Lower East Branch DuPage River Stream Restoration Project, DuPage & Will Counties, IL Conceptual Design Report

SUBMITTED TO
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inter·fluve

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1. Executive Summary

This report documents Inter-Fluve's site investigation, field data collection efforts, conceptual designs, and options assessment for the restoration of the lower East Branch DuPage River (the Project) in DuPage County and Will County, Illinois. The primary goals of the Project are to increase fish biodiversity and improve physical habitat in the East Branch DuPage River. These goals will be met by implementing naturalized stream restoration practices such as re-meandering, engineered large wood structures, and aquatic and riparian habitat enhancements that will help restore geomorphic processes and create habitat complexity.

The project area is an approximately 7.2-mile, low-gradient (0.04%) section of the East Branch DuPage River, including its riparian corridor, that extends from Hobson Road in Woodridge, Illinois (DuPage County) downstream to Weber Road (also referred to as Washington Street) in Naperville, Illinois (Will County). The project area's geology is dominated by the advance and retreat of the glaciers responsible for forming the Great Lakes during the Wisconsin Glaciation.

The modern East Branch DuPage River lies within an alluvial valley incised through a series of glacial end moraines. The river through the project area has been channelized over an approximately 5.2-mile stretch (i.e., 72% of the project area). Currently, industrial land uses, limestone quarries, and development encroach on the straightened channel over an approximately 2-mile reach (i.e., 28% of the project area). The valley is less confined and broader in historically less impacted reaches and where land has been preserved as park space, presently totaling approximately 5.2 miles (i.e., total of 72% of the project area). Effluent from wastewater treatment plants contributes to baseflow, and watershed urbanization leads to flashy flows following rain events. The river has a low gradient, steep banks, and exhibits a relatively stable planform. Urbanization and climate change have contributed to channel widening. The floodplain and near bank vegetation communities are dominated by reed canary grass and spotted smartweed.

Inter-Fluve divided the study area into four reaches and developed recommendations for ecological enhancement of each. Design elements can be grouped into four categories: channel construction (i.e., re-meandering), in-stream and floodplain large wood structures, in-stream habitat treatments, and revegetation. Conceptual designs incorporating these elements were tailored to the opportunities and constraints in each reach. Implementation of the recommendations would result in an improvement of channel conditions based on QHEI scoring. The greatest improvements and categorical changes (e.g., Fair to Good overall condition) would be realized in reaches where meanders can be re-introduced to areas that were previously channelized. Construction cost opinions have been provided for each reach.

2. Introduction

This report documents Inter-Fluve's site investigation, field data collection efforts, conceptual designs, and options assessment for the restoration of the lower East Branch DuPage River (the Project) in DuPage County and Will County, Illinois.

2.1 PROJECT PARTNERS

The Project benefits from the support of the following project partners:

- DuPage River Salt Creek Workgroup (DRSCW);
- Forest Preserve District of Will County;
- Naperville Park District;
- Bolingbrook Park District;
- City of Naperville; and
- Village of Bolingbrook.

The Project will also involve a variety of stakeholders, including Vulcan Materials Company, Commonwealth Edison Company (ComEd), and Independent Baptist Church.

2.2 PROJECT GOALS AND DESIGN CRITERIA

The primary goals of the Project are to increase fish biodiversity and improve physical habitat in the East Branch DuPage River. These goals will be met by implementing naturalized stream restoration practices such as re-meandering, engineered large wood structures, and aquatic and riparian habitat enhancements that will help restore geomorphic processes and create habitat complexity.

The Project will support continued and enhanced recreational enjoyment of the East Branch DuPage River corridor and will be designed to minimize impacts to surrounding infrastructure and private property.

Specific project objectives were identified by the project partners during a conceptual design charrette on November 9, 2021. They are:

- Improve fish and macroinvertebrate population size and diversity;
- Improve instream, riparian, and floodplain habitat to fair/good quality standards, as measured by QHEI and IBI scores;
- Improve floodplain and riparian vegetation quality, reduce invasive species presence, and restore wetlands;
- Increase recreational value within the river corridor;
- Reduce bank erosion and provide widespread bank stability; and
- Provide a regional example of a healthy stream and riparian area.

The partners also communicated that the project should be permittable, should limit maintenance to practical levels, and be constructable within identified budgets.

Based on the identified project objectives, Inter-Fluve developed the following design criteria:

- Increase the amount of in-stream cover and habitat complexity using large wood and boulder elements;
- Restore naturalized river processes to channelized portions of river through targeted re-meandering of the river;
- Improve the quality and increase the abundance of pool habitat and riffles;
- Re-establish diverse assemblages of native plants in riparian and floodplain areas for regionally appropriate vegetative communities; and
- Increase the number of access points for paddlers.

3. Data Collection and Review

3.1 PROJECT AREA

The project area is an approximately 7.2-mile, low-gradient (0.04%) section of the East Branch DuPage River, including its riparian corridor, that extends from Hobson Road in Woodridge, Illinois (DuPage County) downstream to Weber Road (also referred to as Washington Street) in Naperville, Illinois (Will County) (Figure 1). Site survey was collected in the reach between Royce Road and Weber Road (see Section 4). Conceptual designs have been prepared for the entire project area, although engineering design will only take place in the area between Royce Road and Weber Road, which lies entirely within Will County. The land available for active construction and staging includes the channel bed and banks and publicly owned parcels. Any project activities on privately owned parcels will be subject to agreements between landowners and the project partners.

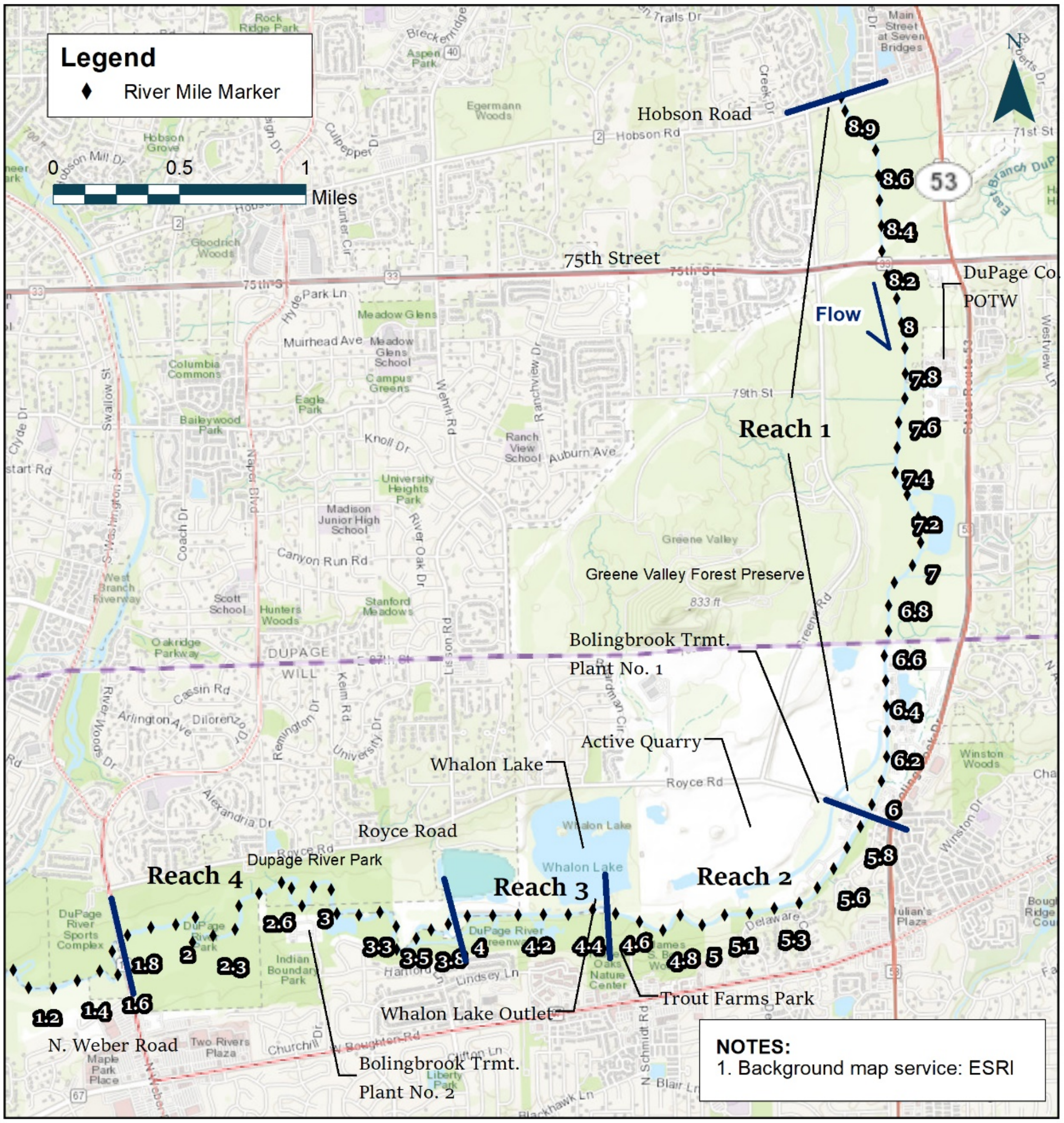

Figure 1. Project area location. River mile markers begin with 0.0 at the confluence of the East Branch with the West Branch.

3.2 LANDSCAPE CONTEXT

The project area's geology is dominated by the advance and retreat of the glaciers responsible for forming the Great Lakes during the Wisconsin Glaciation. Near the end of this period, advances and retreats of the Lake Michigan lobe left a series of terminal moraines throughout the majority of the East Branch DuPage River Watershed (Figure 2). Together, these moraines are part of the West Chicago and Valparaiso morainal systems. The river and its tributaries formed valleys within low-lying portions of the moraines, draining to the western edge of the morainal complex.

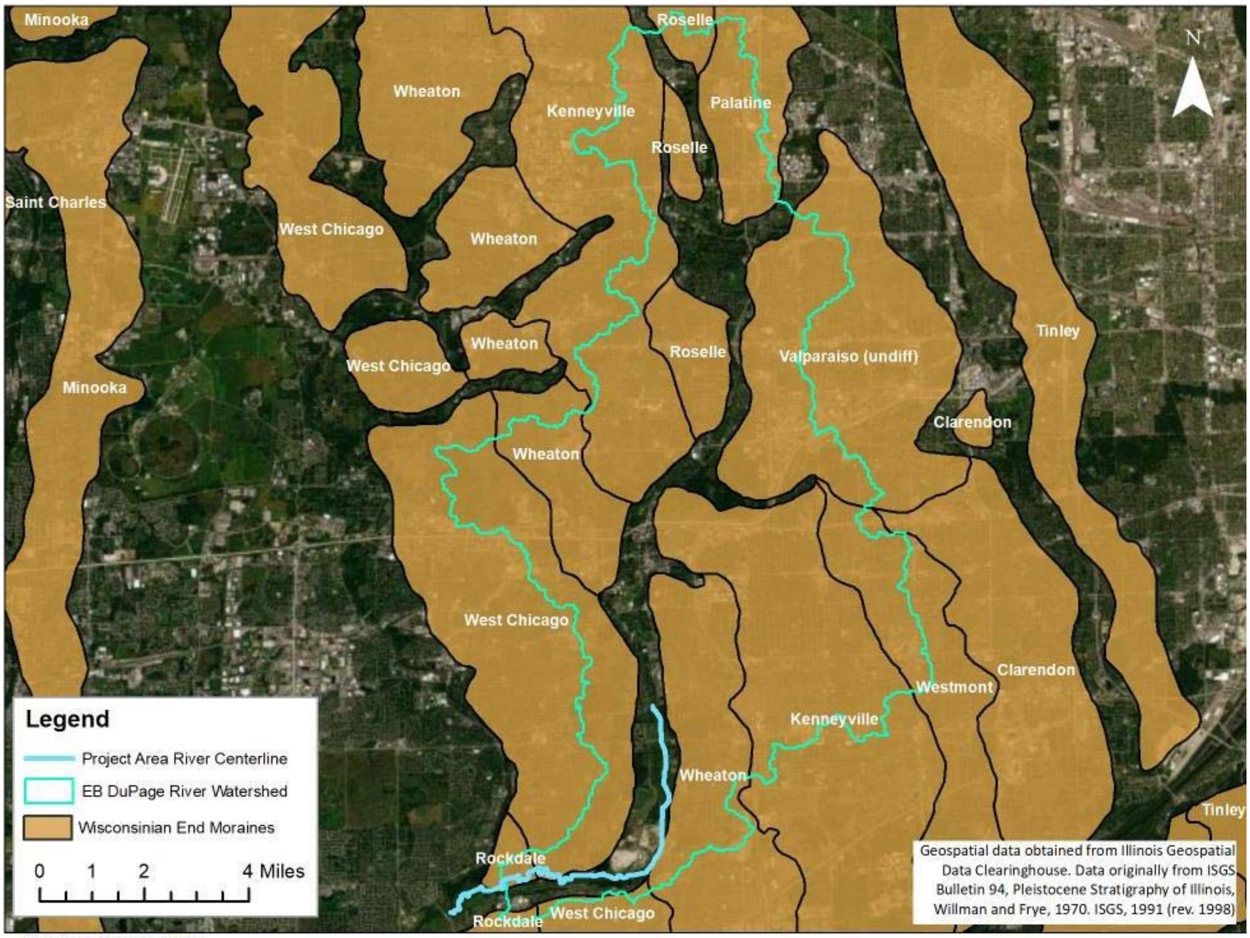

Figure 2. Map of end moraines within the East Branch DuPage River watershed. Glacial ice movement in the area was primarily to the northeast as glaciers receded.

The present-day East Branch DuPage River valley surficial geology is composed of Cahokia alluvium, a stratified formation of sand, silt, and clay less than five feet thick in much of the project area (Caron, 2017). The Henry Formation, a primarily sandy glacial outwash unit, is present along the valley margins, including in the areas surrounding the quarries north and west of the channel. Upland areas surrounding the valley are composed of the Wadsworth Formation, a thick till deposit associated with the West Chicago and Valparaiso terminal moraine systems (Figure 3).

Bedrock underlying the project area is composed of gently sloped Silurian dolomite and limestone Within the river valley, the depth to bedrock is generally less than 50 feet. Groundwater table elevations within the relatively shallow glacial deposits range from 650 to 625 feet in the project area. The regional slope of the groundwater potentiometric surface is to the east, although localized municipal and industrial groundwater pumping create a high-relief potentiometric surface within the watershed (Sasman et al., 1981).

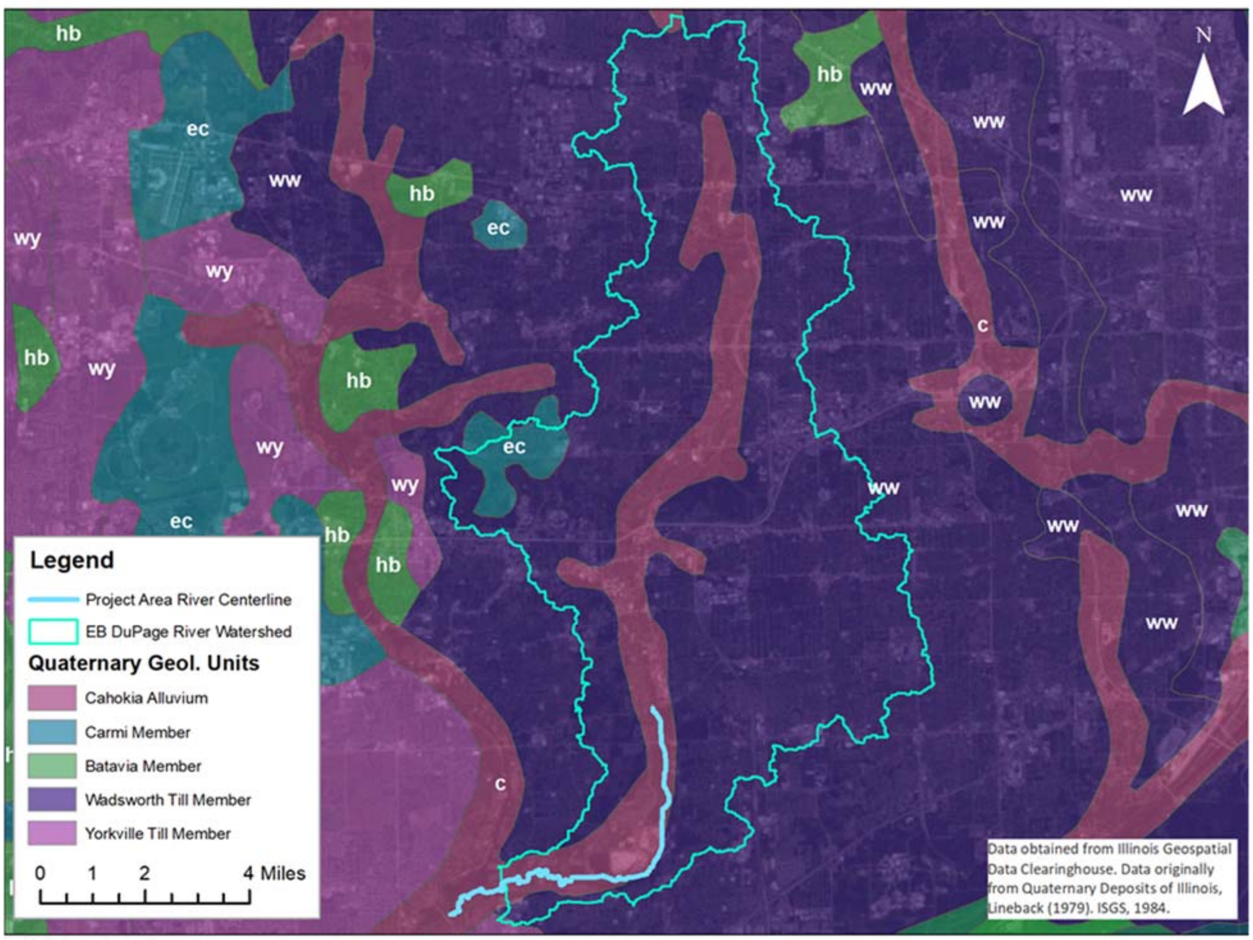

Figure 3. Map of generalized quaternary geology of the East Branch DuPage River Watershed

3.3 HYDROLOGY

Flow data for the East Branch DuPage River is available from the USGS gaging station located at the Royce Road bridge (USGS 05540250), which is located at the upstream end of the reaches which will be advanced to final design. The gage has a period of record dating from 1989 to the present day. We computed flood flow quantiles from annual peak flows using the USACE software package HEC-SSP Version 2.2 and USGS Bulletin 17C methodology. Peak flood discharge estimates are provided in Table 1.

Table 1. Peak flood estimates at USGS gage 05540250, located at Royce Road within the project area. The period of considered for analysis is 1989-2020.

Annual Exceedance Probability (%)	Average Recurrence Interval (years)	Estimated Peak Discharge at Royce Road Gage (cfs)
0.2	500	8,232
0.5	200	6,549
1	100	5,454
2	50	4,494
5	20	3,401
10	10	2,686
20	5	2,048
50	2	1,274
80	1.25	836
90	1.11	686
95	1.05	588
99	1.01	452

Inter-Fluve's analysis of annual peak flow data indicates the largest peak flow on record is 5,070 cfs, which occurred in 2013. The lowest recorded annual peak flow is 497 cfs, which occurred in 1989. Our analysis shows an increasing trend of peak flows at Royce Road since 1989, and the average annual rate of increase of annual peak flow between 1989 and 2020 is approximately 29 cfs per year. Urbanization and climate change both play a role in increasing peak flows (Aboelnour et al., 2020), and urbanization contributes to "flashy" flood hydrology in which flow peaks arrive more quickly, are greater in magnitude, and are shorter in duration than pre-urbanization conditions.

Analysis of daily mean flow records of the Royce Road gage indicates the East Branch DuPage River benefits from consistent baseflow exceeding 40 cfs, which is in part due to effluent from upstream wastewater treatment plants. The median flow in the river is 80 cfs. Flow is typically greatest in the spring and early summer and decreases in the fall and winter months.

Flood discharge estimates are also available for the East Branch DuPage River from the most recent Will County FEMA Flood Insurance Study (FIS; FEMA, 2019). FEMA peak discharge estimates for the East Branch DuPage River were made using the Illinois State Water Survey State Standard Method and regional equations and are shown in Table 2 (FEMA, 2019).

Table 2. FEMA FIS peak flood discharge estimates for the East Branch DuPage River at Royce Road

Annual Exceedance Probability (%)	Average Recurrence Interval (years)	FIS Estimated Peak Flow at Royce Road (cfs)
0.2	500	4,350
1	100	3,250
2	50	2,800
10	10	1,870

FEMA FIS mapping indicates the project area lies within the regulatory floodway. As such, the project is regulated by floodplain ordinances which stipulate that proposed activities do not result in an increase to the 1% flood elevation in any location.

3.4 HISTORICAL CONDITIONS

Inter-Fluve used historical images and maps of the project area to identify past locations and dimensions of the channel, floodplain characteristics, infrastructure, and land use. Prior to development of the watershed and floodplain, the river had a meandering single thread or multiple thread channel with a frequently inundated wetland floodplain.

Historical aerial photographs are available from the Will County and DuPage County GIS webpages, and we accessed historical topographic maps from the USGS Topoview database (USGS, 2021). USGS topographic maps show period of rapid channelization of the river. In 1923, the first year for which detailed mapping of the river is available, the reach upstream of Royce Road featured a meandering planform with an attendant floodplain wetland (USGS, 2021). The reach between Royce Road and the present-day Whalon Lake contained several more meanders not currently present along the river. By 1939, the first year for which aerial photographs are available, the reach upstream and downstream of Royce Road had been channelized to the present-day location of Trout Farm Park (Will County GIS, 2021). The meander bend downstream of Trout Farm Park was subsequently channelized between 1939 and 1954 (USGS, 2021).

The timing of channelization of the East Branch DuPage River corresponds to increasingly industrial and agricultural land uses within the river valley. In areas upstream of Royce Road, wetlands were mapped in 1923 (Figure 4); but by 1939, when the river is channelized, agricultural fields were present along much of the river. Quarries are first present on the 1954 topographic map along the west bank of the river, corresponding with channelization of meander bends downstream of Royce Road evident in aerial photos from 1947 (USGS, 2021; Will County, 2021).

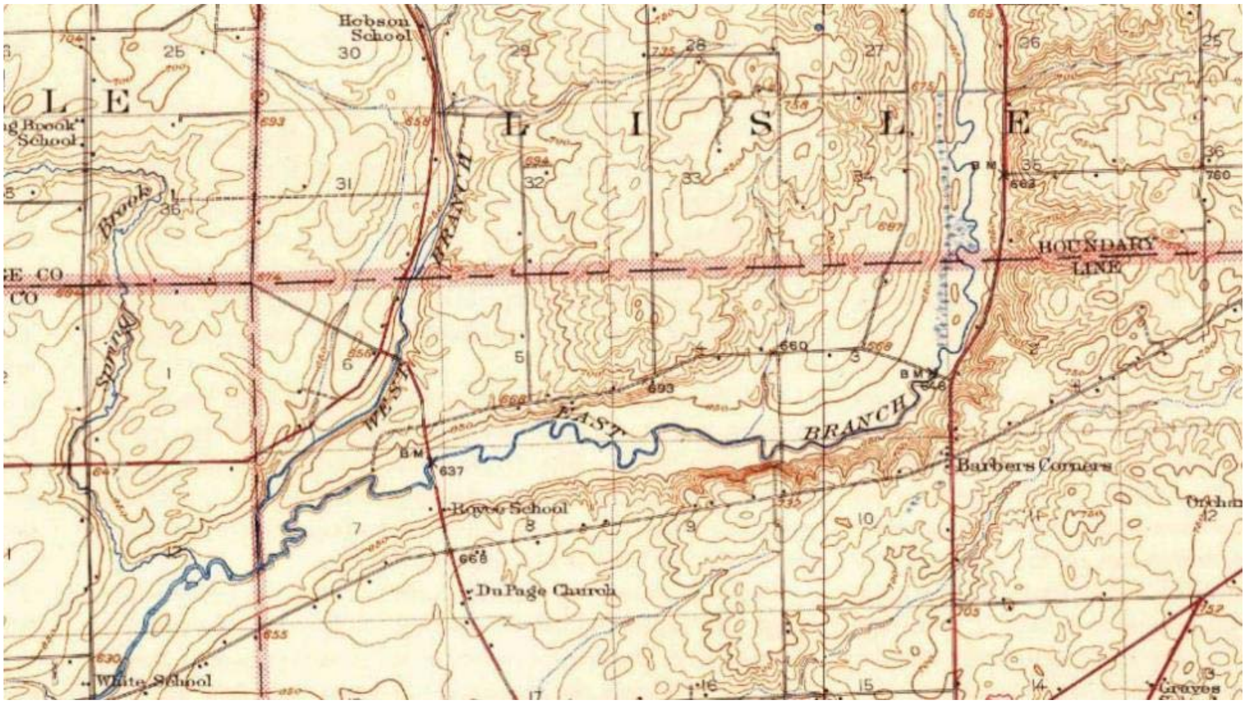

Figure 4. Excerpt from the 1923 USGS topographic map showing a relatively unaltered meandering river planform. The Royce Road crossing is shown just to the north of the Barbers Corners intersection.

To better discern changes to the planform and geometry of the channel, we digitized historical bank lines from the 1939 and 1970 aerial photo sets. Bank lines were manually digitized from georeferenced photos based on apparent waterline and vegetative indicators. In areas where indicators were unclear, we did not digitize bank lines. Uncertainties in the accuracy of digitization of historical geomorphic indicators exist as a result of photo resolution, georeferencing procedures, digitization scale, and physical variability of the indicators. In recognition of the myriad uncertainties, we offer a qualitative overview of channel change within the project area rather than a quantitative analysis.

The project area is remarkable for its relative lack of natural planform change between 1939 and 2020, even in reaches that had not been channelized. While the planform was relatively stable, the channel cross section appears to widen over the same time period. These trends are illustrated by a small area of the project reach shown in Figure 5. This area of channel, near the present-day DuPage River Trail parking lot, has widened appreciably since 1939. In 1939, the channel at riffle sections was approximately 50-55 feet wide. In 1970, riffle sections in this area were approximately 60-70 feet wide, and in 2020, they were approximately 80-90 feet wide. This progressive widening occurred without substantial migration of the channel's meander planform.

Based on our understanding of the watershed, the observed trends of channel widening and planform stability are likely caused by two main factors. First, urbanization and climate change have resulted in increased peak flows, which in turn have resulted in an increase in channel capacity. Second, bank materials are primarily composed of fine-grained silt and clay, with relatively small fractions of coarse material. When banks do erode, the channel lacks the stream power necessary to transport the coarser gravels and cobbles, which settle at the bank toe, and finer materials are carried as suspended load far downstream. Thus, neither fraction forms the bars and bedforms that typically contribute to meander migration in other systems.

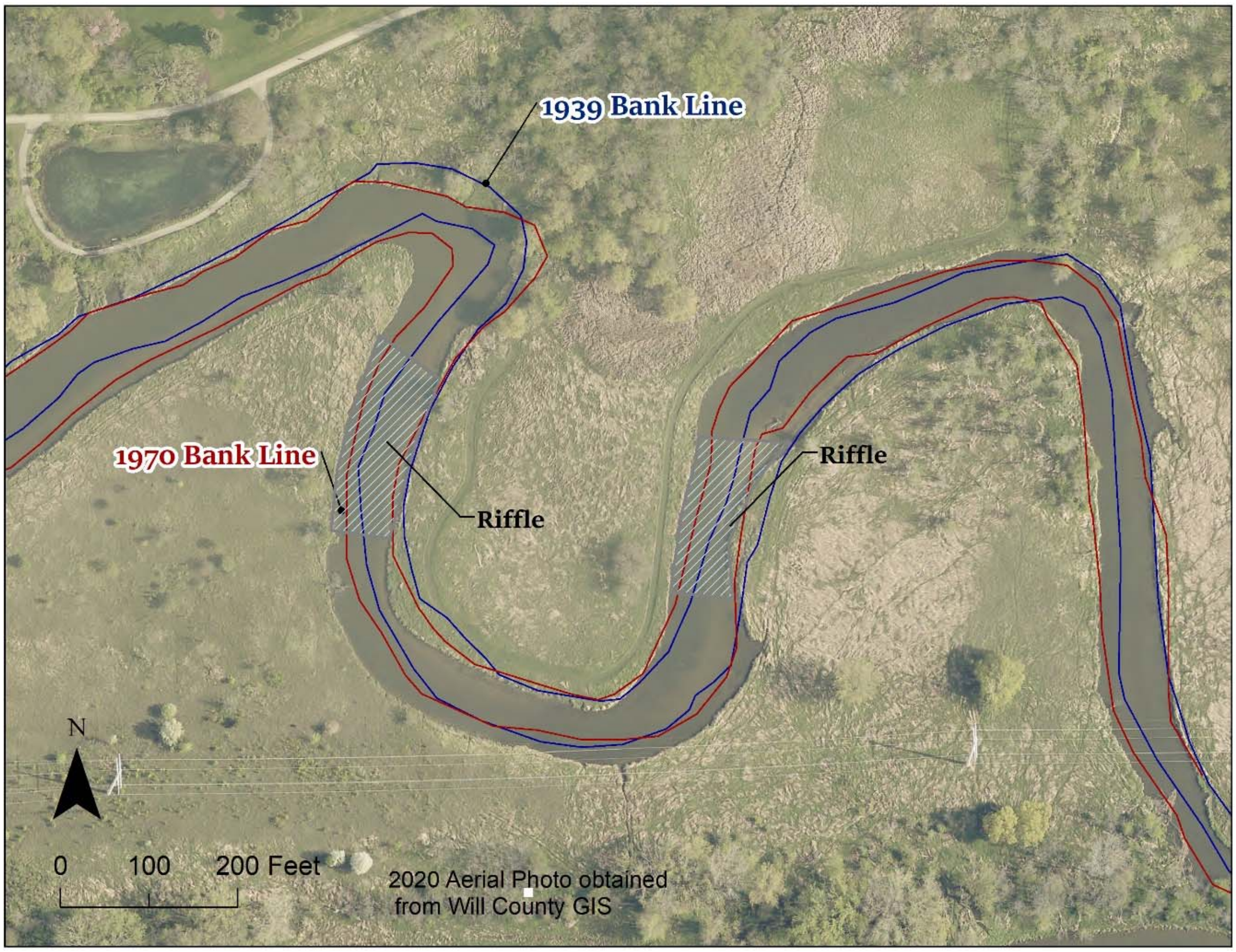

Figure 5. Image of the East Branch DuPage River overlain with historical bank lines digitized from 1939 and 1970 aerial photos. Map location is adjacent to the DuPage River Trail parking area on Royce Road (river mile 2.7 to 3.2). Approximate locations of riffles are shown.

3.5 TOPOGRAPHY/ BATHYMETRY SURVEY

The Inter-Fluve team collected topographic and bathymetric survey in the reach between Royce Road and Weber Road in September 2021. Flow was relatively uniform during the period of survey and approximated baseflow conditions. A HyDrone (Seafloor Systems, Inc.) equipped with a Hydrolite-TM single beam echosounder synced with RTK-GPS was used to obtain bathymetric survey of the channel in areas free of aquatic vegetation and with depths of at least one foot (Figure 6). Follow-up manual RTK-GPS surveys obtained bathymetric data in locations too shallow or otherwise inaccessible to the HyDrone. Topographic survey captured bank features, ground elevations within 50 feet of the channel, relevant utilities, trees, and infrastructure relevant to the project design.

Figure 6. Image of the HyDrone equipped with single-beam sonar and RTK-GPS equipment in operation upstream of Trout Farm Park

3.6 GEOMORPHIC ASSESSMENT

As described above, the East Branch DuPage River lies within an alluvial valley incised through a series of glacial end moraines. The river through the project area has been channelized over an approximately 5.2-mile stretch (i.e., 72% of the project area). Currently, industrial land uses, limestone quarries, and development encroach on the straightened channel over an approximately 2-mile reach (i.e, 28% of the project area). The valley is less confined and broader in historically less impacted reaches and where land has been preserved as park space, presently totaling approximately 5.2 miles (i.e., total of 72% of the project area). Effluent from wastewater treatment plants contributes to baseflow, and watershed urbanization leads to flashy flows following rain events. The river has a low gradient and steep banks. The floodplain and near bank vegetation communities are dominated by reed canary grass and spotted smartweed.

Inter-Fluve geomorphologists completed a reconnaissance geomorphic investigation of the project area between Hobson Road and Weber Road. Referenced river miles (RM) are approximate and correspond to those shown in Figure 1 and the accompanying concept design plans. For clarity, the project area is divided into the following four reaches:

- Reach 1: Hobson Road to Royce Road, in which the channel is entirely channelized;
- Reaches 2 and 3: Royce Road to a point approximately 1,900 feet downstream of the Whalon Lake outfall. This portion of the stream is predominantly channelized; and
- Reach 4: The downstream end of Reach 3 to Weber Road, in which the river has largely retained its historic meanders.

3.6.1 Reach 1: Hobson Road to Royce Road

In Reach 1, the East Branch DuPage River is channelized and flows through the Greene Valley Forest Preserve for approximately 2.3 miles (RM 8.9 to 6.6). Within the Forest Preserve, the river is bordered by wide floodplains, though these areas do not appear to be inundated frequently. For approximately 3,500 feet upstream of Royce Road, the river is bordered by industrial areas, including a large quarry owned by Elmhurst-Chicago Stone Company and leased to Vulcan Materials Company on river right. Several small tributaries and ditches, most of which were dry during field visits, enter the river in the reach. Flow enters from a pipe and ditch associated with Dupage County's Woodridge-Greene Valley Wastewater Facility (RM 7.7) on State Highway 53 downstream of 75th Street, and from a hydraulically connected pond downstream (south) of the wastewater facility (RM 7). During the field visit, substantial flow discharged from the quarry outfall approximately 4,500 feet upstream of Royce Road (RM 6.5) (Figure 7). Quarry discharge was cold (approximately 55° F), discharged through a marl (calcium carbonate) coated channel, and had a milky appearance, suggesting a suspended silt or clay load.

Between Hobson Road and the wastewater facility (RM 8.9 to 7.7), the channel banks are approximately 6 to 8 feet tall, with 2-4 feet of that height due to the presence of spoil berms left over from channel construction or clearing. Banks are predominantly vegetated with either shrubs or grasses. Banks vegetated with shrubs typically feature undercut banks with exposed gravel and cobble (D50 = 2 to 4 inches; Figure 8) at the toe. Areas with grassed banks are dominated by reed canary grass (*Phalaris arundinacea*) on the upper portions, spotted smartweed (*Persicaria maculosa*) on the lower banks, and generally are not undercut. Large woody debris is common along the stream banks throughout the reach.

Water depths during the field visit varied from approximately 3 inches over riffles to greater than 3 feet through runs and pools. Substrate material in the reach includes sand, gravel, and invasive clam shells, with some coarser material evident at riffles. Riffles are present at approximately 2,000-foot intervals between Hobson Road and the quarry outfall, downstream of which the channel bed displays undulating run-pool bedforms and generally deeper flow depths.

Figure 7. View of the Vulcan Materials quarry outfall upstream of Royce Road. Photo taken September 28, 2021.

Downstream of the wastewater facility at RM 7.7, channel widths range from 45 to 55 feet, and the banks are approximately 4 feet high, due to the absence of spoil berms. Relict meanders are present on the left (east) bank floodplain of the river upstream of the quarry outfall. One relict meander is particularly distinct on aerial photographs (RM 6.6), and it was discovered in the field that its banks, the channel bed, and associated riparian vegetation including mature cottonwood trees have been preserved.

Figure 8. Banks in Reach 1 are typically vegetated with trees and shrubs, undercut, and feature exposed gravel and cobble at the toe. Coarse toe material falls out of the upper banks, but the river lacks the energy to transport this material regularly.

3.6.2 Reaches 2 and 3: Royce Road to Whalon Lake

Reach 2 consists of the channelized portion of the East Branch DuPage River downstream of Royce Road, and extends for approximately 1.4 miles (RM 5.8 to 4.6). In this reach, the river is bounded by the DuPage River Trail and residential subdivisions on the left bank, and the Bolingbrook Sewage Treatment Plant No. 1 and the Vulcan Materials quarry on the right bank.

Reach 3 consists of approximately 0.5 miles of channelized river downstream of Trout Farm Park (RM 4.6 to 3.7). Downstream of Trout Farm Park, the left (south) bank is adjacent to a wide floodplain vegetated with box elder and reed canary grass. Several stormwater outfalls and small CMP culverts are present along the banks, though all were dry during the field visit. Whalon Lake discharges in two locations in Reach 3. The upstream, cascading outfall intermittently discharged during field visits (RM 4.5; Figure 9). The downstream outfall consists of culverts that outlet at river level and were not actively flowing during our field investigations (RM 4.3). Two inlets to floodplain channels are present on the left bank downstream of the Whalon Lake culverts. The channels convey water through a wetland complex south of the main channel and re-enter the main channel around RM 3.7 at the downstream limit of Reach 3.

Figure 9. View of the upstream, cascading Whalon Lake outfall. The height of the hydraulic drop is approximately 8 feet.

Throughout Reaches 2 and 3, the right bank features a constructed berm 8 to 20 feet above the baseflow water surface that is vegetated with trees and shrubs. The left bank is generally lower through the reaches and ranges from 4 to 6 feet in height. The left bank is predominantly vegetated with reed canary grass and spotted smartweed, with pockets dominated by trees and shrubs. Banks are most commonly near vertical, although select areas feature lower, more mildly sloping vegetated depositional features within the bankfull channel. Throughout the reaches, a thick, resistant clay layer is exposed intermittently along the right bank toe.

Large woody debris is less common in Reaches 2 and 3 than in Reach 1, though several large log jams were observed, including at the mouths of the inlets to the floodplain channels. Where present, large woody debris can force split flow, control upstream water surface elevations, and force local aggradation and scour (Figure 10).

Figure 10. Example in Reach 2 of large woody debris forcing split flow and varied bedforms across the channel section

Water depths during the field visit range from approximately 3 inches at riffles to over 5 feet through runs and pools. Several areas where the river appears wider than average feature plane-bed conditions and shallow flow. Bed sediments in these areas consist of sand, gravel, and invasive clam shells. Riffles are present throughout the reach, specifically where large woody material constricts flow and in locations of stormwater outfalls. Elsewhere in the reach, bed sediments are comprised of silts, sand, and fine to medium gravel. Downstream of Trout Farm Park to the end of Reach 3, flow depths are deeper and fewer riffles are present than upstream areas.

3.6.3 Reach 4: Downstream End of Reach 3 to Weber Road

Reach 4 is a meandering portion of the river that has experienced the least amount of anthropogenic alteration. The river lies within a broad floodplain nearly exclusively vegetated with reed canary grass and bordered by suburban development and parkland. The downstream half of the reach flows through the DuPage River Park, and walking trails bound both sides of the river's valley. A pond on the left (south) side of the river (RM 3.2) has a hydraulic connection to the river, and several small pipes are present along the banks of the river. One of the outfalls carries discharge from the Bolingbrook Sewage Treatment Plant No. 2.

Banks in Reach 4 are approximately 6 feet high, near-vertical, and almost exclusively vegetated with reed canary grass and spotted smartweed. Riprap is present in some locations along the outside of river bends. The clay layer observed at the bank toe in upstream reaches is present along both banks over large stretches near the waterline.

The channel in Reach 4 is characterized by riffle-pool sequences, although the nature of the riffles and pool depths are variable over the course of the reach. In the upstream portion of the reach, pools at the outside of several meander bends are shallow; whereas in areas downstream, pool depths exceed 4 feet. Riffles in the reach have shallow flow depths at baseflow, and bed material consists of sand, gravel, and clam shells. One distinct riffle approximately 2,000 feet upstream of Weber Road (RM 3.1) is composed of coarser gravels, cobbles, and boulders. Although the origin of the coarse material is unknown, it is likely lag material derived from glacial deposits that form the banks of the river in some locations. Aquatic vegetation is common in shallower areas of the reach. Several fish spawning redds were present in shallow areas with sand and gravel substrates (Figure 11).

The floodplain throughout Reach 4 is wide, unconstrained, and predominantly vegetated with reed canary grass and scattered dead box elder and black ash trees. An important exception is the right (north) bank floodplain approximately 3,000 feet upstream of Weber Road, (RM 2.9) where a pocket of mature silver maple (*Acer saccharinum*) trees occupies a forested wetland. The floodplain in this area is 6 to 12 inches higher than surrounding areas. Large European black alder (*Alnus glutinosa*) trees, a non-native species, are growing in several locations along the bank with exposed roots in direct contact with the water line.

Figure 11. Fish spawning redd observed in Reach 3 during the field visit

4. Conceptual Design

The conceptual designs prepared by Inter-Fluve are shown on the accompanying plan set. The designs for Reaches 1 through 4 are intended to provide an overview of potential restoration work that could be implemented to meet the objectives set forth by the project partners. We understand Reach 1 (Hobson Road to Royce Road) designs will not be advanced to final design in the near-term. No work has been proposed for the downstream end of Reach 1 (approximately RM 5.9 to 6.6) because of the channel and potential treatments are constrained by the quarry on the right bank and heavy industrial development on the left bank.

The concepts prepared for Reaches 2, 3, and 4 have been developed to meet the project's objectives and design criteria with the understanding that the work advanced to final design may be a subset of the work depicted in the conceptual design drawings. Two alternatives have been developed for Reach 3: one including a generous application of large wood to maximize ecological enhancement and another with reduced wood inclusion to fit a reduced budget. Costs are provided for each alternative.

4.1 DESIGN ELEMENTS

The design elements included in the conceptual designs can generally be broken down into four groupings: channel construction (including re-meandering), in-stream and floodplain large wood structures, in-stream habitat treatments, and revegetation. The following sections briefly describe the intent, significance, and relationships of the proposed work.

4.1.1 Channel Construction

Earthwork using heavy machinery to construct a re-meandered river and wetland areas is an intensive option to re-establish river processes in heavily impacted reaches. Meander restoration is limited to areas where adequate space is available; therefore, channel construction is being considered for Reaches 1 and 3 as described below.

Reach 1: In Reach 1 (Hobson Road to Royce Road), the proposed planform of the river follows the historical alignment of the river observed in the 1923 USGS topographic map of the area (USGS, 1923). The river cross section would be designed as a low-gradient, single-thread, unconfined wetland river with an accessible floodplain that is inundated every 1 to 1.5 years. The existing channel would be filled with earthwork spoils, roughened, and stabilized with large wood then planted with shrubs and trees to minimize the risk of avulsion. The river has relatively low energy during floods, and additional stabilization of the banks would not be necessary except at bridge crossings or near other sensitive infrastructure.

Reach 3: Re-meandering in Reach 3 is intended to restore more natural river processes to what is currently a channelized, entrenched reach. The proposed planform in Reach 3 is intended to maintain critical hydraulic connections to Whalon Lake, provide sediment transport continuity and geomorphic stability, and maximize habitat improvements in the reach. Where allowable channel movement is limited by infrastructure constraints, such as at the upstream end of the reach, an armored bank consisting of a stone toe and bioengineered materials would be constructed. Existing floodplain channels are utilized within the planform design to reduce the amount of excavation, and new side channels are included to add habitat complexity. Wetland restoration are shown in presently low-lying areas of the floodplain. The design would allow for proposed channels to be constructed off-line in order to let bank and riparian vegetation establish for one growing season before hydraulically connecting the channel. The construction approach will be finalized in the next design phase.

4.1.2 Large Wood

We propose a number of large wood structures (LWS) throughout the project area within the river channel, on banks, and on floodplain surfaces. The design life of wood structures is dependent on the rot resistance of the wood used, and also the degree to which the wood is exposed to the air. Fully submerged wood can last indefinitely, but floodplain roughness elements, exposed to wet and dry cycles, will have a design life of 10 to 15 years. Such floodplain elements serve their function of providing short-term avulsion and erosion protection, and those functions are then replaced by native vegetation. Because of the river's consistent baseflow, the proposed in-stream habitat and bank stabilization large wood treatments will be partially inundated. For such structures as the large wood cribs described below, the lower portion of the structure will last indefinitely, while the upper parts above base flow will slowly degrade and be replaced by woody plant root systems. Each large wood structure has a specific function and construction requirements, which are briefly discussed here.

Rootwads, log piles, and logs for LWS may be sourced from within the grading limits of the project and from nearby road construction or development projects. The potential for salvage and the extent of wood import will be investigated more fully in the next design phase.

A number of options are available for ballasting and securing LWS. The most common ballasting methods are log piles driven into the ground and boulders attached to the structures (which may be buried). Connections between logs, or logs and boulders may consist of threaded rod, cables, chain, or other materials.

We propose four main applications of large wood throughout the project area:

- *Large Wood Crib Structures*: These robust structures are constructed where banks must be immobile over the long-term to provide complexity at the channel margins. Logs are crossed over one another in layers, and the structures are filled with slash, and gravel or cobble (Figure 12). Banks can be constructed on top of the structures using bioengineering methods and are seeded and planted. These would be used primarily in sections where the new river crosses the existing channel to be filled.
- *Bank Large Wood Structures (LWS):* These are large wood structures constructed into stream banks to provide aquatic and riparian habitat (Figure 13). Rootwads can be used to encourage scour and maintain pools and to provide cover for fish. Bank LWS can be arranged to produce patterns of local deposition and scour that mimic natural processes observed throughout the project area. Bank LWS also can be used to define and maintain channel inlets or outlets, and to provide hydraulic roughness within the channel.
- *Apex or Mid-channel LWS:* These structures are placed mid-channel to encourage flow splits and bedform complexity and to protect bars (Figure 14). Several examples of naturally-occurring apex jams exist in the project area. Low-profile mid-channel LWS would be located at proposed new flow splits and in plane-bed riffle areas where existing bedform complexity and habitat value is low.
- *Floodplain/Wetland LWS:* These structures placed in wetland and floodplain areas serve several purposes. Where existing channels would be filled as a part of re-meander work, they would provide hydraulic roughness, mimicking that of a floodplain forest and preventing avulsion. Structures elsewhere on the floodplain and in wetlands would mimic naturally occurring downed wood and provide habitat to a number of aquatic, amphibious, and terrestrial species (Figure 15).

Figure 12. Large wood crib structures, Sheboygan River, Wisconsin. During (left) and two years after construction (right).

Figure 13. Bank large wood structure, Cowlitz River, Washington. Five years after construction.

Figure 14. Example of an apex bar jam

Figure 15. Floodplain wetlands with large wood, Eel River, Massachusetts. Three years after construction.

4.1.3 Habitat Features

Constructed habitat features directly provide specific habitat types for specific species. A specific habitat feature included in the conceptual design is a heron and/or egret rookery. These features consist of whole standing snags harvested and anchored in isolated island features between side channels (Figure 16). The intent is to recreate critical nesting habitat for these birds, which is typically found on islands where egg predation is minimized. Over decades, trees planted nearby the rookeries as a part of the project would be large enough to support nesting habitat and replace the constructed perches.

Within the river channel, boulders placed on existing sand/gravel riffles would provide the complexity and flow diversity sought by many species of fish. Boulders would maintain local scour and could be arranged in groupings at specific elevations to produce desired local hydraulic conditions.

Terrestrial features may include bird and bat nesting boxes or perching areas, snake hibernacula and herptile habitats, or turtle nesting areas and basking logs. These habitat features can be a la carte options and included as site conditions and project budget allow.

Figure 16. Example of a rookery

4.1.4 Plantings

A crucial element of any restoration project is the revegetation plan. The vegetation communities installed must be appropriately matched to the site's hydrologic, climatic, and soil conditions, and be designed to provide maximum habitat benefits over the long term.

Much of the project area is floodplain dominated by reed canary grass in relatively higher areas and spotted smartweed nearer the water line. In sparse areas generally about 1 foot higher than the surrounding land surface, floodplain forests composed of silver maple and cottonwood are present, and provide shade, woody debris, and canopy cover in the floodplain. Where possible and as costs allow, we propose to plant native genotypes of cottonwood, silver maple, and black willow on floodplain and in riparian areas. These trees would provide a source of large wood recruitment to the river, compete against reed canary grass and buckthorn, and provide habitat within the floodplain. Native seed and shrubs would be planted in the areas between trees.

Lower-lying areas within the floodplain would be planted to recreate shrub-carr or wet meadow wetland communities. Although species selection would occur at final design, shrub-carr areas would likely consist of willows, dogwoods, and appropriate berry-producing shrubs to provide forage for birds. Diverse and pollinator-friendly grasses and forbs would be selected to support insect communities within the project area.

Invasive species control will be critical to the success of revegetation efforts. The extent and nature of planted areas should be designed such that planted species are not out-competed by reed canary grass, phragmites, or hybridized cattail after the end of the project's vegetation management period. Species selection and long-term management will be carefully considered during final design.

5. Options Assessment

5.1 QHEI PREDICTIONS FOR HABITAT ENHANCEMENT

Inter-Fluve evaluated the potential habitat benefits of the proposed conceptual designs with the Qualitative Habitat Evaluation Index (QHEI) data collected by the Midwest Biodiversity Institute (MBI) at the reach scale. The QHEI (Ohio EPA, 1989, 2006; Rankin, 1995) is the principle aquatic habitat assessment method used by the DSRCW to evaluate stream water quality. The QHEI measures six categories of important attributes to the aquatic biota with a scoring range of 0 to 100 (Table 3). QHEI scores of 55 in headwaters and 60 in larger streams are generally regarded as sufficient to support the General Use for aquatic life. Table 3 shows the ranges for each habitat quality ranking, and Table 4 summarizes our estimate of sub-group and total QHEI scores for each project reach under existing (2021 MBI data) and proposed conditions. The "narrative change" category is based on the narrative classification for each subgroup per grouping information provided by DSRCW.

Table 3. QHEI scores in relation to habitat quality ranking

Habitat Quality Ranking	QHEI Score Range
Very Poor	0-40
Poor	41-50
Fair	51-60
Good	61-70
Very Good	71-80
Excellent	81-90
Extraordinary	91-100

As shown in Table 4, intensive work consisting of channel re-meandering, large wood installation, and diverse riparian vegetation planting would substantially increase the Instream Cover and Channel Morphology sub-group scores, in addition to the overall QHEI scores. In Reaches 1 and 3, the overall habitat condition would change from Poor/Fair to Good/Excellent. These improvements are designed to be self-sustaining over time given the climate, hydrology, and geomorphic processes of the river, and would result in reach-scale changes.

Extensive habitat-specific improvement work such as boulder and large wood placement is predicted to have a lesser influence on the habitat quality within channelized and naturally meandering sections of river. In these segments (Reaches 2 and 4), improvements of 6 to 8 QHEI points would be realized to instream cover. Localized improvements to bedforms and channel morphology, such as scour holes and associated depositional features, would be expected. These treatments would create or add complexity to small areas (e.g., maintaining a pool) but would not address impacts to broader river processes or improve overall QHEI categorization.

Table 4. Comparison of 2021 QHEI sub-group scores for representative sites within each project reach, and the relative change between existing conditions and those proposed in the concept designs.

QHEI Reach	Example Sampling Station	Existing 2021	Proposed	Score Change	Narrative Change
Reach 1 (RM 7.6 – 8.6)	RM 7.6	69	83	14	Good to Excellent
Reach 2 (RM 5.8-4.6)	RM 5.4	70	70	0	Good/No Change
Reach 3 (4.6-3.7)	RM 4.51	57	83	26	Fair to Excellent
Reach 4 (3.7 – 1.8)	RM 3.26	76	76	0	Excellent/No Change

Analysis of Chicago area streams by Rankin (1995) shows some correlation between measured QHEI values and fish IBI (fIBI) scores. Figure 17 shows the 95th percentile regression, which predicts a 0.48 unit increase in *Potential* fish IBI for each unit improvement in QHEI. Potential IBI is defined as a possible IBI target influenced ultimately by outside stressors and the scale of habitat limitations in the watershed. Based on this relationship, the East Branch DuPage River restoration may be expected to improve fIBI scores by between 6 and 12 points for Reaches 1 and 3. Additional improvements could be realized with improvements to watershed water quality.

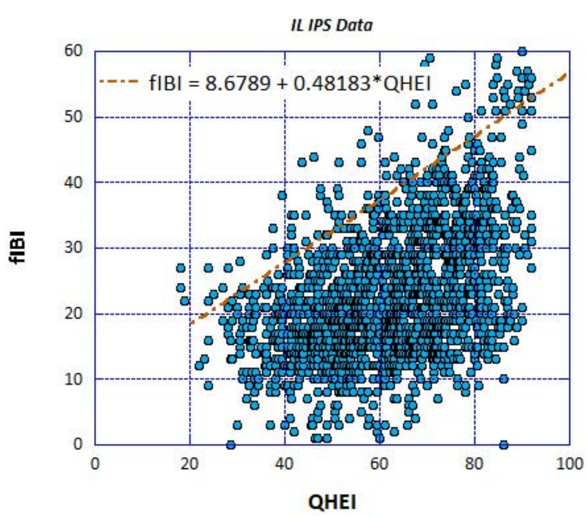

Figure 17. Fish IBI values in relation to QHEI values for Chicago area streams

When evaluating potential restoration success, it is also important to consider increases in available habitat area and volume, and the complexity of those spaces. With river restoration projects that transform channelized river segments into meandering rivers, there is often a dramatic increase in the total available area and volume of usable riverine space. Channelized reaches of the East Branch have homogenous bedforms with even distribution of sediment across the cross section. Meander restoration results in heterogenous bedforms with differential deposition resulting in deep pools, riffles, runs, and bars. With the East Branch DuPage River meander restoration, the available aquatic river habitat area and volume will increase 50 to 75% depending on the sub-reach. Normally shallow, homogenous runs would be transformed into undulating bedforms with deep pools at each meander bend location.

5.2 ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

An engineer's opinion of probable construction cost (EOPCC) for each reach is provided in Appendix A and summarized in Table 5. We estimated lump sum and unit costs based on review of construction costs for similar items in past projects and applicable reference cost data. The actual implemented cost may vary from these estimates as a result of market factors, detailed design development, or other factors.

Reach	Estimated Construction Cost	Potential Range (-20% to +40%)
Reach 1	$10.0M	$7.9M to $14.0M
Reach 2	$148k	$118k to $207k
Reach 3 – Alt 1	$5.4M	$4.3M to $7.5M
Reach 3 – Alt 2	$4.6M	$3.7M to $6.4M
Reach 4	$1.0M	$829k to $1.5M

We recognize that the total estimated cost of the work for Reaches 2, 3, and 4, which are being advanced to final design, would exceed DRSCW's current construction budget of approximately $3.5M. Based on feedback from stakeholders, we have developed a second alternative for Reach 3 to accommodate this current budget restriction. Both alternatives are included in the accompanying plan set and the cost estimates in Appendix A.

It is important to note that the design concepts are intended to be a menu to aid selection of the scope for final design and to assist future project planning. This project would be an excellent candidate for a phased construction approach, and the attached EOPCCs can be modified to fit this approach as needed. Large wood, floodplain vegetation, and in-stream work extents can be tailored to meet budget needs similar to what has been done for Reach 3. Additionally, mobilization, erosion control, and other incidental project costs would be reduced if work in separate reaches was consolidated under a single construction contract.

We made several assumptions during the development of construction cost estimates. Key assumptions include:

- Excavated material from channel re-meandering will be reused on site, and no off-site disposal will be required;
- Utilities relocations will be not be required; and
- Working in the wet will be allowed.

Design, permitting, and construction observation costs are not included in the EOPCCs. We applied a contingency of 30% to account for uncertainty associated with bidding and the construction process, uncertainty or future changes in unit costs, and scope or design changes that may arise during the design process or as a result of permit conditions.

We have also indicated an industry standard accuracy range (AACE 2016) for our construction cost estimates. In addition to the degree of project definition, the accuracy range takes into account the complexity of the project, quality of reference cost estimating data, quality of assumptions, time and level of effort budgeted to prepare the estimate, and the lack of local reference data for similar projects. The AACE Class 4 (i.e., feasibility stage) expected accuracy range is -15% to -30% on the low end and +20% to +50% on the high end. We recommend factoring in an accuracy range of -20% to +40%.

6. References

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Appendix A – Cost Estimates

East Branch DuPage River
Concept-Level Cost Estimate
Reach 1: Hobson Road to Royce Road
January 2022

Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	**PRELIMINARIES**					
1.1	MOBILIZATION, SITE ACCESS, AND STAGING	LUMP	1	$ 680,000	$ 680,000	Assumes 10% of total construction cost, rounded to the nearest thousand. Includes insurance, bonds, mobilization, onsite facilities, site access, demobilization, as-builts, etc.
1.2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 204,000	$ 204,000	Assumes 3% of total construction cost
				SUBTOTAL	**$ 884,000**	
2	**CHANNEL CONSTRUCTION**					
2.1	CONTROL OF WATER	LUMP	1	$ 300,000	$ 300,000	
2.2	CLEARING	ACRE	7	$ 8,000	$ 56,000	Assumes approx. 25% of proposed channel area requires clearing. Includes stockpiling wood and slash for reuse.
2.3	CHANNEL EXCAVATION AND FILL	CY	200,000	$ 18	$ 3,600,000	Includes rough grade, hauling, stockpiling, filling existing channel, and fine grading. Assumes topsoil salvage/respread.
2.4	GROUNDWATER GALLERY GRAVEL/SAND MIXTURE	CY	1,000	$ 70	$ 70,000	Assumes mix of sand and gravel with spec'd hyd. conductivity
				SUBTOTAL	**$ 4,026,000**	
3	**LARGE WOOD & HABITAT FEATURES**					
3.1	LARGE WOOD CRIB STRUCTURE	LF	1,500	$ 660	$ 990,000	Includes wood procurement, storage, handling, and installation. Includes all connections. Includes bank construction.
3.2	APEX LARGE WOOD STRUCTURES	EACH	2	$ 5,500	$ 11,000	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.3	BANK LARGE WOOD STRUCTURES	EACH	75	$ 4,650	$ 348,750	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.4	FLOODPLAIN LARGE WOOD STRUCTURES	EACH	95	$ 3,700	$ 351,500	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.5	HABITAT BOULDERS	EACH	115	$ 300	$ 34,500	
3.5	MISC. HABITAT FEATURES	LUMP	1	$ 50,000	$ 50,000	Allowance for misc. features such as turtle nesting areas, bird houses, microtopography, etc.
				SUBTOTAL	**$ 1,785,750**	
4	**REVEGETATION**					
4.1	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	45	$ 14,500	$ 652,500	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
4.2	WETLAND ZONE REVEGETATION	ACRE	5	$ 14,000	$ 70,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
				SUBTOTAL	**$ 722,500**	
5	**RECREATION**					
5.1	NEW CANOE LAUNCH	EACH	1	$ 10,000	$ 10,000	
5.2	RELOCATED PEDESTRIAN TRAIL	LUMP	1	$ 100,000	$ 100,000	Relocated portion of path is approximately 1,160 ft long.
5.3	NEW PEDESTRIAN BRIDGE	LUMP	1	$ 150,000	$ 150,000	
				SUBTOTAL	**$ 260,000**	

Rounded Subtotal	**$ 7,678,300**
30% Contingency	**$ 2,303,500**
Construction Total	**$ 9,981,800**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 7,985,500**
Construction Total (Max)	**$ 13,974,600**

East Branch DuPage River
Concept-Level Cost Estimate
Reach 2: Royce Road to Trout Farm Park
January 2022

Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	MOBILIZATION, SITE ACCESS, AND STAGING	LUMP	1	$ 30,000	$ 30,000	Includes insurance, bonds, mobilization, onsite faciliities, site access, demobilization, as-builts, etc.
2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 5,000	$ 5,000	
3	CONTROL OF WATER	LUMP	1	$ 5,000	$ 5,000	
4	MID CHANNEL LARGE WOOD STRUCTURES	EACH	2	$ 5,600	$ 11,200	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
5	BANK LARGE WOOD STRUCTURES	EACH	4	$ 5,400	$ 21,600	Includes wood procurement, storage, handling, excavation, and installation. Includes all connections and pile installation.
6	HABITAT BOULDERS	EACH	30	$ 300	$ 9,000	
7	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	1.5	$ 14,500	$ 21,750	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
8	RECONSTRUCT CANOE LAUNCH	EACH	1	$ 10,000	$ 10,000	

Rounded Subtotal	**$ 113,600**
30% Contingency	**$ 34,100**
Construction Total	**$ 147,700**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 118,200**
Construction Total (Max)	**$ 206,800**

East Branch DuPage River
Concept-Level Cost Estimate
Reach 3: Trout Farm Park to Whalon Lake - Alternative 1
January 2022

Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	**PRELIMINARIES**					
1.1	MOBILIZATION, SITE ACCESS AND STAGING	LUMP	1	$ 366,000	$ 366,000	Assumes 10% of total construction cost, rounded to the nearest thousand. Includes insurance, bonds, mobilization, onsite faciliities, site access, demobilization, as-builts, etc.
1.2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 110,000	$ 110,000	Assumes 3% of total construction cost
				SUBTOTAL	**$ 476,000**	
2	**CHANNEL CONSTRUCTION**					
2.1	CONTROL OF WATER	LUMP	1	$ 200,000	$ 200,000	
2.2	CLEARING	ACRE	2	$ 8,000	$ 16,000	Assumes approx. 25% of proposed channel area requires clearing.
2.3	CHANNEL EXCAVATION AND FILL	CY	75,000	$ 18	$ 1,350,000	Includes rough grade, hauling, stockpiling, filling existing channel, and fine grading. Assumes topsoil salvage/respread.
2.4	BIOENGINEERED BANK	LF	900	$ 200	$ 180,000	
2.5	GROUNDWATER GALLERY GRAVEL/SAND MIXTURE	CY	2,600	$ 70	$ 182,000	Assumes mix of sand and gravel with spec'd hyd. conductivity
				SUBTOTAL	**$ 1,928,000**	
3	**LARGE WOOD & HABITAT FEATURES**					
3.1	LARGE WOOD CRIB STRUCTURE	LF	1,250	$ 660	$ 825,000	Includes wood procurement, storage, handling, and installation. Includes all connections. Includes bank construction.
3.2	APEX LARGE WOOD STRUCTURES	EACH	1	$ 5,600	$ 5,600	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.3	BANK LARGE WOOD STRUCTURES	EACH	40	$ 4,650	$ 186,000	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.4	FLOODPLAIN LARGE WOOD STRUCTURES	EACH	30	$ 3,700	$ 111,000	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.5	WHOLE TREES - HERON/OSPREY ROOKERY	EACH	17	$ 4,000	$ 68,000	Includes wood procutrement, storage, handling, connections, and installation.
3.6	MISC. HABITAT FEATURES	LUMP	1	$ 50,000	$ 50,000	Allowance for misc. features such as turtle nesting areas, bird houses, microtopography, etc.
				SUBTOTAL	**$ 1,195,600**	
4	**REVEGETATION**					
4.1	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	27	$ 14,500	$ 391,500	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
4.2	WETLAND ZONE REVEGETATION	ACRE	10	$ 14,000	$ 140,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
				SUBTOTAL	**$ 531,500**	

Rounded Subtotal	**$ 4,131,100**
30% Contingency	**$ 1,239,400**
Construction Total	**$ 5,370,500**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 4,296,400**
Construction Total (Max)	**$ 7,518,700**

East Branch DuPage River
Concept-Level Cost Estimate
Reach 3: Trout Farm Park to Whalon Lake - Alternative 2
January 2022

Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	**PRELIMINARIES**					
1.1	MOBILIZATION, SITE ACCESS AND STAGING	LUMP	1	$ 311,000	$ 311,000	Assumes 10% of total construction cost, rounded to the nearest thousand. Includes insurance, bonds, mobilization, onsite facilities, site access, demobilization, as-builts, etc.
1.2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 94,000	$ 94,000	Assumes 3% of total construction cost
				SUBTOTAL	**$ 405,000**	
2	**CHANNEL CONSTRUCTION**					
2.1	CONTROL OF WATER	LUMP	1	$ 100,000	$ 100,000	Assumes entirely offline construction and min. 1 growing season of veg. establishment along proposed channel prior to routing flow. Limited cofferdam construciton and local dewatering required. Includes turbidity curtain and BMPs.
2.2	CLEARING	ACRE	2	$ 8,000	$ 16,000	Assumes approx. 25% of proposed channel area requires clearing.
2.3	CHANNEL EXCAVATION AND FILL	CY	75,000	$ 18	$ 1,350,000	Includes rough grade, hauling, stockpiling, filling existing channel, and fine grading. Assumes topsoil salvage/respread.
2.4	BIOENGINEERED BANK	LF	1,500	$ 200	$ 300,000	Assumes combination of stone toe and FES Lifts
2.5	GROUNDWATER GALLERY GRAVEL/SAND MIXTURE	CY	2,600	$ 70	$ 182,000	Assumes mix of sand and gravel with spec'd hyd. conductivity
				SUBTOTAL	**$ 1,948,000**	
3	**LARGE WOOD & HABITAT FEATURES**					
3.1	LARGE WOOD CRIB STRUCTURE	LF	600	$ 660	$ 396,000	Includes wood procurement, storage, handling, and installation. Includes all connections. Includes bank construction.
3.2	APEX & MID CHANNEL LARGE WOOD STRUCTURES	EACH	2	$ 5,600	$ 11,200	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.3	BANK LARGE WOOD STRUCTURES	EACH	20	$ 4,650	$ 93,000	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.4	FLOODPLAIN LARGE WOOD STRUCTURES	EACH	25	$ 3,700	$ 92,500	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.5	WHOLE TREES - HERON/OSPREY ROOKERY	EACH	5	$ 4,000	$ 20,000	Includes wood procutrement, storage, handling, connections, and installation.
3.6	MISC. HABITAT FEATURES	LUMP	1	$ 50,000	$ 50,000	Allowance for misc. features such as turtle nesting areas, bird houses, microtopography, etc.
				SUBTOTAL	**$ 662,700**	
4	**REVEGETATION**					
4.1	TEMPORARY SEEDING	LUMP	1	$ 10,000	$ 10,000	Seeding for temporary stockpiles, access roads, etc. Stockpile seeding is while channel is off line.
4.1	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	23	$ 14,500	$ 333,500	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
4.2	WETLAND ZONE REVEGETATION	ACRE	11	$ 14,000	$ 154,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
				SUBTOTAL	**$ 497,500**	

Rounded Subtotal	**$ 3,513,200**
30% Contingency	**$ 1,054,000**
Construction Total	**$ 4,567,200**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 3,653,800**
Construction Total (Max)	**$ 6,394,100**

East Branch DuPage River
Concept-Level Cost Estimate
Reach 4: Whalon Lake to Washington Street
January 2022

Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	MOBILIZATION, SITE ACCESS AND STAGING	LUMP	1	$ 100,000	$ 100,000	Assumes 15% of total construction cost, rounded to the nearest thousand. Includes insurance, bonds, mobilization, onsite faciliities, site access, demobilization, as-builts, etc.
2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 21,000	$ 21,000	Assumes 3% of total construction cost
3	CONTROL OF WATER	LUMP	1	$ 10,000	$ 10,000	
4	LARGE WOOD CRIB STRUCTURE	LF	450	$ 660	$ 297,000	Includes wood procurement, storage, handling, and installation. Includes all connections. Includes bank construction.
5	BANK LARGE WOOD STRUCTURES	EACH	8	$ 5,400	$ 43,200	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
6	HABITAT BOULDERS	EACH	45	$ 300	$ 13,500	
7	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	10	$ 14,500	$ 145,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
8	WETLAND ZONE REVEGETATION	ACRE	11	$ 14,000	$ 154,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
9	POND GRADE CONTROL	LUMP	1	$ 3,000	$ 3,000	Assumes rock grade control structure to base flow elevation
10	NEW CANOE LAUNCH	EACH	1	$ 10,000	$ 10,000	

Rounded Subtotal	**$ 796,700**
30% Contingency	**$ 239,100**
Construction Total	**$ 1,035,800**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 828,700**
Construction Total (Max)	**$ 1,450,200**