



Gaines Township Welcome to the Plaster Creek Watershed

PLASTER CREEK STEWARDS

Sharing a mission with Gaines Township to improve water quality

Managing the Township's Freshwater Portfolio

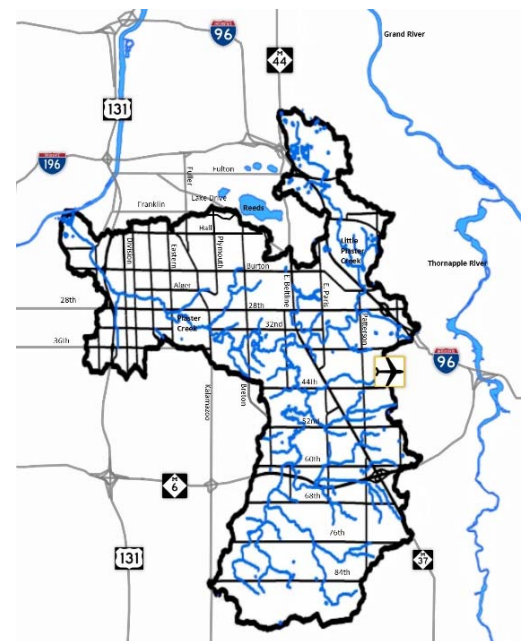
Township officials make decisions to protect the quality of life for current and future township residents. Such an approach is helpful when considering the township's *freshwater portfolio*, which includes Plaster Creek and its watershed. Clean fresh water is such a vital requirement for life, yet it can all too quickly be overlooked and taken for granted. When township officials work to protect, enhance and restore fresh water resources they will be improving living conditions for township residents. Healthy waterways like Plaster Creek will provide multiple benefits for residents and visitors, benefits that will be passed on to those living downstream as well as to future generations. This brochure explains why land use decisions in the township should be made with careful consideration of their impact on waterways like Plaster Creek.

What is a watershed?

A watershed is an area of land, within which all falling water (rain or snow) is directed to the same place. In other words, a watershed is an area of land that drains to a common point. Through many tributaries and feeder streams, the Plaster Creek Watershed directs its water into Plaster Creek, which empties into the Grand River one mile southwest of downtown Grand Rapids.

Why care about Plaster Creek?

Plaster Creek is an ecological, recreational and educational asset that because of neglect and abuse now poses a public health threat, particularly to downstream residents. A healthy Plaster Creek and its supporting wetlands can provide environmental services such as floodwater retention, natural stormwater drainage, groundwater infiltration, wildlife habitat, and surface water filtering. Plaster Creek connects upstream and downstream communities. It is the place where generations of children have learned to value the natural world.



Why is water quality in the creek *impaired*?

Plaster Creek is considered impaired because it does not meet state water quality standards for safe human body contact due to high bacterial levels. A second impairment is due to unnaturally high sediment load (caused by erosion) which prevents healthy aquatic life. Both high bacterial levels and high sediment loads are examples of *nonpoint source pollutants*. This designation also includes excess nutrients, salts, oils, heavy metals and other pollutants that enter the stream from *impervious surfaces*, failed septic systems, eroding stream banks, chemically-treated lawns, and agricultural runoff.

What is *nonpoint source* (NPS) pollution?



NPS pollution occurs when rain and snowmelt carry pollutants from a variety of land surfaces into waterways. NPS pollution is difficult to manage because there is no single source and no single *best management practice* (BMP) to fix the problem and generate the desired result - better water quality. Many types of NPS pollution can be broadly managed with *low impact development*, which includes a diversity of BMP options.

What is an *impervious surface*?



As development progresses, more and more land in the watershed is covered by *impervious surfaces* - streets, parking lots and roof tops - where water cannot soak into the ground. Instead, water coming off these areas runs off rapidly and washes untreated *NPS pollutants* into Plaster Creek. Studies have correlated increased imperviousness with degraded water quality, a trend that already begins to show itself when impervious surfaces cover as little as 7% of a watershed.

What is *low impact development* (LID) and *best management practices* (BMPs)?



Low Impact Development (LID) is an approach to land development that works with nature to manage stormwater where it falls. *Best management practices* (BMPs) are methods that have been used to promote LID and reduce NPS pollution. These practices include rain gardens, bio-swales, retention basins, rainwater storage (rain barrels, cisterns, etc.), vegetated rooftops, streamside buffers, tree planting, and porous pavement. More LID in the Plaster Creek Watershed would significantly help restore water quality, biodiversity, and environmental services.

The 2008 Plaster Creek Watershed Management Plan (WMP)

The 2008 WMP goals for Plaster Creek are to *improve and protect its habitats for fish and other native aquatic life and wildlife plus improve and protect the safety and enjoyment of fishing, public access, and wading*. The long-term goal is to improve Plaster Creek so that it is no longer classified as an *impaired waterway* but instead meets and exceeds safe water quality standards. The WMP is a helpful guide for townships and organizations committed to protecting and improving water quality in Plaster Creek.

The challenge is to manage “nonpoint source pollution” so that Gaines Township has both a healthy watershed and a healthy economy.

What Townships Do Best Can Help Plaster Creek

- Water resource responsibilities are shared with **many levels of government** in the Plaster Creek watershed. Township officials are experienced at navigating through these different levels.

- **Daily interactions** of local officials with residents can encourage informative and educational conversations that raise awareness and concern for Plaster Creek.
- Residents rely on township officials to pursue actions reflecting their '**duty of care**' as stewards of local natural resources, including its freshwater portfolio.
- Managing water quality is strongly influenced by **land use decisions** and land use decisions are a function of local governance. Township officials define land use standards and manage water quality impacts in developing master plans, passing ordinances, and reviewing developments.
- Townships **pursue positive actions**. There is *always* something positive the township can do to protect and improve water quality in Plaster Creek and the environmental quality of its watershed.

The Role for Township Planning Officials

As new issues present themselves, such as reducing NPS pollution, township planning commissions might be inclined to look for quick solutions. But remedying stormwater pollution and implementing **low impact development (LID)** takes time. Working through the process stimulates planners, officials, and residents in the township to learn, negotiate, and reach solutions that everyone understands. The planning commission can ensure that the community is adequately prepared to reasonably apply LID solutions in master plans, zoning ordinances, and siting decisions for development and redevelopment proposals.

Perseverance is the hard work you do after you're tired from doing the hard work you've already done. Newt Gingrich

The Master Plan Role in Water Quality

Planning enables the township to thoughtfully look ahead and avoid missteps that might compromise township assets, including its freshwater portfolio. Planning is an opportunity to review the beneficial qualities of the township and potentially harmful threats to the township. What is good can be nurtured and protected. What is harmful can be changed. Updating the master plan enables the township to step back, examine water quality issues, and devise a plan of action to guide local decision-making. It can specify that watershed health be considered in land use decisions, zoning, site plan review, and other actions. Careful master planning will achieve a healthy balance between a township's gray infrastructure (built environment) and its green infrastructure (natural areas and open spaces).

The Role of Zoning in Water Quality

Zoning plays a major role in the township's ability to implement approaches such as *low impact development* and restoring water quality. Zoning is both a problem and a solution to water quality. In the past, zoning has led to land use arrangements that were detrimental to water resources. But zoning can also direct land uses in ways that respect water flow and protect the township's freshwater portfolio. Zoning is intended to serve the best interests of the township, striking a balance between being hastily innovative and inflexibly conservative. It is a powerful tool that can be used to guide market forces and foster development in a manner that accommodates today's desires yet anticipates tomorrow's needs.

The Impact of Land Use Decisions

Land use affects water quality. Considerations about water quality first take shape in proposed site plans. A site plan review can address impervious surfaces and determine whether stormwater runoff can be infiltrated onsite rather than conveyed into storm sewers. Such decisions impact the township, its residents, those living downstream, and future generations yet to choose this township for their home.

How the Township Can Protect and Improve Plaster Creek

- ✓ Get to know Plaster Creek and its watershed by **reviewing its watershed management plan**.
- ✓ Organize a **strategy** for implementing recommended actions for the township.
- ✓ Formally support **WMP goals** in township resolutions and master plan.
- ✓ Use the WMP to identify **vulnerable areas** and causes of nonpoint source pollution.
- ✓ Join with **other watershed communities** to repair and remedy NPS pollution in Plaster Creek.
- ✓ Respect **downstream neighbors** when making land use decisions.
- ✓ Develop a shared **working knowledge** of low impact development through training.
- ✓ Pilot and demonstrate **low impact development** in township projects.
- ✓ Establish a water quality and watershed role as part of township **job descriptions**.
- ✓ Organize a **citizen's committee** to assist in researching changes to the master plan and zoning ordinance that will benefit the township and Plaster Creek watershed

Plaster Creek Stewards

We are a collaboration of Calvin College faculty, staff, and students working with local schools, churches, and community partners to restore the health and beauty of the watershed. We focus on research and education plus working directly to restore the watershed. Our goals are to:

- Educate the community about the plight of Plaster Creek and its surrounding watershed,
- Conduct research that informs how best to address problems in the watershed,
- Implement on-the-ground restoration projects to restore health and beauty to the watershed.

Other Support

Support for this document was provided in partnership with Plaster Creek Stewards. This project has been funded through the Michigan Nonpoint Source Program by the U.S. Environmental Protection Agency under the assistance agreement #2012-0023 to Plaster Creek Stewards for the Plaster Creek Watershed Restoration project. The contents of the document do not necessarily reflect the views and policies of the U.S. EPA nor does the mention of trade names or commercial products constitute endorsement or recommendations for use.

Prepared by the
Center for
Environmental
Study



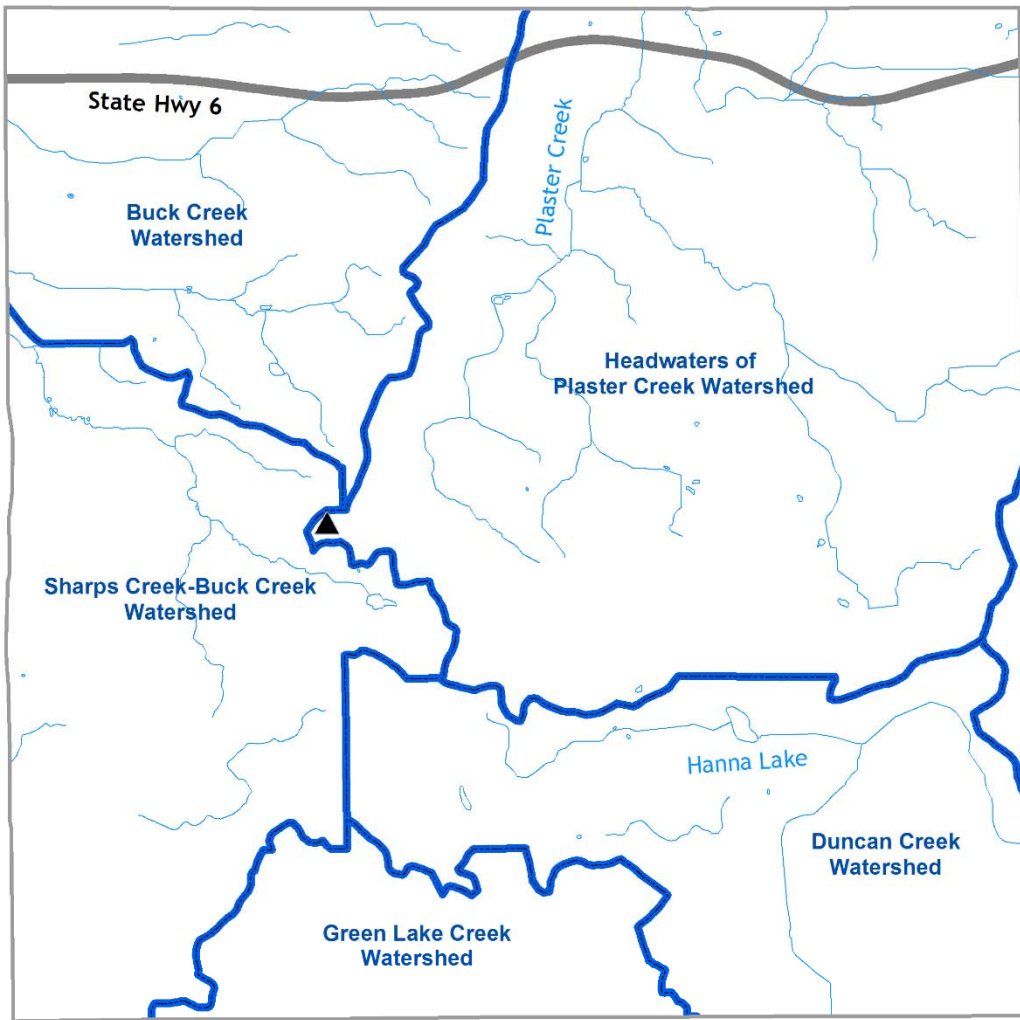
Prepared for the
*Plaster Creek
Stewards*
Calvin College
3201 Burton
SE Grand Rapids,
MI 49546

Funded by the
Michigan
Department of
Environmental
Quality

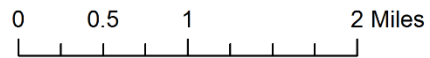


Funded by the
U.S. Environmental
Protection Agency

Plaster Creek WATERSHED PROFILE



Gaines Township



- ▲ Gaines Township Hall
- Water features
- Major road
- Watersheds



Center for Social Research, Calvin College

Plaster Creek Watershed (PCW)

Intent of Watershed Profile	<ul style="list-style-type: none"> • Raise awareness of Plaster Creek and how its degradation threatens watershed residents. • Assemble, condense, and present selected PCW information to <i>Ada</i>, <i>Caledonia</i>, and <i>Gaines</i> Townships (non-MS4 townships in the Plaster Creek Watershed). • Encourage best practices to address water quality issues in township land use decisions. • Suggest strategies for township master plans and zoning ordinances to improve water quality. • Acknowledge that PCW is complex and that we all need to learn more about how to best care for this watershed. 						
Plaster Creek	<ul style="list-style-type: none"> • Plaster Creek is a 14-mile long tributary of the Grand River. • Indigenous Ottawa called the stream ‘Kee-No-Shay’, meaning ‘Water of the Walleye.’ • The name ‘Plaster Creek’ reflects streamside gypsum deposits that were mined and milled into plaster (beginning in the mid-1800s), activities that sometimes turned the creek milky white. • Water in the creek is supplied by springs and by runoff from rainfall and snowmelt. • The creek originates in actively farmed regions then travels through developed, urban areas. • Plaster Creek’s main channel originates south of 84th Street (Caledonia and Gaines Townships), flowing north, and is joined near the East Beltline and 28th Street by the northern flowing Little Plaster Creek (from Ada Township), then swings west through the city to the Grand River. • Plaster Creek meets the Grand River approximately one mile south of downtown Grand Rapids and 27 miles east of Grand Haven, where the Grand River empties into Lake Michigan. • It takes about 6 days for water in Plaster Creek to reach Lake Michigan. • Stormwater runoff is the trigger that exacerbates all other water quality problems. • Plaster Creek harbors extremely high levels of <i>E. coli</i> bacteria, levels that consistently categorize it unsafe for even partial human body contact. • The creek also carries extremely high levels of sediment, diminishing its ability to support healthy aquatic organisms including fish. 						
Watershed Location	<ul style="list-style-type: none"> • Plaster Creek watershed (PCW) is located completely within Kent County, Michigan. • PCW is nested within the Lower Grand River Watershed, part of the Lake Michigan Basin. • PCW includes agricultural, suburban, commercial, industrial, and urban areas. • 33% of the population of Grand Rapids resides within the PCW. 						
Watershed Size	<ul style="list-style-type: none"> • 58 square miles (36,448 acres) • Roughly 10 miles wide from east to west and 15 miles long from north to south 						
HUC	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px dashed black; padding-right: 5px;"><i>Hydrologic Unit Code</i></td> <td style="padding: 0 5px;">04050006 0505 Plaster Creek south</td> <td style="padding: 0 5px;">04050006 0506 Plaster Creek north</td> </tr> <tr> <td style="border-right: 1px dashed black;"></td> <td colspan="2" style="padding: 0 5px;">Plaster Creek and tributaries (Little Plaster, Whiskey, etc)</td> </tr> </table>	<i>Hydrologic Unit Code</i>	04050006 0505 Plaster Creek south	04050006 0506 Plaster Creek north		Plaster Creek and tributaries (Little Plaster, Whiskey, etc)	
<i>Hydrologic Unit Code</i>	04050006 0505 Plaster Creek south	04050006 0506 Plaster Creek north					
	Plaster Creek and tributaries (Little Plaster, Whiskey, etc)						
Headwaters	<ul style="list-style-type: none"> • Caledonia and Gaines Townships contain Plaster Creek’s headwaters, where the creek originates as a series of small tributaries. • Wetlands in the headwater region tend to be small and isolated. • Headwater flows are collected mostly from agricultural and developing suburban areas. • Such flows are particularly vulnerable to changes in local land use and surface drainage. • Increasing imperviousness in headwaters impacts downstream water quality and hydrology. • Plaster Creek rises rapidly after rainfall events, intensifying erosion. • Stormwater inflows also elevate nutrient levels and <i>E. coli</i> concentrations. 						

Wetlands	<ul style="list-style-type: none"> • 47% of PCW wetlands have been drained or filled over time (representing a loss of 2,028 acres). • Large portions of PCW wetlands were drained for conversion to agricultural land use. • 53% of original wetlands remain in the PCW, still providing many valuable watershed functions. • Overall, the wetlands in the PCW are widely scattered, mostly bordering creeks and tributaries. <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; padding-right: 10px;"> <i>Pre-settlement wetlands in PCW</i> 4,318 total acres of wetlands 17 acres - average wetland size </td> <td style="width: 50%; padding-left: 10px;"> <i>2005 wetlands in PCW</i> 2,290 total acres of wetlands (53% left) 2.2 acres - average wetland size </td> </tr> </table>	<i>Pre-settlement wetlands in PCW</i> 4,318 total acres of wetlands 17 acres - average wetland size	<i>2005 wetlands in PCW</i> 2,290 total acres of wetlands (53% left) 2.2 acres - average wetland size
<i>Pre-settlement wetlands in PCW</i> 4,318 total acres of wetlands 17 acres - average wetland size	<i>2005 wetlands in PCW</i> 2,290 total acres of wetlands (53% left) 2.2 acres - average wetland size		
Elevation	<ul style="list-style-type: none"> • The highest point in PCW is just under 800 feet above sea level. • The lowest point is 580 feet above sea level where the creek joins the Grand River. • From 44th Street to the Grand River the creek loses approximately 106 feet in elevation. • The Silver Creek sub-watershed drops 160 feet from East Grand Rapids to Roosevelt Park. 		
Climate	<ul style="list-style-type: none"> • Long-term average annual rainfall in PCW is approximately 36 inches. • Long-term average annual snowfall is approximately 78 inches. • There are typically 155 frost-free growing days in the watershed. • 55-60% of growing season precipitation is from showers and about 40% from thunderstorms. • The Köppen climate classification for this area is ‘Humid Continental.’ 		
Hydrology	<ul style="list-style-type: none"> • PCW hydrology changed drastically when the watershed transitioned from its natural condition to an active agricultural area. • As urbanization expanded out from the center of Grand Rapids, this transition continued, further accelerating stormwater runoff into the creek, heightening peak flows and increasing stream bank erosion. • Plaster Creek carries an average flow of 34 cubic feet/second or 22 million gallons/day. 		
Flooding	<ul style="list-style-type: none"> • Flooding often occurs when runoff is heaviest in late winter and early spring while vegetation is dormant and the ground is frozen or saturated. • As natural surfaces are replaced by impermeable roads, parking lots and rooftops, more pollutants make their way into Plaster Creek, and flooding events become increasingly frequent and more damaging. • There has not been an official flood stage established for Plaster Creek. 		
Landforms	<ul style="list-style-type: none"> • Plaster Creek originated as meltwater when the last glacier receded, around 15,000 years ago. • Glaciated landforms define the PCW, including glacial till (sand and gravel) and outwash plains (silt and clay). • The area was historically a mosaic of alternating well and moderately well-drained rises and poorly to very poorly-drained linear depressions along waterways and within valleys. • Upland, better drained soils historically supported open Oak and Hickory forests while lower lying and more poorly drained sites supported Sugar Maple, Beech and Ash forests. • Floodplain forests along the creek were dominated by Sycamore, Swamp White Oak, Burr Oak, Silver Maple, White Cedar, and Black Ash. 		
Soils	<ul style="list-style-type: none"> • In general, the upstream reaches of the watershed have clay-dominated soils whereas the downstream areas have mostly sandy soils. • Hydrologic soil group (HSG) is a soil classification system based on drainage capacity, and is an important tool used in modeling. • HSG A soils are primarily sandy or loamy and have a high capacity for water infiltration; in the PCW these soils are found mostly along the stream channels, and in the Alger Heights, Oakdale, Garfield Park, Burton and Roosevelt Park neighborhoods. • Much of the rest of the PCW hosts HSG C and HSG D soils, soils with low infiltration capacity. 		

Other watersheds	<ul style="list-style-type: none"> Plaster Creek Watershed is the largest watershed in Gaines Township, draining most of the center and northeast quarter of the township in a northerly direction. Gaines Township Hall is located in the furthest west portion of the Plaster Creek Watershed. Other watersheds in the township are Buck Creek, draining the eastern regions, Green Lake Creek which drains a southern area, and Duncan Creek, which drains the southeastern quarter of the township. 					
Plant and animal communities	<ul style="list-style-type: none"> Plaster Creek Watershed hosts a diverse assemblage of plants and animals. The stream corridor is home to turkey, deer, fox, muskrat, mink, heron, and many others. MDEQ classifies Plaster Creek as a warm water fishery. Fishermen find a variety of fish including sunfish and salmon. One endangered mollusk species (<i>snuffbox mussel</i>) is found in Plaster Creek. This is the only place in Kent County where the state-threatened <i>beak grass</i> is known to grow. Several rare plants persist in natural areas of the watershed, e.g. <i>pawpaw</i>, <i>bladdernut</i>, <i>green dragon</i>, <i>American gromwell</i>, and <i>Virginia bluebells</i>. Problematic <i>non-native</i> plant species are also present and advancing, including <i>garlic mustard</i>, <i>Japanese knotweed</i>, <i>glossy buckthorn</i>, <i>Tartarian honeysuckle</i>, and <i>purple loosestrife</i>. Due to water quality problems, fish and macroinvertebrate communities are rated poor. 					
Local units of government	<ul style="list-style-type: none"> PCW is wholly contained within Kent County, comprising portions of the following 9 communities: <ul style="list-style-type: none"> Cities of East Grand Rapids, Grand Rapids, Kentwood, and Wyoming. Townships of Gaines, Cascade, Grand Rapids, Caledonia, and Ada PCW has more than 100 land use decision makers. 					
MS4 Communities	<ul style="list-style-type: none"> NPDES Phase II or <i>municipal separate storm sewer system</i> (MS4) communities in PCW include: cities of East Grand Rapids, Grand Rapids, Kentwood, and Wyoming and the townships of Cascade and Grand Rapids (note that townships of Ada, Caledonia, and Gaines not MS4s). MS4 communities are subject to permit requirements defining their responsibilities for protecting water quality in the watershed. 					
PCW	<i>Population</i> (2010 Census) 116,490		<i>Land area</i> 58 mi² (36,454 acres)		<i>Density</i> 2,009 people/mi ²	
Population (2010 Census)	Total community population	PCW population in community	% of community population in PCW	% of PCW population in community	Community population density	PCW population density in community
<i>Ada</i>	13,142	983	1%	7%	355 people/ mi ²	1,966 people/ mi ²
<i>Caledonia</i>	12,332	689	<1%	6%	342 people/ mi ²	313 people/ mi ²
<i>Gaines</i>	22,731	6,173	5%	27%	631 people/ mi ²	441 people/ mi ²
<i>MS4s</i>	353,860	108,645	93%	31%	2,464 people/ mi ²	2,698 people/ mi ²
Land area	Community total land area	PCA land area in community	% of community land area in PCW	% of PCW land area in community		
<i>Ada</i>	23,712 acres (37 mi ²)	338 acres (0.6 mi ²)	0.9%	1.4%		
<i>Caledonia</i>	22,844 acres (36 mi ²)	1,427 acres (2.2 mi ²)	3.9%	6.3%		
<i>Gaines</i>	22,880 acres (36 mi ²)	8,857 acres (14 mi ²)	24.3%	38.7%		
<i>MS4s</i>	143.6 mi ²	25,832 acres (40.4 mi ²)	70.9%	40.4%		

**Land use
Land cover**

- The Plaster Creek Watershed Management Plan has identified wise land use decisions as key to improving Plaster Creek's health.
- Since 1992 there has been rapid urban expansion in the watershed.
- Many areas that were previously farmland have been developed as commercial or residential.
- In 2006, **54%** of the PCW was considered developed.
- An additional **19%** was identified as open space, which includes lawns, parks, and medians.
- Agricultural land use accounts for **16%** of the watershed, down from **38%** in 1992.
- The remaining **11%** consists of natural or naturalized forests and wetlands.
- Plaster Creek originates mostly in agricultural areas, moves through suburban and commercial developments to more industrial sections and eventually lower-income urban neighborhoods.
- Some high quality natural areas remain along the stream, particularly at Paris Park, Ken-O-Sha Park, and a section between 28th Street and Madison Avenue.

**Septic
systems**

- Domestic wastewater can release pathogens, such as harmful bacteria and viruses.
- In properly functioning septic systems soil and associated soil bacteria can effectively remove most disease-causing microorganisms from wastewater.
- Many suburban and rural watershed residents are serviced by private septic systems.
- Between 1994 and 2004, the number of septic systems in Kent County rose 30%, largely due to development of formerly rural areas.
- Data from three Michigan locations (Washtenaw, Wayne and Barry/Eaton counties) that have inspection programs for onsite septic systems report failure rates of 17%, 26%, and 27% respectively.
- Michigan is the only state *without* a statewide sanitary code governing onsite sewage systems.

Plaster Creek where it drains into the Grand River, one mile south of downtown Grand Rapids



Plaster Creek water quality impairments per 2008 Watershed Management Plan (WMP)

State designated uses	<p>Impaired Uses</p> <ul style="list-style-type: none"> • Warm water fishery • Indigenous aquatic life and other wildlife • Total body contact recreation (swimming) 	<p>Threatened Uses</p> <ul style="list-style-type: none"> • Partial body contact recreation (e.g. wading) 	
Impaired water body	12-mile stretch of Plaster Creek from its Grand River confluence upstream to Dutton Park		
Water quality goals	Goals designated to improve the impaired and threatened uses of PCW are: <ol style="list-style-type: none"> 1. <i>Improve and protect habitats for fish and other indigenous aquatic life and wildlife.</i> 2. <i>Improve and protect the safety and enjoyment of fishing, public access, and wading.</i> 		
Pollutants	Sediment, <i>E. coli</i> bacteria, and nutrient loadings to Plaster Creek		
Pollutant sources and causes	<p>Priority Pollutants</p> <p>Sediment</p>	<p>Sources of Pollutant</p> <p><i>Stream bank erosion</i></p> <p><i>Urban runoff</i></p> <p><i>Agricultural runoff</i></p> <p><i>Construction sites</i></p>	<p>Potential Causes for Pollutant Presence</p> <p>Flashy flows</p> <p>Stormwater outfalls + tile drainage</p> <p>Livestock access</p> <p>Road/stream crossings</p> <p>Log jams</p> <p>Off-road vehicle use</p> <p>Untreated urban runoff</p> <p>Rill and gully erosion</p> <p>Improper erosion/sedimentation control measures</p>
	<p>E. coli bacteria</p>	<p><i>Animal wastes</i></p> <p><i>Septic systems</i></p> <p><i>Sanitary sewer connections</i></p>	<p>Livestock access</p> <p>Manure spreading</p> <p>Feedlot runoff</p> <p>Wildlife</p> <p>Pet waste</p> <p>Improper septic system maintenance</p> <p>Faulty connections</p>
	<p>Nutrients (phosphorous + nitrates)</p>	<p><i>Lawn inputs</i></p> <p><i>Animal wastes</i></p> <p><i>Septic systems</i></p> <p><i>Sanitary sewer connections</i></p>	<p>Improper fertilizer management and yard waste disposal</p> <p>Livestock access</p> <p>Manure spreading</p> <p>Feedlot runoff</p> <p>Wildlife</p> <p>Pet waste</p> <p>Improper septic system maintenance</p> <p>Faulty connections</p>
Water quality indicators	<p>WMP prioritizes critical areas and provides framework for implementing restoration practices. It also presents the following goals for sediment and nutrient load reduction:</p> <ul style="list-style-type: none"> • 25% reduction in sediment, resulting in an in-stream sediment concentration of 30 mg/L (TMDL suggests 40% reduction in sediment loads to meet the 30 mg/L in-stream concentration). • 40% reduction in total phosphorus loadings. • 20% reduction in total nitrogen loadings. <p>To attain designated uses. <i>E. coli</i> concentrations must meet WQS established for total body contact recreation. Total body contact recreation standards, set by the State, are 130 count <i>E. coli</i> per 100 milliliter (ml) as a 30-day geometric mean from May 1 to October 31.</p>		

<p>Profile resources</p>	<ul style="list-style-type: none"> • 2012 BMP Planning to Address Urban Runoff - Plaster Creek Watershed SUSTAIN Pilot http://www.calvin.edu/admin/provost/pcw/Plaster_SUSTAIN_12312012(final).pdf • 2010 Lower Grand River Watershed Management Plan (Revised) http://www.gvsu.edu/wri/isc/lower-grand-river-watershed-management-plan-312.htm • 2008 Plaster Creek Watershed Management Plan http://michigan.gov/documents/deq/wb-nps-plaster_cr_wmp_293403_7.pdf • 2004 Lower Grand River Watershed Management Plan – Fact sheet https://www.michigan.gov/documents/deq/ess-nps-fs-lower-grand-planning_207945_7.pdf • 2002 Total Maximum Daily Load for <i>Escherichia Coli</i> in Plaster Creek, Kent County http://www.epa.gov/waters/tmdl/docs/deq-swq-gleas-tmdlplaster.pdf • 2002 Total Maximum Daily Load for Sediment in Plaster Creek, Kent County http://www.epa.gov/waters/tmdl/docs/3905_PlasterCkbioTMDL1.pdf • Urban Waters Learning Network http://www.urbanwaterslearningnetwork.org/category/water-quality • Plaster Creek Watershed GIS Interactive Website http://www.gis.calvin.edu/PlasterCreek
<p>Watershed Organizations</p>	<p>Many volunteers have been working to address the problems of Plaster Creek by pursuing the restoration of its ecological, recreational, and quality of life potential. Several community-based watershed groups implement various stewardship activities in the PCW and in other adjacent watersheds. These groups have been involved in tree planting, installing rain gardens and other local LID projects. The Plaster Creek Stewards is a group based at Calvin College that has organized and sponsored many such activities in the watershed. They focus on research, education and on-the-ground restoration projects. Community-based efforts like these are critically important for watershed improvement and provide wonderful opportunities for township residents to become involved.</p> <ul style="list-style-type: none"> • Plaster Creek Stewards http://www.calvin.edu/admin/provost/pcw/ • Lower Grand River Organization of Watersheds (LGROW) http://www.lgrow.org/ • Thornapple River Watershed Council http://thornappleriver.org/

Support for this document was provided by partners with the Plaster Creek Stewards. This Nonpoint Source Pollution Control Project has been funded wholly through the Michigan Nonpoint Source Program by the U.S. Environmental Protection Agency under the assistance agreement #2012-0023 to Plaster Creek Stewards for the Plaster Creek Watershed Restoration project. The contents of the document do not necessarily reflect the views and policies of the U.S. EPA nor does the mention of trade names or commercial products constitute endorsement or recommendations for use.



Prepared by the Center for Environmental Study for the Plaster Creek Stewards



Funded by the U.S. Environmental Protection Agency and the Michigan Department of Environmental Quality



DEQ
Michigan's Nonpoint Source Program



Clean Water Starts in Gaines Township

PLASTER CREEK STEWARDS

Sharing a mission with Gaines Township to improve water quality

Recommendations for Gaines Township

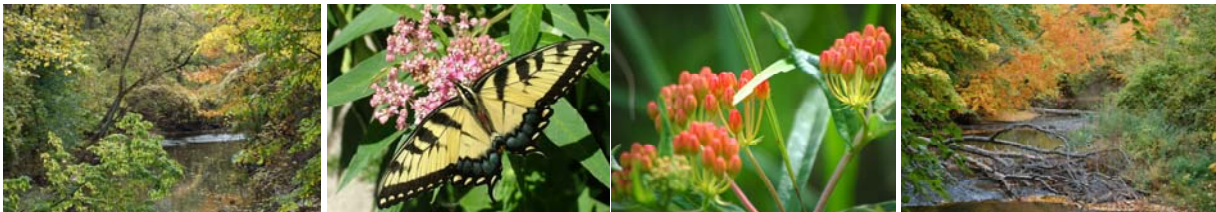
Township officials are no different than residents in preferring healthy local waterways over polluted, degraded ones. Township officials, however, are more uniquely positioned to impact the health of their community's water resources. When developing the master plan and deciding on local ordinances, officials influence how a community interacts with its water. These influences directly affect water quality within the township and in communities further downstream.

Based on review of several townships' master plans and zoning ordinances, this brochure provides recommendations for implementing low impact development (LID). Because of the expansion of impervious surfaces in the watershed, and subsequent increases in stormwater runoff, there is a need for LID in Gaines Township, an important part of the Plaster Creek watershed.

Some of these recommendations involve education and outreach, while others focus on updating the master plan and revising the zoning ordinance. Every enlightened official, updated master plan, revised zoning ordinance, and improved site plan is an opportunity to improve the quality of the township's freshwater resources.

We offer this document as resource for township officials to work together in identify short-term and long-term goals for improving and protecting local water quality.

A healthy Plaster Creek starts with your township!



1.0 Reach out and Connect

Notes: Public outreach and education is always helpful preparing residents for policy changes. Help **increase awareness** about watershed planning issues. Introduce water quality topics and LID concepts and encourage residents to learn about stormwater runoff. Help develop passionate advocates for clean water in your township.

Actions	Concerns?	Comment or Question
Provide website links to local watershed groups (such as Plaster Creek Stewards) and other sources that advocate for healthy watersheds.	<input type="checkbox"/> Yes <input type="checkbox"/> No	1a
Volunteer to serve as a channel for watershed groups in distributing literature.	<input type="checkbox"/> Yes <input type="checkbox"/> No	1b
Regularly offer informal speaker presentations on topics like watersheds and water quality.	<input type="checkbox"/> Yes <input type="checkbox"/> No	1c
Offer Low Impact Development (LID) technical workshops on installing rain gardens, green roofs, and managing stormwater where it falls.	<input type="checkbox"/> Yes <input type="checkbox"/> No	1d
Write newsletter articles about watershed topics.	<input type="checkbox"/> Yes <input type="checkbox"/> No	1e
Promote proper septic system functioning and provide homeowner education on maintenance.	<input type="checkbox"/> Yes <input type="checkbox"/> No	1f
Encourage property owners to install and maintain LID practices on their properties.	<input type="checkbox"/> Yes <input type="checkbox"/> No	1g
Organize a tour of LID projects and invite township officials and the public to see LID work.	<input type="checkbox"/> Yes <input type="checkbox"/> No	1h
Other ideas:		

2.0 Participate and Collaborate

Notes: Participation in watershed-related work and collaboration with watershed partners will be central to successfully managing nonpoint source pollution in Plaster Creek. Collaboration helps promote coordinated messages from many voices while fostering fruitful partnerships.

Actions	Concerns?	Comment or Question
Partner with Plaster Creek Stewards and other local watershed groups (such as LGROW).	<input type="checkbox"/> Yes <input type="checkbox"/> No	2a
Work with local schools or education initiatives like Groundswell that have programs focused on watershed issues.	<input type="checkbox"/> Yes <input type="checkbox"/> No	2b
Take advantage of MS4 resources in planning and implementing outreach programs.	<input type="checkbox"/> Yes <input type="checkbox"/> No	2c
Advocate for training of LID implementation—recognize installation and maintenance skills as job creation tools.	<input type="checkbox"/> Yes <input type="checkbox"/> No	2d
Work with partners to find opportunities to familiarize residents with names of creeks or other local water bodies.	<input type="checkbox"/> Yes <input type="checkbox"/> No	2e
Seek ways to support collaborative restoration efforts along Plaster Creek.	<input type="checkbox"/> Yes <input type="checkbox"/> No	2f
Facilitate gatherings to explore watershed issues and strengthen partnerships.	<input type="checkbox"/> Yes <input type="checkbox"/> No	2g
Foster public conversations by bringing diverse groups together to build civic capacity and find solutions for the future of Plaster Creek.	<input type="checkbox"/> Yes <input type="checkbox"/> No	2h
Initiate Learning Networks (e.g. Urban Waters Learning Network) to share and promote best land use practices for protecting and restoring water quality.	<input type="checkbox"/> Yes <input type="checkbox"/> No	2i
Participate in watershed management planning .	<input type="checkbox"/> Yes <input type="checkbox"/> No	2j
Other ideas:		

3.0 Lead by Example

Notes: Take the lead on managing stormwater runoff in your township. Encourage township residents and others to follow these examples and reduce stormwater runoff from yards, roofs, parking areas, and other impervious surfaces. Capitalize on “teachable moments” whenever they arise.

Actions	Concerns?	Comment or Question
Adopt a resolution to address water quality in township programs and projects.	<input type="checkbox"/> Yes <input type="checkbox"/> No	3a
Establish a task force to map drainage patterns and impervious surfaces that connect to storm drains in your township.	<input type="checkbox"/> Yes <input type="checkbox"/> No	3b
Use township property to showcase best management practices (BMPs) like rain gardens and rain barrels. Use permeable paving on township property and projects . Limit the increase of impervious surfaces on public land .	<input type="checkbox"/> Yes <input type="checkbox"/> No	3c
To show how natural landscaping looks, functions, and is maintained, use native plant landscaping on township property .	<input type="checkbox"/> Yes <input type="checkbox"/> No	3d
Develop a strategy to learn about and stay up to date on emerging techniques for improving water quality.	<input type="checkbox"/> Yes <input type="checkbox"/> No	3e
Due to the ability of trees to intercept stormwater, set forest cover goals . <i>American Forests</i> recommends urban areas strive for 40% canopy overall, 50% in suburban residential areas, 25% in urban residential areas, and 15% canopy in commercial areas.	<input type="checkbox"/> Yes <input type="checkbox"/> No	3f
Develop a Stormwater Guidebook specific to Gaines Township to help determine where stormwater practices should be placed and what practices should be incorporated to control stormwater runoff from a variety of land uses.	<input type="checkbox"/> Yes <input type="checkbox"/> No	3g
Conduct an environmental inventory to describe and map the characteristics and locations of important natural resources within Gaines Township. Results of an inventory can be used, for example, to target areas within a community for open space zoning to protect wetlands.	<input type="checkbox"/> Yes <input type="checkbox"/> No	3h
Other ideas:		

4.0 Master Plan

NOTE: Your Township Master Plan sets policies and establishes land-use standards that have implications on water quality and other natural resources. The Township Master Plan can establish standards for protecting water quality by promoting open space, limiting impervious surfaces (and managing runoff from impervious surfaces), and avoiding certain activities near surface water bodies. Consider these provisions in the Township Master Plan.

Actions	Concerns?	Comment or Question
Adopt a resolution to address some or all these recommendations in next review of the master plan.	<input type="checkbox"/> Yes <input type="checkbox"/> No	4a
Clearly designate clean water as part of the township's vision .	<input type="checkbox"/> Yes <input type="checkbox"/> No	4b
Acknowledge the Plaster Creek Watershed Management Plan (WMP) in the master plan.	<input type="checkbox"/> Yes <input type="checkbox"/> No	4c
List in the master plan what township efforts will assist in achieving clean water goals (like those listed in the WMP).	<input type="checkbox"/> Yes <input type="checkbox"/> No	4d
Use WMP data and findings to establish water quality protection and restoration priorities .	<input type="checkbox"/> Yes <input type="checkbox"/> No	4e
Introduce best management practices (BMPs) in master plan for improving water quality.	<input type="checkbox"/> Yes <input type="checkbox"/> No	4f
Support the use of Low Impact Development techniques in development plans.	<input type="checkbox"/> Yes <input type="checkbox"/> No	4g
Adopt No Adverse Impact principles where: <i>"development is done in a manner that does not pass the cost of flooding on to other properties, other communities, or to future generations."</i> -Association of State Floodplain Managers	<input type="checkbox"/> Yes <input type="checkbox"/> No	4h
Include a goal for the maximum percentage of township covered by impervious surfaces and total impervious surfaces allowed in development/redevelopment.	<input type="checkbox"/> Yes <input type="checkbox"/> No	4i
Emphasize preference for retaining native vegetation in development projects. Use a reference list of native plant species that is appropriate for projects in different settings, e.g. riparian buffer or parking lot islands.	<input type="checkbox"/> Yes <input type="checkbox"/> No	4j
Prioritize creation of a network of green infrastructure in the township.	<input type="checkbox"/> Yes <input type="checkbox"/> No	4k
Promote conservation easements as effective ways of protecting remnant natural areas.	<input type="checkbox"/> Yes <input type="checkbox"/> No	4l

5.0 Zoning Ordinance

NOTE: The Zoning Ordinance is a key tool for implementing the master plan. Master plans inform land use decisions, but land use decisions are made through zoning. Zoning standards impact water quality by addressing impervious surfaces and stormwater runoff. Zoning standards can be designed to reduce the impact of nonpoint source pollution from developed areas and protect local water resources.

Actions	Concerns?	Comment or Question
Expand definitions on watershed issues (such as low impact development, impervious surfaces, green infrastructure, stormwater runoff, etc.).	<input type="checkbox"/> Yes <input type="checkbox"/> No	5a
Add language to protect and restore water quality in Plaster Creek and other water bodies to the Purpose Section of ordinance.	<input type="checkbox"/> Yes <input type="checkbox"/> No	5b
Allow flexibility in BMP choices that accomplish water quality goals. Accept mitigation that compensates for lost functions when, for example, more impervious surfaces result.	<input type="checkbox"/> Yes <input type="checkbox"/> No	5c
Use overlay districts to add LID requirements to existing zoning districts or use floating zones where LID standards are established for development without specifying a geographic area.	<input type="checkbox"/> Yes <input type="checkbox"/> No	5d
Define landscaping in parking areas to function as stormwater management features as well as shade and visual impact screening.	<input type="checkbox"/> Yes <input type="checkbox"/> No	5e
Develop standards for each district limiting <i>total impervious surface area</i> and <i>connected impervious areas</i> . Manage for <i>disconnected impervious areas</i> . Distinguish between these impervious surface areas in definitions.	<input type="checkbox"/> Yes <input type="checkbox"/> No	5f
Specifically mention SESC permits in zoning ordinance. A permit is required for all earth change greater than one acre, and all activity within 500 feet of a lake or stream.	<input type="checkbox"/> Yes <input type="checkbox"/> No	5g
Requests for accessory buildings should trigger standards when impervious surfaces expand. Start with menu of BMP options to manage additional stormwater runoff.	<input type="checkbox"/> Yes <input type="checkbox"/> No	5h
Adopt a net zero stormwater runoff requirement for new developments.	<input type="checkbox"/> Yes <input type="checkbox"/> No	5i
Require that all stormwater runoff be routed through landscaped areas .	<input type="checkbox"/> Yes <input type="checkbox"/> No	5j

6.0 Low Impact Development (LID)

NOTE: LID helps mitigate the effects of stormwater runoff and stormwater pollution to local water bodies. Whether areas are newly developed or being re-developed, LID practices can be implemented. Some constraints may be present, such as low infiltration rates of stormwater through soils, steep slopes, high groundwater tables, and population density may limit retention, but these site characteristics can be accommodated into the appropriate plan for site. Phase in LID standards into the zoning over time.

Actions	Concerns?	Comment or Question
Assemble teams of residents, officials, developers, landscapers, and others to review LID standards for integration into zoning ordinance.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6a
Add language about restoring and protecting water quality to the <i>Intent and Purpose</i> section of Site Plan Review.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6b
Incorporate LID criteria into Site Plan Review, e.g. standards for infiltrating precipitation, on-site percent impervious surfaces, riparian buffers, stormwater runoff, etc.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6c
Provide LID training to officials and staff that review projects and enforce ordinances.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6d
Expand list of design elements required in site plan submittals to address opportunities for LID.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6e
Commit to priority status for LID projects in time for review. Some LID projects may need more information that must be identified early.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6f
Adopt LID Checklist to guide developers about using LID options that preferred by township.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6g
Implement LID through conditional use permits , enable higher standards.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6h
Use LID Scoring to evaluate LID in site plans and include incentives when certain scores are achieved.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6i
Identify LID as default standard for managing runoff before conventional engineering. Then balance between <i>gray</i> and <i>green</i> infrastructure.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6j
Allow applicants to choose LID strategies from a BMP hierarchy to prevent pollutants and minimize runoff volumes and rates.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6k
Track LID projects and collect information on results and problems. Scheduled reviews ensure approved LID installed and maintained.	<input type="checkbox"/> Yes <input type="checkbox"/> No	6l
Require LID in PUD process .	<input type="checkbox"/> Yes <input type="checkbox"/> No	6m

7.0 Other Recommendations

Actions	Concerns?	Comment or Question
Facilitate approach to ensure septic systems are maintained long-term to prevent sewage release, e.g. point of sale inspections, system registration, zoning district standards, voluntary inspections, risk-based permits, etc.	<input type="checkbox"/> Yes <input type="checkbox"/> No	7a
Use existing LID manuals as reference guides (e.g., Semcog's Low Impact Development Manual for Michigan , available online). Ordinances should not include details about BMP design specifications or performance criteria, since stormwater management is rapidly evolving.	<input type="checkbox"/> Yes <input type="checkbox"/> No	7b
To control bacterial inputs to local water bodies, adopt a pet waste control ordinance.	<input type="checkbox"/> Yes <input type="checkbox"/> No	7c
To control bacterial inputs to local water bodies, adopt waterfowl feeding control ordinance to prohibit feeding waterfowl near local water bodies.	<input type="checkbox"/> Yes <input type="checkbox"/> No	7d
Discourage invasive/exotic species in landscaping.	<input type="checkbox"/> Yes <input type="checkbox"/> No	7e
Provide links to other ordinances that affect stormwater management.	<input type="checkbox"/> Yes <input type="checkbox"/> No	7f
Tap into local expertise from watershed groups with LID experience: Plaster Creek Stewards, LGROW, the Kent Conservation District, MDEQ, Cooperative Extension, and engineering/consulting firms.	<input type="checkbox"/> Yes <input type="checkbox"/> No	7g
LID is a new concept. It can be challenging to implement. Ease public concerns and raise support for LID via public conversation .	<input type="checkbox"/> Yes <input type="checkbox"/> No	7h
Develop model site design templates for township's land uses (residential, commercial, and agricultural). Illustrate LID principles that preserve natural stream and floodplain functions. Develop versions of each template for "conventional" developments. Templates can be used for training or guiding site designs.	<input type="checkbox"/> Yes <input type="checkbox"/> No	7i

Support for this document was provided by partners with the Plaster Creek Stewards. This Nonpoint Source Pollution Control Project has been funded wholly through the Michigan Nonpoint Source Program by the U.S. Environmental Protection Agency under the assistance agreement #2012-0023 to Plaster Creek Stewards for the Plaster Creek Watershed Restoration project. The contents of the document do not necessarily reflect the views and policies of the U.S. EPA nor does the mention of trade names or commercial products constitute endorsement or recommendations for use.



Prepared by the Center for Environmental Study
for the Plaster Creek Stewards



Funded by the U.S. Environmental
Protection Agency and the Michigan
Department of Environmental Quality

