HONEY CREEK AQUATIC ECOSYSTEM RESTORATION – SECTION 206 WRDA 1996

Appendix H - Monitoring & Adaptive Management Plan

USACE, Chicago and Detroit Districts

APPENDIX H – Monitoring & Adaptive Management Plan

May 2021

Table of Contents

Introduction

Section 2039 of WRDA 2007 directs the Secretary of the Army to ensure, that when conducting a feasibility study for a project (or component of a project) under the Corps ecosystem restoration mission, that the recommended project includes a monitoring plan to measure the success of the ecosystem restoration and to dictate the direction adaptive management should proceed, if needed. This monitoring and adaptive management plan shall include a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring as well as specify that monitoring will continue until such time as the Secretary determines that the success criteria have been met.

Section 2039 of WRDA 2007 also directs the Corps to develop an adaptive management plan for all ecosystem restoration projects. The adaptive management plan must be appropriately scoped to the scale of the project. The information generated by the monitoring plan will be used by the Districts in consultation with the Federal and State resources agencies and the Major Subordinate Command (MSC) to guide decisions on operational or structural changes that may be needed to ensure that the ecosystem restoration project meets the success criteria.

An effective monitoring program is necessary to assess the status and trends of ecological health and biota richness and abundance on a per project basis, as well as to report on regional program success within the United States. Assessing status and trends includes both spatial and temporal variations. Gathered information under this monitoring plan will provide insights into the effectiveness of current restoration projects and adaptive management strategies, and indicate where goals have been met, if actions should continue, and/or whether more aggressive management is warranted.

Monitoring the changes at a project site is not always a simple task. Ecosystems, by their very nature, are dynamic systems where populations of macroinvertebrates, fish, birds, and other organisms fluctuate with natural cycles. Water quality also varies, particularly as seasonal and annual weather patterns change. The task of tracking environmental changes can be difficult, and distinguishing the changes caused by human actions from natural variations can be even more difficult. This is why a focused monitoring protocol tied directly to the planning objectives needs to be followed.

This Monitoring and Adaptive Management Plan describes the existing habitats and monitoring methods that could be utilized to assess projects. By reporting on environmental changes, the results from this monitoring effort will be able to evaluate whether measurable results have been achieved and whether the intent of the Honey Creek Restoration is being met.

Guidance

The following documents provide distinct Corps policy and guidance that are pertinent to developing this monitoring and adaptive management plan:

1. Section 2039 of WRDA 2007 Monitoring Ecosystem Restoration

   (a) In General - In conducting a feasibility study for a project (or a component of a project) for ecosystem restoration, the Secretary shall ensure that the recommended project includes, as an integral part of the project, a plan for monitoring the success of the ecosystem restoration.
   (b) Monitoring Plan - The monitoring plan shall--
   (1) include a description of the monitoring activities to be carried out, the criteria for ecosystem restoration success, and the estimated cost and duration of the monitoring; and

(2) specify that the monitoring shall continue until such time as the Secretary determines that the criteria for ecosystem restoration success will be met.

(c) Cost Share - For a period of 10 years from completion of construction of a project (or a component of a project) for ecosystem restoration, the Secretary shall consider the cost of carrying out the monitoring as a project cost. If the monitoring plan under subsection (b) requires monitoring beyond the 10-year period, the cost of monitoring shall be a non-Federal responsibility.

2. USACE. 2011. Implementation Guidance for the Water resources Development Act of 2007 (WRDA 2007) – Section 5011, Great Lakes Fishery and Ecosystem Restoration Program.

   States that the term "monitoring" means the activities performed, including the collection and analysis of data that are necessary to determine if predicted outputs of the project are being achieved. Monitoring plans for Section 506 projects will not be complex but the scope and duration will address the minimum monitoring actions necessary to evaluate project success. Within a period of ten years from completion of construction of an ecosystem restoration project, monitoring shall be a cost-shared project cost.

3. USACE. 2009. Planning Memorandum. Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration

4. USACE. 2000. ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies. Washington D.C.

5. USACE. 2003a. ER 1105-2-404. Planning Civil Work Projects under the Environmental Operating Principles. Washington, D.C.

General Monitoring Objectives

The following are general project monitoring objectives:

- To determine and prioritize needs for ecosystem restoration
- To support adaptive management of implemented projects
- To assess and justify adaptive management expenditures
- To minimize costs and maximize benefits of future restoration projects
- To determine “ecological success”, document, and communicate it
- To advance the state of ecosystem restoration practice

Project Area Description

Detailed description of the study area may be found in the Feasibility Study, 1.4 – Study Area. Honey Creek is located in Wauwatosa, Milwaukee County, Wisconsin. The study area is an approximately 9,300 linear feet reach of Honey Creek extending from the outlet of Honey Creek to the Menomonee River upstream to the utility crossing near the Wisconsin Lutheran High School (approximately 1,600 feet downstream of the culverts north of Interstate 94 at 84th Street and O’Connor Avenue).

Habitat Trends Triggering Restoration

This project aims to remedy adverse trends of:

- Loss of fluvial-geomorphic processes (riverine habitat)
    - Loss of cut and fill alluviation (actively meandering and migrating)
    - Abnormal sediment inputs, transport, and substrate sorting
    - Instability of banks, streambank armoring, and lack of native vegetation
    - Loss of habitat features (e.g., riffles and pools)
    - Flow velocities homogenized (hydraulics)
    - Presence of foreign debris and loss of natural organic debris (e.g., large wood)
- Degradation of Hydrologic Regime
    - 90% impervious surface across watershed
    - Natural hydrologic inputs altered
    - Flashy urban hydrography with extremely high flood flows
    - Loss of hydro periods
    - Fragmentation of channel by culverts, abutments, and channelization
- Loss of Riparian Zone
    - Reduced extent of riparian buffers
    - Habitat fragmentation
    - Loss of riparian inputs (large woody debris, leaf litter, insects/other food)
- Loss of Species Richness (riverine and riparian native species)
    - Extirpation through physical removal; development/agriculture
    - Loss in remnant area via invasive species and other degradation
    - Fragmentation of stream channels and riparian zones

Restoration Design Overview

Implementation of Alternative 8, the National Ecosystem Restoration (NER) Plan, would greatly improve the ecosystem conditions of Honey Creek. The removal of the concrete lined channel, addition of aquatic habitat structure, reconnection of floodplain, and addition of native riparian habitat would reestablish passage for native fish and mussel species as well as increase native species richness and diversity of the surrounding environment. The plan recommended in the feasibility study is the most environmentally and economically justifiable that would address the adverse trends of Honey Creek. Key restoration features include restoring floodplain connectivity of Honey Creek, addition of in-stream fish habitat, and reestablishment of native plant communities. Structural components of the project include:

a) Removal of concrete lined channel
b) Reconnection of floodplain
c) Installation of fish habitat
d) Removal of invasive plant species
e) Reestablishment of native plant community types:
    i. Marsh Persistent
    ii. Transitional Meadow
    iii. Riparian Woodland

Monitoring Components

All monitoring components would continue to be refined as design and construction progresses. This version of the monitoring plan is based on feasibility level information.

Component 1 – Structural Sustainability

Surveys of the structural sustainability of the implemented features will be conducted by USACE. This monitoring would take place once every year over a 5 year period after the construction contract is closed out (year one). This component covers the structural sustainability of the implemented features. It is a qualitative assessment of whether each feature is retaining its physical character and project purpose. The most important information derived from this component would be to determine if adaptive management measures are needed or not. Assessments would be conducted by walking through the project and visually assessing each of the components or project features that are listed below. This is intended to be fairly quick and to notice problems before they require complete overhauls that may adversely impact other project features. Structural components are currently broken down into the following:

1) Riffles/Step pools
2) In-stream fish habitat
3) Graded stream banks
4) Plant community reestablishment
    a) Marsh Persistent
    b) Meadow Transitional
    c) Riparian Woodland

The following is a list (i.e., living list) of parameters that would be assessed:

1. Riffles/Step pools
    a. Presence of scour or deposition
    b. Structural integrity - loss of stone and significant movement of stone
2. In-stream fish habitat
    a. Presence/absence of habitat features
    b. Structural integrity – loss or significant movement of material
3. Graded stream banks
    a. Presence of erosion
    b. Structural integrity – slumping, undercutting, etc.
4. Plant Community Zones
    a. Spatial coverage
    b. Invasive species % coverage
    c. Predator induced damages
    d. Hydraulic induced damages
5. Human Interference & Damages
    a. Physical damage
    b. Removal
    c. Rubbish and foreign debris

The previously listed parameters will be monitored by USACE via annual visual inspections beginning the year after construction contract completion (year one) and then every year for five years. It is recommended that one of these inspections take place during the growing season, when vegetation can be more easily identified and the percent cover estimated. Additional inspections will follow significant local rain events exceeding the two-year event to assess potential damages including movement of rock within the riffles and at the toe of slopes; excessive bank erosion; shoaling; or headcutting. Monitoring reports will include an evaluation of general site conditions, percent survival of each plant species, percent cover of herbaceous vegetation, notes on areas of failure or instability in the stream bed and bank protection, percent of invasive species, photographic documentation, and recommendations for any maintenance and corrective actions. Any corrective actions deemed necessary will be considered part of

the Operation and Maintenance of the project. Based on said site visits, adaptive management protocols may be initiated. Success of structural components, and any adaptive management triggered by observations, would be determined by the absence of structural problems at the end of 5 years. The non-Federal sponsors, Milwaukee Metropolitan Sewerage District (MMSD) and Milwaukee County, would be responsible for performance of operations, maintenance, repair, rehabilitation and replacement (OMRR&R) during the monitoring period or outside of the contract specifications.

General site conditions that will be reported in the monitoring reports will include:

- Approximate water depth at the pools in the channel,
- Visual indicators of water quality (turbidity, oily sheen on water surface, etc.),
- Recent weather conditions and precipitation,
- Indications of the frequency with which the water rises into the floodplain,
- Presence of nuisance invasive species of plants or animals (terrestrial or aquatic),
- Wildlife observations and indications of spawning/nesting activity, and
- Safety issues or concerns.

Component 2 – Biological Response

Surveys of the fish and benthic macroinvertebrate communities would be conducted by the MMSD or a representative of MMSD (e.g., Wisconsin Lutheran College) beginning the year after construction contract completion (year one) and then every year for five years with the goal of determining the responsiveness of the biological community to the restoration features. Sampling events should be coordinated with agencies actively monitoring other local streams, including U.S. Geological Survey's (USGS) Wisconsin Water Science Center and Wisconsin Department of Natural Resources (WDNR), to avoid any duplication of effort. Survey results will be included with the biennial monitoring report that follows the biological surveys.

Aquatic Community and Habitat Structure

Monitoring fish community response to structural features (i.e., riffles/step pools) and addition of in-stream fish habitat (i.e., woody revetments) will be conducted using seine and electro-shock methods. Successful restoration is expected to increase fish species richness and diversity once concrete removal from the channel has been completed. Fish community sampling will be conducted following protocols detailed in Moulton et al. (2002). Sampling should occur during the recommended index period (August 1st – September 15th), however exceptions can be made to sample in the spring and fall as close to the index period as possible based on resource availability.

The sampling reach will be defined as 20 times the wetted channel width (minimum - 150 m; maximum - 300 m) and should be located at a representative location within the restoration reach. Electrofishing will be conducted in two separate passes of the sampling reach, with processing of the specimens collected during the first pass occurring prior to the initiation of the second pass. Seining is performed as a complement to electrofishing and is conducted after electrofishing is complete. A composite sample comprising three seine collections (hauls or kicks) is taken before fish processing. Most specimens will attempt to be identified to species and enumerated in the field. External anomalies will be recorded on 30 randomly selected specimens of each species, if possible.

The resulting data will be used to calculate a Fish Index of Biotic Integrity (F-IBI) score developed by Lyons (1992), which includes the following metrics:

- *Species Richness and Composition*

    - Total number of native species
    - Number of darter species
    - Number of sucker species
    - Number of sunfish species
    - Number of intolerant species
    - Percent (by number of individuals) that are tolerant species
- *Trophic and Reproductive Function*
    - Percent that are omnivores
    - Percent that are insectivores
    - Percent that are top carnivores
    - Percent that are simple lithophilic spawners
- *Fish Abundance and Condition*
    - Number of individuals (excluding tolerant species) per 300 meters sampled
    - Percent with deformities, eroded fins, lesions, or tumors (DELT)

Within the sampling reach, macroinvertebrate samples will also be collected. A minimum of three aquatic D-net kicks will be collected from each sampling reach. Specimens collected will be preserved and identified in the laboratory.

The resulting data will be used to calculate a Macroinvertebrate IBI (M-IBI) score developed by Weigel (2003), which includes the following metrics:

- Species Richness
    - Total number of native species
    - Ephemeroptera-Plecoptera-Trichoptera (EPT)
    - Mean Pollution Tolerance Value
    - Proportion of Depositional Taxa
    - Proportion of Diptera (Dipt)
    - Proportion of Chironomidae (Chir)
    - Proportion of Shredders (Shr)
    - Proportion of Scrapers (Scr)
    - Proportion of Gatherers (Gath)
    - Proportion of Isopoda (Isop)
    - Proportion of Amphipoda

In addition to monitoring fish and macroinvertebrate response, the Qualitative Habitat Evaluation Index (QHEI) will be used to measure the change in physical habitat as a result of riverine restoration. The QHEI is described in section 2.5.1 Qualitative Habitat Evaluation Index (QHEI) in the main report. The QHEI is correlated to fish habitat suitability such that as the QHEI score increases so should native fish species richness and abundance. The QHEI is calculated by visual inspection of the physical characteristics of the stream reach of interest. An inspection of Honey Creek will be conducted in order to calculate the QHEI one year after construction and again 5 years after construction. The QHEI would be conducted by USACE and would occur once per year in late spring over the course of 5 years. The USACE would conduct the QHEI assessment at the same time as annual monitoring for component 1 – structural sustainability. Successful restoration of fish habitat as a result of structural features (i.e., riffles/step pools) and addition of instream fish habitat (i.e., woody revetments) is expected to result in an increase in the QHEI. A comparison with the Future With Project Conditions (*Table 1*) predicted from the feasibility stage will also be used to determine success. Adaptive management measures will be triggered by decreasing trends in both the QHEI and fish species richness and abundance. Adaptive management measures may include, but are not limited to, increasing habitat diversity along the stream banks to provide different types of refuge or foraging areas, increasing number of riffles to provide more

oxygenation of water, and/or removal of new unanticipated environmental stressors, such as foreign debris.
Success Criteria:

1. Increases in fish IBI and MBI for first and third year of monitoring. Richness and abundance may stay the same or continue to increase year 3-5 of monitoring.
2. QHEI will increase the 1st year of monitoring and remain the same or increase at the 5th year of monitoring.

Plant Communities

Surveys of the plant communities would be conducted by USACE beginning the year after construction contract completion (year one) and then every year for five years with the goal of determining the floristic quality of the restored area. Results from monitoring will be reported per year of monitoring efforts and project success determined and reported in the final report to be completed in the 5th year of monitoring. Evaluation of plant community zones would be accomplished using the Floristic Quality Assessment Index (FQA) and native plant richness, as described in the 2.5.5 Floristic Quality Assessment. In short, the FQA is a measure of overall environmental quality based on the presence or absence of certain plant species. Plant species that are assigned a coefficient of conservatism of 5 to 10 are indicative of less human mediated disturbance and a higher level of functionality. As the area stabilizes after restoration measures are complete, the number of higher conservative plant species that become established should increase. Communities that have an average mean coefficient of conservatism of between 3 to 5 fair quality. This is a good estimate of the future quality of the area based on the current plant community restorations and ongoing monitoring. Success will be determined by comparing FQA results with those predicted from the Future With Project Conditions (*Table 2*). Adaptive management measures will be taken if there is a decreasing trend of floristic quality over a period of three consecutive years. Adaptive management measures may include installation of native plant seed in areas of downward trend, more frequent mowing or more intensive efforts to remove invasive species.

In order to maintain and track the progress of the native plant communities, the results of the monitoring efforts should document the species of native plants found, their abundances and their Floristic Quality Assessment scores (i.e., results of monitoring activities). The number of native plant species and their associated abundances per community should increase as time increases, although 5-7 years post construction shows a much slower rate of new species accrual. An inventory of each plant community should reveal a Mean Coefficient of Conservatism (Mean C) being maintained at above 3 and hopefully will increase with time. However, it has been found that most native plant restorations tend to plateau and no longer show increases overtime.

If the results of the monitoring efforts show a decline in these three metrics, 1) number of native plant species, 2) abundance of native plant species and 3) Mean C, over time, remedial actions should be taken to correct trends. A negative trend will be indicated by two or more years in a row with a less than desirable outcome, such as, if the Mean C value for any one community dips below 3 for two consecutive years post construction. Comparisons of trends in plant community metrics will be made with post construction monitoring data.

None of the dominant species within a plant community type shall be an invasive species. Invasive species should not be the most abundant (as measured by percent cover) nor frequent (as measured by number of occupied quadrats) along any one transect. It is important to continue to reduce the amount of viable weed seed in the seed bank, this will reduce the level of effort needed in future years to maintain a low level of invasive species within the site. Monitoring efforts should show a decline in abundance and frequency of occurrence of invasive species over time. However, if monitoring efforts document the

opposite trend, invasive species increasing in abundance or frequency, then remedial management efforts should be taken to correct trends.

Floristic Data Gathering Protocol:

Data collection will follow the Standard Vegetation Monitoring Protocols for Grasslands and Prairie for herbaceous vegetation. Formal line transect surveys will be conducted biennially. In general, surveys will be conducted in summer/early fall during the course of the monitoring period. Transects will be laid out to include all habitats and restoration measures. Vegetation community composition (identification of plant species and estimated coverage of each) within quadrats will be made along each transect in 10 meter intervals. The first and last 10 meters within each transect will be skipped. Because transect data may not provide information needed to evaluate overall herbicide efficacies (or plant establishment efforts), meander surveys will be conducted at the same time as line transect surveys to supplement transect data, with focuses on plant response to herbicide applications, volunteer plant species occurrences, and survival, growth, and spread of planted species.

Success Criteria:

1. Eradicate/reduce the presence of non-native and invasive species: Target Invasive Species Eradication Percentage <10% Areal Coverage.
2. Improve native plant species richness and assemblage structure as measured by coefficient of conservatism of the Chicago Region Floristic Quality Index: Target Overall Mean C Score ≥ 3

Other Communities

Ancillary data will be collected on other assemblages as well. During fish monitoring, effort would be spent observing wildlife utilizing the habitats, including aquatic and terrestrial insects, amphibians, reptiles, birds, and mammals.

Component 3 – Planning Goal & Objectives

The goal of this proposed project is to restore floodplain connectivity, native riparian corridor, and create a more complex ecosystem to benefit fish, plants, amphibians, reptiles, mammals, and migratory birds. Specific planning objectives for this study are as follows:

- *Objective 1 – Reestablish Quality and Connectivity of Riverine Habitats*
- *Objective 2 – Reestablish Quality and Connectivity of Riparian Habitats*

These objectives pertain to the following concepts:

- Restore hydrologic and habitat connectivity
- Increase native fish habitat
- Increase native conservative plant species richness of persistent marsh, wetland transitional, and riparian woodland communities
- Reduce and/or eradicate invasive species
- Restore floodplain connectivity and native plant communities

These objectives would be assessed the same way as the FWOP and FWP project benefits were modeled as described in the Main Report, Section 2.5 – Forecasting Habitat Quality. If the following specific targets are not achieved, the non-Federal sponsor would need to implement necessary measures to bring the quality of the habitat types up to the functional levels expected from restoration activities:

Table 1 – Stream Channel Future With-Project Conditions

Habitat Type	Acre	QHEI	AAHSI	AAHU	NetAAHU
Stream Channel (SCa)*	8.2	84.9	0.85	6.97	3.69
Stream Channel (SCb)*	8.2	83.5	0.84	6.89	3.61

*monitors restoration of the concrete to natural substrate restoration

Table 2 - Plant Communities Future With-Project Conditions

Community Type	Acres	Mean C	AAHSI	AAHUs	NetAAHU
Transitional Meadow & Persistent Marsh	2.2	5.2	0.48	1.05	1.05
Riparian Woodland	46.0	4.3	0.41	18.86	12.53

Monitoring Responsibilities

USACE in conjunction with MMSD will currently be responsible for implementing all of the Monitoring Components as described above. Coordination with partner agencies and organizations to discuss future monitoring responsibilities is planned.

Monitoring Costs & Funding Schedule

Table 3 - Schedule of Monitoring Costs

Tasks	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Component 1		[redacted]				
Component 2						
Component 3						
Report						
Total						

Reporting Results

A yearly monitoring summary report would be drafted by USACE in conjunction with MMSD that briefly summarizes the data collected and determines if adaptive management is needed. A final monitoring report would be drafted in year five that details the outcomes of the restoration project.

Adaptive Management

Adaptive management measures are not the same as typical operation and maintenance activities described in the following section. These measures are technically response actions to changes that adversely affect how the system was predicted to respond. In so being adaptive, there are no absolute measures that can be defined prior to issue arising. The primary concerns for this project are restoration and establishment of native plant communities. Descriptions of adaptive managements below are brief and will be further detailed once a complete set of plans and specifications are drafted. This is necessary since the adaptive management measures will need to be based upon contracting bid items, final feature designs and predicted adverse responses. It is also noted that these measures have relatively low costs to regain lasting benefits.

Fish Habitat – Failure of habitat to support the expected species would primarily result from stability issues within the channel. Conditions unforeseen, such as unexpected floods or other human activities

could cause these issues to arise. Adaptive management actions would be undertaken to offset these instability issues, such as adding stone, adjusting orientation of the structures, varying dimensions of structures, etc.

Native Plantings – The risk of large scale plant failure is low, mostly due to the species selection of those adapted to the conditions found within Honey Creek. Most of the requirements for native plant communities are covered under routine operation and maintenance. If for some reason extensive patches of native plant community begin to fail, the cause would need to be determined in order to design and implement repair measures. Accidental or intentional human induced instances have damaged or removed native plantings in the past as well. No matter what the solution would be for the cause of the problem, it would certainly be coupled with reestablishing native plant patches by replanting. It may be that other thriving areas would be able to have live plants and seed transferred to the damaged patch. Or it may be that plants and seed would need to be repurchased. Actions would include, but not limited to, installing native seed over the winter months, installation live plugs, adding in soil amendments to reduce available nutrients in order to increase the soil suitability for native plant species, etc.

Operation & Maintenance

The operation and maintenance (O&M) costs of the project are estimated to be an average annual cost of $[redacted] over 50 years (*Table 4*). A detailed O&M Manual containing all the duties will be provided to the non-Federal sponsor after construction is closed out. The O&M for Chicago and Detroit Districts' ecosystem projects are practical and minimal due to initial project design efforts and design targets for sustainability. Mostly if not all of the O&M activities are no different than the specific activities that take place during construction. The O&M described here is not the same as the Adaptive Management measures described in the previous section.

Table 4 – Proposed O&M costs for Honey Creek

TASK	Annual Frequency	Acres Treated	Cost/Acre	Total AA Cost
Mowing	0.33	7	$	[redacted]
Invasive Control	0.5	25	$	
Seeding	0.25	8	$	
Stream	0.33	2	$	
TOTAL				

Invasive Plant Species Control – The maintenance activity is probably the most important to conduct. Preventing the establishment of invasive species and weedy vegetation prevents the need for large scale herbicide or physical eradication and replanting efforts. An annual maintenance plan should be drafted taking into account the types of invasive and non-native species to be treated and the acreage of the treatment area. Problematic areas will include the meadow transitional and marsh persistent zones. Species such as white and yellow sweet clover, cut-leaved teasel, reed canary grass, common reed, buckthorn, honeysuckle, are known invasive species which will need to be kept at bay.

Precautions should be taken to ensure that any long term herbicide application is appropriately dispensed to remove non-native plants and invasive species while avoiding native plant communities.

Native Plant Community Maintenance – It will be required to maintain the species richness, abundance and structure of the restored plant communities within Honey Creek. Aside from minor re-plantings, it will be important to continue to protect plant communities from external changes by man's daily

activities, whether single incidents or chronic stressors. These can cause native plant communities to experience significant species richness declines even to the point of becoming monotypic stands. The best operational measure to quickly identify and rectify external stressors is vigilance. Routine inspections by the non-Federal sponsor's qualified stewards are imperative to notice adverse change quickly. The long term monitoring plan provided above will not catch quick change as would routine inspection by site stewards.

Precautions should be taken to ensure MMSD staff understands the limits of native plant communities and how those areas should be maintained. Buffers around aquatic resources and native plants which border mowed turf grass areas should be avoided when routine mowing occurs.

Plan Formulation Habitat Analysis for CE/ICA

Stream Channel (SC1 and SC2) Future without Project (FWOP) vs. Future with Project (FWP)
Qualitative Habitat Evaluation Index (QHEI)

Category	Attribute	FWOP		FWP (SC1)		FWP (SC2)	
		Reach 1	Reach 2	Reach 1	Reach 2	Reach 1	Reach 2
Substrate	Type	9	17	19	17	17	17
	Origin	0	0	1	0	1	0
	Quality	0	0	0	0	0	0
	Sum (Max 20 Points)	9	17	20	17	18	17
Instream Cover	Type	1	8	9	9	9	9
	Amount	1	3	11	11	11	11
	Sum (Max 20 Points)	2	11	20	20	20	20
Channel Morphology	Sinuosity	1	2	1	3	1	3
	Development	1	3	7	5	7	5
	Channelization	1	1	1	1	1	1
	Stability	3	3	3	3	3	3
	Sum (Max 20 Points)	6	9	12	12	12	12
Riparian Zone	Width	3	1	3	3	3	3
	Flood Plain Quality	1	1.0	2.5	2.5	2.5	2.5
	Bank Erosion	3	3	3	3	3	3
	Sum (Max 10 Points)	7	5	8.5	8.5	8.5	8.5
Pool/Glide Quality, Current Velocity	Max Depth	0	1	2	2	2	2
	Current	2	3	4	5	4	5
	Channel Width	1	1	2	2	2	2
	Sum (Max 12 Points)	3	5	8	9	8	9
Riffle/Run Quality	Riffle Depth	0	1	2	2	2	2
	Run Depth	1	2	2	2	2	2
	Substrate Stability	0	2	2	2	2	2
	Substrate Embedded	0	1	1	1	1	1
	Sum (Max 8 points)	1	6	7	7	7	7
Gradient	(Max 10 Points)	4	6	10	10	10	10
QHEI Score (EX)		**32**	**59**	**85.5**	**83.5**	**83.5**	**83.5**
Average QHEI Score (EX)		**45.5**		**84.5**		**83.5**	

Degraded Riparian Woodland Existing Condition Floristic Quality Analysis (FQA)

SITE: Honey Creek
DATE: 10/11/2013
BY: Robbie Sliwinski

CONSERVATISM-BASED METRICS		ADDITIONAL METRICS	
MEAN C (NATIVE SPECIES)	2.46	SPECIES RICHNESS (ALL)	104
MEAN C (ALL SPECIES)	1.28	SPECIES RICHNESS (NATIVE)	54
MEAN C (NATIVE TREES)	3.06	% NON-NATIVE	0.48
MEAN C (NATIVE SHRUBS)	2.17	WET INDICATOR (ALL)	0.61
MEAN C (NATIVE HERBACEOUS)	2.17	WET INDICATOR (NATIVE)	0.11
FQAI (NATIVE SPECIES)	18.10	% HYDROPHYTE (MIDWEST)	0.42
FQAI (ALL SPECIES)	13.04	% NATIVE PERENNIAL	0.44
ADJUSTED FQAI	17.75	% NATIVE ANNUAL	0.07
% C VALUE 0	0.59	% ANNUAL	0.12
% C VALUE 1-3	0.22	% PERENNIAL	0.81
% C VALUE 4-6	0.19		
% C VALUE 7-10	0.00		

SPECIES NAME (NWPL/ MOHLENBROCK)	SPECIES (SYNONYM)	COMMON NAME	C VALUE	MIDWEST WET INDICATOR	NC-NE WET INDICATOR	HABIT	DURATION	NATIVITY
Acer negundo	Acer negundo var. violaceum	Ash-Leaf Maple	0	FAC	FAC	Tree	Perennial	Native
Acer platanoides	ACER PLATANOIDES	Norway Maple	0	UPL	UPL	Tree	Perennial	Adventive
Acer rubrum	Acer rubrum	Red Maple	5	FAC	FAC	Tree	Perennial	Native
Acer saccharinum	Acer saccharinum	Silver Maple	1	FACW	FACW	Tree	Perennial	Native
Acer saccharum	Acer saccharum	Sugar Maple	5	FACU	FACU	Tree	Perennial	Native
Ageratina altissima	Eupatorium rugosum	White Snakeroot	3	FACU	FACU	Forb	Perennial	Native
Ailanthus altissima	AILANTHUS ALTISSIMA	Tree-of-Heaven	0	FACU	UPL	Tree	Perennial	Adventive
Alliaria petiolata	ALLIARIA PETIOLATA	Garlic-Mustard	0	FAC	FACU	Forb	Biennial	Adventive
Ambrosia artemisiifolia	Ambrosia artemisiifolia elatior	Annual Ragweed	0	FACU	FACU	Forb	Annual	Native
Arctium minus	ARCTIUM MINUS	Lesser Burrdock	0	FACU	FACU	Forb	Biennial	Adventive
Bromus inermis	BROMUS INERMIS	Smooth Brome	0	FACU	UPL	Grass	Perennial	Adventive
Carex blanda	Carex blanda	Eastern Woodland Sedge	1	FAC	FAC	Sedge	Perennial	Native
Carex grisea	Carex grisea	Inflated Narrow-Leaf Sedge	3	FAC	FAC	Sedge	Perennial	Native
Celastrus orbiculatus	CELASTRUS ORBICULATUS	Asian Bittersweet	0	UPL	UPL	Vine	Perennial	Adventive
Celtis occidentalis	Celtis occidentalis	Common Hackberry	2	FAC	FAC	Tree	Perennial	Native
Centaurea stoebe ssp. micranthos	CENTAUREA MACULOSA	Spotted Knapweed	0	UPL	UPL	Forb	Biennial	Adventive
Chenopodium album	CHENOPODIUM ALBUM; Chenopodium missouriense	Lamb's-Quarters	0	FACU	FACU	Forb	Annual	Adventive

Cichorium intybus	CICHORIUM INTYBUS	Chicory	0	FACU	FACU	Forb	Perennial	Adventive
Cirsium arvense	CIRSIUM ARVENSE	Canadian Thistle	0	FACU	FACU	Forb	Perennial	Adventive
Cirsium vulgare	CIRSIUM VULGARE	Bull Thistle	0	FACU	FACU	Forb	Biennial	Adventive
Crataegus mollis	Crataegus mollis	Downy Hawthorn	2	FAC	FAC	Tree	Perennial	Native
Cryptotaenia canadensis	Cryptotaenia canadensis	Canadian Honewort	4	FAC	FAC	Forb	Perennial	Native
Dactylis glomerata	DACTYLIS GLOMERATA	Orchard Grass	0	FACU	FACU	Grass	Perennial	Adventive
Daucus carota	DAUCUS CAROTA	Queen Anne's Lace	0	UPL	UPL	Forb	Biennial	Adventive
Digitaria sanguinalis	DIGITARIA SANGUINALIS	Hairy Crab Grass	0	FACU	FACU	Grass	Annual	Adventive
Elaeagnus umbellata	ELAEAGNUS UMBELLATA	Autumn-Olive	0	UPL	UPL	Shrub	Perennial	Adventive
Erigeron annuus	Erigeron annuus	Eastern Daisy Fleabane	0	FACU	FACU	Forb	Biennial	Native
Erigeron canadensis	Conyza canadensis	Canadian Horseweed	0	FACU	FACU	Forb	Annual	Native
Euonymus alatus	EUONYMUS ALATUS	Winged Euonymus	0	UPL	UPL	Shrub	Perennial	Adventive
Euonymus hederaceus	EUONYMUS FORTUNEI	Climbing Euonymus	0	UPL	UPL	Shrub	Perennial	Adventive
Euthamia graminifolia	Solidago graminifolia; Solidago graminifolia nuttallii; Euthamia nuttallii	Flat-Top Goldentop	4	FACW	FAC	Forb	Perennial	Native
Forsythia X intermedia	FORSYTHIA X INTERMEDIA	Hybrid Golden Bell	0	UPL	UPL	Shrub	Perennial	Adventive
Fraxinus pennsylvanica	Fraxinus pennsylvanica subintegerrima; Fraxinus lanceolata	Green Ash	4	FACW	FACW	Tree	Perennial	Native
Galinsoga parviflora	GALINSOGA PARVIFLORA	Gallant-Soldier	0	FACU	UPL	Forb	Annual	Adventive
Geum canadense	Geum canadense	White Avens	1	FAC	FAC	Forb	Perennial	Native
Glechoma hederacea	GLECHOMA HEDERACEA	Groundivy	0	FACU	FACU	Forb	Perennial	Adventive
Gleditsia triacanthos	Gleditsia triacanthos	Honey-Locust	1	FACU	FAC	Tree	Perennial	Native
Hackelia virginiana	Hackelia virginiana	Beggar's-Lice	1	FACU	FACU	Forb	Perennial	Native
Helianthus tuberosus	Helianthus tuberosus	Jerusalem-Artichoke	3	FACU	FACU	Forb	Perennial	Native
Hesperis matronalis	HESPERIS MATRONALIS	Mother-of-the-Evening	0	FACU	FACU	Forb	Perennial	Adventive
Impatiens pallida	Impatiens pallida	Pale Touch-Me-Not	6	FACW	FACW	Forb	Annual	Native
Juglans nigra	Juglans nigra	Black Walnut	3	FACU	FACU	Tree	Perennial	Native
Juncus dudleyi	Juncus dudleyi	Dudley's Rush	2	FACW	FACW	Forb	Perennial	Native
Leonurus cardiaca	LEONURUS CARDIACA	Motherwort	0	UPL	UPL	Forb	Perennial	Adventive
Ligustrum vulgare	LIGUSTRUM VULGARE	European Privet	0	FACU	FACU	Shrub	Perennial	Adventive
Lonicera tatarica	LONICERA TATARICA	Twinsisters	0	FACU	FACU	Shrub	Perennial	Adventive
Lonicera X bella	LONICERA X BELLA	Showy Fly Honeysuckle	0	FACU	FACU	Shrub	Perennial	Adventive
Malus pumila	MALUS PUMILA	Apple	0	UPL	UPL	Tree	Perennial	Adventive
Melilotus albus	MELILOTUS ALBA	White Sweet-Clover	0	UPL	UPL	Forb	Biennial	Adventive
Melissa officinalis	MELISSA OFFICINALIS	Lemonbalm	0	UPL	UPL	Forb	Perennial	Adventive
Morus alba	MORUS ALBA VAR. TATARICA	White Mulberry	0	FAC	FACU	Tree	Perennial	Adventive
Muhlenbergia frondosa	Muhlenbergia frondosa	Wire-Stem Muhly	2	FACW	FACW	Grass	Perennial	Native

Nepeta cataria	NEPETA CATARIA	Catnip	0	FACU	FACU	Forb	Perennial	Adventive
Panicum dichotomiflorum	Panicum dichotomiflorum	Fall Panic Grass	0	FACW	FACW	Grass	Annual	Native
Parthenocissus quinquefolia	Parthenocissus quinquefolia	Virginia-Creeper	4	FACU	FACU	Vine	Perennial	Native
Persicaria lapathifolia	Polygonum lapathifolium; POLYGONUM SCABRUM; PERSICARIA SCABRA	Dock-Leaf Smartweed	0	FACW	FACW	Forb	Annual	Native
Phalaris arundinacea	PHALARIS ARUNDINACEA	Reed Canary Grass	0	FACW	FACW	Grass	Perennial	Adventive
Phragmites australis ssp. australis	PHRAGMITES AUSTRALIS	Common Reed	0	FACW	FACW	Grass	Perennial	Adventive
Physostegia virginiana	Physostegia virginiana	Obedient-Plant	4	FACW	FACW	Forb	Perennial	Native
Picea abies	PICEA ABIES	Norway Spruce	0	UPL	UPL	Tree	Perennial	Adventive
Pinus sylvestris	PINUS SYLVESTRIS	Scots Pine	0	UPL	UPL	Tree	Perennial	Adventive
Plantago lanceolata	PLANTAGO LANCEOLATA	English Plantain	0	FACU	FACU	Forb	Perennial	Adventive
Plantago major	PLANTAGO MAJOR	Great Plantain	0	FAC	FACU	Forb	Perennial	Adventive
Plantago rugelii	Plantago rugelii	Black-Seed Plantain	0	FAC	FAC	Forb	Annual	Native
Poa pratensis	POA PRATENSIS	Kentucky Blue Grass	0	FAC	FACU	Grass	Perennial	Adventive
Polygonum aviculare	POLYGONUM AVICULARE	Yard Knotweed	0	FAC	FACU	Forb	Annual	Adventive
Populus alba	POPULUS ALBA	White Poplar	0	UPL	UPL	Tree	Perennial	Adventive
Populus deltoides	Populus deltoides	Eastern Cottonwood	0	FAC	FAC	Tree	Perennial	Native
Prunella vulgaris ssp. lanceolata	Prunella vulgaris lanceolata	Common Selfheal	1	FAC	FAC	Forb	Perennial	Native
Prunus virginiana	Prunus virginiana	Choke Cherry	3	FACU	FACU	Shrub	Perennial	Native
Ptelea trifoliata	Ptelea trifoliata	Common Hoptree	4	FACU	FACU	Shrub	Perennial	Native
Quercus alba	Quercus alba	Northern White Oak	5	FACU	FACU	Tree	Perennial	Native
Quercus macrocarpa	Quercus macrocarpa	Burr Oak	5	FAC	FACU	Tree	Perennial	Native
Quercus rubra	Quercus rubra	Northern Red Oak	5	FACU	FACU	Tree	Perennial	Native
Rhamnus cathartica	RHAMNUS CATHARTICA	European Buckthorn	0	FAC	FAC	Shrub	Perennial	Adventive
Rhus hirta	Rhus typhina	Staghorn Sumac	1	UPL	UPL	Tree	Perennial	Native
Rubus occidentalis	Rubus occidentalis	Black Raspberry	0	UPL	UPL	Shrub	Perennial	Native
Rudbeckia laciniata	Rudbeckia laciniata	Green-Head Coneflower	4	FACW	FACW	Forb	Perennial	Native
Salix amygdaloides	Salix amygdaloides	Peach-Leaf Willow	4	FACW	FACW	Tree	Perennial	Native
Salix fragilis	SALIX FRAGILIS	Crack Willow	0	UPL	UPL	Tree	Perennial	Adventive
Salix interior	Salix interior	Sandbar Willow	2	FACW	FACW	Shrub	Perennial	Native
Sambucus nigra ssp. canadensis	Sambucus canadensis	Black Elder	4	FAC	FACW	Shrub	Perennial	Native
Sanicula odorata	Sanicula gregaria	Clustered Black-Snakeroot	3	FAC	FAC	Forb	Perennial	Native
Scirpus atrovirens	Scirpus atrovirens	Dark-Green Bulrush	4	OBL	OBL	Sedge	Perennial	Native
Securigera varia	CORONILLA VARIA	Crown Vetch	0	UPL	UPL	Forb	Perennial	Adventive
Senecio hieraciifolius	Erechtites hieracifolia	American Burnweed	0	FAC	FACU	Forb	Annual	Native
Setaria pumila	SETARIA GLAUCA	Yellow Bristle Grass	0	FAC	FAC	Grass	Annual	Adventive
Solidago altissima	Solidago altissima	Tall Goldenrod	1	FACU	FACU	Forb	Perennial	Native

Solidago gigantea	Solidago gigantea	Late Goldenrod	4	FACW	FACW	Forb	Perennial	Native
Sonchus arvensis ssp. uliginosus	SONCHUS ULIGINOSUS	Field Sow-Thistle	0	FACU	FACU	Forb	Perennial	Adventive
Symphoricarpos occidentalis	Symphoricarpos occidentalis	Western Snowberry	0	UPL	FACU	Shrub	Perennial	Native
Symphyotrichum drummondii	Aster sagittifolius drummondii	Drummond's Aster	3	UPL	UPL	Forb	Perennial	Native
Symphyotrichum lateriflorum	Aster lateriflorus	Farewell-Summer	4	FACW	FAC	Forb	Perennial	Native
Taraxacum officinale	TARAXACUM OFFICINALE	Common Dandelion	0	FACU	FACU	Forb	Perennial	Adventive
Tilia americana	Tilia americana	American Basswood	5	FACU	FACU	Tree	Perennial	Native
Trifolium pratense	TRIFOLIUM PRATENSE	Red Clover	0	FACU	FACU	Forb	Perennial	Adventive
Trifolium repens	TRIFOLIUM REPENS	White Clover	0	FACU	FACU	Forb	Perennial	Adventive
Ulmus pumila	ULMUS PUMILA	Siberian Elm	0	UPL	FACU	Tree	Perennial	Adventive
Ulmus rubra	Ulmus rubra	Slippery Elm	4	FAC	FAC	Tree	Perennial	Native
Verbascum thapsus	VERBASCUM THAPSUS	Woolly Mullein	0	UPL	UPL	Forb	Biennial	Adventive
Verbena urticifolia	Verbena urticifolia var. leiocarpa	White Vervain	2	FAC	FAC	Forb	Perennial	Native
Viburnum opulus var. opulus	VIBURNUM OPULUS	Highbush-Cranberry	0	FAC	FACW	Shrub	Perennial	Adventive
Viola sororia	Viola priceana	Hooded Blue Violet	3	FAC	FAC	Forb	Perennial	Native
Vitis riparia	Vitis riparia var. syrticola	River-Bank Grape	1	FACW	FAC	Vine	Perennial	Native

Riparian Woodland (RW) Future-With Project FQA

SITE:	Honey Creek									
LOCALE:	Marsh FWP									
BY:	Robbie Sliwinski									
NOTES:										
CONSERVATISM-BASEDMETRICS				ADDITIONALMETRICS						
MEAN C(NATIVE SPECIES)	5.18		SPECIES RICHNESS(ALL)	39						
MEAN C(ALL SPECIES)	5.18		SPECIES RICHNESS(NATIVE)	39						
MEAN C(NATIVE TREES)	n/a		% NON-NATIVE	0.00						
MEAN C(NATIVE SHRUBS)	5.75		WET INDICATOR(ALL)	-1.67						
MEAN C(NATIVEHERBACEOUS)	5.11		WET INDICATOR(NATIVE)	-1.67						
FQAI(NATIVE SPECIES)	32.35		% HYDROPHYTE(MIDWEST)	0.97						
FQAI(ALL SPECIES)	32.35		% NATIVEPERENNIAL	0.97						
ADJUSTED FQAI	51.79		% NATIVE ANNUAL	0.03						
% C VALUE 0	0.00		% ANNUAL	0.03						
% C VALUE 1-3	0.21		% PERENNIAL	0.97						
% C VALUE 4-6	0.54									
% C VALUE 7-10	0.26									
SPECIESACRONYM	SPECIES NAME(NWPL/MOHLENBROCK)	SPECIES(SYNONYM)	COMMONNAME	C VALUE	MIDWEST WET INDICATOR	NC-NE WET INDICATOR	WET INDICATOR (NUMERIC)	HABIT	DURATION	NATIVITY
acoame	Acorus americanus	Acorus americanus	Several-Vein Sweetflag	9	OBL	OBL	-2	Forb	Perennial	Native
alisub	Alisma subcordatum	Alisma subcordatum	American Water-Plantain	3	OBL	OBL	-2	Forb	Perennial	Native
ascinc	Asclepias incarnata	Asclepias incarnata	Swamp Milkweed	3	OBL	OBL	-2	Forb	Perennial	Native
bidcer	Bidens cernua	Bidens cernua	Nodding Burr-Marigold	3	OBL	OBL	-2	Forb	Annual	Native
cxcomo	Carex comosa	Carex comosa	Bearded Sedge	5	OBL	OBL	-2	Sedge	Perennial	Native
cxemor	Carex emoryi	Carex emoryi	Emory's Sedge	5	OBL	OBL	-2	Sedge	Perennial	Native
cxlacu	Carex lacustris	Carex lacustris	Lakebank Sedge	5	OBL	OBL	-2	Sedge	Perennial	Native
cxstri	Carex stricta	Carex stricta	Uptight Sedge	5	OBL	OBL	-2	Sedge	Perennial	Native
corser	Cornus alba	Cornus stolonifera; Cornus baileyi;	Red Osier	5	FACW	FACW	-1	Shrub	Perennial	Native
corobl	Cornus obliqua	Cornus obliqua	Pale Dogwood	5	FACW	FACW	-1	Shrub	Perennial	Native
decver	Decodon verticillatus	Decodon verticillatus	Swamp-Loosestrife	8	OBL	OBL	-2	Shrub	Perennial	Native
elepal	Eleocharis palustris	Eleocharis erythropoda; Eleocharis palustris major; Eleocharis smallii;	Common Spike-Rush	1	OBL	OBL	-2	Sedge	Perennial	Native
eupper	Eupatorium perfoliatum	Eupatorium perfoliatum	Common Boneset	4	OBL	FACW	-2	Forb	Perennial	Native
eutmac	Eutrochium maculatum	Eupatorium maculatum	Spotted Trumpetweed	5	OBL	OBL	-2	Forb	Perennial	Native
hiblae	Hibiscus laevis	Hibiscus laevis	Halberd-Leaf Rose-Mallow	7	OBL	OBL	-2	Forb	Perennial	Native
irivir	Iris virginica var. shrevei	Iris virginica shrevei	Virginia Blueflag	5	OBL	OBL	-2	Forb	Perennial	Native
juneff	Juncus effusus ssp. solutus	Juncus effusus	Lamp Rush	5	OBL	OBL	-2	Forb	Perennial	Native
leeory	Leersia oryzoides	Leersia oryzoides	Rice Cut Grass	3	OBL	OBL	-2	Grass	Perennial	Native
liaspi	Liatris spicata	Liatris spicata	Dense Gayfeather	7	FAC	FAC	0	Forb	Perennial	Native
lobsip	Lobelia siphilitica	Lobelia siphilitica	Great Blue Lobelia	4	OBL	FACW	-2	Forb	Perennial	Native
lycuni	Lycopus uniflorus	Lycopus uniflorus	Northern Water-Horehound	4	OBL	OBL	-2	Forb	Perennial	Native
mimrin	Mimulus ringens	Mimulus ringens	Allegheny Monkey-Flower	4	OBL	OBL	-2	Forb	Perennial	Native
nellut	Nelumbo lutea	Nelumbo lutea	American Lotus	9	OBL	OBL	-2	Forb	Perennial	Native
nymtub	Nymphaea odorata	Nymphaea tuberosa	American White Water-Lily	5	OBL	OBL	-2	Forb	Perennial	Native
pelvir	Peltandra virginica	Peltandra virginica	Green Arrow-Arum	10	OBL	OBL	-2	Forb	Perennial	Native
phyvir	Physostegia virginiana	Physostegia virginiana	Obedient-Plant	4	FACW	FACW	-1	Forb	Perennial	Native
poncor	Pontederia cordata	Pontederia cordata	Pickerelweed	9	OBL	OBL	-2	Forb	Perennial	Native
pycvir	Pycnanthemum virginianum	Pycnanthemum virginianum	Virginia Mountain-Mint	5	FACW	FACW	-1	Forb	Perennial	Native
rudsub	Rudbeckia subtomentosa	Rudbeckia subtomentosa	Sweet Coneflower	8	FACU	FACU	1	Forb	Perennial	Native
rumbri	Rumex britannica	Rumex orbiculatus	Greater Water Dock	8	OBL	OBL	-2	Forb	Perennial	Native
saglat	Sagittaria latifolia	Sagittaria latifolia	Duck-Potato	3	OBL	OBL	-2	Forb	Perennial	Native
schtab	Schoenoplectus tabernaemontani	Scirpus validus creber	Soft-Stem Club-Rush	3	OBL	OBL	-2	Sedge	Perennial	Native
sciatv	Scirpus atrovirens	Scirpus atrovirens	Dark-Green Bulrush	4	OBL	OBL	-2	Sedge	Perennial	Native
silper	Silphium perfoliatum	Silphium perfoliatum	Cup-Plant	5	FACW	FACW	-1	Forb	Perennial	Native
siusua	Sium suave	Sium suave	Hemlock Water-Parsnip	7	OBL	OBL	-2	Forb	Perennial	Native
spaeur	Sparganium eurycarpum	Sparganium eurycarpum	Broad-Fruit Burr-Reed	5	OBL	OBL	-2	Forb	Perennial	Native
spapec	Spartina pectinata	Spartina pectinata	Freshwater Cord Grass	4	FACW	FACW	-1	Grass	Perennial	Native
spialb	Spiraea alba	Spiraea alba	White Meadowsweet	5	FACW	FACW	-1	Shrub	Perennial	Native
symnov	Symphyotrichum novae-angliae	Aster novae-angliae	New England American-Aster	3	FACW	FACW	-1	Forb	Perennial	Native

Persistent Marsh/Transitional Meadow (MM) Future-With Project FQA

SITE:	Honey Creek									
LOCALE:	Marsh FWP									
BY:	Robbie Sliwinski									
NOTES:										
CONSERVATISM-BASED METRICS				**ADDITIONAL METRICS**						
MEAN C (NATIVE SPECIES)	5.18		SPECIES RICHNESS (ALL)	39						
MEAN C (ALL SPECIES)	5.18		SPECIES RICHNESS (NATIVE)	39						
MEAN C (NATIVE TREES)	n/a		% NON-NATIVE	0.00						
MEAN C (NATIVE SHRUBS)	5.75		WET INDICATOR (ALL)	-1.67						
MEAN C (NATIVE HERBACEOUS)	5.11		WET INDICATOR (NATIVE)	-1.67						
FQAI (NATIVE SPECIES)	32.35		% HYDROPHYTE (MIDWEST)	0.97						
FQAI (ALL SPECIES)	32.35		% NATIVE PERENNIAL	0.97						
ADJUSTED FQAI	51.79		% NATIVE ANNUAL	0.03						
% C VALUE 0	0.00		% ANNUAL	0.03						
% C VALUE 1-3	0.21		% PERENNIAL	0.97						
% C VALUE 4-6	0.54									
% C VALUE 7-10	0.26									

SPECIES ACRONYM	**(NWPL/ MOHLENBROCK)**	**SPECIES (SYNONYM)**	**COMMON NAME**	**C VALUE**	**MIDWEST WET INDICATOR**	**NC-NE WET INDICATOR**	**INDICATOR (NUMERIC)**	**HABIT**	**DURATION**	**NATIVITY**
acoame	Acorus americanus	Acorus americanus	Several-Vein Sweetflag	9	OBL	OBL	-2	Forb	Perennial	Native
alisub	Alisma subcordatum	Alisma subcordatum	American Water-Plantain	3	OBL	OBL	-2	Forb	Perennial	Native
ascinc	Asclepias incarnata	Asclepias incarnata	Swamp Milkweed	3	OBL	OBL	-2	Forb	Perennial	Native
bidcer	Bidens cernua	Bidens cernua	Nodding Burr-Marigold	3	OBL	OBL	-2	Forb	Annual	Native
cxcomo	Carex comosa	Carex comosa	Bearded Sedge	5	OBL	OBL	-2	Sedge	Perennial	Native
cxemor	Carex emoryi	Carex emoryi	Emory's Sedge	5	OBL	OBL	-2	Sedge	Perennial	Native
cxlacu	Carex lacustris	Carex lacustris	Lakebank Sedge	5	OBL	OBL	-2	Sedge	Perennial	Native
cxstri	Carex stricta	Carex stricta	Uptight Sedge	5	OBL	OBL	-2	Sedge	Perennial	Native
corser	Cornus alba	Cornus stolonifera; Cornus baileyi; Cornus sericea	Red Osier	5	FACW	FACW	-1	Shrub	Perennial	Native
corobl	Cornus obliqua	Cornus obliqua	Pale Dogwood	5	FACW	FACW	-1	Shrub	Perennial	Native
decver	Decodon verticillatus	Decodon verticillatus	Swamp-Loosestrife	8	OBL	OBL	-2	Shrub	Perennial	Native
elepal	Eleocharis palustris	Eleocharis palustris major; Eleocharis smallii; Eleocharis xyridiformis; Eleocharis macrostachya	Common Spike-Rush	1	OBL	OBL	-2	Sedge	Perennial	Native
eupper	Eupatorium perfoliatum	Eupatorium perfoliatum	Common Boneset	4	OBL	FACW	-2	Forb	Perennial	Native
eutmac	Eutrochium maculatum	Eupatorium maculatum	Spotted Trumpetweed	5	OBL	OBL	-2	Forb	Perennial	Native
hiblae	Hibiscus laevis	Hibiscus laevis	Halberd-Leaf Rose-Mallow	7	OBL	OBL	-2	Forb	Perennial	Native
irivir	Iris virginica var. shrevei	Iris virginica shrevei	Virginia Blueflag	5	OBL	OBL	-2	Forb	Perennial	Native
juneff	Juncus effusus ssp. solutus	Juncus effusus	Lamp Rush	5	OBL	OBL	-2	Forb	Perennial	Native
leeory	Leersia oryzoides	Leersia oryzoides	Rice Cut Grass	3	OBL	OBL	-2	Grass	Perennial	Native
liaspi	Liatris spicata	Liatris spicata	Dense Gayfeather	7	FAC	FAC	0	Forb	Perennial	Native
lobsip	Lobelia siphilitica	Lobelia siphilitica	Great Blue Lobelia	4	OBL	FACW	-2	Forb	Perennial	Native
lycuni	Lycopus uniflorus	Lycopus uniflorus	Northern Water-Horehound	4	OBL	OBL	-2	Forb	Perennial	Native
mimrin	Mimulus ringens	Mimulus ringens	Allegheny Monkey-Flower	4	OBL	OBL	-2	Forb	Perennial	Native
nellut	Nelumbo lutea	Nelumbo lutea	American Lotus	9	OBL	OBL	-2	Forb	Perennial	Native
nymtub	Nymphaea odorata	Nymphaea tuberosa	American White Water-Lily	5	OBL	OBL	-2	Forb	Perennial	Native
pelvir	Peltandra virginica	Peltandra virginica	Green Arrow-Arum	10	OBL	OBL	-2	Forb	Perennial	Native
phyvir	Physostegia virginiana	Physostegia virginiana	Obedient-Plant	4	FACW	FACW	-1	Forb	Perennial	Native
poncor	Pontederia cordata	Pontederia cordata	Pickerelweed	9	OBL	OBL	-2	Forb	Perennial	Native
pycvir	Pycnanthemum virginianum	Pycnanthemum virginianum	Virginia Mountain-Mint	5	FACW	FACW	-1	Forb	Perennial	Native
rudsub	Rudbeckia subtomentosa	Rudbeckia subtomentosa	Sweet Coneflower	8	FACU	FACU	1	Forb	Perennial	Native
rumbri	Rumex britannica	Rumex orbiculatus	Greater Water Dock	8	OBL	OBL	-2	Forb	Perennial	Native
saglat	Sagittaria latifolia	Sagittaria latifolia	Duck-Potato	3	OBL	OBL	-2	Forb	Perennial	Native
schtab	Schoenoplectus tabernaemontani	Scirpus validus creber	Soft-Stem Club-Rush	3	OBL	OBL	-2	Sedge	Perennial	Native
sciatv	Scirpus atrovirens	Scirpus atrovirens	Dark-Green Bulrush	4	OBL	OBL	-2	Sedge	Perennial	Native
silper	Silphium perfoliatum	Silphium perfoliatum	Cup-Plant	5	FACW	FACW	-1	Forb	Perennial	Native
siusua	Sium suave	Sium suave	Hemlock Water-Parsnip	7	OBL	OBL	-2	Forb	Perennial	Native
spaeur	Sparganium eurycarpum	Sparganium eurycarpum	Broad-Fruit Burr-Reed	5	OBL	OBL	-2	Forb	Perennial	Native
spapec	Spartina pectinata	Spartina pectinata	Freshwater Cord Grass	4	FACW	FACW	-1	Grass	Perennial	Native
spialb	Spiraea alba	Spiraea alba	White Meadowsweet	5	FACW	FACW	-1	Shrub	Perennial	Native
symnov	Symphyotrichum novae-angliae	Aster novae-angliae	New England American-Aster	3	FACW	FACW	-1	Forb	Perennial	Native

Table 1 – Future-Without Project and Future-With Project Benefit Calculations

Description	Habitat Types	Acres	HIS	AAHUs	NAAHUs																	
No Action / FWOP	Stream Channel FWOP	8 2	0 46	3 73		0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46
	Transitional Meadow & Persistent Marsh FWOP	0 0	0 13	0 00		0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13
	Riparian Woodland FWOP	48 7	0 13	6 33		0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13
						0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Action / FWP	Stream Channel (SCa) FWP	8 2	0 85	6 93	3 20	0 5	0 53	0 61	0 69	0 77	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85
	Stream Channel (SCb) FWP	8 2	0 84	6 85	3 12	0 5	0 53	0 61	0 68	0 76	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84
	Transitional Meadow & Persistent Marsh FWP	2 2	0 48	1 05	1 05	0 1	0 2	0 28	0 35	0 43	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50
	Riparian Woodland (RWa) FWP	19 5	0 41	8 04	1 71	0 1	0 2	0 25	0 31	0 37	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43
	Riparian Woodland (RWb) FWP	39 1	0 41	16 12	9 79	0 1	0 2	0 25	0 31	0 37	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43
	Riparian Woodland (RWc) FWP	46 0	0 41	18 86	12 53	0 13	0 19	0 25	0 31	0 37	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43

Habitat Types																	
Stream Channel FWOP	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46
Transitional Meadow & Persistent Marsh FWOP	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13
Riparian Woodland FWOP	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13
	17	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**
Stream Channel (SCa) FWP	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85
Stream Channel (SCb) FWP	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84
Transitional Meadow & Persistent Marsh FWP	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50
Riparian Woodland (RWa) FWP	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43
Riparian Woodland (RWb) FWP	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43
Riparian Woodland (RWc) FWP	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43

Habitat Types																	
Stream Channel FWOP	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46	0 46
Transitional Meadow & Persistent Marsh FWOP	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13
Riparian Woodland FWOP	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13	0 13
	34	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
Stream Channel (SCa) FWP	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85	0 85
Stream Channel (SCb) FWP	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84	0 84
Transitional Meadow & Persistent Marsh FWP	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50	0 50
Riparian Woodland (RWa) FWP	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43
Riparian Woodland (RWb) FWP	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43
Riparian Woodland (RWc) FWP	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43	0 43

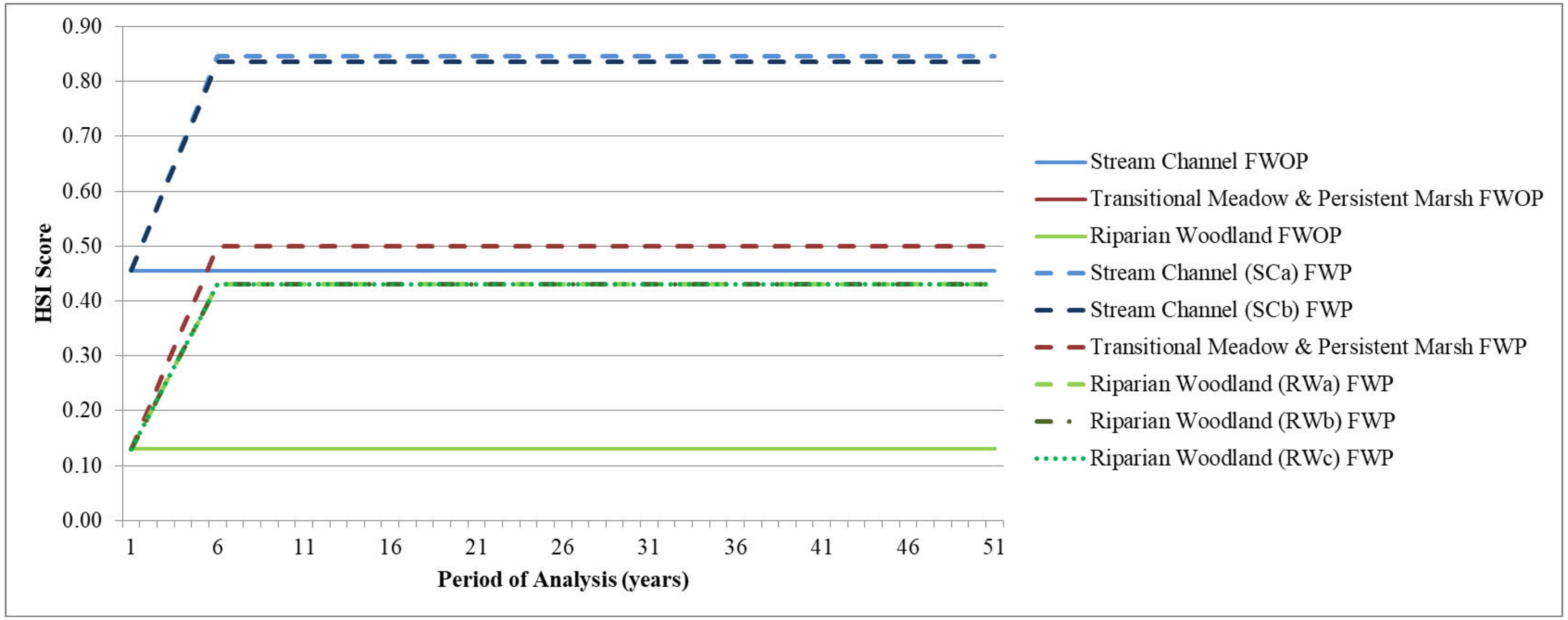

Figure 1 – FWOP vs. FWP for Stream Habitat (SCa and SCb) and Marsh and Riparian Plant Community Habitat Suitability. Transitional Meadow & Persistent Marsh and Riparian Woodland FWOP = 0.13, Which Overlie Each Other.

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