

## Executive Summary

The Upper Des Plaines River watershed originates in Racine and Kenosha counties of southeastern Wisconsin. The watershed then extends 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 Study includes the entire drainage area upstream of the confluence with Salt Creek, including 12 major tributaries to the river. The Upper Des Plaines watershed covers approximately 484 square miles, an area that spans approximately 60 miles from north to south and 8 miles 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.

Development in the watershed coincided with the development of the Chicago metropolitan area. Although the southern portion of the watershed in and around Chicago is more urbanized than the northern portion of Lake County in Illinois and Kenosha and Racine Counties in Wisconsin, land use changes have impacted the entire study area. Only 9% of the current land use remains as natural open space. Communities along the Upper Des Plaines River and its tributaries have experienced major flooding resulting in hundreds of millions of dollars in damages over the past several decades.

An earlier study, the Upper Des Plaines River, Illinois Feasibility (Phase I Study) formulated plans to address severe overbank flooding along the Upper Des Plaines River. Two particularly severe events in 1986 and 1987, together causing over \$100 million in damages, prompted initiation of the study. Federal interest in flood risk management in the Upper Des Plaines watershed was established in a Reconnaissance Report that preceded the Phase I Study and was approved in 1989. The Phase I Study recommended six projects to reduce mainstem flooding. The Feasibility Report was approved in 1999 and the recommended projects were authorized in Section 101 of the Water Resources Development Act (WRDA) of 1999. Project benefits, if all projects are built, would provide an estimated 25% reduction in flood damages.

This Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase II Study), was authorized by Section 419 of the Water Resources Development Act (WRDA) of 1999 (P.L. 106-53). The Phase II Study provides an opportunity to develop a more comprehensive solution to address ongoing occurrences of flooding in the Upper Des Plaines River watershed and the degraded watershed ecosystem. The study authorization directs the secretary to evaluate plans to manage flood risk and address environmental restoration and protection on both the mainstem and tributaries. Additionally, the study authorization includes water quality, recreation and related purposes. Further reduction of flooding along the mainstem Des Plaines River and its tributaries, and environmental restoration of degraded ecosystems within the basin are the primary purposes of the study. Secondary purposes are improving water quality and enhancing recreational opportunities throughout the basin. The study considers sites located within tributary watersheds and along the mainstem for both Flood Risk Management (FRM) and Ecosystem Restoration (ER) potential. It also evaluates the effects of FRM sites within tributary watersheds on mainstem flooding.

An assessment of existing and projected future without project conditions determined significant flood risk of overbank flooding exists in the watershed and that the aquatic ecosystem is degraded. Expected annualized without project condition flood damages across the watershed for the fifty year period of analysis total \$54,932,000. Approximately 39,000 acres of natural areas were evaluated for this study. Several communities types were evaluated – prairie, savanna, woodland, isolated wetlands, and floodplain wetlands.

The need for additional flood risk management in the watershed was highlighted by major flooding during the spring of 2013. On April 18, 2013, the Chicago area received on average 5 inches of rain, with localized precipitation of over 7 inches over an 18 to 24 hour period. The study area received widespread rainfall between 0.25 and 1.5 inches several days before the event, which saturated the ground and increased the potential for overbank flooding when heavier rains fell a few days later. These antecedent conditions resulted in significant flooding throughout northeast Illinois with the greatest impacts on the Des Plaines, Fox, and East Branch DuPage Rivers.

Major flood stage was reached along the entire Des Plaines study area. New record stages were reached at the Des Plaines (0.02-ft over previous 1986 record) and Riverside (0.67-ft over previous 1987 record). These record stages resulted in widespread overbank flooding along the majority of the study area. Thousands of structures were inundated and many road crossings and parallel roads were closed for several days. FEMA declared this a Major Disaster Declaration (DR-4116) on May 10, 2013 and as of July 2013 approved over 60,000 applications totaling nearly \$150M in individual disaster relief.

The feasibility study evaluated a range of measures to meet both the FRM and ER purposes. To develop the FRM plan, structural measures such as floodwater storage reservoirs, levees and floodwalls, and road raises and non-structural measures such as floodproofing and elevating structures were evaluated individually to determine whether they were economically justified. Justified sites were then combined to form an incrementally justified plan, optimizing benefits throughout the watershed. To develop the ER plan, open lands throughout the watershed were evaluated to determine whether cost-effective aquatic ecosystem restoration at that site was possible and what measures would provide the lowest incremental cost per unit of habitat output. Cost-effective ecosystem restoration sites were then grouped to determine the most incrementally cost effective plan that would best improve habitat quality and quantity throughout the watershed. The FRM and ER plans were then compared to determine whether there was any competition between the purposes. Since there is no physical overlap between the identified FRM and ER plans and their effects, it was determined there is no competition between the plans and a combined FRM/ER plan that includes all features of both plans was identified.

Three plans, discussed below, are tentatively recommended by this study: an NED/NER Plan, a CAP Plan, and a Full Plan. A National Economic Development/National Ecosystem Restoration (NED/NER) plan is tentatively recommended for congressional authorization. Projects that could reasonably be implemented under the Continuing Authorities Program (CAP) are recommended for conversion to that program for implementation. Other features which are economically justified but not policy compliant, are included in the Full Plan and are recommended for implementation by the appropriate state and local agencies.

The study authorization directs the Secretary to “not exclude from consideration and evaluation flood damage reduction measures based on restrictive policies regarding the frequency of flooding, the drainage area, and the amount of runoff.” Sites along tributaries that do not meet the minimum criteria for USACE participation (flows greater than 800 cfs during the 10% annual chance of exceedance event) were therefore included in the formulation and evaluation. In addition, implementation of measures such as road raises for the sole purpose of addressing flood induced road closures have not traditionally been included in the USACE mission. In order to meet the study authority, these measures, which are not compliant with current USACE policy, are included in a plan designated as the “Full Plan” – this is the plan that includes all economically justified flood risk management features and cost-effective restoration features evaluated during the course of the study, regardless of policy compliance or implementation authority.

The Full Plan is the most inclusive plan and includes 26 features as shown in Table 0.1. All of the sites shown in the table below would be included in the Full Plan. The plan includes 18 ecosystem restoration projects – 13 ecosystem restoration sites and 5 dam removals – and 10 Flood Risk Management projects – 1 floodwater storage reservoir, 4 levees/floodwalls, 1 road raise, 1 modification to an existing structure, and 3 non-structural flood risk management plans (non-structural measures to be implemented in Kenosha, Lake, and Cook Counties). Features in the Full Plan that are not compliant with current USACE policy, and therefore not included in the CAP or NED/NER Plans, include the First Avenue Bridge Modification (DPBM04), Lake Mary Anne Pump Station (FPCI01), and economically justified non-structural sites that are in portions of tributaries not meeting the minimum flow criteria. These features are recommended for implementation by state or local flood risk management or transportation agencies.

A “CAP Plan,” shown in Table 0.2, has also been identified that includes all policy compliant, separable features that are economically justified (for flood risk management features) or cost-effective (for restoration features) and of such scope that they could reasonably be implemented under the USACE Continuing Authorities Program (CAP). This program allows USACE to plan, design, and construct smaller projects using existing program authorities provided by Congress. Small Flood Risk Management projects with a Federal cost under \$7 million are authorized by Section 205 of the Flood Control Act of 1948, as amended. Small Ecosystem Restoration projects with a Federal cost under \$5 million are authorized by Section 206 of the Water Resources Development Act of 1996, as amended. Individual features of the CAP Plan are recommended for implementation by USACE under these existing authorities.

The policy compliant features that could reasonably be implemented under CAP are included in the CAP Plan. This plan includes: 7 Ecosystem Restoration Projects – 5 dam removals and 2 ecosystem restoration site – and 1 Flood Risk Management project – a levee/floodwall. Features included in the CAP Plan will be converted to this program upon approval by the Division Engineer.

Policy compliant features that are economically justified (for flood risk management features) or cost-effective (for restoration features) and of such scope that they could not reasonably be implemented under CAP authorities are included in a plan designated as the Combined “NED/NER Plan,” shown in Table 0.3. This plan, upon approval by the Chief of Engineers, will be recommended for specific authorization by Congress.

There are 16 separable features in the NED/NER Plan. The features of this plan include: 12 ecosystem restoration sites and 6 Flood Risk Management projects – 1 floodwater storage reservoir, 3 levee/floodwall, and 2 non-structural flood risk management plans (non-structural measures to be implemented in Lake, and Cook Counties). The NED/NER Plan will be recommended for Congressional authorization.

Overall, the cumulative impact of the flood risk management project is beneficial economically, environmentally and socially. The proposed full plan would restore over 10,900 acres of native community types including: marsh (2,850 acres), meadow (808 acres), prairie (2,491 acres), savanna (1,048 acres), woodland (2,912 acres) and forest (805 acres), and restore natural hydrology by filling an estimated 13,400 feet of unnatural ditch along with disabling hundreds of thousands of feet of agricultural drain tiles. These measures would provide approximately 27,222 net average annual habitat units (AAHU). The flood risk management features of the proposed Full Plan would provide \$9,702,000 in annual net economic benefits in the watershed.

The NED/NER Plan would provide \$6,039,000 in annual net economic benefits and 26,573 net AAHU. The CAP Plan would provide \$157,000 in annual net economic benefits and 649 net AAHU. Minor ecological improvements resulting from the FRM plans include reducing the flashiness of the Des Plaines River watershed and minor water quality improvements. The proposed floodwater storage site would impact habitat by inundating or excavating existing natural areas. However, these impacts will be mitigated through the restoration of marsh and wet prairie habitat at nearby sites.

The total costs for the NED/NER Plan and CAP plan, along with the Federal and non-Federal shares, are presented in Table 0.4. Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R) of project features will be required to ensure the sustainability of the projects and is a non-Federal responsibility. A summary of annualized costs and benefits for the tentatively selected flood risk management and ecosystem restoration plans is presented in Table 0.5.

Table 0.1 – Full Plan

Site ID	Site Name	Purpose	Measure	Municipality	Total First Cost (\$1,000)	Annual OMRR&R (\$1,000)
<b>Racine County, WI</b>						
R04	Mt. Pleasant Wet Prairie	ER	Restoration	Sturtevant		
<b>Kenosha County, WI</b>						
K09	Somers Marsh	ER	Restoration	Somers		
K33	Paris Wet Prairie	ER	Restoration	Union Grove		
K47	Bristol Marsh	ER	Restoration	Bristol		
K41	Dutch Gap Forested Floodplain	ER	Restoration	Pikesville		
--	Kenosha County Non-structural	FRM	Non-structural	Various		
<b>Lake County, IL</b>						
L41	Dutch Gap Aquatic Complex	ER	Restoration	Antioch		
L43	Red Wing Slough & Deer Lake Wetland Complex	ER	Restoration	Antioch		
L39	Pollack Lake & Hastings Creek Riparian Wetlands	ER	Restoration	Antioch		
L33	Mill Creek Riparian Woodland	ER	Restoration	Old Mill Creek		
L31	Gurnee Woods Riparian Wetland	ER	Restoration	Wadsworth		
L05	Granger Woods Floodplain Forest	ER	Restoration	Mettawa		
ACRS08	Aptakisic Creek Reservoir	FRM	Reservoir	Buffalo Grove		
--	Lake County Non-structural	FRM	Non-structural	Gurnee		
<b>Cook County, IL</b>						
C09	Northbrook Marsh	ER	Restoration	Wheeling		
--	Dam #1 Removal	ER	Dam Removal	Wheeling		
--	Dam #2 Removal	ER	Dam Removal	Des Plaines		
C15	Beck Lake Meadow	ER	Restoration	Des Plaines/ Glenview		
--	Dempster Ave Dam Removal	ER	Dam Removal	Des Plaines		
FPCI01	Lake Mary Anne Pump Station	FRM	Structure Mod.	Maine		
DPLV09	Ashland-Fargo Levee	FRM	Levee/Floodwall	Des Plaines		
--	Touhy Ave Dam Removal	ER	Dam Removal	Park Ridge		
--	Dam #4 Removal	ER	Dam Removal	Park Ridge		
DPLV05	Belmont Irving Park Levee	FRM	Levee/Floodwall	Schiller Park/Franklin Park		
DPLV04	Fifth Canadian National Levee	FRM	Levee/Floodwall	River Grove		
DPBM04	First Ave Bridge Modification	FRM	Bridge Mod.	River Grove		
DPLV01	Groveland Ave Levee	FRM	Levee	Riverside		
--	Cook County Non-structural	FRM	Non-structural	Various		

Table 0.2 – CAP Plan

Site ID	Site Name	Purpose	Measure	Municipality	Total First Cost (\$1,000)	Annual OMRR&R (\$1,000)
<b>Lake County, IL</b>						
L33	Mill Creek Riparian Woodland	ER	Restoration	Old Mill Creek		
L05	Granger Woods Floodplain Forest	ER	Restoration	Mettawa		
<b>Cook County, IL</b>						
--	Dam #1 Removal	ER	Dam Removal	Wheeling		
--	Dam #2 Removal	ER	Dam Removal	Des Plaines		
--	Dempster Ave Dam Removal	ER	Dam Removal	Des Plaines		
--	Touhy Ave Dam Removal	ER	Dam Removal	Park Ridge		
--	Dam #4 Removal	ER	Dam Removal	Park Ridge		
DPLV01	Groveland Ave Levee	FRM	Levee	Riverside		

Table 0.3 – NED/NER Plan

Site ID	Site Name	Purpose	Measure	Municipality	Total First Cost (\$1,000)	Annual OMRR&R (\$1,000)
<b>Racine County, WI</b>						
R04	Mt. Pleasant Wet Prairie	ER	Restoration	Sturtevant		
<b>Kenosha County, WI</b>						
K09	Somers Marsh	ER	Restoration	Somers		
K33	Paris Wet Prairie	ER	Restoration	Union Grove		
K47	Bristol Marsh	ER	Restoration	Bristol		
K41	Dutch Gap Forested Floodplain	ER	Restoration	Pikesville		
<b>Lake County, IL</b>						
L41	Dutch Gap Aquatic Complex	ER	Restoration	Antioch		
L43	Red Wing Slough & Deer Lake Wetland Complex	ER	Restoration	Antioch		
L39	Pollack Lake & Hastings Creek Riparian Wetlands	ER	Restoration	Antioch		
L31	Gurnee Woods Riparian Wetland	ER	Restoration	Wadsworth		
ACRS08	Aptakisic Creek Reservoir	FRM	Reservoir	Buffalo Grove		
--	Lake County Non-structural	FRM	Non-structural	Gurnee		
<b>Cook County, IL</b>						
C09	Northbrook Marsh	ER	Restoration	Wheeling		
C15	Beck Lake Meadow	ER	Restoration	Des Plaines/ Glenview		
DPLV09	Ashland-Fargo Levee	FRM	Levee/Floodwall	Des Plaines		
DPLV05	Belmont Irving Park Levee	FRM	Levee/Floodwall	Schiller Park/Franklin Park		
DPLV04	Fifth Canadian National Levee	FRM	Levee/Floodwall	River Grove		
--	Cook County Non-structural	FRM	Non-structural	Various		

Table 0.4 – NED/NER and CAP Plans: Total Costs

Plan	Federal	Non-Federal	Total Implementation	OMRR&R (non-Federal)
NED/NER Plan				
CAP Plan				

Table 0.5 – Summary of Annualized Costs and Benefits

		Full Plan	NED/NER Plan	CAP Plan
Flood Risk Management	First Cost			
	Annualized OMRR&R			
	Total Annualized Cost	\$5,510,000	\$4,332,000	\$275,000
	Annual Benefits	\$15,213,000	\$10,371,000	\$432,000
	Net Benefits	\$9,702,000	\$6,039,000	\$157,000
	BCR	2.8	2.4	1.6
Ecosystem Restoration	First Cost			
	Annualized OMRR&R			
	Total Annualized Cost	\$14,644,645	\$13,853,055	\$837,890
	Net Habitat Units	27,222	26,572	649