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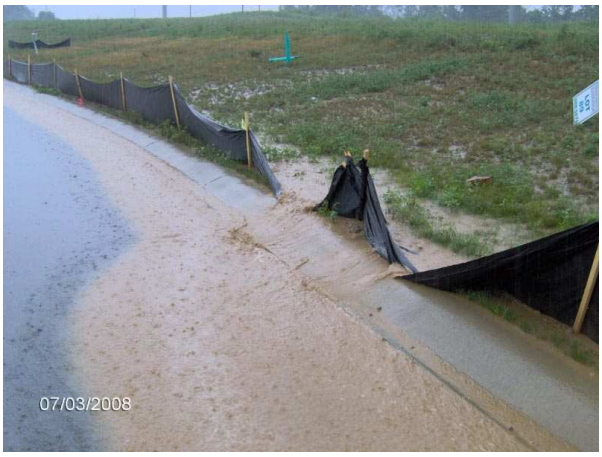

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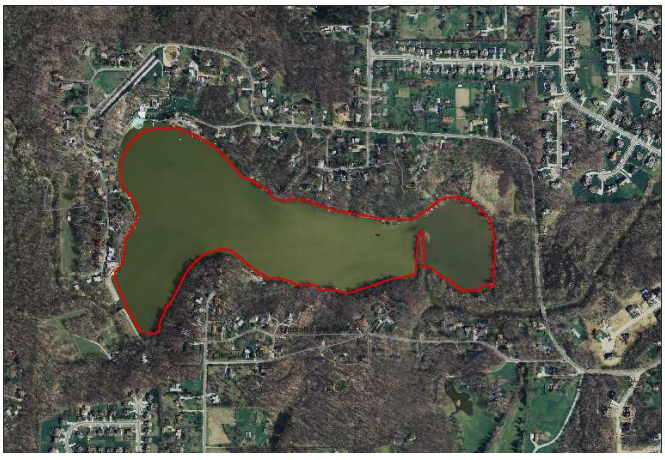

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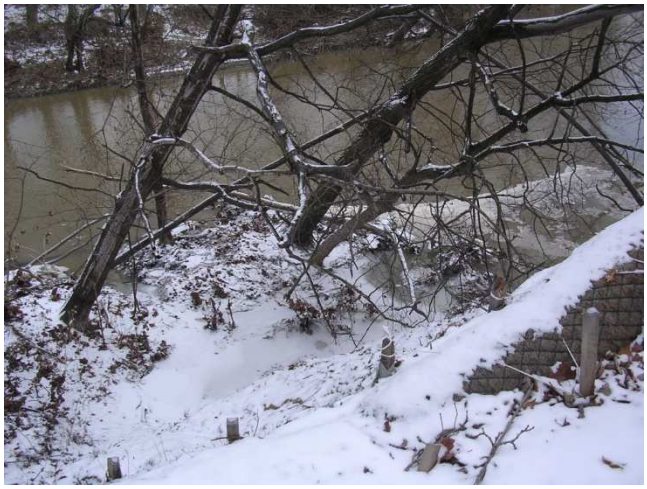

Figure 4-3: Eroded Streambank at Windridge Condominiums

Several stakeholders present at the public meetings, Steering Committee meetings, and Work Group meetings discussed the effects of streambank erosion and how it can potentially have a direct effect on hundreds of property owners. One example of such significant damages caused by streambank erosion is located near the intersection of Emerson Way and 56th Street. Windridge Condominiums and the National Headquarters of Phi Kappa Psi experienced a significant loss of streambank in March 2007 requiring them to relocate approximately 400 linear feet of sanitary sewer along Fall Creek (**Figure 4-3**) and close to the main entrance to the Phi Kappa Psi house.

This area has been identified as a Critical Area within the Lower Fall Creek Watershed since it represents the magnitude of social, physical, and economic losses that result when streambank erosion is not addressed. Streambank erosion is usually a symptom of a larger problem in the watershed.

Further downstream, the accumulation of sediment and large woody debris from the eroded banks of Fall Creek have restricted flow and flooded commercial and residential developments. The Windridge Condominiums Homeowners Association have recently retained the services of a professional engineering firm to study the drainage area and determine the best solution to stabilize the banks of Fall Creek, reduce additional streambank erosion, and downstream flooding.

Nutrient Critical Areas

Nutrient Critical Areas or activities were identified as the over application of lawn fertilizers on residential lakes and golf courses. The Steering Committee and Work Groups worked to determine where to focus efforts on reducing nutrient loads with the anticipation of having the greatest overall watershed effect and a high visibility for implemented practices or BMPs. As a result, lakes greater than 50 acres in size and surrounded by residential land use and golf courses were identified. **Exhibit 4-2** illustrates the location of these 5 lakes and 8 golf courses in the Fall Creek Watershed.

Golf Courses

The maintenance practices of golf courses are often identified as a source of runoff polluted with excess nutrients and chemicals. Courses are also designed with several ponds or "water hazards" which may be attractive to water fowl such as Canada Geese, also commonly identified as a source of nutrient, and other pollutant, loadings. Without good course design and maintenance practices, golf courses can have a detrimental effect on riparian buffers, wetlands, and water quality. Further, groundwater may be impacted by heavily applied fertilizers and pesticides.

Of the 8 golf courses identified on Exhibit 4-2, only one, Indian Lake Country Club Golf Course, lies within a Wellfield Protection Area (Geist). In addition, there are 5 courses that are directly adjacent to or span across bodies of water: Brendonwood (Fall Creek); Fort Golf Course (Camp Creek); Gray Eagle (Mud Creek); Hawthorne (Mud Creek); and Ironwood (Mud Creek). The Fort Golf Course (**Figure 4-4**) is in the process of achieving certification through the Audubon International's Cooperative Sanctuary Program for Golf Courses. The Ironwood Golf Course, shown in **Figure 4-5**, highlights the proximity of the golf course to Stonebridge Lake, which is one of the prioritized residential lakes within the Lower Fall Creek watershed.

Golf courses within the Lower Fall Creek Watershed have been identified as Critical Areas due to the potential for elevated levels of fertilizers and pesticides in runoff to surface waters or the potential for leaching into groundwater systems. These public courses are highly visible, visited by thousands of stakeholders each year, and may also serve as sites for future projects related to reduced fertilizer application, stormwater pollutant filtration measures, riparian buffers, and education and outreach efforts.

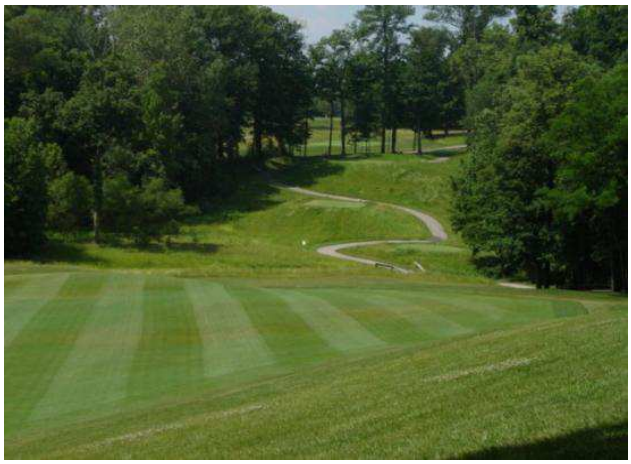

Figure 4-4: Fort Golf Course

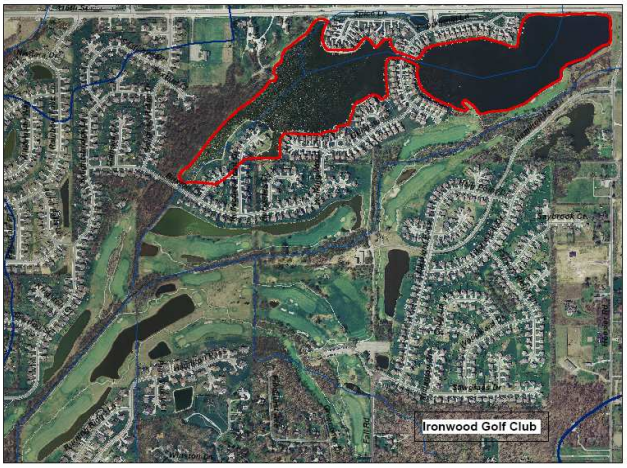

Figure 4-5: Ironwood Golf Club

Residential Lakes

Inland lakes surrounded by residential land use may be severely impacted due to excess lawn fertilizers, pet & wildlife waste, and even failing residential septic systems. As the lake systems are impacted by increased bacteria and nutrient loadings human health issues, aesthetic value, and property values may also be negatively impacted as a result. Residential lakes were selected based on the potential concentrations of homeowners reached through education and outreach efforts focused through the HOA, the visibility of BMPs installed or measures implemented, and the ability to involve individual homeowners or the HOA through long-term monitoring and measurement of the impacts of BMP installation.

Five residential lakes greater than 50 acres were selected as Critical Areas. These include: Lake Kesslerwood (East & West), Lake Maxinhall, Stonebridge, and Indian Lake. These were selected because there is opportunity to build the partnerships needed to implement management measures and observe or monitor water quality improvements. Two of the 5 lakes (Indian Lake and Lake Maxinhall) were created through sand and gravel mining operations several years ago. These lakes also lie within WFPAs, further creating the need for designation as a critical area as there is a direct connection between surface water and ground water within these areas. **Figure 4-6** is of Lake Maxinhall, one of the lakes located within a WFPA. This particular lake is of particular interest because it is within proximity to several non-sewered neighborhoods along its eastern border. Other lakes considered critical have a direct connection to Fall Creek or tributary streams as Indian Creek travels through Indian Lake (also located within a WFPA), tributaries to Sand Creek travel through Stonebridge Lake, and Atkinson Creek flows to Lake Kesslerwood and an outlet to Fall Creek has been constructed in

Figure 4-6: Lake Maxinhall

this area.

More details regarding other sources of nutrient loading to the watershed, non-sewered areas and CSOs, will be included within the pathogens discussion.

Pathogen Critical Areas

Specific Critical Areas or activities for pathogens were identified by the Fall Creek TMDL, Steering Committee, Work Groups, and watershed stakeholders as non-sewered developments, livestock and manure management, and Wellfield Protection Areas. **Exhibit 4-3** shows the overall location of these Critical Areas or activities. Other areas discussed by these groups, but not considered as a Critical Area (or activity) within this WMP, are CSOs, waterfowl, and stormwater runoff.

Non-Sewered Development

Septic systems can be a safe and effective method for treating wastewater if they are sized, sited, and maintained properly. However, as discussed in Section 3.0, failing and inadequately functioning systems are a common source of bacteria and pathogens in waterbodies. The NRCS has rated 92% of the soil in the Lower Fall Creek as moderate or severely limited for septic system use.

An additional concern within non-sewered developments is the potential for septic systems to be tied directly to local drainage tiles, ditches and storm sewer systems. These illicit discharges serve as a direct conduit for bacteria and pathogens (and excess nutrients) to travel to streams within the watershed. As a part of the NPDES Stormwater Phase I and Phase II requirements, communities within the Lower Fall Creek Watershed are required to screen outfalls during periods of dry weather to identify these illicit discharges. For many of the Lower Fall Creek Watershed Communities, this process has not yet began as regulatory schedules have not required this action.

Development in the Madison County portion of the Lower Fall Creek Watershed is scattered, very low in density, and on septic. If growth and development follows the guidance of the Comprehensive Plan, this area is expected to remain this way. Further downstream, the Hamilton Southeastern Sewer District provides sewer service to the portions of Hamilton County, City of Noblesville, and Town of Fishers in the Lower Fall Creek Watershed. Similar to Madison County, the development in this portion of Hamilton County is scattered, very low density, and on septic. However, as the City of Noblesville grows into this area, sewer lines will be extended and new (and existing) development will be connected to a wastewater treatment facility. The Town of Fishers has recently implemented a program to assist homeowners in their jurisdiction to connect to sanitary sewer. All new development is required to be sewered.

In 2005, the City of Indianapolis DPW Clean Stream Team initiated a Septic Tank Elimination Program (STEP) to convert entire neighborhoods on septic to sewer by 2025. This program replaces the Barrett Law conversion program and is estimated to save homeowners 50% of the cost to connect to sanitary sewer. In the Lower Fall Creek Watershed, there are 12 neighborhoods that have been identified and prioritized in STEP.

The STEP areas include:

- High Priority Neighborhoods – 82nd and Redbud, 46th and Millersville, 46th and Emerson, 42nd and Sherman, 42nd and Millersville
- Medium Priority Neighborhoods – 62st and Allisonville, 46th and Allisonville

- Low Priority Neighborhoods – 57th and Kessler, 55th and Allisonville, Fall Creek and Johnson, 46th and Ritter

In Hancock County, with the exception of some isolated septic systems, the developed areas are serviced by the Town of McCordsville Sewer District.

Livestock and Manure Management

Manure, whether being stored, applied for crop nutrition, or simply the by-product of grazing is a water quality concern within Lower Fall Creek Watershed. The Fall Creek TMDL did not discuss agricultural sources of bacteria or pathogens due to the limited amount of agricultural land use within Marion County. However, elsewhere in the watershed, livestock and manure are more of a contributing factor.

- Confined Feeding Operations

A Confined Feeding Operation (CFO) is a livestock operation that has in excess of 600 hogs, 300 cattle, or 600 sheep. These facilities are required, by IAC 16-2-5, to obtain a permit from IDEM's Office of Land Quality. According to IDEM's records, there is only 1 active CFO located in the Lower Fall Creek Watershed. In addition to this CFO within the watershed, there are Animal Feeding Operations (AFOs) in the upper reaches of the Lower Fall Creek Watershed in Hamilton, Hancock, and Madison Counties. These operations continue to decline in number and in number of cattle, pigs, and sheep at each operation. Further, Hamilton County ranks among the top 10 counties in Indiana in regard to the number of horses.

As discussed earlier within previous sections, the Steering Committee and Working Groups have agreed that agricultural related management efforts are best led by the individual county SWCDs. Local SWCD and NRCS staff have long-established relationships with agricultural landowners as well as an extensive knowledge of USDA programs designed to mitigate livestock and manure impacts as well as those designed to protect water quality in a livestock production area.

- Indiana State Fair Grounds

In urban areas, runoff from impervious surfaces, such as parking lots and roads are major contributors to stream pollution. The Indiana State Fair Grounds was identified as a Critical Area because it comprised of more than 250 acres (approximately 70 acres of imperviousness) in the Lower Fall Creek Watershed. The State Fair is home to more than 300 events each year, including the annual Indiana State Fair. During the State Fair, the fairgrounds are populated with thousands of livestock, including horses, cattle, hogs, sheep, poultry and numerous others (**Figure 4-7**). The livestock are usually available for display in one of the fairgrounds 7 livestock barns.

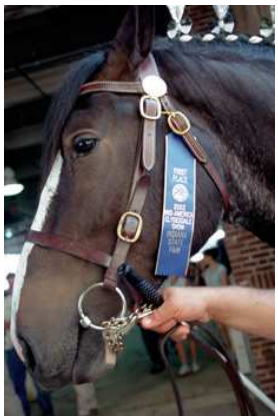

Figure 4-7: Horse event at State Fair

Water quality data collected to date indicates that the State Fair grounds are contributing *E. coli* loadings to Fall Creek. Since 1993, the Health Department has collected grab samples on Fall Creek during the State Fair. This sampling program has included the collection of *E. coli* samples at 39th Street, which is located upstream of the fairgrounds, at the fairgrounds stormwater outfall, and downstream of the fairgrounds at 30th Street. A similar sampling program conducted since 1994 has demonstrated parallel results.

There has long been recognition that animal waste from the fairgrounds contributes to pollution to Fall Creek. In 1999, the City of Indianapolis DPW completed a 104(b)(3) water quality cooperative grant to design a wetland-type wastewater treatment system for runoff leaving the fairground site. However, this project was never constructed.

Wellfield Protection Areas

There are 5 Wellfield Protection Areas (WFPA) in the Lower Fall Creek Watershed. These include the Riverside, Fall Creek, Lawrence, Geist, and Southern Madison County Utilities wellfields.

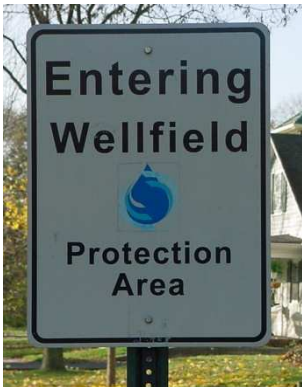

Figure 4-8: Wellfield Protection Area

WFPAs were identified as a Critical Area because of the potential contamination to groundwater and drinking water supply to approximately 20% of central Indiana population. Pollutants of particular concern in these areas are nutrients and pathogens. Land use and land use practices in the 4 WFPAs in Marion County that may impact groundwater are regulated through a Wellfield Protection Ordinance (City County General Ordinance # 91, 2003). As part of this Ordinance, new development and redevelopment plans are reviewed by a Technically Qualified Person (TQP).

The Ordinance also established a Marion County Wellfield Education Corporation (MCWEC) whose mission is to prevent contamination of groundwater through public awareness and education – like the "Entering Wellfield Protection Area" roadside sign illustrated in **Figure 4-8**. MCWEC targets it education and outreach efforts toward the businesses in the WFPAs that were grandfathered under the Ordinance. Although a Source Water Protection Plan has been prepared for the WFPA in Madison County, an Ordinance regulating land use has not been adopted.

Other

As mentioned, the Fall Creek TMDL, as well as the Steering Committee, Work Groups, and stakeholders also mentioned concerns over the pathogen loadings attributed to CSOs, waterfowl (and other wildlife), and stormwater runoff within the Lower Fall Creek Watershed. While these are important considerations throughout the watershed, and throughout Indiana, this WMP will not highlight specific areas as Critical Areas.

Regarding CSOs within the watershed, the City of Indianapolis has developed their LTCP which will ultimately capture 95-97% of sewage entering streams during wet weather and it is estimated that the implementation of this plan will cost more than $1.73B. The LTCP has detailed actions that will be taken to reduce water quality problems associated with CSOs, and should be referenced for all CSO related water quality improvements.

It is anticipated that actions taken to reduce pollutant loadings within the Critical Areas previously discussed will also reduce pollutant loadings associated with waterfowl (and wildlife) and pollutant laden stormwater runoff. For example, stabilization of streambanks will help reduce sediment loadings, but will also help to reduce pollutant loadings from waterfowl as bank and overhanging vegetation along streambanks and shorelines prohibit Canada Geese from staying in areas for prolonged periods of time. Further reducing applications of nutrients, implementing erosion control practices, and conversion from conventional to conservational tillage practices will also decrease the amount of pollutants within stormwater runoff.

Table 4-1: Identifying Critical Areas Work Group Exercise

DOCUMENTED WATER QUALITY POLLUTANT IN LOWER FALL CREEK	TYPICAL LAND USE/LAND USE PRACTICE ASSOCIATED WITH POLLUTANT		CRITICAL AREAS IN LOWER FALL CREEK WATERSHED
SEDIMENT impacts: Aquatic Life – *reduces plant growth, smothers and covers spawning grounds and benthic habitats* Recreational Impact – *reduces water clarity, reduces aesthetic appeal, stresses sport fishing populations* Drinking Water – *increases drinking water treatment costs, damages pumps and infrastructure*	**BENEFIT** water quality: • Riparian Buffers • Filter Strips • Conservation Areas • Post-Construction Practices	**DEGRADE** water quality: • Tillage Practices • Construction Practices • Streambank Erosion • Stormwater Runoff	• *Erosion and sediment control enforcement* • *HEL & PHEL Classified Soils* • *Indian Lake Watershed* • *Eroded Streambanks*
NUTRIENT (Phosphorus & Nitrogen) impacts: Aquatic Life – *promotes algal blooms, reduces dissolved oxygen concentrations* Recreational Impact – *causes algal blooms, reduces aesthetic appeal, and causes unpleasant odors* Drinking Water – *increases drinking water treatment costs (taste and odor), resultant algae can clog water intakes and filters*	**BENEFIT** water quality: • Riparian Buffers • Filter Strips • Post-Construction Practices	**DEGRADE** water quality: • Fertilizer Application • Failing Septic Systems	• *Over application of fertilizers (residential lakes and golf courses)* • *Wellfield Protection Areas*
PATHOGENS (Bacteria & Viruses) *impacts:* Aquatic Life – *exposes aquatic life to disease causing organisms* Recreational Impact – *exposes recreational users to disease causing organisms* Drinking Water – *increases drinking water treatment costs*	**BENEFIT** water quality: • Sewer Service • Exclusionary Fencing	**DEGRADE** water quality: • Failing Septic Systems • Combined Sewer Overflows (CSO) • Illicit Connections to Storm Sewer • Wildlife • Stormwater Runoff • Livestock & Manure Management	• *Indiana State Fair Grounds* • *Wellfield Protection Areas* • *Non-sewered development* • *Wellfield Protection Areas* • *Livestock and Manure Management Areas*

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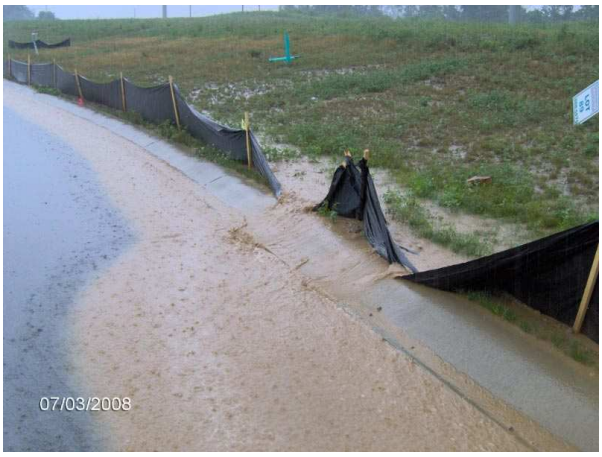

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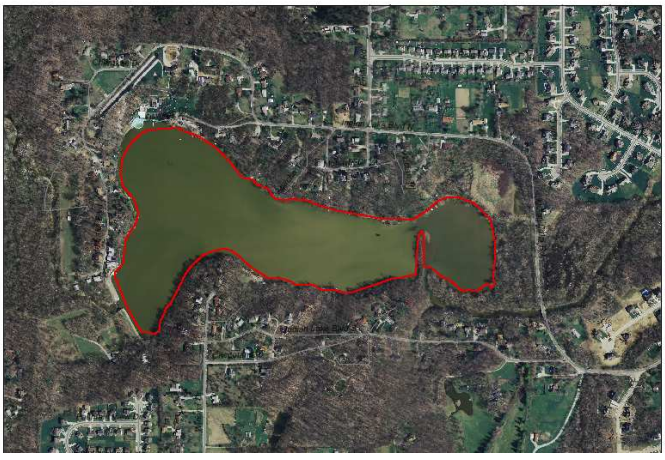

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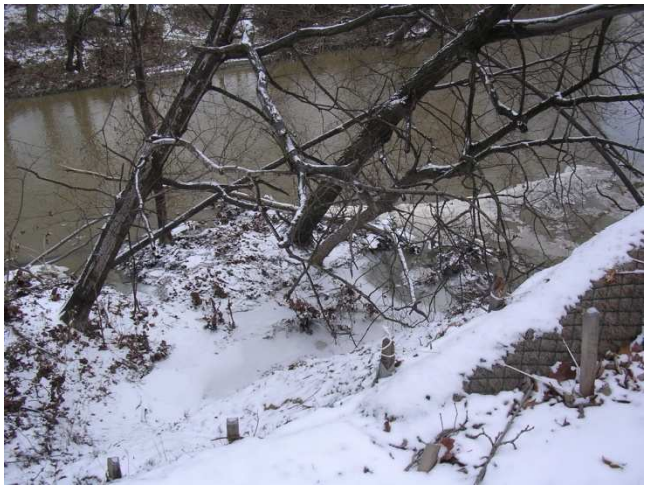

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This area has been identified as a Critical Area within the Lower Fall Creek Watershed since it represents the magnitude of social, physical, and economic losses that result when streambank erosion is not addressed. Streambank erosion is usually a symptom of a larger problem in the watershed.

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Golf Courses

The maintenance practices of golf courses are often identified as a source of runoff polluted with excess nutrients and chemicals. Courses are also designed with several ponds or "water hazards" which may be attractive to water fowl such as Canada Geese, also commonly identified as a source of nutrient, and other pollutant, loadings. Without good course design and maintenance practices, golf courses can have a detrimental effect on riparian buffers, wetlands, and water quality. Further, groundwater may be impacted by heavily applied fertilizers and pesticides.

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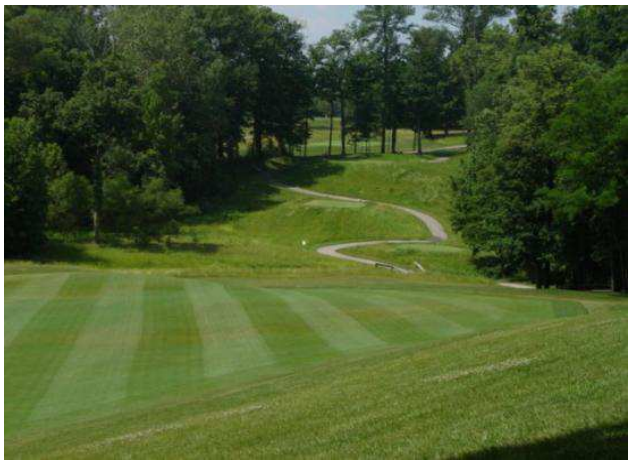

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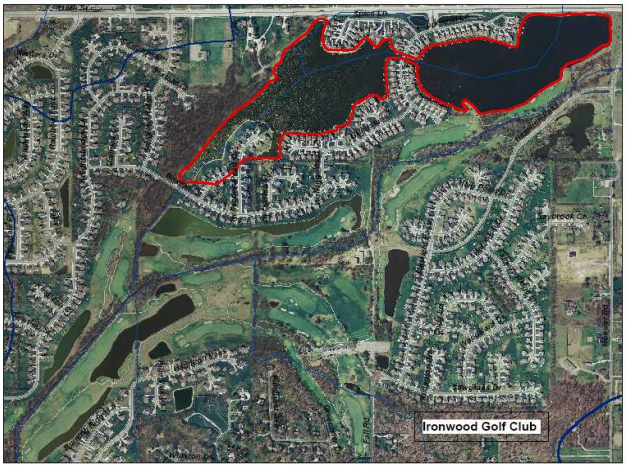

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Figure 4-6: Lake Maxinhall

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More details regarding other sources of nutrient loading to the watershed, non-sewered areas and CSOs, will be included within the pathogens discussion.

Pathogen Critical Areas

Specific Critical Areas or activities for pathogens were identified by the Fall Creek TMDL, Steering Committee, Work Groups, and watershed stakeholders as non-sewered developments, livestock and manure management, and Wellfield Protection Areas. **Exhibit 4-3** shows the overall location of these Critical Areas or activities. Other areas discussed by these groups, but not considered as a Critical Area (or activity) within this WMP, are CSOs, waterfowl, and stormwater runoff.

Non-Sewered Development

Septic systems can be a safe and effective method for treating wastewater if they are sized, sited, and maintained properly. However, as discussed in Section 3.0, failing and inadequately functioning systems are a common source of bacteria and pathogens in waterbodies. The NRCS has rated 92% of the soil in the Lower Fall Creek as moderate or severely limited for septic system use.

An additional concern within non-sewered developments is the potential for septic systems to be tied directly to local drainage tiles, ditches and storm sewer systems. These illicit discharges serve as a direct conduit for bacteria and pathogens (and excess nutrients) to travel to streams within the watershed. As a part of the NPDES Stormwater Phase I and Phase II requirements, communities within the Lower Fall Creek Watershed are required to screen outfalls during periods of dry weather to identify these illicit discharges. For many of the Lower Fall Creek Watershed Communities, this process has not yet began as regulatory schedules have not required this action.

Development in the Madison County portion of the Lower Fall Creek Watershed is scattered, very low in density, and on septic. If growth and development follows the guidance of the Comprehensive Plan, this area is expected to remain this way. Further downstream, the Hamilton Southeastern Sewer District provides sewer service to the portions of Hamilton County, City of Noblesville, and Town of Fishers in the Lower Fall Creek Watershed. Similar to Madison County, the development in this portion of Hamilton County is scattered, very low density, and on septic. However, as the City of Noblesville grows into this area, sewer lines will be extended and new (and existing) development will be connected to a wastewater treatment facility. The Town of Fishers has recently implemented a program to assist homeowners in their jurisdiction to connect to sanitary sewer. All new development is required to be sewered.

In 2005, the City of Indianapolis DPW Clean Stream Team initiated a Septic Tank Elimination Program (STEP) to convert entire neighborhoods on septic to sewer by 2025. This program replaces the Barrett Law conversion program and is estimated to save homeowners 50% of the cost to connect to sanitary sewer. In the Lower Fall Creek Watershed, there are 12 neighborhoods that have been identified and prioritized in STEP.

The STEP areas include:

- High Priority Neighborhoods – 82nd and Redbud, 46th and Millersville, 46th and Emerson, 42nd and Sherman, 42nd and Millersville
- Medium Priority Neighborhoods – 62st and Allisonville, 46th and Allisonville

- Low Priority Neighborhoods – 57th and Kessler, 55th and Allisonville, Fall Creek and Johnson, 46th and Ritter

In Hancock County, with the exception of some isolated septic systems, the developed areas are serviced by the Town of McCordsville Sewer District.

Livestock and Manure Management

Manure, whether being stored, applied for crop nutrition, or simply the by-product of grazing is a water quality concern within Lower Fall Creek Watershed. The Fall Creek TMDL did not discuss agricultural sources of bacteria or pathogens due to the limited amount of agricultural land use within Marion County. However, elsewhere in the watershed, livestock and manure are more of a contributing factor.

- Confined Feeding Operations

A Confined Feeding Operation (CFO) is a livestock operation that has in excess of 600 hogs, 300 cattle, or 600 sheep. These facilities are required, by IAC 16-2-5, to obtain a permit from IDEM's Office of Land Quality. According to IDEM's records, there is only 1 active CFO located in the Lower Fall Creek Watershed. In addition to this CFO within the watershed, there are Animal Feeding Operations (AFOs) in the upper reaches of the Lower Fall Creek Watershed in Hamilton, Hancock, and Madison Counties. These operations continue to decline in number and in number of cattle, pigs, and sheep at each operation. Further, Hamilton County ranks among the top 10 counties in Indiana in regard to the number of horses.

As discussed earlier within previous sections, the Steering Committee and Working Groups have agreed that agricultural related management efforts are best led by the individual county SWCDs. Local SWCD and NRCS staff have long-established relationships with agricultural landowners as well as an extensive knowledge of USDA programs designed to mitigate livestock and manure impacts as well as those designed to protect water quality in a livestock production area.

- Indiana State Fair Grounds

In urban areas, runoff from impervious surfaces, such as parking lots and roads are major contributors to stream pollution. The Indiana State Fair Grounds was identified as a Critical Area because it comprised of more than 250 acres (approximately 70 acres of imperviousness) in the Lower Fall Creek Watershed. The State Fair is home to more than 300 events each year, including the annual Indiana State Fair. During the State Fair, the fairgrounds are populated with thousands of livestock, including horses, cattle, hogs, sheep, poultry and numerous others (**Figure 4-7**). The livestock are usually available for display in one of the fairgrounds 7 livestock barns.

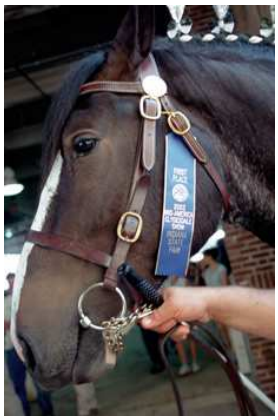

Figure 4-7: Horse event at State Fair

Water quality data collected to date indicates that the State Fair grounds are contributing *E. coli* loadings to Fall Creek. Since 1993, the Health Department has collected grab samples on Fall Creek during the State Fair. This sampling program has included the collection of *E. coli* samples at 39th Street, which is located upstream of the fairgrounds, at the fairgrounds stormwater outfall, and downstream of the fairgrounds at 30th Street. A similar sampling program conducted since 1994 has demonstrated parallel results.

There has long been recognition that animal waste from the fairgrounds contributes to pollution to Fall Creek. In 1999, the City of Indianapolis DPW completed a 104(b)(3) water quality cooperative grant to design a wetland-type wastewater treatment system for runoff leaving the fairground site. However, this project was never constructed.

Wellfield Protection Areas

There are 5 Wellfield Protection Areas (WFPA) in the Lower Fall Creek Watershed. These include the Riverside, Fall Creek, Lawrence, Geist, and Southern Madison County Utilities wellfields.

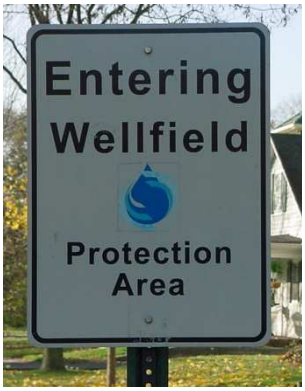

Figure 4-8: Wellfield Protection Area

WFPAs were identified as a Critical Area because of the potential contamination to groundwater and drinking water supply to approximately 20% of central Indiana population. Pollutants of particular concern in these areas are nutrients and pathogens. Land use and land use practices in the 4 WFPAs in Marion County that may impact groundwater are regulated through a Wellfield Protection Ordinance (City County General Ordinance # 91, 2003). As part of this Ordinance, new development and redevelopment plans are reviewed by a Technically Qualified Person (TQP).

The Ordinance also established a Marion County Wellfield Education Corporation (MCWEC) whose mission is to prevent contamination of groundwater through public awareness and education – like the "Entering Wellfield Protection Area" roadside sign illustrated in **Figure 4-8**. MCWEC targets it education and outreach efforts toward the businesses in the WFPAs that were grandfathered under the Ordinance. Although a Source Water Protection Plan has been prepared for the WFPA in Madison County, an Ordinance regulating land use has not been adopted.

Other

As mentioned, the Fall Creek TMDL, as well as the Steering Committee, Work Groups, and stakeholders also mentioned concerns over the pathogen loadings attributed to CSOs, waterfowl (and other wildlife), and stormwater runoff within the Lower Fall Creek Watershed. While these are important considerations throughout the watershed, and throughout Indiana, this WMP will not highlight specific areas as Critical Areas.

Regarding CSOs within the watershed, the City of Indianapolis has developed their LTCP which will ultimately capture 95-97% of sewage entering streams during wet weather and it is estimated that the implementation of this plan will cost more than $1.73B. The LTCP has detailed actions that will be taken to reduce water quality problems associated with CSOs, and should be referenced for all CSO related water quality improvements.

It is anticipated that actions taken to reduce pollutant loadings within the Critical Areas previously discussed will also reduce pollutant loadings associated with waterfowl (and wildlife) and pollutant laden stormwater runoff. For example, stabilization of streambanks will help reduce sediment loadings, but will also help to reduce pollutant loadings from waterfowl as bank and overhanging vegetation along streambanks and shorelines prohibit Canada Geese from staying in areas for prolonged periods of time. Further reducing applications of nutrients, implementing erosion control practices, and conversion from conventional to conservational tillage practices will also decrease the amount of pollutants within stormwater runoff.

Table 4-1: Identifying Critical Areas Work Group Exercise

DOCUMENTED WATER QUALITY POLLUTANT IN LOWER FALL CREEK	TYPICAL LAND USE/LAND USE PRACTICE ASSOCIATED WITH POLLUTANT		CRITICAL AREAS IN LOWER FALL CREEK WATERSHED
SEDIMENT impacts: Aquatic Life – *reduces plant growth, smothers and covers spawning grounds and benthic habitats* Recreational Impact – *reduces water clarity, reduces aesthetic appeal, stresses sport fishing populations* Drinking Water – *increases drinking water treatment costs, damages pumps and infrastructure*	**BENEFIT** water quality: • Riparian Buffers • Filter Strips • Conservation Areas • Post-Construction Practices	**DEGRADE** water quality: • Tillage Practices • Construction Practices • Streambank Erosion • Stormwater Runoff	• *Erosion and sediment control enforcement* • *HEL & PHEL Classified Soils* • *Indian Lake Watershed* • *Eroded Streambanks*
NUTRIENT (Phosphorus & Nitrogen) impacts: Aquatic Life – *promotes algal blooms, reduces dissolved oxygen concentrations* Recreational Impact – *causes algal blooms, reduces aesthetic appeal, and causes unpleasant odors* Drinking Water – *increases drinking water treatment costs (taste and odor), resultant algae can clog water intakes and filters*	**BENEFIT** water quality: • Riparian Buffers • Filter Strips • Post-Construction Practices	**DEGRADE** water quality: • Fertilizer Application • Failing Septic Systems	• *Over application of fertilizers (residential lakes and golf courses)* • *Wellfield Protection Areas*
PATHOGENS (Bacteria & Viruses) *impacts:* Aquatic Life – *exposes aquatic life to disease causing organisms* Recreational Impact – *exposes recreational users to disease causing organisms* Drinking Water – *increases drinking water treatment costs*	**BENEFIT** water quality: • Sewer Service • Exclusionary Fencing	**DEGRADE** water quality: • Failing Septic Systems • Combined Sewer Overflows (CSO) • Illicit Connections to Storm Sewer • Wildlife • Stormwater Runoff • Livestock & Manure Management	• *Indiana State Fair Grounds* • *Wellfield Protection Areas* • *Non-sewered development* • *Wellfield Protection Areas* • *Livestock and Manure Management Areas*

4.0 CRITICAL AREAS

Critical Areas are specific areas or activities in the watershed that are suspected of degrading water quality. Focusing on a few specific areas or activities should be more effective at improving water quality than a generalized watershed-based program. Implementation of management measures (programs, policies, or projects) for these specific areas or activities in the watershed should have the greatest impact on water quality. However, not all areas and activities identified as Critical Areas may be at a stage where management measures can be implemented. In this case, these are still valid Critical Areas because they provide an example of what is happening in the Lower Fall Creek Watershed and an opportunity to learn what, if anything could be done differently to improve water quality.

4.1 IDENTIFICATION OF CRITICAL AREAS

To identify Critical Areas in the Lower Fall Creek Watershed, each of the 3 work groups (Education & Outreach, Land Use & Economic Development, and Water Quality) met and reviewed the list of Stakeholder concerns from Table 3-1 and composite GIS maps showing wellfield protection areas, erodible lands, floodplains, sewer service areas, impaired streams, and land use.

Each work group discussed the impact of sediment, nutrients, and pathogens on aquatic life, recreation, and drinking water; the land use or land use practice associated with each pollutant; and then identified specific areas or activities in the Lower Fall Creek Watershed suspected of degrading water quality. **Table 4-1** is a copy of the exercise used to identify Critical Areas with each work group.

Sediment Critical Areas

As shown on **Exhibit 4-1**, the specific sediment Critical Areas include areas classified as HEL or PHEL, especially those areas lacking sediment and erosion controls and those with conservation tillage; the Indian Lake watershed, and streambanks identified as undergoing severe erosion.

HEL & PHEL Classified Soils

HEL determinations are made by the NRCS, are based on mathematical equations considering rainfall factors, erodibility of the soil type, allowable loss for that soil type, and the length and the slope of the area. Soil map units may be classified as Potentially Highly Erodible (PHEL) based on a varying range of length/slope values. In such instances, the final determination of erodibility must be made through an onsite investigation.

Approximately 20% of the soils within the watershed are classified as HEL or PHEL. Activities exposing HEL or PHEL soil types for periods of time, such as construction or conventional tillage, may exacerbate the erosion and sedimentation impact within the Lower Fall Creek Watershed.

- Lack of Erosion & Sediment Control

According to US EPA, the most environmentally dangerous period of development is the initial construction phase when land is cleared of vegetation and graded to create a proper surface for construction. The removal of natural vegetation and topsoil makes the exposed area particularly susceptible to erosion, causing transformation of existing drainage areas and disturbance of sensitive areas.

Erosion and sediment control is widely accepted as a necessary practice, but there are certain caveats to making it effective. First, communities need to have the staff and resources to adopt and enforce an Erosion & Sediment Control Ordinance. In addition, a Technical Standards or Manual (as part of the Erosion & Sediment Control Ordinance) needs to provide useful guidance on selecting erosion and sediment control measures. Finally, education of contractors, engineers, and designers regarding the importance and effective use of erosion and sediment controls is imperative to implementing effective erosion and sediment control. **Figure 4-1** shows an example of a poorly installed erosion and sediment control system.

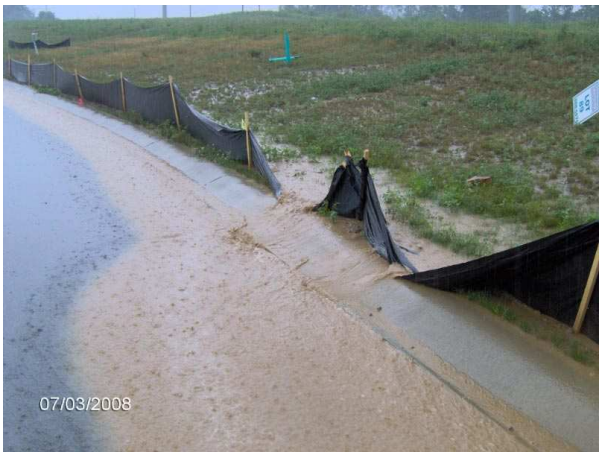

Figure 4-1: Poorly installed silt fencing

Erosion and sediment control has been identified as a Critical Area (or critical activity) because of the current development and potential for development in the Lower Fall Creek Watershed. The City of Lawrence, City of Noblesville, Town of Fishers, Hamilton County, and Madison County are required to have a an Erosion & Sediment Control Ordinance in order to be in compliance with the NPDES Phase II Stormwater Program. The City of Indianapolis has an Erosion & Sediment Control Ordinance as a requirement of the NPDES Phase I Stormwater Program. As construction and development occur within the Lower Fall Creek Watershed, additional precaution should be taken in areas of HEL or PHEL soil classifications.

- Conventional Tillage Practices

Within the Lower Fall Creek Watershed approximately 22,000 acres are in agricultural production; while approximately 13,500 acres are classified as HEL. As identified in Table 3-7, much of those acres in Hamilton, Hancock, and Madison Counties associated with corn production are utilizing conventional tillage (no data is available for Marion County tillage types).

Conventional tillage systems disturb the entire soil surface, resulting in less than 15% residue cover after planting. Conventional tillage practices on HEL or PHEL classified soils allow those erodible soils to be exposed to the weather for periods of time, typically during the spring wet weather prior to planting, or after harvest in the fall, leaving the soil exposed during the spring thaw, or both.

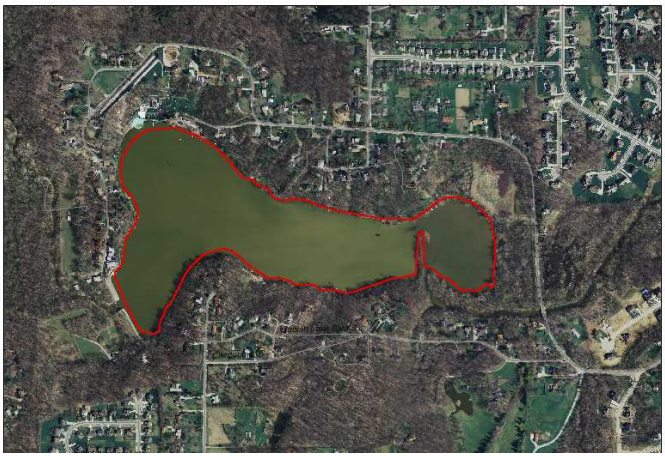

Figure 4-2: Indian Lake

Indian Lake Watershed

Indian Lake is located in the City of Lawrence. Approximately 16,000 acres drain to this 54 acre lake (**Figure 4-2**). This ratio of 300:1 far exceeds the current standard of 100:1. The Hancock County portion of the Indian Lake subwatershed remains primarily undeveloped with the

exception of proposed growth in the Town of McCordsville. The Marion County portion is predominantly residential.

The Indian Lake Homeowners Association has been dredging approximately 3,000-5,000 tons of sediment from the lake on an annual basis. Due to this frequency and volume, the Association has found it to be more cost effective to purchase their own dredging equipment. In 2007, the Indian Lake Homeowners Association reached a settlement agreement with INDOT for damages due to negligence in erosion control during a 2005 Pendleton Pike road project. The settlement funds are to be put toward dredging cost.

Indian Lake was selected by the working groups and the Steering Committee based on the amount of sediment entering the lake necessitating dredging on a routine basis. Water quality, macroinvertebrate, and physical assessments completed within the Indian Lake watershed have attributed impaired waters or degraded habitats to the excessive amount of silt within the streams and tributaries leading to the lake.

Indian Lake can provide a good representation of the issues faced by many of the lakes within the Lower Fall Creek Watershed and is currently managed by an active Homeowners Association willing to put forth effort to protect the quality and aesthetic value of their lake.

Eroded Streambanks

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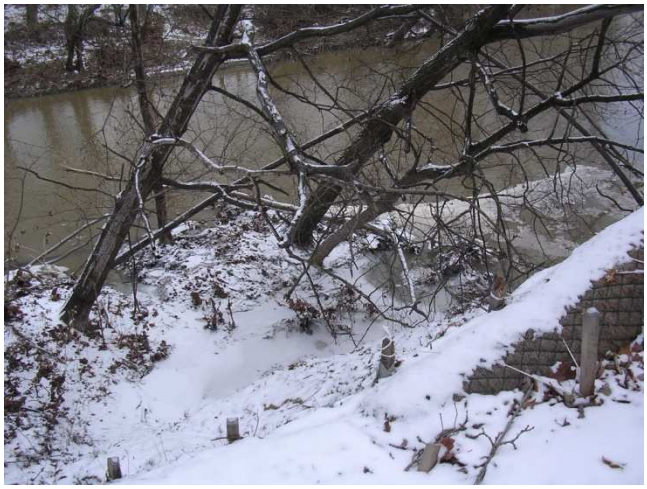

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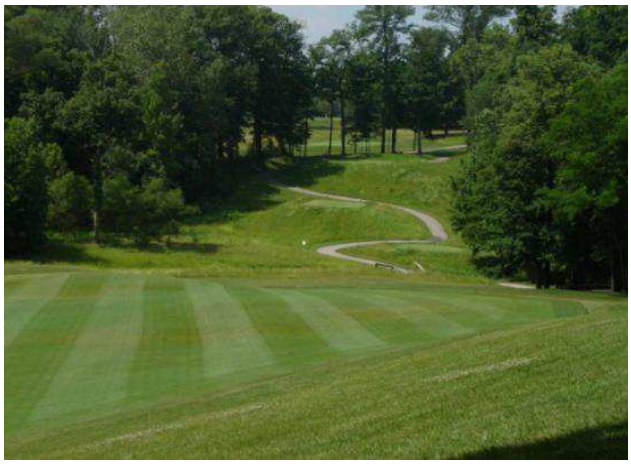

Figure 4-4: Fort Golf Course

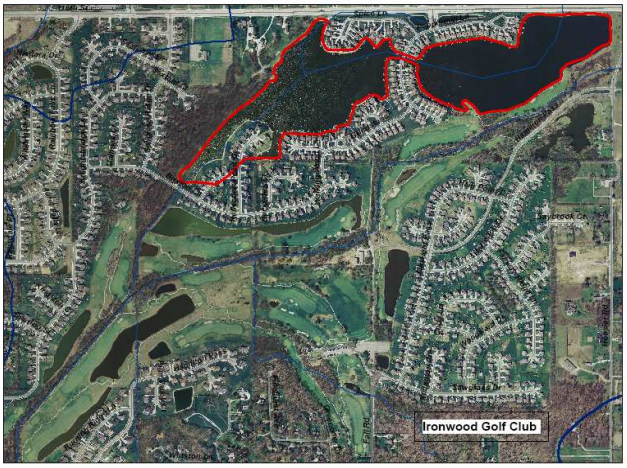

Figure 4-5: Ironwood Golf Club

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Figure 4-6: Lake Maxinhall

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More details regarding other sources of nutrient loading to the watershed, non-sewered areas and CSOs, will be included within the pathogens discussion.

Pathogen Critical Areas

Specific Critical Areas or activities for pathogens were identified by the Fall Creek TMDL, Steering Committee, Work Groups, and watershed stakeholders as non-sewered developments, livestock and manure management, and Wellfield Protection Areas. **Exhibit 4-3** shows the overall location of these Critical Areas or activities. Other areas discussed by these groups, but not considered as a Critical Area (or activity) within this WMP, are CSOs, waterfowl, and stormwater runoff.

Non-Sewered Development

Septic systems can be a safe and effective method for treating wastewater if they are sized, sited, and maintained properly. However, as discussed in Section 3.0, failing and inadequately functioning systems are a common source of bacteria and pathogens in waterbodies. The NRCS has rated 92% of the soil in the Lower Fall Creek as moderate or severely limited for septic system use.

An additional concern within non-sewered developments is the potential for septic systems to be tied directly to local drainage tiles, ditches and storm sewer systems. These illicit discharges serve as a direct conduit for bacteria and pathogens (and excess nutrients) to travel to streams within the watershed. As a part of the NPDES Stormwater Phase I and Phase II requirements, communities within the Lower Fall Creek Watershed are required to screen outfalls during periods of dry weather to identify these illicit discharges. For many of the Lower Fall Creek Watershed Communities, this process has not yet began as regulatory schedules have not required this action.

Development in the Madison County portion of the Lower Fall Creek Watershed is scattered, very low in density, and on septic. If growth and development follows the guidance of the Comprehensive Plan, this area is expected to remain this way. Further downstream, the Hamilton Southeastern Sewer District provides sewer service to the portions of Hamilton County, City of Noblesville, and Town of Fishers in the Lower Fall Creek Watershed. Similar to Madison County, the development in this portion of Hamilton County is scattered, very low density, and on septic. However, as the City of Noblesville grows into this area, sewer lines will be extended and new (and existing) development will be connected to a wastewater treatment facility. The Town of Fishers has recently implemented a program to assist homeowners in their jurisdiction to connect to sanitary sewer. All new development is required to be sewered.

In 2005, the City of Indianapolis DPW Clean Stream Team initiated a Septic Tank Elimination Program (STEP) to convert entire neighborhoods on septic to sewer by 2025. This program replaces the Barrett Law conversion program and is estimated to save homeowners 50% of the cost to connect to sanitary sewer. In the Lower Fall Creek Watershed, there are 12 neighborhoods that have been identified and prioritized in STEP.

The STEP areas include:

- High Priority Neighborhoods – 82nd and Redbud, 46th and Millersville, 46th and Emerson, 42nd and Sherman, 42nd and Millersville
- Medium Priority Neighborhoods – 62st and Allisonville, 46th and Allisonville

- Low Priority Neighborhoods – 57th and Kessler, 55th and Allisonville, Fall Creek and Johnson, 46th and Ritter

In Hancock County, with the exception of some isolated septic systems, the developed areas are serviced by the Town of McCordsville Sewer District.

Livestock and Manure Management

Manure, whether being stored, applied for crop nutrition, or simply the by-product of grazing is a water quality concern within Lower Fall Creek Watershed. The Fall Creek TMDL did not discuss agricultural sources of bacteria or pathogens due to the limited amount of agricultural land use within Marion County. However, elsewhere in the watershed, livestock and manure are more of a contributing factor.

- Confined Feeding Operations

A Confined Feeding Operation (CFO) is a livestock operation that has in excess of 600 hogs, 300 cattle, or 600 sheep. These facilities are required, by IAC 16-2-5, to obtain a permit from IDEM's Office of Land Quality. According to IDEM's records, there is only 1 active CFO located in the Lower Fall Creek Watershed. In addition to this CFO within the watershed, there are Animal Feeding Operations (AFOs) in the upper reaches of the Lower Fall Creek Watershed in Hamilton, Hancock, and Madison Counties. These operations continue to decline in number and in number of cattle, pigs, and sheep at each operation. Further, Hamilton County ranks among the top 10 counties in Indiana in regard to the number of horses.

As discussed earlier within previous sections, the Steering Committee and Working Groups have agreed that agricultural related management efforts are best led by the individual county SWCDs. Local SWCD and NRCS staff have long-established relationships with agricultural landowners as well as an extensive knowledge of USDA programs designed to mitigate livestock and manure impacts as well as those designed to protect water quality in a livestock production area.

- Indiana State Fair Grounds

In urban areas, runoff from impervious surfaces, such as parking lots and roads are major contributors to stream pollution. The Indiana State Fair Grounds was identified as a Critical Area because it comprised of more than 250 acres (approximately 70 acres of imperviousness) in the Lower Fall Creek Watershed. The State Fair is home to more than 300 events each year, including the annual Indiana State Fair. During the State Fair, the fairgrounds are populated with thousands of livestock, including horses, cattle, hogs, sheep, poultry and numerous others (**Figure 4-7**). The livestock are usually available for display in one of the fairgrounds 7 livestock barns.

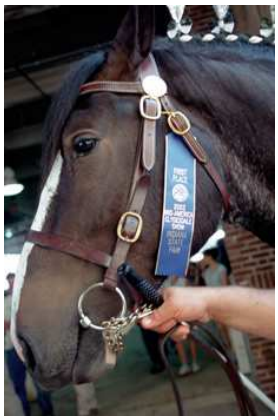

Figure 4-7: Horse event at State Fair

Water quality data collected to date indicates that the State Fair grounds are contributing *E. coli* loadings to Fall Creek. Since 1993, the Health Department has collected grab samples on Fall Creek during the State Fair. This sampling program has included the collection of *E. coli* samples at 39th Street, which is located upstream of the fairgrounds, at the fairgrounds stormwater outfall, and downstream of the fairgrounds at 30th Street. A similar sampling program conducted since 1994 has demonstrated parallel results.

There has long been recognition that animal waste from the fairgrounds contributes to pollution to Fall Creek. In 1999, the City of Indianapolis DPW completed a 104(b)(3) water quality cooperative grant to design a wetland-type wastewater treatment system for runoff leaving the fairground site. However, this project was never constructed.

Wellfield Protection Areas

There are 5 Wellfield Protection Areas (WFPA) in the Lower Fall Creek Watershed. These include the Riverside, Fall Creek, Lawrence, Geist, and Southern Madison County Utilities wellfields.

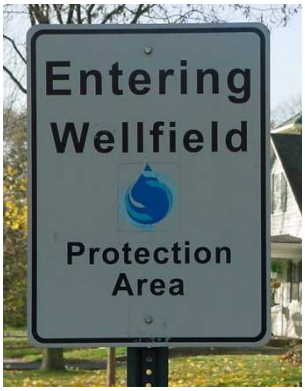

Figure 4-8: Wellfield Protection Area

WFPAs were identified as a Critical Area because of the potential contamination to groundwater and drinking water supply to approximately 20% of central Indiana population. Pollutants of particular concern in these areas are nutrients and pathogens. Land use and land use practices in the 4 WFPAs in Marion County that may impact groundwater are regulated through a Wellfield Protection Ordinance (City County General Ordinance # 91, 2003). As part of this Ordinance, new development and redevelopment plans are reviewed by a Technically Qualified Person (TQP).

The Ordinance also established a Marion County Wellfield Education Corporation (MCWEC) whose mission is to prevent contamination of groundwater through public awareness and education – like the "Entering Wellfield Protection Area" roadside sign illustrated in **Figure 4-8**. MCWEC targets it education and outreach efforts toward the businesses in the WFPAs that were grandfathered under the Ordinance. Although a Source Water Protection Plan has been prepared for the WFPA in Madison County, an Ordinance regulating land use has not been adopted.

Other

As mentioned, the Fall Creek TMDL, as well as the Steering Committee, Work Groups, and stakeholders also mentioned concerns over the pathogen loadings attributed to CSOs, waterfowl (and other wildlife), and stormwater runoff within the Lower Fall Creek Watershed. While these are important considerations throughout the watershed, and throughout Indiana, this WMP will not highlight specific areas as Critical Areas.

Regarding CSOs within the watershed, the City of Indianapolis has developed their LTCP which will ultimately capture 95-97% of sewage entering streams during wet weather and it is estimated that the implementation of this plan will cost more than $1.73B. The LTCP has detailed actions that will be taken to reduce water quality problems associated with CSOs, and should be referenced for all CSO related water quality improvements.

It is anticipated that actions taken to reduce pollutant loadings within the Critical Areas previously discussed will also reduce pollutant loadings associated with waterfowl (and wildlife) and pollutant laden stormwater runoff. For example, stabilization of streambanks will help reduce sediment loadings, but will also help to reduce pollutant loadings from waterfowl as bank and overhanging vegetation along streambanks and shorelines prohibit Canada Geese from staying in areas for prolonged periods of time. Further reducing applications of nutrients, implementing erosion control practices, and conversion from conventional to conservational tillage practices will also decrease the amount of pollutants within stormwater runoff.

Table 4-1: Identifying Critical Areas Work Group Exercise

DOCUMENTED WATER QUALITY POLLUTANT IN LOWER FALL CREEK	TYPICAL LAND USE/LAND USE PRACTICE ASSOCIATED WITH POLLUTANT		CRITICAL AREAS IN LOWER FALL CREEK WATERSHED
SEDIMENT impacts: Aquatic Life – *reduces plant growth, smothers and covers spawning grounds and benthic habitats* Recreational Impact – *reduces water clarity, reduces aesthetic appeal, stresses sport fishing populations* Drinking Water – *increases drinking water treatment costs, damages pumps and infrastructure*	**BENEFIT** water quality: • Riparian Buffers • Filter Strips • Conservation Areas • Post-Construction Practices	**DEGRADE** water quality: • Tillage Practices • Construction Practices • Streambank Erosion • Stormwater Runoff	• *Erosion and sediment control enforcement* • *HEL & PHEL Classified Soils* • *Indian Lake Watershed* • *Eroded Streambanks*
NUTRIENT (Phosphorus & Nitrogen) impacts: Aquatic Life – *promotes algal blooms, reduces dissolved oxygen concentrations* Recreational Impact – *causes algal blooms, reduces aesthetic appeal, and causes unpleasant odors* Drinking Water – *increases drinking water treatment costs (taste and odor), resultant algae can clog water intakes and filters*	**BENEFIT** water quality: • Riparian Buffers • Filter Strips • Post-Construction Practices	**DEGRADE** water quality: • Fertilizer Application • Failing Septic Systems	• *Over application of fertilizers (residential lakes and golf courses)* • *Wellfield Protection Areas*
PATHOGENS (Bacteria & Viruses) *impacts:* Aquatic Life – *exposes aquatic life to disease causing organisms* Recreational Impact – *exposes recreational users to disease causing organisms* Drinking Water – *increases drinking water treatment costs*	**BENEFIT** water quality: • Sewer Service • Exclusionary Fencing	**DEGRADE** water quality: • Failing Septic Systems • Combined Sewer Overflows (CSO) • Illicit Connections to Storm Sewer • Wildlife • Stormwater Runoff • Livestock & Manure Management	• *Indiana State Fair Grounds* • *Wellfield Protection Areas* • *Non-sewered development* • *Wellfield Protection Areas* • *Livestock and Manure Management Areas*