UPPER SOUTH BRANCH KISHWAUKEE RIVER WATERSHED IMPROVEMENT PLAN

A WATERSHED-BASED GUIDE TO PROTECTING AND RESTORING WATERSHED HEALTH











This page intentionally left blank.

UPPER SOUTH BRANCH KISHWAUKEE RIVER WATERSHED IMPROVEMENT PLAN

DeKalb County, Illinois

A Watershed-Based Guide for Protecting and Restoring Watershed Health

FINAL REPORT

OCTOBER 2020 (AES #16-1003)

Prepared by:



Applied Ecological Services, Inc."

120 West Main Street West Dundee, Illinois 60118 http://www.appliedeco.com Phone: (847) 844-9385

for



DeKalb County Soil & Water Conservation District

1350 West Prairie Drive Sycamore, Illinois 60178 Phone: 815-756-3234 ext. 3

Funding for this project provided, in part, by the Illinois Environmental Protection Agency through Section 319 of the Clean Water Act (#3191804).

Preface iii

ACKNOWLEDGEMENTS

Funding for the Upper South Branch Kishwaukee River Watershed Improvement Plan was provided, in part, by the Illinois Environmental Protection Agency (IEPA) through Section 319 of the Clean Water Act via Financial Assistance Agreement #3191804. The DeKalb County Soil & Water Conservation District (DCSWCD) was the recipient of the IEPA grant. Additional funding was generously provided by the DeKalb County Community Foundation and the Kishwaukee Water Reclamation District.

Christine Davis acted as project manager for Illinois EPA's Bureau of Water while Dean Johnson (Executive Director of the DCSWCD) acted as Watershed Coordinator for the Steering Committee and worked closely with watershed partners and Applied Ecological Services, Inc. (AES) to produce the watershed planning document.

The Steering Committee consists of representatives from various municipal, governmental, private, and public organizations as well as local residents. Key partners include DeKalb County Soil & Water Conservation District, the DeKalb County Community Foundation, DeKalb County, City of DeKalb, City of Sycamore, Kishwaukee Water Reclamation District, DeKalb County Forest Preserve District, DeKalb Park District, Northern Illinois University, University of Illinois Extension, Illinois Tollway Authority, and Shabbona/Milan Drainage District. These partners played an important role in providing input on plan content, watershed goals & objectives, various planning approaches, and input on potential watershed projects.

Applied Ecological Services, Inc. (AES) conducted analysis, presented at Steering Committee and stakeholder meetings, summarized results, and authored the Upper South Branch Kishwaukee River Watershed Improvement Plan.

People from the following entities attended and provided input at Steering Committee meetings:

Applied Ecological Services, Inc.: Kasey Clark, Cecily Cunz, Steve Zimmerman

City of DeKalb: Zac Gill

City of Sycamore: Mark Bushnell

DeKalb County Board: Paul Stoddard

DeKalb County Community Development: Marcellus Anderson, Derek Hiland **DeKalb County Community Foundation:** Teri Spartz, Dan Templin, Anita Zurbrugg

DeKalb County Forest Preserve District: Patrick McCrea **DeKalb County Highway Department**: Nathan Schwartz

DeKalb County Soil & Water Conservation District: Dean Johnson, Jeff Woodyatt **DeKalb County Stormwater Management & Planning Committee**: Donna Prain

DeKalb Park District: Amy Doll, Mat Emken

Illinois Tollway Authority: Jessica Flynn, Kelsey Musich

Kishwaukee Water Reclamation District: Mark Eddington, Mike Holland, Allison Yates **Northern Illinois University**: Mike Konen, Melissa Lenczewski, Carl Von Ende (retired)

Shabbona-Milan Drainage District: Robert Mullins

University of Illinois Extension: Peggy Doty

All photos by Applied Ecological Services unless otherwise noted.

TABLE OF CONTENTS

Section		
EXECUTIVE SUMMARY		xiii
1.0 INTRODUCTION		1
1.1 Upper South Branch Kishwaukee River Watershed Setting	1	
1.2 Project Scope & Purpose	5	
1.3 USEPA Watershed-Based Plan Requirements	6	
1.4 Planning Process	7	
1.5 Using the Watershed-Based Plan	8	
1.6 Prior Studies & Projects	10	
2.0 MISSION, GOALS, AND OBJECTIVES		11
2.1 Upper South Branch Kishwaukee River Improvement Plan Mission	11	
2.2 Places-of-the-Heart	12	
2.3 Goals and Objectives	14	
3.0 WATERSHED RESOURCE INVENTORY		19
3.1 Geology, Climate, & Soils	19	
3.2 Pre-European Settlement Landscape Compared to Present Landscape	22	
3.3 Topography, Watershed Boundary, & Subwatershed Management Units	28	
3.4 Hydric Soils, Soil Erodibility, & Hydrologic Soil Groups	33	
3.5 Jurisdictions, Roles, & Protections	38	
3.6 Existing Policies and Ordinances Review	49	
3.7 Drainage Districts	50	
3.8 Transportation Network	53	
3.9 Demographics	56	
3.10 Existing and Future Land Use/Land Cover	61	
3.11 Impervious Cover Impacts	67	
3.12 Open Space Inventory, Prioritization, & Green Infrastructure Network	75	
3.13 Important Natural Areas	85	
3.14 Watershed Drainage System	91	
3.14.1 Upper South Branch Kishwaukee River & Tributaries	91	
3.14.2 Detention Basins	1.12	
3.14.3 Wetlands & Potential Wetland Restoration Sites	1.17	
3.14.4 Floodplain & Flood Problem Areas	.24	
3.15 Agricultural Land	127	
3.16 Groundwater Aquifers & Community Water Supply	133	
3.17 Wastewater Treatment Plants & Septic Systems	137	
4.0 WATER QUALITY & POLLUTANT MODELING ASSESSMENT		141
4.1 Water Quality	141	
4.2 Pollutant Loading Analysis	151	

Preface

5.0 CAUSES/SOURCES OF IMPAIRMENT & REDUCTION TARGETS			155
5.1 Causes & Sources of Impairment		155	
5.2 Critical Areas, Management Measures & Estimated Impairment Reductions		157	
5.3 Watershed Impairment Reduction Targets		169	
6.0 MANAGEMENT MEASURES ACTION PLAN			173
6.1 Programmatic Management Measures Action Plan		175	
6.1.1 Policy Recommendations	175		
6.1.2 Dry & Wet Bottom Detention Basin Design/Retrofits, Establishment & Maintenance	176		
6.1.3 Rain Gardens	180		
6.1.4 Vegetated Swales (Bioswales)	180		
6.1.5 Pavement Alternatives	181		
6.1.6 Vegetated Filter Strips	182		
6.1.7 Natural Area Restoration & Native Landscaping	182		
6.1.8 Wetland Restoration	183		
6.1.9 Stormwater Trees/Tree Planting Program	184		
6.1.10 Street Sweeping & Yard Waste Management	185		
6.1.11 Stream & Riparian Area Restoration & Maintenance	186		
6.1.12 Septic System Maintenance	188		
6.1.13 Agricultural Management Practices	188		
6.1.14 Downspout Disconnection/Rainwater Harvesting & Re-use	196		
6.1.15 Conservation & Low Impact Development	197		
6.1.16 Green Infrastructure Network Planning	200		
6.1.17 Water Quality Trading & Adaptive Management	200		
6.2 Site-Specific Management Measures Action Plan		202	
6.2.1 Detention Basin Retrofits & Maintenance Recommendations	206		
6.2.2 Wetland Restoration Recommendations	208		
6.2.3 Streambank & Riparian Area Restoration Recommendations	210		
6.2.4 Agricultural Management Practice Recommendations	213		
6.2.5 Flood Mitigation Recommendations	215		
6.2.6 Other Management Measures	215		
6.2.7 Site-Specific Management Measures Action Plan Table	217		
7.0 INFORMATION & EDUCATION PLAN			241
8.0 PLAN IMPLEMENTATION			249
8.1 Plan Implementation Roles and Coordination/Responsibilities		249	
8.2 Implementation Schedule		251	
8.3 Funding Sources		251	
9.0 MEASURING PLAN PROGRESS & SUCCESS			253
9.1 Water Quality Monitoring Plan & Evaluation Criteria		253	
9.2 Goal Milestones/Implementation & Progress Evaluation "Report Cards"		264	
10.0 LITERATURE CITED			271
11.0 GLOSSARY OF TERMS			277

LIST OF FIGURES

Figur	<u>e</u>	<u>Page</u>
1.	Hypothetical watershed setting	1
2.	Watershed locator maps	2
3.	Places-of-the-Heart mapping exercise results	13
4.	Glacial boundaries in Illinois	20
5.	Land surface elevation	20
6.	Climate records for DeKalb, IL	21
7.	1842 PLSS Land Cover	25
8.	1939 Aerial Photography	26
9.	2017 Aerial Photography	27
10.	Digital Elevation Model	29
11.	Subwatershed Management Units (SMUs)	32
12.	Hydric Soils	34
13.	Potential Erosion Hazard	35
14.	Hydrologic Soil Groups	37
15.	Jurisdictions	39
16.	Drainage Districts	51
17.	Transportation Network	55
18.	2010 Total Population	58
19.	2010 Total Households	59
20.	2010 Total Employed Population	60
21.	2019 Land Use/ Land Cover	63
22.	Future (2030) Land Use/Land Cover Changes	66
23.	Relationship between impervious surfaces, evapotransporation, & infiltration	67
24.	Impervious cover classification by SMU based on 2019 land use/land cover	71
25.	Predicted future (2030) impervious cover classification by SMU	73
26.	Vulnerability ranking of SMUs based on predicted future land use/land cover changes	74
27.	Distribution of open, partially open, and developed parcels	75
28.	Open, partially open, and developed parcels	76
29.	Distribution of private and public open and partially open parcels	77
30.	Distribution of protected and unprotected open and partially open parcels	77
31.	Public versus private ownership of open and partially open parcels	79
32.	Protection status of open and partially open parcels	80
33.	Open Space Parcel Prioritization	82
34.	Green Infrastructure Components	83
35.	Green Infrastructure Network	84
36.	Important Natural Areas	86
37.	Stream Reaches	93
38.	Stream Evolution Model	103

Preface vii

Figur	<u>e</u>	Page
39.	Stream Channelization	105
40.	Streambank Erosion	108
41.	Riparian Area Condition	111
42.	Detention Basins	116
43.	Pre-European Settlement Wetlands And Existing Wetlands	119
44.	Potential Wetland Restoration Sites	123
45.	100-Year Floodplain And Floodway Depiction	124
46.	Fema 100-Year Floodplain & Flood Problem Areas	126
47.	USDA Cropland Data 2018	128
48.	Transects, locations, and watershed boundaries for the 2018 IL Conservation Transect Survey	130
49.	Agricultural Management Practice Conditions	131
50.	Tile drainage probability in Illinois	132
51.	Cross section of the Northeastern Illinois deep and shallow aquifer units	133
52.	Year 2050 modeled groundwater drawdown in the Ancell Unit and Ironton- Galesville Unit	134
53.	Aquifer recharge potential in the Rock River Basin	135
54.	Existing Water Quality Monitoring Locations	144
55.	Estimated percent contributions to existing (2019) pollutant load by source	152
56.	Nonpoint Source Pollutant loading "Hot Spot" SMUs	154
57.	Critical Areas	168
58.	Naturalized dry bottom infiltration basin design	177
59.	Naturalized wet bottom detention basin design	177
60.	Illustration of how trees help with stormwater management	184
61.	Riparian function, pollutant removal, and wildlife benefits for various buffer widths	187
62.	Use of tile control to raise water table after harvest, drawdown prior to seeding, and raised again in midsummer	194
63.	Subsurface Bioreactor	195
64.	Stormwater Treatment Train within Conservation Development	197
65.	Traditional vs. Conservation Development Design (Elkhorn, WI)	197
66.	Conservation/Low Impact development design	197
67.	Greener Streetscape using LID practices	198
68.	Water quality trading components	201
69.	Detention Basin Retrofit Recommendations	207
70.	Wetland Restoration Recommendations	209
71.	Streambank & Riparian Area Restoration Recommendations	212
72.	Agricultural Management Practice Recommendations	214
73.	Other Management Measure Recommendations	216
74.	Future Water Quality Monitoring Locations	256
75.	Steps to measure social indicators	261

LIST OF TABLES

<u>Table</u>		Page
1.	Upper South Branch Kishwaukee River Watershed Steering Committee meeting schedule	8
2.	Location and description of Places-of-the-Heart group exercise	12
3.	Subwatershed Management Units and size	31
4.	Hydrologic Soil Groups and their corresponding attributes	36
5.	Hydrologic Soil Groups including acreage and percent of watershed	36
6.	County, township, unincorporated, and municipal jurisdictions	38
7.	Levels of jurisdiction	40
8.	Drainage Districts within the watershed	50
9.	USCB and IDPH Population Projections 2010-2025	56
10.	Demographics data by location	57
11.	2019 land use/land cover classifications and acreage.	61
12.	Comparison between 2019 and predicted future (2030) land use/land cover statistics	65
13.	Impervious category & corresponding stream condition	67
14.	Existing 2019, predicted (2030) impervious cover, and vulnerability by SMU	70
15.	Criteria used to prioritize parcels for a Green Infrastructure Network	81
16.	Important natural area summary data	85
17.	Summary of Upper South Branch Kishwaukee River and tributary reaches and length	92
18.	Summary of stream and tributary channelization	104
19.	Summary of stream and tributary bank erosion	107
20.	Summary of stream and tributary riparian area condition	110
21.	Summary of detention basin types, ecological condition, and acreage	114
22.	Site ID, size, and existing condition of potential wetland restorations	121
23.	Documented Flood Problem Areas	125
24.	USDA 2018 Cropland Data for cropland cover types	127
25.	Community water supply wells within the watershed	136
26.	KWRD NPDES permit requirements	138
27.	Estimated number of rural households/septic systems by SMU	139
28.	Illinois EPA Designated Uses and impairments for Upper South Branch Kishwaukee River and tributaries	142
29.	List of chemical/physical surface water quality monitoring sites (2010-2019)	143
30.	NIU water chemistry data (averages) for sites on Upper South Branch Kishwaukee River (2018-2019)	146
31.	AES and KWRD sample results for baseline on 7/18/19	147
32.	AES and KWRD sample results after 1" rain event on 8/27/19	147
33.	AES and KWRD sample results on 12/5/19	148
34.	Illinois EPA water chemistry data (averages) for sites on Upper South Branch Kishwaukee River (2011-2016)	148
35.	KWRD NPDES permit requirements and effluent water quality average for October 2018- October 2019	150

Preface ix

<u>Table</u>		Page
36.	Estimated average annual pollutant load from KWRD	151
37.	Estimated existing (2019) annual pollutant load by source at the watershed scale	152
38.	Pollutant load "Hot Spot" SMUs	153
39.	Known or potential causes and sources of watershed impairment	156
40.	Critical Areas, existing conditions, recommended Management Measures, & estimated nutrient and sediment load reductions	159
41.	Basis for known impairments, reduction targets, & impairment reduction for pollutants from Critical Areas	170
42.	Key Upper South Branch Kishwaukee River watershed stakeholders/partners	174
43.	Three-year vegetation establishment schedule for naturalized detention basins	179
44.	Three-year cyclical long-term maintenance schedule for naturalized detention basins	179
45.	Savings of Conservation Development over Traditional Subdivision Design for ten Midwestern conservation development projects	199
46.	Region 5 Model percent pollutant removal efficiencies for Management Measures	203
47.	Watershed-wide summary of Management Measures recommended for implementation	205
48.	Site-Specific Management Measures Action Plan	217
49.	Information and Education Plan Matrix	246
50.	Key Upper South Branch Kishwaukee River watershed stakeholders/partners	250
51.	Recommended water quality monitoring programs/locations	255
52.	Physical & chemical stream monitoring parameters, collection, and handling procedures	257
53.	Illinois EPA indicators of aquatic life impairment using MBI and fIBI scores	259
54.	QHEI score classes and characteristics	259
55.	Social indicators and measures to understand behavior toward watershed issues	261
56.	Set of criteria related to water quality goal and objectives	263

LIST OF APPENDICES

(Note: All appendices are included on attached CD)

APPENDIX A. Upper South Branch Kishwaukee River Steering Committee Meeting Minutes

APPENDIX B. Center for Watershed Protection Local Ordinance Review Results

APPENDIX C. Upper South Branch Kishwaukee River Watershed Resource Field Inventory

APPENDIX D. Pollutant Load STEPL Modeling and Pollutant Load Reductions Calculations

APPENDIX E. Funding Opportunities