

## Nonpoint Source Pollution Management in Dearborn County

This chapter has three purposes: (1) to identify nonpoint (NPS) source pollution issues in Dearborn County, (2) to determine which types of nonpoint sources can be linked to water quality problems, and (3) to identify resources and strategies available to address them. The Ohio•Kentucky•Indiana Regional Council of Governments (OKI) has consulted with local, state and federal organizations to update OKI's water quality management recommendations for nonpoint sources in Dearborn County.

*Nonpoint source* is a technical term with non-technical meanings. The U.S. EPA defines nonpoint sources as “diffuse pollution sources (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet.) The pollutants are generally carried off the land by storm water.” (*Terms of Environment: Glossary, Abbreviations, Acronyms*, 2006) Some agencies simply define nonpoint source pollution as any source of water pollution that is not a point source.

The Indiana Department of Environmental Management (IDEM) provides a fuller definition that is highlighted on the right. It aptly describes the nonpoint source pollution issues affecting Dearborn County. The state agency adds: “Because NPS doesn't come out of a pipe that's easily located, it has to be managed differently than facilities with site-specific permits. That's why so many measures directed at NPS are voluntary, and why so many people need to be involved.” This statement guided OKI's rationale for identifying NPS management strategies and resources for Dearborn County.

“Pollution of ground and surface water results from the variety of ways that humans use the land. Unlike pollution from factories and sewage treatment plants (point sources), NPS comes from many diffuse widespread sources. Soil particles, fertilizers, animal manure, pesticides, oil, road salt, fecal material from failing septic systems, pet waste and debris from paved areas are transported over the landscape by storm runoff, snow melt and wind. Eventually entering streams, wetlands and lakes, or penetrating into groundwater, these pollutants damage aquatic habitat, harm aquatic life, and reduce the capacity of water resources to be used for drinking water and recreation.”

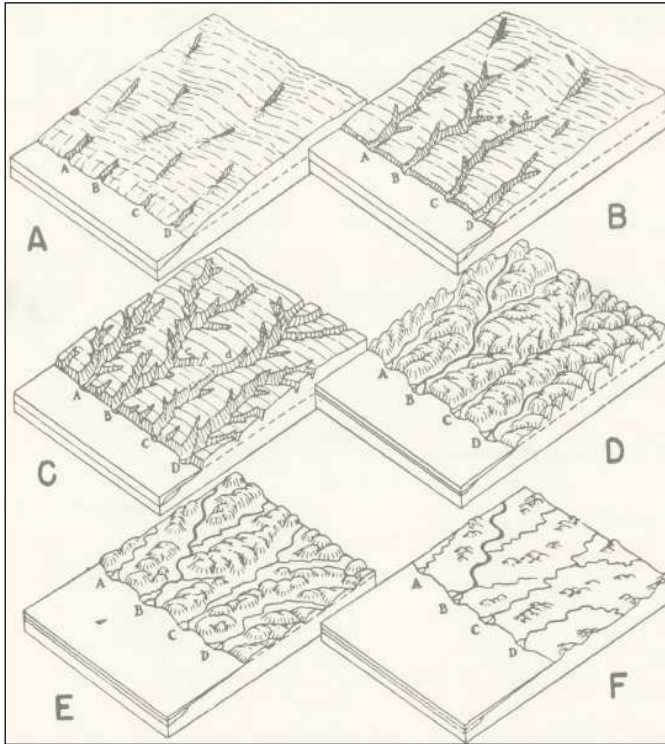
*Indiana Watershed Planning Guide* (IDEM, 2003)

Nonpoint source pollution management is significant to water quality management planning in at least two ways. First, NPS management identifies areas where costly improvements to centralized sewage service would do little to fulfill water quality standards because the water quality problems are originating from diffuse pollution sources rather than point source sewage discharges. Second, NPS management identifies areas where centralized sewage service is warranted as the best available alternative to concentrations of failing onsite wastewater treatment systems, which IDEM recognizes as a nonpoint source problem.

Susceptibility to nonpoint source pollution depends primarily on natural features and land uses. The natural feature that makes Dearborn County most susceptible is slope. Much of the county has gradually become a dissected, steeply sloped landscape, as shown by Figure 4-1.

Glaciers have the power to level landscapes. What is now Dearborn County, however, lies just south of the terminus for the latest glacial invasion, known as the Wisconsinan. That means the county's landscape has been subject to the stream erosion cycle for at least 130,000 years, after the last Illinoian glaciers melted. This down-cutting process has created deep drainage valleys with steep side slopes. As a result, 55 percent of Dearborn County's land area is covered by steep slopes. The rugged terrain, quite naturally, is more likely to erode and pollute the county's streams with soil particles, which are the most common type of nonpoint source pollution.

**Figure 4-1: Stream Erosion Cycle**



Much of Dearborn County's landscape is basically equivalent to step D on the left. The drawings are reprinted from *Outlines of Physical Geology* (Longwell, Kropf and Flint), which says, "This is the history and fate of every region upon which rain falls and which has sufficient elevation above the sea level." With an average annual precipitation of nearly 44 inches and an elevation ranging from 452 to 1,038 feet above sea level, Dearborn County is fully subject to the stream erosion cycle.

Soils also make Dearborn County naturally susceptible to nonpoint source pollution. Slow permeability makes the land surface more likely to encourage stormwater runoff, which is the main transport mechanism for nonpoint source pollutants. More than 92 percent of Dearborn County's land area is covered with slow

permeability soils. This aspect, in combination with the county's slopes, makes polluted stormwater runoff common throughout most of the county. Attached to the eroded soil particles found in stormwater are other pollutants, such as phosphorus, a non-soluble nutrient.

Steep slopes and slow permeability not only increase polluted runoff, but also pose problems as natural limiting factors to the functionality of septic tank leach fields or soil absorption systems. Other natural limiting factors to wastewater treatment by leaching and soil absorption are:

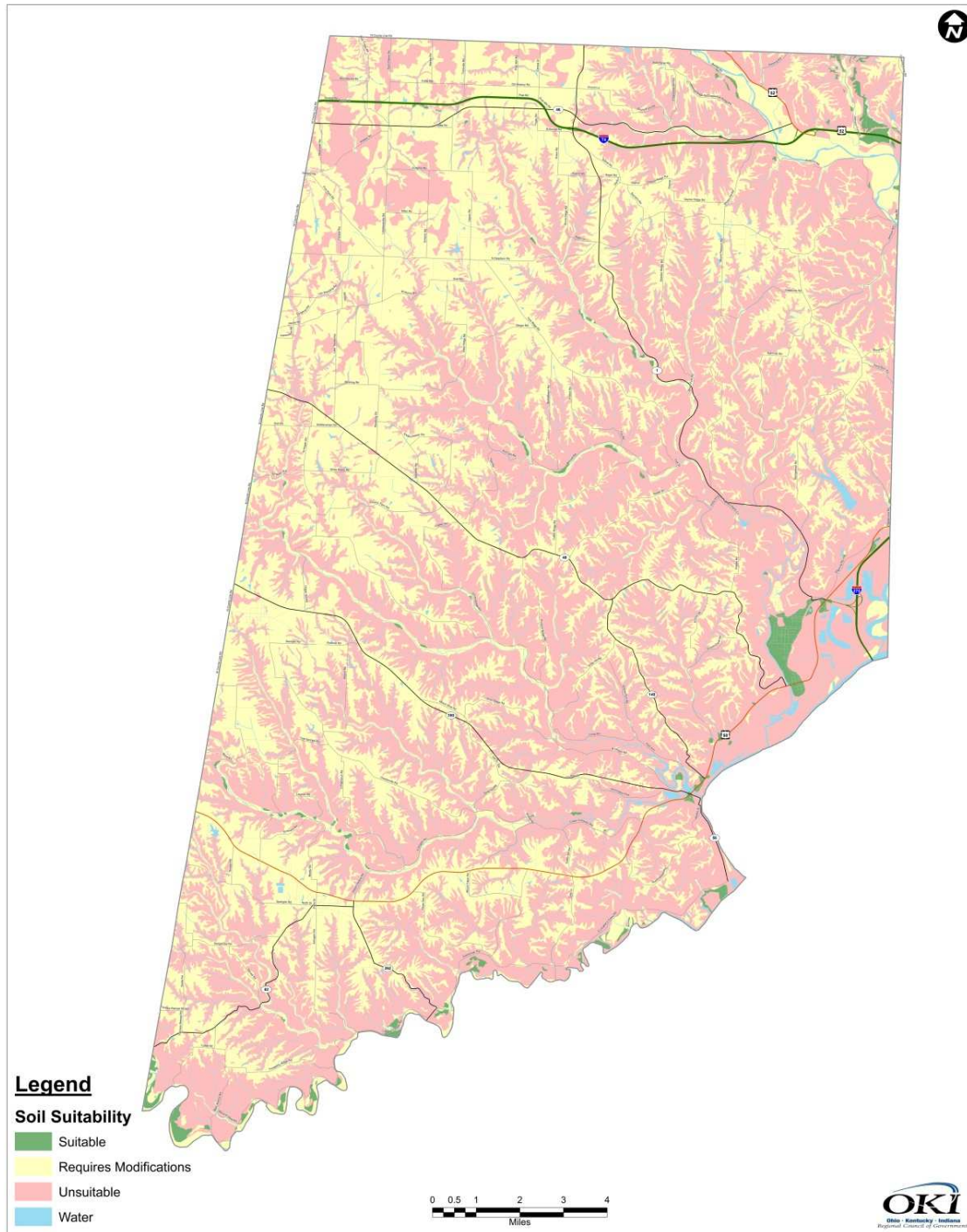
- limited depth to bedrock, which underlies 32 percent of the land area in Dearborn County
- high water tables, which underlie 12 percent of the county's land area
- poor surface drainage, where high water table and slow permeability coincide in a low spot
- susceptibility to flooding, which is most prevalent in southeast Dearborn County along the Ohio River Valley and northeast Dearborn County along the Whitewater River Valley
- potential for groundwater contamination, where permeability exceeds 6 inches per hour

The land areas with these natural limiting factors overlap each other in much of the county. Where two or more limiting factors coincide, the area is generally unsuitable for a septic tank-leach field system. Such an area, however, may still be suitable for an alternative onsite wastewater treatment system, such as an aeration unit or mound system. Based on challenging natural conditions:

- about **61 percent** of the county's land area is generally **unsuitable** for septic tank – leach fields
- about **38 percent** of the county's land area generally **requires modifications**, such as a curtain drain, an operational second leach field, or an over-sized leach field. The need for modifications is usually triggered by a slow soil permeability of less than 0.6 inch per hour in the upper four feet of soil or a seasonally high water table within 3 feet of the ground's surface
- less than **1 percent** of the county's land area is generally **suitable** for septic tank – leach field systems, provided the systems are properly installed, operated and maintained

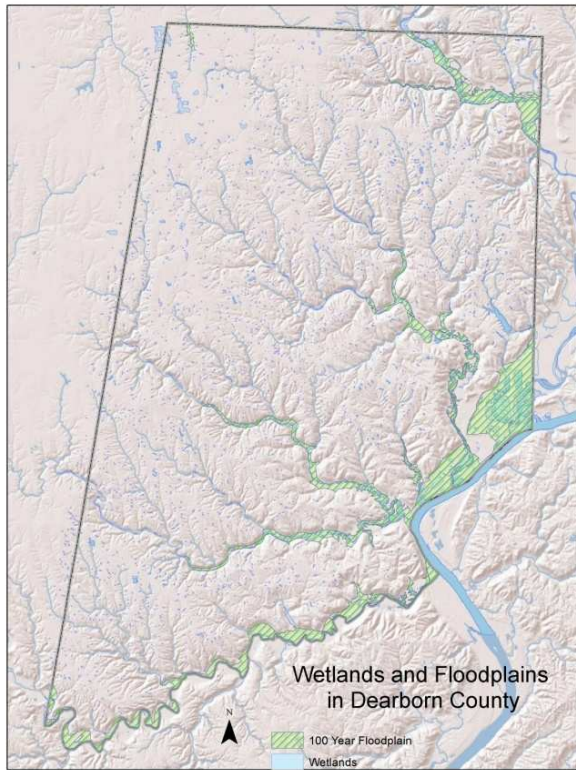
Figure 4-2 below shows the geo-spatial distribution of the three categories of soil suitability for septic tank – leach field systems, which remain the most common type of onsite system.

**Figure 4-2: Soil Suitability for Septic Tank – Leach Field systems in Dearborn County**



The map above illustrates how the steeply sloped walls of Dearborn County’s stream valleys are unsuitable for septic tank – leach fields. It is fortunate that the flatter ridgelines are more amenable to leach fields because they are ideal for local roads, which attract housing and onsite systems. Beyond soil types, state and county health regulations prohibit onsite systems in floodplains.

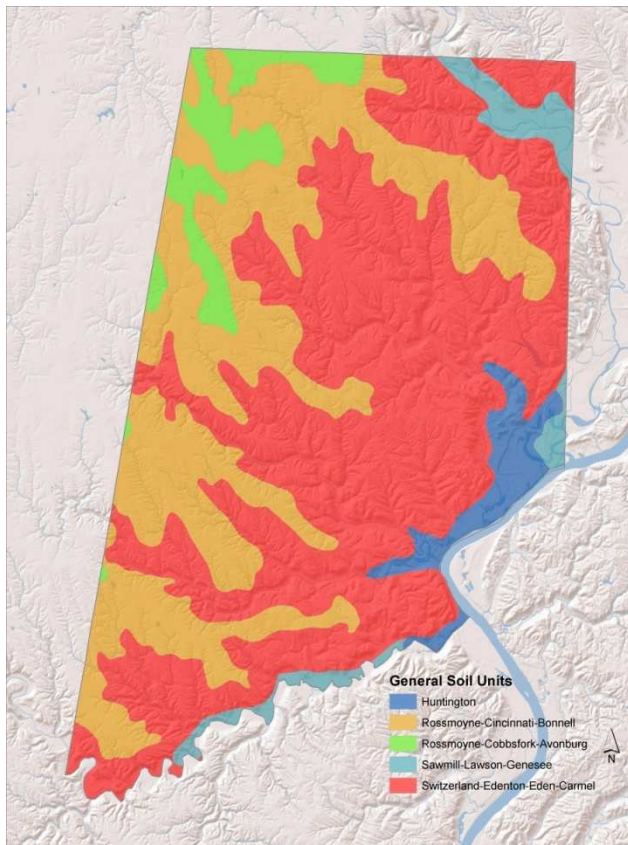
**Figure 4-3: Wetlands and Floodplains**



Wetlands and floodplains help reduce nonpoint source pollution by slowing water flow and allowing sediments with attached pollutants to settle out. Wetland and floodplain plants take up nitrogen and phosphate through their roots, thus reducing the NPS problem of excessive nutrients. Figure 4-3 on the left shows the county’s wetlands and floodplains, according to the National Wetland Inventory and Federal Emergency Management Agency.

Most land uses increase NPS pollution, especially where urbanization is dense or agriculture is intense. Erosion, siltation and sedimentation are common outcomes. In urbanizing areas, expanding impervious surfaces and storm sewers rush the runoff to streams, causing them to flood, scour and erode. In agricultural areas, the tilled earth drains tons of soil particles to nearby surface waters. Soil characteristics affect how erosive land uses can be. Figure 4-4 shows Dearborn County’s general soil units color-coded with their gross erosion levels.

**Figure 4-4: General Soil Units**



**Gross Erosion Levels**

Erodibility classifications for the general soil units in Figure 4-4 (at left) are based on a *Gross Erosion* map developed by the Indiana Department of Natural Resources, Soil and Water Conservation Committee, in collaboration with the U.S. Department of Agriculture and the Purdue University Extension.

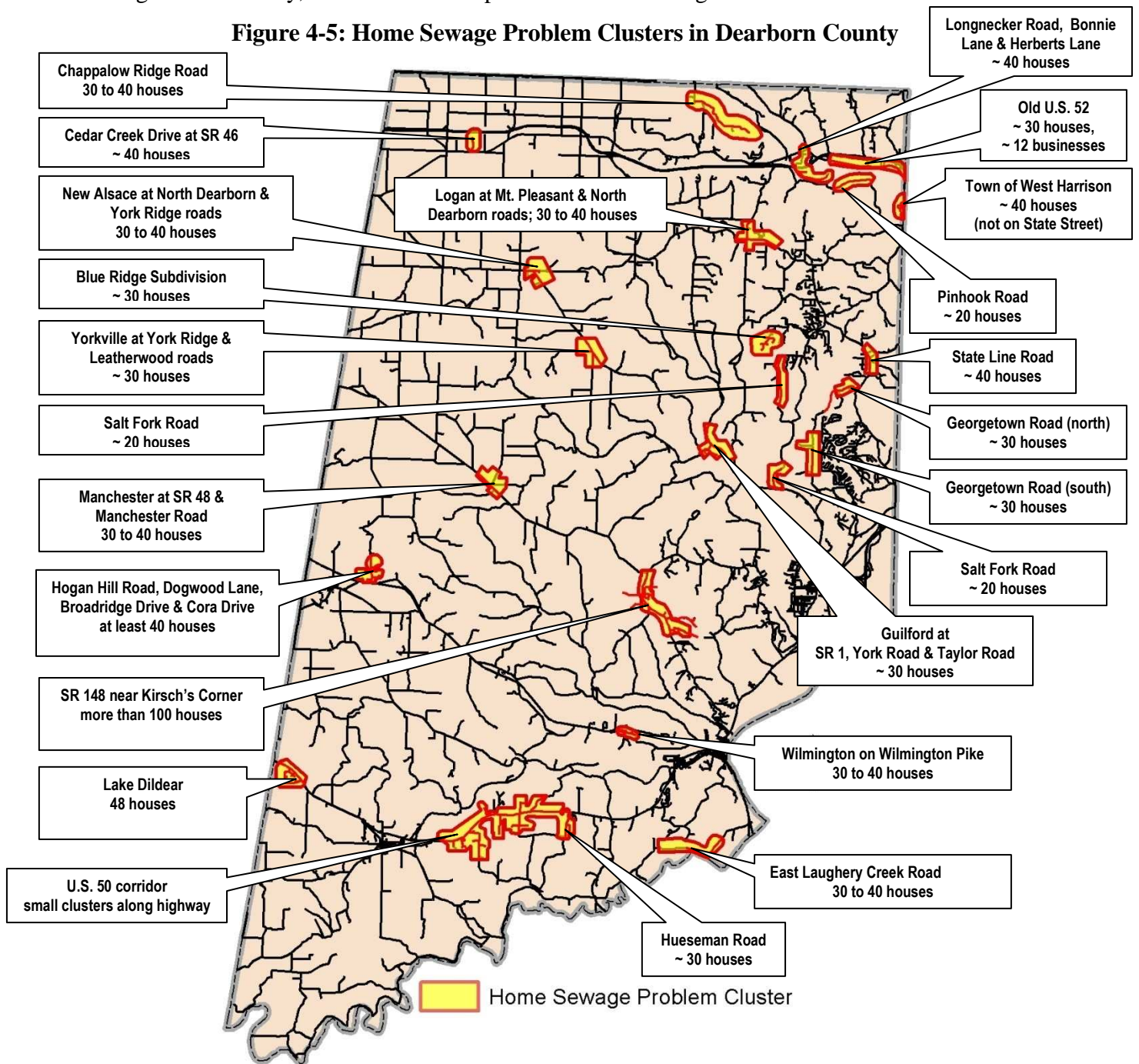
**Gross Erosion Levels For Dearborn County Soils**

- Very High
- High
- Medium
- Medium
- Low

The Dearborn County land use that causes the most nonpoint source pollution is residential development with onsite wastewater treatment systems. As previously explained, most of the land in the county is unsuitable for the most popular type of onsite system, a septic tank with leach field. Pockets of failing onsite systems can be found throughout the county, typically in areas where topography, development patterns or economics have constrained centralized sewage service.

The Dearborn County Health Department is the primary regulatory agency for onsite systems. The health department's sanitarian estimated the septic system failure rate at about 50 percent throughout the county, and identified the problem clusters in Figure 4-5 below.

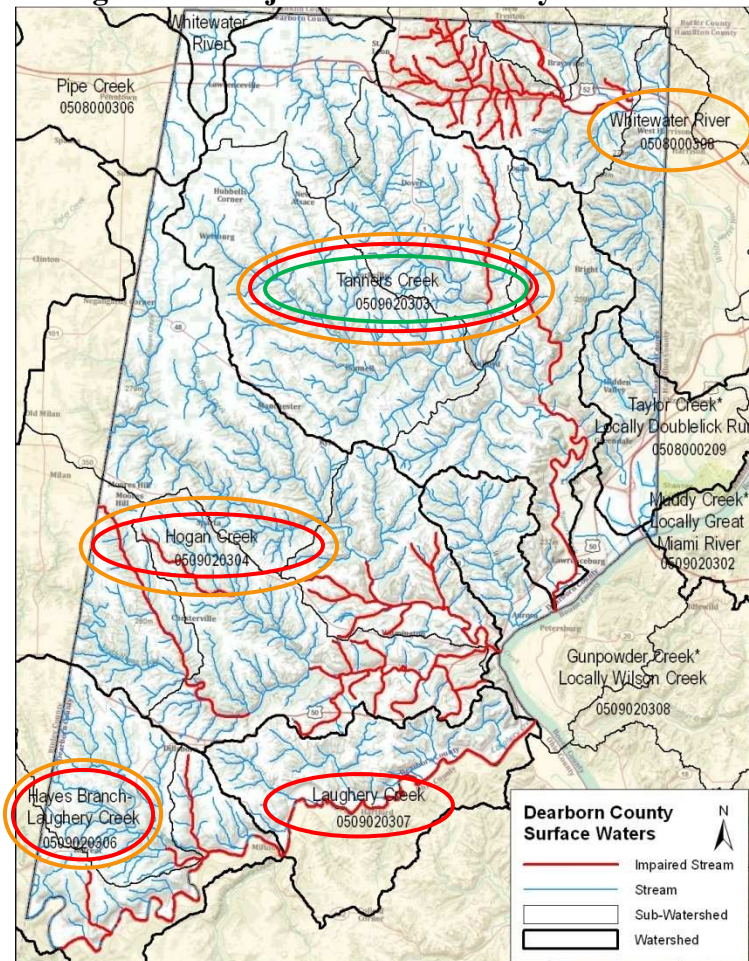
**Figure 4-5: Home Sewage Problem Clusters in Dearborn County**



The term *home sewage problem clusters* is used because some households do not use onsite systems, but directly discharge raw sewage to surface waters. That is one of three routes for surface water pollution by untreated or inadequately treated household sewage. The other two routes are surface ponding accompanied by runoff, and movement over an impervious layer until reaching surface waters. Failing septic tanks could also pollute groundwater, which is the major source of drinking water in Dearborn County. The three common routes by which failing septic tanks contaminate aquifers are: (1) subsurface lateral movement of the effluent, (2) infiltration of contaminated surface waters to groundwater recharge areas, and (3) entry via improperly sealed or abandoned wells.

Watersheds with failing onsite systems are likely to suffer bacterial pollution. Segments of the following seven Dearborn County waterways are impaired by excessive levels of the common sewage bacteria *Escherchia coli* (E. coli): Whitewater River, Logan Creek, an un-named tributary of Johnson Fork, Salt Fork, South Hogan Creek, Whitaker Creek and Hayes Branch. This data is from the *Indiana Integrated Water Monitoring and Assessment Report 2010*. Developed by IDEM, the *Integrated Report* also reports two other types of impairments attributable to nonpoint source pollution: low dissolved oxygen and impaired biotic communities. Segments of two streams--Tanners Creek and Brushy Fork--are impaired by low dissolved oxygen. Segments of four streams--Tanners Creek, Whitaker Creek, South Laughery Creek and Hayes Branch-- have impaired biotic communities. IDEM has documented up to three types of nonpoint source impairments to Dearborn County watersheds. This is illustrated below in Figure 4-6.

**Figure 4-6: Major Dearborn County Watersheds with Nonpoint Source Impairments**



**Color-Coded Key to Impairments**



low dissolved oxygen



impaired biotic communities



excessive bacteria (E. coli)

WATERSHED IMPAIRMENTS	low dissolved oxygen	impaired biotic communities	excessive bacteria
Whitewater River watershed			●
Tanners Creek watershed	●	●	●
Hogan Creek watershed		●	●
Laughery Creek watershed		●	
Hayes Branch- Laughery Creek watershed		●	●

As pointed out by the *Indiana Watershed Planning Guide*, the successful management of nonpoint source pollution requires many measures by many people taking voluntary actions. The Dearborn County Soil and Water Conservation District and the Dearborn County Health Department have nonpoint source duties assigned to them, but they can turn to a wide variety of collaborators to fully address the issue. This is graphically represented below in Figure 4-7.

**Figure 4-7: Stakeholders in Nonpoint Source Management in Dearborn County**



# Nonpoint Source Impairments to Dearborn County Streams

An impaired stream does not attain water quality standards nor does it support its designated uses. The boxes below feature impairments indicative of nonpoint source pollution. Staff from the Dearborn County SWCD, Health Department, Natural Resources Conservation Service and watershed steering groups concurred on suspected reasons and suggested remedies for the impairments reported by the Indiana Department of Environmental Management.

**Waterway: Brushy Fork Creek**

Watershed: area drained by Tanners Creek  
Impairment: low dissolved oxygen  
Suspected reasons: low stream flow, livestock, home construction, septic tanks, fertilized cropland  
Remedies: filter strips, onsite system upgrades, livestock exclusion, pasture management, sewer line extensions

**Waterway: South Hogan Creek**

Watershed: area drained by Hogan Creek  
Impairment: excessive bacteria (E. coli)  
Suspected reasons: septic tanks, livestock, low stream flow, point source pollution  
Remedies: onsite system inspections and upgrades, sewer line extensions, livestock exclusion, pasture management

**Waterway: Tanners Creek**

Watershed: area drained by Tanners Creek  
Impairments: low dissolved oxygen, impaired biotic communities  
Suspected reasons: plant nursery, fertilized lawns, railroad drainage, industrial discharges, natural pooling of Ohio River, former septic tanks and sewage lagoons  
Remedies: industrial discharges management, sewer line extensions, streambank stabilization, no-wake zones, filter strips and riparian buffers with trees

**Waterway: South Laughery Creek**

Watershed: area drained by Laughery Creek  
Impairment: impaired biotic communities  
Suspected reasons: failing septic tanks, sewage discharges from summer homes and camps, steep streambanks have less area for habitat, streambank erosion, boat wake erosion, point source pollution  
Remedies: streambank stabilization, floodplain easements, wetland restoration or creation, filter strips and riparian buffers with trees

**Waterway: Logan Creek**

Watershed: area drained by Whitewater River  
Impairment: excessive bacteria (E. coli)  
Suspected reasons: septic tanks, livestock  
Remedies: onsite system inspections and upgrades, sewer line extensions and connections

**Waterway: Hayes Branch**

Watershed: area drained by Hayes Branch  
Impairments: excessive bacteria (E. coli) and impaired biotic communities  
Suspected reasons: livestock (incl. goats), slower stream flow with sedimentation, cumulative effect of several tributaries, upstream septic tanks  
Remedies: livestock exclusion, pasture management, onsite inspections and upgrades

**Waterway: Whitaker Creek**

Watershed: area drained by Hogan Creek  
Impairment: impaired biotic communities  
Suspected reasons: septic tanks, livestock, natural low flow, point source pollution  
Remedies: onsite system inspections and upgrades, sewer line extensions, livestock exclusion, pasture management

**Waterway: Salt Fork**

Watershed: area drained by Tanners Creek  
Impairment: excessive bacteria (E. coli)  
Suspected reasons: septic tanks, discharges  
Remedies: onsite system inspections and upgrades, sewer line extensions and connections, stormwater management