



Stantec

Indian Creek Watershed Plan

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3.0 Goals, Decisions and Progress Measures

Setting realistic and measurable goals will contribute to the successful implementation of this Plan. A goal is the desired change or outcome as a result of the watershed planning effort. Depending on the magnitude of the problem, goals may be general, specific, long-term, or short-term. The IDEM suggests watershed groups focus on developing goals, management measures, action plans, resources, and legal matters as part of the watershed planning process.

According to the IDEM, management measures describe what needs to be controlled or changed in order to achieve the goal. The timeline or milestones to accomplish the individual management measure is identified in an action plan. In order to successfully implement the Plan, resources such as people, programs, and money need to be identified. It is important to have the support of individuals identified as resources to successfully execute the goals of the Plan. Successful implementation may require some legal matters such as obtaining permits, purchasing easements or the adoption of an ordinance (IDEM, 2002).

The watershed goals described in this chapter were formulated to directly address the water quality problems and their sources as were determined by the watershed inventory and assessment portion of this Plan which are summarized in Chapters 1 and 2. Information from stakeholders, reports, assessment tools, physical features, as well as in stream physical, chemical, and biological data were used to evaluate the current conditions of the Indian Creek Watershed and establish goals.

The current conditions have indicated three main issues - ***recreational use impairment***, ***aquatic life use impairment***, and ***flooding***. The causes of these problems are attributed to bacteria (E.Coli), low dissolved oxygen (DO), stormwater runoff, and disturbed habitat.

In the sections that follow, Action Plans for septic systems, agricultural areas, urban areas, karst and monitoring are provided. These Action Plans identify key actions needed to address the issues identified in the Indian Creek Watershed. Each action plan includes management measures, action plan strategies, resources and costs, legal matters and progress indicators. It is important to note that because strategies that reduce bacteria also provide nutrient reduction benefits, these goals and strategies were combined.

Local resources are intended to provide a list of local organizations that could potentially provide support, advice or consultation on a particular management measure. These lists are not intended to be comprehensive or to exclude other entities from participating in the development and/or implementation of a management measure. Lead agencies will vary

with program directives, funding and staffing abilities and other organizations are encouraged to participate as available.

Proposed management measures are discussed and prioritized into High, Moderate and Low categories. It is recognized that each strategy is anticipated to provide some benefit. Prioritization considers a balance of anticipated benefits and ease of implementation, rather than a prescribed implementation of strategies in priority order. Adaptive implementation is likely to occur, such that if an opportunity and/or funding to implement a strategy becomes available, efforts on that strategy will be pursued. Estimated costs are shown in **Table 3.1**.

Table 3.1. Strategy Cost Estimates

Category	Estimated Cost
Low	Less than \$10,000
Moderate	\$10,000-\$50,000
High	Greater than \$50,000

Anticipated timeline dates in **Table 3.2** are provided as a reference for estimated start dates for management measure implementation.

Table 3.2. Priority Timeline

Category	Estimated Timeline
High	Within 2 years
Medium	Within 5 years
Low	Within 10 years

As a first step toward implementation, the Harrison County Regional Sewer District intends to identify and evaluate funding sources to support implementation of this watershed plan in 2008. Funding sources will be evaluated in terms of applicability to watershed priority strategies identified in the table below, funding availability and competitiveness, match requirements and other considerations. Based on these findings, one or more sources of funding may be sought to support appropriate aspects of watershed plan implementation. An initial list of potential sources to be evaluated is provided in **Appendix 3.1**. This list is not comprehensive or exclusive, and additional funding research will be conducted.

3.1 INDIAN CREEK WATERSHED PLAN AND PLANNED TMDLS

IDEM anticipates developing TMDLs the Indian Creek Watershed between 2017 and 2023. The NPS load reductions provided in this plan are initial estimates. IDEM is anticipated to conduct additional monitoring of the watershed prior to TMDL development, providing an updated snapshot of water quality conditions. The assessments and modeling conducted in

support of TMDL development are anticipated to provide more refined estimates of point and nonpoint source load reductions needed to achieve water quality standards for bacteria and aquatic life. This watershed plan will be amended as needed to ensure that the strategies identified herein achieve the goals of the TMDL. Other updates to the plan will be completed on a 5 year cycle to incorporate changes in water quality, strategies and regulatory considerations.

3.2 CRITICAL AREAS

Critical areas for water quality improvement and protection were grouped and shown below by subwatershed, using monitoring data, WWTP compliance data and Bacterial Indicator Tool results. By evaluating these factors on the smaller subwatershed scale, a more detailed understanding of critical areas was gained. In addition, strategies can be focused within subwatersheds to facilitate measurable improvements. Critical areas and strategies to improve and protect water quality in these areas are shown in **Table 3.3** and additional detail is provided in **Appendix 3.2**.

Table 3.3. Critical Areas and Strategies

Site	Critical Area Subwatersheds	Strategies to Achieve Surface Water Quality Standards
Critical Area 1: Little Indian Creek North		
1	Little Indian Creek North	Sample this location during normal flow conditions; both IDEM data and this project collected data during low flow and drought conditions. Use data collected under normal flow conditions to re-assess this stream.
Critical Area 2: Indian Creek in Floyd County and Harrison County above Corydon		
2	Georgetown Creek above Indian Creek	Work with farmer near Site 2 on cattle exclusion/ alternate water supply, elsewhere in this subwatershed, repair/eliminate failing septic systems, stream buffer / streambank stabilization
3	Indian Creek above Georgetown Creek	Investigate, repair or replace improperly functioning septic systems. Work toward compliance at Woods of Lafayette WWTP
4	Crandall Branch above Indian Creek	Perform visual assessment to investigate elevated bacteria. Encourage agricultural BMPs such as cattle exclusion/ alternate water supplies, manure management plans; stream buffers & streambank stabilization.
5	Indian Creek Below Crandall Branch	Improve WWTP Compliance at Lanesville Welcome Center; Encourage agricultural BMPs such as cattle exclusion/ alternative water supplies, manure management plans; stream buffers and streambank stabilization. If septic system failures are reported, investigate with dye and smoke testing and repair or replace as needed
Critical Area 3: Indian Creek Devils Backbone Segment		
7	Indian Creek at Mathis Road bridge	Our data showed DO criteria were met; Encourage IDEM to resample this location and delist as appropriate
8	Indian Creek above Rocky Hollow Road Bridge, IDEM Site OBS100-0001	Our data showed DO criteria were met; Encourage IDEM to resample this location and delist as appropriate
9	Indian Creek above Lickford Road Bridge, IDEM Site OBS100-0006	Our data indicate that this area may be affected by Ohio River backwater and very reduced flows due to karst. If the DO violation is confirmed as being caused by natural conditions, pursue delisting and avoid TMDL development
Critical Area 4: Watershed Protection Areas		
6	Indian Creek above Little Indian Creek at Water Street	Maintain compliance at Corydon WWTP
10 & 11	Little Indian Creek	Maintain compliance at WWTPs (Corydon, Tyson); continue to monitor and assess nutrients below Lanesville.

3.3 WATER QUALITY IMPROVEMENT GOAL AND ACTION PLANS

Water Quality Improvement Goal: Reduce concentrations of bacteria and nutrients in Indian Creek Watershed streams to ensure progress toward meeting water quality standards for recreational and aquatic life designated uses.

Bacteria From Failing Septic Systems

Problem Statement: *The Bacterial Indicator Tool results indicate that there are an estimated 400 failing septic systems in the Indian Creek Watershed, contributing a total estimated load of 2.12 E10 FC/day to streams. While this loading is low relative to agricultural sources, the potential human health risk associated with exposure to sewage is relatively high. The strategies below are designed to reduce the potential human health risk associated with exposure to sewage, to improve quality of life and promote economic development through available sewer capacity.*

Table 3.4. Reduce the number of failing septic systems in Indian Creek Watershed by 10% by 2018

Management Measure	Action Plan	Resources	Schedule / Cost	Legal Matters	Progress Indicators
Sewer commercial area near Berkshire Mobile Home Park	Provide sewage treatment to ~20 commercial entities in 2008 currently served by lagoon treatment	Harrison County Regional Sewer District Board	2008 / High – Harrison Co RSD applied for Community Development Block Grant	NA	Harrison County Regional Sewer District Annual Report describes progress

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Management Measure	Action Plan	Resources	Schedule / Cost	Legal Matters	Progress Indicators
Sewer Paul's Lane Development	Provide sewage treatment to homes in Floyd County currently served by failing septic systems	Floyd County Engineer	2008 / Cost High	NA	Floyd County Engineer
Inspect septic systems in association with real-estate transfer	Continue to inspect septic systems prior to property closings; work with buyers & sellers to repair or replace problem systems	Harrison County Health Department	2008 & ongoing / Cost Low for inspection; Moderate to High for repair/ replacement	NA	Harrison County Health Department reports problem areas to Harrison County Regional Sewer District at monthly meetings; District integrates with sewerage priorities
Septic system tracking database	Continue to track failing systems, repairs & replacements in Health Dept Database	Harrison County Health Department	2008 & ongoing / Cost Low for database; Moderate to High for repair/ replacement	NA	Harrison County Health Department reports problem areas to Harrison County Regional Sewer District at monthly meetings; District integrates with sewerage priorities
Identify & address problem septic systems through Stormwater (MS4) program	Continue to identify and address failing & problem systems through Illicit Discharge Detection & Elimination	Clark County MS4 Coordinator; Floyd County MS4 Coordinator	2008 & ongoing / Cost Low for inspection; Moderate to High for repair/ replacement	NA	Floyd County Annual MS4 Report Clark County Annual MS4 Report
Develop Harrison County Masterplan that identifies priority areas for addressing failing septic systems	Develop Masterplan by 2009	Harrison County Regional Sewer District Board	2009 / High	NA	Harrison County Regional Sewer District Annual Report describes progress

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Management Measure	Action Plan	Resources	Schedule / Cost	Legal Matters	Progress Indicators
Pursue funding to implement Masterplan	Seek Community Development Block Grants, Economic Development Funding, SRF Loans and other funds to implement priority sewerage projects identified in the Masterplan	Harrison County Regional Sewer District Board	2010, after Masterplan adoption; Cost Moderate to pursue funding	NA	Harrison County Regional Sewer District Annual Report describes progress
Septic system education & outreach	Conduct septic system workshop if funding becomes available	Harrison County Health Department	By 2009 if funding becomes available / Cost Low	NA	Post workshop information to Harrison County Septic System website (1)
Sewer homes near Berkshire Mobile Home Park	Provide sewage treatment to ~100 homes currently served by septic systems	Harrison County Regional Sewer District Board	2010 / High	NA	Harrison County Regional Sewer District Annual Report describes progress

Notes

(1) Harrison County Septic System website: http://www.harrisoncountyhealth.com/septic_system_information.htm

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Bacteria from Urban Sources

Problem Statement: *The Bacterial Indicator Tool results indicate that urban areas contribute a relatively small (0.01%) but concentrated loading of bacteria to the watershed. Many of the areas that are urbanizing rely on septic systems, and strategies to reduce bacterial loadings from this source are identified in Table 3.3. The strategies outlined below are designed to reduce bacterial loading from other (non-septic) urban sources.*

Table 3.5. Reduce urban (non-septic) sources of bacteria by 10% by 2018

Management Measure	Action Plan	Resources	Schedule / Cost	Legal Matters	Progress Indicators
Collection system inspection and repair	Initiate inspection & repair as needed on the newly acquired Berkshire WWTP	Harrison County Regional Sewer District contractor	2008 & ongoing / Cost for inspection Low, Cost for repair Moderate to High	NA	Harrison County Regional Sewer District Annual Report describes progress
Improve WWTP Compliance	Continue to monitor, inspect and address issues non-compliant facilities	IDEM	2008 & ongoing / Cost for inspection Low, Cost for compliance Moderate to High	NA	Permit Compliance System database
Continue implementation of stormwater programs (1)	Continue to implement all aspects of Stormwater (MS4) programs in Clark County & Floyd County and renew permits as per IDEM requirements	Clark County MS4 Coordinator; Floyd County MS4 Coordinator	2008 & ongoing / Cost Moderate	NA	Clark County Annual Stormwater Report; Floyd County Annual Stormwater Report
WWTP upgrades and expansions	Continue to upgrade, expand and construct new facilities as per the Masterplan	Harrison County Regional Sewer District	2010 / Cost High	NA	Harrison County Regional Sewer District Annual Report describes progress

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Stormwater outfall and conveyance mapping and illicit discharge screening	Continue to map and screen for illicit discharges 25% per year of MS4 systems in Clark County and Floyd County, with 100% complete by 2009	Clark County MS4 Coordinator; Floyd County MS4 Coordinator	2008 & ongoing / Cost Moderate	NA	Clark County Annual Stormwater Report; Floyd County Annual Stormwater Report
Stormwater management ordinance	Harrison County will draft and propose a basic stormwater ordinance in 2008 and will initiate implementation after adoption	Harrison County Regional Sewer District	2008 & ongoing / Cost Low	See Note 2	Harrison County Regional Sewer District Annual Report describes progress

Notes

(1) Harrison County is not densely populated enough to be required to participate in the Stormwater program.

(2) Since Harrison County is not required to participate in the Stormwater program, this initial ordinance is anticipated to focus on peak flow control and may or may not include water quality measures.

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Protecting Karst Resources

Problem Statement: *Through the Sinkhole Inventory developed through this watershed planning project, approximately 15,000 sinkholes were mapped in the Indian Creek watershed. This highly developed karst system is hydrologically connected to the Blue River Watershed, a National Scenic River. Thus, water entering the karst system in the Indian Creek watershed may travel to the Blue River and impact, positively or negatively, the water quality and resources of the Blue River watershed. In addition, caves and other underground features, including Binkley Cave, Indiana’s longest cave, provide habitat to rare, threatened and endangered species. Another consideration is that water travels easily between surface streams and underground environments in this watershed. The impacts of water resurfacing in Indian Creek streams, in terms of dilution and/or degradation, are not well understood, but could be significant in this highly developed karst watershed. Data were not sufficient to develop a numeric target for protecting and improving karst systems, but the group did agree on the importance of these strategies.*

Table 3.6. Improve protection of karst systems by 2018

Management Measure	Action Plan	Resources	Schedule / Cost	Legal Matters	Progress Indicators
Karst policy development	Develop a karst policy outlining strategies to protect karst features, property adjacent to these features	Harrison County Regional Sewer District	2008 / Cost to develop Moderate; Cost to implement Moderate to High	See Note 1	Harrison County Regional Sewer District Annual Report describes progress
Karst BMP Pilot Project	Seek funding and support to conduct a pilot project to evaluate the draft karst policy, test karst BMPs locally and inform decision-making on whether an ordinance is needed	Harrison County Regional Sewer District If funding becomes available, assistance may be requested from karst experts, The Nature Conservancy, Indiana Karst Conservancy and others	2008 & ongoing/ Cost to seek grant funding is Low; Cost to implement project Moderate	NA	Harrison County Regional Sewer District Annual Report describes progress

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Underground Injection Control (UIC) Program Implementation	Continue to fully implement the UIC Program by submitting inventory forms for UIC Class V wells, including modified sinkholes annually or more often as needed	Harrison County Highway Department	2008 & ongoing / Cost Low	NA	Inventory forms submitted to USEPA Region IV as required
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Notes

(1) Karst policies and ordinances are not required by federal programs so this effort may encounter opposition.

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Bacteria from Agricultural Sources

Problem Statement: *The Bacterial Indicator Tool results show that bacteria from agricultural sources (pasture, cropland with manure application and cattle access to streams) is a significant source of bacteria in Indian Creek Watershed streams. This watershed is largely agricultural, so reducing agricultural sources of bacteria and managing nutrients and sediment before they become problems are important measures of success.*

Our biological and habitat monitoring was affected by the drought of 2007. However, existing data indicate that biological and habitat quality are relatively good in this watershed. Therefore the strategies below are designed to provide dual benefits: reduction of bacteria from agricultural sources and continued protection of aquatic life and habitat resources. In addition, the strategies described in Tables 3.3 to 3.6 above will provide a benefit for aquatic life and habitat by reducing pollutant inputs, protecting water quality and habitats. These strategies are incorporated by reference.

Table 3.7. Reduce bacterial loads from agricultural sources by 10% by 2018 and continue to protect aquatic life and habitat.

Management Measure	Action Plan	Resources	Schedule / Cost	Legal Matters	Progress Indicators
Continue and expand agricultural buffers, with a target of a 10% increase (36 acres) by 2018.	Through annual farm program enrollments, continue to encourage buffers for crop and pasture lands, including identification of funding sources to alter the economic balance in favor of buffers.	Harrison County SWCD; Floyd County SWCD; Clark County SWCD	2008 & ongoing / Cost High	NA	NRCS and SWCD Annual Reports

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Conduct habitat and visual assessments in Crandall Branch, Georgetown Creek and other priority areas (1)	Assess Crandall Branch and Georgetown Creek, and prioritize areas for stream and habitat visual assessments to identify erosion, actual buffer condition and site specific projects	Harrison County SWCD; Floyd County SWCD;	2009, if funding becomes available / Cost Moderate	NA	SWCD Annual Reports
Continue and expand cattle exclusion projects	Through annual farm program enrollments, continue to encourage cattle exclusion fencing and alternate water supplies on pasture lands, including identification of funding sources to alter the economic balance in favor of these projects.	Harrison County SWCD; Floyd County SWCD; Clark County SWCD	2008 & ongoing / Cost High	NA	NRCS and SWCD Annual Reports
Seek funding for stream buffer workshop	Seek grant funding, and if awarded, educate 20 or more landowners on the importance of buffers to water quality, habitat, and flood control.	Harrison County Regional Sewer District	2008 & ongoing/ Cost to seek grant funding is Low; Cost to implement project Moderate	NA	Harrison County Regional Sewer District Annual Report describes progress

Notes

(1) As noted in Table 3.2, Georgetown Creek and Crandall Branch were prioritized based on visual observations of cattle access in Georgetown Creek and elevated bacteria in Crandall Branch, with no obvious sources.

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Reducing Risks of Flooding

Problem Statement: *Flooding is a significant concern in this watershed. The volume and rate of stormwater flows has increased in the steep hill slopes of Floyd County and is affecting narrow valleys in this county as well as downstream Harrison County. Significant concerns related to risks associated with loss of life and property were expressed at each public meeting. New floodplain maps are being prepared by the Indiana Department of Natural Resources. These maps and associated data can be used to better understand and quantify the risks of flooding as well as to identify specific strategies to prevent and mitigate flood damage.*

It is important to highlight that many strategies that provide flood protection benefits also have water quality benefits. Stream buffers are an important example. As flood protection strategies are identified, complimentary water quality benefits will be identified.

Table 3.8. Reduce Risks of Flooding

Management Measure	Action Plan	Resources	Schedule / Cost	Legal Matters	Progress Indicators
Reduce the number of structures affected by flooding	Work with IDNR when updated floodplain maps are released to identify number of structures affected and develop strategy, including possible applications for HMGP and PDM grants	Harrison County Planner	2008 & Ongoing/ Cost to identify affected structures Low to Moderate; Cost to mitigate Moderate to High	NA	Reduced number of repetitive loss structures in FEMA's Community Information System database
USGS Flow Gage	Pursue funding to re-instate USGS flow gage in Indian Creek watershed	USGS - Indiana Water Science Center	2010 / Cost low to identify funding; Moderate annual cost for gage	NA	USGS National Water Information System

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Monitoring and Assessment

Problem Statement: *The availability of reliable, high quality data is essential to monitoring the progress and in-stream benefits of the strategies outlined above. The entities involved in developing this plan do not currently have resources to conduct this monitoring. Therefore, this aspect of watershed plan implementation relies on ongoing data collection efforts by IDEM.*

Table 3.9. Monitoring and Assessment

Management Measure	Action Plan	Resources	Schedule / Cost	Legal Matters	Progress Indicators
Future water quality assessments	IDEM will collect additional water quality, biological and habitat data on a 5 year rotating cycle, returning again in 2012 and at the Indian Creek South of Corydon (OBS100-0004) monthly	IDEM	Ongoing / Cost Low to Moderate	NA	Report results in STORET and Integrated Report
Continue to pursue de-listing of Dissolved Oxygen in Devils Backbone segment	IDEM will collect additional dissolved oxygen data prior to developing the Dissolved Oxygen TMDL (1)	IDEM	Monitoring – Ongoing DO TMDL – 2017 E. Coli TMDL – 2017 to 2023 / Cost Low to Moderate	NA	Report results in STORET and Integrated Report
Collect biological data at normal flows in Indian Creek North	IDEM will collect additional biological and habitat data prior to developing the aquatic life TMDL	IDEM	Monitoring – Ongoing TMDL - 2017 / Cost Low to Moderate	NA	Report results in STORET and Integrated Report

Notes

(1) Data collected for this watershed plan indicate acceptable (above criteria) levels in the upper portion of the 17 mile long Devils Backbone segment (IDEM Segment Number INN04A3_00) with sampling during stressful summer drought conditions. Our data indicated depressed levels near the Ohio River confluence and attributed these levels to natural backwater and diminished flow due to karst geology. A letter requesting de-listing of this waterbody was submitted to IDEM in December 2007.

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