

WATER QUALITY CHARACTERIZATION REPORT MONROE COUNTY, INDIANA

NPDES PHASE II MS4 GENERAL PERMIT
Permit No. INR040089

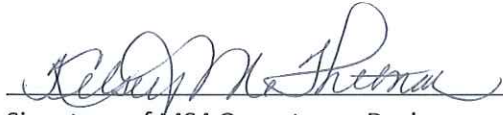


UPDATED MARCH 2023

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Monroe County, Indiana
NPDES Phase II Water Quality Characterization Report

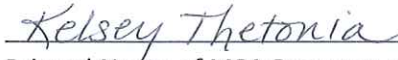
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Signature of MS4 Operator or Designee per 40 CFR 122.22



Date



Printed Name of MS4 Operator or Designee per 40 CFR 122.22

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	MS4 AREA AND MS4 RECEIVING WATERBODIES.....	2
	Land Use Assessment	
	Watersheds Within the MS4 Area	
	MS4 Receiving Waterbodies	
	Inventory of MS4-owned Stormwater Management Facilities	
3.0	SENSITIVE AREAS.....	8
	Karst	
	Public Drinking Water Sources	
	Recreational Waters and Public Swimming Areas	
	Wetlands and Floodplains	
	Steep Slopes and Highly Erodible Soils	
	Threatened and Endangered Species Habitat	
4.0	SUMMARY OF EXISTING WATER MONITORING DATA.....	10
	IDEM 305(b) Report and 303(d) List of Impaired Waters	
	Total Maximum Daily Load (TMDL) Reports	
	Watershed Management Plans	
	Lake and River Enhancement (LARE) Program	
	Ongoing Lake Monitoring	
	Indiana University Capstone Studies	
	Monroe County Long-Range Stormwater Improvement Plan	
	Superfund Sites and Legacy Pollutants	
5.0	EVALUATION OF STORMWATER QUALITY CONCERNS.....	16
	Stormwater Concerns Reported to the MS4	
	Illicit Discharge Detection and Elimination Program	
6.0	IDENTIFICATION OF PRIORITY AREAS FOR STORMWATER MANAGEMENT.....	17
	Monroe County Critical Watersheds	
	Urban Areas	
	Forests and Forest Harvesting Activities	
	Agricultural Areas	
7.0	ACKNOWLEDGEMENTS AND UPDATES.....	19
8.0	REFERENCES.....	20

LIST OF TABLES

- 2.1 Land Use in Unincorporated Monroe County
- 2.2 HUC-10 Watersheds in Monroe County MS4 Area
- 2.3 HUC-12 Watersheds in Monroe County MS4 Area
- 2.4 Monroe County MS4 Receiving Waterbodies
- 2.5 Land Use in Monroe County MS4 Receiving Watersheds
- 2.6 Inventory of MS4-owned Stormwater Management Facilities
- 4.1 TMDL Reports for Watersheds in Monroe County
- 4.2 Watershed Management Plans for Watersheds in Monroe County
- 5.1 Stormwater Requests Received from 2018 through 2022

LIST OF FIGURES

- 2.1 Monroe County MS4 Area Map

LIST OF APPENDICES

- A Map of Monroe County MS4 Area
- B Map of Land Use within the Monroe County MS4 Area
- C Monroe County MS4 Outfalls and Receiving Waterbodies
- D Map of Stormwater Requests Received 2018 through 2022

1.0 INTRODUCTION

Monroe County, Indiana, covers 412 mi² and is located approximately 35 miles south of the City of Indianapolis. Within Monroe County there are five (5) entities operating under coverage of the State's Phase II Municipal Separate Storm Sewer System (MS4) General Permit (MS4GP): the City of Bloomington, the Town of Ellettsville, Indiana University – Bloomington, Ivy Tech Community College – Bloomington, and unincorporated Monroe County. The unincorporated Monroe County and Ivy Tech Community College – Bloomington MS4s operate as co-permittees as established through a Memorandum of Agreement, and these MS4s will be the focus of this report.

The unincorporated Monroe County MS4 area (referred to in this report as the MC MS4) consists of all land within the County boundary, minus the land within the corporate limits of the City of Bloomington and the Town of Ellettsville. The MC MS4 Program is housed within the Monroe County Highway Department and includes 4 full-time MS4 program staff as well as a 7-person Stormwater Crew for managing stormwater utility operations. The stormwater utility is funded by a stormwater fee, which was first implemented in 2013 and increased to \$75.77 annually per Equivalent Residential Unit in March 2021.

This report fulfills the requirements of Section 3.0 of the Indiana MS4GP for the completion of a Water Quality Characterization Report for MC MS4 and Ivy Tech Community College – Bloomington. The following information is included in this report:

1. An assessment of land use;
2. An inventory of MS4 owned/operated structural stormwater management measures that are operated for the purpose of stormwater quality, stormwater management, and flood control;
3. The identification of all receiving waters that receive discharges from outfalls within the MS4 area, including wetlands and lakes;
4. The identification of 303(d) listed waters and Total Maximum Daily Load (TMDL) reports for receiving waters;
5. The identification of known sensitive areas including, but not limited to, public swimming areas, drinking water intakes, habitats associated with threatened or endangered species, and outstanding state and national resource waters;
6. A review and summary of existing and available monitoring data of the MS4 receiving waters, including as applicable, data that can be correlated from stream reach characterization and evaluation reports (SRCER);
7. The identification of areas that have a reasonable potential for or are actually contributing to stormwater quality problems based on available land use and complaint information and relevant chemical, biological and physical data;
8. An evaluation of data collected to determine which areas or specific discharge points that may need to be considered for future planning and implementation of new stormwater measures or modification of existing measures. The highest priority should be given to sensitive areas and the prohibition of new or significantly increased MS4 discharges.

This report serves as an update to Monroe County's previous Water Quality Characterization Report, dated April 2004.

2.0 MS4 AREA AND MS4 RECEIVING WATERBODIES

Monroe County is located in the interior plateau ecoregion of south-central Indiana, and the landscape is characterized by karst topography, steep rocky hills, and streams in deep valleys. The county is situated on the Crawford Upland and the Mitchell Plateau geological regions, which are known for their sandstone, siltstone, and limestone bedrock. The area receives an average of 50.9 inches of rainfall annually.

Monroe County is the twelfth (12th) most populous county in the state with a total population of 148,219 people. From 2010 to 2020, the population of the MC MS4 area increased 19.6%, from 51,716 people to 61,846 people (Stats Indiana). The county is expected to continue to increase in population and will see further development of rural areas outside the City of Bloomington and Town of Ellettsville municipal limits.

This section will provide an assessment of current land use within the MC MS4 area, a description of the County's drainage patterns, a summary and analysis of receiving waters for the MC MS4, and an inventory of stormwater management facilities owned and/or operated by the MC MS4.

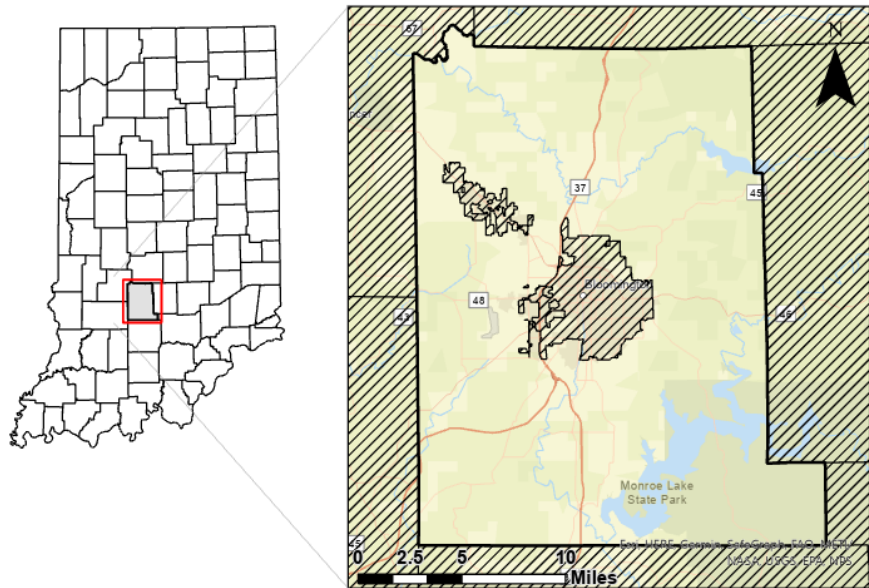


Figure 2.1: Location map for the Monroe County MS4. A full-page map of the Monroe County MS4 area can be found in Appendix A.

2.1 LAND USE ASSESSMENT

The predominant land use in the MC MS4 area is forested (67%), while 9% is developed. Most of the developed area occurs in the urbanizing areas around the City of Bloomington and the Town of Ellettsville. Other incorporated areas and rural towns include the towns of Stinesville, Smithville, and Harrodsburg. Lake Monroe and Lake Lemon comprise most of the open water in the MS4 area. Wetland areas can mostly be found in the headwaters of Lake Monroe, as well as in the bottomlands of Bean Blossom Creek. Row crop land uses are mostly found in floodplains of larger rivers, including Bean Blossom Creek, McCormick's Creek, Sinking Creek, and around the Monroe County Airport.

Major changes in land use that have occurred since the original Water Quality Characterization Report was completed for the MC MS4 in 2004 include the construction of I-69, increased development in the urbanizing area around Bloomington and Ellettsville, and the expansion of quarrying activities in the county.

Table 2.1: Land Use for the Unincorporated Monroe County MS4 Area. The National Land Cover Database (NLCD) layer for 2019 was used to calculate the percentage of land uses based on a 30-meter resolution dataset. All layers were projected to UTM Zone 16N.

Land Use	Area (acres)	MS4 Area %
Developed, Open Space	14,630	6.0%
Developed, Low Intensity	3,913	1.6%
Developed, Medium Intensity	2,378	1.0%
Developed, High Intensity	729	0.3%
Barren Land (Rock/Sand/Clay)	1,430	0.6%
Deciduous Forest	152,710	62.3%
Evergreen Forest	491	0.2%
Mixed Forest	11,088	4.5%
Shrub/Scrub	613	0.3%
Grassland/Herbaceous	4,457	1.8%
Pasture/Hay	28,445	11.6%
Cultivated Crops	11,970	4.9%
Open Water	11,223	4.6%
Woody Wetlands	637	0.1%
Emergent Herbaceous Wetlands	260	0.1%
TOTAL	244,973	100%

2.2 WATERSHEDS WITHIN THE MS4 AREA

Monroe County is bisected by a HUC-08 boundary delineating the East and West Forks of the White River. The northern half of Monroe County drains west towards the West Fork White River (Upper White) watershed, while the southern half of the County drains south towards the East Fork White River (Lower White) watershed. There are ten HUC-10 watersheds that drain into or from the MC MS4 area (Table 2.2). Two of the watersheds are named “Indian Creek” so they have been labeled as “Indian Creek (Northeastern Monroe County)” and “Indian Creek (Southwestern Monroe County)” for clarity. These HUC-10 watersheds can be further subdivided into twenty-eight (28) HUC-12 subwatersheds that drain into or from the MS4 area (Table 2.3).

Table 2.2: HUC-10 Watersheds in Monroe County. Watershed acres only for the Monroe County MS4 area.

HUC-10 Name	HUC-10 Code	Basin	Area (acres)
Indian Creek (NE Monroe County)	0512020116	Upper White	1,867
Butler Creek – White River	0512020117	Upper White	9,193
Bean Blossom Creek	0512020201	Lower White	75,208
Fish Creek – White River	0512020202	Lower White	9,730
Plummer Creek	0512020203	Lower White	13,036
North Fork Salt Creek	0512020806	Lower East Fork White	23,897
Lake Monroe – Salt Creek	0512020807	Lower East Fork White	42,468
Lower Salt Creek	0512020808	Lower East Fork White	46,710
Indian Creek (SW Monroe County)	0512020809	Lower East Fork White	22,831

Table 2.3: HUC-12 Subwatersheds in Monroe County. Watershed acres are only for the Monroe County MS4 area.

HUC-12 Name	HUC-10 Name	HUC-12 Code	Area (acres)
Sand Creek – Indian Creek	Indian Creek (NE Monroe County)	051202011603	1,867
Little Indian Creek	Butler Creek – White River	051202011701	2,768
Burkhart Creek – White River	Butler Creek – White River	051202011702	3,866
Fall Creek – White River	Butler Creek – White River	051202011703	948
Indian Creek – White River	Butler Creek – White River	051202011704	1,611
Lake Lemon – Bean Blossom Creek	Bean Blossom Creek	051202020103	5,420
Honey Creek – Bean Blossom Creek	Bean Blossom Creek	051202020104	13,520
Buck Creek – Bean Blossom Creek ⁺	Bean Blossom Creek	051202020105	16,745
Stout Creek – Bean Blossom Creek ⁺	Bean Blossom Creek	051202020106	14,983
Indian Creek – Bean Blossom Creek	Bean Blossom Creek	051202020107	11,669
Jack’s Defeat Creek – Bean Blossom Creek ^{**}	Bean Blossom Creek	051202020108	12,871
Limestone Creek – White River	Fish Creek – White River	051202020202	3,070
Fall Creek – White River [*]	Fish Creek – White River	051202020203	3,606
Little Raccoon Creek – Raccoon Creek	Fish Creek – White River	051202020206	3,053
Little Richland Creek – Richland Creek ⁺	Plummer Creek	051202020301	13,014
Brummett Creek – North Fork Salt Creek [*]	North Fork Salt Creek	051202080605	9,676
Stephens Creek – North Fork Salt Creek	North Fork Salt Creek	051202080606	14,221
Jacobs Creek – Lake Monroe	Lake Monroe – Salt Creek	051202080701	14,016
Moore Creek – Lake Monroe ⁺	Lake Monroe – Salt Creek	051202080702	18,227
Allens Creek – Lake Monroe	Lake Monroe – Salt Creek	051202080703	10,225
Jackson Creek – Clear Creek ^{**}	Lower Salt Creek	051202080801	6,427
May Creek – Clear Creek ^{**}	Lower Salt Creek	051202080802	18,852
Little Clear Creek – Clear Creek ^{**}	Lower Salt Creek	051202080803	11,396
Hunter Creek – Little Salt Creek	Lower Salt Creek	051202080804	6,266
Knob Creek – Little Salt Creek	Lower Salt Creek	051202080805	2,667
Wolf Creek – Salt Creek	Lower Salt Creek	051202080806	1,102
Headwaters Indian Creek	Indian Creek (SW Monroe County)	051202080901	11,192
Little Indian Creek – Indian Creek	Indian Creek (SW Monroe County)	051202080902	11,639

* Contains a Monroe County Critical Watershed as determined by the Monroe County Drainage Board.

⁺ Identified as a Monroe County MS4 Receiving Waterbody.

2.3 MS4 RECEIVING WATERBODIES

The Monroe County MS4 has mapped eighty-seven (87) outfalls that discharge stormwater from the MS4 into eight (8) of the HUC-12 watersheds in Monroe County. These watersheds are identified as MS4 Receiving Waterbodies and are described in Table 2.4, with additional land use information in Table 2.5.

Table 2.4: Monroe County MS4 Receiving Waterbodies.

HUC-12 Name	HUC-12 Code	Outfalls	TMDL
Jacks Defeat Creek – Bean Blossom Creek	051202020108	25	Bean Blossom Creek TMDL for <i>E. coli</i> (2006)
Stout Creek – Bean Blossom Creek	051202020106	3	Bean Blossom Creek TMDL for <i>E. coli</i> (2006)
Buck Creek – Bean Blossom Creek	051202020105	5	Bean Blossom Creek TMDL for <i>E. coli</i> (2006)
Little Richland Creek – Richland Creek	051202020301	14	Richland Creek TMDL for <i>E. coli</i> (2006)
May Creek – Clear Creek	051202080802	18	Lower Salt Creek TMDL for <i>E. coli</i> (2018)
Jackson Creek – Clear Creek	051202080801	18	Lower Salt Creek TMDL for <i>E. coli</i> (2018)
Moore Creek – Lake Monroe	051202080702	3	N/A
Little Clear Creek – Clear Creek	051202080803	1	Lower Salt Creek TMDL for <i>E. coli</i> (2018)

Jacks Defeat Creek – Bean Blossom Creek

The Jacks Defeat Creek watershed contains 25 outfalls and drains from south to north through the Town of Ellettsville. Due to severe flooding concerns within the Town of Ellettsville and across SR 46, the Monroe County Drainage Board identified the portion of the Jacks Defeat Creek watershed upstream from the Town of Ellettsville as a Critical Watershed. All twenty-five of the MC MS4 outfalls in the Jacks Defeat Creek Watershed are located around the Town of Ellettsville. The Town of Stinesville is also in this watershed, located in the northwest portion of the county near Bean Blossom Creek.

Stout Creek – Bean Blossom Creek

The Stout Creek watershed drains the northwest side of the City of Bloomington north towards Bean Blossom Creek and contains Bloomington’s Blucher-Poole Wastewater Treatment Plant. This watershed contains 3 outfalls, which are all located near the City of Bloomington limits.

Buck Creek – Bean Blossom Creek

The Buck Creek watershed contains 5 outfalls and drains the north part of the City of Bloomington and the north part of Indiana University’s campus, including their golf course and new hospital. A notable landuse in this watershed on the north side of Bloomington is the former Bennett’s quarry, which was a superfund site that was delisted in 2021 and purchased by the Monroe County Commissioners in 2022.

Little Richland Creek – Richland Creek

The headwaters of the Little Richland Creek watershed contain a sinking stream called Cave Creek, which drains 4.2 mi² on the west side of Bloomington. The Cave Creek subwatershed is labeled a Critical Watershed by the Monroe County Drainage Board due to severe flooding issues at the terminal streamsink. Several notable land uses in the Cave Creek subwatershed include the Monroe County Airport (Rule 6 facility), Ivy Tech Community College – Bloomington (MS4 co-permittee), Cook Medical Campus, and the Fieldstone PUD. Within the Fieldstone PUD is a regional detention facility with sluice gates designed to detain stormwater longer than 48-hour duration. The Fieldstone HOA owns the detention facility and is responsible for maintenance, although the MC MS4 operates the controls for the sluice gates. The remainder of the Little Richland Creek watershed is forested or agriculture, with a large quarry owned by Rogers Group on Oard Road. All but one of the fourteen outfalls in the Little Richland Creek watershed are in the Cave Creek subwatershed.

Table 2.5: Land Use for the Monroe County MS4 Area Receiving Watersheds shown in acres followed by percentage of land use for the watershed in parentheses. The 2019 National Land Cover Database (NLCD) layer was used to calculate the percentage of land uses based on a 30-meter resolution raster dataset. All layers were projected to UTM Zone 16N.

Land Use	Jacks Defeat	Stout	Buck	Richland	May	Jackson	Moore	Little Clear
Open Space	1,213 (9.4)	950 (6.3)	1,188 (7.1)	784 (6)	1,433 (7.6)	1,210 (18.9)	920 (5)	711 (6.2)
Developed,	481 (3.7)	377 (2.5)	252 (1.5)	254 (2)	630 (3.3)	755 (11.8)	163 (0.9)	234 (2.1)
Developed, Med	192 (1.5)	326 (2.2)	115 (0.7)	224 (1.7)	580 (3.1)	415 (6.5)	70 (0.4)	68 (0.6)
Developed, High	60 (0.5)	104 (0.7)	32 (0.2)	90 (0.7)	238 (1.3)	91 (1.4)	16 (0.1)	13 (0.1)
Barren Land	173 (1.3)	40 (0.3)	19 (0.1)	414 (3.2)	363 (1.9)	13 (0.2)	70 (0.4)	62 (0.5)
Deciduous Forest	6,146 (47.7)	7,718 (51.5)	11,428 (69)	7,715 (59.3)	9,314 (49.4)	1,435 (22.3)	11,567 (64)	5,472 (48)
Evergreen Forest	26 (0.2)	13 (0.1)	10 (0.1)	40 (0.3)	34 (0.2)	6 (0.1)	35 (0.2)	17 (0.1)
Mixed Forest	906 (7)	609 (4.1)	434 (2.6)	802 (6.2)	1,268 (6.7)	297 (4.6)	436 (2.4)	565 (5)
Shrub	30 (0.2)	40 (0.3)	17 (0.1)	51 (0.4)	71 (0.4)	18 (0.3)	19 (0.1)	88 (0.8)
Grassland	409 (3.2)	282 (1.9)	107 (0.6)	495 (3.8)	284 (1.5)	40 (0.6)	132 (0.7)	55 (0.5)
Pasture	2,171 (16.9)	2,418 (16.1)	2,188 (13.1)	1,122 (8.6)	3,886 (20.6)	1,962 (30.6)	923 (0.7)	3,637 (31.9)
Cultivated Crops	1,047 (8.1)	1,712 (11.4)	883 (5.3)	987 (7.6)	698 (3.7)	160 (2.5)	123 (0.7)	454 (4)
Open Water	16 (0.1)	15 (0.1)	39 (0.2)	30 (0.2)	44 (0.2)	10 (0.2)	2,736 (20.5)	7 (0.1)
Woody Wetlands	0 (0)	320 (2.1)	32 (0.2)	0 (0)	9 (0)	2 (0)	12 (0.1)	6 (0.1)
Emergent Wetland	2 (0)	57 (0.4)	2 (0)	6 (0)	2 (0)	7 (0.1)	8 (0)	11 (0.1)
TOTAL AREA*	12,872	14,981	16,745	13,013	18,854	6,421	18,228	11,402

* Watershed total acres were calculated from a 30-meter resolution raster and do not exactly match those in Table 2.3 (vector data).

May Creek – Clear Creek

The headwaters of the May Creek watershed are comprised of two sinking stream basins: Sinking Creek and Bunger Branch. Both watersheds are listed as Critical Watersheds by the Monroe County Drainage Board. Both Sinking Creek and Bunger Branch drain underground and discharge at a spring at Leonard Springs Nature Park, owned by the City of Bloomington Parks and Recreation Department. The Sinking Creek watershed is heavily developed with commercial and industrial properties and contains the former Westinghouse facility that was remediated in the early 2000s. That area is now being developed as a business park and contains a regional retention pond under ownership and maintenance of the business association. Almost all the outfalls in the May Creek watershed are in the Sinking Creek watershed. Bloomington’s Dillman Road Wastewater Treatment Plant is located within this watershed on Clear Creek just downstream from the Jackson Creek – Clear Creek watershed.

Jackson Creek – Clear Creek

The Jackson Creek – Clear Creek watershed contains the urbanized area on the west and south sides of the City of Bloomington. This watershed is the most developed of all the receiving waters. Nearly all of the development is residential, and includes the Bloomington Country Club golf course. There are 18 outfalls in this watershed.

Little Clear Creek – Clear Creek

The Little Clear Creek watershed drains Clear Creek south towards Bedford and contains one outfall. The rural towns of Smithville and Harrodsburg are in this watershed.

Moore Creek – Lake Monroe

The Moore Creek – Lake Monroe watershed is the only MS4 receiving waterbody that drains to Lake Monroe. Due to the protections provided by the County’s Environmental Constraints Overlay zoning ordinance, it is not considered a Critical Watershed.

2.5 INVENTORY OF MS4-OWNED STORMWATER MANAGEMENT FACILITIES

The Monroe County MS4 Program includes a county-wide Stormwater Utility responsible for the operation and maintenance of 3,041 stormwater inlets, 50 miles of stormwater pipes, 3,425 culverts, and ditches along 700 miles of roads. In addition, the stormwater facilities listed in Table 2.6 are owned and/or operated by Monroe County.

Table 2.6: Inventory of stormwater management facilities owned or operated by the Monroe County MS4 Program.

BMP Type	BMP Name	Coordinates	Location	Condition
Detention Pond	Highway Garage 1	39.1407, -86.6092	5850 W Foster Curry Drive	Good
Detention Pond	Highway Garage 2	39.1422, -86.6076	5850 W Foster Curry Drive	Good
Detention Pond	Highway Garage 3	39.1423, -86.6068	5850 W Foster Curry Drive	Good
Detention Pond	Whitehall Plaza	39.1612, -86.5751	3477 W 3 rd St.	Good
Detention Pond	Northwest Park 1	39.1859, -86.5965	4801 W Vernal Pike	Fair
Detention Pond	Northwest Park 2	39.1857, -86.5931	4841 W Old Vernal Pike	Fair
Detention Pond	Northwest Park 3	39.1834, -86.5931	4738 W Vernal Pike	Fair
Mechanical	Aquaswirl 1	39.1214, -86.5383	W Gordon Pike, 240 ft. east of S Rogers St.	Fair
Mechanical	Aquaswirl 2	39.1214, -86.5365	W Gordon Pike, 740 ft. east of S Rogers St.	Fair
Mechanical	Aquaswirl 3	39.1214, -86.5364	W Gordon Pike, 780 ft. east of S Rogers St.	Fair
Sluice Gates	Fieldstone Dam*	39.1595, -86.6068	S Fieldstone Blvd. (access via S West Lake Ct.)	Good

* The Fieldstone HOA owns and maintains the Fieldstone dam and regional detention facility, however the Monroe County MS4 operates the controls for the dam sluice gates.

3.0 SENSITIVE AREAS

3.1 KARST

Karst is a type of topography characterized by the heavy erosion of limestone, which causes ridges, sinkholes, and underground drainage networks. Within Monroe County, most of the karst features manifest themselves either as sinkholes or karst springs. Karst areas provide a direct connection between surface runoff and groundwater, so water quality protection in these areas is very important.

In 1997, the Indiana Geological Survey located karst springs in the southern portion of the state. The study found 57 springs in the unincorporated county (with an additional 10 in Bloomington), all of them on the west side of the county. It should be noted that Monroe County contains an area with the highest density of caves in the State of Indiana, which includes 15+ caves per square mile. In 2011, the Indiana Geological Survey oversaw another study on karst, this time tracking sinkholes in the state. There were 2,109 sinkholes in unincorporated Monroe County (2,304 in the entire county including Bloomington), and like the locations of springs, they are on the West side of the county. The sinkhole inventory was mostly completed via desktop survey and doesn't include all sinkholes in the county; however it gives a good representation of most sinkhole areas.

There are three major sinking stream basins in the unincorporated county: Sinking Creek, Cave Creek, and Bunger Branch. All three of these watersheds are listed as Critical Watersheds by the Monroe County Drainage Board and have restrictions on drainage design for new development. There are also several areas with large, closed contours and smaller sinking streams in the county: one is a large 100-acre closed contour around the Ison Road area located 5 miles southwest of the City of Bloomington, and the other is a 70-acre closed contour by Reeves Road west of the Town of Ellettsville.

3.2 PUBLIC DRINKING WATER SOURCES

A public water supply is designated as a "public water supply for the public provision of piped water for human consumption" if said supply has at least 15 service connections, or regularly serves on average 25 individuals at minimum. Monroe County has 11 active drinking water supply systems and 9 inactive systems, with 2 sourcing water from surface water, 8 from purchased surface water, and 1 from groundwater. The most notable public water source is Lake Monroe, the state's largest reservoir that provides drinking water to the City of Bloomington and surrounding counties. There are no community public water supply systems with Wellhead Protection Plans in Monroe County.

3.3 RECREATIONAL WATERS AND PUBLIC SWIMMING AREAS

The primary recreational waters in the MC MS4 area include Lake Monroe and Lake Lemon. Visitors enjoy boating, kayaking, fishing, swimming, and birding in and around these waterbodies. Lake Monroe has two public beaches at Paynetown State Recreation Area and Fairfax State Recreation Area. There are boat ramps available at Paynetown State Recreation Area, Fairfax State Recreation Area, Cutright State Recreation Area, Pine Grove State Recreation Area, and Allens Creek State Recreation Area. Lake Lemon has two public beaches accessible with a purchased annual pass and allows boating with a permit purchased from the LLCDC.

In addition, numerous streams and rivers are designated for recreational use. Larger streams such as Bean Blossom Creek and the White River are available for kayaking. Multiple nature preserves have been established near floodplains and river bottoms over the years that have hiking opportunities near waterways. These include Bean Blossom Bottoms, Powell Preserve, Amy Weingartner Branigin

Peninsula, and Cedar Bluffs. State and Federal-managed properties with access to water include Morgan-Monroe State Forest, Stillwater Marsh Waterfowl Resting Area, North Fork State Wildlife Refuge, Muscatatuck National Wildlife Refuge, Hardin Ridge Recreation Area, Salt Creek State Recreation Area, Fairfax State Recreation Area, Monroe Lake Spillway, Allens Creek State Recreation Area, Cutright State Recreation Area, Paynetown State Recreation Area, Cartop State Recreation Area, and Pine Grove State Recreation Area.

3.4 WETLANDS AND FLOODPLAINS

According to the National Wetlands Inventory, there are approximately 17,920 acres of wetlands in Monroe County, most of which consists of Lake Monroe and Lake Lemon. Most forested and emergent wetlands are in the headwaters of Lake Monroe and in the floodplain of Bean Blossom Creek. The Bean Blossom Creek watershed spans the northern third of Monroe County and has the largest drainage area of any stream in Monroe County and therefore has the most extensive floodplain network. Many of the bottomlands in the north part of the county are farmed for conventional crops. The floodplains for Clear Creek south of Bloomington and Sinking Creek and Cave Creek on the west side of Bloomington, are affected by urban development and see extensive flash flooding and stream bank erosion.

3.5 STEEP SLOPES AND HIGHLY ERODIBLE SOILS

The Soil Survey for Monroe County identifies approximately 178,139 acres (68%) of highly erodible and potentially highly erodible soils. Additionally, the Soil Survey identifies approximately 168,576 acres (64%) as “unusable” or “severely limited” for onsite wastewater treatment. Monroe County’s characteristic steep slopes and ravines are predominantly forested because colonial settlers in the 1800s determined the land was unsuitable for farming (after removing almost all the valuable timber). Conservation efforts gained momentum in the 1930s with the federal purchase of the Hoosier National Forest and continued in 1943 with the creation of the Monroe County Soil & Water Conservation District. Despite successful efforts to restore forests, erosion is still an issue for steep slopes and ravines. To prevent further damage to these sensitive areas, Monroe County’s Planning Department implements a 15% slope restriction for new development in the County.

3.6 THREATENED AND ENDANGERED SPECIES HABITAT

Monroe county’s diverse landscape with large forests, caves, and reservoirs offers a variety of habitat for sensitive species. According to the IDNR’s Division of Nature Preserves Natural Heritage Data for the State of Indiana, Monroe County hosts 22 insects, 6 crustaceans, 8 mollusks, 2 arachnida, 4 amphibians, 5 reptiles, 12 birds, 11 mammals, and 9 vascular plants listed as endangered, threatened, or rare that live in wetland areas. In addition, the High Quality Natural Communities on Indiana’s endangered, threatened, and rare species list for Monroe County includes forests and caves. More specifically, Mesic Floodplain Forest, Highland Rim Dry Upland Forest, Highland Rim Dry-mesic Upland Forest, Highland Rim Mesic Upland Forest, Aquatic Cave, and Limestone Caves are the High Quality Natural Communities on Indiana’s endangered, threatened, and rare species list for Monroe County.

4.0 SUMMARY OF EXISTING MONITORING DATA

The Indiana MS4 General Permit requires that all known existing and available monitoring data for the Monroe County MS4 area receiving waters are reviewed, including data garnered from compliance, chemical, biological, land use, and physical data. This section will detail and evaluate the known and available data for the Monroe County MS4 area receiving waters.

4.1 IDEM 305(B) REPORT AND 303(D) LIST OF IMPAIRED WATERS

Per Section 305(b) of the Clean Water Act, Indiana is required to assess streams and lakes throughout the state and determine which waterbodies are impaired, or do not meet the state's water quality standards. Every two years, IDEM publishes an updated Integrated Water Monitoring and Assessment Report (IR) for the state describing the condition of Indiana's lakes and streams. As of 2022, IDEM has assessed approximately 53% of Indiana streams for recreational use and approximately 58% of streams for aquatic life.

According to the 2022 IR Consolidated List of water bodies, there are 82 assessment units (stream sections and lakes) in Monroe County that have been evaluated. Of those water bodies, 39 are included on the 303(d) list of impaired waters. Impairments include PCBs in fish tissue, mercury in fish tissue, elevated nutrients, elevated *E. coli* levels, low biological integrity, low dissolved oxygen, algae, and/or taste issues. Only 20 of the 28 subwatersheds in Monroe County were sampled as part of the assessment and impaired water bodies were found in 15 of those subwatersheds.

However, it should be noted that 71 of the 82 assessment units are classified as 4A water bodies for *E. coli*. These water bodies were identified as having elevated levels of *E. coli* but then TMDLs were developed for each water body. Because the TMDLs are designed to address the water quality issue, these assessment units were removed from the 303(d) list even though they likely continue to have elevated *E. coli* levels. This means that 81 of the 82 assessment units (and all 20 of the sampled subwatersheds) either currently have an impairment or have a TMDL developed to address an *E. coli* impairment. The sole exception is an unnamed tributary of Little Salt Creek in the Knob Creek – Little Salt Creek subwatershed.

4.2 TOTAL MAXIMUM DAILY LOAD REPORTS

According to IDEM's 2022 Integrated Report, TMDLs have been developed for 71 of the 82 evaluated assessment units in Monroe County to address elevated *E. coli* levels (Table 4.1). This includes the Lower Salt Creek watershed in 2018, the West Fork White River watershed (aka Fish Creek watershed) in 2007, the Bean Blossom watershed in 2006, Richland Creek in the Plummer Creek watershed in 2006, and the Indian Creek watershed (including Robertson Creek in northeastern Monroe County) in 2005. All affected waterbodies have a target *E. coli* WQS of 125 colonies per one hundred milliliters as a 30-day geometric mean.

Indian Creek Watershed TMDL (2005)

In 2005, a TMDL was developed for Indian Creek in northeastern Monroe County for *E. coli*. IDEM sampled 26 sites 5 times over the course of 30 days in 2001. All 26 sites violated the single sample maximum state standard at least once. Of the 24 sites where a geometric mean could be calculated, 20 exceeded the geometric mean standard. The target concentration is 125 colonies per one hundred milliliters as a 30-day geometric mean of five samples.

Table 4.1: TMDL Reports for watersheds in Monroe County.

TMDL Name	Year
Indian Creek Watershed TMDL for <i>E. coli</i>	2005
Middle West Fork White River Watershed TMDL for <i>E. coli</i>	2005
Bean Blossom Creek TMDL for <i>E. coli</i>	2006
Richland Creek Watershed TMDL for <i>E. coli</i>	2006
West Fork White River Watershed TMDL for <i>E. coli</i>	2007
Lower Salt Creek Watershed TMDL for <i>E. coli</i>	2018

Bean Blossom Creek TMDL (2006) and Richland Creek TMDL (2006)

In 2006, TMDLs were developed for both Bean Blossom Creek in northern Monroe County and Richland Creek in western Monroe County (part of the Plummer Creek watershed) for *E. coli*. In Bean Blossom Creek, 9 bodies of water were identified as containing *E. coli* impairment, and in Richland Creek, 8 bodies were identified as containing *E. coli* impairment. The Richland Creek watershed ranges over three counties; 80.20 % of the watershed is in Greene County, 19.20 % is in Monroe County, and 0.60 % is in Owen County. Bean Blossom Creek also touches multiple jurisdictions outside of this MS4 area, and as such, the relative responsibility for achieving the necessary reductions of bacteria and maintaining acceptable conditions is determined by the amount of land under the jurisdiction of the various local units of government within the watershed. Both areas have a target *E. coli* WQS of 125 colonies per one hundred milliliters as a 30-day geometric mean.

Lower Salt Creek TMDL (2018)

The 2018 TMDL for Lower Salt Creek identified 19 sample sites that violated the geometric mean of 125 MPN/100mL and/or secondary assessment methods. Potential sources of contamination include wastewater treatment plants (WWTPs), Municipal Separate Storm Sewer Systems (MS4s), field runoff, and direct deposition from livestock and wildlife. Most contamination occurs during the moist and dry flow regimes, so implementation of controls should target these conditions, and it is estimated that reductions needed to achieve water quality standards range from 47-94 percent.

West Fork White River TMDL (2007)

A TMDL was developed for West Fork White River in 2007 for *E. coli*. To develop the TMDL, IDEM sampled 44 sites in the WFWR Owen County tributary watershed. 43 of the 44 samples were collected 5 times, evenly spaced, within 30 days from May 30, 2006, to June 27, 2006. All 43 violated the geometric mean, though most are not located within the Monroe County MS4 area. For the WFWR Owen County tributary watershed during the recreational season (April 1st through October 31st) the target level is an *E. coli* WQS of 125 per one hundred milliliters as a 30-day geometric mean. It is estimated that reductions needed to achieve water quality standards range from 48-87 percent.

4.3 WATERSHED MANAGEMENT PLANS

All ten of the HUC-10 watersheds in the MS4 area have been studied over the last twenty years (Table 4.2). Eight have watershed management plans developed with funding from the Clean Water Act 319 non-point source pollution reduction grant program. The Indian Creek watershed in northeastern Indiana has a diagnostic study (similar to a watershed management plan) developed through the Indiana Department of Natural Resources (INDNR) Division of Fish & Wildlife's Lake and River Enhancement (LARE) Program. The tenth watershed (Butler Creek – White River) was studied as part of a larger assessment of the Upper White River. Each plan identifies and quantifies the top pollutants of concern,

identifies potential sources, and proposes activities in the watershed that will improve water quality in the target water body and its tributaries.

Table 4.2: Watershed Management Plans for watersheds in Monroe County.

Watershed Management Plan	Year	Sponsor Agency
Indian Creek LARE Diagnostic Study	2001	Johnson County SWCD
Lower White River (Owen County) Watershed Management Plan	2006	Owen County SWCD
Indian Creek Watershed Management Plan	2009	Johnson County SWCD
Bean Blossom Creek Watershed Management Plan*	2009	Monroe County SWCD
Upper White River Watershed Regional Watershed Assessment and Planning Report	2011	White River Alliance
Plummer Creek Watershed Management Plan	2015	Greene County SWCD
Lake Monroe Watershed Management Plan*	2022	Friends of Lake Monroe
Lower Salt Creek Watershed Management Plan*	TBD	Lawrence County SWCD

* These projects encompass large areas of Monroe County.

Indian Creek (Southwestern Monroe County) Lake and River Enhancement Diagnostic Study (2001)

In 2001, a diagnostic study was completed for Indian Creek which spans portions of Monroe, Greene, Lawrence, and Martin Counties. This report is like a watershed management plan in nature and includes identification of nonpoint source pollution water quality issues and proposes solutions. The main nonpoint source pollutants of concern were identified as sediment, nutrients, animal wastes (including human waste), pesticides, salt, and toxics. Recommendations included conservation practices on farms and forests, improved septic system maintenance, wetland restoration, encouraging xeriscaping (landscaping with native plants), streambank stabilization, and reducing the use of pavement. Kirksville and Stanford in Monroe County were identified as areas experiencing ongoing residential development.

Lower White River Watershed Management Plan, Owen County (2006)

A watershed management plan was developed by the Owen County Watershed Initiative for a portion of the Lower White River watershed in 2006. This watershed spans portions of Owen and Monroe Counties including McCormick’s Creek and Big Creek in northwestern Monroe County. Primary concerns were *E. coli*, nitrates, and sediment/turbidity. Primary sources were agriculture (crops and livestock), forestry without erosion control protection, construction without erosion control protection, and failing septic systems.

Indian Creek (Northeast Monroe) Watershed Management Plan (2009)

A watershed management plan was developed for Indian Creek by the Johnson County Soil & Water Conservation District in 2009. This watershed spans portions of northeastern Monroe County, southeastern Morgan County, southwestern Johnson County, northern Brown County including Robertson Creek in northeastern Monroe County. *E. coli* was the primary concern as a TMDL had been developed for Indian Creek in 2005.

Bean Blossom Creek Watershed Management Plan (2009)

A watershed management plan was developed for Bean Blossom Creek and Lake Lemon in 2009 (which the Monroe County Soil & Water Management District hopes to update in 2025). This replaced a watershed management plan developed for Lake Lemon using LARE funding in 2002. The primary concerns were *E. coli*, sediment, nutrients, and a lack of awareness around the issues. *E. coli* was detected in elevated levels throughout Bean Blossom Creek although levels were below the state

standards in Lake Lemon and Griffy Lake. Human waste from failing septic systems and animal waste from poor livestock manure management were both identified as likely sources of *E. coli*. Potential sources of sediment included farming, logging, and construction with insufficient protection in areas with highly erodible soil. Sediment accumulation was (and continues to be) a major concern for Lake Lemon, which began dredging sediment in 2006 and is significantly expanding its dredging operations in 2022. Nutrients appear to be coming from fertilizer, sewage, and/or animal manure.

Upper White River Watershed Regional Watershed Assessment and Planning Report (2011)

Published in 2011, this report assesses water quality across the Upper White River Watershed which spans 17 HUC-10 watersheds including two in northern Monroe County: Butler Creek – White River and Indian Creek (Northeast Monroe). The Butler Creek and Indian Creek subwatersheds were the furthest downstream of the study area and were identified as belonging to the Brown County Hills natural region, characterized by hilly topography, a relatively high percentage of forested land (over 40%), and a relatively low percentage of urban land (less than 4%) compared to the rest of the Upper White River Watershed. Indian Creek (Northeast Monroe) had the lowest percentage of impaired streams, despite having a TMDL and watershed management plan focused on addressing elevated *E. coli* levels in some streams. Butler Creek also has a low percentage of impaired streams, despite having a TMDL developed for some streams in the Morgan County portion. The report identified several critical habitat areas in the Butler Creek subwatershed.

Plummer Creek Watershed Management Plan (2015)

A watershed management plan was developed for Plummer Creek in 2015. This watershed spans portions of Owen, Greene, and Monroe Counties. TMDLs had previously been developed for two streams within the watershed – Richland Creek in Monroe County and lower Plummer Creek in Greene County. The Monroe County portion of the watershed has many karst features (caves and sinkholes) that can make management more difficult. The impairments in the Monroe County portion of the watershed (Little Richland-Richland Creek) were *E. coli*, PCBs, and impaired biotic communities.

Lake Monroe Watershed Management Plan (2022)

In 2022, Friends of Lake Monroe published the Lake Monroe Watershed Management Plan covering the Lake Monroe, North Fork Salt Creek, Middle Fork Salt Creek, and South Fork Salt Creek HUC-10 watersheds. Water quality data were collected 2020-2021 by the IU Limnology Lab and the Brown County Regional Sewer District. Historic data collected by IDEM, CBU, USFS, and USACE were also reviewed. The top concerns were identified as sediment, nutrients (phosphorus and nitrogen), and fecal contamination as indicated by elevated *E. coli* levels. Field observations identified streambank erosion, insufficient riparian buffer, and livestock access to streams in most subwatersheds.

Lower Salt Creek Watershed Management Plan (In progress)

In 2021, the Lawrence County Soil & Water Conservation District began the watershed planning process for the Lower Salt Creek watershed following the completion of the Lower Salt Creek TMDL in 2018. The Watershed Management Plan is expected to be completed by the end of 2022.

4.5 LAKE AND RIVER ENHANCEMENT (LARE) PROGRAM

The Lake and River Enhancement (LARE) Program is a grant program administered by the Indiana Department of Natural Resources (DNR) Division of Fish & Wildlife that aims to reduce non-point source pollution in our state's waterways. The LARE Program provides technical and financial assistance for diagnostic studies (similar to watershed management plans), shoreline stabilization projects, aquatic vegetation management, logjam removals, and watershed land treatment implementation projects.

Lake Lemon Sedimentation Studies and Management

Lake Lemon has used LARE funding for a variety of projects over the last 40 years including a sedimentation study in 1974, multiple aquatic vegetation management plans starting in 1999, a watershed management plan in 2002, multiple feasibility studies, and multiple rounds of shoreline stabilization projects. The two biggest challenges for Lake Lemon are sedimentation (due to both shoreline erosion and incoming sediment from the watershed) and aquatic vegetation management. *E. coli* has also been a concern although concentrations are significantly higher in Bean Blossom Creek than in the lake.

Lower White River (Fish Creek) Watershed Management Plan Implementation

The Monroe County Soil & Water Conservation District and the Owen County Soil & Water Conservation District implemented a LARE Watershed Land Treatment grant from 2013 to 2015 in the Lower White River watershed, which includes McCormick's Creek and Big Creek in Monroe County.

Powell Preserve Streambank Stabilization

Sycamore Land Trust received funds from LARE in 2022 for a streambank stabilization project on a tributary to Bean Blossom Creek. This project will protect the parking area and trail while also reducing the amount of sediment entering Bean Blossom Creek.

Brummetts Creek Logjam Removal

In early 2023, the Monroe County Stormwater Program was awarded a LARE grant to remove a small logjam in Brummetts Creek. The project is still awaiting contract execution but is anticipated to be completed in 2023.

4.6 ONGOING LAKE MONITORING

The US Army Corps of Engineers performs annual ambient monitoring of Lake Monroe, and the City of Bloomington Utilities Department conducts hourly sampling of raw lake water at the intake to the Monroe Water Treatment Plant. The Indiana DNR, IDEM, the State Department of Health, and US Forest Service monitor public beaches and swimming areas for elevated concentrations of *E. coli* and the presence of blue-green algae during the recreation season. At Lake Monroe, the beaches at Paynetown State Recreation Area, Fairfax State Recreation Area, and Hardin Ridge are sampled and advisories issued as necessary. The Lake Lemon Conservancy District also collects samples at their beaches during the summer. The Indiana Clean Lakes Program at Indiana University uses Lake Monroe as an annual training site for new staff, so samples are collected and analyzed once annually. The Clean Lakes Program is also contracted by the Lake Lemon Conservancy District to perform water quality monitoring every two years as part of the Lake Lemon Monitoring Program.

4.7 INDIANA UNIVERSITY CAPSTONE STUDIES

Indiana University's O'Neill School of Public and Environmental Affairs requires all graduates to take a semester-long, intensive, research-oriented project during their final year of the program. Capstone projects frequently collaborate with local organizations to help study or solve real-life situations.

Stream Ecology (annually)

The Stream Ecology capstone course at IU studies both Stephens Creek and Brummetts Creek watersheds in the Lake Monroe watershed, alternating which stream is studied each year. Data collected include habitat evaluations, pebble counts, macroinvertebrate surveys, periphyton analysis,

discharge measurements, and analysis of chemical and physical water quality data from January through April.

Sediment Budget for Lake Monroe (2018)

This capstone course developed a rough sediment model for Lake Monroe to quantify sources of sediment in the lake. Using the RUSLE soil loss model with a number of assumptions, the model indicated total soil loss of 38,726 tons/year in the Lake Monroe Watershed, which translates to a watershed soil loss rate of 0.14 tons/acre/year. This was believed to be an underestimate due to the assumptions made and the lack of data around shoreline erosion. The group also estimated that Lake Monroe has a trap efficiency of 90.77% and a lake lifetime of 347,917 years.

Economic Value of Lake Monroe (2019)

This capstone course gathered data in order to calculate the economic value of Lake Monroe. They considered the economic value of drinking water, property, and business income from recreational use. They considered the effect of water quality on treatment costs and property values, the economic impact of recreational activities on local businesses, the value of ecosystem service provided by the lake, and the general valuation of the lake by local residents and businesses.

Shoreline Erosion Modeling for Lake Monroe (2020)

This capstone course worked on quantifying shoreline erosion at Lake Monroe. They developed a mathematical model to extrapolate an erosion rate of 0.01 cubic feet of soil per foot of shoreline per year. This translates to roughly 649 tons of sediment loss per year, or 1.7% of the annual soil loss calculated by the 2018 capstone class. The project included guidelines for collecting future measurements that could be used to refine the model.

4.4 MONROE COUNTY LONG-RANGE STORMWATER IMPROVEMENT PLAN

The Monroe County Highway Department completed the County's first Long-Range Stormwater Improvement Plan in 2016. This report compiled a long list of drainage improvement projects in the county and prioritized them based on impact and feasibility. Some projects were determined based on public input, although most of the projects came from Highway Department staff and the County's Drainage Engineer. Many of the projects have been addressed or completed 7 years later. As of the writing of this report, the two main projects that have been designed and are still awaiting construction include the Baby Creek and Brock Road low water crossing replacements, and the Stipp Road/Moore's Creek Road drainage improvement project at Lake Monroe.

4.9 SUPERFUND SITES AND LEGACY POLLUTANTS

Monroe County previously had three (3) Superfund sites on the National Priorities List: Bennett Stone Quarry, Lemon Lane Landfill, and Neal's Landfill, though these were all removed from the list in September 2021. All three locations had polychlorinated biphenyls (PCBs) contamination, among other concerns. No further action at these sites is needed other than continued operation and maintenance, monitoring, and five-year reviews.

5.0 EVALUATION OF STORMWATER QUALITY CONCERNS

5.1 STORMWATER CONCERNS REPORTED TO THE MS4

Each year, the Monroe County Highway Department receives several hundred calls concerning drainage-related requests. All calls are logged in asset management software called Cartegraph, and tasks are assigned to the Stormwater Crew. The Stormwater Crew has at least 100 open requests at any given time. A summary of requests and calls are provided in Table 5.1.

Table 5.1: Stormwater Program requests received from 2018 through 2022. Data were reported from the Monroe County Highway Department’s Cartegraph asset management system.

Requests	2018	2019	2020	2021	2022
Open	214	379	191	308	283
Closed	163	303	219	285	325
Calls (Open)	255	522	234	395	342
Calls (Closed)	183	383	273	360	429

In 2019 and 2021, major storms occurred that probably accounted for the increase in requests. In 2022, the Stormwater Crew was fully staffed and received a new vac truck and mini excavator, which helped address outstanding concerns. They purposefully worked (very hard) to bring down the number of open requests that year. Most of the requests received are related to drainage more than water quality, although fixing most of the drainage issues usually helps minimize road and ditch erosion.

Stormwater requests are generally distributed evenly throughout the County except for areas within the Hoosier National Forest, where requests are seldom received. Requests have a higher concentration around the west and south sides of the City of Bloomington and the south and east sides of the Town of Ellettsville. A map of the locations of stormwater requests received from 2018 through 2022 is available in Appendix D.

5.2 ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM

The MC MS4 program implements an Illicit Discharge Detection and Elimination Program as part of the MS4 GP requirements. The public can report an illicit discharge by filling out a survey on the Stormwater webpage, by emailing storm@co.monroe.in.us, or by calling one of the main Highway Department phone numbers. Most illicit discharges are reported by concerned citizens, although many are received from other County departments or partnering agencies. Monroe County typically deals with fewer than 10 illicit discharge cases each year. Most cases involve accidents and spills, and very few are intentional discharges. Some cases are tied to larger Planning and Zoning enforcement cases, permitted active construction sites, or Health Department violations. In these cases, problems are usually enforced using other County ordinances. Water quality concerns are more common in urban areas, however there is still high potential for discharges in rural areas where problems are more easily hidden.

6.0 IDENTIFICATION OF PRIORITY AREAS FOR STORMWATER MANAGEMENT

Rule 13 necessitates the identification of areas having reasonable potential for or actually causing stormwater quality problems based upon relevant land use data and identified sensitive areas, as well as existing and available water quality data. These areas are required to be given the highest priority for the selection of BMPs and the prohibition of new or significantly increased MS4 discharges. The following section defines potential problem areas identified for the MC MS4 Area.

6.1 MONROE COUNTY CRITICAL WATERSHEDS

The Monroe County Drainage Board has identified six (6) watersheds in Monroe County that are considered 'Critical Watersheds' due to serious flooding concerns and/or the prevalence of significant natural features such as karst. There are three (3) sinking stream basins on the west side of the county that have drainage areas over 1 mi² and are of major concern to the County in terms of flooding and water quality issues, and are therefore considered Critical Watersheds. Cave Creek drains 4.2 mi² and comprises part of the headwaters of the Little Richland Creek – Richland Creek watershed. Sinking Creek drains 3 mi² and is located in the May Creek – Clear Creek watershed. Bunger Branch drains 1.2 mi² and is also in the May Creek – Clear Creek watershed. Both Sinking Creek and Bunger Branch outlet at Leonard Springs Nature Park, which is owned by the City of Bloomington and maintained by their Parks and Recreation Department. The McCormick's Creek Critical Watershed is located within the Fall Creek – White River watershed and contains highly-studied geologic features that form the headwaters of the stream that runs through McCormick's Creek State Park in Owen County. The last two Critical Watersheds, Jacks Defeat Creek in Ellettsville and Jackson Creek – Clear Creek south of Bloomington, are noted for their flooding concerns in and around these two municipalities. All Critical Watersheds are required to meet more stringent drainage design standards for new development and redevelopment, as required by the Monroe County Drainage Board.

Recommended projects:

- Prepare detailed hydrologic and hydraulic studies for all Critical Watersheds to determine appropriate release rates for 10% AEP and 1% AEP storms. Adopt specific release rates for each watershed.
- Prepare a feasibility study for a sediment removal project at the Sinking Creek terminal streamsink. Pursue supplemental funding through LARE or 319 implementation.
- Assist the Fieldstone HOA with a sediment removal project for the Fieldstone regional detention facility.
- Upgrade Cave Creek monitoring station sensors and SCADA software for the Fieldstone sluice gates.
- Pursue funding for flood mitigation projects, including property buyout if feasible, for residential areas experiencing severe flooding.

6.2 URBAN AREAS

Almost 10% of unincorporated Monroe County is urbanized, and since urbanization is projected to increase in the coming years, it is key that additional growth and development is managed with the intent to minimize negative impacts on overall water quality.

A major contribution to the increase in development in the unincorporated area of the county is that the City of Bloomington has not annexed any property since 2004. This increased development pressure has caused the MC MS4 to enact a significant stormwater fee increase in 2021 (from \$35.16 annually to

\$75.77 annually per ERU – the second-highest county stormwater utility fee in the state), and nearly triple the number of full-time staff dedicated to the program since 2017 (from 4 positions in 2017 to 11 positions in 2022). The City of Bloomington began the process of annexing eight (8) zones in the urbanizing area in 2017 and as of the writing of this report, the process has still not been completed. If this annexation is completed, unincorporated Monroe County will lose an estimated 14,262 people.

Recommended projects:

- Contract out a storm sewer televising program for the older subdivisions around the City of Bloomington and Town of Ellettsville. Analyze video data to prioritize major repairs and preventative maintenance.
- Help the Highway Department transition to only applying brine or salt in urban areas. Avoid sand usage in subdivisions and sinking stream watersheds.

6.3 FORESTS AND FOREST HARVESTING ACTIVITIES

Forests comprise the largest land use in the MC MS4 area, and are important for biodiversity, wildlife habitat, threatened and endangered species habitat, and for soil conservation and water quality considerations. Logging operations can cause soil erosion where forest harvesting best management practices are not utilized.

Recommended projects:

- Expand local Stormwater Permit to cover commercial logging activities (transfer existing Logging Permit requirements from the Zoning Ordinance to the Stormwater Ordinance).

6.4 AGRICULTURAL LANDS

As agricultural land uses account for nearly 17% of land cover within the MC MS4 area and generally occur in flood-prone or karst areas, the implementation of conservation practices on conventionally-farmed fields is of importance to the MS4 program.

Recommended projects:

- Continue to fund the Stormwater Partnership Grants Program for the Monroe County Soil & Water Conservation District (\$35,000 annually for cost-share assistance for drainage and conservation projects on private property). Target implementation funding in the Lake Monroe watershed, Lake Lemon watershed, and sinking stream watersheds.

7.0 ACKNOWLEDGEMENTS AND UPDATES

Monroe County Stormwater Program Staff at the time of the creation of this report:

- Kelsey Thetonia, MS4 Coordinator
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The Monroe County Stormwater Program would like to thank the following people for their research and contributions to this report:

- Maggie Sullivan – Lake Monroe Watershed Coordinator, Friends of Lake Monroe
- Marie Dishian and Forrest Levy – 2021-2023 O’Neill Graduate Stormwater Fellows, Monroe County Stormwater Program

This report should be updated at least annually, with major updates occurring as notable changes in the MS4 area occur and as new outfalls are created. An in-depth update should occur at least once per five-year permit cycle.

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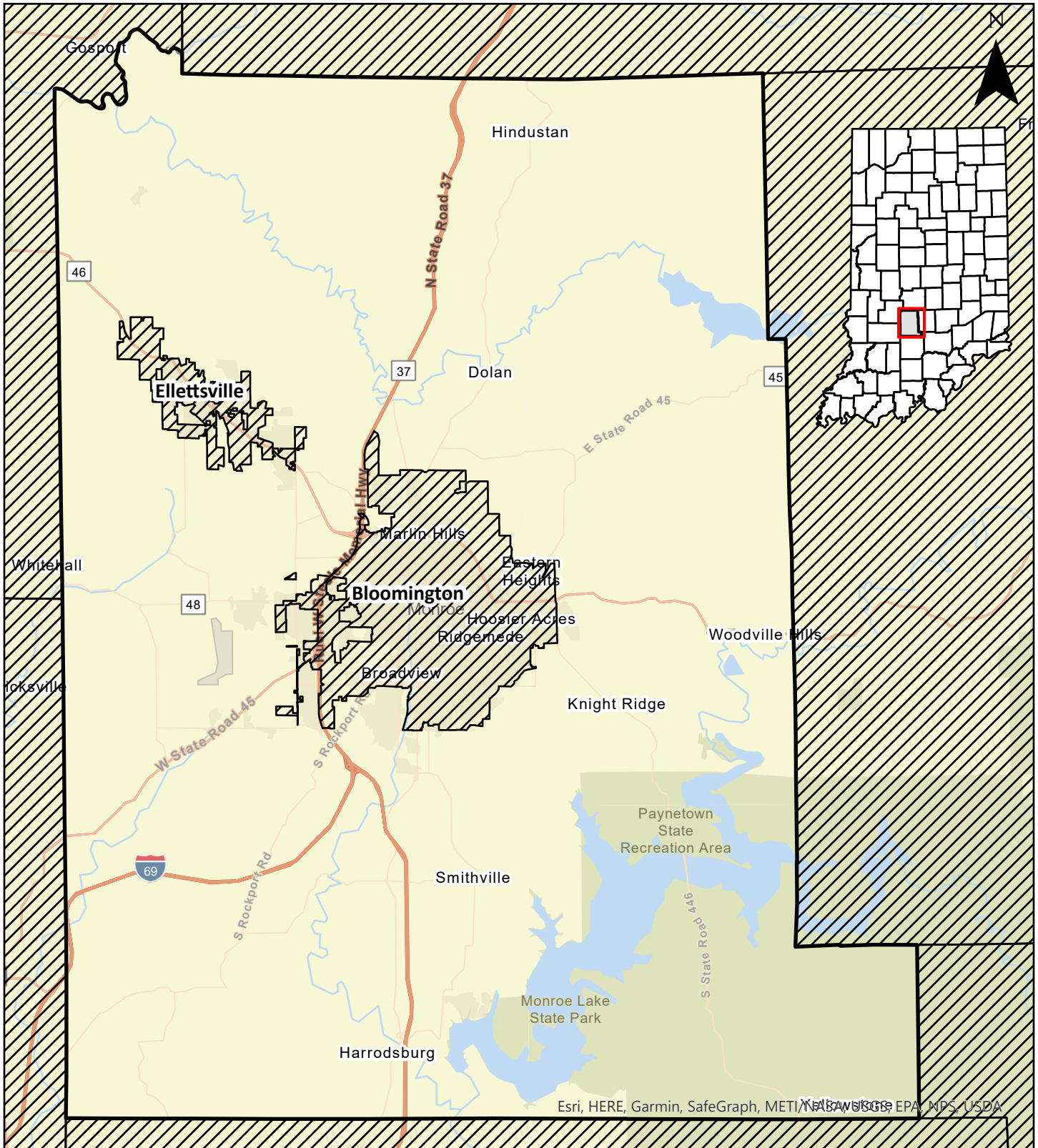
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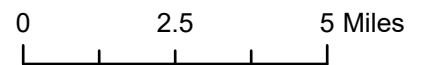
US Department of the Interior, Fish and Wildlife Service, 2014. WETLANDS_NWI_USFWS_IN: Wetlands and Deepwater Habitats of the National Wetlands Inventory (NWI) for Indiana (US Fish & Wildlife Service, Polygon Shapefile), accessed from <https://www.maps.indiana.edu>.

US Geological Survey, 2019. National Land Cover Dataset, 30-meter resolution Raster Dataset, Accessed from <https://www.mrlc.gov/viewer/>

MS4 Area Map for Unincorporated Monroe County, Indiana



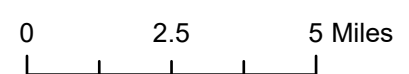
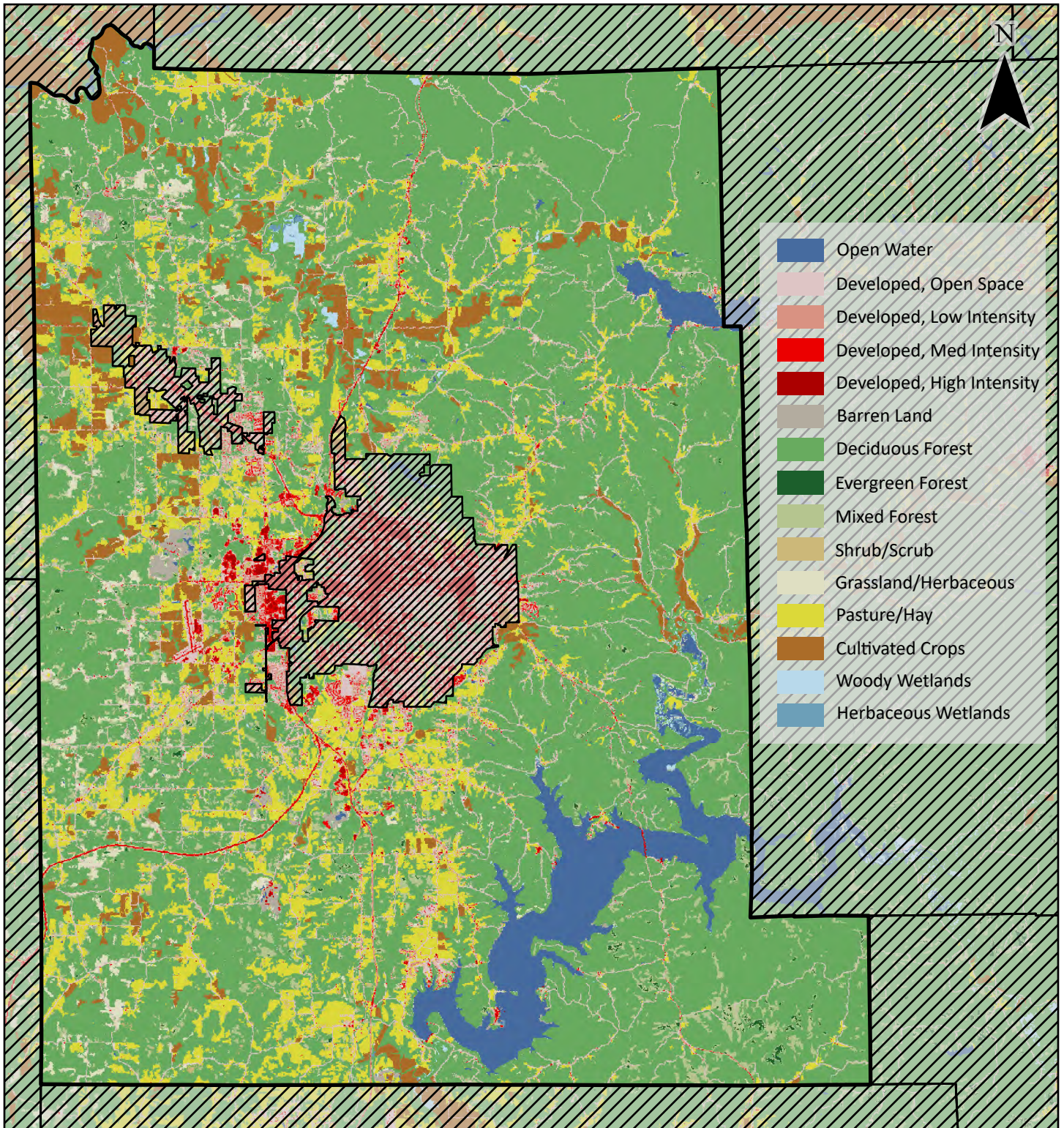
The Monroe County MS4 Area covers all land within the County boundary, excluding the land within the corporate limits of the City of Bloomington and Town of Ellettsville.



Monroe County Stormwater Program Storm Water Quality Management Plan Water Quality Characterization Report

Projection: NAD 1983
UTM Zone 16N
Author: K. Thetonia
Date: 3/2023

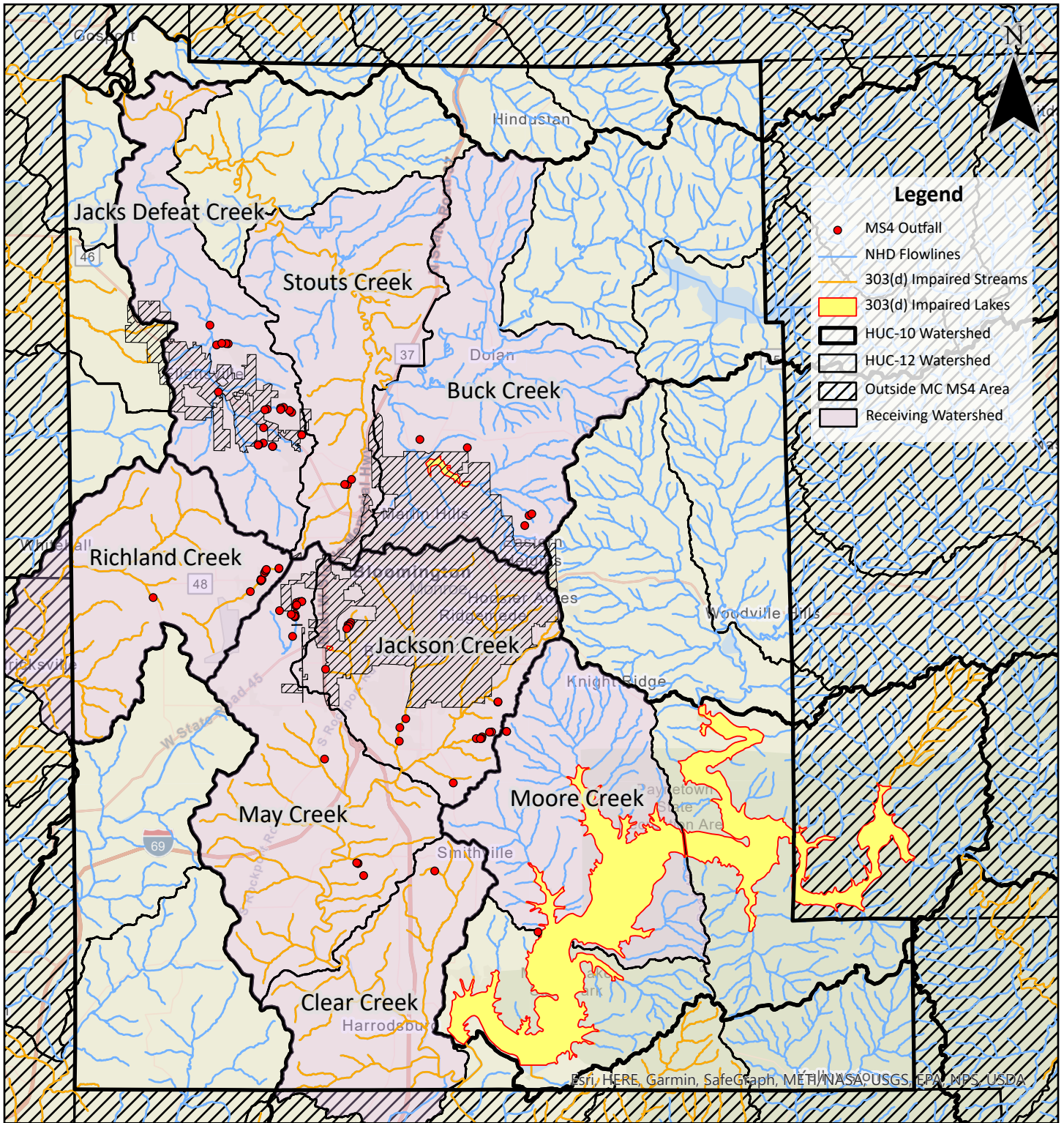




Land Use within the Monroe County MS4 Area

Monroe County Stormwater Program Storm Water Quality Management Plan Water Quality Characterization Report

Source: National Land Cover Dataset 2019
 Projection: NAD 1983
 UTM Zone 16N
 Author: K. Thetonia
 Date: 1/2023

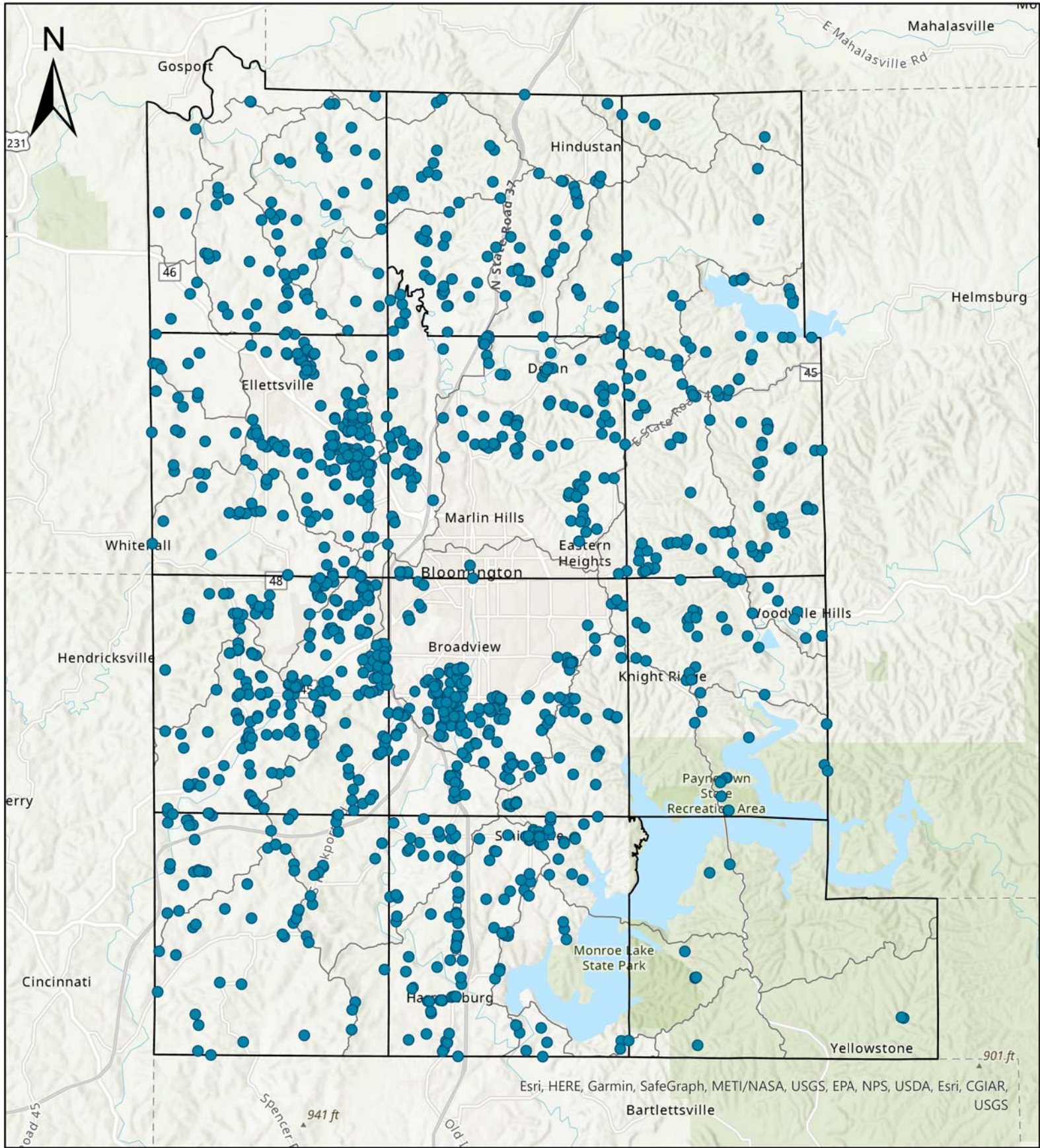


MS4 Outfalls and Receiving Waterbodies

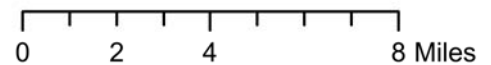
Monroe County Stormwater Program
Storm Water Quality Management Plan
Water Quality Characterization Report

Monroe County Highway Department Stormwater Program

Received Stormwater Requests Jan. 2018 - Mar. 2023



- Stormwater Requests
- Townships
- HUC 12 Watersheds



Author: Lynnette Murphy
Date: March 2023