11 Evaluation

An evaluation process will determine if the plan implementation is effective and if improvements in water quality are being achieved. Measuring improvements and sharing results will increase community support for plan implementation. Since watersheds are extremely dynamic systems influenced by many factors, evaluation can be a difficult and expensive endeavor. As a result, different levels of evaluation are proposed to illustrate levels of success in the watershed. The level of evaluation and the methods utilized will largely be dependant on the formation of a sustainable watershed organization being able to carry out the proposed evaluation methods and on the amount of resources and funding available. Lastly, this Watershed Management Plan should be reviewed and updated periodically.

11.1 Knowledge and Awareness

The first level of evaluation is documenting a change in knowledge or increase in awareness. Measures and data collection for this level can take place in three specific ways:

1. A pre- and post-test of individuals at workshops focused on specific water quality issues in the PPRW. This should be an on-going activity.
2. The tracking of involvement in a local watershed group or increases in attendance at water quality workshops or other events. This should be an on-going activity.
3. A large-scale social survey effort of the PPRW population to understand individual watershed awareness and behaviors impacting water quality. Surveys are expensive, so this level of evaluation will not be able to happen until funding is secured.

Additional evaluation methods for measuring and tracking knowledge and awareness can be found in the Information and Education Plan for the Black and Paw Paw River Watersheds in Appendix 10.

11.2 Documenting Implementation

The second level of evaluation is BMP adoption or implementation. The measurement is mostly a documentation of successful implementation. The evaluation will involve identifying and tracking individuals, organizations and governmental units involved in implementing and adopting BMPs whether they be structural, vegetative or managerial. Data about the BMP implementation can be gathered simply through tracking the number of BMPs installed or adopted. This evaluation should be done annually.

Table 16 has milestones and specific evaluation methods proposed for measuring the progress of BMP implementation and improvements to water quality for each task in the PPRW action plan. The action plan should be reviewed at least annually to ensure progress is being made to meet the milestones. During the annual review, the action plan should be updated as tasks are completed and as new tasks are identified.

11.3 Monitoring Water Quality

Another level of evaluation is documenting changes in water quality through monitoring. The monitoring of water quality is a very complex task, which involves gathering data from a number of sources. Periodic assessments of the water quality in the PPRW are conducted as part of federal and state water quality monitoring programs. Local efforts to monitor water quality include those of lake associations, drain commissioners and the Pokagon Band of Potawatomi Indians. Combining data gathered under these programs, with other periodic water quality assessments will provide a picture of water quality in the watershed. Four types of monitoring are proposed for the PPRW:

1. The volunteer inventory that was conducted during the plan development process could be repeated at the 200 plus sites throughout the watershed. The results could be compared to see if any problem areas have been improved or if any areas are worsening. This activity should take place between 2011 and 2015.

2. Expanding Current Monitoring Efforts:

a. Benthic Monitoring can evaluate changes in the presence and type of aquatic life in the Paw Paw River and its tributaries to provide a general trend of water quality in the watershed. MDEQ performs benthic monitoring in the watershed.

b. Thermal monitoring is of special importance for the coldwater streams in the PPRW. Routine monitoring of temperature regimes will help to evaluate if these coldwater streams are being protected with the BMPs that are being implemented in these subwatersheds. MDNR Fisheries Division sometimes conducts thermal monitoring.

c. E.coli monitoring could be helpful in the Pine and Mill Creek subwatersheds. The levels of E.coli have been extremely high in these subwatersheds in the past several years. A specific monitoring effort in these subwatersheds could help to better understand the problem and to recommend appropriate BMPs for implementation. There is interest from stakeholders in the Hartford area to start this monitoring as soon as possible.

Both benthic and thermal monitoring efforts could be expanded with the development of a local volunteer monitoring program. Once a local watershed group is formed, this could be a task for that group to coordinate.

11.4 Estimating Pollutant Load Reductions

The last level of evaluation is to estimate a reduction in pollutant loadings. A pollutant loading is a quantifiable amount of pollution that is being delivered to a water body. Pollutant load reductions can be calculated based on the ability of an installed BMP to reduce the targeted pollutant. Pollutant loading calculations are best used at specific sites where structural BMPs are installed and detailed data about the reduction of pollutants can be gathered. Specific pollutant load reduction calculations should be completed for structural BMPs when they are proposed and installed.

The PPRW plan is mostly focused on the preservation of water quality and habitat. However, there are pollution problems throughout the watershed. Pollutants of concern include sediment, nutrients (nitrogen and phosphorus), bacteria/pathogens (E.coli), pesticides, oil, grease, metals and temperature.

In Table 16, under the last column (proposed evaluation methods), pollutant loading reduction calculations are suggested for evaluating several tasks in the action plan. Specifically these tasks include: protecting and restoring wetlands and sensitive lands, correcting failing septic systems, installing agricultural BMPs (filter strips, no-till, cover crops, grassed waterways, nutrient mgt, etc), restoring riparian buffers and stabilizing streambanks, utilizing urban stormwater BMPs (road/parking lot sweeping, stormceptors, rain gardens, vegetated swales, constructed wetlands, wet/dry ponds, etc), correcting livestock access problem sites and correcting road/stream crossing problem sites. The other items in the action plan (Table 16) either deal with hydrological modifications or they are proactive and preventative measures. Estimating pollutant loads and load reductions for these types of practices is not feasible.

Appendix 12 presents estimates for pollutant loading and loading reductions for specific agricultural and urban stormwater BMPs implemented in the PPRW. The estimates were derived from modeling efforts which included the Soil and Water Assessment Tool (SWAT) and an empirical build-out model using the Long-term Hydrologic Impact Assessment model (L-THIA).

(SWAT) was utilized to estimate pollutant-loading reductions for sediment and nutrients with the installation of agricultural BMPs (such as no-till, filter strips, cover crops, fertilizer reduction and a combination of filter strips and no-till). The largest load reductions were realized from the combination of no-till and filter strips. Alone, filter strips provided the most water quality benefits, but are the most expensive to implement. No-till is the most cost efficient BMP and large scale implementation of no-till would bring significant water quality benefits.

To address threatened and impaired designated uses, other than Partial and Total Body Contact (Coldwater Fishery, Warmwater Fishery and Other Indigenous Aquatic Life and Wildlife), in the priority agricultural areas, BMPs should be implemented in at least 75% of those areas. At this level of implementation, an estimated reduction of sediment by 65.3%, total phosphorus by 62.1% and total nitrogen by 60.8% needs to be realized at the mouth of the Paw Paw River.

An empirical model utilizing the Long-term Hydrologic Impact Assessment model (L-THIA) was utilized to estimate load reductions in high priority urban areas for sediment and nutrients with the installation of urban stormwater BMPs (such as wet retention ponds, dry detention ponds, vegetated swales, rain gardens and constructed wetlands). Table 17 presents some general treatment efficiencies for urban stormwater BMPs which were used as a baseline in the PPRW build-out empirical model.

Table 17. General Urban BMP Treatment Efficiencies

	TP	TSS
Wet retention pond	90%	90%
Dry detention pond	30%	90%
Vegetated swale	40%	80%
Rain garden [1]	100%	100%
Constructed wetland [2]	90%	90%

[1] Assuming rain gardens absorb all pollutants contained in the runoff captured.
[2] Assuming to be the same as wet retention ponds (Rouge River National Wet Weather Demonstration Project, 2001).

Among the five urban BMPs examined (wet retention ponds, dry detention ponds, vegetated swales, rain gardens, and constructed wetlands), wet retention ponds and constructed wetlands provide the greatest load reductions for TP and TSS while vegetative swales are the most cost-effective (lowest per pound cost of load reduction).

To address threatened and impaired designated uses, other than Partial and Total Body Contact (Coldwater Fishery, Warmwater Fishery and Other Indigenous Aquatic Life and Wildlife), in the priority urban areas, urban stormwater BMPs should be implemented on urban lands at a 50% treatment coverage for wet and dry retention ponds, vegetated swales and constructed wetlands and at a 15% treatment coverage for rain gardens. With those BMP implementation rates on urban lands, an estimated 1,500 pounds/year reduction in total phosphorus and a 60,000 pounds/year reduction in total suspended solids need to be realized in the PPRW. These reduction estimates were calculated by averaging the load reductions for each of the five urban stormwater BMPs modeled for the three urban subwatersheds of the PPRW. The three urban areas are 1) the Ox Creek Area (Benton Harbor/St Joseph); 2) the Paw Paw Lake Area (includes the townships of Coloma and Watervliet and the Cities of Watervliet and Coloma); and 3) the village of Paw Paw and Antwerp Township.

To address the threatened and impaired use of Partial and Total Body Contact, BMPs must be implemented in agricultural, protection and urban areas to ensure all water bodies meet water quality standards for Escherichia coli (E. coli). For Total Body Contact, E. coli levels need to be reduced to 130 E. coli per 100 milliliters (ml) water as a 30-day average and 300 E. coli per 100 ml water at any time during the time period of May 1 to October 1 to meet the water quality standard. For Partial Body Contact, E. coli levels need to be reduced to 1000 E. coli per 100 ml water to meet the water quality standard.

Currently, there are no loading estimates or reduction calculations for pesticides, oils, grease, metals and temperature for the PPRW.

11.5 Evaluating the Watershed Management Plan

The watershed management plan should be reviewed and updated as needed. The Two Rivers Coalition: An alliance for the Black and Paw Paw River Watersheds should take the lead in the management and action plan review process. As general guidance, the review should at a minimum include the following updates:

- Land Cover (Chapter 2.4) – at a minimum every 10 years
- Demographics (Chapter 3.3) – with every new US Census
- Future Growth and Development (Chapter 3.4) – every 5-10 years
- Local Water Quality Protection Policies (Chapter 4.3 and 4.4) – every 3 years
- Water Quality Summary (Chapter 7) – every two years with the release of MDEQ Integrated Reports
- Scheduled TMDLs (Table 14) – every two years with the release of MDEQ Integrated Reports or when a TMDL is completed
- Prioritization of areas, pollutants and sources (Chapter 8) – every 5-10 years
- Goals and Objectives (Chapter 9) – every 5-10 years
- Implementation Strategy (Chapter 10) – review annually and update as needed