FECAL BACTERIA BEST MANAGEMENT PRACTICES (BMPs)

►Identifying Potential Sources

OVERVIEW

Fecal bacteria contamination can come from various sources including human and animal waste. To determine the best management practices (BMPs) that will result in the most effective reduction of fecal bacteria, it's important to identify which sources contribute to elevated fecal bacteria in storm water runoff. Additionally, since human fecal matter in surface water poses a greater threat to human health than animal fecal matter, identifying which areas are contaminated with human fecal bacteria can help prioritize which areas to focus reduction efforts on. To help identify these potential sources, several exercises can help pinpoint significant contributors to fecal bacteria pollution.

Photo Credit: Wisconsin DNR

IMPLEMENTATION

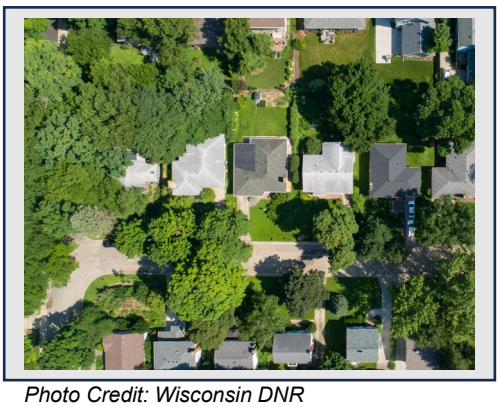

Photo Credit: Wisconsin DNR

What Is The Land Used?

Identifying and mapping land use in a community or watershed is an important first step when determining areas that may be potential fecal bacteria sources. When evaluating land use, here are a few things to consider:

- Parks and open areas.
- Businesses and industries with dumpster storage outside.
- Wastewater treatment plant facilities or septic systems.

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- High-density residential areas.
- Municipal properties that store materials outside such as yard waste, street sweeping and catch basin materials.
- Areas with old infrastructure (Sanitary sewer mains and/or laterals).

Types Of Separate Storm Sewer Systems

Photo Credit: Wisconsin DNR

Before deciding which sources to look for, it's important to consider which types of storm sewer systems are in your community. Each type of system may be associated with different fecal bacteria problems and how they contribute to fecal bacteria pollution in waterways.

Storm Sewer Piping

Communities with primarily storm sewer piping conveyance systems may target fecal bacteria efforts on illicit connections and leaky sanitary sewer systems first. This is because the infrastructure is underground, and therefore may not be obvious that there is a problem. If illicit connections and leaky sanitary sewer systems are prioritized, high-density residential areas, industry or areas known to have old infrastructure (i.e., older sanitary sewer main or laterals) could be investigated first as a potential fecal bacteria source. Areas where wildlife activity in or around storm sewer piping has been observed or reported should also be considered.

Grass Swales

Different from storm sewer piping where the conveyance system is underground and illicit connections or dumping cannot be observed without equipment (e.g., televising), communities with grass-swale storm water conveyance systems can use visual indicators to help identify these sources (e.g., resident complaints, observation, etc.). In some areas, private storm sewer outfalls are connected to swales and these areas should be prioritized based on land use.

Additionally, grass swales may attract wildlife such as geese or nesting raccoons where fecal waste becomes more localized in the swale. In this situation, communities may identify animal

sources of fecal bacteria such as nuisance wildlife congregations (See “Wildlife Waste” BMP in the MS4 BMP Menu under the Total Maximum Daily Loads (TMDL) and Impaired Waters section) or domestic animal waste (See “Managing Domestic Animals” BMP in the MS4 BMP Menu under the Total Maximum Daily Loads (TMDL) and Impaired Waters section). While identifying these sources, targeting areas such as public parks, open parking lots or other areas that drain to grass should be investigated.

Combination

If you are a community with a combination of storm sewer piping and grass swale, determine the percent of each type of conveyance system. In this case, the most abundant storm sewer systems should be the priority. For instance, if the community is 70% storm sewer piping and 30% grass swale, priority could be given to storm sewer piping by targeting efforts on illicit connections and leaky sanitary sewer systems to address the human fecal pollution problem first.

Visual Observation

Visual observation of the community or surrounding watershed can be beneficial in combination with identifying land use. Some observations one could make include:

Photo Credit: Wisconsin DNR

Potential animal sources:

- Nearby animal populations including nuisance wildlife and domestic animals (e.g., farmsteads, dog parks).
- Observations or reports of wildlife in or around storm sewer piping.
- Presence of excessive wildlife or pet waste at public parks.
- Mismanaged storm water retention ponds that contain roosting nuisance wildlife.

Commercial sources:

- Presence of trash cans/dumpsters outside, the proximity to storm water inlets or waterways and whether there are leaks or openings.

Human sources:

- Signs of failing septic systems, sanitary sewer laterals or illicit connections (e.g., pooling water at the surface, foul odors, dye or smoke discharging at improper places when testing).
- Proximity of septic drainage fields to surface water. Wisconsin Law (SPS 383) already requires that septic tank soil drainage systems be placed at least 50 feet from surface water to protect them from contamination. Septic fields closer to surface waters are more likely to discharge wastewater into them.
- Presence of portable toilets, their proximity to storm water inlets or surface water and whether there are cracks causing leaks.

Additional Methods

Fecal Bacteria Testing

(For in-depth information, see “Bacteria Testing” BMP in the MS4 BMP Menu under the Total Maximum Daily Loads (TMDL) and Impaired Waters section)

Photo Credit: Wisconsin DNR

Testing fecal bacteria at suspect outfalls is also useful in pinpointing potential source areas. This can be done using bacterial indicators such as E. Coli and Enterococci or with genetic testing. Genetic testing is beneficial because it can further identify whether the fecal source in a sample is from human (Bacteroides) or an animal source. Therefore, this can save time in the investigation as the presence of the human marker, Bacteroides, in water samples is indicative of sources such as illicit connections, combined or sanitary sewer overflows or failing septic systems. Whereas the presence of animal bacteria markers (e.g., dog, gull, etc.) likely means the fecal bacteria is coming from domestic animals or nuisance wildlife. Since human fecal contamination poses a greater human health risk, identifying which areas are contaminated with human fecal matter can indicate which areas to prioritize source reduction efforts.

Dye, Smoke Or Closed-Circuit Television (CCTV) Testing

(For in-depth information, see “Public Sanitary Sewer Systems” BMP in the MS4 BMP Menu under the Total Maximum Daily Loads (TMDL) and Impaired Waters section).

These methods are commonly used to identify leaky sanitary sewer systems, septic systems or illicit connections that are contributing to fecal bacteria levels:

- Dye testing is useful when trying to investigate illicit connections or cracks in sanitary sewer laterals.
    - For example, the dye is flushed at each unit’s toilet in an apartment complex and suspected outfalls are observed to see if there is the presence of dye.
- Smoke testing is also useful for identifying cracks or illicit connections, as the presence of smoke would indicate that the separate storm sewer system has been compromised.
- Televising both sanitary sewer and separate storm sewer can help identify leaks or illicit connections as well.

ADDITIONAL RESOURCES

Fecal Bacteria Resources

- Minehaha Creek Bacterial Source Identification Guide
- Final Vermillion River Watershed (TMDL) Report Information about source identification tests – Section 3.6.2 and Appendix B
- The California Microbial Source Identification Manual: A Tiered Approach to Identifying Fecal Pollution Sources to Beaches – Southern California Coast Water Research Project
- Milwaukee River Basin TMDL | A framework for water quality improvement | Wisconsin DNR

Different Types Of Separate Storm Sewer Systems

- NPDES: Stormwater Best Management Practice, Eliminating Curbs and Gutters (epa.gov)
- NPDES: Stormwater Best Management Practice, Grassed Swales (epa.gov)

SOURCES

Minnesota Pollution Control Agency. Vermillion River Watershed TMDL Report. Retrieved from: Final Vermillion River Watershed (TMDL) Report Information about source identification tests – Section 3.6.2 and Appendix B

Griffith, J. F., Layton, B. A., Boehm, A. B., Holden, P. A., Jay, J. A., Hagedorn, C., McGee, C. D., Weisberg, S. B. 2013. *The California Microbial Source Identification Manual: A Tiered Approach To Identifying Fecal Pollution Sources To Beaches*. Retrieved from: The California Microbial Source Identification Manual: A Tiered Approach to Identifying Fecal Pollution Sources to Beaches – Southern California Coast Water Research Project.

Sauer, E. P., VandeWalle, J. L., Bootsma, M. J., McLellan, S. L. 2011. *Detection Of The Human-Specific Bacteroides Genetic Maker Provides Evidence Of Widespread Sewage Contamination Of Stormwater In The Urban Environment*. Water Research 45, 4081-4091.

U.S. Environmental Protection Agency (EPA). Septic Systems. Retrieved from: Septic System Improvements to Protect Nearby Water Sources | US EPA

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