Appendix 4. Water Quality Statement by Water Body

Designated uses of many water bodies in the PPRW are threatened or impaired due to habitat loss or fragmentation, rather than any specific pollutant. For the purposes of this summary we will limit the discussion to pollutant based impairments and threats. From a pollutant standpoint, water quality in the PPRW varies greatly from one water body to the next. The connection between which designated uses are being threatened or impaired; the pollutants causing the threat or impairment; the sources of the pollutants; and the causes related to those sources will be examined for individual water bodies in order to provide a detailed description of water quality throughout the watershed. Several sources of information* were used to determine the status of each step in this connection. If a designated use is not mentioned, there was not sufficient information to determine if the use was being met, threatened or impaired. Not all water bodies within the watershed were evaluated. Only water bodies with enough information to make a water quality statement are included in this summary.

*Information used: MDEQ 2006 and 2008 Integrated Reports; MDNR Fisheries Division staff input; MDNR Fisheries Reports; Spicer Study on Paw Paw Lake; TNC Agricultural Impact Study; TNC Floodplain Forest Study; Van Buren County Drain Commissioner input; MDEQ Biosurvey Reports; PPRW Volunteer Inventory; MDEQ Road Stream Crossing Inventory, MDEQ Wetland Functional Analysis, MDEQ Flashiness Report

Paw Paw Mainstem

The Paw Paw Mainstem originates at the confluence of the North and South Branches and flows centrally through the watershed in a southwest direction to the St. Joseph River. The designated uses of Warmwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. Nutrients and pesticides are also suspected to be threatening water quality. Streambanks are the only known source of sediment within the mainstem corridor. Agricultural lands, roads, building sites and impervious surfaces throughout the watershed are suspected to be contributing sediment, nutrients and pesticides.

Land cover along the Paw Paw Mainstem is predominantly natural. The floodplain forests, wetlands, and sand/gravel geology along the mainstem provide excellent habitat for a diverse assemblage of fish species. Land cover changes throughout the PPRW are the primary threat to the hydrology of the mainstem. Wetland loss, channel modification and increased runoff from urban and agricultural land without BMPs creates flow fluctuations and increased stream power. These hydrologic changes cause stream bank erosion and habitat modification resulting in adverse impacts to native biota. The Paw Paw River has relatively stable flows, but a study of historic streamflow data by MDEQ suggests flashiness is increasing. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

According to the 2008 Integrated Report, the Paw Paw Mainstem is meeting its designated use for Other Aquatic Life and Wildlife, but it was not assessed for its Warmwater Fishery designated use. The Paw Paw Mainstem was sampled at eight locations in a biological survey conducted by the MDEQ in 2006. According to the staff report, the riparian corridor was very complete with most stations having riparian zones that were more than 150 feet wide with a large amount and variety of vegetation. Although some bank erosion was evident at nearly every station, the river did not appear flashy and large woody debris was stable and extended into the active stream channel.

Coldwater Tributaries

Blue Creek

Blue Creek is a coldwater stream that joins the Paw Paw River in Benton Twp. Yellow Creek is the only significant tributary to Blue Creek. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. The designated uses of Total and Partial Body Contact are impaired due to known bacteria and pathogens, as evidenced by the presence of Escherichia coli (E. coli). Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. Agricultural and developed lands are suspected sources of sediment, nutrients, pesticides and increased water temperature. Streambanks are a known source of sediment. Illicit discharges of wastewater are the primary suspected source of E. coli.

Land cover in the Blue Creek watershed is approximately 57% agricultural, 35% natural and 8% developed. Most of the natural riparian corridor along Blue Creek remains intact. According to the MDEQ Landscape Level Wetland Functional Assessment report, 82% of presettlement wetlands in the Blue Creek watershed remain intact. Many of these wetlands have a high significance for sediment and other particulate retention. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) increase runoff allowing sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Developed lands and associated impervious surfaces also increase runoff. Without sufficient stormwater management practices, runoff from developed lands within the watershed will carry sediment, nutrients, oils, metals and chemicals directly to Blue Creek.

Increased runoff creates flow fluctuations and reduces groundwater infiltration, which affects base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

Failing and improperly designed road/stream crossings can cause fish passage impairment, bank erosion and other changes to channel morphology. There are two known impaired road/stream crossings along Blue Creek, both on Territorial Road. The first crossing has a failing culvert that is undersized causing erosion and a shifting sand bedload on top of the fine gravel streambed. Stormwater runoff at the second crossing

is causing erosion and variable flow rates. The undersized culverts at this crossing are impacting fish passage, flow and sand/woody debris transport.

According to the 2008 Integrated Report, Blue Creek was not assessed for its Coldwater Fishery designated use. It was found to be meeting its designated use for Other Aquatic Life and Wildlife. Blue Creek is not meeting its designated use for Total and Partial Body Contact due to E. coli. A TMDL is scheduled for development in 2017. A biological survey conducted by the MDEQ in 2006 at Park Road rated the macroinvertebrate community acceptable. Habitat was rated excellent due to epifaunal substrate consisting of undercut banks, leaf packs and abundant woody debris. However, the report noted that the deposition of sand was evident.

The biological survey conducted by the MDEQ in 2006 also includes information about elevated E. coli levels found in a strom drain discharging to Blue Creek downstream of Highland Avenue. According to the report, illicit discharges of wastewater from the community of Millburg in Benton Twp are the likely source of the E. coli. The MDEQ is working with the Berrien County Health Department to address this problem. In addition to the E. coli issue, a great deal of sedimentation has occurred in Blue Creek from a gully that formed along the streambank due to the stormwater discharges at this site.

Brush Creek

Brush Creek is a coldwater stream that joins the Paw Paw River in the Village of Lawrence. Its tributaries include Red Creek and White Creek. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. Agricultural lands are the primary suspected source of sediment, nutrients, pesticides and increased water temperature. Streambanks are a known source of sediment.

Land cover in the Brush Creek watershed is approximately 57% agricultural, 38% natural and only 4% developed. Although a large portion of the natural riparian corridor along Brush Creek remains intact, there is a lack of riparian buffers on many of the small agricultural ditches in the watershed. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. According to the MDEQ Wetland Functional Assessment report, the Brush Creek watershed has only lost 28% of its presettlement wetlands. However, 45% of the wetlands with a high significance for streamflow maintenance and sediment and other particulate retention have been lost.

Wetland loss, channel modification and lack of BMPs cause increased runoff from agricultural lands. Increased runoff creates flow fluctuations and reduces groundwater infiltration, which affects base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform

flow throughout the year typically have more stable channel morphology and fish assemblages.

Failing and improperly designed road/stream crossings can cause fish passage impairment, bank erosion and other changes to channel morphology. There are two known impaired road/stream crossings in the Brush Creek watershed. The CR 215 crossing of White Creek is preventing fish passage and causing modifications to stream morphology. The CR 215 crossing of Brush Creek is preventing fish passage and causing streambank erosion.

According to the 2008 Integrated Report, Brush Creek was not assessed for its Coldwater Fishery designated use. It was found to be meeting its designated use for Other Aquatic Life and Wildlife. A biological survey conducted by the MDEQ in 2006 at 63rd Street rated the macroinvertebrate community as acceptable. The habitat was rated good due to large woody debris, undercut banks and a small amount of gravel. However, the report noted that the substrate was dominated by sand, the banks were somewhat scoured and the stream appeared to be somewhat flashy.

Campbell Creek

Campbell Creek is a coldwater tributary of the North Branch. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to suspected sedimentation. Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. Suspected sources of sediment are agricultural lands and streambanks. Agricultural and developed lands are also a suspected source of nutrients, pesticides and increased water temperature.

The Campbell Creek watershed contains a tremendous amount of natural land cover including a very large wetland complex known as the Almena Swamp. According to the MDEQ Wetland Functional Assessment report, 66% of presettlement wetlands in the Campbell Creek watershed remain intact. Many of these wetlands have a high significance for streamflow maintenance and nutrient transformation. Small farms are scattered throughout this watershed and residential development is increasing. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) increase runoff allowing sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Developed lands and associated impervious surfaces also increase runoff. Without sufficient stormwater management practices, runoff from developed lands within the watershed will carry sediment, nutrients, oils, metals and chemicals directly to Campbell Creek.

Increased runoff creates flow fluctuations and reduces groundwater infiltration, which affects base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

According to the 2008 Integrated Report, Campbell Creek was not assessed for its Coldwater Fishery designated use. It was found to be meeting its designated use for Other Aquatic Life and Wildlife. A biological survey conducted by the MDEQ in 2006 at 28th Street rated the macroinvertebrate community at the high end of acceptable. Habitat was rated excellent, but a lack of cobble and gravel was evident. A biological survey conducted by the MDEQ in 1991 at Stevens Road reported that Campbell Creek demonstrated classic temperature and macroinvertebrate profiles of a cold headwater stream. The 1991 report stated that the water was well oxygenated with good instream habitat only modestly impacted by silt and sand deposition. Overall scores in 1991 indicated the stream was meeting its coldwater designated use.

Eagle Lake Drain

Eagle Lake Drain is a coldwater tributary of the West Branch. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are impaired due to known sedimentation. Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. Suspected sources of sediment are agricultural lands and streambanks. Agricultural lands are also a suspected source of nutrients, pesticides and increased water temperature.

Land use in the Eagle Lake Drain Watershed is primarily agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with wind and runoff from rain events. Increased runoff due to wetland loss, channel modification and lack of BMPs (buffer strips, no-till, cover crops, etc.) creates flow fluctuations and increased stream power. Increased runoff also reduces groundwater infiltration and decreases base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

Eagle Lake Drain is listed as a Category 4c water body in MDEQ's 2006 Integrated Report and the 2008 Integrated Report. According to these reports, Eagle Lake Drain is not supporting its designated use for Other Indigenous Aquatic Life and Wildlife due to channel modifications and other flow regime alterations. According to the 2008 Integrated Report, it is meeting its designated use for Coldwater Fishery based on dissolved oxygen measurements. However, biological surveys conducted by the MDEQ in 1991 and 1996 found the Coldwater Fishery designated use not being supported. In addition, the biological survey conducted by the MDEQ in 2006 rated the macroinvertebrate community poor and the habitat marginal at 42nd Street. Habitat was rated as marginal because woody debris was absent from the stream channel and there was very little substrate available for colonization. Discussions with MDNR Fisheries Division staff suggest the coldwater fishery is being impaired by sediment laden agricultural runoff.

East Branch

The East Branch is a coldwater stream that joins the West Branch in the Village of Paw Paw. Its tributaries include Cook Drain, Mattawan Creek and Paw Paw Lake in Kalamazoo County. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. Streambanks are the only known source of sediment. Agricultural and developed lands are suspected sources of nutrients, pesticides and increased water temperature.

The East Branch has the highest groundwater inflow in the PPRW and therefore is more stable and less affected by major precipitation events. The natural riparian corridor along the stream remains mostly intact and this watershed contains an extensive area with high potential for groundwater recharge. This watershed also contains several large prairie fens, which are unique wetlands rich in species diversity.

The Village of Mattawan and a portion of the Village of Paw Paw are found within the East Branch watershed. Commercial and residential development is increasing rapidly in this area. Agricultural land cover in the East Branch watershed is dominated by orchards, vineyards and non-tilled forage crops. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) increase runoff allowing sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Developed lands and associated impervious surfaces also increase runoff. Without sufficient stormwater management practices, runoff from developed lands within the watershed will carry sediment, nutrients, oils, metals and chemicals directly to the East Branch.

Flow fluctuations created by increased runoff reduce groundwater infiltration, which affects base flow and water depth during periods of low flow. These hydrologic changes also cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

Failing and improperly designed road/stream crossings can cause fish passage impairment, bank erosion and other changes to channel morphology. There are two known impaired road/stream crossings along the East Branch. The crossing at 26th Street has a culvert that is poorly aligned with the stream dimensions and as a result is preventing fish passage upstream and causing scouring downstream. The crossing at 63rd Avenue is undersized and perched preventing fish passage, creating scouring downstream and impounding water upstream.

According to the 2008 Integrated Report, the East Branch was not assessed for its Coldwater Fishery designated use. It was found to be meeting its designated use for Other Aquatic Life and Wildlife. A biological survey conducted by the MDEQ in 2006 at 32nd Street rated both the macroinvertebrate community and habitat as excellent. However, the report noted that woody debris within the stream channel was at least

50% embedded, and the bottom substrate was dominated by sand. Two stations near the Village of Paw Paw were also surveyed in 2006. The macroinvertebrate communities were rated as acceptable and the habitats were rated as good at these sites.

The biological survey conducted by the MDEQ in 2006 also includes information on the possible effects of contaminated venting groundwater on the East Branch. Thomas Drain has been enclosed and functions as a city storm drain for the Village of Paw Paw. The drain meets the East Branch just downstream of the Gremps Street crossing and just upstream of the confluence with the West Branch. The drain historically has been thought to carry venting groundwater contaminated with trichloroethene from the Paw Paw Plating facility on Commercial Street. Water samples were collected from the storm drain itself and sediment samples were collected downstream and upstream of its confluence with the East Branch. Water quality standards were being met for all parameters analyzed. Sediment sample results from the downstream site exceeded sediment quality guidelines for several parameters and were much higher than the results from the upstream site. The MDEQ will continue to investigate the Paw Paw Plating site.

Hayden Creek

Hayden Creek is a coldwater tributary of the North Branch. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to suspected sedimentation. Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. Suspected sources of sediment are agricultural lands and streambanks. Agricultural and developed lands are also a suspected source of nutrients, pesticides and increased water temperature.

The natural riparian corridor along Hayden Creek remains mostly intact including a wide wetland zone in many areas. According to the MDEQ Wetland Functional Assessment report, the wetlands along Hayden Creek have a high significance for sediment and other particulate retention as well as fish, shellfish and other wildlife habitat. There is a considerable amount of agricultural land cover within the Hayden Creek watershed. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) increase runoff allowing sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Developed lands and associated impervious surfaces also increase runoff. Without sufficient stormwater management practices, runoff from developed lands within the watershed will carry sediment, nutrients, oils, metals and chemicals directly to Hayden Creek.

Increased runoff creates flow fluctuations and reduces groundwater infiltration, which affects base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

According to the 2008 Integrated Report, Hayden Creek was not assessed for its Coldwater Fishery designated use. It was found to be meeting its designated use for Other Aquatic Life and Wildlife. A biological survey conducted by the MDEQ in 2006 at 30th Street rated the macroinvertebrate community in the mid-range of excellent. Habitat was also rated excellent. The 2006 report notes that the banks appeared stable and although the substrate consisted entirely of sand, there was an excellent amount of pool variability and a mix of available cover including large woody debris and undercut banks. A biological survey conducted by the MDEQ in 1991 at 32nd Street found the stream to be somewhat limited by sand and silt deposition. It noted that insects commonly found in rocky or gravel riffle zones were absent. Although one trout was found during this survey, a number of warmwater fish were also found. The report noted that these warmwater species might be emigrants from Lime Lake or other small impoundments on Hayden Creek. Overall scores in 1991 indicated the stream was meeting its coldwater designated use.

Mill Creek

Mill Creek is a coldwater stream that meets the Paw Paw River in the City of Watervliet. The Total and Partial Body Contact designated uses are impaired due to known bacteria and pathogens (E. coli). The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. Livestock and septic systems are the suspected sources of E. coli. Streambanks are a suspected source of sediment. Agricultural lands are a suspected source of sediment, nutrients, pesticides and increased water temperature.

Land use in the Mill Creek Watershed is primarily agricultural. Unrestricted livestock access to streams and improper management of manure causes bacteria and pathogens to enter surface water. There are no known unrestricted livestock access sites in the Mill Creek Watershed, but there are several farms with livestock. There is also a large amount of manure being applied to fields within the watershed. Improper management of manure is the primary suspected cause of E. coli in Mill Creek. Improperly designed or maintained septic systems are another suspected cause of E. coli.

Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. According to the MDEQ Wetland Functional Assessment report, 60% of the wetlands with a high significance for sediment and other particulate retention have been lost in the Mill Creek Watershed. Increased runoff due to wetland loss, channel modification and lack of BMPs creates flow fluctuations and increased stream power. Increased runoff also reduces groundwater infiltration and decreases base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

Mill Creek is listed as a Category 5 water body in MDEQ's 2006 Integrated Report and the 2008 Integrated Report. According to these reports, Mill Creek is not meeting its designated use for Total and Partial Body Contact due to E. coli. A TMDL is scheduled for development in 2009. In the 2008 Integrated Report, Mill Creek was not assessed for its Coldwater Fishery designated use and its Other Aquatic Life and Wildlife designated use was found to be fully supported. A biological survey conducted by the MDEQ in 2006 at a site just upstream of Red Arrow Hwy rated the habitat as good due to a large amount of gravel and some woody debris, but also found evidence of flow fluctuations and sedimentation. A biological survey conducted by the MDEQ in 2005 rated the habitat at 67th Street as severely impaired. In addition to MDEQ reports, the SWAT model places the Mill Creek Watershed in the second highest category for sediment loading.

North Branch

The North Branch is designated as a coldwater stream above M-40. Coldwater tributaries of the North Branch include Campbell Creek, Hayden Creek, and Ritter Creek. The only significant warmwater tributary is Brandywine Creek and it joins the North Branch approximately 1.5 miles before the confluence of the North and South Branches. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. The designated uses of Total and Partial Body Contact are threatened due to suspected bacteria and pathogens (E. coli). Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. Agricultural lands are the primary suspected source of sediment, nutrients, pesticides and increased water temperature. Streambanks are a known source of sediment. Livestock are the only known source of suspected E. coli.

The North Branch watershed includes a large historic wetland area known as the Mentha Flats, which has been severely channelized to facilitate vegetable production. This area and Brandywine Creek are suspected to be contributing the largest amounts of sediment to the North Branch. Land cover in the Mentha Flats area is 71% agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with wind and runoff from rain events.

Failing and improperly designed road/stream crossings can cause fish passage impairment, bank erosion and other changes to channel morphology. There is one known impaired road/stream crossing north of Whiskey Run on CR 653 causing severe streambank erosion. The culverts are poorly aligned and undersized restricting flows and creating modifications to the stream dimensions. Unrestricted livestock access to streams also causes streambank erosion and allows bacteria and pathogens to enter surface water. There are two known sites where livestock have unrestricted access to streams within the North Branch watershed. One site is located on Ritter Creek at 30th Street and the other is on the Paw Paw and Allegan Road Drain at 45th Street.

Below the Mentha Flats, the North Branch flows through approximately 1,500 acres of wetland known as the Almena Swamp. According to the MDEQ Wetland Functional

Assessment report, the coldwater portion of the North Branch Watershed has lost 40% of its presettlement wetlands. However, 94% of the wetlands with a high significance for sediment and other particulate retention still remain. Wetland loss, channel modification and lack of BMPs can increase runoff creating flow fluctuations and increased stream power. Increased runoff also reduces reduces groundwater infiltration, which affects base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

According to the 2008 Integrated Report, the North Branch was not assessed for its Coldwater Fishery designated use. It is meeting its designated use for Other Aquatic Life and Wildlife. However, a biological survey conducted by the MDEQ in 2006 at 35 ½ Street rated the macroinvertebrate community in the mid-range of acceptable. Habitat was rated as good, but the riparian zone was noted to be impacted by the road running parallel and very close to the stream for several yards. The survey noted a lack of epifaunal substrate due to sand embedding most of the large woody debris.

Pine Creek

Pine Creek is a coldwater stream that meets the Paw Paw River near the City of Hartford. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are impaired due to known sedimentation. The Total and Partial Body Contact designated uses are impaired due to known bacteria and pathogens (E. coli). Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. The only known source of sediment is streambanks. Livestock and septic systems are the suspected sources of E. coli. Agricultural lands are a suspected source of sediment, nutrients, pesticides and increased water temperature.

Land use in the Pine Creek Watershed is primarily agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Increased runoff due to lack of BMPs, wetland loss and channel modification, creates flow fluctuations and increased stream power. Increased runoff also reduces groundwater infiltration and decreases base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

Failing and improperly designed road/stream crossings can cause fish passage impairment, bank erosion and other changes to channel morphology. There is one known impaired road/stream crossing at 64th Street causing sedimentation. The bottom of this box culvert is elevated above the streambed resulting in a semi-perched condition affecting channel morphology.

Unrestricted livestock access to streams and improper management of manure causes bacteria and pathogens to enter surface water. There are no known unrestricted livestock access sites in the Pine Creek Watershed, but there are several farms with livestock. There is also large amount of manure being applied to fields within the watershed. Improper management of manure is the primary suspected cause of E. coli in Pine Creek. Improperly designed or maintained septic systems are another suspected cause of E. coli.

Pine Creek is listed as a Category 5 water body in MDEQ's 2006 Integrated Report and the 2008 Integrated Report. According to the 2008 Integrated Report, Pine Creek is not supporting its designated use for Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife due to channel modifications and other flow regime alterations. It is not meeting its designated use for Total and Partial Body Contact due to E. coli. A TMDL is scheduled for development in 2009. A biological survey conducted by the MDEQ in 2006 rated the macroinvertebrate community poor at Red Arrow Hwy. Habitat was rated as marginal because the substrate consisted entirely of sand with little pool variability. According to the staff report the stream appeared to experience severe flow fluctuations. In addition to MDEQ reports, the SWAT model places the Pine Creek Watershed in the second highest category for sediment loading.

Red Creek

Red Creek is a coldwater tributary of Brush Creek. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are impaired due to known sedimentation. Nutrients, pesticides and increased water temperature are also suspected to be threatening water quality. The only known source of sediment is agricultural lands. Streambanks are a suspected source of sediment. Agricultural lands are a suspected source of nutrients, pesticides and increased water temperature.

Land use in the Red Creek Watershed is primarily agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) are the primary source of sedimentation. They allow sediment, nutrients and pesticides to be transported to surface water with runoff from rain events. Increased runoff due to lack of BMPs, creates flow fluctuations and increased stream power. Increased runoff also reduces groundwater infiltration and decreases base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

According to the 2008 Integrated Report, Red Creek is meeting its designated use for Other Aquatic Life and Wildlife. However, a biological survey conducted by the MDEQ in 2006 rated the macroinvertebrate community as barely acceptable at 56th Street. The MDEQ staff report from biological surveys conducted in 1991 notes that habitat was significantly impacted by sediment deposition and poor stream bank vegetation producing unstable banks. Red Creek's designated use of Coldwater Fishery was not

assessed in the 2008 Integrated Report. Biological surveys conducted by the MDEQ in 1991 found the Coldwater Fishery designated use not being supported. In addition to MDEQ reports, the SWAT model places the Red Creek Watershed in the highest category for sediment loading. Discussions with MDNR Fisheries Division staff confirm that the coldwater fishery is being impaired by sediment laden agricultural runoff.

Sand Creek

Sand Creek is a coldwater stream that meets the Paw Paw River near Benton Harbor. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are impaired due to known sedimentation. Streambank erosion is the primary suspected source of sediment. Increased water temperature, nutrients, pesticides, metals, oils and grease are also suspected to be impacting water quality. Developed lands are the only suspected source of these pollutants.

The Sand Creek Watershed contains a significant amount of urban land cover and associated impervious surfaces. Insufficient management of the stormwater runoff created by impervious surfaces leads to sedimentation, polluted runoff and altered hydrology. Increased runoff reduces groundwater infiltration causing decreased base flow and water depth during periods of low flow. Flow fluctuations, increased stream power and other hydrology changes cause stream bank erosion, habitat modification and adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages. Increased water temperature can be caused by impervious surfaces (such as parking lots and rooftops), which may increase the temperature of water moving over them, and reduced water depth during low flow periods due to decreased base flow. Suspected causes of polluted runoff include improper application, storage, and disposal of fertilizers and pesticides by landowners. Poor vehicle maintenance and improper oil disposal are suspected causes of oil and grease in urban stormwater runoff.

Sand Creek was not assessed for its Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife designated uses in MDEQ's 2008 Integrated Report. In the staff report of biological surveys conducted by the MDEQ in 2006, Sand Creek is considered a potential concern due to the possible addition of a large culvert to facilitate runway extension at the Southwest Michigan Regional Airport in Benton Harbor. The report notes that in 2004 the macroinvertebrate community was rated acceptable, but the fish community was rated poor. Discussions with MDNR Fisheries Division staff suggest the coldwater fishery is being impaired by sedimentation resulting from altered hydrology.

West Branch

The West Branch is a coldwater stream that joins the East Branch in the Village of Paw Paw. Its tributaries include Eagle Lake Drain, Lawton Drain, Gates Extension Drain and Three Mile Lake Drain. The designated uses of Coldwater Fishery and Other Indigenous Aquatic Life and Wildlife are impaired due to known sedimentation and low dissolved oxygen (DO) levels. The designated uses of Total and Partial Body Contact are threatened due to suspected bacteria and pathogens (E. coli). Nutrients, pesticides and increased water temperature are suspected to be threatening water quality. The

only known source of sediment is streambanks. Agricultural lands are a suspected source of sediment, nutrients, pesticides and increased water temperature. Livestock are the only known source of suspected E. coli.

Land use in the West Branch Watershed is primarily agricultural. Presettlement land cover in the watershed was dominated by wetlands. According to the MDEQ Wetland Functional Assessment report, 57% of presettlement wetlands in the West Branch Watershed have been drained and converted to agricultural lands. Of those lost wetlands, 81% had a high significance for streamflow maintenance and 47% had a high significance for sediment and other particulate retention. Increased runoff due to wetland loss, channel modification and lack of BMPs (buffer strips, no-till, cover crops, etc.) creates flow fluctuations and increased stream power. Increased runoff also reduces groundwater infiltration and decreases base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion, temperature fluctuations and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

Unrestricted livestock access to streams causes streambank erosion and allows bacteria and pathogens to enter surface water. There is one known unrestricted sheep access site on Lawton Drain at CR 665. Agricultural lands without BMPs allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. There are no known causes of low DO levels in the West Branch, but nutrients are often related to the impairment.

The West Branch is listed as a Category 5 water body in MDEQ's 2008 Integrated Report. The West Branch is listed as not supporting its designated use for Coldwater Fishery due to low DO levels. A TMDL is scheduled for development in 2018. According to the report, it is fully supporting its designated use for Other Aquatic Life and Wildlife. However, a biological survey conducted by the MDEQ in 2006 rated the macroinvertebrate community at the low end of acceptable. Habitat was rated as marginal due to sedimentation and silt exceeding three feet in depth in some areas. In addition to MDEQ reports, the West Branch was identified in the TNC Agricultural Impact study as a problem area. The Van Buren County Drain Commissioner and the Village of Paw Paw have identified the West Branch as the primary source of sediment problems in Briggs Pond and Maple Lake.

Warmwater Tributaries

Brandywine Creek

Brandywine Creek is a warmwater tributary of the North Branch. Its tributaries include the North Extension Drain and Martin Lake Drain. The designated use of Warmwater Fishery is impaired and the designated use of Other Indigenous Aquatic Life and Wildlife is threatened due to known sedimentation. The designated uses of Total and Partial Body Contact are threatened due to suspected bacteria and pathogens (E. coli). Nutrients and pesticides are also suspected to be threatening water quality.

Streambanks are the only known source of sediment. Livestock are the only known source of suspected E. coli. Agricultural lands are a suspected source of sediment, nutrients and pesticides.

Land cover in the Brandywine Creek Watershed is approximately 56% agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Unrestricted livestock access to streams causes streambank erosion and allows bacteria and pathogens to enter surface water. There is one known unrestricted livestock access site on Martin Lake Drain at 18th Ave.

According to the MDEQ Wetland Functional Assessment report, the Brandywine Creek Watershed has lost 61% of its wetlands with a high significance for streamflow maintenance. Wetland loss, channel modification and lack of BMPs create flow fluctuations and increased stream power. These hydrologic changes cause stream bank erosion and habitat modification resulting in adverse impacts to native biota.

Brandywine Creek is listed as a Category 4c water body in MDEQ's 2006 Integrated Report. According to the 2008 Integrated Report, Brandywine Creek is fully supporting its designated use for Other Aquatic Life and Wildlife. However, a biological survey conducted by the MDEQ in 2006 rated the habitat as marginal because existing woody debris was deeply embedded by sediment. The survey also noted that the stream appeared flashy as evidenced by eroded streambanks. Brandywine Creek's designated use of Warmwater Fishery was not assessed in the 2008 Integrated Report. Biological surveys conducted by the MDEQ in 1991 found the fish populations acceptable, but noted a significant lack of instream structure for fish cover.

In addition to MDEQ reports, Brandywine Creek was identified in the TNC Agricultural Impact study as a in-stream erosion problem area. Bank Erosion Hazard Index scores from the Volunteer Inventory were very high in this watershed. The Van Buren County Drain Commissioner identified Brandywine Creek and the North Extension Drain as high priorities for restoration due to sedimentation problems. Discussions with MDNR Fisheries Division staff suggest the warmwater fishery is being impaired by sedimentation.

Branch & Derby Drain

Branch & Derby Drain is a warmwater stream that is the largest tributary of Paw Paw Lake. The designated uses of Warmwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. The designated uses of Total and Partial Body Contact are threatened due to suspected bacteria and pathogens (E. coli). Nutrients and pesticides are also suspected to be threatening water quality. Agricultural lands are a suspected source of sediment, nutrients and pesticides. Streambanks are a suspected source of sediment. Livestock are the only known source of suspected E. coli.

Land use in the Branch & Derby Drain Watershed is primarily agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Unrestricted livestock access to streams causes streambank erosion and allows bacteria and pathogens to enter surface water. There is one known pasture with unrestricted livestock access on Branch & Derby Drain between M-140 and North Watervliet Rd. Wetland loss, channel modification and lack of BMPs create flow fluctuations and increased stream power. These hydrologic changes cause stream bank erosion and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

According to the 2008 Integrated Report, Branch & Derby Drain was not assessed for the designated uses of Other Indigenous Aquatic Life and Wildlife or Warmwater Fishery. The Spicer Group conducted an assessment of the Branch & Derby Drain as part of a study of the Paw Paw Lake Watershed in 2007. According to the study, Branch & Derby Drain is the largest contributor of sediment to Paw Paw Lake. The unrestricted livestock access site between M-140 and North Watervliet Rd was discovered during this assessment.

Carter Creek

Carter Creek is a warmwater stream that meets the Paw Paw River northwest of the Village of Paw Paw in Waverly Twp. Brownwood Lake and a few county drains are the only significant tributaries. The designated uses of Warmwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. Nutrients and pesticides are also suspected to be threatening water quality. Agricultural lands are a suspected source of sediment, nutrients and pesticides. Discharges from the Coca-Cola Paw Paw facility are a suspected source of nutrients.

Land cover in the Carter Creek Watershed is 58% natural, 38% agricultural and 4% urban. According to the MDEQ Wetland Functional Assessment report, 57% of the presettlement wetlands have been lost. Wetland loss, channel modification and lack of agricultural BMPs (buffer strips, no-till, cover crops, etc.) create flow fluctuations and increased runoff. Increased runoff reduces groundwater infiltration, which affects base flow and water depth during periods of low flow. These hydrologic changes cause stream bank erosion and habitat modification resulting in adverse impacts to native biota. Agricultural lands without BMPs allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events.

According to the 2008 Integrated Report, Carter Creek was not assessed for its Warmwater Fishery designated use. It was found to be meeting its designated use for Other Aquatic Life and Wildlife. A biological survey conducted by the MDEQ in 2006 downstream of 47th Avenue rated the macroinvertebrate community as acceptable. However, the habitat was rated marginal and the report noted that historic channel alterations were evident. More than 50% of the stream bottom was affected by sediment deposition, but the banks appeared stable. Large amounts of aquatic

vegetation were present. The report notes that in July of 2001, MDEQ staff observed nuisance level algae conditions, but these conditions were not present in 2006. Increased flow was noticed compared to 2001. This increase may be attributed to the discharge from the Coca-Cola Paw Paw facility, which began in 2002.

Hog Creek

Hog Creek is a warmwater stream that meets the Paw Paw River just east of the City of Hartford. The designated uses of Warmwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. Nutrients and pesticides are also suspected to be threatening water quality. Streambanks are the only known sources of sediment. Agricultural lands are a suspected source of sediment, nutrients and pesticides.

Land use in the Hog Creek Watershed is primarily agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. According to the MDEQ Wetland Functional Assessment report, the Hog Creek Watershed has lost 85% of its wetlands with a high significance for sediment and other particulate retention. Wetland loss, channel modification and lack of BMPs create flow fluctuations and increased stream power. These hydrologic changes cause stream bank erosion and habitat modification resulting in adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and fish assemblages.

Hog Creek is listed as a Category 4c water body in MDEQ's 2006 Integrated Report. According to the 2008 Integrated Report, Hog Creek is fully supporting its designated use for Other Indigenous Aquatic Life and Wildlife, but its designated use for Warmwater Fishery was not assessed. A biological survey conducted by the MDEQ in 2006 at Red Arrow Hwy rated the habitat marginal and the macroinvertebrate community as acceptable, but noted that the banks were scoured up to three feet above the water surface suggesting the stream is somewhat flashy.

Mud Lake Drain

Mud Lake Drain is a warmwater stream that meets the Paw Paw River north of the City of Hartford. The designated use of Warmwater Fishery is impaired and the designated use of Other Indigenous Aquatic Life and Wildlife is threatened due to known sedimentation. Nutrients are also suspected to be threatening water quality. Suspected sources of sediment are agricultural lands and streambanks. Agricultural lands are the suspected source of nutrients.

Land use in the Mud Lake Drain Watershed is primarily agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment and nutrients to be transported to surface water with runoff from rain events. Increased runoff, due to the lack of BMPs, wetland loss and channel modification, creates flow fluctuations and increased stream power. These hydrologic changes cause stream bank erosion and habitat modification resulting in adverse impacts to native biota. Streams with more

uniform flow throughout the year typically have more stable channel morphology and fish assemblages. According to the MDEQ Wetland Functional Assessment report, the Mud Lake Drain Watershed has lost 42% of its wetlands with a high significance for streamflow maintenance and 81% of its wetlands with a high significance for fish and shellfish habitat.

Mud Lake Drain is listed as a Category 4c water body in MDEQ's 2006 Integrated Report. According to the 2008 Integrated Report, Mud Lake Drain is fully supporting its designated use for Other Indigenous Aquatic Life and Wildlife, but its designated use of Warmwater Fishery was not assessed. A biological survey conducted by the MDEQ in 2006 at 52nd Street noted that 70% of the stream bottom was affected by sand deposition. MDNR Fisheries Division staff reported that Mud Lake Drain has recently lost two fish species.

Ox Creek

Ox Creek is a warmwater stream that joins the Paw Paw River in Benton Harbor. The designated uses of Warmwater Fishery and Other Indigenous Aquatic Life and Wildlife are impaired due to known sedimentation, metals, oils and grease. Nutrients, pesticides and contaminated sediment are also suspected to be impacting water quality. Developed lands are a suspected source of these pollutants. Streambanks are a suspected source of sediment. Agricultural lands in the headwaters of the stream are another suspected source of sediment, as well as nutrients and pesticides. Heavy metals and organic compounds have been found in Ox Creek. Historic industrial practices are a known source of these pollutants.

The Ox Creek Watershed contains the most urbanized portion of the PPRW, with over 2000 acres of impervious surface. Insufficient management of the stormwater runoff created by impervious surfaces leads to sedimentation, polluted runoff and altered hydrology. Flow fluctuations, increased stream power and other hydrology changes cause stream bank erosion, habitat modification and adverse impacts to native biota. Streams with more uniform flow throughout the year typically have more stable channel morphology and more stable fish assemblages. Flow fluctuations can also affect environmental conditions, such as water temperature and chemistry. Suspected causes of polluted runoff include improper application, storage, and disposal of fertilizers and pesticides by landowners. Poor vehicle maintenance and improper oil disposal are suspected causes of oils and grease in urban stormwater runoff. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events.

Ox Creek is listed as a Category 5 water body in MDEQ's 2006 Integrated Report and a TMDL is scheduled for 2009. According to the 2008 Integrated Report, Ox Creek is not supporting its designated use for Other Indigenous Aquatic Life and Wildlife due to several pollutants including sediment, solids, chromium, copper, lead, oils and grease. Sediment samples taken in 2006 by MDEQ indicated that levels of lead, zinc and several polycyclic aromatic hydrocarbons exceeded sediment quality guidelines. The designated use of Warm Water Fishery was not assessed in the 2008 Integrated Report

due to insufficient information. Biological surveys conducted by the MDEQ in 2006 rated the macroinvertebrate community poor at 2 of 3 survey locations. Habitat was rated as marginal at one location due to a lack of epifaunal substrate and heavy deposits of sand. The fish community was rated at the low end of acceptable at Meadowbrook Rd., the only location sampled for fish and the most upstream survey station on Ox Creek. The fish community further downstream is more affected by high stormwater flows and altered hydrology.

South Branch

The South Branch is designated as a warmwater stream originating at the confluence of the East and West Branches in the Village of Paw. Approximately 5 miles downstream of Maple Lake, the South Branch joins the North Branch to become the Paw Paw River Mainstem. The designated uses of Warmwater Fishery and Other Indigenous Aquatic Life and Wildlife are threatened due to known sedimentation. Nutrients, pesticides, metals, oils and grease are also suspected to be threatening water quality. Agricultural lands are a suspected source of sediment, nutrients and pesticides. Streambanks are the primary suspected source of sediment. Urban stormwater runoff from the Village of Paw Paw is a suspected source of nutrients, pesticides, metals, oils and grease.

Land cover in the South Branch Watershed below the confluence of the East and West branches is 49% natural, 40% agricultural and 11% urban. According to the MDEQ Wetland Functional Assessment report, 75% of the presettlement wetlands remain intact. The Village of Paw Paw contains most of the urban land cover and associated impervious surfaces in the South Branch Watershed. Insufficient management of stormwater runoff created by impervious surfaces leads to sedimentation and polluted runoff. Suspected causes of polluted runoff include improper application, storage, and disposal of fertilizers and pesticides by landowners. Poor vehicle maintenance and improper oil disposal are suspected causes of metals, oil and grease in urban stormwater runoff.

The West Branch is the largest tributary to the South Branch and its watershed is predominantly agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Wetland loss, channel modification and lack of BMPs create flow fluctuations in the West Branch and its tributaries. These hydrologic changes cause stream bank erosion and allow sediment and nutrients to be transported to Maple Lake in suspension.

Most of the sediment from urban stormwater runoff and the West Branch is trapped by Maple Lake, but nutrients, pesticides and other pollutants can move through the lake to the South Branch. Although Maple Lake serves as a sediment trap, the lack of suspended sediment in the water below the lake can actually lead to increased bank erosion along the South Branch. Water devoid of suspended sediment has an enhanced ability to cause streambank erosion.

According to the 2008 Integrated Report, the South Branch was not assessed for its Warmwater Fishery designated use. It was found to be meeting its designated use for Other Aquatic Life and Wildlife. A biological survey conducted by the MDEQ in 2006 at 3750th Avenue rated the macroinvertebrate community as acceptable. The habitat was rated good, but the report noted that very little substrate was available for colonization. The pool substrate was dominated by silt, and there were several deep deposits of silt.

Lakes

The following lakes were assessed by Michigan Department of Environmental Quality and were found to be supporting their designated use for Other Indigenous Aquatic Life and Wildlife: Paw Paw Lake (Kalamazoo County), Fish Lake, Brandywine Lake, Martin Lake (Little Brandywine Lake), Ackley Lake, Threemile Lake, Eagle Lake, Maple Lake, Lake Cora, Upper Reynolds Lake, School Section Lake, Rush Lake, Van Auken Lake, Shafer Lake, Hall Lake and Paw Paw Lake (Berrien County).

Maple Lake

Maple Lake is a man made impoundment of the East and West Branches of the Paw Paw River. The designated use of Warmwater Fishery is impaired due to known sedimentation. The designated use of Other Indigenous Aquatic Life and Wildlife is threatened by sediment and suspected nutrients. Pesticides, metals, oils and grease are also suspected to be impacting water quality. Suspected sources of sediment are streambanks and agricultural lands in the West Branch Watershed. Agricultural lands are a suspected source of nutrients and pesticides. Urban stormwater runoff from the Village of Paw Paw is a suspected source of nutrients, sediment, pesticides, metals, oils and grease.

The Village of Paw Paw contains the largest amount of urban land cover and associated impervious surfaces in the Maple Lake Watershed. Insufficient management of the stormwater runoff created by impervious surfaces leads to sedimentation and polluted runoff. Suspected causes of polluted runoff include improper application, storage, and disposal of fertilizers and pesticides by landowners. Poor vehicle maintenance and improper oil disposal are suspected causes of metals, oil and grease in urban stormwater runoff. Polluted runoff and increased nutrient levels lower dissolved oxygen (DO) in the water column.

The West Branch is the largest tributary to Maple Lake and its watershed is predominantly agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Wetland loss, channel modification and lack of BMPs create flow fluctuations and increased stream power in the West Branch and its tributaries. These hydrologic changes cause stream bank erosion and allow sediment and nutrients to be transported to Maple Lake in suspension. The sediment and nutrients accumulate in the lake resulting in lowered DO levels and habitat modification with adverse impacts to native biota.

According to the 2008 Integrated Report, Maple Lake is meeting its designated use for Other Aquatic Life and Wildlife. However, increasing sediment, nutrients and weed growth is altering the lake's habitat and chemistry. Maple Lake's designated use of Warmwater Fishery was not assessed in the 2008 Integrated Report. Lake levels were lowered during the fall of 2007 to facilitate repair of the dam. Lower water levels revealed the extent of sedimentation and weed growth. The Village of Paw Paw is working with the Van Buren County Drain Commissioner to determine how they can restore Maple Lake and protect it from further sedimentation and weed growth.

Paw Paw Lake

Paw Paw Lake is the largest lake in Berrien County and the largest lake in the PPRW. The designated use of Warmwater Fishery is impaired due to known low dissolved oxygen (DO) levels. The designated use of Other Indigenous Aquatic Life and Wildlife is threatened by known sediment and nutrients. Pesticides, metals, oils and grease are also suspected to be impacting water quality. Developed lands are a suspected source of nutrients, sediment, pesticides, metals, oils and grease. Agricultural lands in the headwaters of the lake are a suspected source of nutrients, sediment and pesticides. Tributary streambanks are another suspected source of sediment.

The area immediately adjacent to Paw Paw Lake contains a significant amount of urban land cover and associated impervious surfaces. Insufficient management of the stormwater runoff created by impervious surfaces leads to sedimentation and polluted runoff. Suspected causes of polluted runoff include improper application, storage, and disposal of fertilizers and pesticides by land owners. Polluted runoff and increased nutrient levels lower DO in the water column. Poor vehicle maintenance and improper oil disposal are suspected causes of metals, oil and grease in urban stormwater runoff.

Land cover in the headwaters of the Paw Paw Lake Watershed is predominantly agricultural. Agricultural lands without BMPs (buffer strips, no-till, cover crops, etc.) allow sediment, nutrients and pesticides to be transported directly to surface water with runoff from rain events. Wetland loss, channel modification and lack of BMPs create flow fluctuations and increased stream power in Paw Paw Lake tributaries. These hydrologic changes cause stream bank erosion and allow sediment and nutrients to be transported to the lake in suspension. The sediment and nutrients accumulate in the lake resulting in lowered DO levels and habitat modification with adverse impacts to native biota.

According to the 2008 Integrated Report, Paw Paw Lake is meeting its designated use for Other Aquatic Life and Wildlife. However, habitat has been severely impaired by increased armoring of the shoreline (sea walls, sheet piling and rip-rap). Paw Paw Lake's designated use of Warmwater Fishery was not assessed in the 2008 Integrated Report. The Spicer Group conducted a study of Paw Paw Lake and its watershed in 2007. According to the study, low DO levels are impairing the water quality of the lake. Accumulating nutrients (phosphorus & nitrogen) and organic material on the lake bottom is using up the available oxygen in the water column. Discussions with MDNR Fisheries Division staff confirm the fishery is impaired.