11.0 MEASURING PLAN PROGRESS & SUCCESS

It is essential to have a monitoring plan and evaluation component as part of any watershed plan to evaluate plan implementation progress and success over time. This watershed plan includes two monitoring/evaluation components:

1) The **"Water Quality Monitoring Plan"** includes methods and locations where monitoring should occur and a set of criteria (indicators & targets) used to determine whether impairment reduction targets and other watershed improvement objectives are being achieved over time.

2) **"Report Cards"** for each plan goal were developed that include interim, measurable milestones linked to evaluation criteria that can be evaluated by the planning committee over time.

11.1 Water Quality Monitoring Plan & Evaluation Criteria

Background Information

This subsection provides a monitoring plan that can be implemented to measure changes in watershed impairments related primarily to water quality. Water quality monitoring is performed by first collecting physical, chemical, biological, and/or social indicator data. This data is then compared to criteria (indicators & targets) related to established water quality objectives. Water in Pike River is currently monitored under WDNR, Racine Health Department, Carthage College, and Citizens Monitoring programs.

Known water quality data collected in the past 10 years is summarized in Section 6. According to WDNR's Draft 2012 303(d) list, Pike River, North Branch Pike River, and Waxdale Creek are all considered non-supporting for the Fish and Aquatic Life designated use. Pike River is non-supporting of the Fish and Aquatic Life designated use due to excessive amounts of phosphorus resulting in a degraded biological community. North Branch Pike River and Waxdale Creek both fail to support the Fish and Aquatic Life designated use due to an unknown pollutant and for sediment/total suspended solids resulting in chronic aquatic toxicity and degraded habitat.

The water quality monitoring plan is designed to; 1) capture snapshots of water quality within the Pike River and its tributaries through time; 2) assess changes in water quality following implementation of Management Measures, and 3) assess the public's social behavior related to water quality issues. It is crucial to collect representative water samples using careful handling procedures. Unrepresentative samples or samples contaminated during collection or handling are often useless. It is also critically important that all future monitoring be completed using the same protocol and methods used by WDNR. The EPA requires that WDNR submit a Quality Assurance Project Plan (QAPP) for all programs and projects receiving EPA funds. Additional guidance on QAPP requirements can be found in EPA's publication entitled *EPA Requirements for Quality Assurance Project Plans* (USEPA, March 2001).

Physical and chemical water quality criteria and indicators in streams are typically measured during base flow and again after a significant (≥ 1.5 inches) storm event. Monitoring water quality in streams usually includes monitoring for nutrients, suspended solids, water clarity, and dissolved oxygen to name a few. Water quality samples should be sent to certified labs to analyze for specific chemicals in the water samples. Physical parameters, such as temperature, and oxygen concentration, should be collected in the field using a portable data collection unit. It is also important to obtain

stream discharge calculations when monitoring pollutant loading in streams. These calculations are easily obtained by measuring the stream width, average depth, and flow rate at the monitoring location. In addition, biological (fish and macroinvertebrates) and habitat assessments can also be performed depending on the criteria being assessed.

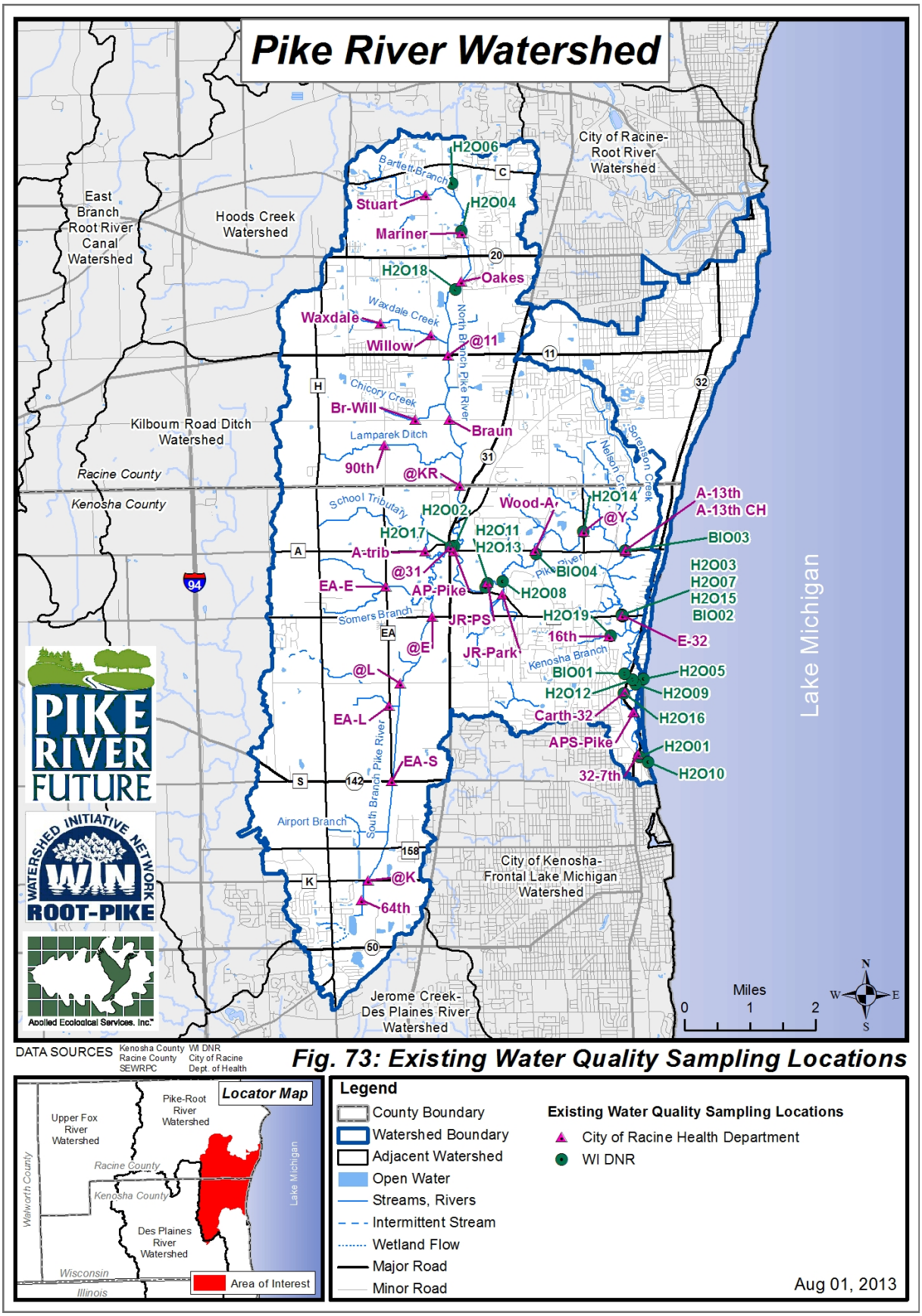
In the future, water quality sampling related to individual Management Measures should also be monitored if possible. Management Measure monitoring should include samples of water entering the measure and a second sample at the water leaving the measure such as a detention basin that has been retrofitted. It is best to complete Management Measure monitoring during or shortly after large rain events (≥ 1.5 inches) to obtain data on how well the practice works. Biological and habitat quality monitoring should also be part of any habitat improvement project, such as a stream restoration. Because funding for such monitoring is typically limited, money should be built into the initial Management Measure project budget.

Monitoring Plan Implementation

Procedures by which physical, chemical, and biological monitoring data should be collected in the watershed, existing and recommended monitoring locations, monitoring entity, and monitoring frequency are outlined in Table 46 and Figure 73. Note: monitoring locations related to Management Measures are not described as this monitoring will come later as projects are implemented.

Table 46. Existing and recommended water quality and biological monitoring locations.

Recommended or Existing Monitoring Entity	Sampling Location (See Figure 73)	Sampling Frequency	Parameters Tested
Existing Monitoring Programs			
WDNR	H2O2, H2O8, H2O9, H2O17, H2O19	Monthly	Physical, Chemical
WDNR	BIO1-4	Every 5-7years	Biological
Racine Health Department	See Figure 73	Weekly	Physical, Chemical, Microbial
Citizens Monitoring – Carthage College	H2O4-5, H2O10-11, H2O13-16, H2O18	Bi-monthly	Physical, Chemical
Additional Recommended Monitoring Programs			
Racine Health Department	See Figure 73	Weekly	Physical, Chemical, Microbial
RHD/Citizens Monitoring	See Figure 73	Bi-monthly	Physical, Chemical
USGS/Engineering Consultant	Wood-A	Ongoing	Bed load testing
WDNR	Wood-A	Ongoing	Stream cross section



DATA SOURCES Kenosha County, Racine County, SEWRPC, WI DNR, City of Racine Dept. of Health

Fig. 73: Existing Water Quality Sampling Locations

Legend

- County Boundary
- Watershed Boundary
- Adjacent Watershed
- Open Water
- Streams, Rivers
- Intermittent Stream
- Wetland Flow
- Major Road
- Minor Road

Existing Water Quality Sampling Locations

- City of Racine Health Department
- WI DNR

Aug 01, 2013

Physical and Chemical Monitoring Methods & Recommendations

Physical and chemical monitoring of water can be time consuming and expensive depending on the complexity of the sampling program. Usually the budget and/or personnel available for monitoring limit the amount of data that can be collected. Therefore, the monitoring program should be developed to maximize the usable data given the available funding and personnel. Any monitoring program should be flexible and subject to change to collect additional information or use newer equipment or technology when available.

Many different parameters can be included in physical monitoring of water quality in streams. Measurements of temperature, pH (typically not done in field by Carthage College or Racine Health Department), dissolved oxygen, turbidity should be collected in the field for any monitoring done on Pike River or tributaries using portable instruments. The measurements can then be recorded on data sheets in the field or the units can be taken back to the lab and the data downloaded.

Many different chemical components can be quantified in streams but it is recommended that testing only be completed for parameters outlined in Table 47. Unlike physical monitoring, chemical monitoring requires grab samples be collected and taken to certified labs for analysis. Future chemical monitoring in Pike River/tributaries should be done following significant rain events (≥ 1.5 inches) in order to capture storm event data that can be compared to baseline data and target pollutant values summarized in Section 6. This same monitoring technique can be used to determine pollutant removal efficiencies resulting from implementation of some Management Measures. It is also important to obtain stream discharge calculations at stream monitoring locations so that pollutant loads can be calculated if needed. Stream discharge is calculated by measuring the stream width, average depth, and flow rate (ft/sec) at the sample location.

In addition to continuing WDNR's existing physical, chemical, and biological monitoring programs, four stream monitoring programs are recommended for Pike River watershed (Table 47 and Figure 74). The first is the ongoing physical and chemical monitoring being conducted weekly by the Racine Health Department. This program is part of a two year study of water quality at 31 locations on the Pike River and its tributaries.

The second recommended monitoring effort should be a joint program implemented by Racine Health Department, Carthage College and Citizens Monitoring. This monitoring should be continued at a minimum of 13 of the original Racine Health Department monitoring sites, including Oakes, Waxdale, Willow, 90th, @KR, @31, JR-PS, @E, A-13th CH, 16th, Carth – 32, EA-S, and 32-7th. The joint monitoring effort should include collecting air temperature, water temperature, dissolved oxygen, pH, conductivity, turbidity, *E. coli*, phosphorus, nitrogen and chloride. Monitoring for these variables at these key locations will yield data over time that will indicate if pollutants in the watershed are being reduced to target levels, are staying the same, or increasing. The resulting data will help to determine the location of possible water quality issues.

Annual costs for weekly water quality monitoring of E. coli, water temp, pH, turbidity, conductivity, DO, TSS, phosphorus and nitrogen would amount to $60,000. Annual costs for monthly water quality monitoring of the same chemical components would be $30,000.

Presently, Carthage faculty and students determine chloride ion concentration in the watershed using Ion Selective Electrode analysis of chloride ions, EPA Method 9212. This method is accurate and precise but very time-consuming and their ability to contribute is dependent on student research

interests in surface water analysis. The City of Racine Health Department currently collects monthly surface water samples for nutrients (nitrates and phosphorous) but lacks the instrumentation to process them at their facility. Samples are sent to the Wisconsin State Laboratory of Hygiene at an approximate cost of $2000/year and delay of about 60 days between sample receipt and result generation.

The purchase of an Ion Chromatography system (approximately $50,000), to be shared between Carthage College and the City of Racine Health Department, would allow for more efficient and cost-effective analysis of chloride, nitrate and phosphorous in the Pike River Watershed, as well as provide a platform for expansion into other methods supportive of long-term water quality monitoring as outlined in the Pike River Watershed-Based Plan. This initiative will further support the Great Lakes Initiative Action Plan priority area with respect to the assessment and reduction of nutrient loading to the Great Lakes. This partnership will also create and/or enhance existing public-academic partnerships between the cities of, and industries or colleges/universities in the Kenosha/Racine area. Such relationships will foster continued monitoring of the water quality and serve to educate future generations in the importance of watershed restoration and civic engagement.

Continued physical and chemical monitoring of the Pike River Watershed over the next 25 plus years is paramount to the success of the plan. Only through continued monitoring and assessment will the effectiveness of restoration initiatives in improving watershed health.

Additional monitoring should include either bed load testing or a stream cross section in order to monitor ongoing sediment loading on the Pike River. Bed load testing should be completed by USGS and/or an engineering consultant firm to measure flow-related sediment levels; unfortunately, this testing can often be a cost-prohibitive and time consuming program. Alternately, stream cross sections can possibly be used to assess sediment loads, as developed by WDNR's technical services division.

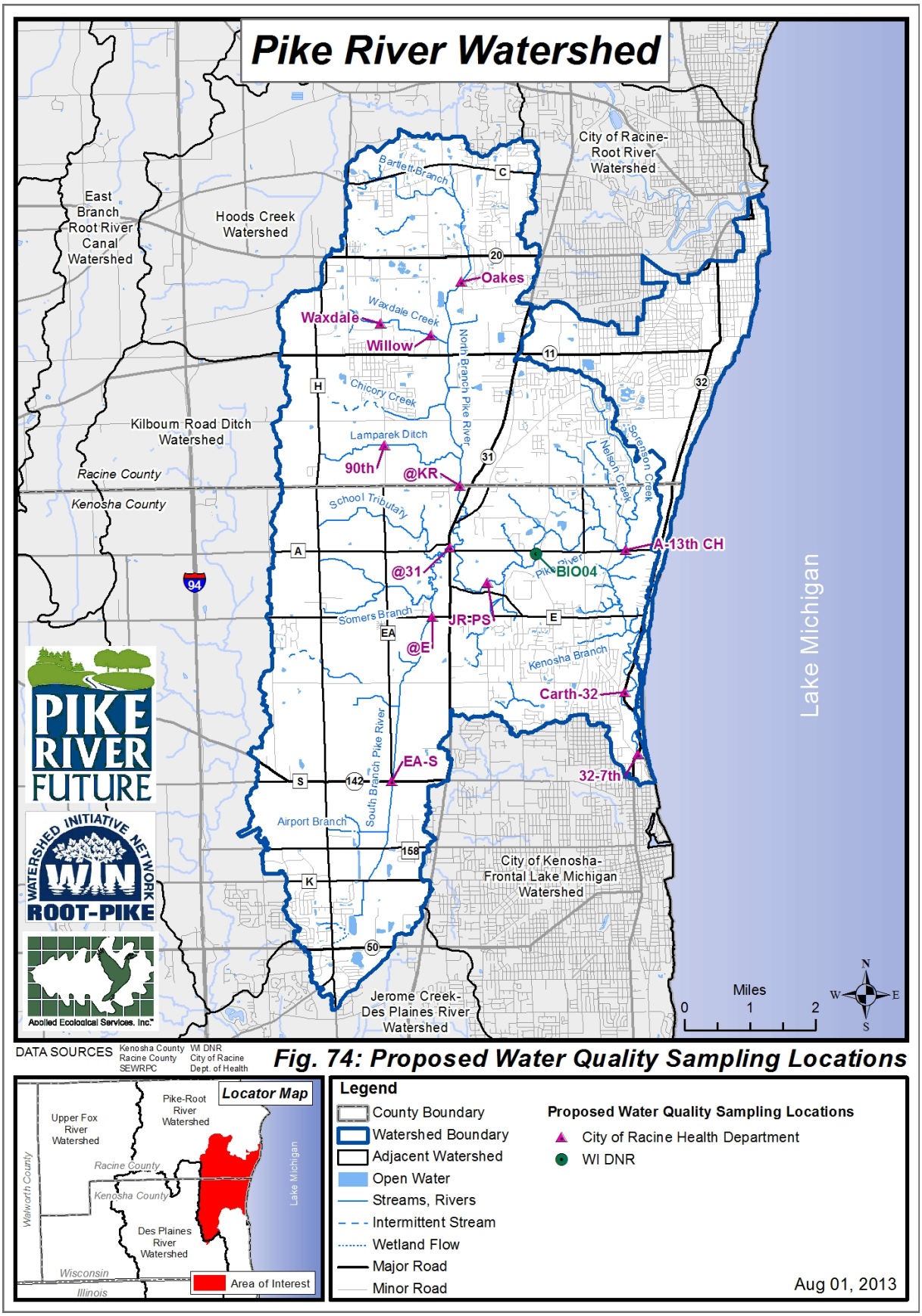


Fig. 74: Proposed Water Quality Sampling Locations

Table 47. Stream monitoring water quality parameters, collection, and handling procedures.

Parameter	Statistical, Numerical, or General Use Guideline	Container	Volume	Preservative	Max. Hold Time
Physical Parameters Measured in Field					
Dissolved Oxygen	>5.0 mg/l	These parameters are measured in the field			
Temperature	<90° F				
Chemical & Physical Parameters Analyzed in Lab					
Total Suspended Solids	<19 mg/l	Plastic or glass	32 oz	Cool 4 °C	7 days
Nitrate-Nitrite Nitrogen	<1.798 mg/l (optional sampling with Oakton ionchromoroghapher)	Plastic or glass	4 oz	Cool 4 °C 20% Sulfuric Acid	28 days
Total Phosphorus	<0.075 mg/l	Plastic or glass	4 oz	Cool 4 °C 20% Sulfuric Acid	28 days
Chloride	<230 mg/l	Plastic or glass	32 oz	Cool 4 °C	28 days
E. Coli	> 235 MPN is advisory > 1,000 MPN is beach closure	Plastic or glass	16 oz	Cool 4 °C	24 hours
pH	>6.0 or <9.0	Plastic or glass	16 oz	Cool 4 °C	immediately
Conductivity	<1,500 μmhos/cm	Plastic or glass	16 oz	Cool 4 °C	24 hours
Turbidity	<14 NTU	Plastic or glass	16 oz	Cool 4 °C	24 hours

Biological Monitoring Methods and Recommendations

Biological data can be used alone or in conjunction with physical-chemical data to make an impairment assessment on a waterbody in Wisconsin. A Fish Index of Biotic Integrity (Fish IBI) is one method of assessing biological health and water quality through several attributes of fish communities found in streams. The WDNR uses biological data to determine water quality condition of streams because fish and macroinvertebrates are relatively easy to sample/identify and reflect specific and predictable responses to human induced changes to the landscape, stream habitat, and water quality.

Two indices have been developed that measure water quality using fish (fish Index of Biotic Integrity (fIBI)) and macroinvertebrates (Macroinvertebrate Index of Biological Integrity (M-IBI)). These indices are best applied prior to a project such as a stream restoration to obtain baseline data and again following restoration to measure the success of the project. Or, they can be conducted to simply assess resource quality in a stream reach.

Fish Indices of Biotic Integrity (fIBI)
The fIBI is designed to assess water quality and biological health directly through several attributes of fish communities in streams. After the fish have been collected using electrofishing equipment and identified, the data is used to evaluate 12 metrics and a rating is assigned to each metric based on whether it deviates strongly from, somewhat from, or closely approximates the expected values found in a high quality reference stream reaches. The sum of these ratings gives a total IBI score for the site. The best possible IBI score is 100. The WDNR has determined that a score less than 30 indicates a stream is not fully supporting for *Warm Water Sport Fish*.

Macroinvertebrate Indices of Biological Integrity (M-IBI)
The M-IBI is designed to rate water quality using aquatic macroinvertebrate samples. An M-IBI score of 0-2.5 is considered grounds for 303(d) listing a stream.

Habitat Monitoring Methods and Recommendations
Stream habitat assessments comprise a major component of physical water quality monitoring. Many habitat assessment methods are available for assessing streams. WDNR most commonly uses the Qualitative Physical Habitat Evaluation of Wadeable Streams, also known as the Fish Habitat Rating (FHR) System, developed by the USDA and WDNR Bureau of Fisheries Management (WDNR, June 2002 and Simonson, 1994).

The FHR System is used to assess streams based on how they score within seven various types of stream qualities including riparian buffer widths, bank erosion, pool area, width to depth ratio, riffle to riffle or bend to bend ratio, fine sediments, and cover for fish. This assessment method offers a quick and comprehensive evaluation of stream health. An example of the evaluation is included in Figure 75. Qualitative ratings are based off of a range of scores from 0 to 100, with scores ranked as follows: Excellent ≥ 75; Good 50 to 74; Fair 25 to 49; Poor < 25.

The index can be used on any stream reach and on stream restoration projects to document improvements. Prior to stream restoration, a FHR System evaluation should be completed by the project ecologist or engineer. A follow-up evaluation for comparison purposes should be conducted by the same ecologist/engineer at least 2-4 years following project implementation after plant material grows and in-stream structures have had time to perform.

Figure 75. Example of the Fish Habitat Rating for Streams (Source: WDNR, 2007).

Wadable Stream Qualitative Fish Habitat Rating for Streams < 10 m wide

Form 3600-532A (R 6/07) Page 2 of 2

Rating Item	Excellent	Good	Fair	Poor	Score
Riparian Buffer Width (m) Width of contiguous undisturbed land uses; meadow, shrubs, woodland, wetland, exposed rock	Riparian zone well protected; buffer wide (> 10.0 m)	Riparian zone protected, but buffer width moderate (5.0 - 10.0 m)	Riparian zone moderately disturbed, buffer narrow (1.0 - 4.9 m)	Most of the riparian zone disturbed, buffer very narrow or absent (< 1.0 m)	
	15	10	5	0	
Bank Erosion Width of bare soil on bank, along transects	No significant bank erosion; < 0.20 m of bank is bare soil	Limited erosion; 0.20 - 0.50 m of bank is bare soil	Moderate erosion; 0.51 - 1.0 m of bank is bare soil	Extensive erosion; > 1.0 m of bank is bare soil	
	15	10	5	0	
Pool Area % of stream length in pools	Pools common; wide, deep, slow velocity habitat, balanced by other habitats; 40 to 60% of station	Pools present; not frequent or over-abundant; 30 to 39% or 61 to 70% of station	Pools present, but either rare or overly dominant, few other habitats present; 10 to 29% or 71 to 90% of station	Pools either absent or dominant, not balanced by other habitats; < 10% or > 90% of station	
	10	7	3	0	
Width:Depth Ratio Average stream width divided by average thalweg depth in runs and pools	Streams very deep and narrow; width/depth ≤ 7	Stream relatively deep and narrow; width/depth 8-15	Stream moderately deep and narrow; width/depth 16-25	Stream relatively wide and shallow; width/depth > 25	
	15	10	5	0	
Riffle:Riffle or Bend:Bend Ratio Average distance between riffles or bends divided by average stream width	Diverse habitats; meandering stream with deep bends and riffles common; ratio < 10	Diverse habitats; bends and riffles present, but not abundant; ratio 10 to 14	Habitat diversity low; occasional riffles or bends, ratio 15 to 25	Habitat monotonous; riffles or bends rare; generally continuous run habitat; ratio > 25	
	15	10	5	0	
Fine Sediments % of the substrate that is < 2 mm (sand, silt, or clay)	Fines rare or absent, < 10% of the stream bed	Fines present but limited, generally in stream margins or pools; 10 to 20% of stream bed	Fines common in mid-channel areas, present in riffles and extensive in pools; 21 to 60%	Fines extensive in all habitats; > 60% of stream bed covered	
	15	10	5	0	
Cover for Fish % of the stream area with cover	Cover/shelter for fish abundant; > 15% of stream	Cover common, but not extensive; 10 - 15% of stream	Occasional cover, limited to one or two areas; 5 - 9% of stream	Cover rare or absent; limited to < 5% of stream	
	15	10	5	0	
				Total Score	

Social Indicators of Water Quality

Quantifying social indicators of success in a watershed planning initiative is difficult. It is subjective to a large degree and complaints about poor conditions are often heard rather than compliments on improvements. The Great Lakes Regional Water Program (GLRWP), a leading organization that addresses water quality research, education, and outreach in Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin, defines social indicators as standards of comparison that describe the context, capacity, skills, knowledge, values, beliefs, and behaviors of individuals, households, organizations, and communities at various geographic scales. The GLRWP suggests that social indicators used in water quality management plans and outreach efforts are effective for several reasons including:

- Help watershed committee evaluate projects related to education and outreach;
- Help support improvement of water quality projects by identifying why certain groups install Management Measures while other groups do not;
- Measure changes that take place within grant and project timelines;
- Help watershed committee with information on policy, demographics, and other social factors that may impact water quality;
- Measure outcomes of water quality programs not currently examined.

GLRWP has developed a Social Indicators Data Management and Analysis Tool (SIDMA) to assist watershed stakeholders with consistent measures of social change by organizing, analyzing, and visualizing social indicators related to non-point source (NPS) management efforts. The SIDMA tool uses a seven step process to measure social indicators as shown in Figure 76. Detailed information about GLRWP's social indicator tool can be found at: http://35.8.121.111/si/Home.aspx

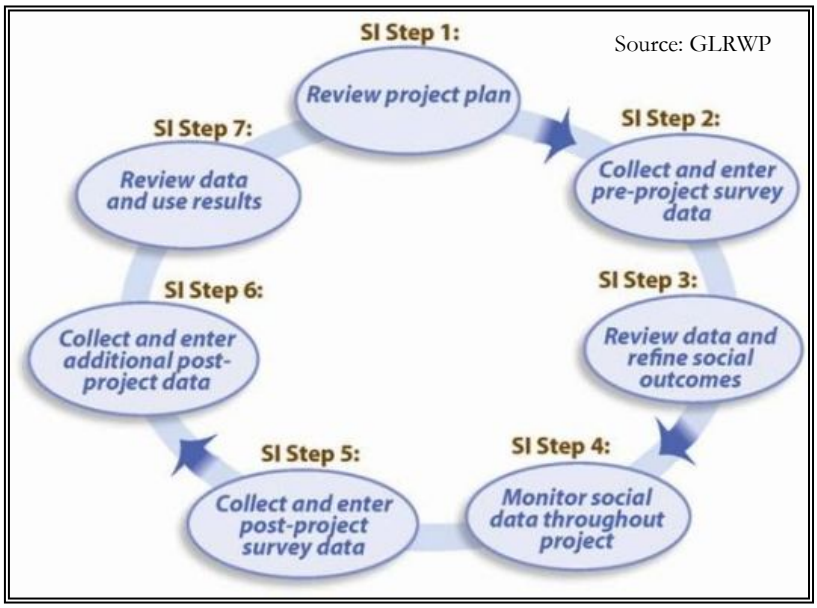


Figure 76. Steps to measure social indicators.

Several potential social indicators could be evaluated by the Pike River Education Public Outreach Committee (PREPOC) using different strategies to assess changes in water quality. For example, surveys, public meetings, and establishment of interest groups can give an indication of the public knowledge about the water quality in the watershed. It is important to involve the public in the water quality improvement process at an early stage through public meetings delineating the plans for improvement and how it is going to be monitored. Table 48 includes a list of potential social indicators and measures that can be used by the watershed committee to evaluate the social changes related to water quality issues.

Table 48. Social indicators and measures related to understanding behavior toward water quality issues.

Social Indicator	Measure
1) Media Coverage	• # of radio broadcasts related to water quality protection • # of newspaper articles related to water quality protection
2) Citizen Awareness	• # of informational flyers distributed per given time period • % of citizens who are able to identify where pollution is originating from • % change in volunteer participation to protect water quality • % change in attendance at water quality workshops • # of requests to create public use areas with interpretive signage • % of stakeholders who are aware of watershed management information
3) Watershed Management Activities	• # of stream miles cleaned up per year • # of linear feet or miles of trails created or maintained each year • # of municipalities adopting watershed management plan • # of watershed groups implementing plan recommendations

Monitoring social indicators in the watershed should be the responsibility of PREPOC. On-line internet surveys are among the most popular method to gauge social behavior toward water quality. Demographic information on a county basis can be obtained from the U.S Census Bureau but will need to be modified based on the watershed boundary. This information is then followed by taking a randomized sample of individuals in the watershed from a phone directory or other means. Next, a survey should be developed that identifies citizens' perceptions of water quality problems and protection strategies. Citizens that respond to the survey should be given a chance to donate a small amount of money ($1 for example) to a not for profit environmental group then sent thank you letters while those that did not respond should be sent a second survey. The results of the survey can be used to develop appropriate media, citizen awareness, and watershed management activities to improve social behavior.

Water Quality Evaluation Criteria

Water quality criteria (expressed as measurable indicators & targets) need to be developed so that water quality objectives can be evaluated over time. The criteria are designed to be compared against data gathered from the Water Quality Monitoring Plan as well as other data and analyzed to determine the success of the watershed plan in terms of protecting and improving water quality. These criteria also support an adaptive management approach by providing ways to reevaluate the implementation process if adequate progress is not being made toward achieving water quality objectives.

Section 1 of this plan includes a water quality goal (Goal B) with eight objectives. Criteria are selected for each water quality objective to determine whether components of the water quality goal are being met (Table 49). Criteria are based on WDNR water quality criteria, data analysis, reference conditions, literature values, and/or expert examination. Criteria are also designed to address potential or known sources of water quality impairment identified in Section 7.2. Future evaluation of the criteria will allow PREPOC to gage plan implementation success or determine if there is a need for adaptive management. Note: evaluation criteria are included for the water quality goal only; criteria for other plan goals are examined within the appropriate progress evaluation "Report Cards" in Section 11.2.

Table 49. Set of criteria related to water quality objectives.

GOAL B: Improve surface water quality and groundwater resources to achieve DNR/EPA water quality standards.	
Water Quality Objective	**Criteria: Indicators and Targets**
1) Identify, implement, and monitor Management Measures (Best Management Practices (BMP's)) that address "Critical" and other high priority pollutant loading areas.	• *# of Restored Stream & Riparian Areas:* Implement at least 7 "Critical Area" or high priority stream channel & riparian area restoration projects within 10 years. • *# of Ravine and Brownfield Restoration Projects:* Implement at least 1 short term ravine restoration project and 2 short term brownfield restoration projects within 10 years. • *# of Detention, Pond, Wetland Retrofits*: Implement at least 4 "Critical Area" or high priority detention, pond, or wetland retrofits within 10 years. • *# of Wetland Restorations:* Implement 18 "Critical Area" wetland restoration projects within 25 years. • *Chemical & Physical Water Quality Standards:* Water in streams meets "Fish & Aquatic Life" statistical guidelines (Table 25). • *Biotic Indexes:* Biological communities achieve at least "Fair" resource quality (Table 26) • *Social Indicator:* 75% of surveyed citizens are able to identify where water pollution originates and the methods to protect water quality.
2) Retrofit existing stormwater management systems and design new systems within developed areas to specifically improve water quality and create wildlife habitat.	• *# of Detention, Pond, Wetland, Retrofits*: Implement at least 4 "Critical Area" or high priority detention, pond, or wetland retrofits within 10 years. • *New Stormwater Design:* 100% of all new systems properly implement best management practices.
3) Retrofit stormwater systems in intensely developed areas, specifically those in the Direct Drainage area.	• *# of Stormwater Retrofits*: Implement at least 2 city blocks to green streets projects within 15 years, including reduced pavement, adjacent swales and increased green space between the sidewalk and the street.
4) Protect and restore the river corridor by reducing blockages, stream bank erosion, and impacts to stormwater systems.	• *# of Streambank and Channel Restorations*: Implement at least 7 "Critical Area" or high priority stream channel & riparian area restoration projects within 10 years. • *# of Priority Green Infrastructure Protection Areas Protected:* Implement at least 3 "Critical Area or high priority green infrastructure protection areas in the next 10 years.
5) Encourage use of alternatives to road salt and best application practices of deicers.	• *Chloride (salt):* Less than 230 mg/l in stream samples through winter and spring months. • *% of Communities using Alternatives:* 50% of local communities and campuses utilizing best management practices for deicing roadways within 15 years. • *Social Indicator:* 50% of surveyed citizens are able to identify road salt as a pollutant.
6) Maintain setbacks and buffers in stream, tributaries and wetlands. Decrease invasive species in these zones.	• *Setbacks/Open Space:* Use Green Infrastructure Plan in conjunction with identified "Priority Protection Areas" to implement 100% of recommendations as development occurs. • *% of Ag Land at headwaters:* 25% of agricultural land identified as "Critical" or high priority to install agricultural filter strips and utilize no-till soil conservation practices in the next 25 years. • *# of Riparian Area Restorations:* Implement at least 4 "Critical Area or high priority riparian area restorations in the next 10 years.
7) Identify opportunities for drain tile modification to improve water quality.	• *Drain tile survey:* Conduct study to determine the location of existing drain tiles within the watershed.
8) Continue water quality monitoring programs, specifically including Nitrogen, Phosphorus and Total Suspended Solids.	• *Monitoring Program:* Racine and Carthage College establish plan to continue water quality monitoring program for the next 10 years. • *Monitoring Program:* WDNR to continue fish monitoring yearly.

11.2 Goal Milestones/Implementation & Progress Evaluation "Report Cards"

Milestones are essential when determining if Management Measures are being implemented and how effective they are at achieving plan goals over given time periods. Tracking milestones allows for periodic plan updates and changes that can be made if milestones are not being met.

Watersheds are complex systems with varying degrees of interaction and interconnection between physical, chemical, biological, hydrological, habitat, and social characteristics. Criteria that reflect these characteristics may be used as a measure of watershed health. Goals and objectives in the watershed plan determine which criteria should be monitored to evaluate the success of the watershed plan.

A successful watershed plan involves volunteer stakeholder participation to get projects completed, and must include a feedback mechanism to measure progress toward meeting goals. Watershed "Report Cards", developed specifically for the each goal in this plan, provide this information. Each Report Card provides:

1) Summaries of current conditions for each goal to set the stage for what efforts are needed
2) Most important performance criteria related to goal objectives (see Section 1.5)
3) Milestones to be met for various time frames
4) Monitoring needs and efforts required to evaluate milestones
5) Remedial actions to take if milestones are not met
6) Notes section

Report Cards were developed for each of the six plan goals and are located at the end of this section. The milestones are based on the implementation schedule with short term (1-10 years (2014-2024)), medium term (10-25 years (2024-2039)), and long term (25+ years (2039+) objectives. Grades for each milestone term should be calculated using the following scale: 80%-100% of milestones met = A; 60%-79% of milestones met = B; 40%-59% of milestones met = C; and < 40% of milestones met = failed.

Report Cards should be used to identify and track plan implementation to ensure that progress is being made towards achieving the plan goals and to make corrections as necessary. Lack of progress could be demonstrated in factors such as monitoring that shows no improvement, new environmental problems, lack of technical assistance, or lack of funds. In these cases the Report Card user should explain why other factors resulted in milestones not being met in the notes section of the Report Card.

Early on in the plan implementation process Pike River Education Public Outreach Committee (PREPOC) should assign or hire a Watershed Implementation Coordinator to update the committee on plan implementation progress by way of the Report Cards. If needed, adaptive management should be implemented accordingly by referencing the adaptive management recommendations on the each Report Card then developing a strategy to either change the milestone(s) or decide how to implement projects or actions to achieve the milestone(s).

Goal A Report Card

Foster engagement and provide opportunities for stewardship of our watershed.

Current Condition:

- The Root-Pike Watershed Initiative Network is currently spearheading and promoting the Watershed-Based Plan. Cities of Kenosha and Racine, Town of Somers, Villages of Mount Pleasant and Sturtevant are the other partners involved.
- The watershed partners: Cities of Kenosha and Racine, Town of Somers, Villages of Mount Pleasant and Sturtevant currently promote engagement and stewardship of the watershed through many education and volunteer campaigns.
- Education will be ongoing and involve constant and continuous campaigns to reach as many target audiences as possible.

Criteria to Meet Goal Objectives:

- Pike River Education Public Outreach Committee (PREPOC) meeting regularly to lead ongoing plan implementation.
- Number of ways taken to inform the general public that a watershed plan has been developed.
- Number of people that attend campaigns aimed at land management links to watershed impacts, benefits of ecological restoration, and benefits of managing green infrastructure.
- Number of elected officials that attend watershed tours.
- Number of people attending volunteer days in the watershed.
- Number of environmental interpretation signs posted throughout the watershed.
- Number of demonstration projects implemented.
- Number of people attending public education seminars regarding fertilizer and pesticide use.
- Number of people attending public education seminars regarding alternatives to road and other pavement salt use.

Goal Milestones:	**Grade**
1-10 Yrs: 1) Watershed partners inform public about the watershed plan via media and watershed activity campaigns. 2) At least one elected official representing each watershed partner attending all PREPOC meetings. 3) At least two demonstration projects are implemented.	
10-25 Yrs: 1) ≥20 people attend each land management, ecological restoration, and green infrastructure campaign. 2) ≥30 people attend each fertilizer, pesticide and road salt education campaign. 3) 75% of surveyed citizens able to identify where water pollution originates and methods to protect water quality. 3) At least two elected officials representing each watershed partner attend a watershed tour. 4) ≥50 people attend each volunteer day event. 5) ≥5 school level watershed education campaigns are supported by watershed partners. 6) At least four demonstration projects are implemented.	
25+ Yrs: 1) ≥20 people attend each land management, ecological restoration, and green infrastructure campaign. 2) ≥50 people attend each volunteer day event. 3) ≥5 school level watershed education campaigns are supported by watershed partners. 4) At least four demonstration projects are implemented.	

Monitoring Needs/Efforts:

- Track number of ways taken to inform general public that a watershed plan has been developed.
- Track number of people attending land management, ecological restoration, and green infrastructure campaigns.
- Track number of people that attend education campaigns related to management of fertilizer, pesticide, and road salt use.
- Conduct and track survey of citizens on watershed issues.
- Track number of elected officials that attend each PREPOC meeting.
- Track number of school level education projects supported.
- Track number of demonstration projects implemented.

Remedial Actions:

- PREPOC consider hiring a Watershed Implementation Coordinator to organize education programs.
- Actively pursue target audiences if attendance at education campaigns is low.
- Put out requests for volunteers to spearhead watershed education campaigns.
- Contact elected officials with a personal invite to attend watershed tours.
- Provide access and signage for all watershed improvement projects to promote them as demonstrations.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal B Report Card

Improve surface water quality and groundwater resources to achieve WDNR/EPA water quality standards.

Current Conditions:

- Water quality in Pike River is generally poor based on collected data. Total nitrogen, total phosphorus, and total suspended solids exceed recommended standards; agricultural land use is a primary cause.
- The main stem of the Pike River from the mouth at Lake Michigan to the junction of Pike River and South Branch Pike River is proposed to be newly 303(d) listed because of excessive amounts of phosphorus resulting in a degraded biological community.
- North Branch Pike River from the junction of South Branch Pike River to the headwaters of Pike River is 303(d) listed for an unknown pollutant and for sediment/total suspended solids resulting in chronic aquatic toxicity and degraded habitat.
- Waxdale Creek 303(d) listed for an unknown pollutant that has since been removed as well as sediment/total suspended solids resulting in chronic aquatic toxicity and degraded habitat.

Criteria to Meet Goal Objectives:

- See Criteria in Table 49

Goal Milestones:	**Grade**
1-10 Yrs: 1) Three short term streambank restoration projects completed. 2) One short term ravine restoration and two short term brownfield restorations completed. 3) Four short term detention, pond, wetland retrofits completed. 4) Four short term riparian areas/ag swale restoration projects completed. 5) The municipalities in the watershed implement recommended water quality monitoring plan. 6) 100% of all new stormwater systems properly implement best management practices.	
10-25 Yrs: 1) Five medium term streambank restoration projects implemented. 2) Three medium term ravine restorations and two medium term brownfield restorations completed. 3) Thirteen medium term detention, pond, wetland retrofits completed. 4) Nine medium term riparian areas/ag swale restoration projects completed. 5) "Critical Area" wetlands are restored on all parcels where new development occurs. 6) 25% of "Critical" or "High Priority" agricultural land utilizes filter strips and no-till farming practices. 7) Deicing best management practices or alternatives to road salt are used by all municipalities.	
25+ Yrs*:* 1) Five long term streambank restoration projects completed. 2) One long term ravine restoration completed. 3) Four long term detention, pond, wetland retrofits completed. 4) Two long term riparian areas/ag swale restoration projects completed. 5) "Critical Area" wetlands are restored on all parcels where new development occurs. 6) Alternatives to road salt are used by all municipalities and DOTs. 7) 75%+ of "Critical" or "High Priority" agricultural land utilizes filter strips and no-till farming practices. 8) Water quality monitoring indicates Pike River meets "Fish & Aquatic Life" statistical guidelines. 9) Biological communities achieve at least "Fair" resource quality (fIBI>29).	

Monitoring Needs/Efforts:

- Chemical monitoring will need to continue indefinitely to track changes in water quality.
- Track # of streambank, ravine, brownfield, riparian area, wetland, agricultural land management, and detention retrofit projects implemented.
- Track # of municipalities that have adopted best management practices for road salts/deicers.

Remedial Actions:

- Assess number of projects and actions that have been implemented versus water quality changes to determine if projects are effectively removing pollutants.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal C Report Card

Identify, enhance and protect important natural areas and provide open space for appropriate recreational benefits.

Historic and Current Condition:

- The historic landscape was a mix of prairie, southern oak forest, southern mesic forest, oak openings, and marshland prior to European settlement in the 1830s and '40s.
- In 2010, agriculture comprises the most acreage in the watershed (14,175 acres; 38.5%) followed by single-family residential (6,686 acres; 18.1%), and open space (4,140.9 acres; 11.2%).
- Only 1,484.3 acres of wetland remain (21.3% of the 6,965 acres of pre-settlement wetlands).
- The largest loss of a land use/land cover is predicted to occur on agricultural land (-10,721.3 acres; -29.1%) by 2035.
- Several Ecologically Significant Areas remain: Sanders Park Hardwoods, Petrifying Springs, Hawthorn Hollow, and Campbell's Hardwoods.

Criteria to Meet Goal Objectives:

- # of communities incorporating Green Infrastructure Plan into Comprehensive Plans and development review maps.
- # of new developments on "Priority Green Infrastructure Protection Areas" that incorporate Conservation Design.
- % of protected green infrastructure parcels harboring "Ecologically Significant Areas" or T&E species.
- % of public natural area Green Infrastructure Network parcels with management plans that are implemented.
- # of new water and land based recreational opportunities.

Goal Milestones:	**Grade**
1-10 Yrs: 1) The Green Infrastructure Plan is incorporated into all municipal Comp Plans and development reviews. 2) All "Priority Green Infrastructure Protection Area" recommendations are followed. 3) Management plans are developed for all of public natural area Green Infrastructure Network parcels. 4) At least two new water or land based recreational opportunities provided in the watershed.	
10-25 Yrs: 1) At least 50% of sites with Ecologically Significant Areas or T&E species are protected. 2) All "Priority Green Infrastructure Protection Areas" recommendations are followed. 3) All management plans developed for public natural area Green Infrastructure Network parcels are implemented. 4) At least four new water or land based recreational opportunities provided in the watershed.	
25+ Yrs: 1) At least 75% of sites with Ecologically Significant Areas or T&E species are protected. 2) All "Priority Green Infrastructure Protection Area" recommendations are followed. 3) All management plans developed for public natural area Green Infrastructure Network parcels are updated and implemented. 4) At least six new water or land based recreational opportunities provided in the watershed.	

Monitoring Needs/Efforts:

- Track number of communities that incorporate Green Infrastructure Plan into Comp Plans and development reviews.
- Track new developments on "Priority Green Infrastructure Protection Areas" that incorporate Conservation Design.
- Track number of protected parcels with "Ecologically Significant Areas" or T&E species.
- Track number of green infrastructure natural areas with management plans and those where implementation has occurred.
- Track number of new water and land based recreational opportunities provided within the watershed.

Remedial Actions:

- Find out why a community does not include the Green Infrastructure Plan in Comp Plans and development reviews.
- Reassess municipal budgets for green infrastructure protection efforts and adjust if necessary.
- Check permitting process to ensure "Priority Green Infrastructure Protection Area" recommendations are considered.
- Determine whether appropriate recreational opportunities have been considered on all new Green Infrastructure Protection Area acquisitions.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal D Report Card

Reduce existing structural flood damage and ameliorate potential flooding where flooding threatens structures and infrastructure.

Current Condition:

- Seven documented Flood Problem Areas (FPAs) were identified in the Pike River watershed. See Section 5.6, Table 21 and Figure 51.
- Ongoing Pike River Restoration Project continues along the North Branch.

Criteria to Meet Goal Objectives:

- Number of stream restoration projects that reconnect the stream channel to the adjacent floodplain.
- % of new and redevelopment that incorporates impervious reduction stormwater measures.
- # of identified FPAs that are mitigated for.

Goal Milestones:	**Grade**
1-10 Yrs: 1) Stream reaches PC03, PC04 and PR16 are evaluated for potential to reconnect hydrologically to adjacent floodplain. 2) At least 1 FPA has been mitigated for flooding.	
10-25 Yrs: 1) All "Priority Green Infrastructure Protection Areas" are developed using Conservation Design. 2) At least 3 FPA have been mitigated for flooding. 3) At least one stream reach is modified to help the hydrologic connection to the adjacent floodplain.	
25+ Yrs: 1) All "Priority Green Infrastructure Protection Areas" are developed using Conservation Design. 2) All FPA's have been mitigated for flooding. 3) At least one stream reach is modified to help the hydrologic connection to the adjacent floodplain.	

Monitoring Needs/Efforts:

- Track number of stream projects that include floodplain reconnection.
- Track number of new developments and redevelopments that incorporate impervious reduction stormwater measures.
- Track number of mitigated Flood Problem Areas

Remedial Actions:

- Reassess municipal budgets for green infrastructure protection efforts.
- Conduct follow-up visits to Flood Problem Area sites during flood events to determine if additional remedial work is needed.
- Conduct inventory of new developments and redevelopments to determine feasibility for potential flood reduction retrofits.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal E Report Card

Improve aquatic and terrestrial habitat to encourage diverse, resilient ecosystems.

Current Condition:

- The historic landscape was a mix of prairie, southern oak forest, southern mesic forest, oak openings, and marshland prior to European settlement in the 1830s and '40s.
- Following European settlement, fires rarely occurred, woodland was cleared, prairies were tilled for farmland or developed, wetlands were drained, and many streams were channelized.
- Several Ecologically Significant Areas remain: Sanders Park Hardwoods, Petrifying Springs, Hawthorn Hollow, and Campbell's Hardwoods.
- Over 80% of stream length is moderately to high channelized; 59% of stream length is moderately to highly eroded.
- 166,923 linear feet (50%) of riparian corridor along stream lengths is in poor condition.
- 238 total detention basins (197 of which were inventoried): one hundred twenty (120) wet bottom, 16 wetland bottom, and 8 dry bottom turf grass basins as well as 48 ponds, 4 wetland/marsh areas, and 1 agricultural swale site were assessed.

Criteria to Meet Goal Objectives:

- Percentage of natural area Green Infrastructure Network parcels with management plans that are implemented.
- Acres of riparian habitat managed, restored, or enhanced.
- Linear feet and/or number of stream reaches where habitat is enhanced.
- Percentage of detention basins that are actively managed.
- Number of "Critical Area" and "High Priority" detention basins retrofitted with native vegetation.

Goal Milestones:	**Grade**
1-10 Yrs: 1) Management plans are developed for all of public natural area Green Infrastructure Network parcels. 2) At least 4 "Critical" riparian areas have been managed, restored, or enhanced. 3) At least 3 "Critical" stream reaches where habitat was enhanced. 3) At least 3 "Critical" or "High Priority" detention basins are retrofitted with native vegetation.	
10-25 Yrs: 1) All management plans for public natural area Green Infrastructure Network parcels are implemented. 2) At least 9 additional "Critical" riparian areas have been managed, restored, or enhanced. 3) At least 4 additional "Critical Area" or "High Priority" stream reaches where habitat is enhanced. 4) At least 13 additional "Critical" or "High Priority" detention basins are retrofitted with native vegetation.	
25+ Yrs: 1) All management plans for public natural area Green Infrastructure Network parcels are updated and implemented. 2) At least 2 additional "Critical" riparian areas have been managed, restored, or enhanced. 3) At least 3 additional "Critical Area" or "High Priority" stream reaches where habitat is enhanced. 4) At least 4 additional "Critical" or "High Priority" detention basins are retrofitted with native vegetation.	

Monitoring Needs/Efforts:

- Public entities track % and acres of natural green infrastructure areas where management plans have been developed and implemented.
- Track linear feet of stream where riparian areas have been managed, restored or enhanced.
- Track total linear feet of stream or number of stream reaches where habitat is enhanced.
- Track number of "Critical Area" and "High Priority" detention basins retrofitted with native vegetation.

Remedial Actions:

- Public entities prepare annual budgets for restoring habitat.
- Assist detention basin owners with selecting ecological management companies and potential funding sources.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal F Report Card

Increase communication and coordination among municipal decision-makers, business and agricultural communities and other stakeholders in the watershed.

Current Condition:

- A limited number of watershed stakeholders are currently pursuing grant funds to implement watershed improvement projects. Root-Pike WIN is the leading entity pursing grant money and implementing watershed improvement projects.
- A number of practices and projects will require multi-jurisdictional and public-private participation/cooperation.
- Municipal decision-makers have not always worked collectively in the past to develop productive multijurisdictional partnerships related to funding, grant proposals, cost sharing ideas, and greenway/open space protection.

Criteria to Meet Goal Objectives:

- Number of municipalities in the watershed that adopt the Pike River Watershed-Based Plan.
- Number of municipalities, businesses, farmers, and stakeholders that participate in the Pike River Education Public Outreach Committee (PREPOC).
- Number of municipalities that adopt municipal comprehensive plans, codes, and ordinances supportive of watershed plan goals and objectives.
- Number of planning, funding, and implementation mechanisms implemented by multi-jurisdictional and/or public-private partnerships to provide stream channel maintenance across multiple jurisdictions.

Goal Milestones:	**Grade**
1-10 Yrs: 1) All municipalities and other governing bodies in watershed adopt the Pike River Watershed-Based Plan and implement plans, codes, and projects that support watershed plan goals and objectives. 2) Representatives from all municipalities, local businesses, the agricultural community, and other select stakeholders attend regular meetings of the Pike River Education Public Outreach Committee (PREPOC). 3) At least 3 multi-jurisdictional and/or public-private stream channel maintenance projects are implemented. 4) At least 2 leaders from the business community attend PREPOC meetings regularly. 5) At least 2 leaders from the agricultural community attend PREPOC meetings regularly.	
10-25 Yrs: 1) All municipalities and other governing bodies in watershed adopt the Pike River Watershed-Based Plan and implement plans, codes, and projects that support watershed plan goals and objectives. 2) Representatives from all municipalities and other select stakeholders attend regular meetings of PREPOC. 3) At least 3 multi-jurisdictional and/or public-private stream channel maintenance projects are implemented. 4) At least 3 leaders from the business community attend PREPOC meetings regularly. 5) At least 5 leaders from the agricultural community attend PREPOC meetings regularly.	
25+ Yrs: 1) All municipalities and other governing bodies in watershed adopt the Pike River Watershed-Based Plan and implement plans, codes, and projects that support watershed plan goals and objectives. 2) Representatives from all municipalities and other select stakeholders attend regular meetings of PREPOC. 3) All jurisdictions work together on stream channel maintenance projects. 4) At least 3 leaders from the business community attend PREPOC meetings regularly. 5) At least 5 leaders from the agricultural community attend PREPOC meetings regularly.	

Monitoring Needs/Efforts:

- Track number of municipal and other governing bodies that adopt the Pike River Watershed-Based Plan and implement recommendations.
- Track number of multijurisdictional and/or public-private projects implemented during each milestone time period.
- Track number of leaders from business and agricultural community attend PREPOC meetings regularly.

Remedial Actions:

- PREPOC encourage government officials among jurisdictions to adopt the watershed plan if it is not adopted in years 1-10.
- PREPOC meet with government officials regarding high priority stream maintenance and other projects among jurisdictions that have not been implemented.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

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