



**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**July 26, 2006 9:30 AM to 11:00 AM**

**Harrison County Annex Building, 124 S Mulberry Street, Corydon**

**MEETING AGENDA**

- 1. Introduction to Watershed Planning**
  
- 2. IDEM's Expectations**
  
- 3. Watershed Plan Approach**
  
- 4. Quality Assurance Project Plan (QAPP)**
  
- 5. Monitoring Site Selection**
  
- 6. Next Steps**

**Handouts**

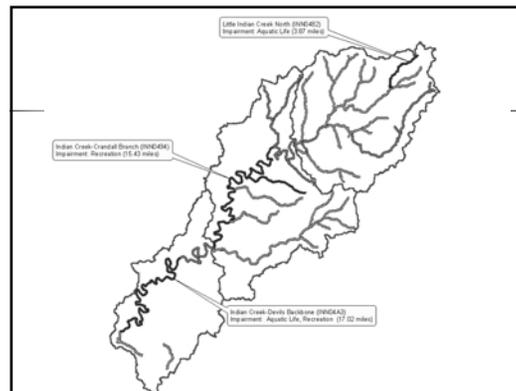
- Watershed Plan Outline**
- Draft Quality Assurance Project Plan**

<h2>Indian Creek Watershed Management Plan</h2>
<p>Indian Creek Watershed Plan Subcommittee July 27, 2006</p>  

<h2>Presentation Overview</h2>
<ul style="list-style-type: none"> <li>• Introduction to Watershed Planning</li> <li>• IDEM's Expectations</li> <li>• Watershed Plan Approach</li> <li>• Quality Assurance Project Plan</li> <li>• Monitoring Site Selection</li> <li>• Next Steps</li> </ul> 

<h2>Introduction to Watershed Planning</h2>
<ul style="list-style-type: none"> <li>• Implement Feasibility Study goals in Indian Creek Watershed             <ul style="list-style-type: none"> <li>➢ Foster economic development</li> <li>➢ Preserve environmental integrity</li> <li>➢ Enhance quality of life</li> </ul> </li> <li>• Approach to address water quality issues prior to IDEM TMDLs</li> </ul>

<h2>Introduction to Watershed Planning</h2>
<h3>Indian Creek Watershed Description</h3> <ul style="list-style-type: none"> <li>➢ Drains 256 square miles</li> <li>➢ Harrison and Floyd Counties</li> <li>➢ 56 miles of impaired streams</li> <li>➢ Prone to flooding</li> <li>➢ Poised for growth</li> <li>➢ Numerous karst features, including Binkley Cave</li> </ul>



<h2>Introduction to Watershed Planning</h2>
<h3>Indian Creek Watershed Plan – Suggested Outline</h3> <ul style="list-style-type: none"> <li>• Executive Summary</li> <li>• Introduction</li> <li>• Water Quality Problems</li> <li>• Goals and Decisions</li> <li>• Measuring Progress</li> <li>• Practical Matters</li> <li>• Appendices – Maps &amp; Supporting Documentation</li> </ul> 

<b>IDEM's Expectations</b>	
<ul style="list-style-type: none"> <li>• \$99,930.00 Grant §205(j)</li> <li>• Major Tasks               <ol style="list-style-type: none"> <li>1. Establish Watershed Plan Committee</li> <li>2. Conduct Quarterly Public Outreach</li> <li>3. Develop Quality Assurance Project Plan</li> <li>4. Conduct Monitoring and Assessment</li> <li>5. Inventory and Map Sinkholes</li> <li>6. Develop Watershed Management Plan</li> </ol> </li> </ul>	

<b>IDEM's Expectations</b>	
<b>TIMELINE</b>	
IDEM Awards Grant to Harrison County	3/2006
RFP to Hire Watershed Coordinator	3/2006
Establish Indian Creek Watershed Subcommittee	7/2006
Conduct Quarterly Public Outreach	8/2006 to 3/2008
Develop Quality Assurance Project Plan	8/2006
Conduct Monitoring & Assessment	9/2006 to 10/2007
Inventory & Map Sinkholes	10/2006 to 10/2007
Develop Watershed Management Plan	final by 3/1/2008

<b>Watershed Plan Approach</b>	
<b>Task 1. Establish Indian Creek Watershed Subcommittee</b>	
<ul style="list-style-type: none"> <li>• <b>Roles</b> <ul style="list-style-type: none"> <li>• Develop goals</li> <li>• Provide policy direction</li> <li>• Develop watershed strategies</li> </ul> </li> <li>• Eight quarterly meetings</li> </ul>	

<b>Watershed Plan Approach</b>	
<b>Task 2. Conduct Quarterly Public Outreach</b>	
<ul style="list-style-type: none"> <li>• Engage watershed stakeholders &amp; citizens</li> <li>• <b>Roles</b> <ul style="list-style-type: none"> <li>➢ Recommend watershed strategies</li> <li>➢ Implement Watershed Plan</li> <li>➢ Enhanced citizen involvement</li> </ul> </li> <li>• <a href="http://www.indiancreekwatershed.com">www.indiancreekwatershed.com</a></li> </ul>	

<b>Watershed Plan Approach</b>	
<b>Task 3. Develop Quality Assurance Project Plan</b>	
<ul style="list-style-type: none"> <li>• IDEM approval required</li> <li>• Establishes monitoring goals</li> <li>• Monitoring plan</li> <li>• Data analysis</li> </ul>	

<b>Watershed Plan Approach</b>	
<b>Task 4. Conduct Monitoring and Assessment</b>	
<ul style="list-style-type: none"> <li>• Evaluate current conditions</li> <li>• Identify pollution sources</li> <li>• Address Data Gaps</li> <li>• Support Watershed Plan Development</li> </ul>	
<b>Tools:</b> GIS, statistical analysis, IDEM Pollutant Load Reduction Workbook	

## Watershed Plan Approach

### Task 5. Inventory and Map Sinkholes

- Compile existing sinkhole data
- Field verify
- Support karst policy implementation
- BMP demonstration projects



## Watershed Plan Approach Task 6. Develop Watershed Plan

### Suggested Outline & Schedule

Watershed Plan Chapter	3/06	6/06	9/06	12/06	3/07	6/07	9/27	12/07	3/08
•Executive Summary									
•Introduction									
•Water Quality Problems									
•Goals and Decisions									
•Measuring Progress									
•Practical Matters									
•Appendices									

## Quality Assurance Project Plan

### Proposed Monitoring Goals

- **Evaluate current conditions**
  - 56 miles of impaired streams - Recreation, Aquatic Life
- **Identify pollution sources**
  - Bacteria, low dissolved oxygen, poor quality habitat
- **Address Data Gaps**
  - New monitoring locations, range of hydrologic conditions
- **Support Watershed Plan Development**
  - Identify watershed implementation strategies



## Monitoring Site Selection

Site #	IDEM Site #	Location	WO	AQL	Rationale
1	08S080-0001	Indian Creek North between Banet Rd & Bethel Road	X	X	303(d) Segment - Aquatic Life
2	08S090-0002	Indian Creek above Crandall Branch near Motts Rd & Adgorn Rd	X		303(d) Segment - Recreation
3	08S090-0004	Indian Creek above SR355 Bridge	X		303(d) Segment - Recreation
4	08S090-0005	Indian Creek at Big Indian Road & Brigette Road	X	X	303(d) Segment - Recreation
5	08S100-0001	Indian Creek above Rocky Hollow Road Bridge	X	X	303(d) Segment - Recreation, Aquatic Life
6	08S100-0006	Indian Creek above Lickford Road Bridge	X	X	303(d) Segment - Recreation, Aquatic Life
7		Little Indian Creek above Water Street Bridge	X	X	Major tributary
8	08S080-0005	Indian Creek above Georgetown Creek	X		Floyd County drainage, near County boundary, downstream
9		Indian Creek near Hostel Road	X	X	Upstream end of 303(d) Segment - Recreation, Aquatic Life
10		Crandall Branch above SR355 Bridge	X		303(d) Segment - Recreation (may be an artifact of mapping?)
11		Indian Creek above Little Indian Creek at Water Street	X		Downstream end of HUC, 303(d) Segment - Recreation, above WWTP, receives Corydon runoff
12		Little Indian Creek above Turkey Rd Bridge	X		Mid-point of major tributary, downstream of CAFO, classified as "impaired" by IDEM
13		Little Indian Creek below Georgetown Creek near Utz Road	X	X	Possible reference reach, downstream of impaired segments, upstream end of 303(d) Segment - Recreation

## Next Steps

- Finalize QAPP & Submit to IDEM for approval
- Initiate Monitoring
- Hold Public Outreach Event
- Populate website
- Next Subcommittee Meeting

## Conclusion

- Importance
  - Water Quality Issues
  - Flooding
- Implement Feasibility Study goals in Indian Creek



## Questions





**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**July 26 2006 9:30 AM to 11:00 AM**

**Harrison County Annex Building, 124 S Mulberry Street, Corydon**

**MEETING SUMMARY**

**1. Introduction to Watershed Planning**

Steve Hall and Karen Schaffer provided an overview of watershed planning. Key considerations include implementing the Regional Sewer District Feasibility Study Goals of fostering economic development, preserving environmental integrity and enhancing quality of life.

There are several waterbodies that the Indiana Department of Environmental Management (IDEM) has identified as impaired. They will be developing Total Maximum Daily Loads (TMDLs) for these waterbodies. The TMDLs have an impact on the ability to obtain wasteload allocations for new or expanded wastewater discharges.

Proactively planning for the numerous wastewater decisions to be made, and addressing impairments before IDEM develops the TMDLs are important advantages of the Watershed Plan.

**2. IDEM's Expectations**

IDEM's expectations for the 2-year grant include establishing a Watershed Plan Committee (accomplished through the RSD Indian Creek Subcommittee), conducting quarterly public outreach, developing a Quality Assurance Project Plan, conducting monitoring and assessment, inventory and map sinkholes, develop watershed management plan.

**3. Watershed Plan Approach**

FMSM was hired as the Watershed Coordinator and will be assisting the Subcommittee with implementing the project, including drafting the watershed management plan. The Indian Creek Watershed Management Plan will address the Feasibility Study goals, integrate the karst policy and identify opportunities for BMP demonstration projects. By developing the Watershed Plan, the RSD will become eligible to apply for additional grant funds to support implementation projects that are identified in the watershed plan.

FMSM has developed a website to facilitate public outreach. A password protected link will be added to the Subcommittee page. Draft documents will be available to the Subcommittee on this page. Final documents or documents available for public comment will be moved to the public page.

#### **4. Quality Assurance Project Plan (QAPP)**

The QAPP is required for all water quality (WQ) monitoring conducted through this project and must be approved by IDEM. It describes monitoring design, field data collection, laboratory analysis, quality assurance review and data analysis.

The draft QAPP was handed out and discussed. The Subcommittee was encouraged to review and provide input on the QAPP.

Review of IDEM data revealed that they have sampled few times and typically under summer low flow conditions. FMSM recommended a monitoring design that includes sampling multiple times over a range of hydrologic conditions to better understand the range of water quality. Biological (benthic invertebrates), habitat, water chemistry, bacteria and flow are recommended parameters.

FMSM will collect grab samples and measure flow using a wading rod. Through the Harrison County Health Department's participation in the project, water chemistry samples will be analyzed for free by the State Health Department laboratory in Indianapolis. A local lab will be found to analyze bacteria samples because these must be analyzed within 6 hours. Thus shipping to Indianapolis is not feasible for bacteria.

#### **5. Monitoring Site Selection**

FMSM proposed 13 monitoring locations. Site selection considerations included locations that IDEM had monitored previously, sites that are located in reaches that IDEM characterized as impaired, near county boundaries, near reaches that IDEM characterized as "unassessed" and a possible reference reach.

FMSM will incorporate the new monitoring location, recommended on the Little Indian Creek downstream of Lanesville.

#### **6. Next Steps**

- Floyd County should have an active role on the Subcommittee. In addition to Don Lopp (Planning), FMSM will work with Floyd County to engage a wastewater/ engineering representative.
  
- Subcommittee will provide comments on the draft QAPP

- FMSM will finalize QAPP based on input from the Subcommittee, including the recommended monitoring location on the Little Indian Creek downstream of Lanesville, and submit to IDEM for approval
- FMSM will develop a press release and schedule a public event showcasing biological monitoring

### **Handouts**

- Presentation Slides: Indian Creek Watershed Management Plan
- Watershed Plan Outline
- Draft Quality Assurance Project Plan



**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK WATERSHED PLAN SUBCOMMITTEE**

**JULY 26, 2006 9:30 AM to 11:00 AM**



<b>Name</b>	<b>Organization</b>	<b>Telephone</b>	<b>Email</b>
Anthony Combs	Harrison County Regional Sewer District & Harrison County Health Dept.	812 738 3237	anthonycombs@hotmail.com
Chris Cunningham	Harrison County Health Dept.	812 738 3237	ccunningham20@hotmail.com
Gary Davis	Harrison County Council President	812 366 3354	gldavis@epowerc.net
Steve Hall	FMSM Engineers, Inc.	812 206 0060	shall@fmsm.com
Daniel Lee	Harrison County Regional Sewer District, & Tyson Foods	812 738 5853	daniel.lee@tyson.com
Bill Sanders	Heritage Engineering	812 280 8201	bsanders@heritageeng.com
Karen Schaffer	FMSM Engineers, Inc.	812 206 0060	kschaffer@fmsm.com
Dan Schroeder	Harrison County Health Dept.	812 738 3237	ninthschroeder@hotmail.com
Ralph Schoen	Harrison County GIS	812 738 8241	rschoen@harrisoncounty.in.gov
Tom Tucker	Harrison County Regional Sewer District	812 738 4087	tomtucker@insightbb.com
Eric Wise	Harrison County Planning Commission	812 738 8927	ewise@netpointe.com



**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**August 9, 2006 9:30 AM to 11:00 AM**

**Harrison County Annex Building, 124 S Mulberry Street, Corydon**

**MEETING AGENDA**

- 1. Introductions**
  
- 2. Review and Approval of Meeting Summary**
  
- 3. Quality Assurance Project Plan (QAPP)**
  
- 4. Mission Statement**
  
- 5. Brochure/Press Release**
  
- 6. Next Meeting**

**Handouts**

- Meeting Summary**
- Draft Quality Assurance Project Plan**
- Brochure**
- Press Release**
- Mission Statement**



**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK WATERSHED PLAN SUBCOMMITTEE**



**Mission Statement**

**DRAFT August 8, 2006**

**Option 1**

The Indian Creek Watershed Plan Subcommittee is a partnership of concerned citizens dedicated to fostering economic development, preserving environmental integrity and enhancing the quality of life for all who live and work here.

**Option 2**

The Indian Creek Watershed Plan Subcommittee is a partnership of concerned citizens dedicated to wise and sustainable use of our water resources.

**Option 3**

The Indian Creek Watershed Plan Subcommittee is comprised of watershed stakeholders dedicated to the preservation, protection, and improvement of the Indian Creek watershed. Our mission is to realize a long-term vision for a healthy watershed and an educated citizenry. Our goal is to educate while building partnerships to improve water quality, reduce flooding, and preserve and restore wetlands, woodlands, and other natural resources for future generations.



**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**September 5, 2006 1:00 PM to 2:30 PM**

**Harrison County Annex Building, 124 S Mulberry Street, Corydon**

**MEETING AGENDA**

- 1. Site Reconnaissance Results**
  
- 2. Draft Chapter 1 of Watershed Plan**
  
- 3. Draft Data Summaries of IDEM Data**
  
- 4. Next Meeting**

**Handouts**

- Site Reconnaissance Report**
- Draft Chapter 1 of Watershed Plan**
- IDEM Assessment Maps and Tables**



**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**September 5, 2006 1:00 PM to 2:30 PM**

**Harrison County Annex Building, 124 S Mulberry Street, Corydon**

**MEETING SUMMARY**

**1. Site Reconnaissance Results**

Several members of the subcommittee expressed an interest in visiting monitoring sites. A date will be scheduled.

Dan Lee talked to Keith regarding e. coli analysis. Information regarding frequency and numbers of samples is needed.

**2. Draft Chapter 1 of Watershed Plan**

This chapter provides an introduction to the region and watershed. The Subcommittee was asked to provide comments by Sept 15, 2006.

**3. Draft Data Summaries of IDEM Data**

Draft water quality data summaries were presented. These form the basis for Watershed Plan Chapter 2. Identifying Water Quality Issues. IDEM was making impairment decisions based on very limited data in many cases. The monitoring associated with this project will greatly expand the available dataset.

Other findings include:

- e. coli levels were above criteria at all assessed stations
- Low dissolved oxygen was an issue during the summer of 2000 near the confluence with the Ohio River, where karst and low flow could influence results.
- Although not on the 303d List, elevated pH was found in the Little Indian Creek near Galena
- Un-ionized ammonia levels were well below criteria
- Comparison values were used to evaluate total phosphorus, turbidity and total Kjeldahl nitrogen.

Pollution sources will be discussed in Chapter 2 using summary statistics. The goal is to identify sources in sufficient detail to support positive action. Septic systems, agriculture and abandoned landfills will be evaluated as sources.

Wetlands and floodplains can have important roles in watershed planning. Strategies that protect water quality can provide floodplain and wetlands benefits, and vice versa. Official floodplain maps are available in paper, and unofficial digital maps are available. Because of significant karst, wetlands may not be extensive in this watershed.

Flow was also discussed as an issue. New Jersey was developing an approach to estimate flows required to support aquatic life. Indiana recognized flow as an issue in the 2004 triennial review for Surface Water Quality Standards and this topic is expected to be revisited again in the 2007 review.

There are numerous low head dams in many Indiana watersheds, including Indian Creek that influence flow. EPA has funding available to remove these dams.

#### **4. Next Meeting**

A stakeholder meeting will be scheduled. We will provide a presentation, maps on boards, brochure and live GIS. The stakeholder list will be forwarded to the Subcommittee for comment.

#### **Handouts**

- Site Reconnaissance Report**
- Draft Chapter 1 of Watershed Plan**
- IDEM Assessment Maps and Tables**



**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**June 21, 2007 - 2:00 PM to 3:30 PM**

**Harrison County Annex Building, 124 S Mulberry Street, Corydon, Indiana**

**MEETING AGENDA**

- 1. Watershed Plan Chapter 2 – Water Quality Problems**
  
- 2. Sinkhole Inventory**
  
- 3. Public Meeting**
  
- 4. Next Meeting**

**Handouts**

- Chapter 2 Water Quality Issues – 80% Draft**

## Indian Creek Watershed Management Plan

Indian Creek Watershed Plan Subcommittee  
June 21, 2007




## Presentation Overview

- Introduction
- Watershed Plan Chapter 2 – Water Quality Problems
- Sinkhole Inventory
- Public Meeting
- Next Steps & Closing



## Introduction

- Implement Goal of Indian Creek Watershed:

*Foster economic development, preserve environmental quality and enhance the quality of life for all who live and work in the Indian Creek Watershed.*

- Approach to address water quality issues prior to IDEM TMDLs

## Introduction

**Indian Creek Watershed Description**

- Drains 256 square miles
- Harrison, Floyd Clark Counties
- 56 miles of impaired streams
- Prone to flooding
- Poised for growth
- Numerous karst features, including Binkley Cave



## Introduction

- **Indian Creek Watershed Plan**

Executive Summary

1. Introduction
2. Water Quality Problems
3. Goals and Decisions
4. Measuring Progress
5. Practical Matters

Appendices – Maps & Supporting Documentation



## Introduction Progress to Date

- Website (298 hits)
- Public Meeting #1
- Newsletter Articles, Brochure
- Chapter 1 – Watershed Description - Final
- Chapter 2 – Water Quality Issues - 80% draft
- Sinkhole Inventory Data Compiled
- Monitoring Plan & QAPP

## Watershed Management Plan Chapter 2 Outline



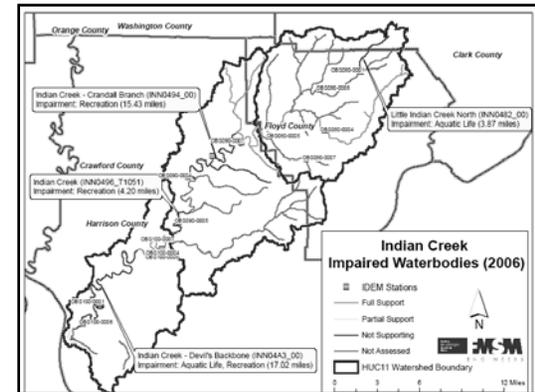
- Known Water Quality Problems
- Found Water Quality Problems
- Causes and Sources
- Addressing Data Gaps: Sinkhole Inventory
- Priority Water Quality Problems

## Watershed Management Plan Chapter 2



### Known WQ Problems

- **Recreational Use Support**
  - Impaired by E. coli – 36.65 miles (TMDL 2010-2015)
- **Aquatic Life Use Support**
  - Low Dissolved Oxygen – 17.02 miles (TMDL 2010-15)
  - Impaired Biotic Communities- 3.87 miles
    - (TMDL 2010 – 2015)
- **Fish Consumption Advisory**
  - Mercury
  - PCB's Statewide Advisory



Indian Creek Waterbody Assessment Results							
Waterbody Segment Name	Waterbody Segment ID	Size (Miles)	Aquatic Life	Primary Contact	Fish Consumption	Category	
Little Indian Creek (North)	INN0482_00	3.87	N	X	X	5A	
Indian Creek-South Trib	INN0491_00	8.84	F	X	P	3A	
Indian Creek-Crandall Branch	INN0494_00	15.43	F	N	P	5A	
Indian Creek	INN0495_T1050	4.75	X	N	P	3A	
Indian Creek	INN0496_T1051	4.20	X	N	P	5A	
Indian Creek-North Karst Area	INN04A1_00	6.27	F	X	N	3A	
Indian Creek-Devils Backbone	INN04A3_00	17.02	N	N	P	5A	
Indian Creek-Blue Spring	INN04A4_00	4.89	X	X	P	3A	

Source: IDEM, 2006.  
Use Categories: F = Full Support, P = Partial Support, N = Not Supporting, X = Not Assessed.

## WMP Chapter 2 Known WQ Problems



- **Recreational Use Support**
  - Impaired by E. coli – 36.65 miles (TMDL 2010-2015)
- **Aquatic Life Use Support**
  - Low Dissolved Oxygen – 17.02 miles (TMDL 2010-15)
  - Impaired Biotic Communities- 3.87 miles
    - (TMDL 2010 – 2015)
- **Fish Consumption Advisory**
  - Mercury
  - PCB's Statewide Advisory

## WMP Chapter 2 Known WQ Problems



- Fish Consumption Advisory – PCB's

Table 2.5. Statewide Carp Fish Consumption Advisory

Advisory Group	Carp Size (inches)	Description	
		Women of childbearing years, nursing mothers and children under 15	Other Adults
1		Limit to 1 meal per week	Unlimited consumption
2		One meal per month	One meal per week
3	15-20	No consumption (Do Not Eat)	One meal per month
4	20-25	No consumption (Do Not Eat)	One meal every two (2) months
5	Over 25	No consumption (Do Not Eat)	No consumption (Do Not Eat)

Source: ISDH, 2006. Note: A meal is defined as 8 ounces (before cooking) of fish for a 150-pound person or 2 ounces of uncooked fish for a 40-pound child.

## WMP Chapter 2 Known WQ Problems



- Unified Watershed Assessment (2000-01)

<p><b>NO DATA</b></p> <ul style="list-style-type: none"> <li>■ Aquatic Life Use Support</li> <li>■ Recreation Use Attainment</li> <li>■ Lake Fishery</li> <li>■ Eurasian Milfoil Infestation</li> <li>■ Lake Trophic Status</li> </ul>	<p><b>GOOD CONDITIONS</b></p> <ul style="list-style-type: none"> <li>■ % Cropland</li> <li>■ Mineral Extraction</li> <li>■ Degree of Urbanization</li> <li>■ Aquifer Vulnerability</li> <li>■ Population Using Surface Water Supply</li> </ul>
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## WMP Chapter 2 Known WQ Problems



- Unified Watershed Assessment (2000-01)

**ISSUES IDENTIFIED**

- Mussel Diversity and Occurrence – degraded or rare
- Stream Fishery - Degraded
- Critical Biodiversity Resource – T&E Reports Filed
- Residential Septic System Density - >40 / sq. mi.
- Density of Livestock – high for Indiana

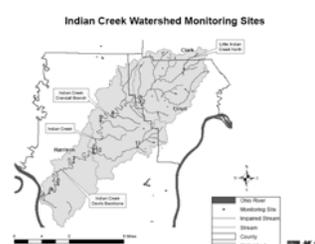
## WMP Chapter 2 Found WQ Problems



Water Quality Monitoring Parameters		
Chemical	Physical	Biological
Total Phosphorus (TP)	Dissolved Oxygen (DO)	E. coli
Ortho-Phosphorus (PO4)	pH	Benthic Macroinvertebrate
Total Kjeldahl Nitrogen (TKN)	Temperature (T)	Habitat
Nitrate-Nitrogen (NO3)	Specific Conductivity (SC)	
Total Ammonia (NH3+NH4)	Turbidity	
Total Solids (TS)	Stream Flow	

## WMP Chapter 2 Found WQ Problems





Indian Creek Watershed Monitoring Sites

Sample Type	# Sample Events
E. Coli	5
Water Quality	6
Biological	1
Field Parns	6
Flow	11
Habitat	1

- 3 low flow
- 3 high flow

## WMP Chapter 2 Causes & Sources



Possible causes and sources of the following are discussed in this section:

- Recreational use impairments
- Aquatic life use impairments
- Fish tissue contamination

## WMP Chapter 2 Causes & Sources



**Causes of Recreational Use Impairments**

Due to elevated bacteria which is evident in IDEM sampling, 36.65 miles of streams are considered impaired for primary contact recreational use.

**Primary Contact Recreation = Swimming**

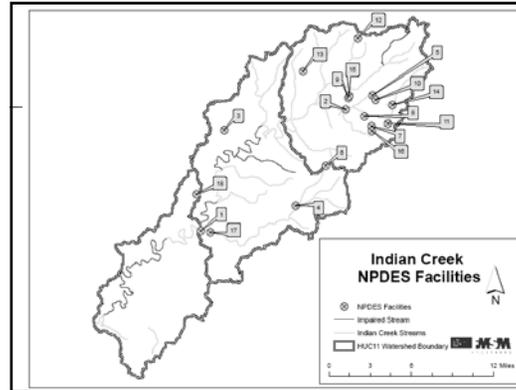
## WMP Chapter 2 Causes & Sources



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### Potential Sources of E. Coli

- Human Sources
  - Wastewater treatment plants in non-compliance
  - Stormwater
  - Failing Septic Systems
  
- Animal Sources
  - Livestock
  - Wildlife, Pets



**Table 2.1. National Pollution Discharge Elimination System (NPDES) Violations**

Facility	NPDES #	Monitoring Location	Total # of Violations (03/2002 - 02/2007)	# of E. Coli Violations (03/2002 - 02/2007)	Most Recent E. Coli Violation (03/2002-02/2007)
Chimneywood Sewage Works, Inc.	NO050181	Effluent Outfall	16	0	N/A
Phoncar Auto Wash Corp.	NO050803	Effluent Outfall	42	0	N/A
Wash Corp.	NO020883	Effluent Outfall	1	0	N/A
WVTP	NO050159	Effluent Outfall	1	0	N/A
Southern View Subdivision	NO036585	Effluent Outfall	1	0	N/A
Darabic Incorporated	NP000153	Effluent Outfall	7	0	N/A
Woods CI	NO054101	Effluent Outfall	46	12	6/30/2006
Woods CI	NO054101	Effluent Outfall	15	0	N/A
Floyd Knobs Elementary School	NO050572	Effluent Outfall	6	1	5/31/2006
Galena Elem & Hood Central HS	NO031178	Effluent Outfall	22	0	N/A
Galena WWTP	NO050219	Effluent Outfall	55	0	N/A
Greenview Elementary School	NO050564	Effluent Outfall	0	0	N/A
Higdoner Home Shopping Ctrs	NO050532	Effluent Outfall	37	0	N/A
Huler Family Restaurant	NO050794	Effluent Outfall	32	11	10/31/2002
McCord's Car Wash & Store	NO050382	Effluent Outfall	10	5	9/30/2006
Lanesville Municipal STP	NO040215	Effluent Outfall	81	0	5/31/2006
Lanesville Welcome Center Ltd.	NO040542	Effluent Outfall	2	0	N/A
Tyson Foods, Inc.	NP000117	Effluent Outfall	1	0	N/A
Wymerly Sanitary Works, Inc.	NO043923	Effluent Outfall	1	0	N/A

Source: DCM



**Number of E. Coli Effluent Violations in Past 5 Years**

## WMP Chapter 2 Causes & Sources



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### Potential Sources of E. Coli: Stormwater

**6 Minimum Control Measures (MCMs)**

- Public education and outreach
- Public participation and involvement
- Illicit discharge detection and elimination
- Construction site runoff controls
- Post-construction stormwater management
- Municipal operations pollution prevention and good housekeeping

## WMP Chapter 2 Causes & Sources



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### Potential Sources of E. Coli: Stormwater

- Clark & Floyd County – MS4 Programs
- Harrison County - Developing Stormwater Ordinance
- Floyd County
  - 13.2 miles conveyance, 540 outfalls mapped
  - 1 Potential Illicit Discharge

## WMP Chapter 2 Causes & Sources



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### Potential Sources of E. Coli: Failing Septic Systems

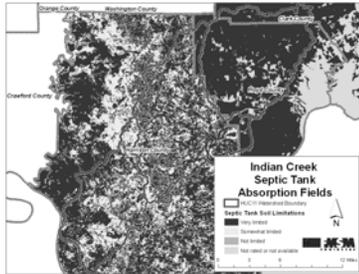
**Floyd County**

- 31% of households use septic systems (~9,000 septic)
- 81% of soils are severely limited for septic

**Harrison County**

- 80% of households use septic (~10,000 septic)
- ~70% functioning improperly (~7,000 w/ issues)
- 67% of soils are severely limited for septic

## WMP Chapter 2 Causes & Sources



## WMP Chapter 2 Causes & Sources



### Potential Sources of E. Coli: Livestock

- 1 Confined Animal Feeding Operation – in compliance
- 6 Concentrated Feeding Operations – no data
- High livestock density
- Wildlife & pets?

## WMP Chapter 2 Causes & Sources



### Livestock, Poultry and Farms in Clark, Floyd, and Harrison Counties

	Cattle		Hogs		Horses		Poultry	
	Head	Farms	Head	Farms	Head	Farms	Head	Farms
Clark	10,972	288	2,288		10,972	288	84	29
Floyd	2,621	135	70		2,621	135	162	10
Harrison	19,640	607	3,184		19,640	607	1.2 M	52
<b>Total</b>	<b>33,233</b>	<b>1,030</b>	<b>5,542</b>		<b>33,233</b>	<b>1,030</b>	<b>&gt;1.2 M</b>	<b>91</b>

Source: ISDA DSC, 2004.

## WMP Chapter 2 Causes & Sources



### AQUATIC LIFE USE IMPAIRMENT Causes and Sources...

## WMP Chapter 2 Causes & Sources

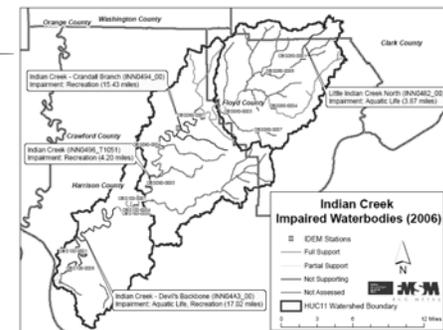


### Causes of Aquatic Life Use Impairments

Aquatic life use is impaired at two locations:

- 1) Devils Backbone – Dissolved Oxygen
- 2) Little Indian Creek North – Fish Community

### Locations of Aquatic Life Use Impairments



### WMP Chapter 2 Causes & Sources

**Cause of AQL Impairment: Low DO**

- 5 DO readings at Indian Creek at Lickford Bridge Road (Site OBS100-006) in July and August of 2000
- Four of the 5 samples did not meet DO criteria
- IDEM listed Devil's Backbone (17.2 miles) as impaired for DO in 2006
- Data collected upstream at Indian Creek at Rocky Hollow Road (OBS100-001) indicated acceptable levels of DO

### WMP Chapter 2 Causes & Sources

**Possible Sources of Low DO**

- **Organic enrichment (nutrients)**
  - Not supported by upstream nutrient data
- **Ohio River backwater &/or losing stream**
  - Flow very slow to none
  - Potentially natural cause !

### WMP Chapter 2 Causes & Sources

**Cause of AQL Impairment: Impaired Fish Community**

- **Little Indian Creek North**
  - Chemical parameters – supportive of aquatic life
  - Tolerant fish species present
- IBI score 24/60 = Impaired
- Habitat Score – 57/100
- Instream cover, pool/glide quality, riparian zone, erosion, channel morphology - suboptimal

### WMP Chapter 2 Causes & Sources

**Cause of Fish Consumption Impairment: Mercury & PCBs**

- **Combustion of fossil fuels**
- **Air deposition**
- **Legacy pollution**
- **No evidence of site specific sources in Indian Creek Watershed**

### Watershed Management Plan Chapter 2

**Other WQ Concerns Nutrients - phosphorus and nitrogen**

- City Park South of Corydon (Site OBS1000-0004), elevated phosphorus and nitrogen
- Phosphorus: 0.015 mg/l to 3.6 mg/l
- Nitrate: 0.06 mg/l to 11.0 mg/l
- DO: 4.6 mg/l to 17.3 mg/l

### WMP Chapter 2 Other WQ Concerns

Table 2.14. Estimate of 2005 Nutrient Applications in the Indian Creek Watershed

County	% County in ICW	X	Total Nutrients (tons)		X 2,000 lbs/ton	Nutrients in IWC (lbs)	
			N	P2O5		N	P2O5
Clark	2.8%	X	5646.28	6950.12	X 2000	158	194
Floyd	58.0%	X	190.46	108.75	X 2000	220,934	126,150
Harrison	32.9%	X	3588.95	2116.99	X 2000	2,361,529	1,392,979
<b>Total</b>						<b>2,582,621</b>	<b>1,519,323</b>

Source: OIGC, 2005.

## WMP Chapter 2 Other WQ Concerns



Table 2.15. Conservation Tillage in Indian Creek Watershed, Corn

County	No-Till		Mulch-Till		Reduced Till		Conventional		Rank
	Acres	%	Acres	%	Acres	%	Acres	%	
Clark	9,773	63	455	3	682	4	4,546	30	8
Floyd	1,176	79	0	0	0	0	321	21	2
Harrison	20,716	88	0	0	600	3	2,102	9	1
Total	31,655	79	455	1	1,282	3	6,969	17	

Source: ISDA DSC, 2004.

- Ag practices in place to reduce runoff !

## WMP Chapter 2 Other WQ Concerns



Table 2.17. Pesticides Detected in Indian Creek Watershed

Parameter	Concentration (parts per billion)
Bromacil (ug/L)	0.1
Malathion (ug/L)	0.1
Metolachlor (ug/L)	0.2
Oxadiazon (ug/L)	1.1
Simazine (ug/L)	0.08

Source: IDEM, 2006.

- 149 other organic chemicals & pesticides – not detectable in Indian Creek Watershed !

## Sinkhole Inventory



- Geology of the Indian Creek watershed is highly prone to karst features such as sinkholes, springs and caves.
- Pollutants can be rapidly transported to groundwater systems without soil filtration.
- UIC Inventory required for modified sinkholes

## Sinkhole Inventory



- **Underground Injection Control (UIC) program**
- Modified sinkhole - change flow of stormwater to the karst system
- Regulated under the USEPA's UIC program
  - Inventory
  - Treat or cease discharge if drinking water supply affected

## Sinkhole Inventory Pilot Study



- Compiling existing data
- Advanced analysis of GIS data
- Prioritization
- Field inventory
- **FINAL PRODUCT:** Shapefile and FGDC standard metadata of field inventoried sinkholes

## Sinkhole Inventory Pilot Study



### Existing Data

- **Harrison County Engineers Office** –
  - 18 visually plotted sinkholes
- **Lanesville Corridor Project**
  - Ten (10) sinkholes
- **Indian Geological Survey**
  - Sinkhole basins

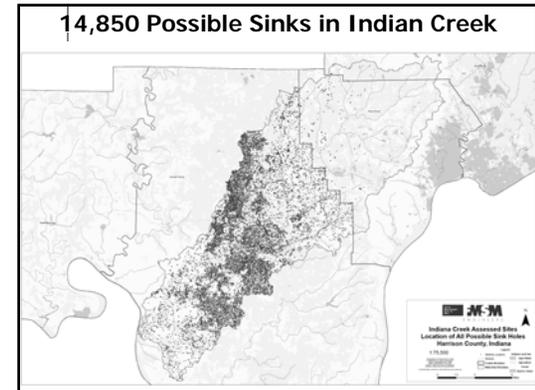
## Sinkhole Inventory Pilot Study

### Advanced Analysis of GIS Data

- LIDAR and Digital Elevation Model (DEM) data
- Bowl-shaped depressions or closed contour depressions were identified
- The centroid of the closed contour depression was identified using GIS data to create point locations

## Sinkhole Inventory Pilot Study

- **Harrison County**
  - LIDAR data for Harrison County were obtained
  - Included 2 foot and 4 foot contours
  - **14,687 possible sinkhole locations** in Harrison Co
- **Floyd and Clark Counties** -
  - USGS used (DEM) data
  - 10-meter (~30 feet) and 30-meter (~90 feet)
  - **163 possible sinkhole locations** in the Floyd and Clark Co
  - (this method showed 6,452 in entire watershed)



## Sinkhole Inventory Pilot Study

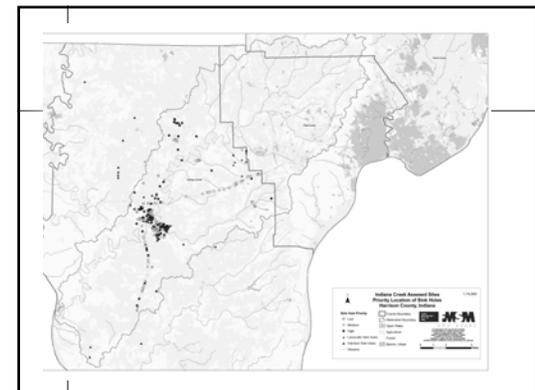
Table 2.18. Land Use and Possible Sinkhole Locations

Land Use/ Land Cover Description	Number of Possible Sinkhole Locations
Low Intensity Residential	215
High Intensity Residential	15
Commercial, Industrial, Transportation	71
Urban Recreational Grasses	14
<b>Total</b>	<b>315</b>

## Sinkhole Inventory Pilot Study

Table 2.19. Priority for Field Inventory

Site Description	Number of Possible Sinkhole Locations	Priority
Possible Sinkhole	152	High
Drainage	117	Medium
Construction Site	2	Low
Building, Parking Lot, Street	24	Low
Pond, Quarry	7	Low
<b>Total</b>	<b>315</b>	





<b>Watershed Management Plan Chapter 2</b> 	
<b>Prioritization of Water Quality Issues</b>	
<p>The following priorities were established at the Indian Creek Watershed Plan Public Meeting held on October 18, 2006.</p> <ul style="list-style-type: none"> <li>■ Failing/ Inadequate septic systems</li> <li>■ Flooding</li> <li>■ Other Issues           <ul style="list-style-type: none"> <li>- Coverage of drainage in Harrison County Ordinances</li> <li>- A water quality problem – foaming Corn Creek</li> <li>- Preservation and protection</li> </ul> </li> </ul>	

<b>Watershed Management Plan Chapter 2</b> 	
<p style="text-align: center;"><b>Public Meeting</b></p> <p style="text-align: center;"><b>Week of July 9</b></p> <p style="text-align: center;"><b>Suggested Location &amp; Time?</b></p>	

	<b>Next Steps</b>
	<ul style="list-style-type: none"><li>■ Public Meeting</li><li>■ Field work – sinkhole inventory</li><li>■ Begin monitoring</li></ul>

- |  |   |
|--|---|
|  | <b>Next Steps</b>   |
|  | <ul style="list-style-type: none"><li>■ Public Meeting</li><li>■ Field work – sinkhole inventory</li><li>■ Begin monitoring</li></ul> |

	<b>Questions</b>
	





**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**June 21, 2007 2:00 PM to 3:30 PM**

**Harrison County Annex Building, 124 S Mulberry Street, Corydon**

**MEETING SUMMARY**

**1. Watershed Plan Chapter 2 – Water Quality Problems**

The main problems in the watershed are **recreational use impairment** caused bacteria contamination and **aquatic life use impairment** caused by low dissolved oxygen.

Members of the subcommittee informed the group of additional monitoring data on Little Indian Creek North is available at the New Albany SWCD.

There was discussion of sources of high nutrient levels. Members discussed the possibility of analyzing nutrient application rates. Larger farms would have information on locations and amounts of applied nutrients etc. It was decided, that this may be something to look into in the future, if the group decides to, the priorities now include the sources and causes of aquatic life and recreational use impairments.

**2. Sinkhole Inventory**

The group discussed different prioritization options for the sinkhole inventory including. Locating areas or subwatersheds with water quality problems or high potential for pollution such as areas known to have a high # of failing septic systems. Kevin Russel suggested creating a shapefile that can be used in the Karst policy of the stormwater ordinance.

The group discussed sinkhole flooding as an issue. It may be more of an issue for sinkholes that can not accept the amount of surface runoff they are receiving than sinkholes that surcharge water.

**3. Public Meeting**

There are several public events coming up in July that may help raise awareness of the Watershed Management Plan, such as the Floyd County Fair (July 9-14) and the Harrison County Fair (end of July). There may be a booth set up for the Indian Creek project at one or more of these events to advertise for the public meeting and raise overall awareness.

**4. Next Meeting**

## **Action Items**

- The subcommittee was asked to review the 80% Draft of Chapter 2 of the watershed plan and return comments to Karen Schaffer by Friday July 20, 2007

## **Handouts**

- Chapter 2 Water Quality Issues – 80% Draft**
- Article as submitted to the Corydon Democrat “Help Protect Water Quality in Your Community”**
- Agenda**
- PowerPoint slides**



**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**November 15, 2007 - 2:00 PM to 3:30 PM**

**Harrison County Annex Building, 124 S Mulberry Street, Corydon, Indiana**

## **MEETING AGENDA**

- 1. Introduction**
  
- 2. Monitoring and Assessment Results**
  
- 3. Goals & Strategies Chapters**
  
- 4. Public Meeting**
  
- 5. Next Steps and Closing**

**Handouts:**

- **Chapter 2: Water Quality Issues - Draft**
- **Chapter 3: Goals and Decisions - Draft**
- **Chapter 4: Measuring Progress – Draft**
- **Newspaper Article**



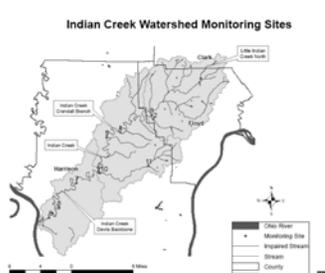
## Agenda

- Introduction
- Monitoring and Assessment Results
- Goals & Strategies Chapters
- Public Meeting
- Next Steps and Closing

## Introduction Progress to Date

- Monitoring completed
- Chapter 2 Water Quality Issues Revised
- Chapter 3 and 4 Drafts
- Sinkhole Inventory Data Compiled
- Public Meeting #2

## Monitoring and Assessment Results



Sample Type	# Sample Events
E. Coli	5
Water Quality	6
Biological	1
Field Parns	6
Flow	11
Habitat	1

- 3 low flow
- 3 high flow

## Monitoring and Assessment Results

**Completed**

- Sample Collection
- E. Coli Analysis
- Biological & Habitat

**Pending**

- WQ Parameters Lab Analysis



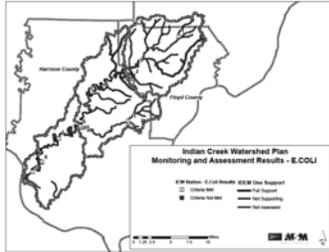
10 sites part of Indian Creek watershed testing

## Monitoring and Assessment Results: E. Coli

Site	Description	Geometric Mean	Maximum Concentration	Criteria Met?
2	Georgetown Creek below Georgetown at Malinee Ott Road	194	300	No
3	Indian Creek above Georgetown Creek, IDEM Site OBS080-0005	147.2	430	No
4	Crandall Branch above SR335 Bridge	779.2	2,200	No
5	Indian Creek above SR355 Bridge, IDEM Site OBS090-0004	268.8	410	No
6	Indian Creek above Little Indian Creek at Water Street	93.3	180	Yes
7	Indian Creek at Mathis Road bridge	19.4	32	Yes
8	Indian Creek above Rocky Hollow Road Bridge, IDEM Site OBS100-0001	46.8	177	Yes
9	Indian Creek above Lickford Road Bridge, IDEM Site OBS100-0006	44.2	132	Yes
10	Little Indian Creek above Water Street Bridge	119.2	140	Yes
11	Little Indian Creek below Lanesville at State Road 62	118.8	226	Yes

Criteria: Geometric mean < 125 MPN / 100 ml and single sample maximum < 576 MPN/100 ml

## Monitoring and Assessment Results: E. Coli



■ Site 2 Georgetown Creek at Malinee Ott Road

## Monitoring and Assessment Results: Bacterial Indicator Tool

- EPA spreadsheet tool to estimate relative contribution of bacteria sources
  - Forest, Pasture, Crop, Built-up
  - Septic systems
  - Cattle in streams
  - For more information: <http://www.epa.gov/waterscience/ftp/basins/system/BASINS3/bit.htm>

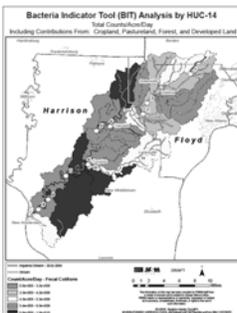
## Monitoring and Assessment Results: Bacterial Indicator Tool

- Indian Creek Watershed BIT
  - 24 HUC 14 subwatersheds
  - Tool Inputs
    - Land use/ Land cover
    - Animal census
    - Animal access to streams
    - Manure application
    - Septic systems & failure rates
    - Wildlife census

## Monitoring and Assessment Results: Bacterial Indicator Tool

- Bacterial Indicator Tool Outputs
  - Counts / acre / day from **land based sources**
    - Crop, pasture, built-up, forest
  - Counts / day from **“direct” inputs to water**
    - Cattle in streams
    - Failing septic systems

## Monitoring and Assessment Results: Bacterial Indicator Tool



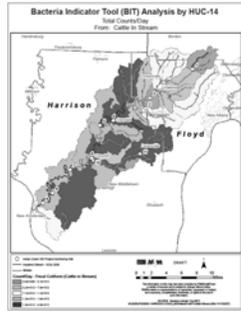
- Results indicated loadings are:
  - Lower in Floyd Co
  - Higher in western Harrison
  - Higher in lower Indian Ck
- Does not account for:
  - Cattle in streams
  - Septic systems
  - Karst system

## Monitoring and Assessment Results: Bacterial Indicator Tool



- Septic System Results
- Tool indicated “direct” loadings from failing septic systems are:
    - Higher in Floyd Co
    - Lower in Harrison
    - Overall lower than cattle in streams
  - Caution: does not account for potential human health impacts from failing septic!

## Monitoring and Assessment Results: Bacterial Indicator Tool

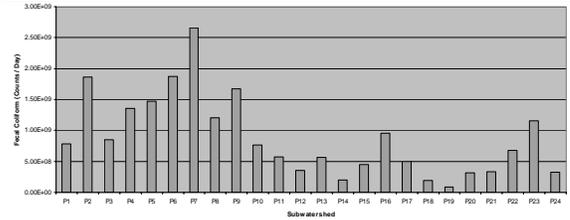


### Cattle in Streams Results

- Tool indicated “direct” loadings from cattle in streams are:
  - Lower in Floyd Co
  - Higher in Harrison
  - Overall higher than septic systems
- Caution: does not account for transport to and through the karst system!

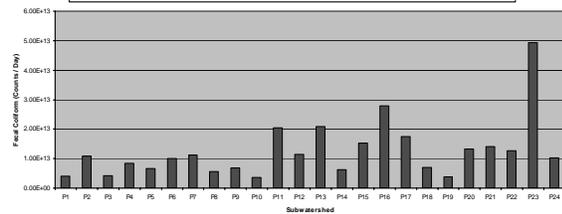
## Monitoring and Assessment Results: Bacterial Indicator Tool

Estimated Fecal Coliform Inputs to Water from Failing Septic Systems



## Monitoring and Assessment Results: Bacterial Indicator Tool

Estimated Inputs to Water from Cattle in Streams

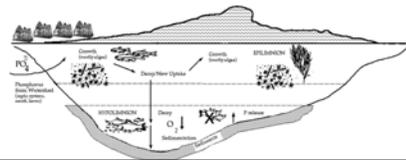


## Monitoring and Assessment Results: Dissolved Oxygen

- Dissolved Oxygen Criterion
  - Instantaneous 4 mg/l, 24-hr average 5 mg/l
- IDEM 303d Assessment: >12 mg/l impaired
  - Elevated DO indicates elevated nutrients & eutrophication

### Generalized Eutrophication

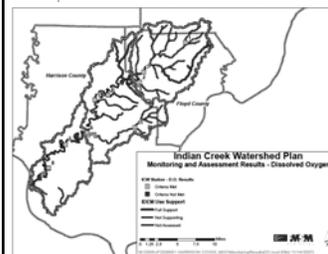
Long Pond, Brewster/Hancock, MA



## Monitoring and Assessment Results: Dissolved Oxygen

Site	Description	Minimum Concentration	Criterion Met?	Maximum Concentration
2	Georgetown Creek below Georgetown at Malinee Ott Road	4.6	Yes	15.0
3	Indian Creek above Georgetown Creek, IDEM Site OBS080-0005	5.7	Yes	8.9
4	Crandall Branch above SR335 Bridge	6.4	Yes	10.4
5	Indian Creek above SR355 Bridge, IDEM Site OBS090-0004	4.5	Yes	8.7
6	Indian Creek above Little Indian Creek at Water Street	7.6	Yes	14.2
7	Indian Creek at Mathis Road bridge	5.6	Yes	9.1
8	Indian Creek above Rocky Hollow Road Bridge, IDEM Site OBS100-0001	6.3	Yes	9.1
9	Indian Creek above Lickford Road Bridge, IDEM Site OBS100-0006	3.1	No	8.9
10	Little Indian Creek above Water Street Bridge	7.7	Yes	11.1
11	Little Indian Creek below Lanesville at State Road 62	4.9	Yes	16.2

## Monitoring and Assessment Results: Dissolved Oxygen



- Site 9 - Indian Creek above Lickford Road Bridge
- Ohio River backwater

## Monitoring and Assessment Results: Aquatic Life

Site	Macroinvertebrate Index of Biotic Integrity (MIBI)	Qualitative Result
Site 6 - Indian Creek above Little Indian Creek at Water Street in Corydon	40	Poor
Site 6D - Indian Creek above Little Indian Creek at Water Street in Corydon	43.9	Fair
Site 7 - Indian Creek at Mathis Road bridge	Not assessed	
Site 8 - Indian Creek above Rocky Hollow	Not assessed	
Site 10 - Little Indian Creek above the Water Street bridge	43.2	Fair

## Monitoring and Assessment Results: Habitat

Site	Description	Habitat Score	Qualitative Result
1	Indian Creek North at Banet Road, IDEM Site OBS080-0001	46	Fair
2	Georgetown Creek below Georgetown at Malinee Ott Road	39.5	Poor
3	Indian Creek above Georgetown Creek, IDEM Site OBS080-0005	61	Good
4	Crandall Branch above SR335 Bridge	61.5	Good
5	Indian Creek above SR355 Bridge, IDEM Site OBS090-0004	40	Not Assessed
6	Indian Creek above Little Indian Creek at Water Street	42	Poor
7	Indian Creek at Mathis Road bridge	62	Good
8	Indian Creek above Rocky Hollow Road Bridge, IDEM Site OBS100-0001	55.5	Fair
9	Indian Creek above Lickford Road Bridge, IDEM Site OBS100-0006	63.5	Good
10	Little Indian Creek above Water Street Bridge	36	Poor
11	Little Indian Creek below Lanesville at State Road 62	58	Good

## Monitoring and Assessment Results: Habitat



- Site 4: Crandall Branch above SR335 Bridge
- Good Habitat

- Site 10: Little Indian Creek above Water Street Bridge
- Poor Habitat



- Site 8: Indian Creek above Rocky Hollow Bridge
- Fair Habitat

## Draft 2008 303d Impaired Waterbodies



Proposed in 2008

- New listings
  - Nutrients
  - PCBs in fish
- Additional miles
  - Bacteria
- No Change
  - Dissolved Oxygen
  - Impaired Biota

## IDEM 303(d) List 2006 Final & 2008 Draft



**Aquatic Life Use Support**  
 Low Dissolved Oxygen  
 - 2006: 17 miles  
 - 2008: 17.3 miles

**Impaired Biotic Communities**  
 - 2006: 3.9 miles  
 - 2008: 3.9 miles

**Elevated Nutrients**  
 - 2006: 0 miles  
 - 2008: 5 miles

**Recreational Use Support**  
 Elevated E. Coli  
 -2006: 36.7 miles  
 -2008: 66 miles

**Fish Consumption**  
 PCBs in Fish Tissue  
 2006: 0 miles  
 2008: 6.4 miles

Indian Creek TMDLs scheduled 2010 - 2015

## IDEM 303(d) List 2006 Final & 2008 Draft



**Nutrient Assessment Method**

- At least 3 sampling events
- Two or more of the following needed to classify as impaired
  - Total Phosphorus: One/more measurements >0.3 mg/l
  - Nitrogen: One/more measurements >10.0 mg/l
  - Dissolved Oxygen (DO): < 4.0 mg/l, or in the range of 4.0-5.0 mg/l or values >12.0 mg/l
  - pH: above 9.0 or in the range of 8.7- 9.0
  - Algal Conditions: Algae are described as "excessive" based on field observations by trained staff.

	<h2>Monitoring and Assessment Results: Next Steps</h2>
	<ul style="list-style-type: none"> <li>■ 2008 Draft 303(d) Comment Letter to IDEM re: delisting DO</li> <li>■ Analyze water quality results from ISDH Laboratory</li> <li>■ Add WQ results to finalize Chapter 2</li> <li>■ Data submittal to IDEM</li> </ul>

	<h2>Chapter 3 Outline</h2> 
	<p><b>3. Goals and Decisions</b></p> <p><u>3.1. Water Quality Improvement Goal</u></p> <p>■ <u>3.2. Aquatic Life and Habitat Improvement Goal</u></p> <p>■ <u>3.3. Flooding Protection Goal</u></p>

	<h2>Chapter 3: Goals and Decisions</h2> <h3>Water Quality Improvement Goal</h3> 
	<ul style="list-style-type: none"> <li>■ Action Plans <ul style="list-style-type: none"> <li>■ Septic System Action Plan</li> <li>■ Agricultural Action Plan</li> <li>■ Urban Areas Action Plan</li> <li>■ Karst Action Plan</li> <li>■ Monitoring and Assessment Action Plan</li> </ul> </li> </ul> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Monitoring Site – Floyd County</p>  <p>Site 6 Algae</p> </div> </div>

	<h2>Chapter 3: Goals and Decisions</h2> <h3>Water Quality Improvement Goal</h3> 
	<ul style="list-style-type: none"> <li>■ Septic System Action Plan <ul style="list-style-type: none"> <li>■ Septic System Workshop</li> <li>■ Operation &amp; Maintenance Requirements</li> <li>■ Septic Management District</li> <li>■ Financial Assistance to Homeowners</li> <li>■ GIS Database of Septic Systems</li> <li>■ Strategy for Homeowner Associations</li> </ul> </li> </ul>

	<h2>Chapter 3: Goals and Decisions</h2> <h3>Water Quality Improvement Goal</h3> 
	<ul style="list-style-type: none"> <li>■ Agricultural Action Plan <ul style="list-style-type: none"> <li>■ Manure &amp; Livestock Management Workshop</li> <li>■ Financial Assistance</li> <li>■ Watershed Stewardship Program</li> </ul> </li> </ul>

	<h2>Chapter 3: Goals and Decisions</h2> <h3>Water Quality Improvement Goal</h3> 
	<ul style="list-style-type: none"> <li>■ Urban Areas Action Plan <ul style="list-style-type: none"> <li>■ Pet waste education</li> <li>■ "Pooper scooper" requirements</li> <li>■ Map stormwater conveyance &amp; outfalls</li> <li>■ Dry weather screening</li> <li>■ Eliminate dry weather flows</li> <li>■ Sewage collection system inspection &amp; maintenance</li> </ul> </li> </ul>

### Chapter 3: Goals and Decisions

#### Water Quality Improvement Goal

- Karst Action Plan
  - Karst Protection Policy
  - Pilot BMP implementation project
  - Karst education
  - Karst inventory
  - Dye tracing
- Monitoring Action Plan
  - Water quality monitoring on a ~5 yr cycle



### Chapter 3: Goals and Decisions

#### Aquatic Life and Habitat Improvement Goal

- Aquatic Life & Habitat Improvement Action Plan
  - Buffer Workshop
  - Greenways Plan
  - Buffer Policy
  - Identify erosion areas
  - Identify stream protection funding sources
  - Implement pilot stream stabilization/ restoration project
  - Monitor benthic macroinvertebrates



Severely eroding stream bank near Site 1, Floyd County

### Chapter 3: Goals and Decisions

#### Flooding Protection Goal

- Flooding Protection Action Plan
  - Stormwater Master Planning
  - Water Quality BMPs included in Flooding Capital Improvement Projects
  - Gages



### Chapter 4 Outline

#### 4: Measuring Progress

- 4.1. Progress Indicators
- 4.2. Monitoring Progress
- 4.3. Operation & Maintenance of Installed Practices
- 4.4. Plan Evaluation

### Chapter 4: Measuring Progress

**Indicators and Measuring Progress**

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

Priority	Goal	Indicators and Progress Measures
	Reduce concentrations of bacteria and nutrients from septic systems	<ul style="list-style-type: none"> <li>•Septic System Workshop held by X</li> <li>•Operation &amp; maintenance requirements triggered by real-estate transfer; number properties inspected and maintained</li> <li>•Septic management district feasibility study completed by X</li> <li>•Identify and educate X homeowners regarding septic system incentives and assistance programs by X</li> <li>•Build septic system GIS database by X</li> <li>•Develop wastewater management strategy for homeowner associations by X</li> </ul>
	Reduce concentrations of bacteria and nutrients from agricultural sources	<ul style="list-style-type: none"> <li>•Manure and Livestock Management Workshop held by X</li> <li>•Identify financial incentives and assistance to encourage manure management &amp; livestock exclusion by X;</li> <li>•Conduct feasibility study and implement a watershed stewardship program by X.</li> </ul>

- Measurable targets needed for IDEM approval of Plan!

### Chapter 4: Measuring Progress

**Indicators and Measuring Progress**

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

Priority	Goal	Indicators and Progress Measures
	Reduce concentrations of bacteria and nutrients from urban sources	<ul style="list-style-type: none"> <li>•Targeted and on-going education of pet-owners by X</li> <li>•GIS database of stormwater outfalls and conveyance system in Harrison County by X</li> <li>•Perform dry weather screening, illicit discharge detection and elimination in Harrison County by X</li> <li>•Inspect and repair as needed, X feet of sewer collection system per year</li> </ul>
	Reduce concentrations of bacteria and nutrients to karst systems	<ul style="list-style-type: none"> <li>•Perform dye tracing at X locations per year</li> <li>•Sample X karst springs per year</li> <li>•Continue UIC program implementation</li> <li>•Plan and implement karst protection BMP pilot project by X</li> <li>•Develop karst protection policy by X</li> <li>•Provide karst education at X events per year</li> <li>•Continue updating Sinkhole Inventory GIS coverage</li> </ul>
	Monitor water quality to provide the data needed to understand status and trends	<ul style="list-style-type: none"> <li>•Collect water quality data at least every 5 years</li> </ul>

## Next Steps



- Dec 13 – Subcommittee Meeting
  - Review draft plan
- Jan 15 – Public Meeting
  - Review draft plan
  - 7:00-8:30 PM, Where?
- Jan 30 – Draft Plan to IDEM
- Feb 29 – Final Plan to IDEM
- Apply for Grant Funds?
  - Implement Indian Creek Watershed Plan
  - Develop Blue River Watershed Plan
  - 319(h) Grants applications due 9/08

## Questions





**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**November 15, 2007 2:00 PM to 3:30 PM**

**Harrison County Annex Building, 124 S Mulberry Street, Corydon**

**MEETING SUMMARY**

**1. Monitoring and Assessment Results**

Monitoring events have been completed and results are being added to the watershed plan. E.Coli, dissolved oxygen, and biological monitoring results are available in the current drafts of the WMP.

The USEPA Bacteria Indicator Tool (BIT) was used in Indian Creek to compare relative contributions of bacteria in the watershed. The tool will also provide information on priority areas for bacteria management measures. Graphic representation of the results will be available on the website, and results will be summarized in the watershed plan.

**2. Goals and Strategies Chapters**

A preliminary draft of goals and strategies has been added to the WMP. Much more input is needed from the Subcommittee in order to finalize.

Part of the goals and strategies section includes identifying adequate funding for management measures. Floyd County provided information regarding a grant administered in Paoli Pike to assist landowners in a densely populated area pay for a pump station and convert from septic to sewers. Similarly, Karen Schaffer explained that 319 grant dollars may be available to assist with the development and implementation of selected strategies in the watershed plan. IDEM has expressed interest in a project to develop a septic system management district.

A stormwater ordinance containing a karst policy has been drafted for Harrison County. RSD is planning to move forward with the ordinance early next year. The ordinance will be added to the Strategies chapter of the WMP.

**3. Public Meeting**

The next public meeting is being scheduled for the week of December 17, 2007. Topics will include monitoring and assessment results, goals and strategies, sinkhole inventory, and implementation.

#### 4. Next Steps and Closing

The next Subcommittee Meeting will be held **December 12, 2007 from 2:00 to 3:30 PM** at the Harrison County Annex Building. This meeting will focus on detailed review of Chapter 3. Goals and Strategies and Chapter 4. Measuring Progress.

#### Project Timeline

- Dec 12 – Draft Final Plan
- Jan 15 – Public Meeting for Draft Final Plan
- Jan 30 – Draft Final Plan to IDEM
- Feb 28 – Final Plan to IDEM
- Apply for Implementation Grant Funds (319(h) applications due Sept 08)

The presentation from today's meeting has been posted to [www.indiancreekwatershed.com](http://www.indiancreekwatershed.com).

#### Action Items

- The subcommittee will review management strategies and provided feedback including additional strategies to consider, edits to drafted strategies, target dates for implementation, and commitments for implementation of the plan.
- FMSM will integrate the monitoring and assessment results in to the WMP
- FMSM will present a final product of the sinkhole inventory at the next Subcommittee meeting
- FMSM will add the stormwater ordinance development and implementation to chapter 3 and 4 of the WMP
- FMSM will draft a letter to IDEM requesting de-listing of the DO listing for Devil's Backbone segment of lower Indian Creek.

#### Handouts

- **Chapter 2: Water Quality Issues - Draft**
- **Chapter 3: Goals and Decisions - Draft**
- **Chapter 4: Measuring Progress – Draft**
- **Newspaper Article**



**HARRISON COUNTY REGIONAL SEWER DISTRICT  
INDIAN CREEK SUBCOMMITTEE**



**Wednesday December 12, 2007 2:00 to 3:30 PM**

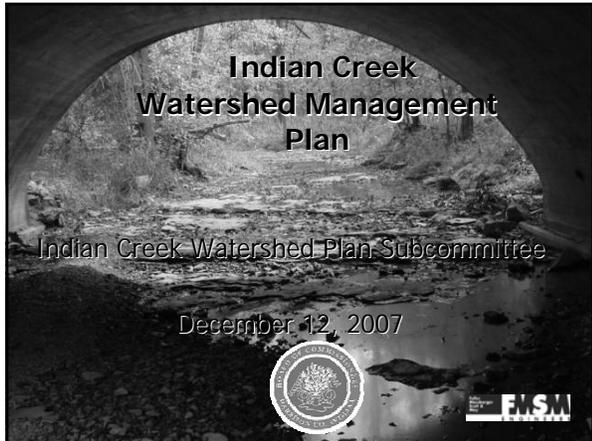
**Harrison County Annex Building, 124 S Mulberry Street, Corydon, Indiana**

## **MEETING AGENDA**

- 1. Introduction**
  
- 2. Goals & Strategies Chapters**
  
- 3. Public Meeting**
  
- 4. Next Steps and Closing**

**Handouts:**

- **Section 2.4: Bacteria Indicator Tool – Draft**
- **Meeting Summary November 15, 2007**



	
<h2>Agenda</h2>	
<ul style="list-style-type: none"> <li>■ Introduction</li> <li>■ Goals &amp; Strategies Chapters</li> <li>■ Public Meeting</li> <li>■ Next Steps and Closing</li> </ul>	

	
<h2>Introduction Progress to Date</h2>	
<ul style="list-style-type: none"> <li>■ Monitoring completed</li> <li>■ Chapter 2 Bacteria Indicator Tool results entered</li> <li>■ Chapter 3 and 4 Drafts</li> <li>■ Sinkhole Inventory Data Compiled</li> <li>■ Public Meeting #2</li> </ul>	

	
<h2>Introduction Project Timeline</h2>	
<ul style="list-style-type: none"> <li>■ Jan 15 – Public Meeting for Draft Final Plan</li> <li>■ Jan 30 – Draft Final Plan to IDEM</li> <li>■ Feb 28 – Final Plan to IDEM</li> <li>■ Apply for Implementation Grant Funds (319(h) applications due Sept 08)</li> </ul>	

	
<h2>Introduction Action Items (from last meeting)</h2>	
<p>The subcommittee will review management strategies and provided feedback including additional strategies to consider, edits to drafted strategies, target dates for implementation, and commitments for implementation of the plan <b>Underway</b></p> <p>FMSM will integrate the monitoring and assessment results in to the WMP <b>Underway</b></p> <p>FMSM will present a final product of the sinkhole inventory at the next Subcommittee meeting <b>Complete</b></p> <p>FMSM will add the stormwater ordinance development and implementation to chapter 3 and 4 of the WMP <b>Drafted</b></p> <p>FMSM will draft a letter to IDEM requesting de-listing of the DO listing for Devil's Backbone segment of lower Indian Creek <b>Complete</b></p>	

	
<h2>Chapter 3 Outline</h2>	
<h3>3. Goals and Decisions</h3> <p><u>3.1. Water Quality Improvement Goal</u></p> <ul style="list-style-type: none"> <li>■ <u>3.2. Aquatic Life and Habitat Improvement Goal</u></li> <li>■ <u>3.3. Flooding Protection Goal</u></li> </ul>	

**Chapter 3: Goals and Decisions**  
Water Quality Improvement Goal 

- Action Plans
  - Septic System Action Plan
  - Agricultural Action Plan
  - Urban Areas Action Plan
  - Karst Action Plan
  - Monitoring and Assessment Action Plan



Monitoring Site – Floyd County



Site 6 Algae

**Chapter 3: Goals and Decisions**  
Water Quality Improvement Goal 

- Septic System Action Plan
  - Septic System Workshop
  - Operation & Maintenance Requirements
  - Septic Management District
  - Financial Assistance to Homeowners
  - GIS Database of Septic Systems
  - Strategy for Homeowner Associations

**Chapter 3: Goals and Decisions**  
Water Quality Improvement Goal 

- Agricultural Action Plan
  - Manure & Livestock Management Workshop
  - Financial Assistance
  - Watershed Stewardship Program

**Chapter 3: Goals and Decisions**  
Water Quality Improvement Goal 

- Urban Areas Action Plan
  - Pet waste education
  - “Pooper scooper” requirements
  - Map stormwater conveyance & outfalls
  - Dry weather screening
  - Eliminate dry weather flows
  - Sewage collection system inspection & maintenance

**Chapter 3: Goals and Decisions**  
Water Quality Improvement Goal 

- Karst Action Plan
  - Karst Protection Policy
  - Pilot BMP implementation project
  - Karst education
  - Karst inventory
  - Dye tracing
- Monitoring Action Plan
  - Water quality monitoring on a ~5 yr cycle



**Chapter 3: Goals and Decisions**  
Aquatic Life and Habitat Improvement Goal 

- Aquatic Life & Habitat Improvement Action Plan
  - Buffer Workshop
  - Greenways Plan
  - Buffer Policy
  - Identify erosion areas
  - Identify stream protection funding sources
  - Implement pilot stream stabilization/ restoration project
  - Monitor benthic macroinvertebrates



Severely eroding stream bank near Site 1, Floyd County

## Chapter 3: Goals and Decisions

### Flooding Protection Goal



- Flooding Protection Action Plan
  - Stormwater Master Planning
  - Water Quality BMPs included in Flooding Capital Improvement Projects
  - Gages



## Chapter 4 Outline



### 4: Measuring Progress

- 4.1. Progress Indicators
- 4.2. Monitoring Progress
- 4.3. Operation & Maintenance of Installed Practices
- 4.4. Plan Evaluation

## Chapter 4: Measuring Progress



**Indicators and Measuring Progress**

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

Priority	Goal	Indicators and Progress Measures
	Reduce concentrations of bacteria and nutrients from septic systems	<ul style="list-style-type: none"> <li>•Septic System Workshop held by X</li> <li>•Operation &amp; maintenance requirements triggered by real-estate transfer; number properties inspected and maintained</li> <li>•Septic management district feasibility study completed by X</li> <li>•Identify and educate X homeowners regarding septic system incentives and assistance programs by X</li> <li>•Build septic system GIS database by X</li> <li>•Develop wastewater management strategy for homeowner associations by X</li> </ul>
	Reduce concentrations of bacteria and nutrients from agricultural sources	<ul style="list-style-type: none"> <li>•Manure and Livestock Management Workshop held by X</li> <li>•Identify financial incentives and assistance to encourage manure management &amp; livestock exclusion by X;</li> <li>•Conduct feasibility study and implement a watershed stewardship program by X.</li> </ul>

- Measurable targets needed for IDEM approval of Plan!

## Chapter 4: Measuring Progress



**Indicators and Measuring Progress**

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

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	Reduce concentrations of bacteria and nutrients to karst systems	<ul style="list-style-type: none"> <li>•Perform dye tracing at X locations per year</li> <li>•Sample X karst springs per year</li> <li>•Continue UIC program implementation</li> <li>•Plan and implement karst protection BMP pilot project by X</li> <li>•Develop karst protection policy by X</li> <li>•Provide karst education at X events per year</li> <li>•Continue updating Sinkhole Inventory GIS coverage</li> </ul>
	Monitor water quality to provide the data needed to understand status and trends	<ul style="list-style-type: none"> <li>•Collect water quality data at least every 5 years</li> </ul>

## Next Steps



- Data submittal to IDEM
- Jan 4 - Additions and Comments from Subcommittee on Chapters 3 and 4 Due to FMSM
- Jan 15 – Public Meeting
  - Review draft of final plan
  - 7:00-8:30 PM, Where?
- Jan 30 – Draft Plan to IDEM
- Feb 29 – Final Plan to IDEM
- Apply for Grant Funds?
  - Implement Indian Creek Watershed Plan
  - Develop Blue River Watershed Plan
  - 319(h) Grants applications due 9/08

## Questions

