in ecosystem restoration, with a planning, design, and construction tool. The following GLFER objectives apply to this project:

- φ Preserve and restore aquatic and associated riparian habitat as part of an ecosystem approach to fishery management (Restores and enhances Lake Michigan estuary, shoreline and wetland resources for native fishery species such as Yellow Perch and Smallmouth Bass).
- φ The restoration of ecosystems to promote naturally reproducing fish communities based on native or high value naturalized fish populations (Provides estuary and marsh habitat important for spawning fish such as Yellow Perch, Largemouth Bass, Smallmouth Bass).
- φ Control the introduction and/or spread of invasive aquatic species. (Removes non-native plant species from the site).
- φ Evaluate the success of projects in order to make future projects better. (Will monitor the restoration to apply lessons learned to future restoration projects).
- φ Assure coordination between locally implemented restoration actions and basin wide restoration plans. (Close coordination with the Illinois DNR and Chicago Park District to ensure plan goals are being met, but not repeated).

Since the proposed alternative is in accord with GLFER 506 objectives, and ecosystem restoration is a high priority mission, there is strong Federal interest providing habitat outputs to the Great Lakes. There is also Federal interest in other related outputs of the potential alternatives, which include increase in diversity and abundance of native species, restoring natural wetland hydrology, and increasing acres of ecotypes in the Lake Michigan basin. There are opportunities within the study area to implement cost effective and environmentally justified projects that would increase the overall acreage of wetlands and natural habitats with the Great Lakes basin.

Planning Objectives

As part of the USACE Civil Works mission, the federal objective of ecosystem restoration projects is to restore the structure, function and dynamic processes of degraded ecosystems to a less degraded, more natural condition. The non-Federal sponsor has an ecosystem restoration objective that partners well with the federal objective stated above. Study objectives are statements that describe the desired results of the planning process by solving the problems associated with the study purpose and need. These objectives were used for the development and evaluation of alternative plans. Objectives must be clearly defined and provide information on the effect desired, the subject of the objective (what will be changed by accomplishing the objective), the location where the expected result will occur, the timing of the effect (when would the effect occur) and the duration of the effect.

Two (2) planning objectives were identified by the study team, including the non-Federal sponsor and various stakeholders in and used in the formulation of alternatives:

Objective 1 – Reestablish Hydrogeomorphology to Support Natural Communities

Currently, Jackson Park is a result of grading and filling in coastal habitats, therefore there is no natural recovery mechanism aside from a glacial event. This included altering the site's hydrology via soil and clay fill materials and grading-out micro-topography. Thus, changes to the current hydrologic regime desired are those that will rehydrate certain patches. These affects would be sustained over the life of the project and optimistically in perpetuity. This objective seeks to reestablish natural hydrologic and geomorphic parameters to support critical wetland and riparian habitats within the Jackson Park natural area. Improvement is predicted via the increase in quantity (acres) and increase in quality (Mean C Value of the FQA) of native plant communities.

Objective 2 – Eradicate Invasive Species from Pond, Wetland, & Riparian Communities

Currently, Jackson Park’s pond, wetland, and riparian habitats are dominated by non-native and invasive plant species. This condition resulted from alteration to the natural hydrogeomorphic regime, disturbance to native soils, prevention of natural processes, and the planting of non-native and native weedy (ruderal) plants. The domination of plant communities by certain species such as buckthorn and Eurasian grasses have also caused pond banks to unravel, further exacerbating adverse affects to the pond and fringing emergent zone. Also, bioturbation and predation of aquatic plants by Common Carp preclude the growth of native aquatic beds. Thusly, the changes to the native plant community desired are those that will reestablish a base native plant community that will diversify overtime. These affects would be sustained and increased over the life of the project and optimistically in perpetuity. This objective seeks to reestablish native plant community richness and structure to support critical wetland and riparian habitats within the Jackson Park’s natural areas. Improvement is predicted via the increase in quantity (acres) and increase in quality (Mean C Value of the FQA) of native plant communities.

3.3 Planning Constraints

The PDT has identified the following planning constraints, in no particular order, for this project:

- Avoid adverse affects to existing migratory bird and butterfly habitats
- Avoid adverse impacts to the intent and visual aesthetics of Olmsted’s plans and designs
- Avoid adverse impacts to surrounding recreational activities
- Avoid adverse affects to the playability of the Jackson Park golf course
- Minimize the removal of trees that are not considered to be highly invasive or having adverse affects on native species

CHAPTER 4 – Plan Formulation & Evaluation

The formulation, evaluation, and comparison of alternative plans comprise the third, fourth, and fifth steps of the USACE planning process. These steps are often referred to collectively as plan formulation. Plan formulation is an iterative process that involves cycling through these steps to develop a reasonable range of alternative plans, and then evaluating and comparing those plans to select a final recommended plan, which is feasible for implementation.

Plan formulation for ecosystem restoration presents a challenge because alternatives have non-monetary benefits. To facilitate the plan formulation process, the Study Team used the methodology outlined in USACE Engineering Regulation, ER 1105-2-100, Planning Guidance Notebook. The steps in the methodology are:

1. Identify a primary project purpose. For this study, ecosystem restoration (ER) is identified as the primary purpose.
2. Formulate and screen management measures to achieve planning objectives and avoid planning constraints. Measures are the building blocks of alternative plans.
3. Formulate, evaluate, and compare an array of alternatives to achieve the primary purpose and identify cost effective plans.
4. Perform an incremental cost analysis on the cost effective plans to determine the National Ecosystem Restoration (NER) plan.

4.1 Habitat Measures

The codes provided for each measure are for purposes of plan formulation via the IWR Planning Suite program, and are not intended to be direct acronyms. This coding is important to be unique for recognition within the programming.

Geomorphic & Hydrologic Restoration

Geomorphic Contouring (GC) – This measure consists of contouring bank areas that are unnaturally steep to a) expose hydrology in certain reaches and b) promote healthy native plant cover. Certain lagoon banks are experiencing minor erosion problems and have become quite steep. Overtime, this condition has allowed various areas to become unvegetated, further exacerbating unnatural bank conditions. These areas are then over taken by nonnative weeds. In some areas the existing plant community has contributed to over shading, which has caused bare soil patches. This lack of herbaceous understory and dense root structure allows for rain waters to wash soils away very easily. Proposed earth contouring areas and wetland scrapes are shown on **Plate 3** and follow Olmsted’s design contours. These contours, for the most part, work well with an ecosystem project because they mimic natural palustrine wetland system morphology and provide stable ground for native vegetation to be planted. Grading select bank areas back would allow for natural fluctuations in the lagoon to reach the wetland fringe plantings and provide needed shoreline insect, fish, frog and migratory bird habitat.

New Island Creation (NIC) – This measure would create new islands within the lagoon which would follow Olmsted’s original design for Jackson Park. There are about 10 small islands totaling 1.6-ac shown on **Plate 3**. The islands would be created to provide habitat around the lagoon for turtles, frogs and migratory and resident bird species. The elevations of the island would be set to create a wet-shrub prairie near the crest and grading down to more of a marsh like condition. The creation of the islands would include:

- Use biodegradable coir logs to form the desired shape of the island
- Build the islands by using excess bank grading material or excavated sand
- Mix in specified amendments (leaf litter compost) to propagate native wet-shrub prairie species
- Stabilizing the islands with a temporary cover crop while vegetation is being established

Vernal Pool Creation (VP) – This measure seeks to create ephemeral wetlands which hold water long enough to support critical life cycles of amphibians and invertebrates, but dry out as natural vernal pools do. Potential vernal pool locations are shown on **Plate 3**. The vernal pools would be designed to ensure the wetland does not dry up during wet months, which would inhibit the development of amphibian and insect larvae and negatively impact critical life cycles. The design would be less concerned with needing the vernal pools to dry out in years with above average rainfall since there would be no avenue for fishes to colonize. These pools would be small excavations that would hold no more than 6” of standing water within existing low areas to recreate vernal pools and would not be very visible unless one was specifically looking for them.

Mudpuppy Habitat (*Necturus maculosus*) (MH) – This measure seeks to provide mudpuppy habitat within the Jackson Park South Lagoon. Potential mudpuppy hut locations are shown on **Plate 3**. Mud puppies have been historically linked with the Chicagoland area and within park lagoons that have a connection with Lake Michigan, as Jackson Park has. Mudpuppies require an entirely aquatic habitat with a sheltered surface, such a limestone slabs, to deposit eggs onto during nesting season.

- Install limestone slabs, stacked along shore, but at least 12 inches below the lagoon’s water surface to provide suitable nesting habitat within the outer lagoon of Jackson Park

Plant Community Restoration

Invasive Plant Species Removal (IPR) – This measure seeks to address 113.3-acres of invasive and non-native plant species from all plant communities located with Jackson Park as shown on **Plate 3**. Invasive, non-native plant species lead to the degradation of suitable habitat and contribute to the overall loss of biodiversity within Jackson Park lagoon. Non-native species commonly occurring within this site include:

Kentucky blue grass (*Poa pratensis*), meadow fescue (*Festuca pratensis*), common plantain (*Plantago major*), English plantain (*Plantago lanceolata*), hairy crab grass (*Digitaria sanguinalis*), yarrow (*Achillea millefolium*), sidewalk knotweed (*Polygonum arenastrum*), white clover (*Trifolium repens*), and common dandelion (*Taraxacum officinale*). Wetland species found within these areas include tolerant and aggressive native species such as three-square (*Schoenoplectus pungens*) and river club-rush (*Schoenoplectus fluviatilis*) as well as invasive species including purple loosestrife (*Lythrum salicaria*) and reed canary grass (*Phalaris arundinacea*). Typical prairie species used in native landscaping projects resemble a disturbed prairie community composed of predominantly early successional and aggressive species such as Indian grass (*Sorghastrum nutans*), Canada wild rye (*Elymus canadensis*), yellow coneflower (*Ratibida pinnata*), big bluestem (*Andropogon gerardii*), black-eyed Susan (*Rudbeckia hirta*), hairy aster (*Aster pilosus*), and tall goldenrod (*Solidago altissima*) as well as other prairie species such as cup-plant (*Silphium perfoliatum*), nodding onion (*Allium cernuum*), and hard-leaf flat-top-goldenrod (*Oligoneuron rigidum*). Non-native and invasive species also dominate unmowed and planted areas including garden bird’s-foot-trefoil (*Lotus corniculata*), red clover (*Trifolium pratense*), yellow foxtail (*Setaria glauca*), yellow sweet-clover (*Melilotus officinalis*), queen Anne’s lace (*Daucus carota*), and smooth brome (*Bromus inermis*).

Non-native and invasive woody plants are found throughout the site such as tree-of-heaven (*Ailanthus altissima*), high-bush cranberry (*Viburnum opulus* var. *opulus*), white poplar (*Populus alba*), weeping

willow (*Salix babylonica*), winged euonymus (*Euonymus alatus*), white mulberry (*Morus alba*), coral-berry (*Symphoricarpos orbiculatus*)

Opportunistic native trees such as box elder (*Acer negundo*), cottonwood (*Populus deltoides*), and green ash (*Fraxinus pennsylvanica*) are found in large numbers within areas resembling degraded woodlands; however, most of these trees would remain to provide appropriate canopy cover until desired trees grow to maturity. Planted native shrubs and trees are also found throughout the site including smooth blackhaw (*Viburnum prunifolium*), American hazelnut (*Corylus americana*), common buttonbush (*Cephalanthus occidentalis*), redbud (*Cercis canadensis*), common hackberry (*Celtis occidentalis*), eastern wahoo (*Euonymus atropurpureus*), and American witch-hazel (*Hamamelis virginiana*).

- Selective tree removal over 4" DBH
- Removal of non-native vegetation through herbicide/mechanical removal
- Spot herbicide all invasive aquatic and terrestrial species through the duration of the establishment period
- Perform prescribed burns in recommended areas

Pond (P) – This measure seeks to improve the pond habitat structure and quality of the North Lagoon and golf course slough (**Plate 4**). This measure is depended on measure IPR. Approximately 17.7-ac of pond habitat would be affected, but not totally planted. Submergent macrophytes would be planted in patches and then predicted to spread throughout the pond overtime. These patches would be protected with anti-predatory meshing/fencing until established. The installation of live submergent plugs include but is not limited to: pondweeds (*Potamogeton* spp.), Yellow Pond-Lily (*Nuphar advena*) Water Shield (*Brasenia schreberi*), and Eel Grass (*Vallisneria americana*).

Existing Island (EI) – This measure seeks to improve the existing island habitat structure and quality of the North Lagoon (**Plate 4**). These islands were designed by Olmsted to create seclusion, which is excellent for providing calm areas for nesting herons and water birds. This measure is depended on measure IPR. Approximately 2.0-ac of existing island habitat would be affected. Wet prairie grass, forb and shrub species would be planted over the whole 2.0-ac. These plantings would be protected with anti-predatory meshing/fencing until established. The installation of live plugs includes but is not limited to: Swamp Loosestrife (*Decodon verticillatus*), St. John's Wort (*Hypericum kalmianum*), and royal catchfly (*Silene regia*). Measure activities include:

- Certain native shrubs and staghorn sumac would be retained
- Plant specified native plugs
- Spot herbicide invasive species for remainder of project
- Perform prescribed burns (as needed) over a five year period

New Island (NI) – This measure seeks to establish vegetative cover on the new islands to provide habitat structure and quality within the North and South Lagoons (**Plate 4**). These islands were designed by Olmsted to create seclusion, which is excellent for providing calm areas for nesting herons and water birds. This measure is depended on measure NIC. Approximately 1.6-ac of new island habitat would be affected. Wet prairie grass, forb and shrub species would be planted over the whole 1.6-ac. The installation of live plugs includes but is not limited to: Swamp Loosestrife (*Decodon verticillatus*), St. John's Wort (*Hypericum kalmianum*), and Royal Catchfly (*Silene regia*). Measure activities include:

- Seed the islands with a native seed mix to establish native vegetation cover
- Plant herbaceous plugs, trees and shrubs of native species to provide habitat structure and diversity
- Spot herbicide invasive species for remainder of project

- Perform prescribed burns (as needed) over a five year period

Fringe Marsh (FM) – This measure seeks to establish fringe/hemi marsh to provide habitat structure and quality within the North and South Lagoons (**Plate 4**). Certain patches of hemi marsh would only be planted with and maintained for shorter stature marsh grasses in order keep Olmsted’s lines of sight intact. This measure is depended on measure IPR. Approximately 19.8-ac of new fringe marsh would be restored. Hydrophytic grass, forb and shrub species would be planted over the whole 19.8-ac. These plantings would be protected with anti-predatory meshing/fencing until established. The installation of live plugs includes but is not limited to: Crimson-Eyed Rose-Mallow (*Hibiscus moscheutos*), Lamp Rush (*Juncus effusus*), Lakebank Sedge (*Carex lacustris*), Pickerelweed (*Pontedaria cordata*), and White Meadowsweet (*Spiraea alba*). Measure activities include:

- Selectively seed the hemi marsh areas with a native seed mix to establish native vegetation cover
- Plant plugs of native marsh species to provide habitat structure and diversity
- Spot herbicide invasive species for remainder of project
- Perform prescribed burns (as needed) over a five year period

Sedge Meadow (SM) – This measure seeks to establish sedge meadow to provide habitat structure and quality at locations shown on **Plate 4**. The areas recommended for sedge meadow restoration would be in congruence with Olmsted’s plan since the action would create a plant community patch with lower growing vegetation. Currently these two areas have weedy shrubs and trees that completely block visual lines of sight into and over. This measure is dependent on measure IPR. Approximately 2.3-ac of sedge meadow would be restored. Hydrophytes, primarily sedges, would be seeded and planted over the whole 2.3-ac. These plantings would be protected with anti-predatory meshing/fencing until established. Native plant species to be reestablished include but are not limited to: Cloud Sedge (*Carex haydenii*), Groove-Stem Indian-Plantain (*Arnoglossum plantagineum*), Sensitive Fern (*Onoclea sensibilis*), and Parasol White-Top (*Doellingeria umbellatus*). Measure activities include:

- Selectively seed the sedge meadow areas with a native seed mix to establish native vegetation
- Plant plugs of native sedge meadow species to provide habitat structure and diversity
- Spot herbicide invasive species for remainder of project
- Perform prescribed burns (as needed) over a five year period

Oak Savanna / Woodland (OSW) –This measure seeks to restore intertwined savanna and open woodland habitats (**Plate 4**). This measure seeks to restore existing (oak) savanna habitat where large remnant burr oaks (*Quercus macrocarpa*) are found that has further degraded as a result of fire suppression. The areas recommended for savanna restoration would be in congruence with Olmsted’s plan since the action would create more open visual vistas, which are currently clogged with nonnative shrubs. This measure is dependent on measure IPR. Approximately 25.0-ac of oak savanna would be restored. Savanna grass, forb and shrub species would be seeded and plugged over the whole 25.0-ac. These plantings would be protected with anti-predatory meshing/fencing until established. Native plant species to be reestablished include but are not limited to: Black Oak (*Quercus velutina*), Hill’s Oak (*Quercus ellipsoidalis*), Wild Lupine (*Lupinus perennis occidentalis*), Pennsylvania Sedge (*Carex pensylvanica*), Canadian Lousewort (*Pedicularis canadensis*), and Silky Aster (*Symphotrichum sericeum*). Measure activities include:

- Selectively seed the savanna areas with a native seed mix to establish native vegetation cover
- Plant plugs of native savanna species to provide habitat structure and diversity
- Spot herbicide invasive species for remainder of project
- Perform prescribed burns (as needed) over a five year period

This measure also seeks to restore existing woodland habitat where large Hackberry (*Celtis occidentalis*), oaks (*Quercus* spp.), American Sycamore (*Platanus occidentalis*) and Northern Catalpa (*Catalpa speciosa*) are found. The areas recommended for woodland restoration would be in congruence with Olmsted's plan since the action would maintain current open visual vistas and seclusion areas. This measure is dependent on measure IPR. Approximately 88.1-ac of woodland would be restored. Woodland grass, forb and shrub species would be seeded and plugged over the whole 88.1-ac. Native tree and plant species to be reestablished include but are not limited to: Pennsylvania Sedge (*Carex pensylvanica*), Eastern Bottle-Brush Grass (*Elymus hystrix*), Downy Service-Berry (*Amelanchier arborea*), Starry False Solomon's-Seal (*Maianthemum stellatum*), Black Huckleberry (*Gaylussacia baccata*), and Smooth Blackhaw (*Viburnum prunifolium*). Measure activities include:

- Selectively seed the woodland areas with a native seed mix to establish native vegetation cover
- Plant plugs of native woodland species to provide habitat structure and diversity
- Plant native woodland trees to replace removed invasive and nonnative tree species
- Spot herbicide all invasive herbaceous species and woody resprouts for remainder of project
- Perform prescribed burns (as needed) over a five year period

Fish Community Restoration

Fish Community Separator (FF) – This measure seeks to isolate the Columbia Basin game fishery from the East and West Lagoon native pond fish community (**Plate 3**). The Columbia Basin is stocked with a low diversity of native game fishes (Bluegill, Bass, Channel Catfish) for an important urban education and recreation program provided by the State of Illinois DNR. It would be prudent to keep the East and West Lagoons and the Columbia Basin fish assemblages separate so they can both be managed appropriately, one for the urban fishing program and one for native glacial pond. In addition, this provides an excellent education tool for the public about the differences between fisheries and native fish communities. It is acceptable for small native fishes and fry to pass through the fence, while there is no potential for hatchery fishes to pass through the fence since their body sizes would not be small enough at the time of stocking.

- Install ¼” meshed fish fence between the connect of the Columbia Basin and the North Lagoon
 - Materials would be optimized for both technical and cost effectiveness

Invasive Fish Removal (FIR) – This measure seeks to eradicate fish species not indicative of a coastal Lake Michigan pond community from the East and West Lagoons only in Jackson Park. Non indicative and rough species which can be found within the isolated east and west lagoons include: Common Carp, Gizzard Shad, Black Bullhead, Channel Catfish, Goldfish, Green Sunfish, and Bluegill. Removal measures include:

- Inventory of all fish current inhabiting the Jackson Park lagoon (provided by ILDNR)
- Physically collect and store in a pen(s) a viable number of the following desirable native species for reintroduction following rotenone application:
 - Black Crappie, White Crappie, Brown Bullhead, Pumpkinseed (robust individuals)
- If necessary, draw down of the lagoon to allow fish to concentrate in a smaller work area
- Administer rotenone, with assistance from Illinois Department of Natural Resources, from small motorized john boats
- Remove fish from lagoon and properly dispose or recycle

Native Species Reintroduction (FNS) – This measure seeks to reintroduce native mussel, fish and newt species into the North Lagoon at Jackson Park. Introduction of native pond species is critical to restoring the overall health of the lagoons at Jackson Park. Native mussel and fish species control phyto- and

zooplankton interactions, play a role in nutrient flux and provide food for other native species, including migratory bird populations. Native pond species to be reintroduced are provided in **Table 5** and based on other healthy communities as reference from the area include. Some of these species include Paper Pondshell, Bowfin, Blackchin Shiner, Lake Chubsucker, Grass Pickerel, Northern Pike, Banded Killifish, Iowa Darter and Eastern Newt.

- Once rotenone dissipates, return collected and stored native fishes to the pond
- Release fathead minnows, golden shiners and mud minnow into the lagoon to provide water birds with prey
- Introduce and monitor mussel species
- Allow for native submergent and emergent macrophytes to reestablish for several years
- Introduce more sensitive species of fish from local source population slowly overtime monitoring and documenting the procedures in detail
- Introduce Eastern Newt to Ponds and vernal pools and monitor results

Table 5: Native Pond Species Introduction List for Measure FNS

Species	Common Name
Mussels	
<i>Pyganodon grandis</i>	Giant Floater
<i>Utterbackia imbecillis</i>	Paper Pondshell
<i>Lampsilis siliquoidea</i>	Fatmucket
<i>Toxolasma parvus</i>	Lilliput
Fishes	
<i>Amia calva</i>	Bowfin
<i>Notemigonus crysoleucas</i>	Golden Shiner
<i>Pimephales promelas</i>	Fathead Minnow
<i>Cyprinella spiloptera</i>	Spotfin Shiner
<i>Notropis heterodon</i>	Blackchin Shiner
<i>Erimyzon sucetta</i>	Lake Chubsucker
<i>Ameiurus nebulosus</i>	Brown Bullhead
<i>Noturus gyrinus</i>	Tadpole Madtom
<i>Esox americanus</i>	Grass Pickerel
<i>Esox lucius</i>	Northern Pike
<i>Umbra limi</i>	Central Mudminnow
<i>Fundulus diaphanus</i>	Banded Killifish
<i>Pomoxis nigromaculatus</i>	Black Crappie
<i>Lepomis gibbosus</i>	Pumpkinseed
<i>Lepomis gulosus</i>	Warmouth
<i>Etheostoma exile</i>	Iowa darter
<i>Etheostoma nigrum</i>	Johnny darter
Amphibian	
<i>Notophthalmus viridescens</i>	Eastern Newt

4.2 Habitat Measures Cost & Assumptions

Conceptual, planning-level cost estimates were prepared for measures/features that were identified by the study team in conjunction with the non-Federal Sponsors. These cost estimates do not represent complete

project construction estimates, but rather individual restoration measures or components of the entire project. The measures were used to provide an economic basis for the development of project alternatives. Once the project alternatives went through the plan formulation process, and additional design information developed for the recommended plan, a more detailed and reliable cost estimate was performed. Planning level cost estimates were developed using data from current construction contracts and other studies. A 25% contingency was applied to all measures. Planning level unit costs were placed into a matrix to utilize the different costs for each measures of work. Costs include initial value estimate real estate, adaptive management and operations and maintenance.

Cost Annualization: Annualizing costs is a method whereby the project costs are discounted to a base year then amortized over the period of analysis. The base year for this project was determined to be the year in which the first phase of the project is to be completed (calendar year 2015). Costs that occur prior to this year need to be compounded to the base year, while those occurring after the base year need to be discounted to the base year. The period of analysis for this project is 50 years. The present value method was used to discount future costs to the base year. Costs are compounded or converted to present value for the base year then amortized over the 50-year period of analysis to determine the average annual cost. The discount rate was determined by the appropriate Economic Guidance Memorandum Economic Guidance Memorandum 13-01, Federal Interest Rates for Corps of Engineers Projects, which is 3.5%. The individual measures of the project have the construction period spread out over 1 to 5-years. Each year of every measure is either compounded or discounted to the base year. Calculation of the measures Average Annual Cost (AA Cost) is completed by multiplying the present value to the 50-year amortization factor (Table 6).

Table 6: Total and Average Annual Costs per Measure.

Code	Measure	Measure Cost	IVE LERRD	AA O&M	AA Cost	Dependency
GC	Geomorphic Contouring					
NIC	New Island Creation					
VP	Vernal Pool					SM, OS
MH	Mudpuppy Habitat					
IPR	Invasive Plant Species Removal					
P	Pond					FF, FIR, MH
EI	Existing Island					IPR
NI	New Island					NIC
FM	Fringe Marsh					IPR
SM	Sedge Meadow					IPR, GC
OS	Oak Savanna / Woodland					IPR
FF	Fish Community Separator					
FIR	Invasive Fish Species Removal					
FNS	Native Fish Species Reintroduction					FF, FIR, P

Real Estate: [REDACTED]

4.3 Habitat Measures Benefits

The evaluation of habitat benefits is a comparison of the with-project and without-project conditions for each measure (Table 7 & Figure 4). Environmental outputs are the desired or anticipated measures

products or results of restoration measures and plans. The term “outputs” is often used interchangeably with “benefits” or “habitat units (HUs)”. Ecosystem restoration plans may possess multiple output categories, as well as other effects that may need to be considered, but the evaluation must at least address cost and an output category that has been determined to represent reasonable ecosystem restoration benefits. A comparison of the future without-project and future with-project HUs was performed in order to determine if a measures, or group of measures, will have beneficial effects to the Jackson Park ecosystem. The measures for this study were evaluated using the Mean C of the Chicago Region Floristic Quality Assessment (FQA) methodology ([Section 2.5 Habitat Quality Forecasting](#)). **Plate 5** provides the calculation sheet for the FWP Average Annual HSI and Average Annual Habitat Units (AAHUs). Floristic Quality Assessment sheets and species lists are provided in **Appendix A**.

Table 7: Total and Net Average Annual Habitat Units per Measure*

Description	Habitat Types	Acres	AAHSI	AAHUs	NAAHUs
No Action / FWOP	Pond	17.7	0	0.0	
	Existing Island	2	1.42	2.8	
	New Island	1.3	0	0.0	
	Fringe Marsh	20	1.78	35.6	
	Sedge Meadow	2.3	1.56	3.6	
	OS/Woodland	113.1	2.43	274.8	
Action / FWP	Pond	17.7	5.62	99.5	99.5
	Existing Island	2	6.51	13.0	10.2
	New Island	1.3	6.51	8.5	8.5
	Fringe Marsh	20	5.62	112.4	76.8
	Sedge Meadow	2.3	5.80	13.4	9.8
	OS/Woodland	113.1	6.28	710.1	435.3

*See Table 4 for FWOP AAHUs

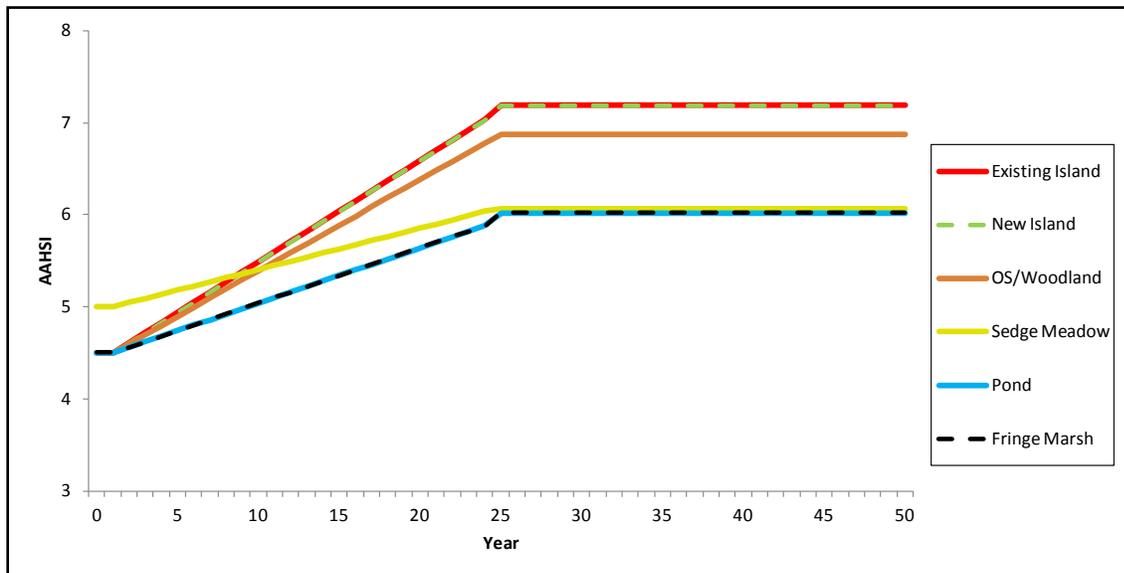


Figure 4: Net Average Annual Habitat Units over 50-year Period of Analysis

*Note: Existing Island and New Island as well as Pond and Fringe Marsh share the exact same values for the average annual habitat units. Because of this the lines are represented by a solid line with an overlying dashed line.

4.4 Alternative Plan Generation

Fifteen (15) measures, including the No Action measure, were input into the IWR-Planning Suite in terms of costs and benefits shown in **Tables 6** and **7**. Vernal Pool (VP) restoration was dependent on restoring Sedge Meadow (SM) and Savanna/Woodland (OSW) habitats. Fish Community Separator (FF), Invasive Fish Species Removal (FIR), Mudpuppy Habitat (MH) and Native Species Reintroduction (FNS) were dependent on restoring Pond (P) habitat. All plant community habitat restorations (P), (EI), (NI), (FM), (SM) and (OSW) were dependent on Invasive Species Removal (IPR). Patches of Sedge Meadow (SM), Fringe Marsh (FM) and Savanna/Woodland (OSW) were dependent on Geomorphic Contouring (GC). New Island (NI) plant community was dependent on New Island Creation (NIC). Based on these inputs and criteria, the IWR-Planning software generated 66 alternative combinations for ecosystem restoration. These alternative combinations were analyzed with the IWR Planning Suite Cost Effective & Incremental Cost Analysis, which are presented in the following sections.

4.5 Cost Effectiveness/Incremental Cost Analysis

Cost effectiveness and incremental cost analysis (CE/ICA) are two distinct analyses that must be conducted to evaluate the effects of alternative plans according to USACE policy. First, it must be shown through cost effectiveness analysis that a restoration plan's output cannot be produced more cost effectively by another alternative. *Cost effective* means that, for a given level of non-monetary output, no other plan costs less and no other plan yields more output at a lower cost.

Incremental cost analysis means that the subset of cost effective plans are examined sequentially to ascertain which plans are most efficient in the production of environmental benefits. Those most efficient plans are called "best buys." As a group of measures, they provide the greatest increase in output for the least increases in cost. They have the lowest incremental costs per unit of output. In most analyses, there will be a series of best buy plans, in which the relationship between the quantity of outputs and the unit cost is evident. As the scale of best buy plans increases (in terms of output produced), average costs per unit of output and incremental costs per unit of output will increase as well. The incremental analysis by itself will not point to the selection of any single plan. The results of the incremental analysis must be synthesized with other decision-making criteria (i.e., significance of outputs, acceptability, completeness, effectiveness, risk and uncertainty, reasonableness of costs) to help the study team select and recommend a particular plan.

4.5.1 Cost Effectiveness

The cost effectiveness analysis was used to ensure that certain options would be screened out if they produced the same amount or less output at a greater cost than other options with a lesser cost. Sixty six (66) alternative combinations were analyzed for cost effectiveness. Of these, seventeen (17) cost effective combinations were identified (**Figure 5**), which is inclusive of the five (5) Best Buy Plans. The No Action plan is always deemed cost effective and a Best Buy Plan. Forty-nine (49) alternative combinations were screened out as non-cost effective.

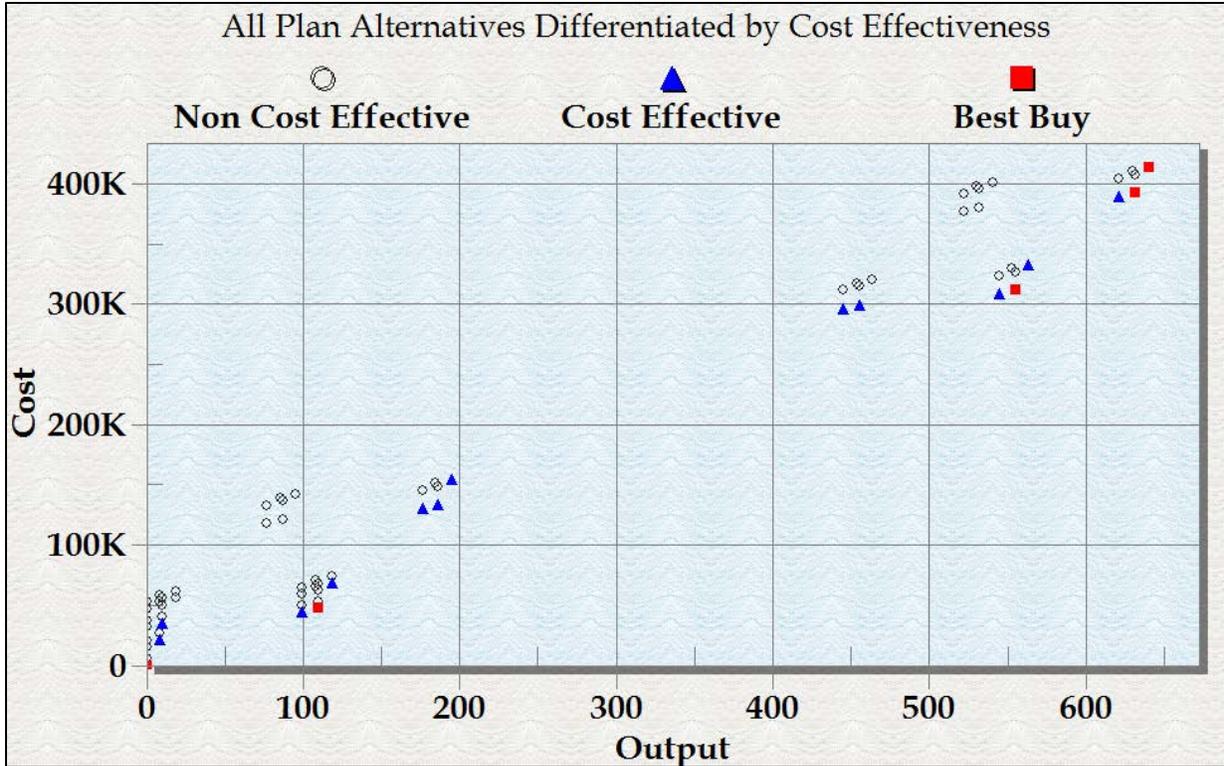


Figure 5: Cost Effective Analysis on 66 Alternative Combinations

4.5.2 Incremental Cost Analysis

An incremental cost analysis was performed on the five (5) Best Buy Plans identified from the cost effectiveness analysis. The objective of the incremental cost analysis is to assist in determining whether the additional output provided by each successive plan is worth the additional cost. This incremental cost analysis (Table 8 and Figure 6) compares seven alternative combinations for ecological restoration that were considered for selecting as the National Ecosystem Restoration (NER) Plan:

Table 8: Summary of CE/ICA “Best Buy” Alternative Plans

#	Alternative Plan	HU	AA Cost	AA Cost / HU	Inc. Cost	Inc. HU	Inc. Cost / HU
1	No Action Plan	0	0				
2	MH, IPR, P, EI, FF, FIR & FNS	109.7	████████	██████	████████	109.7	██████
3	GC, VP, MH, IPR, P1 EI, SM, OSW, FF, FIR & FS	554.8	████████	██████	████████	445.1	██████
4	GC, VP, MH, IPR, P, EI, FM, SM, OSW, FF, FIR & FNS	631.6	████████	██████	████████	76.8	██████
5	GC, NIC, VP, MH, IPR, P, EI, NI, FM, SM, OSW, FF, FIR & FNS	640.1	████████	██████	████████	8.5	██████

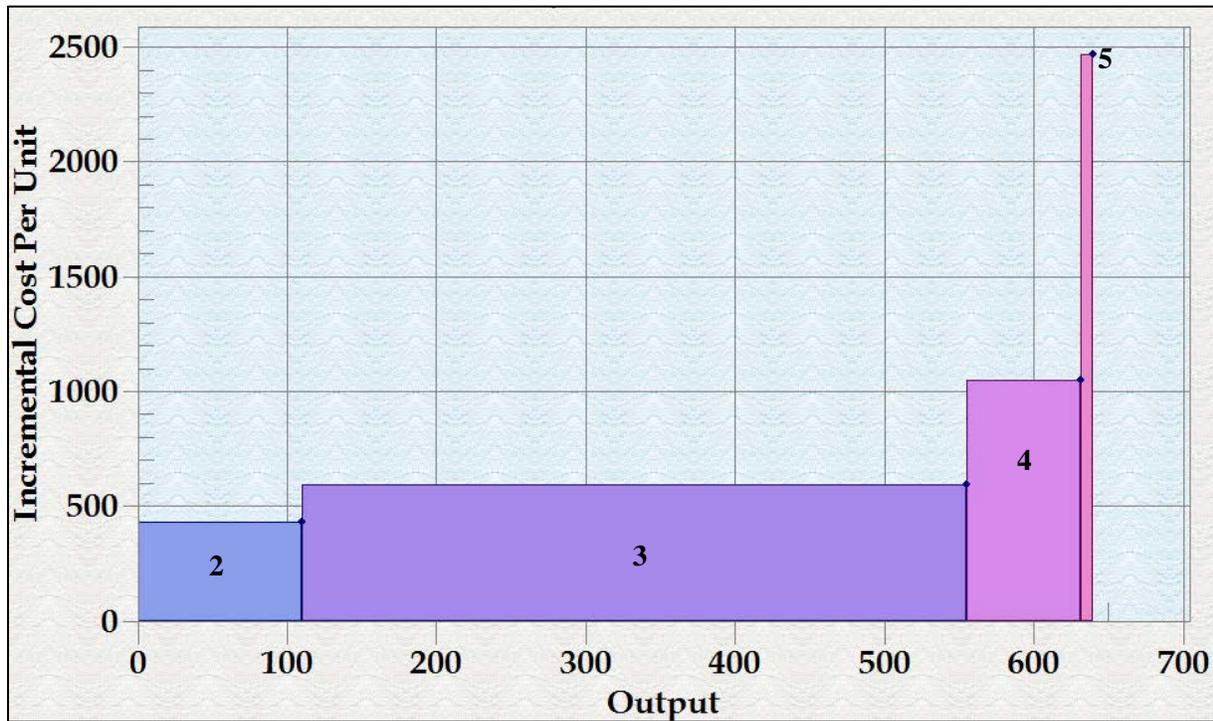


Figure 6: Incremental Cost and Output of “Best Buy” Alternative Plans

4.6 NER Plan Justification

The alternative plan(s) that qualified for further consideration were assessed in order to identify whether the benefits are worth Federal investment. The effects include a measure of how well the plan(s) achieve the planning objectives, benefits and costs. Previously in the evaluation process, the positive effects of each plan on Jackson Park’s ecosystem were considered individually and compared to the without-project condition. In this step, supportive facts are presented to determine if it is worthwhile to select a plan as the NER Plan for implementation. The supportive facts include the reality of the ecosystem outputs; significance of the ecosystem outputs; completeness, acceptability, effectiveness and efficiency of the potential plan, and any associated risks or uncertainties that may affect or result from the potential plan.

Alternative 1 – No Action Plan

Alternative 2 – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond , (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction

Alternative 3 – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland

Alternative 4 – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland, (FM) Fringe Marsh

Alternative 5 – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland, (FM) Fringe Marsh, (NIC) New Island Creation, (NI) New Island

4.6.1 Significance of Ecosystem Outputs

Due to the challenges associated with comparing non-monetized benefits, the concept of output significance plays an important role in ecosystem restoration evaluation. Along with information from cost effectiveness and incremental cost analyses, information on the significance of ecosystem outputs will help determine whether the proposed environmental investment is worth its cost and whether a particular alternative should be recommended. Statements of significance provide qualitative information to help decision makers evaluate whether the value of the resources of any given restoration alternative are worth the costs incurred to produce them. The significance of the Jackson Park restoration outputs are herein recognized in terms of institutional, public, and/or technical importance.

Institutional Recognition

Institutional recognition means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. Sources of institutional recognition include public laws, executive orders, rules and regulations, treaties, and other policy statements of the Federal Government; plans, laws, resolutions, and other policy statements of states with jurisdiction in the planning area; laws, plans, codes, ordinances, and other policy statements of regional and local public entities with jurisdiction in the planning area; and charters, bylaws, and other policy statements of private groups.

Migratory Bird Treaty Act (1918)

The Migratory Bird Treaty Act is the domestic law that implements the United States' commitment to four international conventions for the protection of migratory birds and their habitats. The Act protects species or families of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle. The four Migratory Bird Conventions are:

- Convention for the Protection of Migratory Birds with Great Britain on behalf of Canada (1916)
- Convention for the Protection of Migratory Birds and Game Mammals - Mexico (1936)
- Convention for the Protection of Migratory Birds and Their Environment - Japan (1972)
- Convention for the Protection of Migratory Birds and Their Environment - Union of Soviet Socialist Republics (1978)

The Mississippi Flyway

There are 4 principal North American flyways, the Atlantic, Mississippi, Central and Pacific. Except along the coasts, such as Lake Michigan, the flyway boundaries are not always sharply defined. Its eastern boundary runs along western Lake Erie and the western boundary is ambiguous, as the Mississippi Flyway merges unnoticeably into the Central Flyway. The longest migration route in the Western Hemisphere lies in the Mississippi Flyway; from the Arctic coast of Alaska to Patagonia, spring migration of some shorebird species fly this nearly 3,000 mile route twice. Parts of all four flyways merge together over Panama.

The route which includes Jackson Park is ideal for migratory waterfowl because it is uninterrupted by mountains, dotted with tens of thousands of lakes, wetlands, ponds, streams and rivers, and is well timbered in certain reaches. Chicago is located in the Mississippi Flyway and about 300 species of birds pass along Lake Michigan's shoreline annually. The Chicago reach is also one of America's most important migration routes for songbirds, with more than ~5 million individuals passing through during the migration season. Illinois and Indiana farmland consists of corn and soybean fields, which do not provide the type and variety of food and shelter required by nearly all migrating birds. In comparison, Lake Michigan's shoreline provides a variety of plant life and habitat for resting and refueling. Chicago's parks and even residential backyards are particularly important, because of they are the only patches of habitat left within a concrete watershed. The preservation of parkland along water bodies is critical to the survival of millions of birds that migrate through Chicago every spring and fall. The Jackson Park restoration project has great potential to provide critical migratory bird habitat.

Alternative Plan 4 and 5 is in full support of the Migratory Bird Treaty Act.

EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds – Federal agencies shall restore or enhance the habitat of migratory birds and prevent or abate pollution or detrimental alteration of the environment for migratory birds. This project will restore pond, marsh, sedge meadow, savanna, open woodland, and fish habitat, thus providing forage and shelter for numerous migratory bird species. This project lies within a significant portion of the Mississippi Flyway along the coast of Lake Michigan that particularly favors both ecological and economically valuable waterfowl species. Alternative Plan 4 and 5 fulfills the USACE's role and responsibility by utilizing its Ecosystem Restoration Mission, authority and supporting polices to restore diverse habitats for Migratory Waterfowl and fishes that support these bird species.

EO 13547 Stewardship of the Ocean, Our Coasts, and the Great Lakes – This order establishes a national policy to ensure the protection, maintenance, and restoration of the health of ocean, coastal, and Great Lakes ecosystems and resources, enhance the sustainability of ocean and coastal economies, preserve our maritime heritage, support sustainable uses and access, provide for adaptive management to enhance our understanding of and capacity to respond to climate change and ocean acidification, and coordinate with our national security and foreign policy interests. Alternative Plan 4 and 5 would restore physical characteristics of Lake Michigan coastal habitats, which is in full support of this EO.

Executive Order 13340 - Identified the Great Lakes as a national treasure and defined a Federal policy to support local and regional efforts to restore and protect the Great Lakes ecosystem through the establishment of regional collaboration. A number of activities have been accomplished by Federal agencies working in partnership with state, tribal and local governments in response to the Executive Order. The USACE has been a major participant in these activities. The Executive Order established the Great Lakes Interagency Task Force. The Task Force worked with the governors of the eight Great Lakes states, mayors, and tribal leaders to establish the Great Lakes Regional Collaboration. The initial goal of the Collaboration was to develop a “strategy for the protection and restoration of the Great Lakes” within 1 year. Alternative Plan 4 and 5 would restore physical characteristics of Lake Michigan coastal habitats, which is in full support of this Act. The Collaboration developed the strategy by using teams consisting of 1,500 stakeholders for the following eight priority issues identified by the Great Lakes governors and mayors with items in bold relative to this project:

- | | |
|-------------------------------|--------------------------------|
| 1. Toxic contaminants | 5. Contaminated sediments/AOCs |
| 2. Non-point source pollution | 6. Indicators/information |
| 3. Coastal health | 7. Sustainable development |
| 4. Habitat/species | 8. Invasive species |

Fish and Wildlife Conservation Act of 1980 – all Federal departments and agencies to the extent practicable and consistent with the agency’s authorities should promote the conservation of non-game fish, wildlife, and their habitats. Alternative Plan 4 and 5 would restore physical characteristics of Lake Michigan coastal habitats, which is in full support of this Act.

EO 11514 Protection and Enhancement of Environmental Quality – the Federal Government shall provide leadership in protecting and enhancing the quality of the Nation’s environment to sustain and enrich human life. Improving both the habitat and aesthetic values of Jackson Park would be achieved via Alternative 4 or 5. This project would provide leadership by providing an example to other large metropolis and urban areas that once thought parklands and urban water bodies can be reclaimed for the public and nature to enhance environmental quality.

EO 11990 Protection of Wetlands – each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. Alternative 4 or 5 would restore Jackson Park’s natural area patches to a physically and visually healthy ecosystem, which takes action to further support the enhancement of Lake Michigan.

EO 13112 Invasive Species – prevent the introduction of invasive species and provide for their control and to minimize associated economic, ecological, and human health impacts. Implementation of Alternative Plan 2 through 5 would remove nonnative and invasive plant species from 155.1-ac. It would also remove the effects Common Carp have on habitat by disallowing these species to stir up bottom materials continually in the East and West Lagoons.

Endangered Species Act of 1973 – all Federal departments and agencies shall seek to conserve endangered species and threatened species. The purpose of the act is to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved and to provide a program for the conservation of such endangered and threatened species. Implementation of Alternative Plan 4 or 5 would improve hunting habitat for the state threatened black-crown night-heron and peregrine falcon (*Falco peregrinus*). Also, this project would provide sufficient pond habitat to introduce state listed banded killifish and Iowa darter by provide spawning and foraging habitat.

Clean Water Act – restore the chemical and biological integrity of the Nation’s waters. Although water quality improvement is not within the USACE Mission, policy acknowledges that habitat restoration provides incidental water quality improvements most of the time. The Clean Water Act also has provisions for wetland and biological integrity protection. The No Action Alternative does not support this Act by denying opportunity to improve water quality and increase viable wetland acres. All plans support the Clean Water Act since water quality improvements would be realized.

EO 13653 Preparing the United States for the Impacts of Climate Change – The impacts of climate change — including an increase in prolonged periods of excessively high temperatures, more heavy downpours, an increase in wildfires, more severe droughts, permafrost thawing, ocean acidification, and sea-level rise — are already affecting communities, natural resources, ecosystems, economies, and public health across the Nation. These impacts are often most significant for communities that already face economic or health-related challenges, and for species and habitats that are already facing other pressures. Managing these risks requires deliberate preparation, close cooperation, and coordinated planning by the Federal Government, as well as by stakeholders, to facilitate Federal, State, local, tribal, private-sector, and nonprofit-sector efforts to improve climate preparedness and resilience; help safeguard our economy, infrastructure, environment, and natural resources; and provide for the continuity of executive department and agency (agency) operations, services, and programs. The Federal Government must build on recent progress and pursue new strategies to improve the Nation's preparedness and resilience. In doing so,

agencies should promote: (1) engaged and strong partnerships and information sharing at all levels of government; (2) risk-informed decision-making and the tools to facilitate it; (3) adaptive learning, in which experiences serve as opportunities to inform and adjust future actions; and (4) preparedness planning.

Alternatives 4 and 5 support this Executive Order via the sequestration of carbon and carbon dioxide by increasing the acreage and biomass of native plant material above and below ground. Even dead plant material in the form of peat, detritus and mucks prevents carbon from entering the atmosphere. Converting homogenous spaces to diverse structures and native plants would ultimately absorb more sunlight than reflect it into the atmosphere and in turning heating up the planet.

Public Recognition

Public recognition means that some segment of the general public recognizes the importance of an environmental resource, as evidenced by people engaged in activities that reflect an interest or concern for that particular resource. Such activities may involve membership in an organization, financial contributions to resource-related efforts, and providing volunteer labor and correspondence regarding the importance of the resource.

Jackson Park Advisory Council

The Jackson Park Advisory Council's (JPAC) mission is to be advocates for Jackson Park and the citizens who utilize its programs, facilities, resources, and natural areas; to provide a forum for users of Jackson Park; to advise and to work collaboratively with the Chicago Park District on park improvements, safety, and issues; to encourage long range planning; to seek alternative funding sources for park enhancements; to promote community awareness and increased utilization of this beautiful resource and site of the 1893 World's Columbian Exposition. JPAC is the body that monitors the Park, represents the community and advises the Chicago Park District. JPAC is interested in stewardship, preservation and protection of the park's historic character and special natural areas, provide an open forum and seek a fair share for all park users and communities, the park's common good and highest potential. Committees troubleshoot in the park, work to improve conditions, standards and plans or to conduct park projects. JPAC's goal is a park that is:

- Well managed and maintained
- Safe and healthful
- Accessible, user-friendly, welcoming to all
- Favoring public over reserved use and with less road impact
- With prospering unique habitats
- Respectful of historic and special features
- Rich in recreation and in kids and youth programs including environmental stewardship
- Grounded in sound planning, responsive to community

Some of JPAC's long-range commitments and collaborations include working with the Chicago Park District and other public and private groups to further goals that will enhance Jackson Park and grow the Council. Jackson Park is large, complex, and meets the needs of a wide range of people and wildlife. The Natural Areas-Wooded Island, the Lagoons, Bob-o-link Meadow projects are needed and welcome, but must be accomplished collaboratively, while completing and implementing comprehensive plans for ongoing reevaluation, management, and maintenance of these precious sanctuaries. Also needing careful thought is the role of human visitors and activities in the natural areas. The JPAC is in full support of Alternatives 4 or 5.

Stakeholder Support

Partners in support of the Jackson Park Ecosystem Restoration Project and Alternative Plan 5 presented in this Detailed Project Report includes, but are not limited to: the US Environmental Protection Agency (USEPA), US Fish & Wildlife Service (USFWS), Illinois Environmental Protection Agency (IEPA), Illinois Department of Natural Resources (IDNR), the Audubon Society Chicago, the Field Museum of Natural History, the John G. Shedd Aquarium are all critical and involved stakeholders. The Audubon Society, Field Museum of Natural History, and the Shedd Aquarium have National and Global interests in persevering and restoring biodiversity.

Technical Recognition

Technical recognition means that the resource qualifies as significant based on its “technical” merits, which are based on scientific knowledge or judgment of critical resource characteristics. Whether a resource is determined to be significant may of course vary based on differences across geographical areas and spatial scale. While technical significance of a resource may depend on whether a local, regional, or national perspective is undertaken, typically a watershed or larger (e.g., ecosystem, landscape, or ecoregion) context should be considered. Technical significance should be described in terms of one or more of the following criteria or concepts: scarcity, representation, status and trends, connectivity, limiting habitat, and biodiversity.

Scarcity is a measure of a resource’s relative abundance within a specified geographic range. Generally, scientists consider a habitat or ecosystem to be rare if it occupies a narrow geographic range (i.e., limited to a few locations) or occurs in small groupings. Unique resources, unlike any others found within a specified range, may also be considered significant, as well as resources that are threatened by interference from both human and natural causes.

Representation is a measure of a resource’s ability to exemplify the natural habitat or ecosystems within a specified range. The presence of a large number and percentage of native species, and the absence of exotic species, implies representation as does the presence of undisturbed habitat.

Status and Trend measures the relationship between previous, current and future conditions.

Connectivity is the measure of a resource’s connection to other significant natural habitats.

Limiting Habitat is the measure of resources present supporting significant species.

Technical Summary – Wildlife conservation in urban habitats is increasingly important due to current *urbanization trends*¹⁶. Alternative Plan 4 or 5 focuses on restoring diverse habitats within the Jackson Park, which is *representative* of a *scarce* coastal ecosystem resource. These Lagoons would essentially be an open marshy system with snags, rootwads and limbs to mimic deadfall (all trees or tree parts used for habitat); patches of shrub swamp; large beds of eel grass and pondweeds; patches of emergent reeds and grasses; bank zone buffers of grasses, forbs, shrubs and trees. This type of system is *scarce* within the Chicago Region, with the closest similarity currently being found in Berrien County, Michigan called the Grand Mere Lakes. These habitats were known to occur more frequently at one point in history; however, there are currently no known areas of this type of backshore pond system. In terms of *connectivity*, this project adds to the increasing patches of habitat within the City of Chicago, lessening the distance species have to travel over inhospitable areas of urbanized lands. The coastal zone of Lake Michigan in Illinois is

¹⁶ Fernández-Juricic & Jokimäki 2001

trending towards wide spread improvement and connectivity, indicative of projects such as the Ravine projects along the north shore, 63rd Street Dune and Beach 506, Northerly Island 506, and various smaller parks being restored by the Chicago Park District. Connectivity within the site is important as well, especially between different plant communities. Hydrologic gradients provide the basis for plant community species richness and structure, and because of the gradients, these plant communities seamlessly connect to each other. This makes it critical to restore in-between habitats such as fringing marsh, which connects the submersed pond habitat with the riparian oak savanna and woodland habitats. Species such as the Eastern Newt require all three habitats in order to survive. Their eggs and larvae would be incubated within isolated vernal pools, and then as they morph into adults they move into the fringe marsh and pond, finally emerging from the fringe marsh and seeking isolated vernal pools within the oak savanna and woodland to mate and reproduce again. Certain keystone fishes, such as Northern Pike and Grass Pickerel require open pond habitat for hunting and winter survival, and just as well need the fringe marsh connection for spawning and nursery habitat¹⁷. The State Threatened Banded Killifish's critical spawning and foraging habitat is fringe marsh. The fringe area of many lakes and ponds is also critical in that they provide structure and food to maintain diverse macroinvertebrate populations that support both aquatic and terrestrial species¹⁸. Many species of water fowl also require fringe marsh for both nesting and rearing of young. Restoring viable habitat within and along the Lake Michigan coastal zone would provide a critical habitat for migratory waterfowl and wetland fishes such as Grass Pickerel and Warmouth. The proposed habitat restoration would have great potential to support at least two state threatened species, the Peregrine Falcon and the Banded Killifish.

4.6.2 Acceptability, Completeness, Effectiveness & Efficiency

Acceptability, completeness, effectiveness, and efficiency are the four evaluation criteria USACE uses in evaluating alternative plans. Alternatives considered in any planning study, not just ecosystem restoration studies, should meet minimum subjective standards of these criteria in order to qualify for further consideration and comparison with other plans.

Acceptability

An ecosystem restoration plan should be acceptable to state and Federal resource agencies and local governments. There should be evidence of broad-based public consensus and support for the plan. The tentatively recommended plan must be acceptable to the non-Federal cost-sharing partner.

The Jackson Park 506 study was developed in a collaborative fashion in which planning and design meetings screened and refined habitat restoration measures. The Federal, State and local groups that participated in these activities are discussed in the previous [section](#). Alternative 1, No Action, provides no ecosystem improvements and is not acceptable to the [Federal Objective](#), the non-Federal sponsor's goals and stakeholder desires. Alternatives 4 and 5 are the most acceptable in terms of the Federal Objective and non-Federal sponsor/stakeholder vision for reestablishing a sustainable and viable ecosystem within the Jackson Park study area. Alternatives 2 and 3 provide limited benefits but generally leave critical aquatic habitat types in a degraded state. Taking the Federal Objective, study objectives, and non-Federal sponsor/stakeholder needs into consideration, Alternative 4 or 5 provides the most diverse habitat possible and therefore would be the most acceptable.

¹⁷ (Stephenson 1990, Jude & Papas 1992)

¹⁸ (Krieger 1992)

Completeness

A plan must provide and account for all necessary investments or other actions needed to ensure the realization of the planned restoration outputs. This may require relating the plan to other types of public or private plans if these plans are crucial to the outcome of the restoration objective. Real estate, operations and maintenance, monitoring, and sponsorship factors must be considered. Where there is uncertainty concerning the functioning of certain restoration features an adaptive management plan should be proposed and must be accounted for in the implementation plan.

All of the factors were considered in the development or post formulation assessment of alternative plan costs/outputs, consistency with other Federal and non-Federal Plans, real estate, O&M, monitoring and non-Federal sponsorship. Alternative 1 does not provide any action to restore degraded habitats and therefore is incomplete in realization of ecosystem improvements. Alternatives 2 & 3 are incomplete in terms of restoring the entire Jackson Park system and are inconsistent with State and local plans for reestablishing a healthy coastal zone. Alternatives 4 and 5 are the most complete in that they would change Jackson Park from degraded ruderal park to a diverse and native habitat system for fish, wildlife and migratory birds. Alternatives 4 and 5 would have the least O&M and adaptive management features since the alternatives are complete from ecological systems context.

Effectiveness

Objective 1 – Reestablish Hydrogeomorphology to Support Natural Communities

This objective seeks to reestablish natural hydrologic and geomorphic parameters to support critical wetland and riparian habitats within the Jackson Park natural area.

Objective 2 – Eradicate Invasive Species from Pond, Wetland, & Riparian Communities

This objective seeks to reestablish native plant community richness and structure to support critical wetland and riparian habitats within the Jackson Park's natural areas.

- Alternative 1 takes no action, and therefore does not meet the two planning objectives since the future without-project conditions do not foresee natural recovery of this system.
- Alternative 2 would basically only restore the East, West and golf course Lagoons for fishes, Existing Islands and would place mudpuppy habitat in the South Lagoon. Marsh, Sedge Meadow, Savanna and Woodland communities would not be restored. This alternative would provide about 17.7-acres of pond and 2.0-acres of small island habitat. This alternative does not address Objective 1 and only begins to address Objective 2.
- Alternative 3 builds upon Alternative 2 by adding geomorphic contouring to restore hydrogeomorphic features and plant assemblages for Sedge Meadow, Vernal Pools, Savanna and Open Woodland habitats. This alternative would provide about 135.1-acres of habitat. This alternative nearly addresses Objective 1 and partially addresses Objective 2.
- Alternative 4 builds upon Alternative 3 by adding a critical increment of geomorphic and vegetative restoration which is the (FM) Fringe Marsh. This alternative would provide about 155.1-acres of habitat. This alternative addresses Objective 1 and addresses Objective 2.
- Alternative 5 builds upon Alternative 4 by creating (NIC) and planting (NI) New Islands according to Olmsted's design. This alternative would provide about 155.1-acres of habitat (the

difference is that 1.6-acres of Fringe Marsh would become New Island). This alternative addresses Objective 1 and addresses Objective 2.

Efficiency

An ecosystem restoration plan must represent a cost-effective means of solving habitat problems and seizing opportunities to improve the environment. It must be determined that the plan's restoration outputs cannot be produced more cost effectively than any other plan via the USACE's Six-Step Planning Process.

Fifteen (15) measures, including No Action, were refined to seize site specific opportunities, address Jackson Park's problems and were further honed by targeting two ecosystem objectives. Using the USACE Institute for Water Resources Planning Suite Software, 66 alternative combinations were generated from the measures. Through the CE/ICA analyses, seventeen (17) cost effective combinations were identified, which is inclusive of the six (6) Best Buy Plans. The No Action plan is always deemed cost effective and a Best Buy Plan. Forty-nine (49) alternative combinations were screened out as non-cost effective. Only Best Buy Plans were considered for selection.

4.6.3 Risk and Uncertainty

When the costs and outputs of alternative restoration plans are uncertain and/or there are substantive risks that outcomes will not be achieved, which may be the case, the selection of a recommended alternative becomes more complex. It is essential to document the assumptions made and uncertainties encountered during the course of planning analyses. Restoration of some types of ecosystems may have relatively low risk. For example, removal of drainage tiles to restore hydrology to a wetland area. Other activities may have higher associated risks such as restoration of coastal marsh in an area subject to hurricanes. When identifying the NER plan, the associated risk and uncertainty of achieving the proposed level of outputs must be considered. For example, if two plans have similar outputs but one plan costs slightly more, according to cost effectiveness guidelines, the more expensive plan would be dropped from further consideration. However, it might be possible that, due to uncertainties beyond the control or knowledge of the planning team, the slightly more expensive plan will actually produce greater ecological output than originally estimated, in effect qualifying it as a cost effective plan. But without taking into account the uncertainty inherent in the estimate of outputs, that plan would have been excluded from further consideration.

Overall, there is very low risk associated with Alternatives 4 and 5 not performing as predicted. Sufficient investigations to the level of project complexity were performed to ensure that the restored plant communities would not revert to invasive, weedy species again by a) lessons learned from constructed park like plant restoration projects i.e. Eugene Field Park & 63rd Street Dune & Beach, b) designing plant communities to the hydrology and geomorphology instead of fighting it i.e. the overall design replicating plant communities indicative of Lake Michigan's coastal sandy zone, and c) a dedicated non-Federal sponsor that has a Natural Areas Program, will maintain the project as constructed with intended ecological benefits.

Complete eradication of invasive species always presents a certain level of risk and uncertainty as the chances of reinvasion are likely to occur without proper management, increasingly so when native species have not yet established. A prominent issue is that invasive plant species are adapted for colonizing areas that are disturbed and have ruined soils. Measures that alleviate ruined soil properties consist of adding leaf litter compost to the top 6" of soil during late summer or early fall. Incorporating soil amendments such as this will decrease bulk density, hold moisture longer and increase organic matter and microbial activity. This would further the soil's ability to provide for native plants and reduce the vulnerability of

the plant community to noxious weed invasion. This measure has been found to work on several Chicago District habitat restoration projects where the soils were physically ruined. The other end of the spectrum would be the addition of inorganic substrates to reverse the overly organic substrates currently in place. The only situation worse than a plant community complete comprised of weedy, nonnative species, is no plant community at all. Jackson Park currently has an ideal condition for planting native coastal species since there is about a 12" layer of topsoil over parent material of lacustrine sands.

Native plantings also have an associated risk of not establishing due to a variety of unforeseen events. Predation from herbivorous animals is likely since Common Carp and Canada geese are quite abundant in the area. Weather also plays a large role in the establishment success of new plantings. Periods of drought, flood or early frost can alter the survival percentage of plantings. To mitigate these risks, planting over several years, overplanting and/or adaptive management and monitoring may be incorporated into the overall plan. In addition, climate change may or may not affect project outcomes. Increased temperatures or rainfall may lead to changes in the ecosystem of the project area; however, Lake Michigan primarily drives the weather in the Chicagoland area and may partly mitigate climate change concerns for the near future. This climate concern is alleviated by having a broader pallet of adaptive plant species to compensate for climatic shifts.

4.7 National Ecosystem Restoration (NER) Plan Recommendation

When selecting a single alternative plan for recommendation from those that have been considered, the criteria used to select the NER plan include all the evaluation criteria discussed above. Selecting the NER plan requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes environmental benefits while passing tests of cost effectiveness and incremental cost analyses, significance of outputs, acceptability, completeness, efficiency, and effectiveness.

This restoration project was planned in cooperation with the Chicago Park District and various Federal, State and local stakeholders. Also, this restoration project makes a significant contribution to regional, national, and international programs that include the North American Waterfowl Management Plan, Lake-wide Management Plans, and the Coastal Zone Management Plan. This plan included an opportunity for open comment to ensure all stakeholder parties have had equal contribution.

All costs associated with a plan were considered, and tests of cost effectiveness and incremental cost analysis have been satisfied for the alternatives analyzed. The cost estimates were based on current ecosystem restoration projects that are in construction and design phases. Having established confidence in the estimated implementation costs, the remaining test of reasonableness is to assess the value of the resource to be improved based on the cost to implement the improvement. The importance of Migratory Birds in terms of human uses and aesthetics has been documented through numerous sources, most importantly the Migratory Bird Treaty Act (1918) and Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds.

Non-monetary values associated with the Jackson Park restoration project include a variety of ecological, social and educational benefits. The project will provide important stop-over habitat for birds traveling along the Great Lakes portion of the Mississippi Flyway, a migratory route recognized as nationally significant by the Audubon Society. In addition, the native habitat types planned will benefit native resident species. A variety of aquatic species such as fish, macroinvertebrates, and amphibians will greatly benefit through the addition of important foraging, refuge, and spawning habitat. The restoration of Jackson Park's natural areas will markedly increase the ecological integrity of the surrounding area and is well worth the investment.

It is apparent that wetlands are important for the Federal government to be concerned about due to the massive losses in recent history and the need to recover them. The "No Net Loss" is the United States government's overall policy goal regarding wetland preservation. The goal of the policy is to balance wetland loss due to economic development with wetlands reclamation, mitigation, and restoration efforts, so that the total acreage of wetlands in the country does not decrease, but remains constant or increases. To achieve the objective of no net loss, the federal government utilizes several different environmental policy tools which legally protect wetlands, provide rules and regulations for citizens and corporations interacting with wetlands, and incentives for the preservation and conservation of wetlands. Given the public benefits provided by wetland ecosystem services, such as flood control, nutrient farming, habitat, water filtration, and recreational area, the estimation that over half the acreage of wetlands in the United States has been lost within the last three centuries is of great concern to local, state, and federal agencies as well as the public interest they serve.

The first legal protection of wetlands came from President Jimmy Carter in 1977. He signed Executive Order 11990 into law requiring Federal government agencies to take steps to avoid impacts to wetland when possible. Then, in 1989 President George H. W. Bush established the National policy of "no-net loss of wetlands". This set the groundwork to replace each newly impacted wetland with a replacement wetland of the same size and with similar wetland functions and values. Non-tidal wetland acres within the U.S. have actually increased in recent years; about 250,000 acres of forested wetlands were created or restored between 1998 and 2004 (USFWS). It was on Earth Day, 2004, that President George W. Bush announced that "no-net loss" had been accomplished nationally and that we had a net-gain of wetlands: more wetlands had been restored or created than were being destroyed in the U.S. He also announced a new policy beyond "no-net loss". That goal was to establish 3 million more acres of wetlands beyond those being lost. Following the lead of the previous three Presidents, Barack Obama has increased funding the North American Wetlands Conservation Act and has provided funding specifically to the Great Lakes for restoration via the Great Lakes Restoration Initiative funding. It is not out of line to restore 20 acres of marsh for a total \$1.5-million, The Federal share is \$975K (65%).

Acceptability – Removing the (FM) Fringe Marsh from the NER Plan does not correspond well to the Federal Objective, Laws, Executive Orders, and concerns of local groups seeking to restore habitat for Migratory Birds within the Great Lakes route of the Mississippi Flyway.

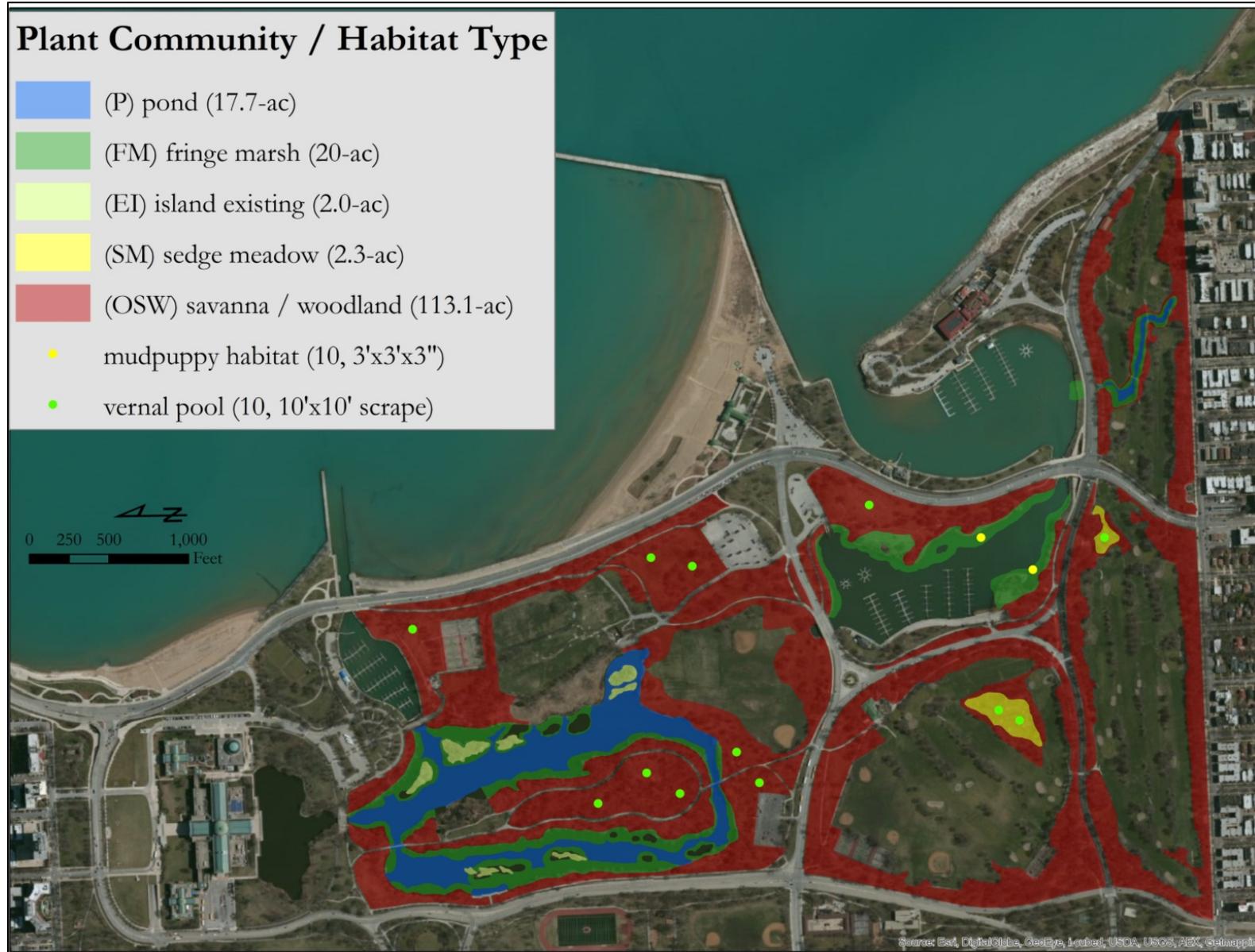
Completeness Criteria – Eliminating the marsh component of this site would allow a void between the pond habitat and the riparian zones, eliminate the most important wetland feature for Migratory Waterfowl, and eliminate critical fish spawning habitat. Leaving the opportunity to restore marsh habitat off the table because it is slightly more expensive due to the extensive damage caused by creating the park and DOD creating NIKE missile sites within the park may not be prudent. Also, removing the Fringe Marsh would not be complete in terms of ceasing opportunities provided by GLRI, which the funds can only be used to restore habitat, address invasive species issues or remediate AOCs.

The plan that reasonably maximizes net National Ecosystem Restoration benefits and is consistent with the Federal objective, authorities and policies, is identified as the NER plan. This NER Plan is considered as the Preferred Plan for direct, indirect and cumulative effects assessment under NEPA in the following Chapter. The NER/Preferred Plan was determined to be Alternative 4 (Figures 7& 8 and Plates 6 & 7).

Figure 7: NER/Preferred Plan Physical Measures



Figure 8: NER/Preferred Plan Plant Community Measures



CHAPTER 5 – ENVIRONMENTAL ASSESSMENT

This chapter involves prediction of direct, indirect and cumulative environmental effects to current conditions stemming from implementation of the Preferred Plan/NER Plan.

5.1 Need & Purpose

Before the 1830's, the Jackson Park area was a sandy ecosystem of primarily of dune, wetland and savanna ecotypes. Over a period of several decades, this ecosystem was severely altered by human activities. Currently, Jackson Park no longer provides a diversity of habitats, nor is the existing habitat quality sufficient to maintain structure and support healthy plant and animal communities. Based on site inventory and characterization by the USACE, a set of [Problems](#) and [Opportunities](#) were developed by the study team, non-Federal Sponsors and supporting stakeholders. These drive the need for action, which is summarized as the historic loss of significant migratory bird, fish and wildlife habitats. The purpose of this feasibility study and integrated environmental assessment is to identify the most environmentally beneficial, cost effective and publicly supported habitat restoration project to restore resources lost by the alteration of coastal habitat via the development of Jackson Park.

5.2 Alternatives Considered

[Section 4.1](#) provides discussion on the suite of measures that were developed to address study problems and meeting objectives. These measures that were processed through the IWR Planning Suite program to generate cost effective plans. The [cost effective](#) and [incremental cost analysis](#) takes implementation and real estate [costs](#) and [ecosystem outputs](#) into consideration. Ecosystem outputs were measured via the Floristic Quality Index ([FQA](#)). Five (5) alternative plans, including the No Action Plan, were deemed best case scenarios for project implementation. Alternative 4 was selected as the National Ecosystem Restoration (NER) Plan, which for the purposes of this Environmental Assessment is termed the Preferred Plan. Rationale for selecting the NER/Preferred Plan is presented in [Section 4.7](#).

[Alternative 1](#) – No Action Plan

[Alternative 2](#) – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction

[Alternative 3](#) – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland

[Alternative 4](#) – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland, (FM) Fringe Marsh

[Alternative 5](#) – (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (P) Pond, (EI) Existing Islands, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland, (FM) Fringe Marsh, (NIC) New Island Creation, (NI) New Island

5.3 The Affected Environment

A detailed description of the affected environment can be found in [Chapter 2 – Study Area inventory & Forecasting](#). Based on data collection, analysis, and modeling conducted under this feasibility study and coordination with Federal, State and local governmental agencies and published studies by academia, it was determined that the physical, chemical and biological conditions of Jackson Park are in a state of severe habitat degradation. As a result, dominant species present at the site are tolerant to habitat loss, anthropogenic disturbance and poor water quality are present (synanthropic species). Slight improvements in water quality and some vegetation patches that have occurred are not enough for native plant and animal communities to reestablish, resulting in missing critical structural habitat components. The No Action Alternative conditions are synonymous with the Future Without-Project Conditions, which are presented in [Section 2.6](#).

5.4 Direct & Indirect Effects of the Preferred Plan

In addition to the effects discussed in the following sections, a 404(b)(1) analysis is provided in **Appendix A**. This analysis further documents whether or not there are effects to the aquatic environment resulting from construction activities.

5.4.1 Physical Resources

Geology, Glacial Stratigraphy & Soils

Jackson Park lies over the Dolton Member of the Equality Formation. This member is dominantly sand, but contains pockets of silt, pebbly sand and gravels. Pebbly sand is the dominant material within the Jackson Park study area. Since the minor surficial grading would not disturb this geomorphic feature or displace glacial materials present, there would be no adverse effects resulting from implementation of the Preferred Plan/NER Plan. Geomorphic features and composition effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial. If native soils are present onsite, they would be preserved through the planting of native vegetation throughout the park.

Sediment Quality

Surficial sediment within the East, West and South Lagoons consist of gray clays and pebble sands, and in wetland areas these are covered by organic mucks. Those areas identified to potentially have contamination would not be disturbed by the Preferred Plan/NER Plan. Implementation of the Preferred Plan/NER Plan would result in beneficial effects to Lagoon sediments via promotion of aquatic macrophyte root structure and associated fungal symbionts and the removal of sediment disturbing fishes.

Water Quality

The Preferred Plan/NER Plan would have incidental water quality benefits through the removal of rough fishes that cause bioturbation, and introduction and establishment of native aquatic macrophytes and fishes. Adverse effects to water quality stemming from construction activities are not anticipated.

Hazardous, Toxic & Radioactive Wastes

The Preferred Plan/NER Plan would not result in the release of or influence HTRW materials. Identified areas have been avoided via the plan formulation process.

Hydrology

Implementation of the Preferred Plan/NER Plan would result in minimized effects to local hydrology by manipulating geomorphology to expose subsurface hydrology for certain marsh patches, two sedge meadow patches and various small vernal pools. Since the Preferred Plan/NER Plan would be implemented in a fashion as to not manipulate widespread water levels and focus on manipulating geomorphology to the existing hydrology, no significant adverse effects resultant from implementing the Preferred Plan/NER Plan are expected.

5.4.2 Ecological Resources

Plant Communities

There are currently no plant species within the aquatic portions of Jackson Park East and West Lagoons. Plant species identified from wetland and buffering communities are generally comprised of a mix of native, non-native, and Eurasian species. The Preferred Plan/NER Plan recommends the removal of invasive, nonnative plants and Eurasian species and the reestablishment of several different native plant communities. While invasive and non native trees will be removed from the project area, large historical trees of importance will be preserved to maintain the canopy structure and aesthetics of Jackson Park. Based on this, there would be no adverse effects to plant communities within Jackson Park or the surrounding areas resulting from implementation of the Preferred Plan/NER Plan. Plant community effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Macroinvertebrates

There have been no studies into the existing macroinvertebrate population within Jackson Park; however the Preferred Plan/NER Plan promotes the success of macroinvertebrates by reestablishing native plant communities, preserving large woody debris in place along the banks of the lagoon and through the introduction of small stone outcroppings within the Lagoons (mudpuppy habitats). There are currently areas within Jackson Park which are planted with native plant species for butterfly habitat. Those areas will be supplemented with additional native seeds and plugs suitable for butterfly habitat. Based on this, there would be no adverse effects to aquatic or terrestrial macroinvertebrate communities within Jackson Park or the surrounding area resulting from implementation of the Preferred Plan/NER Plan. Macroinvertebrate effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Fishes

Currently, the species richness and abundance of fishes is very low and only tolerant species are found within in the East and West Lagoons. Most species identified are nonnative, invasive and/or not indicative of a Lake Michigan coastal pond community. There is currently no colonization route or sufficient habitat for a diverse native assemblage to reestablish naturally within the East and West Lagoons. The Preferred Plan/NER Plan recommends removing non-native fish and reestablishing the East and West Lagoons with a native fish assemblage after habitat has been restored sufficiently (aquatic macrophytes). Based on this, there would be no adverse effects to fish communities within Jackson Park or the surrounding area resulting from implementation of the Preferred Plan/NER Plan. Fish community effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Reptiles & Amphibians

There is currently no physical habitat for diverse assemblage to colonize. The Preferred Plan/NER Plan recommends leaving large woody debris in place along the lagoon and introducing rock outcroppings which can be used as habitat for amphibians, including turtles and the mudpuppy (*Necturus maculosus*). Additionally, vernal pools would be designed to facilitate the development of amphibian and insect larvae. Based on this, there would be no adverse effects to reptile and amphibian communities within Jackson Park or the surrounding area resulting from implementation of the Preferred Plan/NER Plan. Reptile and amphibian community effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Birds

The Jackson Park study area is located within the Great Lakes portion of the Mississippi Flyway, which is nationally recognized as an important route for many migratory and resident birds. The Preferred Plan/NER Plan recommends the removal of invasive plant species and the establishment of native plants which provide habitat for organisms and plants that support migratory birds and in particular, water birds (herons, ducks, mergansers, grebes, etc). Coordination on bird habitat restoration features and activities are being coordinated with the Audubon Society Chicago. Based on this, there would be no adverse effects to migratory and residential birds within Jackson Park or the surrounding area resulting from implementation of the Preferred Plan/NER Plan. Bird species effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Mammals

Currently, only those mammal species indicative of urban life are present within the Jackson Park study area. Based on this, there would be no adverse effects to small or large mammals within Jackson Park resulting from implementation of the Preferred Plan/NER Plan. Mammal species effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial, but minor.

Threatened and Endangered Species

Federal – Currently, there are no Federally Endangered or Threatened Species, or their critical habitats within the Jackson Park study area. Based on this, there would be no adverse effects to Federally Listed Species resulting from implementation of the Preferred Plan/NER Plan.

State – Currently, the only state listed species identified by the State of Illinois within Jackson Park is the threatened Peregrine falcon. This species does not nest within the Jackson Park study area. Based on this, there would be no adverse effects to state Threatened and Endangered Species within Jackson Park resulting from implementation of the Preferred Plan/NER Plan.

5.4.3 Cultural Resources

Archaeological & Historical Properties

The Preferred Plan/NER Plan would have no adverse impacts on archaeological or historic properties. The project area is listed on the National Register of Historic Places, however consultations with the Illinois Historic Preservation Agency have insured that the historic integrity of Jackson Park has not been compromised by this project. Clearance has been provided by the Illinois Historic and Preservation Agency in a letter dated December 12, 2012. Native American groups having an historic cultural interest in northeast Illinois have been consulted (letters dated October 24, 2013). Coordination with SHPO will

continue through the design and implementation phase. The Kickapoo tribe of Oklahoma has responded and provided clearance (letter dated October 30, 2013).

Social Properties

The Preferred Plan/NER Plan will not have any adverse impacts on the area's social properties. Aesthetic and open space improvements resulting from implementation of the Preferred Plan/NER Plan may positive effects on adjacent parks and neighborhoods.

Recreational Activities

The Preferred Plan/NER Plan would have no adverse, long term effects on recreational activities at Jackson Park. Short term impediments to passive recreational activities will occur during first and second years of construction. After all physical restoration features are implement after the second year, portions of the park would be open to the public for recreation once again. The low intensity golf course restoration would primarily take place in the late fall and early winter when golfing is not in full season. The activities of restoring savanna and woodland habitat within the golf course is not much different than the daily maintenance activities performed by the golf course to keep out weeds and promote health ruff areas. The differences are in the plant species selection and mowing schedules.

5.4.4 17 Points of Environmental Quality

The 17 points are defined by Section 122 of the Rivers, Harbors & Flood Control Act of 1970 (P.L. 91-611) from (ER 1105-2-240 of 13 July 1978). Effects to these points are discussed as follows:

Noise – Any of the alternative plans would cause minor and temporary increases in noise levels beyond the current conditions. The minor noise effects would stem from machinery utilized to place substrate for substrate restoration, grade shoreline topography, and tree planting activities.

Displacement of People – None of the alternative plans will displace any people.

Aesthetic Values – Currently, portions of Jackson Park are aesthetically unpleasing due to the overgrowth of invasive plants causing woodlands to be choked out and erosion on the banks of Jackson Park lagoon, therefore; only benefits in aesthetic values are expected by all alternative plans.

Community Cohesion – Any of the alternative plans would not disrupt community cohesion, but provide restored open space for community activities.

Desirable Community Growth – Any of the alternative plans would not adversely affect community growth and would potentially attract people to a more aesthetically pleasing area based on project restoration measures.

Desirable Regional Growth – Any of the alternative plans would not adversely or beneficially affect regional growth.

Tax Revenues – Any of the alternative plans would not adversely or beneficially affect tax revenues.

Property Values – Any of the alternative plans would not have adverse effects on property values, but have the potential to increase surrounding land values since the aesthetics would improve due to project restoration measures.

Public Facilities – Any of the alternative plans would not adversely affect public facilities within the study area.

Public Services – Any of the alternative plans would not adversely or beneficially affect public services. All restoration would require temporary closure of the passive park areas, such as wooded island, the East and West Lagoons and the portions of the South Lagoon. The golf course restoration would primarily take place in the late fall and early winter when golfing is not in full season. It is currently planned the small restoration zones in the golf course would not require the golf course to close.

Employment – Any of the alternative plans would not adversely affect employment and would temporarily increase employment during construction activities.

Business and Industrial Activity – Any of the alternative plans would not adversely or beneficially affect local commerce.

Displacement of Farms – Any of the alternative plans would not adversely affect farmland since restoration areas do not occur on agricultural fields.

Man-made Resources – Any of the alternative plans would not adversely or beneficially affect man-made resources.

Natural Resources – The No Action Plan allows for the Jackson Park ecosystem to remain degraded. The Preferred Plan/NER Plan would have improve natural resources such as fish, wildlife, migratory birds, water quality, natural food production, fishing, bird watching, paddling, etc.

Air Quality – The local air quality in Chicago and Cook County are considered ‘non-attainment’ under the Clean Air Act for ozone, particulates (PM-10 and PM-2.5), and lead. The project is within the non-attainment zone. Once implemented, the project itself will be neutral in terms of air quality, with no features that either emit or sequester air pollutants to a large degree. During the project construction, heavy equipment would cause minor, temporary air quality impacts, however all equipment will be in compliance with current air quality control requirements for diesel exhaust, fuels, and similar requirements. A general conformity analysis was not conducted due to the short and temporary nature of any air quality impacts.

Water Quality – As discussed previously, any of the alternative plans would not adversely affect water quality. The Preferred Plan/NER Plan would incidentally improve water quality within the East and West Lagoons by providing aquatic macrophytes and removing sediment disturbing fishes which would increase and stabilize dissolved oxygen levels and reduce nutrients within the water column.

5.5 Cumulative Effects

Consideration of cumulative effects requires a broader perspective than examining just the direct and indirect effects of a proposed action. It requires that reasonably foreseeable future impacts be assessed in the context of past and present effects to important resources. Often it requires consideration of a larger geographic area than just the immediate “project” area. One of the most important aspects of cumulative effects assessment is that it requires consideration of how actions by others (including those actions completely unrelated to the proposed action) have and will affect the same resources. In assessing cumulative effects, the key determinant of importance or significance is whether the incremental effect of the proposed action will alter the sustainability of resources when added to other present and reasonably foreseeable future actions.

Cumulative environmental effects for the proposed ecosystem restoration project were assessed in accordance with guidance provided by the Council on Environmental Quality (CEQ) and the U.S. Environmental Protection Agency (USEPA 315-R-99-002). This guidance provides an eleven-step process for identifying and evaluating cumulative effects in NEPA analyses.

5.5.1 Scope of Cumulative Effects Analysis

Through this environmental assessment, the cumulative effects issues and assessment goals are established, the spatial and temporal boundaries are determined, and the reasonably foreseeable future actions are identified. Cumulative effects are assessed to determine if the sustainability of any of the resources is adversely affected with the goal of determining the incremental impact to key resources that would occur should the proposal be permitted. The spatial boundary for the assessment was broadened to consider watershed effects. The spatial boundary being considered is normally in the general area of the proposed ecological restoration; however, the area may be expanded on a case-by-case basis if some particular resource condition necessitates broadening the boundary. The analysis will include Jackson Park and a 1.5 mile radius around the project site.

Three temporal boundaries were considered:

- Past – mid to late 1800s because this is the approximate time that the landscape developed by Fredrick Law Olmsted for the World’s Fair of 1893.
- Present – 2014 when the decision is being made on the most beneficial ecological restoration.
- Future – 2064, the year used for determining project life end, although the ecological restoration should last until a geologic event disturbs the area.

Projecting the reasonably foreseeable future actions is difficult. The proposed action (ecosystem restoration) is reasonably foreseeable; however, the actions by others that may affect the same resources are not as clear. Projections of those actions must rely on judgment as to what are reasonable based on existing trends and where available, projections from qualified sources. Reasonably foreseeable does not include unfounded or speculative projections. Some future projections were taken from watershed and specific studies generated for the general project area. In this case, reasonably foreseeable future actions include:

- Further improvements in water quality due to large-scale projects, small BMPs and education
- Further improvements in aquatic and riparian habitat in and along the Lake Michigan system
- Further improvements in connectivity between Lake Michigan system habitats

5.5.2 Cumulative Effects on Resources

The plan formulation process took into account existing and planned projects, studies and known ecological restoration projects in the study area. Existing Projects were identified in [Section 1.5.2](#) that have the potential for affecting or being affected by a potential Jackson Park restoration project. Prior studies and reports, listed in [Section 1.5](#) were reviewed to ensure that the modeled conditions are the best possible representation of actual conditions. The [Technical Recognition Section](#) also takes existing and future habitat restoration projects into consideration for assessing project effects. Finally, the study team also worked with Federal, State and local agencies to coordinate ongoing planning to address local environmental and infrastructure issues.

Physical Resources

The past has brought alteration to the physical resources of the Jackson Park study area. Geology, soils, topography, hydrology, and fluvial geomorphology have all been modified to suit man's needs. All but a few patches of the landscape were modified from its natural form. As a result, geomorphology and hydrology are impacted due to site specific and watershed-scale alterations, as well as daily activities such as road salting, municipal discharge, and the human impacts on areas of the park not purposed for recreation. It is reasonably foreseeable that small projects within the Lake Michigan system for ecological restoration purposes would occur. Best management practices and water reclamation systems are not numerous and big enough to cause significant detrimental affects from sewer waters into the Lake Michigan system at this point, but could possibly be in the future as technology advances. Given the past, current and future condition of the coastal Lake Michigan system, the implementation of ecosystem restoration and infrastructure projects would be minor terms of the vast array and quantity of adverse effects caused by development; however, they are important in terms of beginning to address all the human induced problems the watershed suffers. There are no irrecoverable loss of resources identified in terms of geology, soils, substrates, topography, hydrology, water quality and fluvial geomorphology due to implementation of the Preferred Plan/NER Plan. Cumulative beneficial effects to the Lake Michigan system are anticipated in terms of soils, substrates, hydrology, hydraulics, and water quality.

Ecological Resources

The ecology along the coastal Lake Michigan watershed has had significant impacts as a result of previous physical resource alterations. The watershed was once a diverse mosaic of marsh, prairie, savanna, woodland, and glacial ponds that had a steady and dependable hydrology. Extreme landscape modification has caused most of the natural land use to be converted into concrete. It is estimated that only about 2% of the remaining 14% of open space is considered high quality ecosystem, and that this 2% also suffers from fragmentation. No longer is there a natural landscape to provide enough natural lands for fish and wildlife habitat or to attenuate large rainfall events. Considering these past, current and future conditions of the watershed, the implementation of the Preferred Plan/NER Plan within Jackson Park is minor in terms of the vast array and quantity of significant effects caused by industry and urbanization; however, it is instrumental in beginning to address the human induced problems the watershed suffers. Therefore, there are no irrecoverable losses of resources identified in terms of plant, insect, fish, amphibian, reptile, bird, and mammal taxa or to their habitats they occupy due to implementation of the Preferred Plan/NER Plan. Cumulative beneficial effects to the coastal Lake Michigan system are anticipated in terms of fish and wildlife and their preferred habitats.

Cultural & Historic Resources

Although Jackson Park has cultural and historic significance and is listed on the National Historic Register, there are no negative effects expected to archaeological or cultural resources resulting from implementation of the Preferred Plan/NER Plan. Coordination with SHPO will continue through the design and implementation phase.

Cumulative Effects Summary

The cumulative effects of the Preferred Plan/NER Plan are considered to be beneficial and environmentally important, but not significant from the cumulative/watershed effects perspective. The environment and its human community are expected to benefit from replacing unsightly and overgrown non-native plant communities with plant communities contiguous with the original Olmsted plan for Jackson Park.

5.6 Compliance with Environmental Statutes

The Preferred Plan presented in this integrated Environmental Assessment are in compliance with appropriate statutes, executive orders and memoranda including the Natural Historic Preservation Act of 1966; the Endangered Species Act of 1973; the Fish and Wildlife Coordination Act; Executive Order 12898 (environmental justice); Executive Order 11990 (protection of wetlands); Executive Order 11988 (floodplain management); and the Rivers and Harbors Act of 1899. The potential project is in compliance with the Clean Air Act; the Clean Water Act, and the National Environmental Policy Act of 1969. There were no adverse environmental effects identified which cannot be avoided should the proposal be implemented [1502.16 (102(2)(C)(ii))]. This proposal reverses some of the adverse affects of how man's local and short-term uses of the environment, while maintenance and restoring the long term productivity of a portion of Lake Michigan's coastal zone [1502.16 (102(2)(C)(iv))]. There have been no irreversible and irretrievable commitments of resources identified resulting from the proposed action should it be implemented [1502.16 (102(2)(C)(v))]. The proposed project supports land-use plans identified in the South Lakefront Framework Plan, Phase 2 Jackson Park and South Shore Cultural Center in terms of natural area restoration [NEPA 1502.16].

Environmental Justice

Executive Order 12898 (environmental justice) requires that, to the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

A database search of the EPA EJView mapping tool (Accessed 6 November 2013), revealed that within the portion of Chicago containing the Jackson park project site, that majority of the population (30-100%) is considered below the poverty line. Similarly, the majority of the population (30-100%) is considered as a minority. Since the overall project and the preferred plan is considered ecosystem restoration, no adverse human health effects or environmental effects on minority populations and/or low income populations are expected. It is anticipated that this habitat restoration project would have beneficial affects to local communities in terms of aesthetics, wildlife, green open space, recreational opportunity, cleaner surface waters and cleaner air.

Clean Air Act

The local air quality in Chicago and Cook County are considered 'non-attainment' under the Clean Air Act for ozone, particulates (PM-10 and PM-2.5), and lead. The project is within the non-attainment zone. Once implemented, the project itself will be neutral in terms of air quality, with no features that either emit or sequester air pollutants to a large degree. During the project construction, heavy equipment would cause minor, temporary air quality impacts, however all equipment will be in compliance with current air quality control requirements for diesel exhaust, fuels, and similar requirements. A general conformity analysis was not conducted due to the short and temporary nature of any air quality impacts.

Section 401 of the Clean Water Act

A Section 404(b)(1) analysis was completed for the preferred plan and is located in Appendix A. Features addressed by the 404 include the fill materials for mudpuppy and wetland restoration. No adverse effects

were determined. Since project activities under the jurisdiction of Section 401 are very limited and are all restorative in terms of aquatic ecosystem and water quality, Section 401 Water Certification is already granted via Regional Permit 5 as this project fits all of the requirements. A courtesy copy of the NEPA Document, 401 Certification Application and 404(b)(1) Analysis will be provided to the ILEPA for their records and comment opportunity.

USFWS Coordination

Coordination with the USFWS commenced with a project scoping letter dated 24 October 2013. This environmental assessment identified the NER/Preferred Plan to have “no effects” on federally endangered species or their habitats as determined by following the protocol and guidelines provided by Region 3 Fish & Wildlife Service (<http://www.fws.gov/midwest/endangered/section7/index.html>); therefore Section 7 is precluded and in compliance. Coordination under the FWCA of the NER/Preferred Plan will continue through the NEPA process and would be precluded before the signing of a FONSI or other determinations made. It is anticipated that the USFWS will have “No Objection” based on informal verbal coordination and study contributions of habitat design recommendations.

State of Illinois Historic Preservation Act

Coordination with the Illinois Historic Preservation Agency (IHPA) commenced with a project scoping letter dated 24 October 2012. In a letter 10 December 2012, the IHPA informed USACE that no historic properties are affected by the NER/Preferred Plan.

5.7 Draft Finding of No Significant Impact (FONSI)

The draft Finding of No Significant Impact (FONSI) maybe found in Appendix A. An Environmental Assessment was completed for the proposed habitat restoration Jackson Park, Chicago, Illinois. The Environmental Assessment has found that there would be no adverse affects resulting from implementation of the Preferred Plan/NER Plan. A 30-day Public Review period will be held from 11 April 2014 to 12 May 2014, and any comments received would be incorporated document if necessary. The NEPA document and supporting appendices were placed on the Chicago District’s Civil Works webpage for maximum distribution and sent to the Jackson Park Advisory Council Field House and Hyde Park Historical Society. There are also various information boxes throughout Jackson Park in which a notification card would be placed directing people to the project webpage.

CHAPTER 6 – PLAN IMPLEMENTATION

This chapter outlines details for implementing the Preferred Plan/NER Plan. Plan implementation details include sequencing, environmental assessment findings, mitigation requirements, permit requirements, agency and stakeholder views, project schedule, total project costs and cost sharing requirements.

6.1 Project Authorization

Study and implementation authorization by Congress is provided by the Great Lakes Fishery & Ecosystem Restoration (Section 506 WRDA 2000, as amended). Following completion and approval of this feasibility study, USACE implementing guidance allows the Chicago District to enter into a Project Partnership Agreement for design, plans and specifications, construction and subsequent monitoring.

6.2 NER Plan Implementation & Sequencing

The National Ecosystem Restoration (NER) Plan is the recommended plan, which is Alternative 4. This alternative consists of 12 measures: (MH) Mudpuppy Habitat, (IPR) Invasive Plant Species Removal, (FF) Fish Community Separator, (FIR) Invasive Fish Species Removal, (FNS) Native Pond Species Introduction, (P) Pond, (GC) Geomorphic Contouring, (VP) Vernal Pool, (SM) Sedge Meadow, (OSW) Savanna / Open Woodland, (EI) Existing Islands, (FM) Fringe Marsh. The implementation of all of these measures would restore pond, wetland and riparian communities within Jackson Park. The implementation of these features is generally described as follows and according to the measures descriptions in [Section 4.1](#). Much more detail would be added to the plan should this project commence to the PED/P&S Phases, for example, specifying spatial distribution of native plugs within a given zone and species clumping, planting centers, soil amendment percentages, temporary predator controls, and establishment activities. General construction activities and sequencing would include:

1) Site Preparation – The first task would be to install safety fencing, signage and other safety features in order to keep the public out of the site during heavy construction. Staging areas and access roads would be demarcated.

2) Invasive Species Eradication – All invasive plant species would be physically and if need be, chemically eradicated from the planting zones. Next, aquatic bed, emergent wetland, transition and riparian zone areas would be prepared for planting via amendments. All woody invasive species removed too small for snag habitat would be chipped into small pieces and spread over areas within Jackson Park. Based on lessons learned from Chicago District restoration projects, the addition of these wood chips greatly aids in starting a plant community from scratch and saves money by avoiding hauling and disposal costs and is environmentally preferred over burning the material.

3) Geomorphic Contouring – Once woody invasive are removed, areas along the southern portion of Jackson Park’s West Lagoon, the sedge meadow and vernal pools will be graded to provide a suitable hydrology for establishing native plant species. These areas will be contoured and all excess soils will be incorporated into the landscape within Jackson Park. Graded areas will be planted with seeds, plugs or shrubs and immediately stabilized to prevent erosion according to the plant community the work falls within.

4) Native Plant Community Establishment – Next would be to establish native plant communities of aquatic bed, marsh, sedge meadow, oak savanna and woodland over the remainder of the construction period. Planting lists are presented in Appendix A. Zones would be seeded and planted with seed and live plugs. Live plug areas will require predatory control, primarily stringing and caging to prevent Canada

Goose and Common Carp (for those areas where carp are not removed) predation. Again, the duration of the construction contract would primarily be for spot herbicide application and additional planting; most activities similar to home gardening activities.

5) BMPs – Soil erosion and sediment control measures will be designed during design phase and will comply with local and federal environmental requirements. The minimum measures required at the project site include:

- Hydroseeding, seeding, and mulching to stabilize disturbed areas
- Installation of silt fences around graded slopes and stockpile areas
- Protection of the ponds where grading occurs with silt fencing prevent sediments from traveling into the ponds
- Stabilizing construction entrances to limit soil disturbance at the ingress/egress from the site
- Installing erosion blanket over unprotected finished grades that are to be unplanted for at least two weeks

6.3 Real Estate Considerations

This Real Estate Plan Appendix E was prepared in support of the AFB-level feasibility study of the Jackson Park ecosystem restoration study. The Real Estate Plan identifies and describes the area proposed for construction, operation and maintenance of the Project, in addition to the real estate requirements and procedures for implementation of a recommended Plan.

Non-Federal Sponsor Lands – The non-federal sponsor currently owns in fee all areas that will be utilized for this project. Total acreage of non-federal sponsor property needed for this project is 155.1-acres, which is inclusive of lands needed for ecosystem restoration, staging during construction, and operation and maintenance of restored habitats after construction is complete.

Non-Standard Estates – There are none for this study area.

LERRDs Crediting – Currently crediting amount is estimated to be \$1,059,000.

The entire 2,500-3,000 foot sidewalk is being removed in order to achieve the grade to create the oak savanna/woodland for ecosystem restoration of the West Lagoon due to space constraints as shown on figures 6 and 7. Figure 6 identifies the areas where Geomorphic Contouring or grading is required to achieve the grade necessary to create the woodland. The sidewalk is in the way. The bank of the West Lagoon needs to be pulled back to create the necessary habitat types. It needs to be removed to create the oak savanna/woodland and is not being removed for erosion purposes. Removal is necessary to accrue the projected ecosystem benefits. The sidewalk is being replaced in-kind. The cost for sidewalk replacement is ~\$244,000 with contingency. This cost was included in Geomorphic Contouring and formulated for since it is integral to achieve the ecosystem restoration at the West Lagoon's bank. The Jackson Park sidewalk is within 10 feet and adjacent to the busy Cornell Street and is a public facility. The facility will be relocated to a lower elevation to accommodate grading to support the project habitat features. As a relocation the replacement of the sidewalk is a non-Federal Sponsor responsibility. The cost to replace the sidewalk will be credited as a LERRD. A preliminary determination by Real Estate is that the sidewalk is a public facility and the government has a duty to replace it. The sidewalk connects residential areas outside the park with the Museum of Science and Industry and other locations, is essential for non-auto transportation, and important for public safety.

6.4 Permit Requirements

The following required permits are anticipated and will be obtained prior to implementation of plan components:

- 401 Water Quality Certification
- National Pollutant Discharge Elimination System (NPDES) General Permit (327 IAC 15) – Illinois Environmental Protection Agency
- Lake Michigan Section 39 Permit – Illinois Department of Natural Resources – Office of Water Resources
- Lake Michigan Coastal Zone Coordination
- City of Chicago Harbor Permit – Chicago Department of Transportation (CDOT)

6.5 Monitoring Plan

Ecosystem restoration monitoring plans, activities, results and cost sharing are governed by Section 2039 of WRDA 2007 Monitoring Ecosystem Restoration:

(a) In General - In conducting a feasibility study for a project (or a component of a project) for ecosystem restoration, the Secretary shall ensure that the recommended project includes, as an integral part of the project, a plan for monitoring the success of the ecosystem restoration.

(b) Monitoring Plan - The monitoring plan shall--

(1) include a description of the monitoring activities to be carried out, the criteria for ecosystem restoration success, and the estimated cost and duration of the monitoring; and

(2) specify that the monitoring shall continue until such time as the Secretary determines that the criteria for ecosystem restoration success will be met.

(c) Cost Share - For a period of 10 years from completion of construction of a project (or a component of a project) for ecosystem restoration, the Secretary shall consider the cost of carrying out the monitoring as a project cost. If the monitoring plan under subsection (b) requires monitoring beyond the 10-year period, the cost of monitoring shall be a non-Federal responsibility.

Component 1 – Structural Sustainability

This component covers the structural sustainability of the implemented features. It is a qualitative assessment of whether each feature is retaining its physical character and project purpose. The most important information derived from this component would be to determine if adaptive management measures are needed or not. This monitoring would take place once a year for 10-years. Structural components are currently broken down into the following:

- 1) bank grading
 - a) monitor stability and erosion
- 2) plant community reestablishment
 - a) aquatic bed (pond)
 - b) emergent (vernal pool)
 - c) transitional bank (fringe marsh)
 - d) riparian (sedge meadow, savanna/open woodland)

The following is a list of parameters that would be assessed:

1. Bank Grading
 - a. Cohesiveness and durability

- b. Conformity
- 2. Plant Community Zones
 - a. Spatial coverage
 - b. Invasive species % coverage
 - c. Predator induced damages
 - d. Hydraulic induced damages
- 3. Human Interference & Damages
 - a. Physical damage
 - b. Removal
 - c. Rubbish and foreign debris

Component 2 – Biological Response

These monitoring events would occur every other year during a 10-year monitoring period.

- 1. Plant Communities
 - a. FQA
 - b. Species Richness
- 2. Macroinvertebrate & Fish Community
 - a. Species Richness
 - b. Abundance
 - c. Shannon-Wiener diversity index
- 3. Avian Community
 - a. Species Richness
 - b. Abundance
- 4. Other Fish & Wildlife Communities
 - a. Species Richness
- 5. Supporting Data (DO, pH, temperature, nutrients)

Component 3 – Planning Goal & Objectives

The principal goal of the potential project is to restore a pond, wetland and upland plant communities for resident and migratory birds, native amphibians and fishes in Jackson Park. The monitoring plan goal is to determine if the goal as stated is being met. This would be determined through the assessment of whether the study objectives are being met. Planning objectives for this study are as follows:

The two planning objectives would be assessed the same way as the FWOP and FWP project benefits were modeled as described in [Section 2.5 – Habitat Quality Forecasting](#). The floristic portion of the modeling would be completed as described in Section 2.5. The habitat portion of the modeling would be completed as described in [Section 2.5](#). **Tables 3-5** shows what data would be collected. If the following specific targets are not achieved, the non-Federal sponsor would need to implement necessary measures to bring the quality of these plant communities up to the functional levels expected from restoration activities:

Habitat Types	Acres	AAHSI*	AAHUs	NAAHUs
Pond	17.7	5.62	99.5	99.5
Existing Island	2	6.51	13.0	10.2
New Island	1.3	6.51	8.5	8.5
Fringe Marsh	20	5.62	112.4	76.8
Sedge Meadow	2.3	5.80	13.4	9.8
OS/Woodland	113.1	6.28	710.1	435.3

*Mean C of the Floristic Quality Assessment

Schedule of Costs

Table 9: Monitoring Schedule and Costs

Tasks	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Component 1	\$ -	\$ 1,000	\$ -	\$ 1,000	\$ -	\$ 1,000	\$ -	\$ 1,000	\$ -	\$ 1,000	\$ 5,000
Component 2	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 50,000
Component 3			\$ 1,000	\$ -	\$ -	\$ -	\$ 1,000	\$ -	\$ -	\$ 1,000	\$ 3,000
Final Report	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 10,000	\$ 10,000
Total	\$ 5,000	\$ 6,000	\$ 6,000	\$ 6,000	\$ 5,000	\$ 6,000	\$ 6,000	\$ 6,000	\$ 5,000	\$ 17,000	\$ 68,000

6.6 Operation & Maintenance

A detailed O&M Manual containing all the duties will be provided to the non-Federal sponsor after construction is closed out. The O&M for Chicago District ecosystem projects are practical and minimal due to initial project design efforts and design targets for sustainability. Mostly if not all of the O&M activities are no different than the specific activities that would take place during construction. The O&M described here is not the same as the Adaptive Management measures described in the previous section. The O&M costs of the project are estimated to an average annual cost of \$10,600 with a 3.75% interest rate over 50 years. The following are currently known operation and maintenance activities that the non-Federal Sponsor would undertake.

Invasive Plant Species Control – The maintenance activity is probably the most important to conduct. Staying ahead of the weeds goes a long way in avoiding large scale herbicide or physical eradication and replanting efforts. Three work days a year by a qualified entity would be able to keep weeds from invading the Jackson Park ecosystem since the acres are so small. Most problematic areas will be the bank transition and emergent marsh zones. Species such as white and yellow sweet clover, cut-leaved teasel, reed canary grass, common reed, buckthorn, honeysuckle, tree of heaven.

Native Plant Community Maintenance – It will be required to maintain the species richness, abundance and structure of the restored plant communities within Jackson Park. Invasive plant species are not the only threat to plant community degradation. Aside from minor re-plantings, it will be important to continue to protect plant communities from external changes by man’s daily activities, whether single incidents or chronic stressors. These can cause plant communities to experience significant species richness declines even to the point of becoming monotypic stands. The best operational measure to quickly identify and rectify external stressors is vigilance. Routine inspections by the non-Federal sponsor’s qualified stewards are imperative to notice adverse change quickly. The long term monitoring plan provided above will not catch quick change as would routine inspection by site stewards.

Fish, Amphibian, and Bird Monitoring – It will be required to monitor for the presence of native fish species that will be introduced into Jackson Park lagoon. It will also be encouraged to monitor for the presence of native bird and amphibian species, especially mudpuppies. Monitoring for native fauna provides insight into the continued success of the restoration of Jackson Park ecosystem and may provide clues to the improving or degrading conditions of the site years after the restoration work has been completed onsite.

6.7 Implementation of Environmental Operating Principles

In assessing the environmental effects, USACE implemented the following Environmental Operating Principles (EOPs)¹⁹ as part of this Feasibility Study.

Foster sustainability as a way of life throughout the organization.

Plans to restore native plant and fauna communities to Jackson Park will be easily sustainable because of the adaptability of the proposed communities to the conditions of Jackson Park. With minimal monitoring and maintenance to the newly introduced communities outlined within the NER should have lasting success. This design creates sustainability by avoiding the use any mechanical features which would require intensive operations and maintenance over time. Additionally, the proposed work is taking place within the Chicago Park District lands, which are cared for and maintained in perpetuity.

Proactively consider environmental consequences of all Corps activities and act accordingly.

The study team considered environmental consequences of proposed restoration features and construction activities. A cumulative effects assessment was completed to ensure all things were considered. Participation from Federal, state and local agencies and stakeholders were also held to ensure the most environmentally beneficial project. The study team does not anticipate negative impacts to the Jackson Par study area based on the restorative nature of the project, which would reestablish healthy native plant communities.

Create mutually supporting economic and environmentally sustainable solutions.

The study team formulated potential restoration plans to determine what the most cost-effective solution for ecosystem restoration is; however, appropriate engineering studies and biological assessments were performed to ensure that an implemented plan would be sustainable. Chicago District ecosystem designs avoided costly and unsustainable features such as pumps, weirs, and other fabricated structures. These types of features require continual monitoring, maintenance and funding to ensure they are providing required parameters for the ecosystem to be sustained. Designs for the Jackson Park restoration project rely on the parameters provided by the everyday system and predicted future changes.

Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps which may impact human and natural environments.

This project is exemplary for meeting USACE corporate responsibility and accountability. HTRW analyses were completed and reviewed to ensure construction activities would not result in an unlawful release of contamination (Appendix D). The Laws, Compliance Statues and Executive Orders support the NER plan, which are discussed in the Federal Objective, Institutional Significance of the NER Plan and Compliance.

Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs.

Risks associated with ecosystem restoration projects are typically low, for example, if certain portions of the project were to fail, other portions could be successful just as well; so it is not an all or nothing

¹⁹ USACE. Environmental Operating Principles.
<https://eko.usace.army.mil/usacecop/environmental/eop/>

scenario. There is typically no chance for the loss of or causing discomfort to human life as well. In the case of Jackson Park, restoring native plant and fauna communities within the study area would only have beneficial affects to people and the environment. Risk considerations for this project primarily deal with the cost obligated to restore the environment and ultimately gain no benefits in return. The study team has not only incorporated very detailed engineering models to ensure the physical resilience of the habitat features, but have also weighed the biological conditions against other natural areas and similar restoration projects to ensure the plan will function as expected. The study has also presented this question to review teams within and outside of the USACE to ensure a high level of quality assurance.

Leverage scientific, economic, and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.

This Feasibility Study was conducted in a manner that leveraged scientific knowledge from the USEPA, University of Illinois Chicago, ERDC and previously constructed Chicago District ecosystem restoration projects. The study team will also meet with governmental agencies, local industry, and environmental interest groups to gather scientific, economic and social information that pertains to the Jackson Par study area.

Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

This study process and subsequent Feasibility Report was drafted in a manner that has reduced redundancies, excessive and inconsequential information, and confusing engineering and policy discussions. Presentation of this study was done in a clear sequential order to show what the natural condition of Jackson Park was historically, what the existing conditions are now, what they would be if left alone, what could be done, and what should be done based on considerations of ecosystem improvement and associated costs.

6.8 NEPA Compliance

The President's Council on Environmental Quality guides public participation opportunities with respect to Feasibility Reports and Environmental Assessments, Engineering Regulations, and procedures for implementing NEPA. The Jackson Park ecosystem restoration plan was determined to be in noncompliance with NEPA and all other appropriate statutes, executive orders and memoranda ([Section 5.6 Compliance with Environmental Statutes](#)). Coordination and compliance for this feasibility study and integrated environmental assessment included comprehensive public involvement, agency coordination, and review of and has included compliance with applicable Federal statutes per the USACE Engineering Regulation 1105-2-100, Planning Guidance Notebook.

6.8.1 Mitigation Requirements

Since this is an ecosystem restoration project in which once lost resources would be recovered by the Federal Action; therefore, mitigation is not warranted.

6.8.2 Public/Agency Comments & Views

Public/Agency Review of the Draft EA

Scoping response letters were received from the Illinois SHPO, Illinois DNR, Kickapoo Tribe, USEPA, USFWS, and the Audubon Society Chicago. The Illinois SHPO concurs with the project so as long as the

Plans & Specifications are coordinated during the design phase. The Illinois DNR concurs with project and will perform a final review during the NEPA Public Review period. The Illinois DNR recommends providing a list of existing and proposed fishes for the pond restoration, which is included in this document. The USFWS currently supports this project, but will wait until the NEPA Public Review to provide final comment and support. The USEPA has provided the usual recommendations to comply with CEQ and ensure the project has stewardship towards protecting water quality and habitat. Appendix C provides information on staging, access, construction activities and special BMP provisions.

Public/Agency Meeting on the Draft EA

This section will be furnished when the public input generated is analyzed.

Publication of the Finding of No Significant Impact (FONSI)

This section will be furnished when the public NEPA review is completed and the District Commander signs a FONSI.

6.9 Project Schedule & Costs

Table 10: Study & Tentative Project Schedule

Schedule Item	Completion Date
Feasibility Report Approved	April 2014
Project Partnership Agreement (PPA) Signed	April 2014
Real Estate Complete	July 2014
Contract Award	September 2014
Implementation Complete	Fall 2017

6.9.1 Total Project Costs

Total project costs include costs for study, design, implementation, contingencies, construction management, engineering during construction (EDC) and project management. Costs for design and management are estimated based on a percentage of estimated implementation costs and contingencies. These costs will be revised prior to the execution of a Project Partnership Agreement (PPA) and actual costs for these activities will be used to remedy final cost sharing responsibilities during project close-out. Total project costs were escalated to the mid-point of estimated construction using factors contained in EM 1110-2-1304, Civil Works Construction Cost Index System (CWCCIS). **Table 11** provides a summary of the Fully Funded Project costs for the NER Plan as presented in the Cost Certification TPC. Using the fully funded escalated costs and the implementation schedule, a summary of funding requirements by fiscal year was developed as presented in **Table 12** for the NER Plan.

Table 11: NER Plan Total Costs in 1,000s

(Intentionally Removed)

Table 12: NER Plan Cost Apportionment in \$1,000s

(Intentionally Removed)

6.9.2 Financial Capability of Non-Federal Sponsor

In accordance with regulation ER1105-2-100, Appendix D, the non-Federal sponsor has sufficient funds currently available. The non-Federal sponsor is committed to its specific cost share of the Design & Implementation (D&I) Phase, and expresses willingness to share in the costs of construction to the extent that can be funded.

CHAPTER 7 – RECOMMENDATION

I have considered all significant aspects of the problems and opportunities as they relate to the project resource problems of the Jackson Park restoration project. Those aspects include environmental, social, and economic effects, as well as engineering feasibility. I recommend that the NER Plan be implemented as a Federal project, with such modifications thereof as in the discretion of the Commander, USACE may be advisable. The estimated Fully Funded Cost of the NER Plan is [REDACTED] and the estimated annual operations, maintenance, repair, replacement and rehabilitation (OMRR&R) cost is [REDACTED]. The Federal portion of the estimated total project cost is [REDACTED] for the Feasibility Phase and [REDACTED] for Design & Implementation. The non-Federal share of the estimated first cost of the project is about [REDACTED] and will be covered by lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRDs) of [REDACTED] and a cash contribution of [REDACTED].

As established in PL99-662, as amended, project costs are shared with the non-Federal sponsor in accordance with project outputs. The Chicago Park District has agreed to serve as the local cost-sharing sponsor for the Jackson Park, City of Chicago, Illinois Ecosystem Restoration project. The cost-sharing requirements and provisions will be formalized with the signing of the Project Partnership Agreement (PPA) between the local sponsor and USACE prior to initiation of contract award activities. In this agreement, the local sponsor will agree to pay 35 percent of the total project costs. Federal implementation of the recommended project would be subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, including but not limited to:

- a. Provide 35 percent of total project costs as further specified below:
 1. Provide 35 percent of the separable project costs allocated to environmental restoration as further specified below
 - a) Provide the non-Federal share of all complete planning and design work upon execution of the PCA
 - b) Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations determined by the government to be necessary for the construction and O&M of the project
 - c) Provide or pay to the government the cost of providing all features required for the construction of the project
 - d) Provide, during construction, any additional costs as necessary to make its total contribution equal to 35 percent of the separable project costs allocated to environmental restoration
 2. Contribute all project costs in excess of the USACE implementation guidance limitation of \$10,000,000
 3. For so long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed project or the functional portion of the project at no cost to the government in accordance with applicable federal and state laws and any specific directions prescribed by the government
 4. Give the government a right to enter, at reasonable times and in a reasonable manner, upon land that the local sponsor owns or controls for access to the project for the purpose of inspection and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project
 5. Assume responsibility for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the project or completed functional portions of the project, including mitigation features, without cost to the government in a manner compatible with the project's authorized purpose and in accordance with applicable federal and state laws and specific directions prescribed by the government in the OMRR&R manual and any subsequent amendments thereto
 6. Comply with Section 221 of Public Law (P.L.) 91-611, Flood Control Act of 1970, as amended, and Section 103 of the WRDA of 1986, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resource project or separable element thereof until the nonfederal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element
 7. Hold and save the United States free from damages due to construction of or subsequent maintenance of the project except those damages due to the fault or negligence of the United States or its contractors

8. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs
9. Perform or cause to be performed such investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 *U.S. Code* 9601 through 9675, that may exist in, on, or under lands, easements, or rights-of-way necessary for the construction, and O&M of the project, except that the nonfederal sponsor shall not perform investigations of lands, easements, or rights-of-way that the government determines to be subject to navigation servitude without prior written direction by the government
10. Assume complete financial responsibility for all necessary cleanup and response costs for CERCLA-regulated material located in, on, or under lands, easements, or rights-of-way that the government determines necessary for the construction and O&M of the project
11. To the maximum extent practicable, conduct OMRR&R of the project in a manner that will not cause liability to arise under CERCLA
12. Prevent future encroachment or modifications that might interfere with proper functioning of the project
13. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, P.L. 91-646, as amended in Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, P.L. 100-17, and the uniform regulation contained in Part 24 of Title 49, *Code of Federal Regulations* (CFR), in acquiring lands, easements, and rights-of-way for construction and subsequent O&M of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said acts
14. Comply with all applicable federal and state laws and regulations, including Section 601 of Title VI of the Civil Rights Act of 1964, P.L. 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto and published in 32 CFR, Part 300, as well as Army Regulation 600-7 entitled "Non-Discrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"
15. Provide 35 percent of that portion of the total cultural resource preservation, mitigation, and data recovery costs attributable to environmental restoration that are in excess of 1 percent of the total amount authorized to be appropriated for environmental restoration
16. Do not use federal funds to meet the nonfederal sponsor's share of total project costs unless the federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch.

Frederic A. Drummond Jr.
Colonel, U.S. Army
District Commander