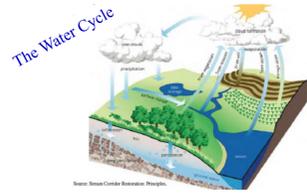


MLWP Muskegon Lake Watershed Partnership

Water, Watersheds, Stormwater, and Best Management Practices



Our water resources can be impacted by NPS pollution.

What is Non Point Source Pollution and how does it move through the landscape?

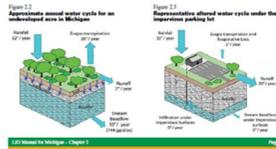
Most commonly, the vehicle is polluted stormwater runoff

Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification and channelization

As watersheds experience more urban development and natural areas are converted to lawns and impervious surfaces, more surface runoff will be conveyed to streams and lakes leading to large pulses of runoff to which the streams are not naturally adapted.

Stormwater also carries pollutants into groundwater and underground aquifers used for drinking and irrigation and into our lakes.

Nutrients introduced to aquatic systems encourage plant growth. This includes toxic algae blooms and invasive species which threaten human health and property values. Reducing stormwater runoff by preserving naturally functioning green infrastructure is a cost effective way to maintain water quality. Forested lands and wetlands have a natural ability to intercept stormwater before it gets into our streams and lakes.



Nonpoint Source Pollutants
NPS pollution is the leading remaining cause of water quality problems today. For more info visit www.wishthefish.com

Good landscaping and lawn care practices can help reduce runoff and improve water quality. Use mulch, avoid fertilizers, and water deeply and infrequently. Don't forget to pick up after your dog!

Use of impervious surfaces like asphalt and concrete can lead to increased runoff and erosion. Use permeable surfaces like grass and gravel.

Use of pesticides and herbicides can harm aquatic life. Use them sparingly and follow instructions.

Use of lawn mowers and trimmers can create noise and air pollution. Use them responsibly.



D-1 Dalton Township Zoning Ordinance Recommendations

D-2 Colerain Township Zoning Ordinance Recommendations

D-3 Muskegon County Zoning Ordinance Recommendations

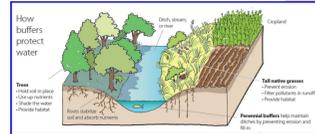
Good planning is one of the best BMPs!

Communities creating green infrastructure and including a variety of BMPs to mitigate the adverse effects of stormwater, add aesthetic value and water quality protections to the landscape. Here is an example of an infiltration swale in the City of Muskegon. This BMP will collect first flush stormwater, filtering nutrients and sediments before releasing water back to drains entering nearby Muskegon Lake. It is located along the historic stream channel of Beidlers Creek which is now entirely underground.



Stormwater BMPs designed to capture stormwater, filter excess nutrients and polluted runoff, trap sediments, slow storm flows and reduce channel velocities.

- Vegetative Filter Strips
 - Field Borders
 - Parking Lot Borders
 - Shelter Belts and Visual Screens
 - Riparian Buffers
- Bioretention
 - Grassed Waterways
 - Grassed Swales and Retention Basins
 - Rain Gardens / Water Quality Swales
- Constructed Wetlands
- Natural Wetlands
- Tree Box Filters
- Sand Filters
 - Sediment Basins
 - Infiltration Trenches
- Cisterns/Rain Barrels
 - Municipal
 - Residential
- Vegetated / Green Roofs
- Permeable Pavement
 - Parking Lots
 - Residential Parking and Drives
 - Road shoulders
- Phyto Remediation



Examples of Green Infrastructure and Best Management Practices



Shoreline Buffers intercept nutrients before they enter waterways.



A Phyto Remediation tree planting in City of Muskegon designed to treat polluted groundwater.



BMPs are more cost effective, efficient, and easier to maintain when included in original engineering and planning design.

Landscaped areas along commercial parking lots and roads can be designed to filter stormwater runoff before it enters the storm drain/water body.

Existing greenspace can be retrofitted to function as a stormwater filter.

Storm drain inlets can be placed on risers to allow the first flush of a storm to filter before the water begins to run into the storm drain/water body.

Curb cuts and gentle grades allow water to run in to a bioswale of native flowers, sedges and grasses