4.0 CAUSES AND SOURCES OF WATERSHED IMPAIRMENT

4.1 Causes & Sources of Impairment

Spring Creek is not listed by Illinois EPA as impaired for any of its 5 Designated Uses because it has not been assessed. However, available data (see Section 3.14) indicates that water quality is generally fair with only moderate impairments. As discussed in Section 3.14, Aquatic Life support is the most applicable Illinois EPA Designated Use for Spring Creek and forms the basis for identifying causes and sources of impairment and guides Management Measures recommendations.

Causes and sources of impairment are based on items identified during the watershed characteristics inventory as well as input from the Spring Creek Watershed partnership (SCW) who met twice during the planning process to discuss the topic. Table 32 includes a summary of causes and known or potential sources of watershed impairment and links this information to Illinois EPA Designated Use Impairment categories but does not necessarily mean that the Illinois Use Impairment is not supported.

Table 32. Link between causes and known or potential sources of Illinois EPA Use Impairment.

Illinois EPA or other Use Impairment	Cause of Impairment	Known or Potential Source of Impairment
Aquatic Life, Aesthetic Quality	Nutrients (Nitrogen & Phosphorus)	Agricultural row-crop runoff Residential and commercial fertilizer use Livestock and waterfowl (geese) defecation Failing Septic systems
Aquatic Life, Aesthetic Quality	Turbidity/ Streambed Sedimentation	Construction sites Streambank erosion at livestock crossings Streambank erosion from increased flows Agricultural row-crop runoff
Aquatic Life	Salinity	Deicing operations on roads & other pavement
Aquatic Life, Aesthetic quality	Low Dissolved Oxygen	Urban stormwater runoff Livestock waste Lack of natural riffles in streams
Aquatic Life	High Water Temperature	Urban stormwater runoff Poorly designed detention basins
Aquatic Life, Primary Contact, Secondary Contact, Aesthetic Quality	Petroleum Hydrocarbons (Oil & Grease)	Canadian National Railway train derailments Trucking cargo spills along major roads General urban and highway runoff Illicit dumping
Aquatic Life	Hydrology Modifications	Increased impervious cover Debris jams in streams Drain tiles
Aquatic Life, Aesthetic Quality	Negative Ecosystem Modification	Stream channelization Land development Poor land management (i.e. large lot turf lawns) Invasive and/or non-native species Hydrology changes Loss of natural management (i.e. fire) Drain tiles or wetland filling (wetland loss)
Structural Flood Damage	Flooding	Impervious surfaces Undersized culverts Structures located in floodplain
Reduced Recharge	Reduced Infiltration	Impervious cover in important recharge areas

4.2 Critical Areas, Management Measures & Estimated Impairment Reductions

For this watershed plan a "Critical Area" is best described as a particular place or area of the watershed where causes/sources of impairment or site function are relatively worse than other areas of the watershed. It also includes open space that if protected and restored to natural conditions or developed using conservation and/or low density design standards would greatly reduce impairments compared to existing conditions. Five Critical Area types were identified in the Spring Creek watershed and are described below. Table 33 includes descriptions of each individual Critical Area (by type) as well as recommended Management Measures and estimated nutrient and sediment load reduction efficiency derived from a comprehensive list found in the Action Plan section of this report. Figure 46 maps the location of each Critical Area.

Critical Stream Reach

Critical stream reaches meet specific impairment criteria. These criteria include; 1) reaches with highly eroded streambanks; 2) moderately eroded reaches with highly channelized conditions; and 3) moderately eroded reaches or highly channelized reaches on public land. Riparian area condition is also a factor in determining Critical Area status. Six total stream reaches were identified using these criteria. Section 3.12 includes a complete summary of streams in the watershed.

Critical Drained Wetland

A summary of the extent of drained wetlands and potential wetland restoration opportunities in the watershed is included in Section 3.12. Four drained wetland areas were determined to be Critical Areas based on their location, size, and potential for restoration.

Critical Detention Basin or Pond

A detention basin/pond inventory was completed as part of this project (Appendix B) and identified basins and ponds needing water quality improvement retrofits and maintenance. Three detention basins and one pond meet the criteria of a Critical Area based of their location near pollutant sources, poor function, and size. A brief summary of the detentions basins and ponds in the watershed is included in Section 3.12.

Critical Lakes

Mud Lake and Spring Lake are located within a dedicated nature preserve in Spring Creek Valley Forest Preserve. Information provided by the Forest Preserve District of Cook County (FPDCC) indicates that restoration of hydrology and the land around these lakes will allow the lakes to have the resilience to heal. The most important action steps include removal of invasive buckthorn, addressing watershed partnership issues offsite, and restoring woodlands in nearby sensitive recharge areas.

Critical Priority Protection Area

Information obtained from existing and future land use data, open space inventory, pollutant loading analysis, and green infrastructure plan sections of this report led to identification of six Priority Protection Areas. Priority Protection Areas 1, 4, and 6 are currently agricultural or a gravel quarry where residential development is likely to occur in the next 30 years. Conservation and/or low density design is recommended for these areas when and if they become developed. Areas 2 and 3 abut Spring Creek Valley Forest Preserve. The recommendation here is for the Forest Preserve District of Cook County (FPDCC) to acquire, protect and restore the land. The last Priority Protection Area (Area 5) is situated in the northwest portion of the watershed at the headwaters of

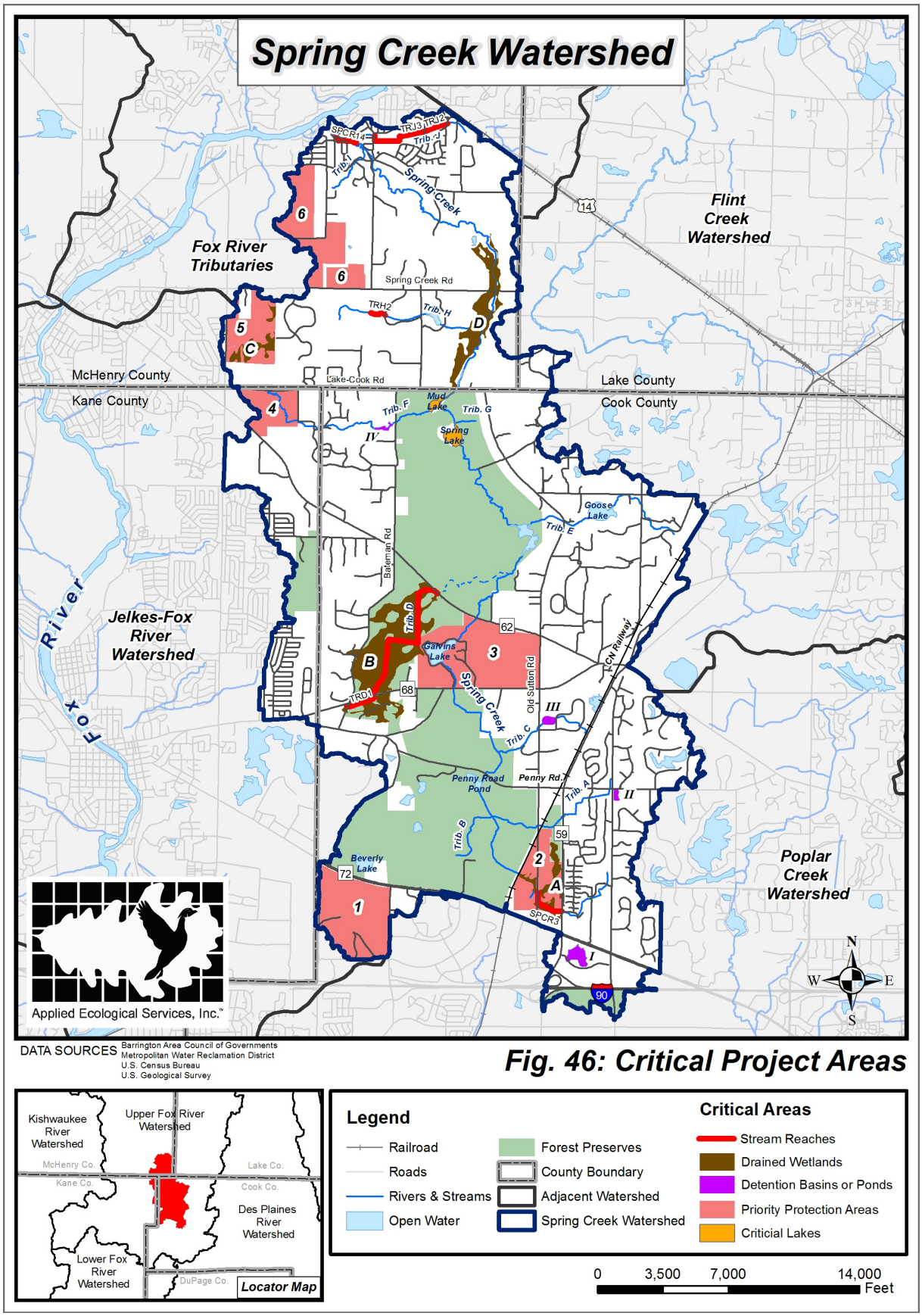
Tributary F in an agricultural area with extensive drained wetlands (Critical Drained Wetland D). Restoration of wetland and prairie in this area would best benefit the watershed.

Table 33. Critical Areas, recommended Management Measures, and estimated nutrient and sediment load reductions.

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction
Stream Reaches			
SPCR3	1,983 lf with moderate streambank erosion, highly channelized, & poor riparian condition on private agricultural land	Streambank restoration, channel improvements, & riparian area restoration	TN= 343 lbs/yr TP= 172 lbs/yr TSS= 172 tons/yr
SPCR14	1,282 lf with moderate streambank erosion & poor riparian condition at Fox River Grove WWTP	Streambank & riparian area restoration	TN= 22 lbs/yr TP= 22 lbs/yr TSS= 22 tons/yr
TRD1	10,313 lf highly channelized within SCVFP	Fill channel or pull back berm edges as part of Wetland Restoration #3	TN= 278 lbs/yr TP= 107 lbs/yr TSS= 151 tons/yr
TRH2	863 lf with high streambank erosion, highly channelized, & poor riparian condition on private residential land	Streambank restoration, channel improvements, & riparian area restoration	TN= 249 lbs/yr TP= 124 lbs/yr TSS= 124 tons/yr
TRJ2 & 3	4,563 lf highly channelized within Fox River Grove's Foxmore Park	Daylight upstream portion, improve channel condition; and improve buffer between stream and adjacent ponds	TN= 132 lbs/yr TP= 66 lbs/yr TSS= 78 tons/yr
Drained Wetlands			
A	52.5 acres drained wetland near Spring Cr headwaters on private agricultural land; development upstream	Restore wetland and buffer	TN= 275 lbs/yr TP= 55 lbs/yr TSS= 22 tons/yr
B	334.6 acres drained wetland at headwaters of Trib. D within SCVFP; includes stream reach TRD1	Restore wetland and buffer	TN= 1,375 lbs/yr TP= 289 lbs/yr TSS= 142 tons/yr
C	37.9 acres drained wetland at headwaters of Trib. F on private agricultural land; potential wetland bank	Restore wetland and buffer	TN= 135 lbs/yr TP= 29 lbs/yr TSS= 14 tons/yr
D	124 acres drained wetland along Spring Creek on private equestrian and residential land	Restore wetland and buffer	TN= 518 lbs/yr TP= 31 lbs/yr TSS= 6 tons/yr
Detention Basins & Ponds			
I	18 acre wet bottom basin with little water quality function; future Sutton Crossing development site	Retrofit w/native plant buffer and emergent zone	TN= 1,386 lbs/yr TP= 134 lbs/yr TSS= 76 tons/yr
II	4 acre dry turf bottom basin with little water quality function at Barbara Rose Elementary School	Retrofit with native vegetation	TN= 88 lbs/yr TP= 13 lbs/yr TSS= 10 tons/yr
III	7 acre wet bottom basin in horse pasture at headwaters of Trib. C.	Recommend detention district for horse access to water, rather than basin	TN= 32 lbs/yr TP= 3 lbs/yr TSS= 2 tons/yr

IV	6 acre pond online with Trib. F. FPDCC indicates that significant fertilizers in runoff flow through pond prior to entering Nature Preserve	FPDCC recommends reworking this pond in ways that would decrease pollutant loading to the Nature Preserve	TN= 414 lbs/yr TP= 115 lbs/yr TSS= 43 tons/yr
Critical Lakes			
Mud Lake & Spring Lake	Two natural lakes within nature preserve at Spring Creek Valley Forest Preserve	Remove invasive buckthorn and other woody growth from adjacent dewatered wetland areas and address watershed partnership issues offsite.	Not Applicable
Priority Protection Areas			
1	334 acres currently being gravel mined; planned future residential development	Use conservation and/or low density design	TN= 292 lbs/yr TP= 30 lbs/yr TSS= 12 tons/yr
2	180 acres in private agriculture; slated for future development; includes stream reach SPCR3	Acquire, protect, & restore prairie/wetland complex adjacent to SCVFP	TN= 944 lbs/yr TP= 188 lbs/yr TSS= 75 tons/yr
3	492 acres currently in private agriculture adjacent to SCVFP	Acquire, protect, & restore prairie adjacent to SCVFP	TN= 1,756 lbs/yr TP= 350 lbs/yr TSS= 140 tons/yr
4	123 acres of private agriculture at headwaters of Trib. F; likely site for future residential development	Use conservation and/or low density design	TN= 508 lbs/yr TP= 111 lbs/yr TSS= 51 tons/yr
5	185 acres in private agriculture; includes wetland restoration site D; potential wetland mitigation	Acquire, protect, and restore prairie/wetland complex	TN= 610 lbs/yr TP= 133 lbs/yr TSS= 61 tons/yr
6	288 acres of private agriculture in areas likely to see future residential development	Use conservation and/or low density design standards	TN= 1,025 lbs/yr TP= 234 lbs/yr TSS= 103 tons/yr

Pollutant load reduction is 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 of sediment and nutrient load reductions from the implementation of *agricultural* Management Measures. Estimate of sediment and nutrient load reduction from implementation of *urban* Management Measures is based on efficiency calculations developed by Illinois EPA. The STEPL Model was used to develop pollutant reduction estimates for Priority Protection Areas. Pollutant load reduction worksheets are located in Appendix D.


Spring Creek Watershed
Fox River Tributaries
Flint Creek Watershed
Jelkes-Fox River Watershed
Poplar Creek Watershed
McHenry County
Kane County
Lake County
Cook County
Spring Creek
Spring Creek Rd
Lake-Cook Rd
Mud Lake
Spring Lake
Goose Lake
Garvins Lake
Penny Road Pond
Beverly Lake
Penny Rd.
Old Sutton Rd
Bateman Rd
CN Railway
Trib. A
Trib. B
Trib. C
Trib. D
Trib. E
Trib. F
Trib. G
Trib. H
Trib. J
TRH2
TRJ1
TRJ2
SPCR14
TRD1
SPCR3
Fox River
Applied Ecological Services, Inc.
N
S
E
W
DATA SOURCES
Barrington Area Council of Governments
Metropolitan Water Reclamation District
U.S. Census Bureau
U.S. Geological Survey
Fig. 46: Critical Project Areas
Kishwaukee River Watershed
Upper Fox River Watershed
McHenry Co.
Lake Co.
Kane Co.
Cook Co.
Des Plaines River Watershed
Lower Fox River Watershed
DuPage Co.
Locator Map
Legend
Railroad
Roads
Rivers & Streams
Open Water
Forest Preserves
County Boundary
Adjacent Watershed
Spring Creek Watershed
Critical Areas
Stream Reaches
Drained Wetlands
Detention Basins or Ponds
Priority Protection Areas
Criticial Lakes
0
3,500
7,000
14,000
Feet

4.3 Impairment Reduction Targets

Table 34 examines the basis for identified impairments in the Spring Creek watershed and provides "Reduction Targets" based on sufficient information. Establishing Reduction Targets is important because it sets the stage for identifying "Critical Aras" where recommended Management Measures are expected to have the greatest reduction impact. Reduction Targets listed in Table 34 are based on documented information, modeling results, best professional judgment, or water quality standards set by the Illinois Pollution Control Board (IPCB). Table 34 also includes a column summarizing the overall impairment reduction expected after addressing the Critical Areas. Nearly all Reduction Targets are met by addressing Critical Areas. The Riparian Corridor condition target is not attainable by addressing Critical Areas and will require that additional projects recommended in the Action Plan be implemented.

Table 34. Basis for impairments, "Reduction Targets", & impairment reduction.

Cause of Impairment	Basis for Impairment	Reduction Target	Reduction from Critical Areas	Target Attainable?
Nutrients (Nitrogen)*	50,327 lb/yr of Nitrogen loading based on STEPL model.	>20% or 10,065 lb/yr reduction in Nitrogen loading	10,203 lbs/yr or 20% Nitrogen reduction	Yes
Nutrients (Phosphorus)	8,883 lb/yr of Phosphorus loading based on STEPL model & 0.79 mg/l average in FOFR water quality samples.	>23% or 2,043 lb/yr reduction in Phosphorus loading to reach 0.61 mg/l Illinois EPA standard for streams	2,138 lbs/yr or 24% Phosphorus reduction	Yes
Turbidity/ Streambed Sedimentation*	17,810 linear feet of moderate to highly eroded streambank and 1,567 tons/yr of Sediment loading based on STEPL model	50% or 784 tons/yr reduction in Sediment loading	1,280 tons/year or 82% Sediment reduction	Yes
Negative Ecosystem Modification (Stream Channelization)	27,603 linear feet or 19% of stream length is highly channelized	50% or 13,802 linear feet of highly channelized stream length enhanced	17,722 lf of channelized stream enhanced	Yes
Negative Ecosystem Modification (Riparian Condition)	139,662 linear feet or 97% along stream length with poor riparian area condition.	20% or 37,932 linear feet of poor riparian condition restored	19,004 lf or 14% of riparian areas restored	No**
Negative Ecosystem Modification (Drained or Filled Wetland)	2,216 acres (55%) of wetlands lost; 59 drained or filled wetlands greater than 5 acres; 120,000 lf of drain tile in 1,600 acre SCVFP study	27% or 5 "Critical Area" drained wetlands restored accounting for 594 acres	594 "Critical Area" wetland acres restored	Yes
Flooding (Culverts & Structures in Floodplain)	7 structural flood problem areas	50% or 4 feasible flood problem areas addressed	Not covered in this watershed planning effort	Not Applicable
Hydrology Modifications	2 Non-Supporting SMUs; 9 Impacted SMUs based on impervious cover model.	< 35% impervious cover for 2 Non-Supporting SMUs; < 25% impervious cover for 9 Impacted SMUs in future	Cannot be evaluated until after future built conditions	Not Applicable
Reduced Infiltration (Impervious Cover)	Approximately 15% impervious cover average in moderate to highly sensitive recharge zones	0% reduction currently required; maintain below 20% impervious cover in future	Cannot be evaluated until after future built conditions	Not Applicable

* Available water quality data indicates pollutant does not exceed Illinois EPA standard; target is based on best professional judgment.
** Target will be met if additional projects recommended in the Action Plan are implemented.