

## **Appendix 8. Water Quality Statement by Water Body and Sub-Watershed**

Designated uses of many water bodies in the PRW are threatened or impaired due to habitat loss and manipulation, land use and practices that threaten those uses and watershed health overall. A connection and analysis of the designated uses being threatened or impaired/ the pollutants causing the threat or impairment; the sources of these pollutants; and causes related to those will be examined. Several sources were used to determine this information: watershed inventory from practitioners, pre-existing data from watershed studies, and a systematic review of land uses within those areas.

Information used: MDEW Integrated Reports, MDNR Fisheries Reports and Staff, MDEQ Bio surveys reports, Lake Association Reports, Drain Commission Reports, PRW Inventory, MDEQ Wetland Function Analysis, Kalamazoo County Health & Community Services.

### **Goose Lake Drain-Portage River and Lateral Drainages (0506)**

*From the confluence of the St. Joseph River upstream north of Portage Lake to just south of Z Ave.*

From the confluence of the Portage River and the St. Joseph River upstream through Portage Lake to the county line between Kalamazoo and St. Joseph Counties and surrounding watershed area. The watershed is 68% agricultural and 5% urban. There are no known impairments to designated uses within this stretch. Threats exist to Warm Water Fishery and Other Indigenous Aquatic Life and Wildlife, and Navigation. The loss of 21.08% of wetlands contribute to those threats and also contribute to threats to hydrology from increased delivery of water volumes and buffering capacity to minimize erosional forces. A loss of storage, buffering, and filtration capacities is threatened, as well. Hoffman pond retains sediment and poses a threat from sedimentation and an increase in temperature. The Parkville Dam increases hydraulics below creating erosion and ponding upstream (as evidenced by Site 17, see Geomorphic Assessment). The St. Joseph Conservation District is in the process of removing the dam. Navigation is threatened by large woody debris falling within the main stem. Fishers Lake is a threat to Partial and Total Water body Contact from *E. coli* due to a lack of sewer system. Aquatic invasive plants and animals, sedimentation from roads and the launch site, and bank armoring are threatening the Warm Water Fishery. Ice action on the east shoreline is damaging shorelines and creating erosion. Agricultural lands, roads, are suspected to be contributing sediment, nutrients and pesticides, as well as impervious surfaces within Three Rivers, and the somewhat urban area surrounding Fishers Lake. The Warm water Fishery and Other Indigenous Wildlife, Partial and Total Water body Use, and Navigation uses are suspected to be threatened from sedimentation, nutrients, *E. coli* and blockages from large woody debris.

Land Cover surrounding the Portage River main stem is predominantly agricultural, with broad expansive floodplains. Threats from surface water withdrawal for irrigation units exist to the Warm Water Fishery and Other Indigenous Wildlife through water drawdown during critical July-September periods through lowering water levels and increasing water temperatures. As well as potentially delivering oils and grease from irrigation units motors and supply storage tanks within the floodplain and surrounding channel area. Channel morphology within this stretch is more natural and the stream maintains a sinuous nature. Geomorphic results suggest that this portion of the main stem is functioning and stable and lateral drainages within this section range from unstable (Goose Lake Drain) to stable (Felker Drain Moorepark Rd. north to Parkville Rd). Both of these drainages have potential for wetland restoration. Goose Lake Drains headwater region from Moorepark Rd. north to Cotherman Rd. should

be protected and the lower reaches from Heimbach Rd south to the confluence of the St. Joseph River if restored could mitigate nonpoint source degradation. Felker Drain has potential for wetland restoration from Marcellus Rd. north to Z Ave. Channelized stretches are suspected to be increasing hydraulics and delivering sediment, nutrients, and pesticides and herbicides to the Portage River main stem. Garman-Foster Drain from the confluence of the St. Joseph River to Buckner Rd. is channelized/modified and has been observed contributing large amounts of sediment from agricultural fields via road-side drainage. This area has a high potential for wetland restoration surrounding Garman Foster Drain from the confluence to its headwaters that could help to mitigate threats from sediment, nutrients, and *E. coli*. Nutrients, pesticides and herbicides are suspected to be delivered as well. Portage Lake Drain is heavily channelized and suspected to deliver sediment, nutrients, and pesticides and herbicides. A large amount of acreage surrounding this drain was observed receiving manure application and is irrigated. It has a small wetland restoration potential from E. Michigan Ave. upstream to Buckner Rd. If the drain is not sprayed with herbicide or modified bank stabilization and filtration of sediment could negate some threats from runoff.



**Photo Group 1.** These photos depict nonpoint source pollution entering Garmin Foster Drain via roadside ditch. The nonpoint source is over a ½ mile from the drain. Clockwise from top: sheet erosion sloping toward the road, nonpoint sources and sediment entering the roadside ditch, and sediment traveling down the roadside ditch eventually entering directly into Garmin Foster Drain.



**Photo Group 2.** Surface water irrigation units pose a threat from water withdrawal during critical base flow conditions during July, August, and September. Oils and fuels pose a threat if leaking or if left within the floodplain during bankfull events.

#### **Butternut Creek- Bear Creek and Lateral Drainages (0504)**

*From the confluence with Portage Lake upstream to U Ave.*

The only known impaired use within this stretch is Partial and Total Body Contact. Land use within the sub-watershed is primarily agricultural (66%) and 1% urban, as a result agricultural land use is suspected to be the primary contributor of *E.coli* and other pathogens from land use application. Land based application of manure has been observed within 100 feet or less of lateral drainages, observed runoff, and tiling from X Ave. upstream to 36<sup>th</sup> St and 38<sup>th</sup> St within the Parker Drain system. Butternut Creek upstream from 32<sup>nd</sup> St. is suspected to contribute *E. coli* from pastured cattle on fields that slope to the creek. Sedimentation, nutrients, pesticides and herbicides, and oils and grease are suspected. Irrigation threatens stream temperatures and July-September water levels.

The highest amount of wetland loss is within this sub-watershed totaling 31.47%. Threats to hydrology and hydraulics and mitigation processes have been lost. Potential for wetland restoration exist west of 33<sup>rd</sup> St. and South of W Ave. Modification to upstream reaches of lateral drainages within the sub-watershed are suspected to increase the sediment delivery, and flashiness of drains which threatens to increase erosional process and delivery of pollutants. Geomorphic locations within this sub-watershed indicate a stable rating. Sites were located at downstream portions of the drainage where little modification has been experienced. Sites within this reach were used as reference reaches because of a lack of modification. However, large amounts of sediment deposition is suspected to be from upstream alterations and agricultural run-off. Modification within the Bear Creek/Parker drainage system is upstream from 34<sup>th</sup> St. and also from 33<sup>rd</sup> St. on the south branch extension.

### **Indian Lake-Portage River, Dorrance Creek (0505)**

*From just north of Portage Lake (south of Z Ave.) upstream through Indian Lake to the headwaters of Dorrance Creek near P Ave. and 43<sup>rd</sup> St.*

The only known impairment within this sub-watershed is Partial and Total Water body Contact. The primary land use within this sub-watershed is agriculture (63%) and 3% urban, as a result suspected sources of *E. coli* are agricultural manure, wildlife, and failing septic systems. Kalamazoo County Health and Community Services data sampled elevated levels of *E. coli* from 2001 to 2009 at sites: YZ Ave (highest), E. W Ave. (medium), East U Ave. (medium) on the main stem between Portage Lake and Indian Lake. Dorrance Creek had elevated levels of *E. coli* at sites: 33<sup>rd</sup> St. (highest), 34<sup>th</sup> St. (medium), S Ave (high), E. R Ave. (high), S. 40<sup>th</sup> St. (low), S. 43<sup>rd</sup> St. (low). E. S Ave between 32<sup>nd</sup> and 33<sup>rd</sup> (none) possibility for low level at this site could be the buffering capacity of Sagamaw Lake and its wetlands. Watershed inventory revealed high levels of manure application within this sub-watershed, sloping terrain toward lateral drainage water bodies, fenced livestock and unfenced livestock most likely contributing to elevated *E. coli* levels. There are at least 3 large CAFOs/AFOs within the Dorrance Creek watershed area. Contribution from CAFOs is unlikely, but delivery and application of manure is a likely contributor to elevate past and present levels of *E. coli* within this sub watershed. Fields north of Y Ave and 27<sup>th</sup> St. and west of the river were observed contributing erosion during the winter of 2013. There is a large buffer here but contributions were still very evident. Those fields have been observed receiving manure application as well.

Wetland loss in the watershed is 10.67% and is the 4<sup>th</sup> highest out of 6 sub-watersheds. Areas for potential wetland restoration tend to be in the headwaters portion of this sub watershed east of 46<sup>th</sup> St. and north of E V Ave. and east of 39<sup>th</sup> St. to 43<sup>rd</sup> St. Very little wetland restoration potential for the area surrounding the main stem from Indian Lake downstream to Portage Lake. This is an area for protection and preservation. Existing wetland floodplain is most likely due to the fact that the main stem of the Portage River is surrounded by a broad pre-modified floodplain. Agricultural drainage is sufficient with the sandy soils so there was little need to modify the channel.

The lower reaches of Dorrance Creek from 36<sup>th</sup> St. downstream to the confluence of Indian Lake is highly sinuous and pre-modified. From 36<sup>th</sup> St. upstream the channel is modified and unstable according to Simons Channel Evolution. From E. R Ave. upstream the creek has patches of buffer and areas of very little buffer which are most likely contributing to nonpoint sources. A small lateral drainage extends easterly from Dorrance Creek to 42<sup>nd</sup> Ave and is a likely contributor of sediment, *E. coli*, and nutrients. Livestock are fenced out of the drain, however very little buffer is observed with gentle slopes. This area has observed manure application and observed runoff from agricultural drains with a majority of the drainage reach with highly inadequate buffer widths. A lateral drain extending from U Ave. and 31<sup>st</sup> St. below Indian Lake has inadequate buffers and observed manure application, the drain extends easterly past 37<sup>th</sup> St.

Drain morphology in this sub watershed at geomorphic reaches were determined to be stability-at-risk and stable tending toward stability-at-risk. These reaches have had modification in the past but a lack of recent efforts have reduced the current impacts from these reaches. Drain maintenance in these reaches would pose a threat to current drain conditions and result in poor recovery potential for the drainage reach. Sediment contribution is suspected to be high in this reach and a supply to downstream reaches and Indian Lake.

Indian Lake Association performed water quality testing from 2010-2012 identifying threats from nutrients. They found elevated levels of phosphorus at the confluence with Indian Lake, 33<sup>rd</sup> St. and 36<sup>th</sup> St. ranking in the eutrophic range, and hypereutrophic ranges for nitrates at these locations indicating nonpoint source contribution from the lower reaches of Dorrance Creek to upstream reaches. Bank armoring, construction sites, storm sewer connections, nutrients from residential homes, irrigation and increased impervious surfaces threaten Indian Lake water quality. Numerous algal blooms have occurred since 2008. Navigation below Indian Lake is threatened due to large woody debris. Watershed technicians located over 30 complete and partial obstructions between Indian Lake and Y Ave. Irrigation and water management should be instituted to alleviate drawdown during critical July periods and lessen the effects of nutrient loss and erosion.

### **Headwaters Portage River (0501)**

*From inlet of Portage River with Indian Lake upstream to the headwater region of Portage Lake in Cold Brook County Park*

There are no known impairments within this sub watershed. The primary land use within the sub watershed is agriculture (66.5%) and 3% urban area, as a result suspected sources of *E. coli* are agricultural manure, wildlife, and failing septic systems. Kalamazoo County Health and Community Services data sampled elevated levels of *E. coli* from 2001 to 2009 at sites: TS Ave. (high), E. S Ave. (Low), E. Q Ave (high), E. (highest) OP Ave., S. 34<sup>th</sup> (high), and S 36<sup>th</sup> St. (moderate). Heavy manure application has been observed from the confluence of the first tributary N. of S Ave. (south tributary of the upper Portage River). The tributary extends through Scotts and to LeFevre Lake. Septic influence is expected as well through this reach. *E. coli* inputs to the main stem to Cold Brook County Park is thought to be agricultural manure, septic systems and wildlife. The county park beach has had closings in the past attributed to geese.

Wetland loss in this sub-watershed ranks third at 19.54%. Modification to upstream reaches of lateral drainages within the sub-watershed are suspected to increase the sediment delivery, and flashiness of drains which threatens to increase erosional process and delivery of pollutants. It is also suspected to threaten elevated water levels in Indian Lake from increased conveyance and drainage making rain events flashy. Wetland restoration potential is high from Q Ave. north to N Ave. and 29<sup>th</sup> St. west to 36<sup>th</sup> St.

Channel pattern from the inlet of the Portage River and Indian Lake upstream to E OP Ave. is channelized. Geomorphic data from this location indicate that the site is stability-at-risk. Average erosion rates are lower than reference values, but this is most likely due to the vegetation and roots stabilizing the site. Extreme amounts of aggradation are evidenced by a lack of pools and uniform entrenched channel. Practitioners believe more bankfull events will result in a much higher lateral erosion rate. The south tributary of the upper Portage River is not channelized from the confluence with the main stem and has a mild buffered floodplain 25-100 feet in areas, but is surrounded by heavy manure application. This tributary has little evidence of tiled drainage inputs. Scotts Mill Pond Dam poses threats from sedimentation, water temperature, nutrients, and increased water levels threatening the warm water fishery. Irrigation poses threats to cool stream designation and water levels during July through September. The upper portion of the Portage River Main stem is threatened with sediment, elevated water temperatures, and nutrients from a low-head dam north of E OP Ave. The channel from 36<sup>th</sup> St. upstream to Cold Brook County Park is pre modified and maintains adequate to good buffers and



should be protected to insure water quality protection. Lateral drains from 31<sup>st</sup> St. east toward OP Ave. have inadequate buffers. The drain just south of here that runs parallel to Q Ave. has inadequate buffer. The drain north of OP and P Ave crossing 32<sup>nd</sup> Ave has a small buffer but observed runoff contributions. Small livestock farms (horses) within this watershed could contribute to *E. coli*. Irrigation and water management should be implemented to alleviate threats to water levels and surface runoff.

Water quality testing performed by MDEQ staff indicated water chemistry was acceptable to Michigan Water Quality Standards but lower than mean values at reference sites within the same region. Indian Lake Association testing indicated eutrophic status from 2010-2012 for phosphorus at TS Ave. and S Ave. Nitrate levels at these locations within the same two-year span resulted in hypereutrophic results indicating elevated levels of nutrients (algal blooms) are posing serious threats to Indian Lake and the Portage River.

### **Portage Creek (0503)**

*From just north of Portage Lake north to Barton Lake followed by Sunset Lake, and terminates just south of TU Ave. north of Sunset Lake.*

There are no known impairments within the sub watershed. Portage Creek Watershed is primarily agricultural (53.99%) and 8.63% urban. Threats exist to Partial and Total Water body Recreation from *E. coli*. Low levels of were found from YZ Ave., Y Ave, 24<sup>th</sup> St., 22<sup>nd</sup> St., Howard Lake, and Barton Lake. Sources for *E. coli* in the watershed are suspected to be agricultural manure application, septic systems, and wildlife. Sedimentation is a problem with Sunset Lake due to the impoundment on the south end. The Kalamazoo County Drain Commission had a study performed, *Lake Level Study for Sunset Lake*, 2013, pertaining to lake levels within Sunset Lake. Evidence of some problems associated with septic systems, weed growth, and lake levels exist. The drain at the north end of Howard Lake north to V Ave. is suspected to deliver sediment, nutrients, and other sources of nonpoint pollutants. The drain is channelized. Irrigation threatens the warm water fishery from increased temperatures and lower water levels during July – September critical periods.

The area of Portage Creek from upstream of Portage Lake to the confluence of Gourdneck Creek should be protected due to the quality of surrounding wetlands and floodplains in order to protect water quality. Portage Creek is has the second lowest amount of wetland loss and should protect these to insure buffering capacity, flood storage, etc.

### **Gourdneck Creek (0502)**

*Gourdneck Creek from confluence east of 23<sup>rd</sup> St. to Gourdneck, West, and Sugarloaf Lakes and the east tributary upstream to Austin and Long Lake.*

Gourdneck Creek sub watershed is 38% agricultural and 15% urban the highest for any sub watershed within the PRW. Threats exist to Partial and Total Water Body Contact from *E. coli*. Kalamazoo County Health and Community Services determined that Gourdneck Creek had very low levels of *E. coli*. The highest levels were at S. 23<sup>rd</sup> St. Suspected contributors are wildlife and septic systems. Low levels were tested at TU Ave. south of Austin Lake and Oakland Drive between Sugarloaf and Gourdneck Lakes.

Threats exist to hydrology from increased impervious surfaces. Oils and grease, pesticides, *E. coli* from storm water connections and surface water runoff.

Wetland loss is the lowest at 9.22% of all sub watersheds and needs to be protected to ensure the headwaters region of the watershed performs critical wetland functions and doesn't increase hydrology downstream.

Threats exist to Lakes in the watershed due to nutrients, sedimentation, *E. coli*, Oils, grease and metals. Austin Lake has instituted

One study estimated pollution in Austin Lake to be attributed to overland and street runoff (15%), leaching septic systems and tile fields (30%), agricultural runoff (20%), overuse of lawn fertilizers (30%), and animal pollution (5%) (Snell 1975). Chemical analysis of sediments from Austin Lake showed significant contamination by chromium, copper, lead and zinc, with many of these samples characterized as heavily polluted (Western Michigan University 1978).

A more recent study of West Lake (Kieser & Associates 1999) determined that phosphorus concentrations are similar to a 1986 study on the lake. Over those years, some storm water drains had been disconnected. The remaining storm water outfalls to West Lake still apparently contribute pollutants such as phosphorus and *E. coli*. This report recommended disconnecting storm drains that discharge directly into the lake, and instead installing leaching basins to promote infiltration.