6. Priority Pollutants and Critical Areas

6.1. Priority Pollutants

The results of field monitoring and data collection presented in Chapter 5 were used along with input from the Huron Creek Watershed Advisory Council (WAC) to compile a prioritized list of pollutants (or characteristics) and sources. This list, provided in Table 6.1, provides a framework for future implementation of improvements that will be targeted first by pollutant, and secondly by sources of each pollutant. In general, each pollutant or characteristic and source or cause was prioritized based on its potential threat to water quality and the designated uses and goals established by the WAC. A more detailed description of prioritization follows.

Table 6.1 Priority Pollutants for Huron Creek Watershed

Pollutant or Characteristic	Pollutant or Characteristic Ranking[1]	Sources or Causes	Sources or Causes Ranking[1]
Metals: Copper, Iron	1	landfill leachate	1
		stamp sands	2
"Flashy" Flow	2	less pervious surfaces/lack of stormwater management	-
Sediments	3	stormwater	1
		construction	2
		bank erosion	3
Pathogens	4	septic systems	-
Nutrients	5	stormwater	1
		landfill leachate	2
		lack of vegetative buffer	3
		septic systems	4
Invasive Species	6	presence of source vegetation	-

[1]Ranking of 1 = "High Priority," with priority decreasing to 5 = "Low Priority"

6.1.1. Metals

Metals (copper and iron) are listed first due to the listing of Huron Creek as being in non-attainment status for copper in the MDEQ's Section 303(d) and exceedance of the Final Acute water quality value for copper (see Figure 5.7). In addition, high iron concentrations are likely responsible for bacteria blooms in a portion of Huron Creek. In Figure 5.5, a consistent "spike" can be seen in iron concentration. The closed landfill located south of Sharon Avenue and adjacent to Huron Creek is listed

as the first priority source, as it may be contributing both copper and iron to the creek. It is also listed first as the City of Houghton has taken measures to collect leachate from the landfill before it reaches the creek. Stamp sands are listed second as these materials are likely secondary contributors to copper in surface water runoff.

6.1.2. "Flashy" Flow

The term "flashy" refers to flows with high peak discharges and rapid times of concentration relative to the onset of a storm. As can be seen by the pre-and post-development hydrographs illustrated in Figure 5.21 and Figure 5.22, the runoff response to a storm has a much higher peak flow rate, and reaches that flow rate in a shorter time when portions of the watershed are developed. The pre-development creek morphology (channel shape, bank slope, vegetation, etc.) developed in equilibrium with the pre-development rates of discharge that occurred in response to precipitation events. When the creek is exposed to post-development flashy flows, the creek channel can be disturbed as evidenced by bed incision, bank erosion and deposition of the disturbed sediment when flow rates drop after storm events. Flashy flows and the corresponding channel disturbance also can be exacerbated by re-arrangement of the creek channel. Flashy flows can cause erosion, generate excess sediment, and compromise aquatic habitat. Each of these problems has been identified as critical by the Huron Creek Advisory Council, which explains why it is ranked as the first pollutant/characteristic after metals.

6.1.3. Sediments

Erosion and excessive sediment deposition is prevalent in Huron Creek. Sediment is by far the most observable and prevalent pollutant currently affecting water quality. This pollutant has been ranked above metals and nutrients because the impairment of biological function and visual quality of a stream can occur from excess sedimentation. The sources or causes of sediments have been ranked with stormwater runoff first, since the impervious surfaces that cause excessive stormwater runoff constitute an extensive portion of the watershed. Sediment from construction is ranked second because it can be a large contributor to erosion and excess sediment, but occurs only temporarily (after the land has been cleared and before it is developed). Bank erosion is listed third as it can be caused by flashy flows and stormwater runoff, and can occur as a result of improperly stabilized construction areas in or near the creek.

6.1.4. Nutrients

Nutrients are ranked third because levels of ammonia have been detected that are in exceedance of the Michigan water quality standards (Final Chronic Value). The primary contributors of nutrients are thought to be stormwater runoff and the closed City of Houghton landfill. This is because a) levels of nutrients generally increase traveling downstream in Huron Creek, and b) ammonia levels sharply increase at the landfill monitoring site (see Figure 5.3). The first priority source listed is stormwater, as control and treatment of stormwater can prevent or reduce the amount of nutrients reaching the creek. Lack of a vegetative buffer is listed next as it is a specific type of "treatment" zone where nutrients can be taken up by vegetation. Residential & commercial fertilizers are listed third, as addressing their use can reduce nutrients at the source. However, it is hard to control the use of fertilizers watershed-wide, which is why buffers and stormwater treatment come in as important "safety measures." Septic systems

are listed last as identification and replacement of inappropriate systems requires local government action and significant costs.

6.1.5. Bacteria

Bacteria are listed fifth as they potentially threaten the Designated Use of Partial Body Contact Recreation. Although only a few exceedances of coliform bacteria have been measured, there is general agreement by the Huron Creek Watershed Advisory Council, the City of Houghton, Portage Township, and the local district Health Department that the aging septic systems in the Dakota Heights neighborhood pose a potential threat to water quality. However, the amount of effort and funds required to eliminate this potential threat through abandonment of non-code systems and connection to the existing City of Houghton sewer system would be considerable.

6.1.6. Invasive Species

Invasive vegetative species have been listed fourth as they pose a threat to all ecosystems in the watershed, including riparian ecosystems. However, their control can require intensive management and their effects on water quality are more indirect than other pollutants.

6.2. Critical Areas

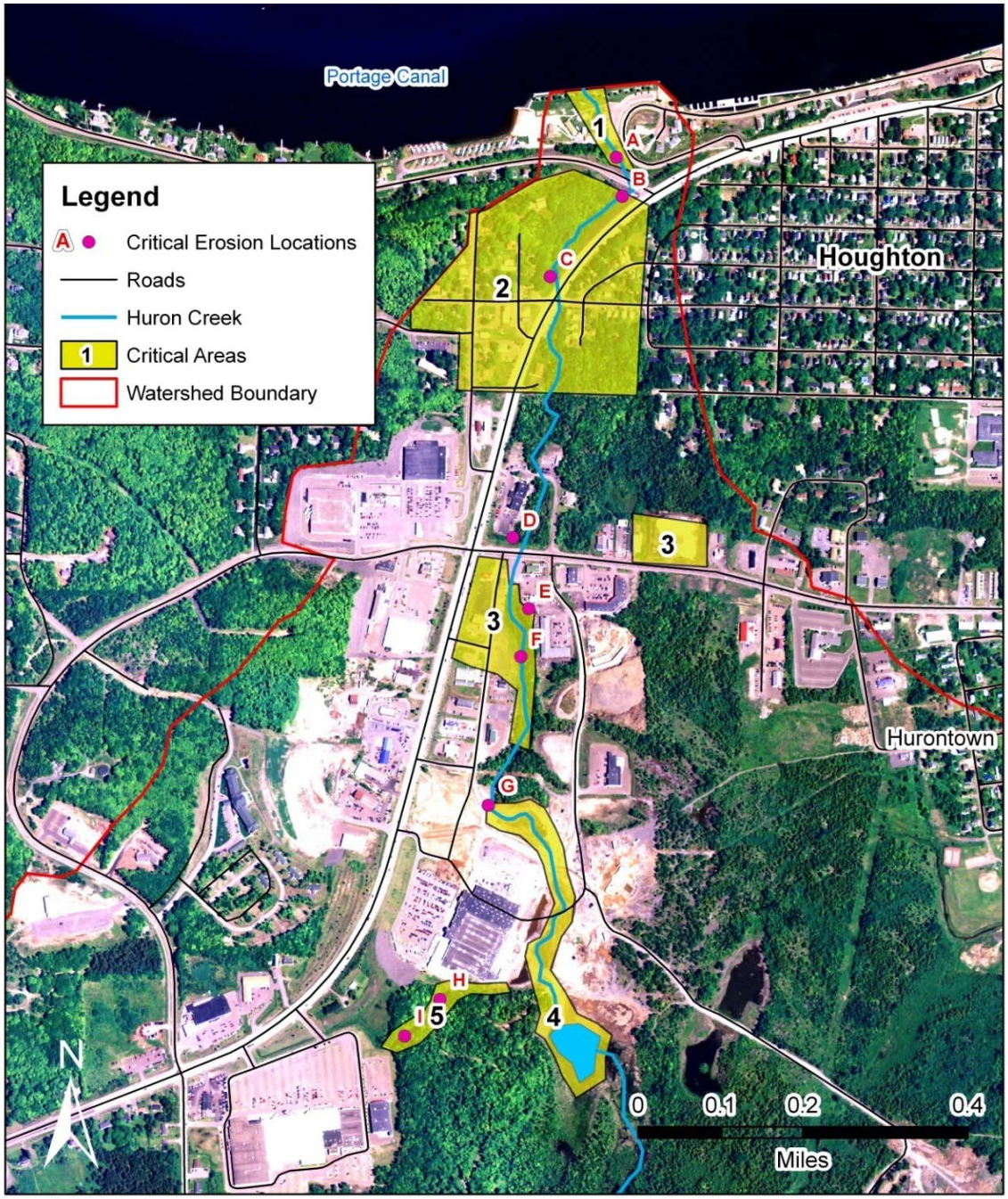
A critical area is the geographic portion of the watershed that is contributing a majority of the pollutants and is having a significant impact on the water body. The concept behind identifying a critical area is to reduce the geographic scope of the overall watershed project, and focus attention on the areas that are in greatest need of improvement. During the implementation phase, the critical areas where the greatest gains in water quality can be obtained relative to the money invested will be targeted for improvement (Elaine Brown, Amy Peterson, Ruth Kline-Robach, Karol Smith, Lois Wolfson, 2000).

Critical areas were identified through meetings of the Huron Creek Watershed Advisory Council and through results of data collection via the water quality, geomorphology and vegetation surveys. Figure 6.1 illustrates the locations and extents of the critical areas, each of which is labeled with a number. In addition, “critical erosion locations” are also identified on Figure 6.1, and are labeled with letters. The “critical erosion locations” are relatively small areas outside of the critical areas where erosion is occurring. Each critical area and erosion location is described below.

6.2.1. Critical Area #1 - Kestner Waterfront Park

The Kestner Waterfront Park (also referred to in this document as the Houghton Waterfront Park) is located within the City of Houghton limits along the Portage Canal. Due to its scenic location and ample facilities, the park is one of the most popular recreation areas in the city. Facilities include a swimming beach, launch site for kayaks and sailboats, an extensive playground area, picnic tables and a walking path. The park also has a pavilion and band shell, making it a prime location for many outdoor events and gatherings. Huron Creek flows through the Kestner waterfront park for approximately 350 feet before emptying into the Portage waterway through a culvert beneath a concrete walkway. The creek channel was excavated when the park was built in 1988. The creek channel in the park consists primarily of straight segments with steep, un-stabilized banks. Historically there have been repeated problems with the banks of Huron Creek washing out from erosion during storms. A severe storm in September

Figure 6.1 Critical areas and erosion locations.



2007 caused several bank areas to completely fail (Figure 6.2) resulting in steep, undercut and unprotected slopes. Various methods have been used to attempt to stabilize the banks over the years including rip-rap, herbaceous plantings and erosion matting with lawn grass. Each method has eventually given way to severe bank erosion.

Figure 6.2 Eroded banks in the Kestner Waterfront Park

The priorities for this area are (a) the repair and stabilization of the creek banks, (b) planting of vegetation along the creeks banks to provide a more natural setting, and (c) replacing the sidewalk-culvert outlet with a bridge. The improvement of the creek in the Waterfront Park is recognized as a high priority by the Huron Creek WAC, since the park is practically the only location where the public interacts with the creek, and so it is especially important to present the creek as a natural amenity here. The thought is that, if the public enjoys the creek as a natural amenity in the park, they are more likely to support he protection and restoration of the remainder of the creek and its watershed.

6.2.2. Critical Area #2 - Dakota Heights

Dakota Heights is the name used to describe the portion of Portage Township that lies within the larger boundaries of the City of Houghton along M-26. The Dakota Heights area is roughly contained in Critical Area #2. As mentioned in Chapters 2 and 4, homes in this area are not connected to a municipal sewer system and rely on septic systems for treatment and disposal of household wastewater. These septic systems are a potential environmental concern for the Huron Creek watershed because many of these septic systems are old and their condition is unknown. Some of the septic systems are cesspools (tanks or holes filled with rock), undersized, have more than one house on a system or are leaking and in need of repair. Some homes with septic systems are on lots that are visibly too small to support the offset and other requirements of modern septic systems (Bingham, 2008).

However, the sanitary sewer system for City of Houghton is no more than a few hundreds of feet from the homes in Dakota Heights. Sewage collected by the City of Houghton sanitary system is sent to the Portage Lake Water-Sewer Authority Treatment Plant. The City of Houghton has the capacity to handle the sewerage from the homes in Dakota Heights. Thus, collaboration between the City of Houghton and Portage Township to connect the Dakota Heights homes to the Houghton sanitary sewer system could eliminate the potential threat of these septic tanks. However, an agreement on a funding scheme for the initial sewer connections and monthly sewerage charges has yet to be worked out between the two governments.

6.2.3. Critical Area #3 - Former Houghton Landfills & Leachate Collection Area

Two closed landfills are located within the Huron Creek watershed. The first of these landfills operated for approximately 15 years beginning in the 1950's and was located just north of Sharon Avenue, extending between the current Quizno's and Huron Creek. This landfill was a "burning dump" where garbage was burned on a regular basis. This landfill was closed in the 1970's during a push towards the removal of burning dumps, and was replaced with a state registered landfill nearby. No apparent water quality impacts have been associated with this landfill. It is assumed that the distance between the materials in this landfill and the creek is large enough to preclude water quality impacts on Huron Creek. However, no assessment of the potential hazards associated with this landfill has been performed.

This second landfill was opened shortly after the close of the first, and is located under Ridge Road, extending south from Sharon Avenue to approximately the location of the current Miner's State Bank. The locations of the landfills are indicated on Figure 6.1. This second landfill was only operated for a few years before it was closed (Greer, 2006). Neither landfill was constructed by today's environmental standards, which would include having impervious liners, caps and leachate and methane collection systems. Therefore there has been concern regarding the environmental impact they are having on soil, groundwater and surface waters.

Figure 6.3 Ridge Road Landfill in the mid-1980's.

In 2000, blooms of iron bacteria were observed seeping from banks and in the bed of Huron Creek immediately next to the Ridge Road landfill. These blooms create an orange and brown slime that covers the creek bottom substrate, which could impact aquatic habitat, as well as reduce the creek's visual appeal (see Figure 4.1). These observations were responded to by MDEQ with water quality monitoring of Huron Creek beginning in 2001, and again in 2006. MDEQ employees confirmed that the "slime" was iron bacteria blooms, and observed it originating from the banks of the creek next to the landfill. Water quality test results indicated levels of dissolved copper in exceedance of the Michigan Rule 57 Aquatic Life protection value at multiple locations (including the landfill site) in both 2001 and 2006. These water quality results are listed on page 12 of the MDEQ Water Bureau December 2007 Staff Report provided in Appendix M.

In July 2005, the MDEQ Water Bureau also collected samples of the material seeping from the landfill area at two locations (seep #1 and seep #2). The seep samples were tested for a variety of parameters including some field parameters (conductivity, pH), metals, nutrients, total dissolved solids, hardness, alkalinity, pesticides and PCBs, volatile compounds (benzene, xylene, etc.) and base-neutral acid compounds.

The results of testing both seeps resulted in exceedances of the Final Chronic Value (FCV) for total dissolved solids, dissolved manganese and dissolved silver. Copper and ammonia concentrations exceeded the Final Acute Value (FAV) by one to two orders of magnitude. No pesticides, PCBs or base-neutral acid compounds were identified in either of the seep samples. The only volatile compound identified in either of the samples was benzene, which was found in seep #2 only. The measured concentration was 4.7 µg/L which is relatively low compared to the FAV for benzene which is 1,800 µg/L. Acute toxicity testing was also completed on the samples. This involves exposing macro-invertebrates (usually *Daphnia magna*) to the collected sample and observing their mortality compared to a control sample. The results of this testing indicated that the material from seep #1 was not acutely toxic to *Daphnia* as it did not exceed the standard of 1.0 Acute Toxicity Units (TUa). However, the material from seep #2 was determined to be acutely toxic to *Daphnia* with a level of toxicity of >3.1 TUa. The report for seep #2 states that seeping groundwater from the landfill may be contributing to the biological impairment of Huron Creek. These results and data summaries by MDEQ are also included in Appendix M.

In fall 2005, MDEQ approached the City of Houghton about completing a remediation project to prevent the seeping groundwater (leachate) from reaching Huron Creek. In response, the city installed a leachate collection system at the toe of the slope of the landfill so that the leachate is intercepted before it reaches the creek. This system includes a perforated pipe that has been installed in a gravel trench lined with impervious geo-membrane. The pipe and trench are sloped so that leachate entering them runs to a sump, where it is then pumped into the city's municipal sewer system for treatment at the wastewater treatment plant. The system began operating in fall 2006.

Although the installation of the leachate collection system is potentially solving the problem of leachate impacting the creek's water quality, the construction during installation of the system resulted in disturbance of soils and vegetation along that portion of Huron Creek. The City of Houghton took measures to control erosion and stabilize the site, but some are in need of repair, or additional stabilization should be completed. For example, the steep side slope of the old landfill that was disturbed during construction is showing rill and gully erosion despite installation of erosion matting and attempts at planting grass seed. Grass is only sparsely filling in on erosion mat at the base of the slope due to a thin or non-existent soil layer. Other locations remain with bare soil and would best be stabilized through planting native riparian vegetation. Figure 6.4 shows the creek and construction area as viewed from the current Arby's parking lot. In addition, as seen in Figure 6.4, the dense shrub and tree vegetation that existed before installation of the leachate collection system has not been replaced.

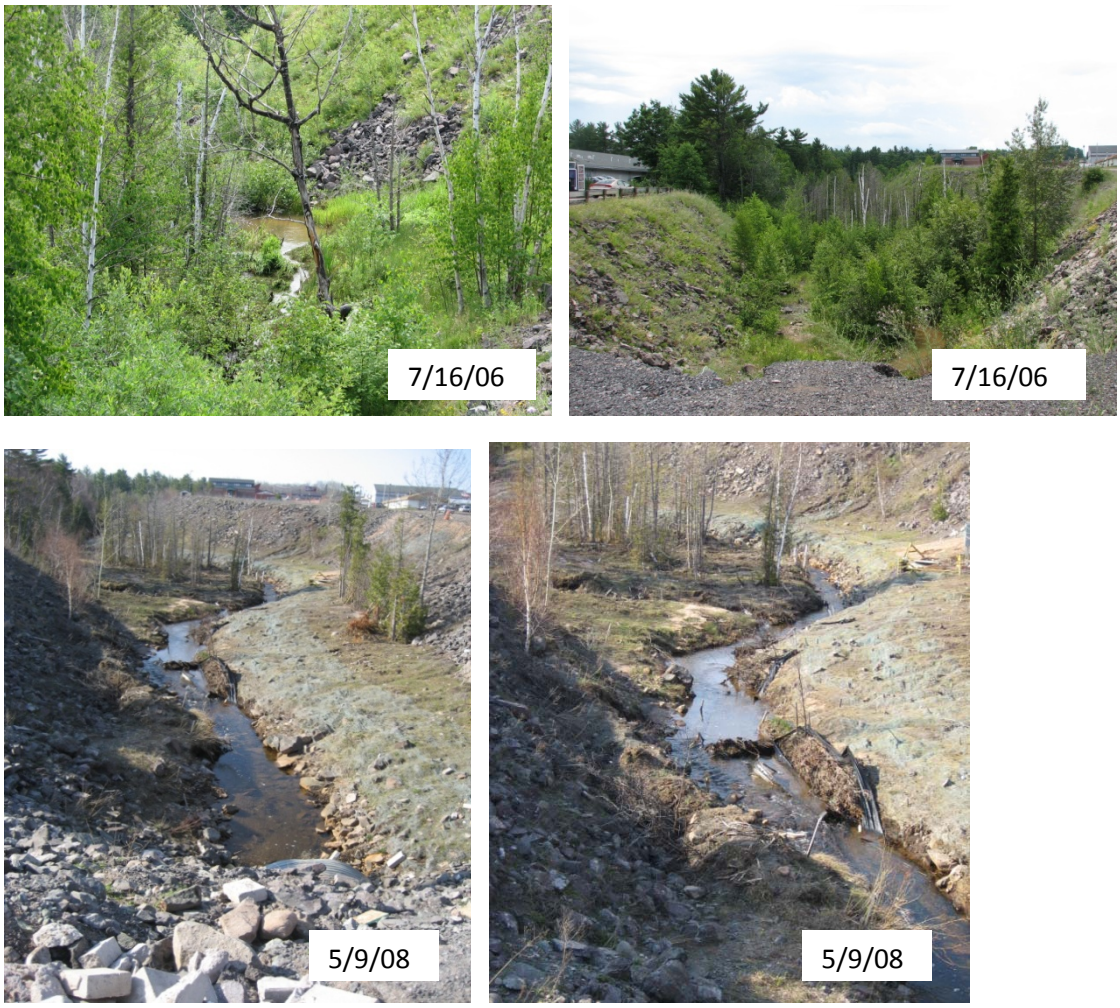


Figure 6.4 Huron Creek and leachate collection system installation area

A final concern associated with the landfills is the emission of methane gas. Because degrading materials within a landfill are buried and therefore in a low oxygen environment, anaerobic (non-oxygen using) bacteria complete a majority of the breakdown of the organic material in the landfill. These bacteria produce methane from their respiration process which then collects and tends to diffuse from the source area, including towards the ground surface. Because methane is combustible, having concentrations in the air above certain levels can pose a safety threat to buildings and people located on or near the landfill. Currently, all of the businesses located on top of the landfill on Ridge Road are aware of this issue and have had methane monitors installed in their buildings by the City of Houghton. The city also contracted out an independent consulting firm to install and operate a methane collection system that has been in operation for several years. The operation of the methane capture system combined with regular monitoring of methane levels in local buildings has thus far prevented any major health concerns or incidents. The landfill located north of Sharon Avenue is not known to be releasing measureable levels of methane.

As mentioned earlier, rill and gully erosion is present on the steep side-slope of the landfill on the west side of Huron Creek. This steep side-slope is at an angle of approximately 60 to 70 degrees relative to horizontal, and continues south along the west side of Huron Creek through Critical Area #3 to the "Frog Pool." Although much of the slope near Frog Pool has been stabilized through the use of mine rock rip-rap, there are several areas where the rock has been disturbed and more rills and gullies have developed. An example of this is discussed in the critical erosion locations section below.

The last item of concern in Critical Area #3 is a pile of stamp sands that is located on the east side of the creek across from the old Ming restaurant. The pile is approximately 20'x30' and has an unknown depth. It also remains entirely un-vegetated as the coarseness of these sands tends to prohibit establishment of topsoil and therefore vegetation. The proximity of this pile of stamp sands to Huron Creek is of concern as it may be adding to levels of dissolved copper or iron in the creek. This is especially likely for dissolved copper, for which the water of Huron Creek currently exceeds a Rule 57 aquatic protection value.

6.2.4. Critical Area #4 - Huron Creek Re-Route and Wetland Mitigation Areas

As mentioned in Chapter 2, 5.5 acres of wetlands were filled and a portion of Huron Creek was relocated when the existing Wal-Mart expanded to a Super Wal-Mart in 2004. The state and federal permits that were obtained for completing these tasks required creation of mitigation areas, which includes the re-routed portion of Huron Creek and the former Huron Lake area.

The former Huron Lake area has been rehabilitated and enhanced as part of the mitigation. In the creek re-route area, the vegetation survey and general observations have indicated that much of the vegetation planted there has not survived or has been out-competed by invasive species such as spotted knapweed (*Centaurea stoebe*) and white and yellow sweetclover (*Melilotus alba, Melilotus officinalis*).

Figure 6.5 Huron Creek Re-route and former Huron Lake mitigation areas

Currently the creek re-route area is open and does not have a variety of tree and shrub species that might provide shade and thereby reduce the warming of the creek water. Invasive species such as spotted knapweed can prevent establishment of any other vegetation through altering the biological or chemical characteristics of the soil, as well as by out-competing them through reproductive or other adaptive means. Therefore, a main concern for this area is to eliminate invasive species and establish a more diverse, preferably native riparian habitat.

The former Huron Lake area is in generally better condition than the re-route area, and has open-water as well as emergent wetland areas. Several small areas of wet meadow fringe the open water areas, and support native herbaceous species such as sedges, rushes and flowering plants such as joe-pye weed and blue vervain. The southern end of the open water area then transitions into a shrub-scrub type wetland. Establishment of invasive species is also a threat to these habitats as reed canary grass (Phalaris arundinacea), a prominent invasive, has been documented there. Future management objectives for the former Huron Lake area might include control of invasive species and enhancement of habitat for wildlife.

Lastly, as mentioned in Chapter 2, the rehabilitation of the former Huron Lake area included removal of several areas of stamp sands that existed around the edge of the lake. Stamp sands are no longer present in most of the mitigation site, except for a small area located on the northwest side of the open-water wetland. This area of stamp sands is located on the side of a relatively small slope that has trees and other vegetation on top. Similar to the pile located in Critical Area #3, this pile could be a source of copper and/or iron and poses a potential threat due to its close proximity to the open-water wetland that Huron Creek flows in and out of.

6.2.5. Critical Area #5 - “Shopping Cart Creek"

“Shopping Cart Creek” is the name given to the man-made tributary to Huron Creek that begins at the northeast corner of the Copper Country Mall parking lot and discharges into the Wal-Mart stormwater detention ponds (which in turn discharge into Huron Creek). Stormwater runoff from the Copper Country Mall (via culvert) and the Festival Foods area (via ditch) provide most of the flow to Shopping Cart Creek. This “tributary” has been designated as a critical area due to the severe erosion that has occurred at multiple locations along its length. The two areas of most concern are a headcut and an exposed, eroded bank that is approximately 6-8 feet high. Both of these locations are designated as critical erosion locations and are described in length in Section 6.2.6. It is likely that these severe areas of erosion have been caused by the high flows associated with runoff from impervious surfaces in the Copper Country Mall and the Festival Foods area.

6.2.6. Critical Erosion Locations

Each of the areas described below is an individual location of documented significant erosion. These areas were identified in the erosion portion of the geomorphology survey (see Section 5.7), which included any observable erosion within a 200-foot buffer of Huron Creek. These areas have been identified as critical as they are contributing to, or have potential to contribute to excessive sediment concentrations in Huron Creek. They also represent possibilities for small future improvement projects that can be completed incrementally, while potentially having a significant impact on water quality.

Figure 6.6 Critical Erosion Location "A."

Location "A": At this location, Huron Creek flows through a man-made rectangular rock channel that was constructed during historical mining operations. It is located immediately south of the Kestner Waterfront Park, north of Canal Road. As shown in Figure 6.6, portions of the channel have collapsed causing soil to erode on the bank above, and the creek to undercut the rock wall.

Figure 6.7 Critical Erosion Location "B."

Location "B": This area of erosion is located immediately south of where Huron Creek passes under Canal Road. In this location, concrete was used to stabilize the creek bank. However, as shown in Figure 6.7, the creek has managed to undercut the concrete and is now flowing underneath it.

Critical Erosion Location "C": This site (see Figure 6.8) is located immediately downstream (north) of where Huron Creek passes under Highway M-26. At this location, a gully has formed adjacent to the culvert sidewall and extends up-slope to M-26.

Figure 6.8 Critical Erosion Location "C"

Critical Erosion Location "D": This site (see Figure 6.9) is a ditch that drains to Huron Creek from a culvert that passes under M-26. The culvert conveys stormwater runoff from the Shopko and Econo Foods areas, and possibly from the Perkins/Kirkish Furniture/Holiday Inn Express development area. The ditch runs between Sharon Avenue and the parking lot of the Rice Memorial Mental Health clinic. It is showing signs of erosion on the parking lot side and undercutting of the banks of the ditch.

Figure 6.9 Critical Erosion Location "D"

Critical Erosion Location "E": This site (see Figure 6.10) is located on the west side of the parking area between the Taco Bell and Dairy Queen restaurants. A culvert discharges stormwater at the edge of the pavement which runs down a slope and combines with Huron Creek. The discharge, as well as the steepness of the slope has carved an approximately 2 to 3-foot deep channel. The banks of the channel are undercut and slope failure is apparent. Sediment from erosion of the bank deposits at the base of the slope near where the stormwater enters Huron Creek.

Figure 6.10 Critical Erosion Location "E"

Figure 6.11 Critical Erosion Location "F"

Critical Erosion Location "F": As mentioned in the description of Critical Area #3, there are several locations of erosion along the steep slopes of this area, predominantly on the west side of Huron Creek. The photo in Figure 6.11 shows a location near Keweenaw Gem & Gift where slope stabilization methods have failed. The photo in Figure 6.12 shows a similar location on the same slope near the Ming Restaurant.

Figure 6.12 Critical Erosion Location "F"

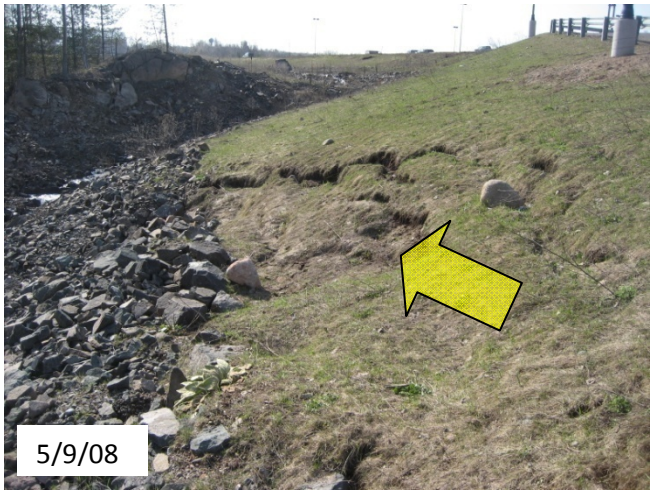


Figure 6.13 Critical Erosion Location "G"

Critical Erosion Location "G": This site is located on the east side of Ridge Road in the creek corridor below Applebee's Restaurant. Here (see Figure 6.13), the soil is showing signs of slope failure. It is evident that the grass planted on this slope is not providing enough stability to hold the soil in place. Although this location is separated from Huron Creek by a zone of rip-rap, it has the potential to create a large area of slope failure and erosion, and may eventually cause sediment to reach the creek.

Figure 6.14 Critical Erosion Location "H"

Critical Erosion Location "H": This site is an erosional feature called a headcut, and is one of the most prominent erosion locations in Critical Area 4. A headcut occurs when flow in an earthen channel or gully encounters a weak point (or "knickpoint") and soil is severely eroded downstream resulting in a sudden elevation decrease of the channel bottom (Hanson, 2008). This elevation decrease creates a small waterfall which, through scour occurring at its base, continues movement of the headcut in an upstream direction. As can be seen in Figure 6.14, the entire portion of Shopping Cart Creek that passes through a hill downstream of the headcut is a large eroded gully. After the gully, the flow follows a smaller channel that passes behind Wal-Mart and then enters the Wal-Mart stormwater ponds prior to discharging to Huron Creek. The headcut poses at least two problems. First, visual observation of the Wal-Mart stormwater ponds indicates that the inlet and outlet culverts are at the same elevation as the bottom of the ponds. If this is the case, sediment entering the ponds is free to pass through them and into Huron Creek. If this is not the case, sediment washing into the storm ponds from Shopping Cart Creek presents a maintenance issue. Sediments collecting in the bottom of the ponds would have to be removed in order to preserve the volume of stormwater the detention ponds were designed for.

Second, The continual movement of the headcut in an upstream direction would eventually lead to the large gully extending all the way to the Copper Country Mall parking lot and culverts. This would result in a large amount of land loss and soil erosion, and may pose a threat to ground stability in the parking lot area.

Figure 6.15 Critical Erosion Location "I"

Critical Erosion Location "I": This site is another prominent area of erosion in Critical Area 4. It is located only a few hundred feet downstream of the Copper Country Mall culverts and the Festival Foods area ditch. As shown in Figure 6.15, the bank of the creek has been eroded away leaving a bare soil and rock face that is approximately 6 to 8 feet high. If this area is not stabilized, it may continue to erode in an outward direction as it is located on the outside of a curve in the creek. As mentioned earlier, this erosion is most likely attributable to the increased peak flow rates and volumes that are generated by runoff from impervious surfaces such as the parking lots of the Copper Country Mall and the development area around Festival Foods.

6.2.7. Other Areas to Note

There are a few areas that have similar environmental concerns as the Critical Areas listed above, but have not been designated as Critical Areas (Figure 6.16 shows these areas).

First, there are several deposits of stamp sands in the Huron Creek watershed that have not been indicated as Critical Areas for the following reasons:

- The stamp sand locations are located relatively far from Huron Creek (on the order of thousands of feet from the creek) and/or do not appear to be eroding. The exception, in terms of distance from the creek, is the area shown in Figure 6.16 indicated with a star. However, the size of the majority of the materials in this area is relatively large (diameter on the order of several inches). The large size of these materials should preclude significant leaching of metals such as copper.
- Due to their significant extent (on the order of tens to hundreds of thousands of square feet), removal or remediation would require large-scale efforts, financing and multiple-property owner collaboration.

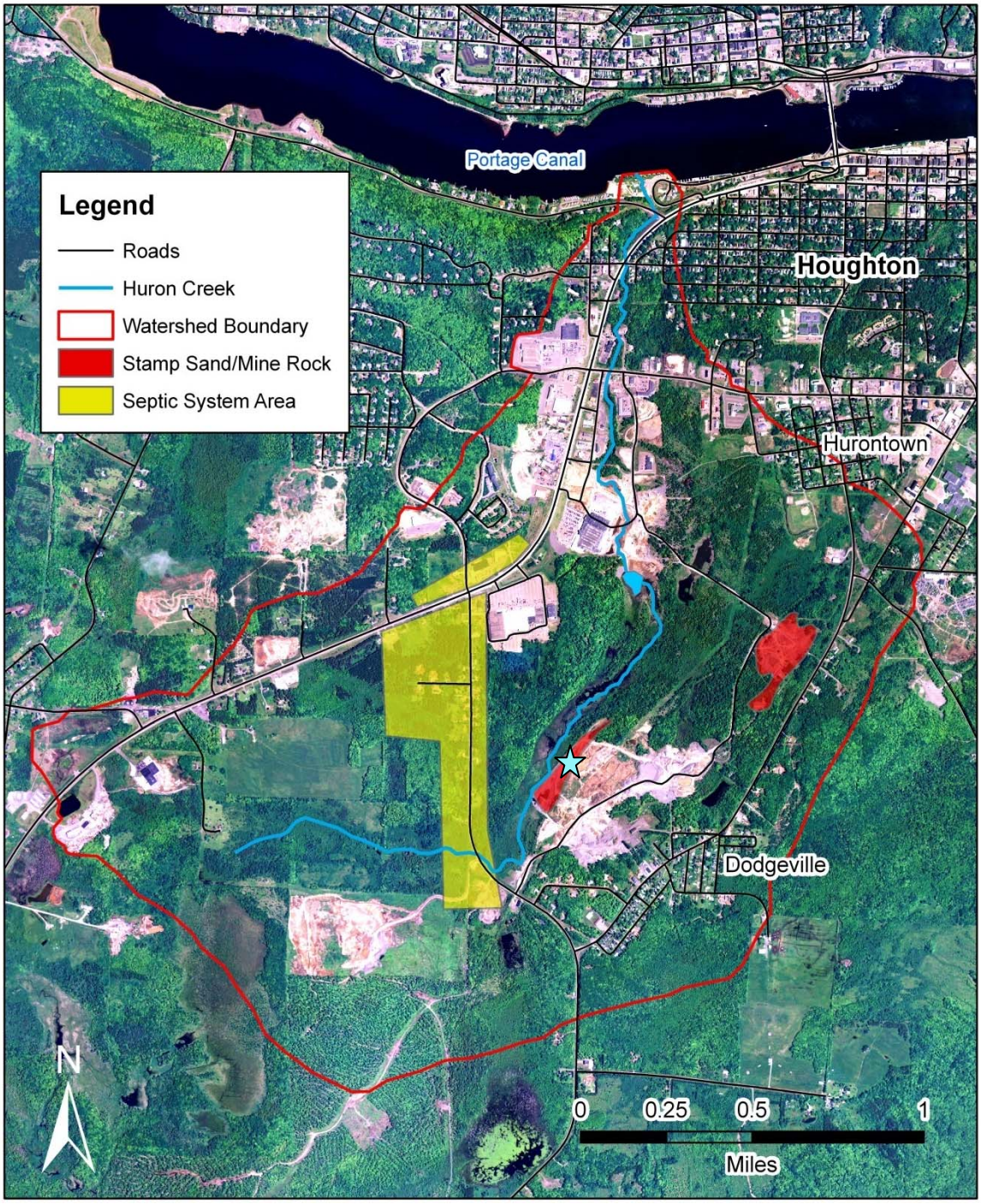


Figure 6.16 Non-critical septic system and stamp sand areas

- These stamp sand locations are associated with old mines, which may have archeological or historical value as cultural resources, and might require management and preservation in addition to remediation.

Excluding these stamp sand locations from designation as Critical Areas is not meant to imply that the perception of environmental impact of these stamp sands should be minimized, as they could be significant sources of dissolved metals. Their presence and impacts should remain as a concern for the watershed, even if their management lies outside of the scope of the Huron Creek watershed management plan.

Second, there are other areas where septic systems are in use in Portage Township besides Dakota Heights, namely on Green Acres road from the intersection with M-26 east to the boundaries of Dodgeville, that have not been included as Critical Areas for the following reasons:

- It is not as obvious if the density of housing and sizes of lots are in conflict with today's state septic system rules as in Dakota Heights. Lot sizes are generally larger and less densely spaced.
- Many of the homes are newer than in Dakota Heights, implying that the age and/or design of their septic systems may not be as old as those in Dakota Heights.