CHAPTER FOUR
Strategies

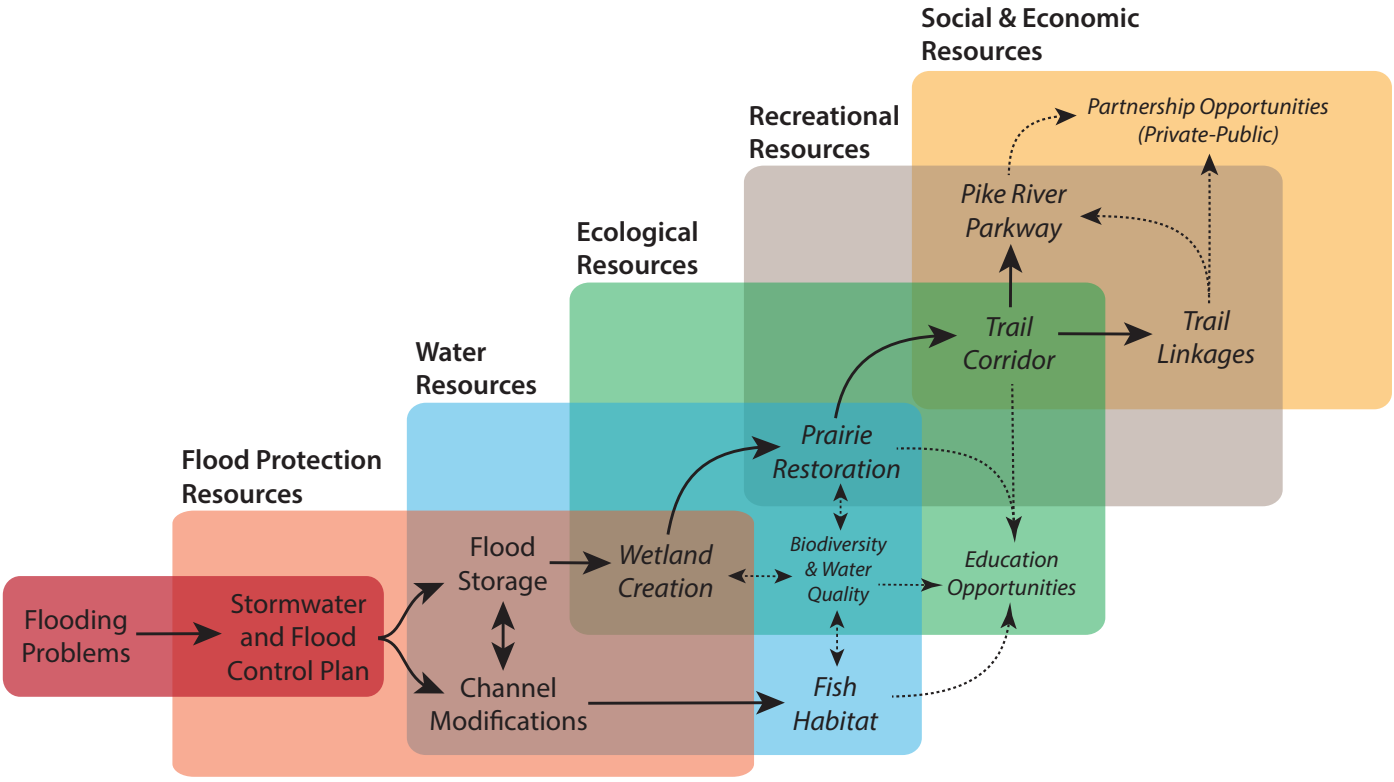
Maintenance Plan and Recommendations

This Chapter of the report identifies issues, concerns, or opportunities that arose during the previous two phases, justification or support information from the previous phases, and outlines all strategies.

INTRODUCTION

The Pike River Corridor has emerged and evolved to become a multi-faceted community asset. The process of developing the initial plan, motivated by the need mitigate the increasing frequency and intensity of flooding, produced a vision for the river that has produced a series of interdependent benefits for water, ecological, recreational and socio-economic resources. The strategy for maintaining the existing investments in infrastructure while also supporting the development of new opportunities for community engagement with the corridor must pay attention to both threats and opportunities across the layers of interdependent and interconnected resources. Maintaining engineered stormwater infrastructure can help reduce flooding. However, the full spectrum of resources can only be sustained with active community private-public partnerships. Building and investing in the social capital and partnerships will be central to the long-term vitality of the Pike River Corridor.

Interconnected Resources and Ecosystem Benefits in the Pike River Corridor



Interconnected Resources and Ecosystem Benefits in the Pike River Corridor

Flood Control and Stormwater Infrastructure

The vision of the Pike River flood control and stormwater infrastructure monitoring and management component is to establish a program of routine monitoring and maintenance to assure that the flood control and stormwater system in the Village operates as designed, that native communities that provide significant wildlife habitat in the Pike River corridor are protected from erosion and sedimentation, and water quality is protected.

GOALS AND VISION

The goals of the Pike River flood control and stormwater infrastructure monitoring and management are to:

- Protect property and public infrastructure from damage of floodwater.
- Protect components of the Village's drainage system to prevent local flooding and assure that engineered facilities such as storm sewers, detention basins and green infrastructure operate as designed.
- Protect the Pike River from sedimentation and erosion due to discharges of excessive volumes of sediment and high runoff velocities from the watershed.
- Identify routine maintenance needs to prevent drainage system failures and reduce the frequency of major system repairs and replacements.

FLOOD CONTROL AND STORMWATER INFRASTRUCTURE

A detailed recommended monitoring and maintenance plan for the next five years for the flood control and stormwater infrastructure is outlined in Chapter 5. The Chapter lists stormwater structures requiring immediate attention including the structure ID, location of the structure by flood control phase, the structure type/ function, its size, material, field observations and maintenance recommendations by year (see Storm Structure Summary Table).

Additional notes to keep in mind when taking action on maintenance items are as follows:

1. ALL structures even if not listed in the Chapter 5 should be monitored every five years and maintained, if needed. An inspection form along with a complete list of structures is found in the Appendix.
2. A photograph log of ALL structures (Phases 1-6, and

Phase 8) is found in the Appendix for future reference.

3. Once Phases 7-9 are built, the Village will need to add these structures to their Maintenance Plan particularly five years post construction when issues are more likely to develop. In 2020 all structures from Phase 1-9 will require a monitoring inventory.
4. Woody debris should be removed and bundled for use in stream management in accordance with Chapter 5. Also, when clearing woody vegetation from around and in front of end sections, it is important that the root system is not removed to avoid causing erosion potential. It is the root system that is holding the ground and/or channel banks in place. Re-sprouting is also undesirable, so herbicide should be applied to the exposed surfaces of the woody vegetation.
5. In order to expedite future observation and maintenance activities, it would be helpful to permanently mark the locations of the channel outfall structures, whether by metal stakes, flagging, or paint markings (e.g. on the bike trail pavement).
6. Although many of the trash racks that were shown on the as-built plans are either missing or were not installed during construction, this did not appear to negatively impact the function of the structures. For example, there were no signs of rodent or other animal nests causing blockage. Therefore, we do not recommend installing trash racks unless future monitoring by the Village reveals problems that were not there during the time of this field assessment.
7. Place grouted riprap in the undermined areas of channel outfalls to stabilize the end sections.
8. Add Structure 52 to the Village's illicit discharge detection elimination program.

Prairie and Wetland Resources

One of the goals of the Pike River prairie and wetland restoration areas is to maintain resilient native species to buffer the river, improve water quality and provide wildlife habitat. And, we have found on the Pike that if you build it, the wildlife will show up!

PRAIRIE AND WETLAND RESOURCES

Goals and Vision

The goals of the Pike River Prairie and Wetland Restoration are to:

- Establish native plant species and habitat immediately after construction to stabilize soil and slopes.
- Maintain resilient native species that will buffer the river and improve water quality and habitat diversity long term.
- Provide vegetative cover to the stream to aid in cooling and filtering water and improving fish and aquatic habitat.

The vision of the Pike River and the restored wetlands and prairies is to establish resilient native communities that provide significant wildlife habitat, water quality and riverine habitat. These aesthetically pleasing green spaces offer significant recreational values to residents and the surrounding community as well.

Prairie and Wetland Vegetation Monitoring

Pike River Vegetation and Habitat monitoring shall be conducted yearly to inform this adaptive management plan. The following monitoring method formalizes and builds on our current practices since 2002. Several worksheets are provided in the Appendix to aid in data collection. The goal of this plan is to utilize the same personnel who are applying herbicide or doing other management tasks concurrent with the monitoring. At the end of each management day, the last task is to fill out maps, or save GPS data, and to write out field notes and worksheets. This creates an on-going data collection system that informs adaptive management, and is more cost effective. The addition of the Adaptive Management Field Worksheet is intended to formalize field observations and create a worksheet that can be readily shared with the Commission yearly. The cost to the Commission for the data collection is merged into the management tasks, the only additional cost is a proposed winter meeting, and the Late Spring management field review. The Management Timeline in the Chapter 5 also incorporates this plan.

This is intended to be used for Phases 1-7 immediately, and for Phases 8 and 9 after the U.S. Army Corps of Engineers complete their monitoring period.

Annual Monitoring Framework

Winter: Review invasive maps and Adaptive Management Field Worksheet notes from previous year and prepare cost estimate proposals for meeting with Commission.

Coordinate an in-person meeting with Mount Pleasant Stormwater Commission or a representative to review previous year's management and maps, review Management Plan tasks, discuss up-coming priorities, estimated cost proposal, and who does what. Proposal shall include budget for management and reporting.

Receive approved cost proposals from Commission by early April.

Early Summer: Control early season species (e.g., crown vetch, birdsfoot trefoil). While applying appropriate herbicide, take photographs, document where Invasives are treated, begin to fill in Adaptive Management Field Worksheet, and fill in vegetation checklist for each phase.

Mid-Late Summer: Control later season species (e.g. cut-leaved teasel, purple loosestrife, *Phragmites*). While applying appropriate herbicide, take photographs, document where Invasives are treated, add any additional management needs or "hot spots" to Adaptive Management Field Worksheet, and fill in vegetation checklist for each phase.

Fall-Early Winter: Create maps of Invasives per Phase, map any new "hot spots", type up Adaptive Management Field Worksheet for each Phase. Send completed maps and worksheets (one for each Phase) to Commission as a PDF document for use in the Winter annual meeting.

Management

In order to establish and maintain resilient native species and natural habitats, it is absolutely critical to conduct management activities including prescribed burning, mowing and invasive species control. No one strategy should be used alone, these tools used together will promote species diversity, and wildlife habitat. This corridor is bordered with heavy residential, industrial and agricultural development, and invasive species inputs from foot, vehicular and stormwater outlets will continue to threaten the native species plantings if they are not properly managed.

Signage: To locate the native planting boundaries would be an effective tool to limit impacts from neighbors including over mowing, ATV use and over plowing. This would be useful on all Phases.

Management Trails: Access for management is needed in a few areas to better allow Maintenance including Phases 2, 3 and the east side of Phases 7-9. These trails could be a simple as a mowed trail, or a wood chip trail. They could also offer access for wildlife viewers off the more well used trails.

Prescribed burning: By far the most effective management tool for maintaining native species diversity in prairie and wet meadow/sedge meadow wetland habitats (Lovell, Henderson and Howell, 2008). Burning is a natural part of prairie and wetland ecology, and is as natural as wind, water, drought, floods and blizzards. The key growing part of most native prairie plants, wetland grasses and sedges is below ground, where the heat of the fire does not penetrate, allowing the grasses and wildflowers to flourish once again following a fire event. Most invasive species are not well adapted to fire, and are outcompeted by natives after a burn. Fire historically occurred by lightning strikes and Native Americans. Native Americans used fires to hunt, improve visibility, protect themselves and their villages from wildfires, and make traveling through the tallgrass prairie easier (Will County Forest Preserve District, 2014).

As European settlement ensued, fire was widely suppressed because of its perception as a destructive impact to human interests. Today, there is an increased understanding about the importance and usefulness of safe, prescribed burns and many companies are available to assist with prescribed burning. Phase 1 of this corridor was burned in 2009, and there are plans to burn Phase 4 this spring (2015). A rotating burn schedule between Phases is the most cost effective tool to retain species diversity from being overtaken by woody vegetation. We recommend fire regimes for the other phases (minimally every five years) where it is feasible, following the schedule provided in the management timeline in Chapter 5.

Mowing is an effective management tool where burning is infeasible, particularly narrow Phases such as areas on Phase 2 and 3 that are bordered by residences and industrial buildings. Although mowing does not contribute the same natural benefits to the native plant species that prescribed burns do, mowing helps keep invasive weeds, particularly woody species at bay and is relatively easy. Because mowing can result in harm or mortality to frogs, snakes, and beneficial insects, it is important to keep the mower deck at a higher height (e.g., 6-8" above the ground surface) to help reduce wildlife injury. Mowing timing and recommendations are provided in the management timeline in Chapter 5. Areas that are inaccessible to a mower are discussed in the next section.

Chemical and Mechanical Control: Regarding invasive species control, spot herbiciding, cutting and treating with herbicide, or chemical girdle coupled with prescribed burning and/or mowing can be very effective. Areas on steep slopes that are inaccessible to mowing will need periodic weed whipping with hand held equipment to set back woody species. If the stems are beyond the diameter to be cut with a weed whipper they can be cut with hand held lopers and the cut stem herbicided to avoid re-sprouting. Another tactic for

The early settlers in southeast Wisconsin found a vast prairie laced with streams and oak woodlands that was maintained by Native Americans fire management. Re-introducing prairie plants and intentional fire into this system gives us the ability to regain a portion of the prairie landscape that was lost.

inaccessible areas to fire or mowing could be a chemical girdle of the woody plant (apply herbicide with a paint brush to bark). This is faster than cut and herbicide and provides good results as the stem dies in place.

Brush Bundles: Can be created for in-stream habitat work from woody shrubs cut along the banks. Drying invasive brush first would decrease the likelihood of the stems sprouting in the stream.

Herbiciding: Is a helpful management tool in areas where mowing or burning is not yet scheduled to get a head start on control, or when fire is not anticipated to kill the plant. Each problem species has a suite of options in terms of the chemical applied, and timing of control in interaction with burning and mowing. These also change over time as new techniques or chemicals are created. For example, bird's foot trefoil and crown vetch (legumes) are best herbicided early in the year prior to flowering stage, and are less set back by a prescribed burn. However the prairie plants that ultimately need to compete with crown vetch will benefit from the fire.An integrated approach using both tools will yield the best result. Invasive woody shrubs, such as common buckthorn and bush honeysuckle are best removed when cut at the base and stump treated during the winter months when other plants are dormant. The snow also helps push down herbaceous vegetation so that the woody trunks are more visible.

As an aggressive prescribed burn / mow schedule is undertaken, the need to treat woody stems by other means will diminish.

Native Seeding: Is an on-going strategy to maintain a diverse corridor. As mentioned above, some Pike Phases could be used to harvest native seed for re-seeding disturbed areas (for example well developed vegetation in Phase 1). Collecting native seed in fall and immediately re seeding small areas is very feasible. Some of the areas hardest hit by crown vetch (for example in Phase 5) need additional prairie seed in bare areas. Woody native plantings, particularly native oaks are best introduced once construction is complete and the hydrology has become established. Bare root stock, although cheap, has a high rate of mortality. By growing available bare root stock in pots of soil (and water) and replanting in fall when the summer heat has abated could provide a cost effective strategy for planting over time.

Native Woody Plantings: Provide value to wildlife, shade the stream, and provide diversity in the corridor. The native trees and shrubs have been planted after initial restoration activities on Phases 1-3. The Village has a donation of native oak trees that could be utilized in Phases 4 and 6 in 2015. Woody plantings also provide shade along the path at park benches and picnic tables. The ten bench locations in Phase 4 could be planted with several faster growing native trees to provide shade including sugar maple, silver maple, hackberry (smaller tree), black cherry and basswood. Woody plantings are incorporated into the construction plans for Phases 8 and 9. Once Phase 7 is restored, additional plantings could be initiated similar to what is planned for Phase 4 and 6. Ongoing woody plantings can be initiated as trees become available to the Village.

Remnant Woods: Exist along the restored Pike including in Phase 1, 2, and 4. The small conifer woods that were retained in Phase 4 have dense common buckthorn in the understory. Cutting out the invasive shrubs and adding small paths within the woods would enhance both the wildlife value of the woodlots and the human use value.

In summary the combined use of these techniques along with monitoring form the basis of adaptive management of the Pike River vegetation. The Five- Year Management Plan details the management of the corridor in a shorter time phase using these practices. The task of long term management will be to revisit this plan in the fifth year and plan the next five years based on the successes and threats evident at that time.

STRATEGIES TO DEAL WITH TRIBUTARY INPUTS AND OTHER THREATS

Five named tributaries to the Pike River – Bartlett Branch (Phase 1), Steele Branch (Phase 4), Waxdale Creek (Phase 5), Chicory Creek (Phase 7) and Lamparek Ditch (Phase 9) were investigated in 2014, as well as adjacent stormwater ponds. These tributaries are a source of invasive species and pollution, and efforts to ameliorate impacts would be very beneficial to the restored Pike River as well as the surrounding watershed.

The Pike River Watershed-Based Plan (2013) designated Waxdale Creek, Chicory Creek and Lamparek Ditch as "Critical" Riparian areas (Figure 59). They also designate two un-named inputs: PRTB (Pike River Tributary "B") enters the stream at Phase 4 and PRTC (Pike River Tributary "C") flows west on the north end of Phase 7. The plan calls for restoring degraded tributary riparian habitat. We found in our field review that PRTB is a very short segment that flows off the AW Oakes Industrial site. It is likely a conduit for *Phragmites* from ponds on the Oakes yard. Tributary PRTC will be intersected by a water quality pond once Phase 7 is constructed.

On our 2014 field review we noted debris trapped in grates and culverts at multiple locations on tributaries. Clearing out physical debris in an on-going maintenance issue. Locations of current debris are on the Tributary Maps in Appendix.

Riparian buffer strips are an effective tool to trap sediment and nitrogen (NRCS, 2015) as well as shade the stream. Within each tributary we identified potential buffer opportunities and highlighted areas currently well buffered. Potential buffer sites are mapped on Phases 1, 5, 7 and 9 (Tributary Maps in Appendix) The first priority might be to buffer Waxdale east of Willow Road on Village of Mt. Pleasant land, and discuss buffers west of Willow Road with We Energies (see Tributary Maps in Appendix).

The agricultural lands surrounding Chickory Creek and Lamparek Ditch offer some of the greatest opportunities to buffer. Buffer strips from 15 to 30 feet from the top of the tributary bank

Vegetation management - Heather Patti spraying herbicide on Phragmites and reed mannagrass, Phase 4. (Photo by Alice Thompson, 2010)

Prescribed burn on Phase 4, by Tallgrass Restoration, April, 2015. (Photo by Alice Thompson, 2015)

Prescribed burn by Tallgrass Restoration, April, 2015 on Phase 4 facing north from trail bridge. (Photo by Alice Thompson, 2015)

On-going ATV damage within Biex-Ramcke prairie at the north end of Lamparek Ditch (Photo by Heather Patti, 2014)

would provide water quality benefits. The Village of Mount Pleasant's Master Plan also recommends 300 foot buffers centered on the tributaries (150 feet on each side). We encourage communication with landowners along the tributaries and identification of funding from local or federal agencies. For example the Environmental Quality Incentives Program or "EQIP" (NRCS, 2014) provides financial and technical assistance to agricultural landowners to improve water quality (as well as other goals) as part of the 2014 Farm Bill. Because these programs change often, the best approach may be for the Village to identify willing landowners, and then work through the county and federal agencies to find the best funding opportunities at that time. The fact that restoration of these tributaries are targeted in this report as well as in the 2013 Pike River Watershed Plan could increase their value to grantors.

The Nature Conservancy and EPA are investigating a two-stage ditch approach to trapping pollutants, particularly Phosphorus which is less successfully trapped with riparian buffers (Montgomery and Associates, 2014). The two-stage ditch is a trapezoidal shaped ditch with a shelf, similar to the Pike River restored stream shelf design. The agricultural creeks, particularly Chicory and Lamparek could be prime locations to test this design in Wisconsin.

Invasive threats were mapped on tributaries to the Pike River. In particular, *Phragmites* or giant reed grass found in adjacent stormwater ponds (see Tributary Maps in Appendix) could be controlled to limit ongoing inputs into the stream. Reed mannagrass source populations are found on the Bartlett Branch and Steele Branch. The Steele Branch population is a smaller size and could be controlled during Phase 4 control activities, the Bartlett Branch population is a well-established 1700 foot long corridor and best controlled by limiting satellite populations downstream at this point.

Another persistent challenge particularly before the public can use the recreational trails is ATV damage. This was a historic issue on Phase 1, before the public began to use the recreational trails and became effective enforcers. Currently there is ATV damage occurring in Phase 4 and 5, and in the Biex-Ramcke prairie plantings adjacent Lamperek Ditch. This will be a potential impact on Phases 7-9 before the public uses the eventual trails. Visible signage on Village properties, showing the boundaries and approved uses would be a critical first step to controlling ATV damage. The Village can also contact local landowners. The ATV trails lead to obvious landowners to contact. The dual message to the local neighbors would include a restriction on ATV use and knowledge of the planted native boundaries so that over plowing or over mowing does not occur on the restored corridor.

Streams and Aquatic Resources

As a naturalized stream habitat, the aquatic resources of the Pike River Corridor will be dynamic and change over time. This section summarizes both the monitoring program that will be necessary to follow these changes and to identify maintenance or enhancement activities necessary to maintain key resources

STREAM AND AQUATIC RESOURCES

Collection and Evaluation of Monitoring Data

The restored floodplain sections will change the hydrological, water quality, temperature, habitat, and biotic characteristics of these streams in a positive manner. By conducting monitoring on the inputs and outputs of these systems we can ensure that the ecological functions restored to damaged streams channel are protected and properly maintained over time. The performance parameters to be monitored and analyzed include the following:

- Stream Hydroperiod and Flow-duration Curves
- Channel Bed and Sideslope Stability
- Stream Bank Erosion and Riparian Vegetation Integrity
- Water Quality and Chemical Properties
- Stream Habitat Quality for Fish and Invertebrates
- Biological Integrity and Abundance of Fish and Invertebrates
- Functioning of Constructed Fish Habitat Structures

In as much as the of the channel and floodplain modifications for the North Branch of the Pike River are intended to improve the ecological integrity of the aquatic habitat and organisms in the watershed, the monitoring plan presented here is designed to:

- Characterize the stream and habitat conditions initially following construction,
- Monitor modifications to the channel in order to verify the integrity of the construction and to identify any necessary modification and/or maintenance needs, and
- Measure and assess the changes in the habitat and biotic integrity of the Pike River relative to both pre-construction conditions and reference sites.

Monitoring Protocols, Parameters, and Schedules

Monitoring activities will be conducted on 3 different temporal and spatial scales. These include: (1) Continuous Water Quality Monitoring, (2) Yearly Inspections, and (3) Long-Term Baseline Monitoring.

Four baseline monitoring stations in the Pike River (Location Map, Appendix) correspond approximately to areas studied by the WDNR for habitat, biological, and hydrological and

for previously conducted monitoring for the Pike River by UW-Milwaukee. Station lengths will be equal to 35 times the mean stream width for the reach (Simonson et al. 1994 – USDA Forest Service Technical Report NC-164). These will provide the overall umbrella data set to establish the change in the structure and function of the Pike River resulting from the channel modifications scheduled for the entire North Branch.

Data collected include the following.

- Two water quality monitoring stations will be continuously maintained at stations in Phase 4 and Phase 9. The parameters measured and frequency of logging is presented in Table 4.1. These data will provide near real-time data on stream conditions. It will also be used to ascertain the date and magnitude of storm flows in excess of the 2-year recurrence interval flow. The sonde (water quality) station has been in operation more-or-less continuously since spring 2000 and the meteorological unit was installed in May 2001. It is possible that the sonde may be removed during periods of cold weather to protect the sensors from ice conditions, although this has not yet proved necessary.
- Stream flow will be continuously recorded during ice-free periods a using a stage-discharge relationship. This relationship will be recalibrated yearly be used to calculate time-discharge via the establishment of a rating curve for the station.
- Habitat, Fish, and Macroinvertebrate data will be collected at reference sites in (Phases 1, 4, 6 and 9) every 5 years during summer low-flow conditions at stations in Table 4.3. using protocols established by the WDNR. Parameters will follow Simonson, et al. (1994, revised 2000) for habitat and Simonson and Lyons (1993, revised 2003) for fish. Habitat ratings for low-gradient streams and a warmwater Index of Biotic Integrity (IBI) will be calculated for each station (Wang et al. 1998, Lyons 1992). Invertebrates will be sampled and analyzed using techniques modified from the EPA guidelines for "Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters" (1990) and Hilsenhoff (1984).

Table 4.1 Continuous Real-Time Monitoring: Stations Located at Phase 4 and Phase 9

Data Type	Measurements	Frequency	Quality Assurance	Metadata
Water Quality - Sondes: ***Multiparameter Probes***	Water depth, temperature, dissolved oxygen, conductivity, pH, turbidity	Readings logged every 20 minutes. Data downloaded every 6 hours via cell phone modem to web database.	Monthly comparison to in-field measurements and calibration of all sensors and back-adjustment for drift, following USGS and manufacturer recommended procedures.	GPS location, drainage area of watershed to location, land use of sub-area.
Water Quality - Nutrients: ***Photometric Measurements***	Total Phosphorus, Orthophosphate, Nitrate, Ammonium, Chloride	Integrated samples taken monthly at sonde monitoring stations	Field sampling following USGS standard procedures. Lab instruments calibrated monthly per manufacturer specifications. Field controls and blank samples included for each sampling session.	Date, time and location of samples
Weather Data: ***Meterological Station***	Temperature, Relative Humidity, Wind speed and direction, Atmospheric pressure, Solar radiation, Rainfall (tipping-bucket rain gauge)	Readings logged every 20 minutes. Data downloaded every 6 hours via cell phone modem to web database.	Monthly comparison with in situ manual measurements. Annual calibration of all sensors.	Sensor detection limits, accuracy (confidence intervals), drift rate, calibration dates, calibration coefficients.
Stream Flow: ***Water Depth Sensor***	Calculate stream discharge, using water depth from multiparameter sondes in conjunction with establishing a depth*discharge rating curve for each station.	Readings logged every 20 minutes. Data downloaded every 6 hours via cell phone modem to web database.	Monthly comparison to field measurements. Post-deployment correction for atmospheric pressure changes.	Rating Curves, flows, cross-sections, and elevations for stage

Yearly Inspections

Yearly Inspections of the entire Pike River Channel will evaluate the structural integrity and functioning of channel modifications and fish habitat structures for each Phase. Parameters measured will include:

- Side-Slope, Stability, and Erosion Potential
- Bank Height, Stability, and Erosion Potential
- Characterization of Longitudinal Stream Bed Profile and Stability
- Channel Width and Depths
- Locations and Amounts of Sediment Deposition / Erosion
- Riffle and Pool Elevations/Depth and Substrate Composition
- Riparian Bank Woody and Herbaceous Vegetation Cover
- Stability and Functioning of Fish Habitat Structures

Inspections will be done yearly, preferably in late spring/early summer. More frequent surveys may be conducted if qualitative inspections suggest that structural failures are indicated.

Channel and Side-slope Stability

Periodic monitoring of bank slope and stability are required. The criteria and protocol for inspection will be developed by a qualified geotechnical engineer and will be conducted at quarterly during the first 12 months and semi-annually thereafter. Special attention will be paid to warning signs of sliding or sloughing. Any cracks or sliding will be measured and photographed for inclusion in reports.

Substrate Composition and Bed Stability

Sediment composition (silt, sand, gravel) will be visually quantified and sediment depths will be measured. Areas where fine sediment deposition is noted will be monitored and reported for further inspection and potential corrective action.

Fish and Aquatic Habitat

Fish Habitat Structures will be monitored as part of the inspection of the structural integrity of the channel (quarterly). Inspection will consist of checking the integrity of the cross-channel and lateral logs, angled riffle deflectors, and wing deflectors. Gaps and/or distances moved will be measured and recorded. Excessive changes will be reported for maintenance. Location of the structure by station along the channel and a photograph of the problem (including an object for scale) will be recorded. Apparent movement of these features associated with changes in function will be documented for inspection at the next interval. Severe movement of the logs associated with erosion or channel blockage, will be noted for maintenance.

Vegetation Density and Composition

The density and composition of vegetation along the stream banks will be monitored as part of the habitat assessment each summer. These data will be compiled and included along with the wetland and riparian vegetation monitoring (see Baseline Monitoring of Ecological Integrity).

Table 4.2 Stream Channel Issue Inventory and Structural Habitat Assessment: Yearly Visual Inspection of Entire Length of Stream Corridor

Data Type	Measurements	Frequency	Quality Assurance	Metadata
Streambed, Substrate and Bank Erosion/Stability	Substrate composition, Siltation & Erosion, Channel width & depth, Streambank conditions, flow status	Conducted yearly for each Phase during summer baseflow conditions	Methods adapted from USEPA RAPID Bioassessment Protocols (http://water.epa.gov/scitech/monitoring/rsl/bioassessment/). See example data sheet for Channel Assessment.	Include GPS geotagged photographs for issues requiring follow-up maintenance actions noting changes from prior year.
Fish Habitat Structures	Functional status of constructed fish habitats; log deflectors, boulder clusters, riffles, pools	See above	Methods adapted from USEPA RAPID Bioassessment Protocols (http://water.epa.gov/scitech/monitoring/rsl/bioassessment/). See example data sheet for Fish Habitat Assessment.	See above
Riparian Zone and Vegetation	Conditions of vegetated riparian buffer, noting issues regarding the presence of invasive species, erosion/runoff, pollution sources.	See above	Methods adapted from USEPA RAPID Bioassessment Protocols (http://water.epa.gov/scitech/monitoring/rsl/bioassessment/). See example data sheet for Riparian Assessment.	See above

Table 4.3 Baseline Monitoring of Ecological Integrity: Conducted Every 5 Years at 4 Stations (1, 4, 7, and 9) using WDNR Protocols

Data Type	Measurements	Frequency	Quality Assurance	Metadata
Habitat Evaluation	Habitat: Substrate composition, water width/depth, bank conditions,flow, fish habitat. Calculated Wisconsin low-gradient habitat rating.	Every 5 years during summer base-flow conditions (mid-June – July)	Methods will follow procedures established by the Wisconsin DNR Baseline monitoring project (Lyons et al. 2000).	Geotagged reference photos for each station
Fisheries Survey	Fish species composition and abundance using stream and/or backpack electrofisher. Calculated warm water Index of Biotic Integrity.	Every 5 years during summer base-flow conditions (mid-June – July)	Methods following WDNR procedures (Lyons et al. 2000). Identification by trained personnel. Voucher specimens will be retained for unusual species.	Fish deformities, reproductive condition
Benthic Macro-invertebrate Survey	Benthic Macro-invertebrate diversity, abundance and Family Biotic Index. Samples collected using either Hess Sampler or Rock Baskets	Every 5 years during summer base-flow conditions (mid-June – July)	Methods following EPA procedures (EPA document 600/4-90/030) with ID as above and voucher specimens retained	Geotagged reference photos for each station

Trail and Recreational Resources

The Pike River Corridor currently serves as a valuable recreational resource. The following strategies will help ensure the maintenance and growth of recreational opportunities available to the Village of Mount Pleasant community.

TRAILS AND RECREATIONAL RESOURCES

Introduction

The Project Area is well on its way to reaching the goal to: Establish the Pike River Corridor as a recreational destination and regional pathway for its residents and visitors. In order to reach this goal, community leaders need to:

Market the corridor not only to residents but also to local businesses to bolster support, sponsorship and partners dedicated to the advancement of the environment, recreation and education within the corridor.

This partnership-oriented strategy demands the public and private sector leaders maintain a highly collaborative relationship that exudes the vision to achieve the goals, objectives and recommendations in this plan. To ensure that by 2020 visitors and residents will 1.) Easily find, access and navigate the corridor trails by car, bicycle and on foot, 2.) Access a diverse array of recreational activities and 3.) Learn about the Pike River Corridor, we recommend the following:

RECOMMENDATIONS

Overall Corridor

- Create a recreational master plan.
- Finalize park master plan for Biex-Ramcke Homestead Park.
- Continue to construct planned improvements throughout the corridor.
- Finalize acquisition of remaining properties within the project limits.
- Determine a short term solutions for safe crossing at the intersections of Highway 11 and 20, while studying and determining long term, permanent solutions.

- Design and implement a complete identification, wayfinding and educational/interpretive signage package: which may include mile markers, regulatory signage and predetermined educational signage program (invasive species, plant identification, wildlife and processes etc.)
- Consider emergency stations at key locations throughout the corridor.

Environmental

- Preserve and enhance attractive view corridors along trails and surrounding amenities.
- Create a corridor master planting plan that includes shade trees for habitat, vegetative screening for nearby industrial yards and user comfort from the elements.
- Consider building habitat amenities (bird and bat houses etc.) for nature observation.

Trail and Recreational Amenities

- Evaluate regional connections from nearby parks to the corridor via trails and on road bicycle routes.
- Consider a trail link from the end of Oakes road, across the Pike to the proposed trail.
- Evaluate suitable locations for fishing piers and river overlooks.
- Consider exercise station adjacent to high use portions of the trail system. Phase 1 and 2 would be the most ideal candidates due to their proximity to residential neighborhoods with 3 and 4 as an alternative due to their proximity to the daytime work populations of nearby businesses.
- Consider nature based play nodes along the trail that coincide with adult exercise stations.
- Consider additional trail amenities that include but are not limited to shade structures, restrooms, drinking fountains, bicycle racks, bicycle repair stations, benches, picnic rental facilities, trash and recycling receptacles.
- Preserve undeveloped open space along and adjacent to the river and its tributaries. When land adjacent becomes available consider purchasing it for additional recreational use.
- Consider a boardwalk system along portions of the river's edge for passive recreation and educational opportunities.

Educational and Stewardship

- Develop educational programming for the corridor. Consider partnering with other local nature centers/ programs and schools.
- Plan and design outdoor laboratory, monitoring station and classroom facilities.
- Study the viability of a nature center at Biex-Ramcke Homestead Park.
- Investigate programming for group exploration/education areas.
- Partner with local businesses for support, sponsorship and volunteer efforts.
- Consider establishing a Friend's of the Pike group to oversee stewardship and events in the corridor.

CHAPTER FOUR Strategies

Key Points

The following list identifies key strategies.

FLOOD CONTROL AND STORMWATER INFRASTRUCTURE

- ALL structures should be monitored every five years and maintained, as needed.
- Add Phases 7-9 to the Maintenance Plan once built
- In 2020 all structures from Phase 1-9 will require a monitoring inventory.
- To expedite future observation and maintenance activities, permanently mark the locations of the channel outfall structures.
- Add Structure 52 to the Village's illicit discharge detection elimination program.

PRARIE AND WETLAND RESOURCES

- On-going management of invasive plant species is critical in maintaining a bio-diverse corridor.
- An aggressive burning and mowing regime is recommended for each Phase in order to suppress woody vegetation encroachment.
- Additional signage along corridor boundaries is recommended where over mowing, over plowing and ATV damage is occurring.
- We have found on the Pike that if you build it, the wildlife will show up!

STREAMS AND AQUATIC RESOURCES

- Monitoring of the integrity of the stream channel, banks, water quality and habitat requires:
  - Yearly visual inspection of the entire stream following then end springtime high flows (typically mid-May);
  - Spot inspections of key locations following significant storms greater than a 10 year recurrence interval (approximately 3 inches of rain in 24 hours);
  - Installation and operation of real-time water quality, flow and weather/rainfall stations in Phase 4 and Phase 9;
  - Baseline fish, habitat and invertebrate monitoring at reference sites every 5 years using standard methods.
- First priority maintenance action include:
  - Removing sedimentation or blockage that reduces channel flow capacity;
  - Stabilizing channel erosion that threatens adjacent structures or property.
- Second priority maintenance actions include:
  - Fixing barriers to fish passage;
  - Stabilizing bank erosion greater than normal that affects water quality;
- Third priority maintenance actions include:
  - Installation of brush bundles to improved stable meandering of the low-flow channel in reaches of chronic bank erosion or sedimentation;
  - Addition of supplemental gravel and cobble substrates in Phase 4 to maintain riffles;

- Enhancing shading with tall grasses and shrubby canopy throughout the corridor.

TRAILS AND RECREATION RESOURCES

- Create a recreational master plan to guide the implementation of added amenities.
- Continue to expand the trail system and connections to the community.
- Develop short term and long term solutions for safe crossings at Highway 11 and 20.
- Improve trail wayfinding and signage.
- Preserve and enhance attractive views along the corridor.
- Evaluate suitable locations for added recreational components such as fishing areas, exercise stations, shade structures for picnicking, and group activities, and nature observation overlooks.
- Seek out partnerships with local businesses, schools, and local grassroots organizations to develop educational and stewardship programming.

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