Section V. Methods: Watershed Characterization and Assessment

Paddling on Portage Creek near Woodburn Lake.
credit: HRWC

A. Stream Corridor Assessment

The watershed planning process relies on field assessment methods to identify and verify in-stream impairments, define protection and/or restoration potential, and acquire information needed for project implementation. The watershed team employed a field assessment method in the stream corridor, the Unified Stream Assessment[i], to rapidly identify, design and rank potential protection and restoration projects and/or monitor improvements in stream quality. The Unified Stream Assessment (USA) includes a semi-quantitative method that asks the investigator to assign a numeric score to various stream habitat or channel parameters by comparing what is seen at points along the stream to a series of descriptions. The numeric score is then used as a basis for classifying the stream's habitat quality.

The Unified Stream Assessment is a continuous stream walking method that systematically assesses the range of impacts and potential protection and restoration projects found along the entire stream corridor. For Portage Creek, stream investigators performed an overall reach assessment in addition to recording impacts related to 1) stream buffers, 2) severe bank erosion, 3) stream crossings, and 4) channel modification. The USA was employed along the main channel of Portage Creek from near Nichols Lake in Stockbridge Township downstream to where the creek flows into Little Portage Lake. In addition, stream investigators assessed the downstream reaches of Livermore Creek, a tributary to Portage Creek. Letters announcing the assessment were mailed to all riparian residents informing them of the work and requesting their cooperation.

Results from the Unified Stream Assessment forms have been entered into a Microsoft Access database for reference and are located at the offices of the Huron River Watershed Council. Sample forms are included in Appendix A. All data collected in the USA were given spatial coordinates and entered into the Portage Creek Watershed project GIS for analysis and map presentation. The results are summarized and presented graphically in Section VI.

B. Stream Flow Study

The stream flow regime in Portage Creek has not received much study prior to this watershed planning project. Over the course of 18 months in 2008 and 2009, a stream flow study produced rating curves for three sites on Portage Creek that can be used to characterize the flow regime of Portage Creek in the short term and evaluate the effectiveness of management practices installed in the future following the completion of the Portage Creek Watershed Management Plan. The upstream site at Unadilla Road is located at the approximate midpoint of Portage Creek, upstream of the chain of lakes and downstream of most agricultural activities in the watershed. The next site downstream is located at Tiplady Road, the site of a former USGS gage station that recorded stream flow until the 1970s. The third and most downstream site is located a few hundred feet downstream of Dexter-Townhall Road.

The Huron River Watershed Council and the Michigan Department of Natural Resources and Environment partnered on the stream flow study. For its part in the study, HRWC recruited, trained, and coordinated volunteers to measure flow periodically with a flow meter at the monitoring locations during several low flow periods and wet weather events in order to capture a variety of stage-discharge events. HRWC used these data to develop rating curves for the sites that will allow estimation of discharge from pressure sensor readings gathered by the MDNRE, Hydrology section. MDNRE deployed surface water instrumentation (Solinst Levelogger Gold) that records water level and temperature at the three sites at 15-minute intervals. Rain gauges were installed by MDNRE at two locations in the Portage Creek watershed to capture local precipitation information.

For more information on the details of the stream flow study, see Appendix B for the Quality Assurance Project Plan for Monitoring Stream Flow on Portage Creek, a tributary to the Huron River, May 5, 2008.

C. Comparative Subwatershed Assessment

The watershed team used a screening tool to assess current watershed conditions and identify protection and restoration priorities. The Comparative Subwatershed Assessment screens watershed protection and restoration potential from a desktop using the concept of subwatershed metrics. This tool, developed by the Center for Watershed Protection[ii], can screen more than 25 different metrics that can be derived from GIS analysis, review of other subwatershed data, and based on stakeholder input. For the Portage Creek watershed project, 11 metrics that best describe protection and restoration potential in the context of watershed goals were chosen for screening purposes for each of the 14 subwatersheds:

1. Current Impervious Cover (%)
2. Current Forest Cover (%)
3. Bioreserve: highest priority (%)
4. Future Impervious Cover (%)
5. Publicly-owned Lands (%)
6. Stream Corridor Forest Cover (%)
7. Sum of Forest, Parks, and Wetlands (%)
8. Road Crossings (crossings/stream mile)
9. Stream Corridor in Public Ownership (%)
10. Water Quality Regulatory Status (comparative index)
11. Severity of Streambank Erosion (comparative index)

The basic method to conduct a Comparative Subwatershed Assessment consists of four tasks:

1. Delineate subwatershed boundaries and review available metric data.
2. Choose and compute metrics that best describe protection and restoration potential.
3. Develop weighting and scoring rules to assign points to each metric.
4. Compute aggregate scores and develop initial subwatershed ranking.

The hydrologic tool in ArcGIS 9.3 was used to delineate the subwatersheds that measure from 1.29 square miles to 20.4 square miles. The results were entered into a Microsoft Excel spreadsheet for review and analysis, and presentation to the watershed team. The subwatersheds were ranked on a continuum of protection and restoration potential based on the results, with the lower scores indicating greater opportunity for restoration and higher scores indicating greater opportunity for protection. Of the 14 subwatersheds assessed, 5 were identified as priorities for protection, and 2 were identified as primary priorities for restoration. However, all of the subwatersheds contained opportunities for protection and restoration with the majority of the subwatersheds scoring in the middle of the ranks.

The Comparative Subwatershed Assessment for each of the 14 subwatersheds is presented in section IV. Watershed Conditions.

D. Wetland Functional Assessment

MDNRE performed a Landscape Level Wetland Functional Assessment for the Portage Creek watershed to identify the status and trends of wetlands, and to assist in identifying potential areas for wetland restoration. The Assessment is based on work by Ralph Tiner of the United States Fish and Wildlife Service in the Nanticoke River watershed of Maryland and Delaware.
The MDNRE produced this map from the following data obtained from other agencies or organizations:

1. The National Wetland Inventory (NWI) conducted by the US Fish and Wildlife Service through interpretation of aerial photos and topographic data.
2. Hydric Soils and hydric soil complexes as mapped by the US Department of Agriculture, Natural Resource Conservation Service (NRCS).
3. Land Cover as mapped by the Michigan Resource Inventory System (MIRIS), MDNRE, through interpretation of aerial photographs.
4. Basemap features as mapped by the MI Dept. of Geographic Information (MCGI).
5. Presettlement Wetlands created from Michigan Natural Features Inventory 1800 Land Cover layer.
6. Urban areas as mapped by MDNRE in 2001 IFMAP land cover layer.

The assessment revealed that the extent of wetlands in the Portage Creek watershed has decreased by 23%, or 3,811 acres. The average size of the wetlands in the watershed has shrunk from 18 acres to 6.5 acres due to land use conversions for agriculture and residential construction.

E. Portage Creek Watershed Hydrologic Study

The Hydrologic Studies Unit of the Land and Water Management Division of MDNRE completed a hydrologic study of the Portage Creek watershed during development of this watershed management plan to better understand the watershed's hydrologic characteristics. The watershed's hydrologic characteristics were evaluated to help determine the watershed management plan's critical areas and to provide a basis for stormwater management ordinances to protect streams from increased erosion and degradation. A variety of parameters were analyzed including land cover (1800, 1978 and 2000); soils; and hydrologic parameters of rainfall, runoff curve numbers, and time of concentration and storage coefficients. This information was used to generate results on runoff volume per area, peak flood flow yield analysis, gage/monitoring peak flow analysis, flashiness, stream morphology, and critical areas based on hydrologic criteria. The hydrologic study is included in this plan as Appendix D.

F. Critical Areas for Preservation

Critical areas for preservation in the Portage Creek watershed were identified and ranked using the Bioreserve method created by the Huron River Watershed Council. The Bioreserve method ranks the

ecological value of the remaining natural areas in the Huron River watershed based on 15 metrics. The project website at www.hrwc.org contains the full description of the method.

- Size
- Core size
- Presence of waterway or lake
- Areas containing wetlands and uplands
- Potential for groundwater recharge
- Presence in the 1800s of conifer swamp, lowland hardwood, oak opening, central hardwood, or emergent wetland
- Glacial variation
- Topographical variation
- Connectedness to other natural areas
- Undeveloped buffer
- Unchanged vegetation: by percentage
- Unchanged vegetation: by area
- Restorability
- Area of Michigan Natural Features Inventory community
- Biorarity, a score reflecting high quality plant communities, occurrences of threatened and endangered plants and animals, and other measures of potential ecological quality maintained by Michigan Natural Features Inventory

The resulting Bioreserve map shows 1,717 natural areas located throughout the Huron River watershed, comprising about 25% of the watershed's area, or 247,000 acres of wetlands, forests and grasslands. The Bioreserve map for the Portage Creek watershed shows 102 natural areas, comprising about 41.5% of the watershed's area, or 23,908 acres. The average size of the natural areas in the Portage Creek watershed is 234 acres.

G. Local Government Codes & Ordinances Review for Water Quality

The communities of the Portage Creek watershed were invited to participate in an audit of their existing codes and ordinances to determine how protective they are of water resources. HRWC conducted the audit over 3 ½ months in 2009. All six townships and the Village of Stockbridge participated; only the Village of Pinckney opted out since they participated in a similar process in 2005.

The audit is based on the work of the Center for Watershed Protection and its Better Site Design manual. All communities in the Huron River watershed now have participated in this audit through the watershed management planning process. The audit process is comprised of the following steps with the time allotted for this project included in parentheses:

1. Initial contact with communities; determine appropriate contacts for each community (2 weeks)

Followed by mailing the Code and Ordinance Worksheet with a letter of introduction

2. Conduct follow-up with individual communities (5 weeks)
   Identify information gaps and complete audits with assistance of community contacts
3. Evaluate results and suggest means for improvement (3 weeks)
4. Compile supplementary material and mail out results (2 weeks)
5. Community contacts review the results, recommendations for improvement and supporting materials
6. Community contacts, along with their elected officials and planning commissions select which recommendations to proceed with first based on conversations with their planning commissions, planning staff or consultants

The community contacts for the COW are:

Dexter Township:	Patrick Sloan; Supervisor Pat Kelly
Lyndon Township:	Supervisor John Francis; Leon Moore
Putnam Township:	Jim Gannon; Supervisor Ron Rau; Keith Tianen
Stockbridge Township:	Supervisor Paul Risner; Dennis Tripp
Unadilla Township:	Mike DeMint; Supervisor Linda Walker; Lori Cowan
Waterloo Township:	Supervisor Mike Sadler; Steve Opp
Village of Stockbridge:	Dan Dancer; Jeff Wilson

The audit materials and results are provided in Appendix I. A summary of the results show that only 2 of the 7 communities have buffer systems and land conservation incentives; 5 of the 7 communities have established substantial open space design policies; and most of the communities do not require or have sidewalks. Although the amount of development in the Portage Creek watershed is low, the creation of impervious surfaces is enabled through the parking ratios, parking codes, cul-de-sacs, and street widths stipulated in the local building codes and ordinances.

As a result of the findings, the most frequent recommendations for improving local codes and ordinances are as follows:

- Protect waterways, lakes and infrastructure: Implement and Maintain a Stream Buffer System
- Protect local wetlands: Implement a Wetlands Ordinance
- Have a plan for handling runoff: Stormwater Ordinance
- Reduce Excessive Clearing and Zoning
- Make Tree Conservation a Priority

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[i] Anne Kitchell and Tom Schueler. February 2005. Urban Subwatershed Restoration Manual No. 10: Unified Stream Assessment: A User's Manual, version 2.0. Ellicott City, MD: Center for Watershed Protection for the Office of Water Management, U. S. EPA.

[ii] Tom Schueler and Anne Kitchell. 2005. Methods to Develop Restoration Plans for Small Urban Watersheds. Ellicott City, MD: Center for Watershed Protection for U.S. EPA.