5.0 Causes/Sources of Impairment & Reduction Targets

5.1 Causes & Sources of Impairment

According to Illinois EPA's most recent 2018 *Integrated Water Quality Report and Section 303(d) List*, Upper South Branch Kishwaukee River (IEPA Segment Codes: IL_PQC-02 and IL_PQC-13) are "Fully Supporting" for *Aquatic Life*, "Not Supporting" for *Fish Consumption*, and the upper half of the Kishwaukee is also "Not Supporting" for *Aesthetic Quality*; neither reach was assessed for *Primary Contact Recreation*. The sources of impairment are unknown for both segments. Recent water quality data collected within the Upper South Branch Kishwaukee River indicates likely overall impairment from elevated total phosphorus, total nitrogen, and total suspended solids (sediment). For more detailed information on water quality and designated uses and impairments, see Section 4.1.

There are also non-water quality related impairments in the watershed such as habitat degradation, loss of open space, hydrologic and flow changes, reduced groundwater infiltration, and structural flood damage. Many different causes and sources are related to these impairments.

Table 39 summarizes all *known* or *potential* causes and sources of watershed impairment as documented by Illinois EPA, items identified via Applied Ecological Service's watershed resource inventory, and input from the Watershed Steering Committee who met during the planning process to discuss impairments.

Table 39. *Known* and *potential* causes and sources of watershed impairment.

Illinois EPA or other Impairment	Cause of Impairment	Known or Potential Source of Impairment
Water Quality: Aquatic Life	Nutrients- *known impairment*: (Phosphorus & Nitrogen)	Agricultural row crop runoff; Streambank erosion; Residential, Ag, and commercial lawn fertilizer; Failing septic systems; Inadequate nutrient restrictions/policy; Level of landowner education; Wastewater treatment plants; Buried stream sections (nitrogen)
Water Quality: Aquatic Life, Aesthetic Quality	Sediment- *known impairment* (Total Suspended Solids/ turbidity)	Agricultural runoff; Streambank erosion; Construction sites; Existing & future urban runoff;
Water Quality: Aquatic Life	Chlorides (salinity)- *potential future impairment*	Deicing operations on roads & parking lots; Inadequate deicing policies; Level of public education
Fish Consumption	Polychlorinated Biphenyls (PCBs) and Mercury- *known impairment*	Urban runoff; Historic commercial and industrial runoff; Atmospheric deposition (mercury)
Habitat Degradation	Invasive/non-native plant species in riparian and other natural areas- *known impairment*	Spread from existing and introduced populations; Level of public education; Lack of maintenance and management
Habitat Degradation	Loss and fragmentation of open space/natural habitat due to development - *known impairment*	Inadequate protection policy; Lack of land acquisition funds; Traditional development design; Streambank, channel, and riparian area modification; Lack of appropriate land management; Lack of restoration and maintenance funds; Wetland loss
Hydrologic and Flow Changes	Alteration of natural drainage channels; buried streams; impervious surfaces- *known impairment*	Existing & future urban runoff; Wetland loss
Overbank Flooding	Encroachment in 100-year floodplain- *known impairment*	Channelized streams; Wetland loss; Poor detention basin design & function; Existing and future urban impervious surfaces; Agricultural drain tiles

5.2 Critical Areas, Management Measures & Estimated Impairment Reductions

For this watershed plan a "Critical Area" is best described as a location in the watershed where existing or potential future causes and sources of an impairment or existing function are significantly worse than other areas of the watershed. Five Critical Area types were identified in Upper South Branch Kishwaukee River watershed and include:

1. poorly designed/functional detention basins or detention needs;
2. large drained wetland complexes;
3. highly degraded stream and riparian area reaches;
4. agricultural areas in need of additional or enhanced infield practices; and
5. other management measure recommendations.

Short descriptions of each Critical Area type are included below. Table 40 includes summaries of the current condition at each Critical Area (by type) and recommended Management Measures with estimated nutrient and sediment load reductions expected. The list of Critical Areas identified in the following paragraphs is a subset of the full management measures as found in the Action Plan section of this report. Figure 57 maps the location of each Critical Area.

Pollutant load reductions are evaluated for the majority of the Critical Area Management Measures based on efficiency calculations developed for the USEPA's Region 5 Model. This model uses "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (MDEQ, 1999) to provide estimates nutrient and sediment load reductions from the implementation of agricultural Management Measures. Estimate of nutrient and sediment load reduction from implementation of urban Management Measures is based on efficiency calculations developed by Illinois EPA. Illinois EPA pollutant load reduction worksheets for each Management Measure, including Critical Areas, are located in Appendix D.

Critical Detention Basins

Critical detention basins are generally defined as existing basins that provide poor ecological and water quality benefits in areas where these attributes are needed. Twenty (20) detention basins meet the criteria of a Critical Area based of their location, function, and size. Most of the Critical Area detention basin retrofit recommendations are located within the City of DeKalb. The most common recommendation is to naturalize basins that are currently turf grass with native vegetation to provide better water quality improvement, greater infiltration, and improve wildlife habitat. A summary of the detention basins in the watershed is included in Section 3.14.

Critical Wetland Restoration Sites

Critical wetlands restoration sites are generally associated with large areas that were historically wetland prior to European settlement in the 1830s but were drained for agricultural purposes. Many of these historic wetlands can be restored by breaking existing drain tiles and planting with native vegetation. Wetland restorations are among the most recommended projects to improve water quality, reduce flooding, and improve wildlife habitat. Ten Critical Area wetland restoration recommendations were identified in the watershed. Critical Area status was assigned based on location, size, and restoration potential. A detailed summary of the extent of drained wetlands and restoration opportunities in the watershed is included in Section 3.14.

Critical Stream and Riparian Area Reaches

Critical stream and riparian area reaches are those with highly eroded streambanks that are a major source of total suspended solids (sediment) carrying attached phosphorus and nitrogen and/or where buffers adjacent to stream reaches are in poor ecological condition or areas lacking a buffer but with excellent ecological restoration and remediation potential to improve water quality and habitat conditions. Streambank stabilization using bioengineering where necessary, installation of artificial riffles in stream, and improved and expanded riparian areas on Critical Area stream reaches will greatly reduce sediment and nutrient transport downstream while improving habitat and increasing oxygen levels. Thirty-two (32) stream reaches totaling 215,995 linear feet were identified as Critical Areas. Section 3.14 includes a complete summary of streams, tributaries, and riparian areas in the watershed.

According to research, nitrogen generally travels 18 times further in a buried stream than in an open stream due to the lack of plants and other organic matter that could feed on those nitrates, keeping streams healthy and oxygenated (Bliss, 2015). Nitrogen levels in Upper South Branch Kishwaukee River watershed are particularly high and one Critical Area solution is to daylight or unbury portions of Tributary 15 Reach 2 running through NIU's campus that are currently piped underground.

Critical Agricultural Land Management

It is well documented that agricultural land is a significant contributor of nutrients and sediment in watersheds. According to modeling, agricultural areas contribute between 28% and 37% of the nutrient load and nearly 53% of the sediment load in the watershed. There are currently 50,405 acres of cropland in the watershed. Four (4) agricultural areas (totaling 48 acres) in need of additional grass waterways or vegetated swales were identified as Critical Areas based on their size and/or location in the watershed. For a full summary of agricultural areas, see Section 3.15.

As an additional Critical Area recommendation, AES recommends encouraging the 39% (19,658 acres) of cropland landowners already participating in reduced or low residue tillage (30-59% residue) to increase residue to 60% or more on their lands. This change alone could reduce watershed wide pollutant loads by 16,912 lbs/year of nitrogen, 7,506 lbs/year of phosphorus, and 3,025 tons/year of sediment, constituting the single largest pollutant reduction potential in the watershed. More details on this recommendation can be found in Section 6.1.13.

Other Critical Management Measures

Several potential Management Measure projects were identified that fit under miscellaneous other categories. In total there were 13 Critical Area projects that fell into the other management measures, including 5 Natural area restorations, 3 Golf course naturalizations, 1 Parking lot best management practice recommendations, 1 swale retrofit, 1 turf/park retrofit, 1 wetland management area, and 1 project to maintain a series of naturalized detention basins. These areas were typically determined to be Critical Areas due to existing or potential future causes and sources of an impairment or where existing function is significantly worse than other areas of the watershed. More information about other management measure recommendations can be found in Section 6.2.6.

Table 40. Critical Areas, existing conditions, recommended Management Measures, & estimated nutrient and sediment load reductions.

ID #	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency		
			TSS (tons/yr)	TP (lbs/yr)	TN (lbs/ yr)
Agricultural Management Measures					
117A	Traditional row crop agricultural field with obviously eroded swale draining land	Design and implement a project to install grass waterways or swales on private agricultural land	59	78	146
117C	Traditional row crop agricultural field with obviously eroded swale draining land	Design and implement a project to install grass waterways or swales on private agricultural land	253	348	654
78A	Traditional row crop agricultural field with obviously eroded swale draining land	Design and implement a project to install grass waterways or swales on private agricultural land	86	115	215
90A	Traditional row crop agricultural field with obviously eroded swale draining land	Design and implement a project to install grass waterways or swales on private agricultural land	95	127	238
N/A	Estimated 39% or 16,658 acres of cropland landowners currently practicing low residue Conservation Tillage such as reduced tillage (30-59% Residue)	Work with existing landowners currently practicing reduced tillage and those practicing conventional tillage to increase residue to 60% or more	3,025	7,506	16,912
Detention Basin Retrofits					
10B	Large wet-bottomed basin with turf side slopes, spot erosion evident, and poor ecological condition; geese present	Design and implement a project to remove turf, spot regrade banks where necessary, increase the size of buffer, naturalize buffer & slope with native plants and maintain for three years to establish	21	63	214
11A	Large wet-bottomed basin with turf side slopes, naturalized but unmaintained in average ecological condition	Design and implement a project to remove invasives, plant sides slopes and buffer with natives and maintain for three years to establish	1	5	6
12B	Huge degraded wetland bottom detention with turf side slopes in poor ecological condition	Design and implement a project to remove invasives and turf on slopes, naturalize with natives and maintain for three years to establish	19	23	171
12C	Dry basin with mowed turf slopes and concrete channels in poor ecological condition	Design and implement a project to break channels, naturalize buffer & slopes with natives, and maintain for three years to establish	7	22	74
14C	Wet-bottomed basin with mowed turf side slopes and severely eroded shoreline in poor ecological condition	Design and implement a project to remove turf, stabilize with rock toe, extend and naturalize buffer and slopes with natives and maintain for three years to establish	3	8	26

ID #	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency		
			TSS (tons/yr)	TP (lbs/yr)	TN (lbs/ yr)
15C	Naturalized basin in good condition	Design and implement a project to maintain well-established naturalized basin	24	29	103
16A	Naturalized basin in good condition	Design and implement a project to maintain well-established naturalized basin	11	10	32
16B	Naturalized basin in good condition	Design and implement a project to maintain well-established naturalized basin	14	17	61
21B	Wet-bottomed basin with naturalized side slopes, but weedy and overgrown and in average ecological condition	Design and implement a project to remove invasives, plant sides slopes and buffer with natives and maintain for three years to establish	0	1	1
21G	Huge wet-bottomed basin with mowed turf side slopes, moderate erosion at toe and near headwaters in poor ecological condition	Design and implement a project to remove turf, spot regrade banks where necessary, naturalize buffer & slope with native plants and maintain for three years to establish	2	2	6
24A	Wet-bottomed basin with mowed turf side slopes, heavily eroded toe with geese present and in poor ecological condition	Design and implement a project to remove turf, install rock toe, naturalize buffer & slope with native plants, stop mowing and maintain for three years to establish	11	13	45
24B	Wet-bottomed basin with mowed turf side slopes, heavily eroded toe with geese present and in poor ecological condition	Design and implement a project to remove turf, install rock toe, naturalize buffer & slope with native plants, stop mowing and maintain for three years to establish	7	8	62
24C	Wet-bottomed basin with mowed turf side slopes, heavily eroded toe with geese present and in poor ecological condition	Design and implement a project to remove turf, install rock toe, naturalize buffer & slope with native plants, stop mowing and maintain for three years to establish	13	16	120
24D	Wet-bottomed basin with mowed turf side slopes, heavily eroded toe with some natives and geese present; in poor ecological condition	Design and implement a project to remove turf, install rock toe, naturalize buffer & slope with native plants, stop mowing and maintain for three years to establish	3	3	25
24E	Wet-bottomed basin with mowed turf side slopes, heavily eroded toe with geese present and in poor ecological condition	Design and implement a project to remove turf, install rock toe, naturalize buffer & slope with native plants, stop mowing and maintain for three years to establish	17	21	155

ID #	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency		
			TSS (tons/yr)	TP (lbs/yr)	TN (lbs/ yr)
30A	Dry-bottomed turf grass basin, mowed with concrete channel and in poor ecological condition; drains NIU field	Design and implement a project to break channels, naturalize buffer & slopes with natives, and maintain for three years to establish	1	4	4
31D	Large wet-bottomed basin with mowed turf side slopes, eroded toe and heavy geese use in poor ecological condition	Design and implement a project to remove turf, regrade/ stabilize toe, install rock/biolog as needed, extend buffer to 20 feet, plant sides slopes and buffer with natives and maintain for three years to establish	72	87	310
41D	Wet-bottomed basin with natural side slopes, unmaintained but in good ecological condition	Design and implement a project to maintain well-established naturalized basin	4	12	38
43A	Wetland bottom basin with prairie side slopes, lots of invasives in good ecological condition	Design and implement a project to remove invasives, plant sides slopes and buffer with natives and maintain for three years to establish including burns	22	30	128
51F	Wetland bottom basin with mowed turf side slopes, cattail and willow present and in average ecological condition	Design and implement a project to remove invasives, plant sides slopes and buffer with natives and maintain for three years to establish	9	13	55
Other Management Measures					
17A	PA Nehring FP: degraded mesic oak woodland	Develop and implement a natural resource inventory & management plan and implement plan	0	3	5
24K	Turf/park throughout remnant oak woodland	Design and implement a project to replace turf w/natives under oaks, maintain for three years	0	1	1
24L	Degraded woodland dominated by young oaks	Develop and implement a natural resource inventory & management plan	2	3	20
31E	Degraded remnant woodland and prairie	Develop and implement a natural resource inventory & management plan	1	8	11
52C	Degraded wetland complex dominated by second growth weedy vegetation.	Develop and implement a natural resource inventory & management plan	7	10	62

ID #	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency		
			TSS (tons/yr)	TP (lbs/yr)	TN (lbs/ yr)
31E	Degraded remnant woodland and prairie	Develop and implement a natural resource inventory & management plan	1	8	11
52C	Degraded wetland complex dominated by second growth weedy vegetation.	Develop and implement a natural resource inventory & management plan	7	10	62
17B	Buena Vista golf course is a typical golf course set within a mowed remnant savanna along the river	Design and implement a project to remove turf in rough areas and replace with native vegetation, particularly under oak trees, and maintain for three years to establish	2	15	35
17D	Kishwaukee Country Club golf course is a typical golf course set within a mowed remnant savanna along the river	Design and implement a project to remove turf in rough areas and replace with native vegetation, particularly under oak trees, and maintain for three years to establish	3	24	55
51J	River Heights Golf Course is a typical golf course in previously farmed areas, no remnant remaining	Design and implement a project to remove turf in rough areas, replace with native vegetation, and maintain for three years to establish	3	25	57
40A	Series of online naturalized detention basins where old tributary channel was historically located. Area is in good ecological condition	Maintain on annual basis and in perpetuity	33	99	335
33B	Degraded wetland complex dominated by invasive phragmites	Implement maintenance to eradicate phragmites	2	4	17
18C	Typical parking lot at DCSWCD office	Design and implement a project to install pavement alternative & bioswales	5	8	77
18E	Mowed turf swale, spot erosion at culvert	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years	1	1	5
18D	Large mowed turf area surrounding DCSWCD office	Design and implement a project to remove turf, install prairie, education signage, maintain for three years	3	4	25
Wetland Restoration Sites					
109A	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	10	13	78
124A	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	9	12	73

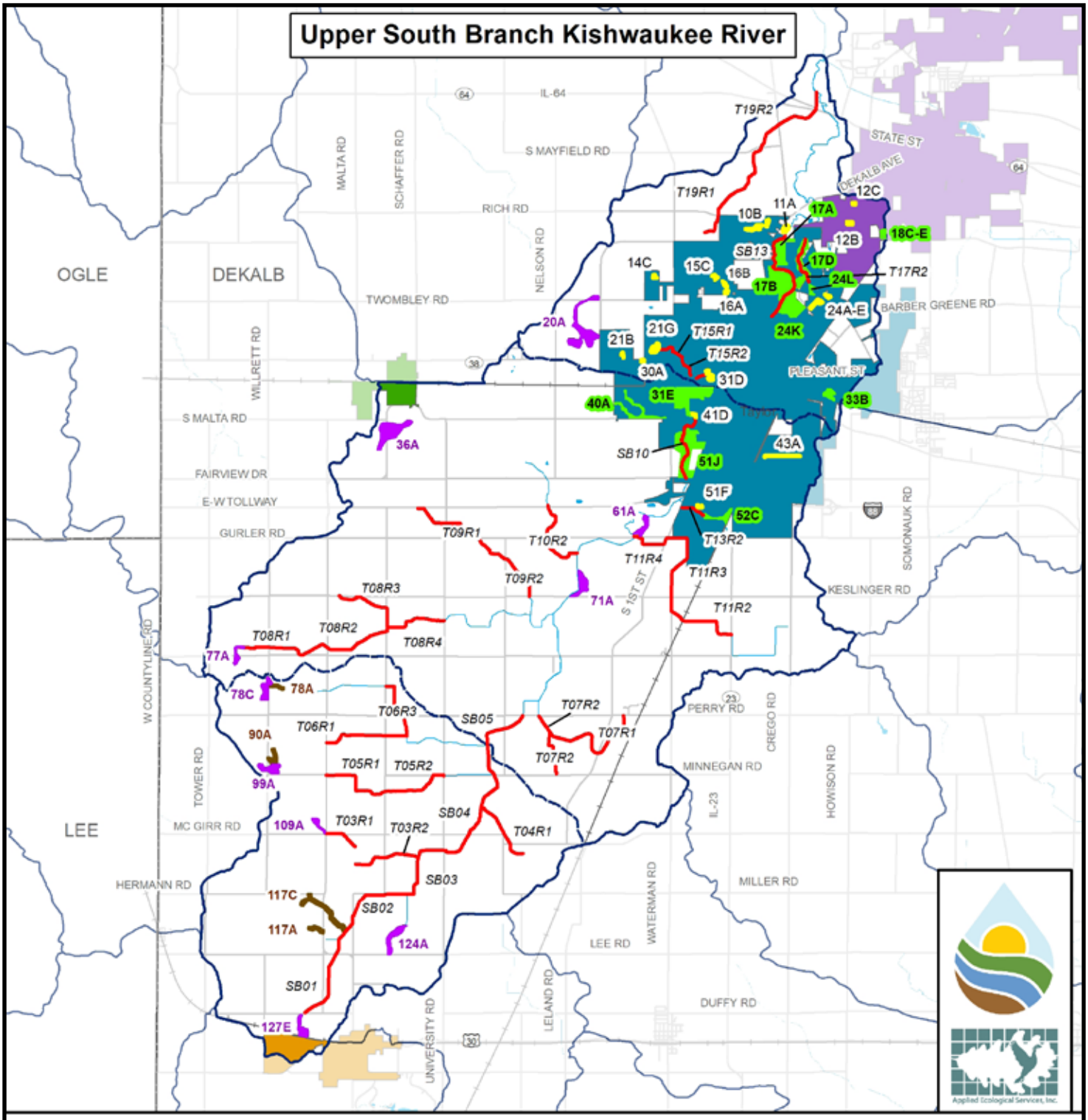
ID #	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency		
			TSS (tons/yr)	TP (lbs/yr)	TN (lbs/ yr)
127E	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	16	22	132
20A	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	30	40	245
36A	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	11	15	89
61A	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	2	3	20
71A	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	4	6	35
77A	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	7	9	56
78C	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	6	9	52
99A	Farmed and/or tile-drained hydric soils confirmed in field as good candidate site for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established	10	13	77

ID #	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency		
			TSS (tons/yr)	TP (lbs/yr)	TN (lbs/ yr)
Stream & Riparian Area Restorations					
SB01	6,586 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	30	44	517
SB02	7,774 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	16	24	281
SB03	8,867 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	23	34	403
SB04	9,637 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	30	43	507
SB05	7,538 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	18	27	313
SB10	6,589 lf of stream exhibiting moderate channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	23	60	379
SB13	10,139 lf of stream exhibiting low channelization, high levels of erosion and poor overall riparian area condition	Design, permit, and implement a project to remove invasives, spot stabilize eroding banks where necessary, and restore riparian buffer with native vegetation; maintain for three years to ensure establishment	1,749	1,531	3,212
T03R1	6,159 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	12	17	202

ID #	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency		
			TSS (tons/yr)	TP (lbs/yr)	TN (lbs/ yr)
T03R2	3,122 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	7	10	123
T04R1	6,090 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	6	20	237
T05R1	6,783 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	22	32	382
T05R2	6,023 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	10	15	173
T06R1	7,637 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	17	25	300
T06R3	5,952 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	14	20	241
T07R1	5,185 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	13	19	228
T07R2	12,039 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	31	45	534
T08R1	8,664 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	34	25	291

ID #	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency		
			TSS (tons/yr)	TP (lbs/yr)	TN (lbs/ yr)
T08R2	6,347 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	21	30	356
T08R3	6,549 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	10	15	178
T08R4	5,538 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	23	33	393
T09R1	10,571 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	60	87	1,023
T09R2	4,651 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	18	26	312
T10R2	7,579 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	12	17	202
T11R2	6,634 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	36	52	616
T11R3	8,925 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	33	48	564

ID #	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency		
			TSS (tons/yr)	TP (lbs/yr)	TN (lbs/ yr)
T11R4	3,830 lf of stream exhibiting high channelization, moderate levels of erosion and poor overall riparian area condition	Design, permit, and implement a project to remove invasives, spot stabilize eroding banks where necessary, and restore riparian buffer with native vegetation; maintain for three years to ensure establishment	175	163	394
T13R2	2,104 lf of stream exhibiting low channelization, moderate levels of erosion and poor overall riparian area condition	Design, permit, and implement a project to remove invasives, spot stabilize eroding banks where necessary, and restore riparian buffer with native vegetation; maintain for three years to ensure establishment	76	69	188
T15R1	2,732 lf of stream exhibiting moderate channelization, high levels of erosion and poor overall riparian area condition	Design, permit, and implement a project to remove invasives, spot stabilize eroding banks where necessary, and restore riparian buffer with native vegetation; maintain for three years to ensure establishment	307	274	730
T15R2	2,649 lf of stream exhibiting moderate channelization, high levels of erosion and poor overall riparian area condition; part of this reach is buried in a pipe	Design, permit, and implement a project to daylight buried portions of stream, remove invasives, spot stabilize eroding banks where necessary, and restore riparian buffer with native vegetation; maintain for three years to ensure establishment	301	270	730
T17R2	4,561 lf of stream exhibiting low channelization, high levels of erosion and poor overall riparian area condition	Design, permit, and implement a project to remove invasives, spot stabilize eroding banks where necessary, and restore riparian buffer with native vegetation; maintain for three years to ensure establishment	482	428	1,052
T19R1	10,385 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	49	74	843
T19R2	8,157 lf of stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/ existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	26	441	37


Upper South Branch Kishwaukee River
OGLE
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LEE
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S MAYFIELD RD
RICH RD
TWOMBLEY RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
MC GIRR RD
HERMANN RD
PERRY RD
MINNEGAN RD
KESLINGER RD
MILLER RD
LEE RD
DUFFY RD
PLEASANT ST
STATE ST
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BARBER GREENE RD
MALTA RD
SCHAFFER RD
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WILLRETT RD
W COUNTYLINE RD
TOWER RD
CREGO RD
HOWISON RD
WATERMAN RD
LELAND RD
UNIVERSITY RD
SOMONAUK RD
S 1ST ST
IL-23
T19R2
T19R1
T17R2
T15R1
T15R2
T13R2
T11R4
T11R3
T11R2
T10R2
T09R1
T09R2
T08R3
T08R2
T08R1
T08R4
T07R2
T07R1
T06R3
T06R1
T05R1
T05R2
T04R1
T03R1
T03R2
SB13
SB10
SB05
SB04
SB03
SB02
SB01
10B
11A
12C
17A
12B
18C-E
17D
24L
14C
15C
16B
17B
16A
24A-E
20A
21G
24K
21B
30A
31D
31E
40A
41D
33B
43A
36A
51J
51F
52C
61A
71A
77A
78C
78A
90A
99A
109A
117C
117A
124A
127E
Figure 57: Critical Areas
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Critical Areas by Type
Detention Basin Retrofit
Wetland Restoration
Stream & Riparian Area Restoration
Agricultural BMP Recommendation
Other Management Measures
Municipality
DeKalb
Sycamore
Shabbona
Malta
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County,
N

5.3 Watershed Impairment Reduction Targets

Establishing "Impairment Reduction Targets" is important because these targets provide a means to measure how implementation of Management Measures at Critical Areas is expected to reduce watershed impairments over time. Table 41 summarizes the basis for known impairments and nonpoint source reduction targets. Since Kishwaukee Water Reclamation District is a permitted source under IEPA's NPDES permit system, their relative contribution to pollutant loading was not included in the calculation of reduction targets. Reduction targets listed in Table 41 are based on documented information, STEPL modeling results, average water quality sampling results at the BB/IL-02 monitoring locations, and water quality standards and criteria set by the Illinois Pollution Control Board (IPCB, 2011), USEPA (2000), and USGS (2006). It is important to note that the assumption is made that percent decrease in sample concentration (mg/l) needed correlates to the percent reduction in annual load (lbs/yr or tons/yr) for phosphorus, nitrogen, and total suspended solids reduction targets. In addition, Table 41 summarizes the load reduction of phosphorus, nitrogen, and total suspended solids expected from addressing Critical Areas.

Watershed-Wide Reduction Targets for Phosphorus, Nitrogen, and Suspended Solids

Watershed-wide nitrogen and phosphorus reduction targets could not be attained by addressing Critical Areas alone according to the pollutant reduction calculations; however, the total suspended solids reduction target can be met. Critical Areas alone would remove 12,926 lbs/yr (24% of the target) and 37,303 (20% of the target) of phosphorus and nitrogen, respectively. However, approximately 7,630 tons/yr of total suspended solids or 377% of the target could be removed by addressing Critical Areas.

Additional watershed-wide reduction targets were established for habitat degradation, hydromodification and flow changes, and overbank flooding flood problems. Habitat degradation and hydromodification and flow changes targets could be met by implementing riparian area restoration and by restoring wetlands. Each of the eight overbank flooding flood problem areas can be addressed on a case by case basis to meet targets.

Table 41. Basis for *known* impairments, reduction targets, & impairment reduction for pollutants from Critical Areas.

Impairment: Cause of Impairment	Basis for Impairment	Nonpoint Source Reduction Target	Reduction from Critical Area	Target Attainable?
Watershed-Wide Reduction Targets				
Water Quality/ Aquatic Life: Phosphorus in Upper South Branch Kishwaukee River	73,249 lbs/yr of phosphorus loading based on STEPL model loading; 0.281 mg/l of total phosphorus based NPS share of average water quality samples	**>74.2% or 54,351 lbs/yr reduction in phosphorus** loading to achieve 0.0725 mg/l total phosphorus USEPA numeric criteria for streams in Ecoregion VI	8,174 lbs/yr or 15% reduction from critical agricultural land	
			387 lbs/yr or 1% reduction from critical detention basin retrofits	
			142 lbs/yr or <1% reduction from critical wetland restorations	
			4,018 lbs/yr or 7% reduction from critical stream & riparian area reaches	
			205 lbs/yr or 1% reduction from other management measures	
TOTAL			**12,926 lbs/yr or 24% total phosphorus reduction from all Critical Areas**	**No**
Water Quality/ Aquatic Life: Nitrogen in Upper South Branch Kishwaukee River	356,385 lbs/yr of total nitrogen loading based on STEPL model loading; 5.040 mg/l of total nitrogen based on NPS share of average water quality results	**>51.2% or 182,469 lbs/yr reduction in nitrogen** loading to achieve 2.461 mg/l total nitrogen USEPA numeric criteria for streams in Ecoregion VI	18,165 lbs/yr or 10% reduction from critical agricultural land	
			1,636 lbs/yr or 1% reduction from critical detention basin retrofits	
			857 lbs/yr or <1% reduction from critical wetland restorations	
			15,940 lbs/yr or 9% reduction from critical stream & riparian area reaches	
			705 lbs/yr or <1% reduction from other management measures	
TOTAL			**37,303 lbs/yr or 20% total nitrogen reduction from all Critical Areas**	**No**
Water Quality/ Aquatic Life: Total suspended solids (sediment) in Upper South Branch Kishwaukee River	33,710 tons/yr of sediment loading based on STEPL model; 19.1 mg/l of total suspended solids based on NPS share of average water quality results	**>6.0% or 2,023 tons/yr reduction in sediment** loading to achieve 19 mg/l total suspended solids based on USGS numeric criteria in Great Lakes Region	3,518 tons/yr or 174% reduction from critical agricultural land	
			258 tons/yr or 13% reduction from critical detention basin retrofits	
			106 tons/yr or 5% reduction from critical wetland restorations	
			3,685 tons/yr or 182% reduction from critical stream & riparian area reaches	
			63 tons/yr or 3% reduction from other management measures	
TOTAL			**7,630 tons/yr or 377% sediment reduction from all Critical Areas**	**Yes**

Impairment: Cause of Impairment	Basis for Impairment	Nonpoint Source Reduction Target	Reduction from Critical Area	Target Attainable?
Habitat Degradation: Invasive/non-native plant species in riparian areas and loss and fragmentation of open space/natural habitat	299,515 lf of riparian areas are currently in poor condition	**149,756 linear feet or 50%** of riparian areas ecologically restored	215,995 lf or 72% of riparian areas restored along critical riparian areas	Yes
Hydromodification and Flow Changes	Increase in flow and channel volumes; 24,164 acres (94%) of wetlands lost since pre-settlement	**10 critical wetlands restored** accounting for 378 acres	378 critical wetland acres restored	Yes
Overbank Flooding	8 overbank flooding flood problem areas	**8 or 100%** structural flood problem areas addressed	Not Applicable*	Yes

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