

Chapter 9 Evaluating Success²⁰

Section 9.1 Qualitative Evaluation Techniques

Effective evaluation is an important part of any watershed management plan. An evaluation process will provide measures of the effectiveness of implementing the watershed management plan. Showing success will gain support from the community and increase the potential for project sustainability. LCWC developed evaluation techniques to fit categories of their implementation tasks based on suggestions outlined by MDEQ (2000).

The implementation plan is directed toward activities dealing with informing, educating, or involving people, the restoration of degraded habitat (i.e. structural improvements), and with restoring and protecting water quality.

The following set of qualitative evaluation techniques and criteria can be used to determine whether pollutant-loading reductions are being achieved over time and whether substantial progress is being made towards attaining water quality goals in the Les Cheneaux watershed. The criteria can be used for determining whether this plan needs to be revised at a future time in order to meet water quality goals.

These evaluation techniques will provide the LCWC partners with a better perspective of the community's response to the project and the implementation plan's success of reaching water quality goals. This evaluation will also provide insight into which activities the partnership should discontinue, continue, or improve. Section 10.2 will describe quantification evaluation techniques.

These evaluation methods are not direct measurements of water quality. Nonetheless, the success of these tasks and objectives, collectively and over time, will have a positive impact on the actual water quality in the watershed.

Table 9.1.1 Qualitative Evaluation Techniques

| Task or Objective | Evaluation Technique | Measurement/ Criteria for success | Pros and Cons | Implementation |
|--|--|--|--|--|
| (I/E) Public education or involvement in the project | Public survey (perform at beginning of implementation phase, midway through project, and at the 3-year mark) | Level of awareness; participation in project; before/after knowledge; opinions; attitudes (proof of behavior change) | Moderate costs. Instant feedback. Low response rate. | Pre and post surveys by mail, telephone, or focus group; attendance lists; suggestion box-feedback forms; determine progress on goals/objectives; initial survey 2006; mid-point 2008; and final review 2010 |
| (I/E) Public meetings; workshops; education and involvement projects | Written evaluations | Level of awareness; participation in project; before/after knowledge; opinions; attitudes (proof of behavior change) | Good response rate. Low cost | Post-event participants will complete brief evaluations requesting what was learned, deficiencies in event, and suggestions for improvement. Evaluations done at event Continuous throughout project after events |

²⁰ The LCWMP evaluation and monitoring strategy is based up the Huron River Watershed Association's *Mill Creek Subwatershed Management Plan* evaluation strategy. (MCSSAG 2003)

| Task or Objective | Evaluation Technique | Measurement/ Criteria for success | Pros and Cons | Implementation |
|--|--|--|--|---|
| (I/E) Education efforts, brochures, public outreach, public consultation | Surveys, phone calls. Maintain office hours. Document correspondence and complaint records | Level of awareness; participation in project; before/after knowledge; opinions; attitudes (proof of behavior change) Public concerns Location of problem areas | Subjective information from limited number of community | Answer phones, emails, and letters. Document correspondence Assess success from content Years 1-3 |
| (I/E) Public involvement and education projects | Participation tracking | Number of people participating. Geographic distribution of participants. Amount of pollution removed. (Stream clean up, hazardous waste removal) | Low cost. Easy to track and understand | Attendance/informational sign up sheets Document pollution materials removed |
| (I/E) Information and education programs | Focus groups, Civic groups | Level of awareness; participation in project; before/after knowledge; opinions; attitudes (proof of behavior change) | Medium to high cost. Instant identification of motivators and barriers to behavior change | Select random sample population as participant. 6-8 people per group. Plan questions, facilitate. Record and transcribe discussion |
| Structural Improvements (Designated Uses) | Photographs, calculations, models, monitoring | Pollutant load, BMP' s installed, physical outcomes, before and after results Aesthetics | Photos are easy to do, moderate costs; calculations are relatively easy to implement, moderate costs | Photograph sites before and after BMP installation, measure erodable soils before and after installation, and design and implement computer and mathematical models; gather continuous physical, chemical, and biological data. |
| Identify riparian and aquatic improvements. Identify recreational and improvements/ opportunities. Aesthetics (Desired Uses) | Stream surveys Shoreline surveys | Habitat; flow; erosion; recreation potential; impacts | Current and first-hand information. Time-consuming. Relatively high cost | Identify parameters to evaluate. Record on standardized form using standardized protocol (GLEAS 51) Assess success; Continue implementation as data directs |

Among some of the programmatic indicators that can be studied to evaluate recommended strategies using these qualitative techniques are number of illicit connections identified/corrected, number of BMPs installed, inspected and maintained, permitting and compliance, and growth and development (e.g. impervious amounts), and on-site BMP performance monitoring.

9.2 Quantitative Evaluation Techniques

In addition to qualitative evaluation of implementation tasks and objectives to assess success with effectiveness of certain specific programs and projects within communities or agencies, it is beneficial to monitor the long-term progress and effectiveness of the cumulative implementation plan efforts in terms of a water quality, quantity and biological monitoring. The following quantitative evaluation will address the watershed project goal to improve “in stream” monitoring of the watershed. The watershed project partners consider the following evaluation goals and strategies necessary to assess success of the watershed project and the community’s adoption of the Les Cheneaux Watershed Management Plan’s pollution control activities. Comprehensive monitoring of water quality will provide baseline data and continuous comparative data to help the Les Cheneaux community manage land use for the protection of the designated uses of water in the Les Cheneaux watershed.

9.2.1 Water Quality Monitoring Design

A significant goal of the LCWC is to compile all the past information that went into this management plan and expand upon that information through a monitoring program that has significant survey locations, frequencies, including wet weather events, and appropriate parameters for assessment. The following monitoring program description will help the Les Cheneaux community more accurately identify the significance of present and future water quality impairments and their sources, as well as how these impairments are impacting the biological communities that serve as indicators of improvements. The program will also track the eventual improvements in water quality as the Les Cheneaux Watershed Management Plan is implemented.

Parameters

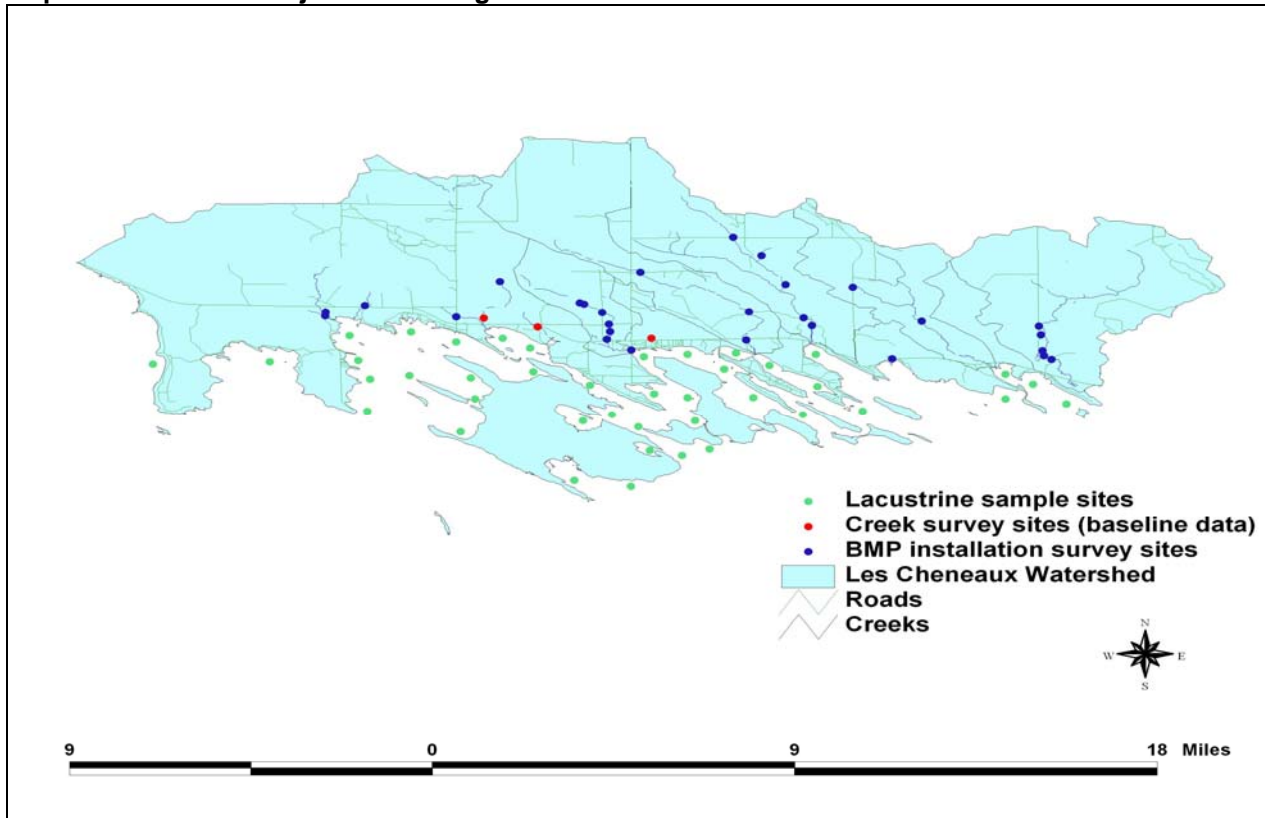
Establish a long-term monitoring program so that progress can be measured over time that includes the following components:

- Increase stream flow monitoring to determine base flows and track preservation and restoration activities upstream. Include as physical and hydrological indicators: stream widening/down cutting; physical habitat monitoring; impacted dry weather flows; increased flooding frequency; and stream temperature monitoring.
- Collect wet and dry weather water quality data in the subwatersheds and Lake Huron to better identify specific pollution source areas within these areas, and measure impacts of preservation and restoration activities upstream and onshore. Include as water quality indicators: water quality pollutant constituent monitoring, loadings, exceedence frequencies of water quality standards, sediment contamination, and human health criteria.
- Increase biological data monitoring (fish, macro invertebrates, and mussels) and use these as indicators of the potential quality and health of the stream and lake ecosystems. Include as biological indicators: fish assemblage; macro invertebrate assemblage; single species indicator; composite indicator; and other biological indicators.
- Identify major riparian corridors and other natural areas in order to plan for recreational opportunities, restoration and linkages.
- Review and revise currently established benchmarks and dates based on new data.
- Increase the use of volunteers where possible, for monitoring program (habitat, macro invertebrates) to encourage involvement and stewardship.

The monitoring plan will employ local volunteers trained by MDEQ personnel or qualified Lake Superior State University faculty to measure dissolved oxygen (DO), biological oxygen demand (BOD), bacteria (E. coli), phosphorus (P) and its forms, nitrogen (N) and its forms, and conductivity at each lacustrine sites on

Map 9.1 at least once each summer to screen for negative differences from target measures outlined below. Additional testing will be completed at added adjacent sites to target specific pollution sources if significant differences are discovered. Each creek (10) will be sampled for these parameters at the sites indicated on the map at least once each summer to follow up MDEQ five-year surveys and to evaluate any changes brought on by BMP installation. Additional components to be monitored, included MDEQ suggested *Rosgen's Bank Erosion Hazard Index*, *streambank erosion with erosion pins*, and *creek flashiness* will be selected with MDEQ consultation during QAPP development.

Map 9.1 Watershed Project Monitoring Sites



Establishing Targets

Measuring parameters to evaluate progress toward a goal requires the establishment of targets or evaluation criteria against which observed measurements are compared. These targets are not necessarily goals themselves, because some of them may not be realistically obtainable. However, the targets do define either Water Quality Standards, as set forth by the State of Michigan, or scientifically-supported numbers that suggest measurements for achieving water quality, quantity and biological parameters to support state designated uses such as partial or total body contact, and fisheries and wildlife. Using these scientifically based targets as targets for success will assist the watershed in deciding how to improve programs to reach both restoration and preservation goals and know when these goals have been achieved. These targets are described below.

The Michigan Department of Environmental Quality (MDEQ) has established state standards for dissolved oxygen (DO). The requirement is no less than 5.0 mg/l as a daily average for all warm water fisheries. The Administrative Rules state:

. . . for waters of the state designated for use for warm water fish and other aquatic life, except for inland lakes as prescribed in R 323.1065, the dissolved oxygen shall not be lowered below a minimum of 4 milligrams per liter, or below 5 milligrams per liter as a daily average, at the design flow during the warm

weather season in accordance with R 323.1090(3) and (4). At the design flows during other seasonal periods as provided in R 323.1090(4), a minimum of 5 milligrams per liter shall be maintained. At flows greater than the design flows, dissolved oxygen shall be higher than the respective minimum values specified in this subdivision.

(Michigan State Legislature. 1999)

State standards are established for bacteria (*E. coli*) by the MDEQ. For the designated use of total body contact (swimming), the state requires measurements of no more than 130 *E. coli* per 100 milliliters as a 30-day geometric mean during 5 or more sampling events representatively spread over a 30-day period. For partial body contact (wading, fishing, and canoeing) the state requires measurements of no more than 1,000 *E. coli* per 100 milliliters based on the geometric mean of 3 or more samples, taken during the same sampling event. These uses and standards will be appropriate for and applied to the creeks and those tributaries with a base flow of, or greater than, 2 cubic feet per second and lakefront concentrated development areas. *E. coli* measures will be taken in creeks following the regular monitoring schedule for the other mentioned parameters. Lacustrine measures will also be at the same sites and schedule as the other parameters.

Conductivity measures the amount of dissolved ions in the water column and is considered an indicator for the relative amount of suspended material in the stream. The scientifically established standard for conductivity in a healthy Michigan stream is 800 microSiemens (μS), which should be the goal for the creeks and lacustrine areas in the Les Cheneaux watershed. Levels higher than the standard indicate the presence of stormwater runoff generated suspended materials or possible nutrient inputs from failing on-site septic system. The Les Cheneaux Project will employ local volunteers to measure conductivity in each creek as part of the monitoring schedule mentioned. Developed lake front areas (Map 9.1) will also be measured as part of a comprehensive monitoring campaign to assess possible OSS failure.

To determine sediment load, embeddedness of the substrate (how much of the stream bottom is covered with fine silts) and the bottom deposition (what percentage of the bottom is covered with soft muck, indicating deposition of fine silts) will be measured at the selected sites. These are measurements taken by the GLEAS protocol habitat assessment conducted by MDEQ every five years. Rating categories are from "poor" to "excellent." The target for this measurement is to maintain ratings consistent with quality systems and improve ratings where possible. The Les Cheneaux project will employ local volunteers to continue evaluating MDEQ established sites each year along with assessment of upstream and downstream areas where BMP's will be installed as part of the restoration of hydrology and elimination of erosion areas.

Stream flow, or discharge, for surface waters do not have a numerical standard set by the state. Using the health of the fish and macro invertebrate communities as the ultimate indicators of stream and river health is most useful in assessing appropriate flow. More recent peak flow data is needed to more accurately compare observed flow to the target flow. Each creek in the watershed will be fitted for a gauging station following USGS consultation, and results will be compared with data generated for similar creeks by USGS to assist in reviewing current discharges for the individual Les Cheneaux subwatersheds.

Numerical or fish community standards have not been set by the state. However, the Michigan Department of Environmental Quality has developed a system to estimate the health of the predicted fish communities through the GLEAS 51 (Great Lakes Environmental Assessment Section) sampling protocol. This method collects fish at various sites in the creek and based on whether or not certain expected fish species are present, as well as other habitat parameters, fish communities are assessed as poor, fair, good, or excellent. The target will be to maintain GLEAS 51 scores of "excellent" at sites where they are attained, "good" at sites where they are attained, improve "fair" sites to "good", and improve "poor" to "good" through the implementation of this plan. The GLEAS 51 protocol also identifies whether or not there are sensitive species present in the creek, which would indicate a healthy ecosystem. Certain species are especially useful for demonstrating improving conditions. These species tend to be sensitive to turbidity, prefer cleaner, cooler water. A goal of the Les Cheneaux watershed project is to restore, protect, and enhance threatened and endangered species, so the target is to continue to find these

species indigenous to the watershed and assume that stable or increasing numbers mean that habitat and water quality is maintained or improved. The project will employ LSSU *Aquatic Research Laboratory* students each summer to electroshock 300' creek sections upstream and downstream of sites being fitted with BMP improvements, once in 2007, prior to installations, and then each summer thereafter to monitor population assemblages and possible success of BMP's. One site possessing representative habitat will be selected for each creek not being fitted with BMP's to provide baseline population assemblages.

Similar to the assessment of fish communities, the state employs the GLEAS 51 protocol for assessing macro invertebrate communities on a five-year cycle in the State's watersheds. LCWC will utilize state sampling sites in the watershed and perform macro invertebrate assessments using the GLEAS 51 procedures each year along with physical habitat health assessment. The monitoring target for macro invertebrate communities will be to increase the number of sites to improve the existing database and attain GLEAS 51 scores of at least "fair" at sites that are determined "poor," and improve "fair" sites to "good," and maintain "good" and "excellent" conditions at the remaining sites.

A wetland review for the Les Cheneaux watershed will be conducted to determine a baseline acreage and number of wetlands remaining. An annual review of MDEQ wetland permit information and local records in order to track wetland fills, mitigations, restoration and protection to establish net loss or gain in wetlands in the watershed. The target for this parameter is to track the net acres of wetland in the Les Cheneaux watershed to determine action for further protection or restoration activities. An initial survey of wetlands using aerial photos, state maps, soil maps (NRCS Soil Survey), and MDEQ field staff consultation will be conducted by project volunteers to document base acreage of wetlands. Further evaluative survey will be conducted every year to assess wetland development and protection trends.

The state standard lists temperature standards only for point source discharges and mixing zones – not ambient water temperatures in surface water. Temperature studies will be conducted for the Les Cheneaux area in order to determine the average daily temperatures and whether increased temperatures are a problem for creek and lake health. Data loggers will be installed in each creek and at three sites in northern Lake Huron, one each in Hessel Bay and Cedarville Bay, to monitor areas with significant stormwater and other urban influences, and one in Mackinac Bay to monitor a relatively untouched area.

State standards do not exist for aesthetics or recreation potential. However, an area with high aesthetic qualities will add, in either a passive or active context, recreational opportunities for the public and a greater appreciation or awareness of the area's natural resources. Measuring aesthetics of an area is inherently a qualitative effort. However, progress toward attaining aesthetically pleasing places can be measured and evaluated effectively using a standard tool, such as a survey, at regular intervals in time. The visual field survey completed by Clark Township in 2000 will be followed by one including regular field investigations of specific sites in the watershed where aesthetics are of most concern, most likely along a stretch of a creek or shoreline. Measurements in the survey, dependent upon community and subwatershed priorities, will include assessing water clarity, ambient odors, vegetative diversity, wildlife use, streambank erosion, debris, evidence of public use, and other parameters that indicate positive or negative aesthetic qualities. Volunteers and/or community field staff will most likely be utilized for this effort.

Measuring and mapping areas with recreation potential should be a community and a watershed effort and should be done by or closely with local or county officials and staff. The first component of this effort will be a one-time recreational opportunities study of the watershed to determine where opportunities and access can be improved. The goal is to identify areas in the watershed, both along the riparian corridor and on the landscape that can provide passive recreation or active recreation. Within the watershed, these areas will be linked where possible to provide linear corridors that connect, or greenways, for both people (hiking, biking trails) and wildlife. This activity will begin with mapping existing areas (with help from Little Traverse Conservancy and Michigan Natural Features Inventory and their current land protection maps) dedicated to recreation or preservation, and then completing a watershed exploration to record information including: evidence of current public use, potential for public access, linkages to other natural areas (greenways potential), ownership of property, vegetation types (forested, wetland area, in

need of riparian cover, etc.), excessive woody debris, etc. This survey will include photographs of potential recreation areas which will assist the community and project partners in prioritizing new areas for preservation and recreation for the public, offering the public more opportunity for using and appreciating Les Cheneaux natural resources. Finally, these activities will lead to the identification of funding mechanisms for purchase of land and conservation easements, as well as any necessary infrastructure (construction of trails, boardwalks, canoe livery, etc.) that would support new or improved recreational opportunities. Details regarding responsible parties, monitoring standards, sampling sites, and frequency of monitoring for the qualitative and quantitative evaluation techniques will be defined in a MDEQ approved quality assurance project plan prior to monitoring activity. (MCSSAG 2003)