

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION

GUIDANCE

CONDUCTING A SUBWATERSHED-SCALE SOURCE SURVEY – FIELD INVENTORIES

This document provides recommendations and method suggestions for conducting watershed- or subwatershed-scale assessments of bacterial sources by conducting windshield surveys (driving the watershed and identifying issues) for pollution problems, as a supplement for Michigan’s Statewide *E. coli* Total Maximum Daily Load (TMDL).

Other resources available on the Michigan Department of Environmental Quality’s (MDEQ) [E. coli TMDL Web site](#) include:

- The MDEQ *E. coli* Pollution and Solution Mapping System
- Conducting a Subwatershed-Scale Source Survey - Remote Sensing
- Locating Priority Areas for Septic System Investigations

Introduction

The MDEQ has provided an [online interactive mapping system](#) to help interested stakeholders locate *E. coli* sources. Additionally, the [MiWaters Site Explorer](#) can provide compliance information and access to public documents for National Pollutant Discharge Elimination System (NPDES), groundwater, biosolids, and other permitting systems. These are all tools in the source assessment toolbox. Field inventories are another tool to build knowledge of sources, best used in conjunction with remote sensing, the *E. coli* TMDL Mapping System, MiWaters Site Explorer, and monitoring water quality (*E. coli* and microbial source tracking techniques).

Field inventories are defined as an on-the-ground inspection of an aquatic system, its riparian zone, or the upland portions of the watershed directly contributing runoff. The primary goal of a field inventory is to identify the specific sources and causes of nonpoint sources of *E. coli*. In this document, a “site” is any area that is visually apparent to potentially cause *E. coli* contamination of surface water, and could include livestock operations, closely spaced homes in unsewered areas, unusual tile discharges, pet kennels, areas frequented by geese, or dog walking areas.

Because not all sources can be seen from the road, a field inventory should be accompanied by remote sensing, such as inspecting aerial photos (see supplemental resources “Conducting a Subwatershed-Scale Source Survey – Remote Sensing”).

We recommend filling out a data sheet for all sites or issues noted, regardless of how far they are from surface water and whether you perceive them as a major or minor issue. Instructions for an [example data sheet or field form](#) are below. This will help you gain a complete picture of potential sources in the watershed. Once the inventory is complete, the sites can be prioritized based on the severity of issues or the magnitude of sources.

Method Recommendations:

- 1) Establish your search area: Your area of interest (political division or subwatershed) is your search area. Shapefiles of these areas are available by searching in Michigan's Center for Geographic Information data library (<http://gis-michigan.opendata.arcgis.com/>). Selecting an entire subwatershed, rather than a middle or lower portion alone, is advised. The 12-digit hydrologic unit code scale is a manageable size (they average about 30-square miles), but this will depend on your available resources.
- 2) Establish timing: Leaf-off conditions (early spring or winter) may allow you to see farther from the road. For example, the hobby horse farm in the below image was missed during a leaf-on (summer) inventory because trees hid it from view (the red arrow points to actual horses in the small pasture). This also illustrates the importance of using remote sensing as part of the source assessment process. Early spring and late fall are also times of the year when manure is being land-applied, which may be a potential source of *E. coli* to your subwatershed.



- 3) Gather supplies: Suggested equipment checklist (many items are optional):
 - Maps with waterways and roads labeled
 - Field data sheets (many copies or electronic data recorder)
 - Clipboard and pens/pencils
 - GPS unit
 - Camera with extra batteries
 - Digital voice recorder for taking notes
 - Waders, hip boots, or wading shoes
 - Traffic cones, safety vests, and flashing vehicle lights (or other equipment to increase your visibility to other drivers)
 - Brush clearing tools
 - First aid kit
 - Insect repellent/sunscreen
 - Lunch/snacks/water for long field day

- 4) Establish your search pattern or driving route: As part of the watershed inventory you will want to visit everywhere in the search area that is legally accessible to you (please avoid trespassing). You may decide to drive all north/south roads, then all east/west roads, or perhaps it is more efficient to drive around each block of roads in a square pattern. Most vehicle navigational GPS systems will track the route that you have traveled as a line on the map (aka “tracks”), helping to ensure that you have not missed an area of your watershed. It is also helpful to have a paper version of the map where you can cross off roads, make notes, and mark locations that you have visited. Driving a watershed can be time consuming, so consider dividing the watershed into logical sections and dividing it among several teams of volunteers, or conducting the surveys over several days.

- 5) Inventory the watershed and record your findings on a data sheet: Safety first! It is advised to have a minimum of two people to share in the responsibility and to allow the driver to focus on driving, and use caution when pulling over to the side of the road. We also recommend calling the local police department and letting them know what you are doing and when you will be doing it, in case any suspicious activity reports are called in by property owners.
 - a. Fill out a data sheet for all visually apparent potential sources of *E. coli* contamination to surface water. The MDEQ has provided a suggested data sheet for collecting information on farms, livestock access to surface water, agricultural runoff, unusual discharges, high pet/wildlife activity, and potential septic system issues. We recommend filling out a data sheet for all sites or issues noted, regardless of how far they are from surface water and whether you perceive them as a major or minor issue. Guidance for each section of our suggested data sheet is provided below.
 - b. Obtain GPS coordinates of each site from the roadside, and take photographs from the side of the road either routinely or when a major issue is found (such as livestock with unrestricted access to the stream).
 - c. Either in a sketch or in notes, be sure to label which direction the site is from the road (e.g., the photo was taken looking east from the road, or, the site is located east of the GPS coordinates).

- 6) After completing the survey, the data should be transferred to a spreadsheet for organizing and mapping.

Guidance on Example Form

This [pollutant source identification form](#) is designed to be filled out at each site during a field inventory conducted from the side of the road (safe locations only).

Site information:

- Latitude and longitude data should be collected for each site and can be collected from the roadside. The suggested format, for ease of use later, is decimal degrees recorded to five decimal places (e.g., 42.12345; -85.12345). Be sure that your GPS unit is recording in an appropriate coordinate system (the use of the “World Geodetic System” (WGS 1984) is widespread and therefore suggested).
- Record the date and time of visit. If photos are taken, the time stamp of the digital camera can help you determine which photo belongs to which site.
- Give each site an identification number to help you keep organized.

Section 1: Livestock Access

Livestock producers are allowed to utilize the surface water as long as it does not impair or damage the surface water resource. This section should be filled out whenever livestock have access to surface water. If the livestock do not have access to the water body, then skip this section and fill out section 2. Note the type of access that the animals have. Unrestricted access refers to the animals having access along most or all of the pasture. Restricted access, often used in combination with gates, refers to a pasture where fences restrict the access to a very small area (usually small enough to allow only a few animals through at a time). If it becomes necessary to refer this animal access issue to the Michigan Department of Agricultural and Rural Development (MDARD), because the resource is being damaged by the use, the name and address of the livestock owner will be needed. This information can usually be obtained from county plat maps or property tax records online; however, if the address is on the mailbox it is very helpful to record it while on site.

Section 2: Other Agricultural Sources (e.g., runoff)

All livestock operations should be noted here, regardless of the size of the operation or position within the watershed (search area). The simple presence of livestock does not implicate them as a source, but a complete record is beneficial to understanding your area. The “obvious runoff issues” portion of the form is intended to later assist the user in prioritization and potential best management practices that could assist in reducing or eliminating pollution. These issues include exposed manure, erosion, and pastures sloped toward surface water where there are no vegetated buffers or berms. Manure stockpiling by farms that do not have an NPDES permit is also allowed, but should not pollute surface water. As with livestock access issues, if it becomes necessary to refer this issue to the MDARD, because the resource is potentially being damaged by contaminated runoff, the name and address of the livestock owner will be needed. See MDARDs Generally Acceptable Agriculture Management Practices for additional guidance (go to www.michigan.gov and search for “MDARD GAAMPs”). It should be noted that while the conformance to the GAAMPs shields farmers from most nuisance complaint lawsuits, all applicable federal and state laws still apply.

Section 3: Unusual Discharge

This section is for documenting pipes or tiles that outlet to surface water that may be contributing to *E. coli* issues based on visual or sensory clue (there is no need to document all pipes). Stop at all river/road crossings and look for symptoms of these issues, which include: constant flow in combinations with odors, bubbles/foams, scums, and slimes or algae in tiles/pipes or streams (note: if algae is present upstream of the pipe then another source is likely). Walking upstream and looking for issues is a possible ‘next step’ for finding these issues, but is very labor intensive. It is recommended to prioritize areas for walking upstream, using *E. coli* data as a guide (also see the TMDL supplement, “Locating Priority Areas for Septic System Investigations”).

Section 4: High Pet/Wildlife Activity Areas

Areas of high pet activity include animal shelters, commercially operated kennels, or veterinary facilities with outdoor areas for pet exercise, dog parks, recreational parks with dog walking areas, etc. This section on areas of high wildlife activity is not intended to target nature preserves or natural wildlife viewing areas. While these areas may contribute to *E. coli* issues, it

is unlikely they are a significant source. This is supported by MDEQ data, which shows that watersheds with more natural landcover generally have lower *E. coli*. This section is intended to document nuisance levels of wildlife, such as flocks of geese in cemeteries, parks, or golf courses, seagulls that frequent parking lots or landfills, raccoons in storm sewers, etc.

Section 5: Potential Septic System Issues

This section is intended to document issues that may warrant follow-up in the future, related to the potential for failing septic systems. Noteworthy items include high housing density in unsewered areas, small towns not served by sanitary sewers, and yards that are too small to support a septic system with all applicable setback requirements (these vary by county). Signs of poor soil drainage, such as ponding in yards, may also be worth noting. Additional guidance is available in the Statewide TMDL document (nonpoint source section), and in the TMDL supplemental resource (“Locating Priority Areas for Septic System Investigations”).