Upper Des Plaines River Feasibility Study

Appendix M – Monitoring & Adaptive Management Plan

August 2013

Study Partnership

Illinois Department of Natural Resources (IDNR)
Southeastern Wisconsin Regional Planning Commission (SEWRPC)
Lake County Stormwater Management Commission (LCSMC)
Preserve District Lake County (FPDLC)
Metropolitan Water Reclamation District of Greater Chicago (MWRDGC)
Cook County Highway Department (CCHD)
Forest Preserve District of Cook County (FPDCC)
U.S. Fish and Wildlife Service (USFWS)
U.S. Army Corps of Engineers (USACE

US Army Corps
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Introduction

Section 2039 of WRDA 2007 directs the Secretary of the Army to ensure, that when conducting a feasibility study for a project (or component of a project) under the Corps ecosystem restoration mission, that the recommended project includes a monitoring plan to measure the success of the ecosystem restoration and to dictate the direction adaptive management should proceed, if needed. This monitoring and adaptive management plan shall include a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring as well as specify that monitoring will continue until such time as the Secretary determines that the success criteria have been met.

Section 2039 of WRDA 2007 also directs the Corps to develop an adaptive management plan for all ecosystem restoration projects. The adaptive management plan must be appropriately scoped to the scale of the project. The information generated by the monitoring plan will be used by the District in consultation with the Federal and State resources agencies and the MSC to guide decisions on operational or structural changes that may be needed to ensure that the ecosystem restoration project meets the success criteria.

An effective monitoring program is necessary to assess the status and trends of ecological health and biota richness and abundance on a per project basis, as well as to report on regional program success within the United States. Assessing status and trends includes both spatial and temporal variations. Gathered information under this monitoring plan will provide insights into the effectiveness of current restoration projects and adaptive management strategies, and indicate where goals have been met, if actions should continue, and/or whether more aggressive management is warranted.

Monitoring the changes at a project site is not always a simple task. Ecosystems, by their very nature, are dynamic systems where populations of macroinvertebrates, fish, birds, and other organisms fluctuate with natural cycles. Water quality also varies, particularly as seasonal and annual weather patterns change. The task of tracking environmental changes can be difficult, and distinguishing the changes caused by human actions from natural variations can be even more difficult. This is why a focused monitoring protocol tied directly to the planning objectives needs to be followed.

This Monitoring and Adaptive Management Plan describes the existing habitats and monitoring methods that could be utilized to assess projects. By reporting on environmental changes, the results from this monitoring effort will be able to evaluate whether measurable results have been achieved and whether the intent of Section 206 Aquatic Ecosystem Restoration are being met.

Guidance

The following documents provide distinct Corps policy and guidance that are pertinent to developing this monitoring and adaptive management plan:

a. 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.

b. USACE. 2009. Planning Memorandum. Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration

c. USACE. 2000. ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies. Washington D.C.

d. USACE. 2003a. ER 1105-2-404. Planning Civil Work Projects under the Environmental Operating Principles. Washington, D.C.

General Monitoring Objectives

As presented in "Guidance on Monitoring Ecosystem Restoration Project" on 12 January 2010, the following are general project monitoring objectives:

- To determine and prioritize needs for ecosystem restoration
- To support adaptive management of implemented projects
- To assess and justify adaptive management expenditures
- To minimize costs and maximize benefits of future restoration projects
- To determine "ecological success", document, and communicate it
- To advance the state of ecosystem restoration practice

Project Area Description

The upper Des Plaines River watershed originates in the agricultural landscape of Racine and Kenosha counties of southeastern Wisconsin. The watershed then slopes south into Illinois through Lake County and then Cook County, where it converges with the Salt Creek Watershed near Riverside, Illinois. The Des Plaines River then flows southwest on to its confluence with the Kankakee River, where the two rivers combine to form the Illinois River. The study area for this Phase II Study includes the entire drainage area upstream of the confluence with Salt Creek, including 12 tributaries to the river.

The upper Des Plaines watershed covers approximately 484 square miles, covering an area that spans approximately 60 miles from north to south and 8 miles wide from east to west. The upper Des Plaines River travels over 69 miles before its confluence with Salt Creek. Tributaries within the study area include about 330 miles of perennial and intermittent streams. The study area is shown in Plate 1, and includes 73 municipalities in Illinois and Wisconsin.

Habitat Trends Triggering Restoration

This project aims to remedy adverse trends of:

- Impairments to wetland, riverine and riparian functions and habitat structure
- Loss of native ecosystem diversity
- Abundance of invasive and nonnative species

Restoration Design Overview

Implementation of the plan will restore hydrology, hydraulics, geomorphology and native plant communities in support of higher order species habitat requirements. The ecological restoration portion of this project would improve hydrology by filling an estimated 17,900-feet of unnatural ditch along with hundreds of thousands of feet of drain tiles dismantled. Natural stream sinuosity would be restored increasing total length from 68,400-feet to 85,500-feet and 7,000-feet of stream would receive instream habitat treatments. Five dams would be removed on the mainstem Des Plaines River. Over 9,800-acres of native community types would be restored including: marsh (2,525-acres), meadow (615 acres), prairie (3,315-acres), savanna (900-acres), woodland (1,450-acres) and forest (1,000-acres). Ecosystem Plan 2 increases the quality of watershed ecosystem communities by 50% of what currently exists.

Monitoring Components

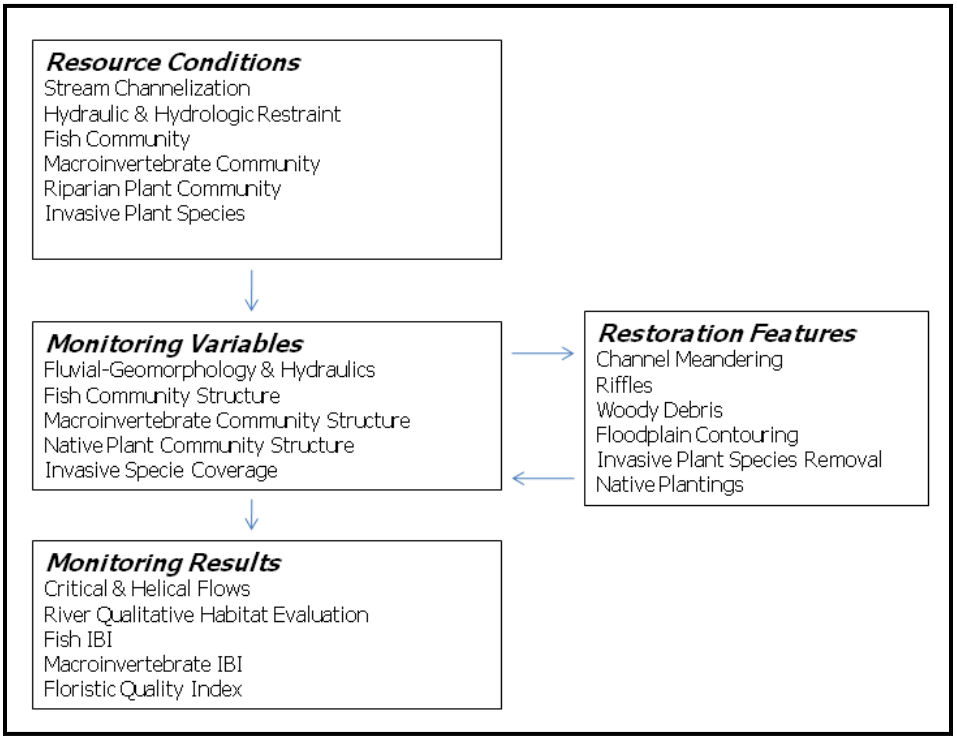
Monitoring Plan Goals & Objectives

The goals of the plan are to increase riverine connectivity, species richness, native ecotypes, water quality, and reduce non-native species. These goals will be met by meeting the following objectives.

- Critical Flow: **~ 1.0**
- Helical Flow: **observation yes or no**
- Restore physical riverine and riparian corridor habitat as measured by the Qualitative Habitat Evaluation Index: Target QHEI Score = **≥75**
- Improve native fish species richness, abundance and assemblage structure as measured by the Illinois Region 4 Index of Biotic Integrity: Target IBI Score = **≥40**
- Improve native plant species richness and assemblage structure as measured by coefficient of conservatism of the Chicago Region Floristic Quality Index: Target Overall Mean C Score = **≥4**
- Eradicate / reduce the presence of non-native and invasive species: Target Invasive Species Eradication Percentage = <**1% Areal Coverage**

In order to evaluate the overall effectiveness of the project and to determine if the specific objectives are met, the following Monitoring Plan is proposed, and includes several basic monitoring components: stream hydraulics, stream habitat, fish community, macroinvertebrate community, and riparian vegetation. All components with be monitored as specified below, once prior to the project and one time per year for five years following completion of the project.

Conceptual Model



Stream Hydraulics

Hydraulic parameters will be monitored at each riffle/pool complex. In order for riffles to provide conditions for lotic macroinvertebrates and fishes, critical flow must be induced over the riffle; otherwise it is just a pile of rocks in a ditch. Critical flow will be monitored through observation and calculation. Helical flow is also important as water flows over the riffle and into the pool at meander bends. Helical flow is a cork-screw effect water under goes as changes course in a meander bend. This effect can be observed through placing semi-buoyant material in the water which becomes entrained in the flow pattern. The phenomenon is important to stream fishes that depend on flowing water to bring food to them. Other data would be taken at certain cross-sections as well to record how the channel is developing, which includes velocity, stream morphology, and substrate counts.

Stream Habitat

Habitat parameters for the restoration reach will be evaluated using the Qualitative Habitat Evaluation Index, or QHEI (Rankin 1989). The QHEI consists of eight sections with a maximum total of 100 points:

1. Characterization of substrate types and the effects of siltation
2. Characterization of in-stream cover
3. Characterization of channel morphology
4. Characterization of the riparian zone and bank erosion
5. Assessment of the pool / glide & riffle / run
6. Gradient
7. Shade
8. Channel incision

One raw data sheet consisting of one to five transects will be completed for each site. The sites will be assessed from a river right descending perspective. The transects were dependent and based on the area sampled for fishes and began some distance up or downstream from evident bridge disturbance to the stream; however, the impacts from these structures should be taken into consideration when implementing restoration measures since this study recommends remedies to anthropogenic disturbance to stream morphology and function.

Macroinvertebrate Community

Macroinvertebrates will be collected concurrently with fish samples, according to Illinois River Watch Protocols (IDNR 2000). Samples will be taken from all habitat types within the restoration reach. The Macroinvertebrate Biotic Index (MBI, Bertrand et al. 1996), a water quality index based on tolerance of taxa to pollution, would be calculated for each location sampled. MBI values range from 0-12, with lower scores indicating better water quality.

Fish Community

Monitoring of fish communities is a well-established approach for evaluating overall aquatic ecosystem health and will be quantified through the use of the Index of Biotic Integrity (IBI). The IBI employs fish assemblage as the indicator of ecological form and function. Fish are not only a highly visible part of the aquatic resource, but they are quite sensitive to the surrounding water and habitat quality. This does not suggest that the use of other organisms is insufficient or inappropriate (Simon 1991). The pre and post dam removal condition of the project reach was and will be evaluated using the IBI (Karr 1981; Karr et. al. 1986; Simon 1991; Smogor 2002). This method makes use of a systematic process to set quantitative criteria that enables the measurement of riverine stream quality. This index employs ten parameters or "metrics" based on structural and functional components of the fish assemblage. Structural components include diversity, taxonomic guilds, and abundance. Functional components include feeding or trophic guilds, reproductive behavior, tolerance to adverse environmental stressors, and individual stresses (Simon 1991; Smogor 2002). These metrics are calibrated to for differences in stream size and geographic region. The following ten metrics may each receive a score 0 to 6, based on comparison to unaltered reference sites, with a total IBI score ranging from 0 to 60 (Smogor 2002):

1. Number of native fish species
2. Number of native Catostomid species
3. Number of native Centrarchid species
4. Number of native intolerant species
5. Number of native Cyprinid species
6. Number of native benthic insectivore species
7. Proportion of individuals as specialist benthic insectivores
8. Proportion of individuals as generalist feeders
9. Proportion of individuals as obligate course-mineral substrate spawners and intolerant
10. Proportion of tolerant species

Native Plant Communities

Evaluation of riparian vegetation will be done using the Floristic Quality Assessment Index (FQA) and native plant richness. In short, the FQA is a measure of overall environmental quality based the presence or absence of certain plant species. Plant species that are assigned a coefficient of conservatism of 5 to 10 are considered to be indicative of less human mediated disturbance and a higher level of functionality. As the area stabilizes after restoration measures are complete, the number of higher conservative plant species that become established will increase. Communities that have an average mean coefficient of

conservatism of between 3 to 5 are considered to be fair quality. This is a good estimate of the future quality of the area based on the current plant community and 'good' quality natural sites in the surrounding areas. The overall number of native plant species is expected to increase dramatically as well, helping to increase the overall biodiversity of the area.

Soils

Soil samples using PRS™ (Plant Root Simulator)-probes (Western Ag Innovations Inc., Saskatoon, SK, Canada) will be used to assess soil properties and responses to implemented restoration measures. Data will be compared to baseline conditions taken during the feasibility phase and will be used to support vegetative monitoring results and adaptive management activities.

Sampling Stations

The entire reach restored will be considered as the monitoring site. The new stream channel will be roughly 3,000-feet.

Reference Site Discussion

No reference site is deemed necessary; improvements will be judged from site current conditions.

Sampling/Survey Frequency

Riverine Hydraulics, Habitat, Fish and Macro Invert Communities

Monitoring would occur between April and October of each year of monitoring activities. Sampling would occur twice a year. The total monitoring period will be 5-years.

Riparian Plant Communities

Plant monitoring would occur between June and August of each year of monitoring activities. Sampling would occur once a year. The total monitoring period will be 5-years.

Soils

Soil samples will be taken every other year (3 years) between June and July.

Data Analysis

Stream Hydraulics, Habitat, Fish and Macro Invert Communities

The information generated through monitoring riverine structure and fish and macroinvertebrate communities would be used to indicate the trend in overall condition of the area. Fish and macroinvertebrate species richness and abundance is expected to increase dramatically within the first two years after the restoration. The repaired hydraulics and habitat structure of the riverine system should allow for a) increased QHEI scores within a year and b) increase in IBI/mIBI scores. If the trends in the data indicate a decrease in condition, adaptive management actions may be taken; however, due to the nature of the project, ecological conditions can only improve with channel repair and vegetation restoration.

Riparian Plant Communities

The information generated through sampling the plant community would be used to indicate the trend in overall condition of the area. The FQA mean coefficient of conservatism is expected to increase each year. If the FQA analysis indicates a decrease in condition, adaptive management actions may be taken to increase the score for the following sampling year.

Monitoring Responsibilities

Eventually, each site would have its own monitoring plan and may have different stewards performing the work. At the current time for this general monitoring plan, the Chicago District assumes monitoring responsibilities.

Monitoring Costs & Funding Schedule

See Main Report for monitoring costs.

Reporting Results

A yearly monitoring summary report would be drafted by the USACE that briefly summarizes the data collected and determines if adaptive management is needed for each site. A final monitoring report would be drafted that details the outcomes of the restoration project. Eventually, an over arching document would be drafted that combines all of the results for all approved NER sites.

Contact Information

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Native Plant Communities

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Adaptive Management

Potential adaptive management needs are primarily of concern for the remeandering of the stream channel. There may need to be minor additions of boulders, cobble and woody debris to prevent the

channel from migrating too much. The need for this would be specifically determined by the stream hydraulics monitoring methods.