

2018-2019

FINAL REPORT

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Pearl Island Recreational Corridor conservation plan

ENVIRONMENTAL STUDIES 972: CONSERVATION PLANNING

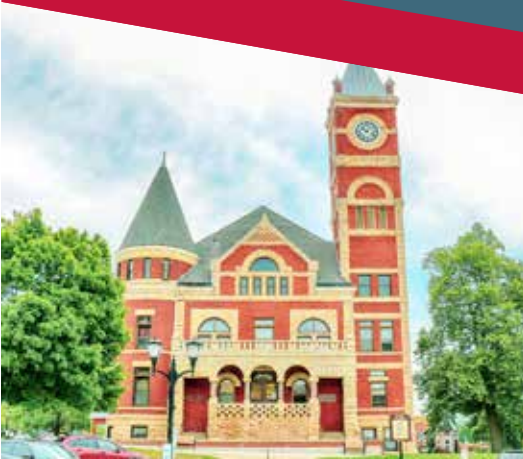


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1. Project Summary

1.1. Project Name: Pearl Island Recreation Corridor Conservation Project

1.2. Project Location: Brodhead, Wisconsin

1.3. Project Vision

“Restoring the Pearl Island Corridor to a healthy biodiverse area, which will serve as a cultural and social escape, while providing recreation opportunities that offer a connection for locals and visitors to the City of Brodhead.”

1.4. Contact Name & Address

Jeff Peterson

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Rich Vogel

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1.5. Project Timeline

- Project Start: Sept 5, 2018
- Project End: Project Goals are striving for success between the years 2025-2030

1.6. Brief Project Description

The Pearl Island Recreational Corridor is an 80-acre recreational property located in Brodhead, WI, just 10 miles north of the Wisconsin/Illinois border. This community project began in November 2012 when the property received a matching grant in order to fund recreational activity enhancement. There are three main ecosystems that were chosen for conservation biodiversity targets (see Glossary). The site contains a portion of Decatur Lake, the first biodiversity target, where the project team choose to focus on increasing the water quality of the lake in order to enhance recreational opportunities such fishing, boating, and kayaking. A second target of this project site is the Mill Race: a hand dug waterway created in the mid 1800's to furnish power for factories and a flour mill in the City of Brodhead. The project team chose to focus on increasing the riparian buffer zone of the Mill Race in an effort to increase native vegetation in order to mitigate runoff from nearby residential and agricultural areas, as well as lessen the severity of flooding. The third and final target of this project is the surrounding lowland forest area along the Mill Race, which contains several recreational trails with cultural

significance to the city. This area was once predominately Ash trees, however, the forest area was recently devastated by the Emerald Ash Borer. This caused a large reduction in tree cover. The area is also highly susceptible to flooding from the Mill Race due to increased precipitation caused by climate change. The focus on this target is to create more “water-resilient” trails by planting trees that can persist in wetter environments as well as replace the Ash trees lost to the Emerald Ash Borer. With the generation of an Open Standards plan for this project site, the Pearl Island Recreational Corridor project aims to increase the engagement, restoration, and management of the composed area in an effort to improve the site as a community recreational attraction.

2. Introduction

2.1 Project Area Description

This project is focused on the specific area of the Pearl Island Recreational Corridor: an 80-acre parcel of land located in Brodhead, WI. Pearl Island gets its name from the “pearl rush” that occurred in the Sugar River in the early 1900’s. During this time, a pearl that was harvested from a mussel in the river was said to be of such fine quality that it ended up in the Crown Jewels of London (Lower Sugar River Watershed Association, 2013).

There are three ecosystems chosen as biodiversity target areas on this property, with the first being a portion of Decatur Lake. This 109-acre/ 10 ft deep lake is part of the larger surrounding area of Brodhead, not just the project site. We are specifically choosing to focus on the aquatic ecosystem at Headgates Park (See Figure 3, in section 4 below) which is based around Decatur Lake and is the main entryway for recreational usage as it is only public boat launch site. The lake can also be accessed through the Mill Race; a hand dug waterway created in the mid 1800’s to furnish power for factories and a flour mill. This is the second ecosystem chosen as a biodiversity target for this project site. More specifically, the project team is focusing on improving the buffer strip along this riparian ecosystem to reduce runoff into the Mill Race. The maximum depth is roughly two feet due to sediment runoff accumulating and the lack of dredging now that the factories and flour mill are no longer in existence. The waterway continues to act as flowage for the city’s treatment plant, but is mainly used for recreational activities such as kayaking, canoeing, and fishing. The third ecosystem chosen as a biodiversity target is the lowland forest ecosystem along the Mill Race. This area is a significant area for recreational

trails as it commonly used for nature hikes in the spring and summer, as well as skiing in the winter. Much of the trail area is surrounded on each side by both the Mill Race watershed and the Lower Sugar River watershed. With precipitation changes from climate change impacts becoming more prevalent, this makes the area more prone to flooding during high precipitation events. Another problem this forest area is facing is the loss of almost all of the Ash trees due to the Emerald Ash Borer; an exotic beetle whose larvae feasts on the inner bark of ash trees and disrupts the tree's ability to transport water and nutrients (WI DNR, 2018). The area lost a substantial amount of tree cover, which has led to increased soil erosion and runoff into the Mill Race.

2.2 Conservation Plan for Project Area: Past & Present

While there has been ongoing work on the Pearl Island Recreational Corridor over the last five years, there has not been any previous use of Open Standards planning on this project. With the help of two WI Department of Natural Resources (DNR) recreational grants, much of the beginning of this work has been to increase the recreational usage of the property. This has involved adding more park benches and clearing the property trails of deceased trees due to Emerald Ash Borer decimation and oversaturated soil due to increased flooding.

With the help of the Pearl Island Corridor Project Managers, we intend to facilitate Open Standards planning efforts in order to further increase the recreational usage of the property. The project team recognized the need for a more detailed analysis of goals and objectives in order to create a detailed strategic plan in the effort to facilitate greater recreational property usage. Climate change will continue to impact this project site and planning efforts are needed to mitigate the predicted impacts on each of the three biodiversity targets. The project team's goals intend to help with the creation and implementation of climate change mitigation actions by creating a friends group in order to increase the workforce needed to maintain recreational usage of the Pearl Island Corridor. The project team would like to use the Open Standards planning process to engage both citizens of Brodhead, as well as attract tourists to the location as a way to boost the local economy.

2.3 Legislation, Orders or Documents Related to Establishment & Management of the Project Area

This area is of high historical significance to the city of Brodhead. The loss of Woodbridge Corporation in 2009, a factory that held jobs for many Brodhead citizens, had a profound economic effect on the city and prompted a reevaluation of its assets, i.e the Mill Race. In November 2012, the city procured the first DNR grant to improve the Mill Race, which began what we now know as the Pearl Island Corridor Restoration Project. The property has since received another grant from the DNR (Alley, n.d). Both of these grants are recreational grants totaling roughly five hundred thousand dollars. We are not aware of any additional funding at this time.

Decatur Lake and the Mill Race are part of the subwatershed of the Sugar River. While the Sugar River is listed as an Exception Resource Water (ERW) in Wisconsin, sections are impaired due to excessive phosphorus. Point source discharge from the City of Brodhead's wastewater treatment facility and non-point source runoff from agricultural fields cause high levels of phosphorus to enter Decatur Lake and the Mill Race. Because of this, both water bodies have been placed on the DNR's 303d Impaired Waters list. This is a section of the Clean Waters Act that publishes waters that are not meeting water quality standards (DNR, 2017).

3. Methods

3.1. Project Team

Redacted

3.2. Conservation Planning Approach

In regard to the creation of this Open Standards project plan for the Pearl Island Recreational Corridor, the project team followed the steps of the cyclical diagram (Figure 1) in order to devise a conservation plan to increase recreational usage of the property.

Step 1: Conceptualize. Using the Miradi software, the project team conducted the following activities to develop an Open Standards plan for the Pearl Island Corridor.

1. Defined the project team, advisors, and stakeholders.
2. Defined the project scope and developed a vision for the project site.
3. Identified conservation biodiversity targets. Three ecosystem targets were chosen: Riparian Buffer (along the Mill Race), Lowland Forest, Aquatic Ecosystem to best represent the composition of the project site.
4. Assessed direct threats, indirect threats, stresses, indicators, and key ecological attributes (KEA's) in relation to the biodiversity targets.
5. Identified and ranked threats using a threat rating table generated in Miradi.
6. Developed a conceptual model in Miradi that described the relationships between targets, threats, human well-being targets, ecosystem services, and vision statements.
7. Developed an action plan based on the goals set for each biodiversity target.

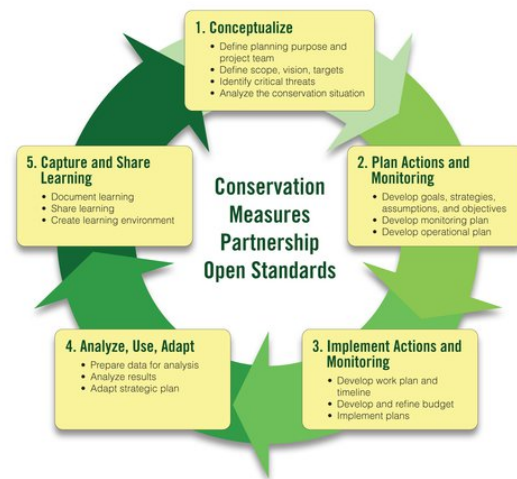


Figure 1: Open Standards Planning Cycle Diagram (CMP, 2013)

Step 2: Plan Actions and Monitoring. The concepts in this step include developing goals, strategies, assumptions, and objectives. From this, the project team was able to develop a monitoring and operational plan in Miradi in order to determine the data needed for the monitoring approach. This information will be needed to evaluate the success of the conservation planning process for this project site.

Step 3: Implement Actions and Monitoring. The concepts in this step include developing a work plan and budget and ultimately implementing the plans. Though the Master's students will not be involved in the actual implementation, a work plan was created in Miradi to lay out the process to be used by the project managers.

Step 4: Analyze, Use, and Adapt. This step involves preparing the data for analysis and analyzing the results. The project team is currently using Miradi to prepare the data analysis and create a way for the project managers to analyze the results once the conservation plan has been finalized.

4. Scope, Vision and Biodiversity Targets

4.1 Scope and Maps



Figure 2 State map (WDOT)

The geographic scope of the Pearl Island Recreational Corridor – hereafter referred to as PIRC scope – is an 80-acre parcel of land located in Green County Wisconsin in the city of Brodhead (Figure 1.). The area is a biodiversity corridor situated between residential and agricultural development. The PIRC scope runs south from Decatur Lake and is bordered by 2 riverways, the Sugar River to the west and the Mill Race on the east. Decatur Lake is a small lake on the north end of the site (Figure 2.).

The PIRC scope is abundant in flora and fauna (Ellefson, 2013). Within the scope is a mesic forest remnant, prairie remnants, a small lake, and the Mill Race. There are 2 dams located on the property, Headgates Dam and Decatur Dam (Figure 2.).

Visitors come to Pearl Island to enjoy recreational activities as well as cultural and spiritual experiences. There are a series of hiking trails throughout the property, two picnic shelters, a boat launch, and information kiosks detailing area history and trail maps. Recreational opportunities include hiking, bird watching, ice skating, biking, kayaking and canoeing.

Preserving and restoring the biologically diverse ecosystems within the PIRC scope will enhance the sustainability of the area as a recreational attraction for generations to come. We have identified three conservation targets important to both biodiversity and the recreational sustainability of the PIRC-scope. Our biodiversity targets include the Lowland Forest, Decatur Lake and the riparian corridor of the Mill Race.

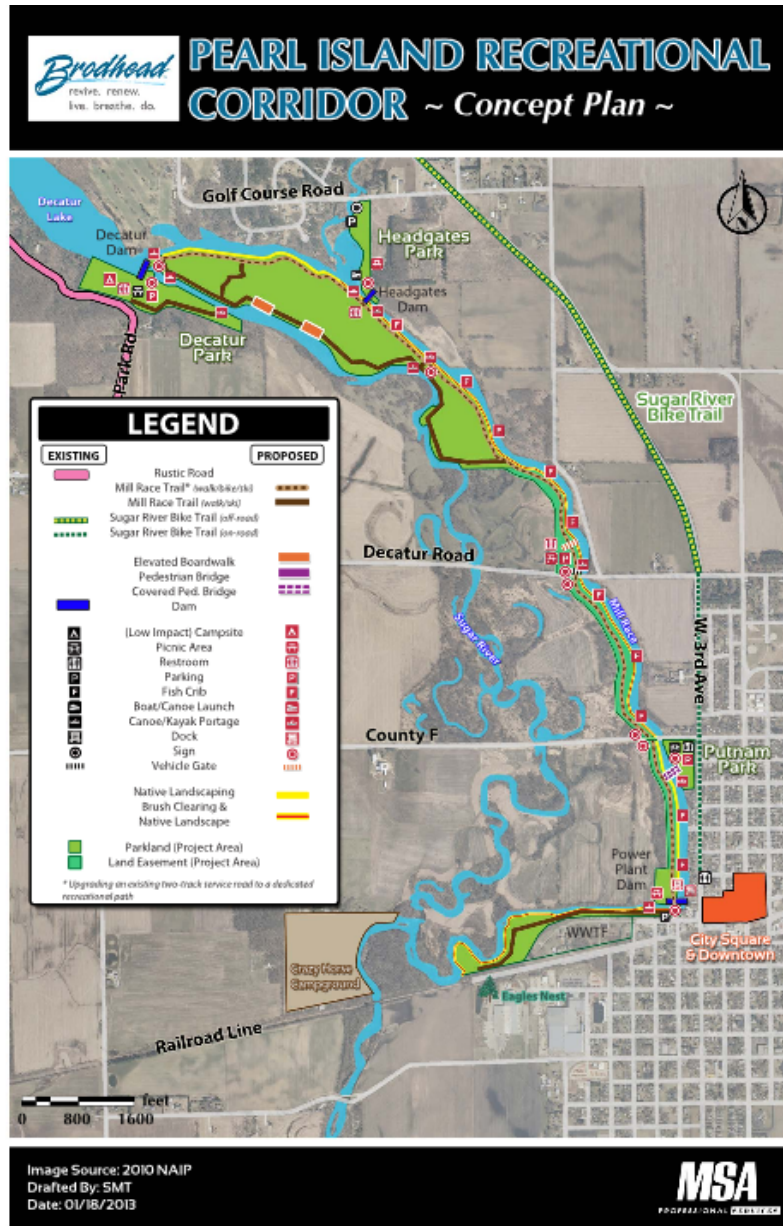


Figure 3 Concept Plan Map, provided by Project Managers. (City of Brodhead)

4.2 Vision

“Restore the Pearl Island Recreational Corridor to a healthy, biodiverse area, which will serve as a cultural and social escape, while providing opportunities that offer a connection for locals and visitors to the City of Brodhead”.

4.3 Biodiversity Targets

- Lowland Forest
- Decatur Lake
- Riparian Buffer

4.3.1 Decatur Lake

Decatur Lake is an aquatic ecosystem biodiversity target near Headgates Park. There is a variety of animal, bird, fish, amphibian, reptile, and insect species in the aquatic ecosystem (Ellefson, 2013). In addition, there is a population of aquatic and native vegetative species. Fishing, kayaking and canoeing are recreational activities provided by this aquatic ecosystem. The lake offers cultural and spiritual identification for locals and visitors and adds aesthetic beauty to the center of the property.

4.3.2 Lowland Forest

Tree species found in the Lowland Forest include, eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), red oak (*Quercus rubra*), shag bark hickory (*Carya ovata*), black oak (*Acer nigrum*) American Linden (*Tilia Americana*), hardy catalpa (*Catalpa speciosa*), hackberry (*Celtis occidentalis*), hop hornbeam (*Ostrya virginiana*), (Appendix A.) The forest is located on the west section of the property along the floodplain of the Sugar River. This area is key habitat for bird, animal, reptile, amphibian, insect populations unique to southern Wisconsin (Ellefson 2013). Understory vegetation consists of native forbs, shrubs, grasses and sedges (Appendix A.). The forest is an important stop over point for migratory bird species (Ellefson 2013) Trails in the lowland forest offer recreational opportunities for hiking, biking, and bird watching. There is a strong connection, spiritually and culturally, to the forest by the local community.

4.3.3 Riparian Buffer

The riparian buffer ecosystem target includes the shoreline running parallel to the Mill Race, on the eastern section of the property. The Mill race is a hand dug riverway, previously used as a waterway to divert water from the Sugar River to a mill and a power facility that is no longer on the property.

There is a strong cultural and historical identification with the Mill Race dating back to the origins of the City of Brodhead. Area naturalist, Paul Roemer, has initiated a prairie restoration project near the riparian buffer (Appendix B.) Restoring the buffer with native flowering plants and prairie grasses will mitigate soil erosion and add aesthetic beauty for the visitors walking the trails along the Mill Race.

5. Viability Assessment

In the viability assessment table below, chosen biodiversity targets, their key ecological attributes (KEAs), indicators of progress and desired statuses are described. Ratings used to describe the amount of management needed to attain differing goals levels of ecological stability is described using the following measurements of success.

1. Poor: Restoration increasingly difficult; May result in extirpation
2. Fair: Outside acceptable range of variation; Requires human intervention
3. Good: Indicator w/in acceptable range of variation; Some intervention required for maintenance
4. Very Good: Ecologically desirable status; Requires little intervention for maintenance

Viability Assessment table: Exported as PNG from Miradi - Pearl Island (v0.51)

Item	Viability Mode	Status	Future Status	Type	Poor	Fair	Good	Very Good	Source
Pearl Island (v0.51)		Good	Very Good						
Decatur Lake	Key	Good	Very Good						
Water Quality		Good	Very Good	Condition					
Turbidity		Good	Very Good		<1m	1-2m	>2-3m	>3m	Onsite /
2018-09-29: 2.5m							⇒ 2.5m		Rapid
2030-10-04								△ >3m	
Lowland Forest	Key	Not Specified	Very Good						
Hydrological Capacity		Not Specified	Very Good	Condition					
Percentage of target area with		Not Specified	Very Good		<25%	25-50%	>50-75%	>75%	Rough Guess
2018-09-29: -									Rough Guess
2030-10-04								△ >75%	
Riparian Buffer	Key	Fair	Good						
Extent of connected buffer		Fair	Good	Landscape					
Miles of connective native species along stretch of habitat		Fair	Good		<2mi	2-4mi	>4-6mi	>6mi	Rough Guess
2018-09-29: 2-4mi (est)						2-4mi (est)			Rough Guess
2030-10-04							△ >4-6mi		
Native species composition		Fair	Very Good	Not Specified					
Observed number of native plant species in metre by metre		Fair	Very Good		0-2	>2 - 3	>3 - 4	>4	Rough Guess
2018-09-30: Est of 2 - 3 native species/meter						⇒ Est of 2 - 3 n...			Rough Guess
2025-10-31								△ 5 native spec...	

Table 4: Viability assessment , Pearl Island

5.1 Biodiversity Target: Decatur Lake – See Table 1, lines 2 – 6

- Description and Justification of KEA (Water Quality) – Water quality is a fundamental component of a healthy aquatic ecosystem. With mentions of erosion, generally cloudy water and heavy rain events featuring in multiple discussions with our primary project representative and Decatur Lake’s presence on state’s list of impaired waters (303d), we knew this attribute was a crucial component for further study and action. (Fondriest, 2014 and LSRWA)

- Description and Justification of Indicator (Turbidity) - Turbidity is recognized as an effective and affordable measurement of general water quality. It is strongly indicative of the amount of suspended particulates, or suspended solids (often referred to as Total Suspended Solids, or TSS) within water. TSS have a generally negative impact on water quality. Turbidity can be easily measured by an individual using inexpensive equipment such as the Secchi disk, used for our initial measurement. However, over time it is likely that investment in more detailed analytical equipment to measure the relative concentrations of specific nutrients in the waterbody will be of value, and lead to increasingly improved understanding of the inputs into the water system. (Fondriest, 2014)
 - Definition of ratings: Our indicator ratings for Turbidity in the Aquatic Ecosystem cover a small measured improvement (thus a reduction in TSS) at each rating level and reflect not only the difficulties in achieving large changes in water quality over compressed timeframes, but also the spatial limitations of the water body itself. Decatur Lake is only 10 feet at its deepest point, meaning that reaching turbidity measurements of just above 3 meters is representative of the highest accomplishment possible for this water body. (Fondriest, 2014)
 - Poor - <1m
 - Fair - 1-2m
 - Good - >2-3m
 - Very Good - >3m

- Current and Desired status:
 - Current: Good - This measurement of 2.5m, taken by secchi disc 09/29/2018 on Decatur Lake at Headgates Park, reflects the current turbidity of Decatur Lake.
 - Desired: Very Good - Our target goal, for the Aquatic Ecosystem, is to see turbidity measurements improve by 20% of current measurements by 2030. This would bring the measurement to 3.0m. As mentioned above, this will act as an indicator of improvements in water quality. Decatur Lake is only 3.048 meters deep at maximum, so expectations of improvements significantly beyond 3 meters are unrealistic. (WDNR)
- Goal for target (Decatur Lake) - Improve current turbidity measurements of 2.5 meters in Decatur Lake at Headgates Park to 3.0 by 2030.

5.2 Biodiversity Target: Lowland Forest - See Table 1, lines 7 - 11

- Description and Justification of KEA (Hydrological capacity) - The capacity of this landscape to mediate and conduct volumes of precipitation has a direct reflection and impact on its usability by the public, as well as the ability to consistently maintain the habitat for both recreation and the exclusion of invasive species harmful to native communities. The usability of the two primary trails through this habitat will depend heavily on the overall systems capability of taking in and processing water.
- Description and Justification of Indicator (Percentage of target area with water tolerant species present) - The lowland forest ecosystem is currently seasonally compromised by extensive flooding, which has worsened significantly over the past three years, alongside the loss of previously resident trees detailed below. In an effort to decrease water retention time within this habitat, we are recommending the inclusion of additional native tree species, who are tolerant of moist soils and punctuated precipitation events. These additional trees would replace previously resident Ash trees, which were decimated by the recent Emerald Ash Borer infestation. Estimated acreage from non-conservation professional is at or above 10 acres. (Romano, 2010)

- Definition of ratings: Our indicator ratings for the “percentage of target area with water tolerant species present” in the Lowland Forest Ecosystem indicate initial estimates based on anecdotal information from Project Manager Jeff Peterson on the former extent of Ash trees on this habitat segment. Ash trees are often considered water tolerant and increasing the volume of tree species present will decrease water retention time, as trees consume sizeable amounts of water. Jeff and other project members credit these trees with regulating flood events in the past and taking in large volumes of water. These estimates do not take in to account the relative amounts of other woody vegetation in the area. These estimates also do not specify a particular biomass/canopy size measurement, as these components will be dependent on tree species. (Romano, 2010)
 - Poor - <25%
 - Fair - 25-50%
 - Good - >50-75%
 - Very Good - >75%
- Current and desired status:
 - Current: Unknown - No current value/data available on relative acreage of current native tree species. Importance of gathering further data emphasized informally and will be described specifically in recommended actions.
 - Desired: Very Good - Est above 75% (or >7.5 acres) of target area would have water-tolerant native tree species present (current estimate from project managers of total acreage at or just above 10 acres).
- Goals for target - Improve percentage of water-tolerant tree species per acre to greater than or equal to 75% by 2030 within the lowland forest ecosystem located west of the Mill Race.

5.3 Biodiversity Target: Mill Race Riparian Buffer - See Table 1, lines 12 – 20

- Description and Justification of KEA (Native Species Composition) – As previous courses and project team background have taught us, species biodiversity is often a direct reflection of ecological health, and the makeup, or composition, of native species within the riparian buffer target will be an excellent indicator of how healthy this biodiversity target is.
- Description and Justification of Indicator (Observed number of native species in riparian buffer meter by meter plots) – Visual observation of native species and corresponding counts of observed species per given area will function as a reliable and inexpensive method of measuring species composition. Transects, or small plots, can be easily designated and delineated with string, after which species within the space can be counted and recorded.
 - Definition of ratings: Our indicator ratings for “Observed number of native species in riparian buffer meter by meter plots...” in the Riparian Buffer Ecosystem Target cover what we feel are workable and realistic goals from a manpower/labor expectation as well as a financial commitment. Recognizing that isolated plantings have already occurred along smaller sections of the Mill Race banks thanks to a member of restoration group Applied Ecological and that species diversity within riparian buffers is strongly variable and not always correlated with efficiency, estimates for these rankings are reflective of the diversity and volume of species planted along with recognition that these sections may be subject to punctuated run-off disturbance. The latter may impede large increases in biodiversity. (Hille, 2018) For a complete list of currently planted species, please see our Appendix 1C.
 - Poor – 0-2/meter
 - Fair - >2 – 3/meter
 - Good - >3 – 4/meter
 - Very Good - >4 /meter

- Description and Justification of KEA (Extent of connected riparian buffer along Mill Race banks) - The degree and scope of the connectivity of riparian buffers in the project area, as well as their adherence to native species composition will directly impact soil retention and nutrient uptake from stormwater events and nearby runoff sources. This will reduce erosion and offer slow but steady benefits to water quality. (Stutter, 2012 and Hille, 2018)

- Description and Justification of Indicator (Miles of connective riparian buffer along Mill Race) - While there are currently an estimated 2+ miles of riparian buffer along respective waterbodies, there remains several miles that could be connected. Additionally, native species composition of said buffer is currently unknown and will have marked impacts not only on invasive species colonization within this specific buffer habitat, but also within the neighboring terrestrial habitats. While obtaining significant width of buffer may be difficult due to bank slopes and available space, connectivity and a focus on attractive native species should improve functionality and palatability for the community. (Stutter, 2012 & Hille, 2018)
 - Definition of ratings: Our indicator ratings for “miles of connective riparian Buffer...” in the Riparian Buffer Ecosystem Target cover what we feel are workable and realistic goals from a manpower/labor expectation as well as a financial commitment. Lower ratings indicate large overall stretches of the Mill Race banks are generally low grasses and common weeds, ineffective at slowly and absorbing runoff from storm events. They are also intended to illustrate the importance and benefits of uninterrupted stretches of buffer, in order to slow and potentially absorb storm water runoff across the length of Mill Race banks. Increasing mileage of connected buffer habitat will correspondingly decrease the volume of uninterrupted runoff that hits and moves into the Mill Race. However, it is worth noting that to achieve the final rating of “Very Good,” additional sections of the eastern bank of the Mill Race will need to be cleared of significant volumes of brush in order to be planted and maintained. This may result in the need/desire for easements on adjacent properties to ensure future ease of access

and management for project partners, particularly with the aim of continuing observation for and removal of invasive species. (Stutter, 2012 and Hille, 2018)

- Poor - <2mi
 - Fair - 2-4mi
 - Good - >4-<6mi
 - Very Good - >6mi
- Current and desired status:
 - Current: Fair - We've estimated 2-3 miles of riparian buffer along the western banks of the Mill Race and Decatur Lake based on two observation periods on September 23 and 29, 2018. Several remaining unconnected or unvegetated miles remain. However, the eastern side of the bank is heavily wooded and has a more severe slope, which extends up into sections of private property.
 - Desired: Good - The group has estimated 4-6 miles of connective buffer as a strong start and significant improvement to the current buffer status/functionality. Currently we estimate between 2 and 3 miles connected. As mentioned in the monitoring plan - as basic distance goals are surmounted, additional attention can be paid to species composition, nutrient/stormwater retention at more granular levels.
 - Goal for target - Establish connected riparian buffer composed of native species along 4-6 miles of the eastern and western banks of the Mill Race by 2030.

6. Direct Threat Assessment

6.1 Threat Rating

6.1(a) Method:

Each of our three established biodiversity targets faces its own unique set of threats. For each target-threat relationship, we used our knowledge of labor and funding resources and reflected on our site observations to rate categories of scope, severity, and irreversibility as low, medium, high, or very high. After entering our determined ratings for these categories, Miradi generated a summary threat rating of low, medium, or high for each threat. Summary target ratings are also generated.

6.1(b) Summary:

The summary threat ratings are as follows:

- Agriculture and Residential Development - Low
- Invasive Species – Low
- Landscape Management Decisions - Medium

The Summary Target ratings are as follows:

- Aquatic Ecosystem – Medium
- Lowland Forest – Low
- Riparian Buffer – Low

*The overall project rating is medium.

Scoring

Scope:

Very High : The threat is likely to be pervasive in its scope, affecting the target across all or most (71-100%) of its occurrence/ population.

High: The threat is likely to be widespread in its scope, affecting the target across much (30-70%) of its occurrence/ population.

Medium: The threat it likely to be restricted to its scope, affecting the target across some (11-30%) of its occurrence/ population.

Low: the threat is likely to be very narrow in its scope, affecting the target across a small proportion (1-10%) of its occurrence/ population.

Severity:

Very High: Within the scope, the threat is likely to destroy or eliminate the target or reduce its population by 71-100% within ten years or three generations.

High: Within the scope, the threat is likely to seriously degrade or reduce the target or reduces its population by 31-70% within ten years or three generations.

Medium: Within the scope, the threat is likely to moderately degrade or reduce the target or reduce its population by 11-30% within ten years or three generations.

Low: Within the scope, the threat is likely to only slightly destroy or eliminate the target or reduce its population by 1-10% within ten years or three generations.

Irreversibility:

Very High: The effects of the threats cannot be reversed, and it is very unlikely the target can be restored, and/or it would take more than 100 years to achieve this (e.g., wetlands converted to a shopping center).

High: The effects of the threats can technically be reversed, and the target can be restored, but it is not particularly affordable, and/or it would take 21-100 years to achieve this (e.g., wetlands converted to a agriculture).

Medium: The effects of the threats can be reversed, and the target restored with a reasonable commitment of resources and/or within 6-20 years to achieve this (e.g., ditching and draining of wetlands).

Low: The effects of the threats can be easily reversed, and the target can be easily restored at a relatively low cost and/or it would take 0-5 years to achieve this (e.g., off road vehicles driving on wetlands).

6.2 Threat Description and Details

Agricultural and Residential Development as well as Landscape Management Decisions both rated as medium threats to the Aquatic Ecosystem target. These direct threats are resulting in the process of increased turbidity due to stresses such as runoff and nitrification from private land nearby farms, and decisions regarding rainfall management.

- The scope and severity rates of the Agricultural and Residential Development on the Aquatic Ecosystem were determined to be medium and the irreversibility rate was determined to be high. For Landscape Management Decisions regarding the Aquatic Ecosystem, the scope was rated high, the severity medium, and irreversibility high.

We currently have Landscape Management Decisions listed as a medium direct threat for the Lowland Forest. Lack of hydrological management has resulted in an increased amount of flooding within this target area.

- In rating the target-threat relationship between Landscape Management Decisions, we determined scope rating to be medium and the severity and irreversibility rates to be high.

Invasive Species are listed as a low-rated direct threat for the Riparian Buffer. Through crowding of invasive species, the growth of native species along this biodiversity target is prevented. Landscape Management Decisions are also listed as a low-rating direct threat for the Riparian Buffer due to the lack of hydrological management and the resulting increase in flooding in this target area.

- This relationship between invasive species and the riparian buffer was rated high in scope, medium in severity, and low in irreversibility. The relationship between

landscape management and the riparian buffer was also rated high in scope, medium in severity, and low in irreversibility.

Climate change contributing factors, such as the increase in greenhouse gas emissions, lead to exposure of the targets to increased precipitation. Increased precipitation impacts the project area's sensitivity to flooding, leading to additional runoff, and soil erosion.

6.3 Threat Summary by Target

- Aquatic Ecosystem: Pollution from pesticides and fertilizers seep in to the lake causing nutrification.
Agriculture and Residential Development = Medium
Landscape Management Decisions = Medium
- Lowland Forest: Target is affected because invasive species crowd out native species. An Emerald Ash Borer infestation has wiped out majority of the Ash tree population. Improper management efforts have led to overlogging, which has exacerbated the flood risk due to unstable soil conditions and punctuated rain events.
Invasive Species = Low
Landscape Management Decisions = Medium
- Riparian Buffer: Invasive species outcompete native species, which causes loss of biodiversity within the buffer. Due to lack of management, the buffer is at risk of increased sedimentation and nutrification.
Invasive Species = Low
Landscape Management Decisions = Low

7. Overall Situation Analysis

7.1 Diagram & Key

Conceptual Model Key & Diagram:

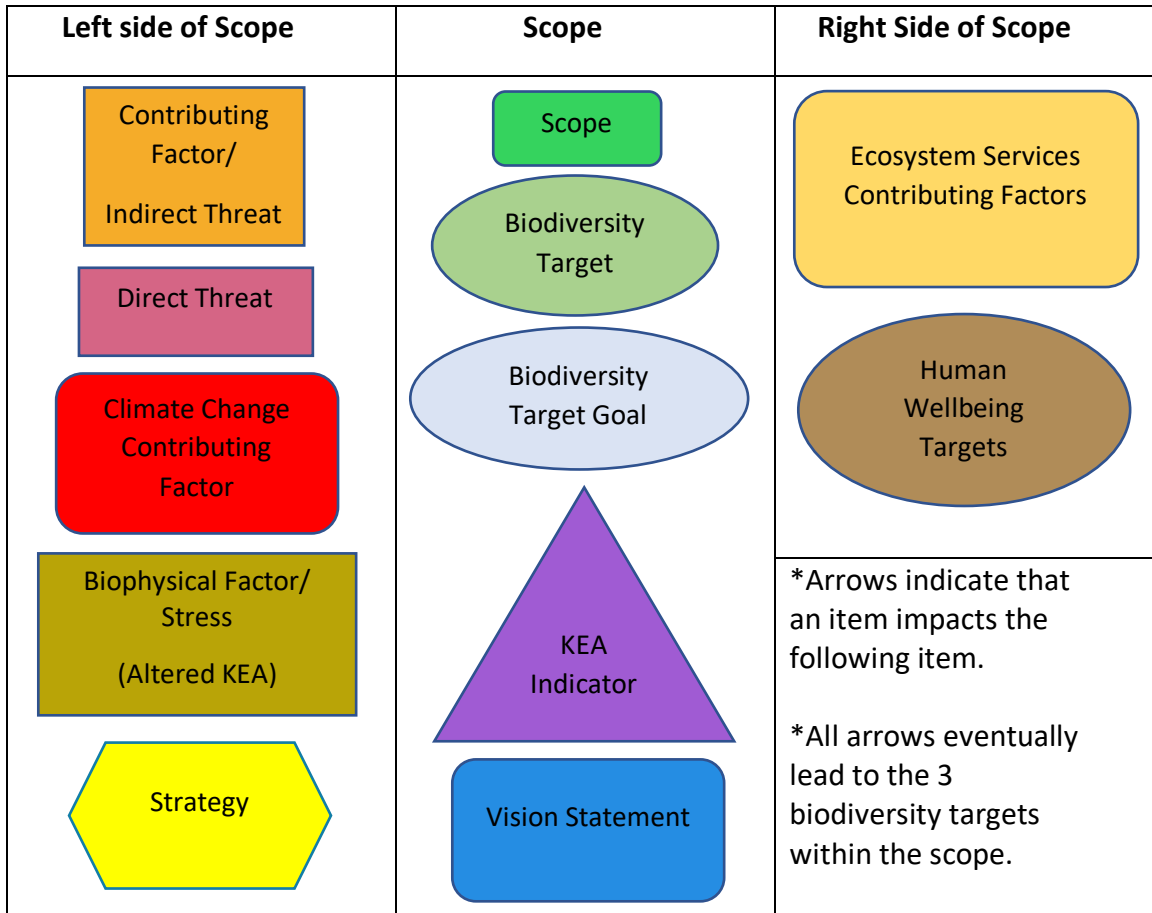


Figure 5 Conceptual Model Diagram Key

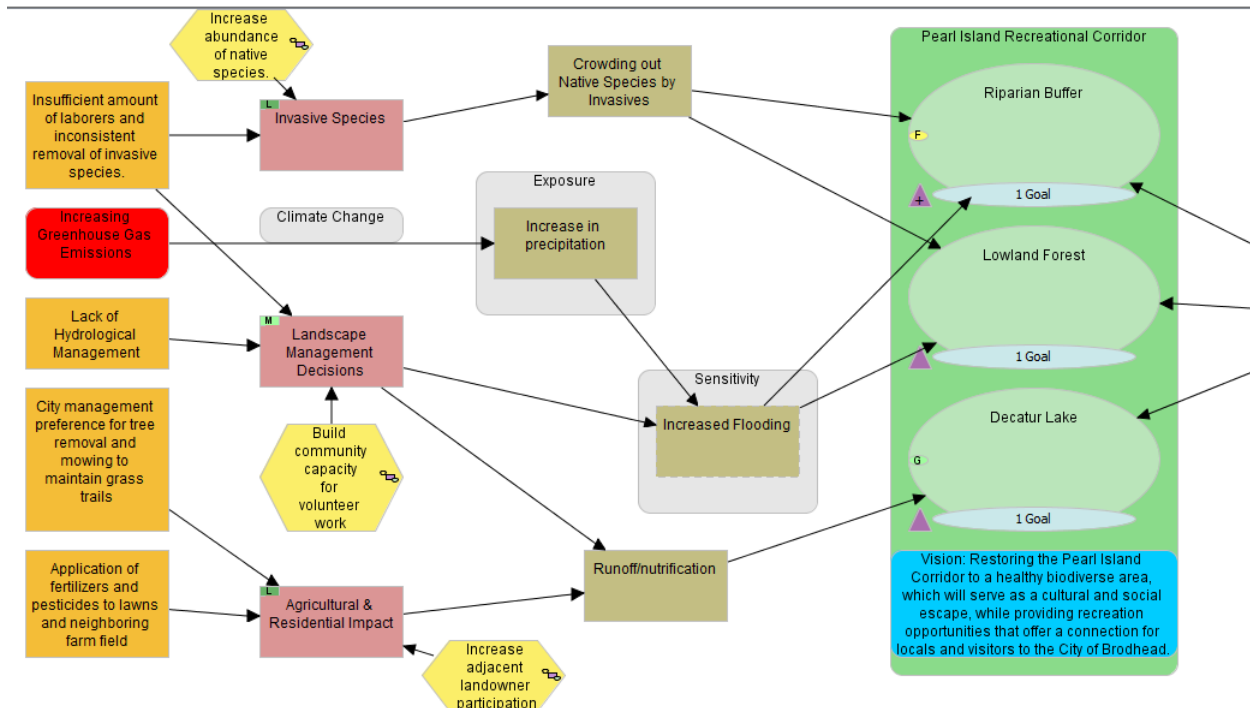


Figure 6 Conceptual Model: Pearl Island Project

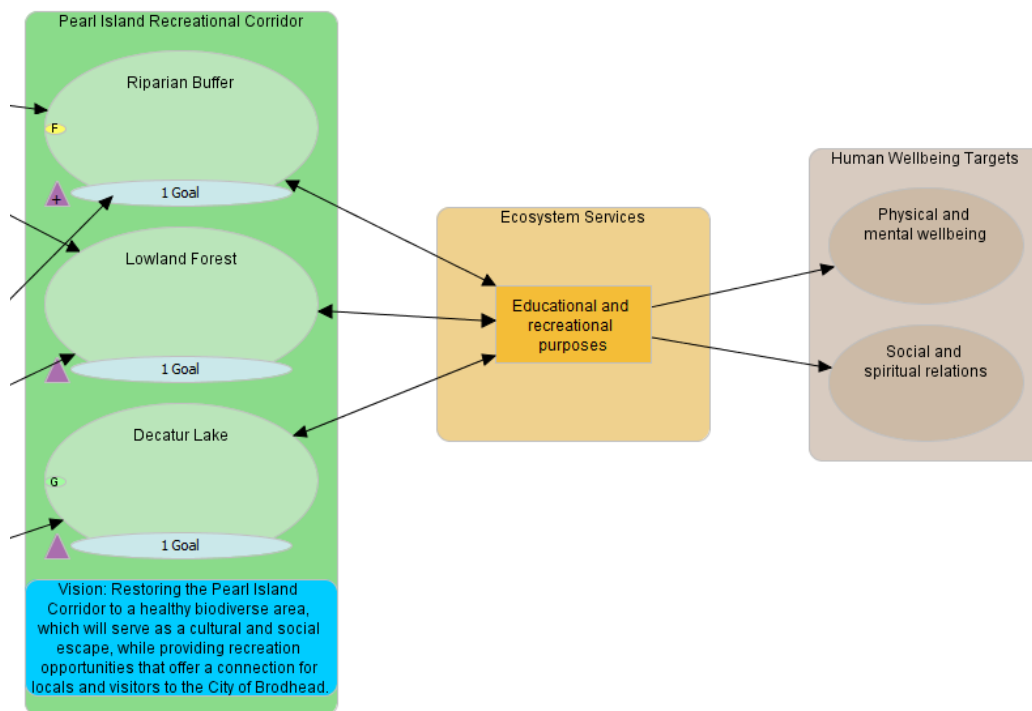


Figure 7 Biodiversity Targets, Ecosystem Services and Human Wellbeing Targets: Pearl Island Project

7.2 Narrative

One indirect threat, which is *Insufficient amount of laborers and inconsistent removal of invasive species*, has an impact on two direct threats, Landscape Management Decisions and Invasive Species. *Lack of hydrological management* is another indirect threat that impacts the direct threat of Landscape Management Decisions.

Without enough physical laborers, management of the invasive species can be overwhelming and unsuccessful. This leads to a situation in which native species are being crowded out by the invasive species, posing as a stress on the Riparian Buffer as well as the Lowland Forest, two of our three biodiversity targets. Furthermore, without enough project team players, there is a lack of expert opinion on hydrological management, leading to poor decisions on how to better control flooding and sediment loading, two of our stresses. Flooding places a stress on our Riparian Buffer target as well as on the Lowland Forest target while sediment loading due to runoff and nitrification places a stress on the Decatur Lake target.

The following indirect threats, *City management preference for tree removal and mowing to maintain grass trails* and *Application of fertilizers and pesticides to lawns and neighboring farm field*, both contribute to the direct threat of Agricultural and Residential Impact.

The application of fertilizers and pesticides by nearby private property owners and farmers contributes to the entire direct threat of Agricultural and Residential Impact. The preference of the city to have trimmed grasses and logged forested areas to promote use of pathways and sidewalks contributes to the residential aspect of Agricultural and Residential Impact direct threat. Frequent mowing along the shoreline eliminates vegetation that is capable of filtering some of the contamination that arrives to the Decatur Lake via runoff. Logging of too many trees can also limit the filtering ability of nature as well as allow for erosion to occur during rainfall, causing a flow of sedimentation in to the surrounding waters. These chemicals and occurrences of erosion impose the stress of runoff sediment loading and nitrification on the Decatur Lake biodiversity target as it results in high turbidity.

Another contributing factor that threatens targets within our scope is climate change. With an increase in greenhouse gas emissions over time, the stress of increased precipitation will further result in flooding within the Lowland Forest and Riparian Buffer biodiversity targets.

It should be noted that to the right of our project scope, and as mentioned earlier in this document, we have listed human wellbeing targets as well as ecosystem services as contributing factors. As far as ecosystem services go, education and recreation are the most significant that the Pearl Island Recreational Corridor has to offer. Education is provided through volunteer opportunities such as informational outings on invasive plants and help with their removal as well as outings for clubs such as boy scouts to learn about outdoor survival skills and how to respect nature by leaving few footsteps. Local and visiting families and schools also have a place to take children to teach them about wildlife and its importance within a community. Recreational activities at Pearl Island are extensive and include water sports, hiking, biking, birding, hunting, as well as winter sports and many others.

With the main focus of the Pearl Island community being recreational use, it was important that our team touched on the human wellbeing targets related to this project. At the top right corner of the conceptual model, we have “Physical and mental wellbeing” listed. Activities such as hiking, bird watching, kayaking, and canoeing have the potential to benefit health as they promote physical exercise and provide an escape from reality where one can build strength and endurance while cleaning their mind of everyday life stresses. We have also mentioned social and spiritual relations. Many individuals seek outdoor spaces for meditation and prayer. This park is also very clearly used as a means of bonding for families and clubs or teams through activities such as fishing, ice skating, and volunteer teamwork to establish cleaner and more aesthetically pleasing recreational areas throughout the park.

The Lowland Forest, Riparian Buffer, and Decatur Lake each provide ecosystem services as there are trails and connecting waters throughout the entire project site, which further allow for attainment of human wellbeing targets. In reverse, ecosystem services impact all three of our biodiversity targets as increasing visitation and recreational use of the site has the potential to change the value of each target. For this reason, human presence should be monitored carefully.

8. Action Plan

The following section outlines the Action Plan for the Pearl Island Recreation Corridor Conservation Project. Within this section, you can find conservation goals (8.1) for each of our 3 biodiversity targets as well as threat reduction objectives (8.2) for our decided upon direct threats. Both the goals and the objectives can be noted to be measurable, time-specific, and location oriented. Furthermore, this section includes our developed strategies that seemed most applicable to ensuring the indirect threats and, therefore, direct threats were both managed and reduced, benefiting all targets. Each management strategy can be viewed as an individual results chain within the Miradi software, as seen in the diagrams below. Our rationales for the results chains, beginning with a strategy and ending with a met conservation goal and including all activities and expected results in between, is detailed in sub section 8.3. A timeline and budget for the listed strategies and included activities and tasks can also be found at the bottom of this section.

8.1. Conservation Goals

Our goals for each of the biodiversity targets are as follows:

- Lowland Forest: Improve percentage of water-tolerant tree species per acre to greater than or equal to 75% by 2030 within the lowland forest ecosystem located west of the Mill Race.
- Riparian Buffer: Establish connected riparian buffer composed of native species along 4-6 miles of the eastern and western banks of the Mill Race by 2030.
- Decatur Lake: Improve current turbidity measurements of 2.5 meters in Decatur Lake at Headgates Park to 3.0 by 2030.

We consider each of these goals to meet the Open Standards criteria for several reasons. It can first be noted that each goal is linked to the specific category of the biodiversity target. The goals for the Lowland Forest and the Riparian Buffer align with our decided category of Landscape Context while the goal for Decatur Lake relates to the Condition of the target. Perhaps even more importantly, each of our goals are time limited and measurable. Each goal is also specific in location- the Mill Race banks, Decatur Lake, the specific ecosystem west of the

Mill Race. Each goal is impact oriented in that they will promote biodiversity within each target through alteration of plant species and water quality.

Although we do not currently have a measurement of the water-tolerant tree species within the Lowland Forest, we plan to make a recommendation to our project directors that this be completed so that the progress of the plan and established goals may be effectively evaluated. Furthermore, we do not currently know the exact mileage of connected riparian buffer that is composed of native species but after site visits by all members of the team, we have agreed that it is currently a “short” distance. A secchi disk has been used to quantitatively measure turbidity for Decatur Lake.

8.2 Threat Reduction Objectives

-Direct Threat: Invasive Species. Biodiversity targets are Riparian Buffer and Lowland Forest.

Threat Reduction Result: Reduce presence of invasive species

Objective (1): Reduction in presence of invasive species along Mill Race banks by 25% by 2030.

Objective (2): Reduction of presence of invasive species with Lowland Forest by 25% by 2030.

-Direct Threat: Landscape Management Decisions. Target Riparian Buffer.

Threat Reduction Result: Repairing the Trails

Objective: Reduction in presence of invasive species along Mill Race banks by 25% by 2030.

-Direct Threat: Agricultural and Residential Impact. Target Decatur Lake.

Threat Reduction Result: Reduce runoff from agricultural and residential development

Objective: Decrease Phosphorus levels in Decatur by to 1-3 parts per million by 2030.

8.3 Management Strategies to Achieve Goals and Threat Reduction Objectives

8.3.1 Strategy Summary

Strategies are a group of actions with a common focus that work together to reduce threats, capitalize on opportunities or restore natural systems. Strategies are designed to achieve the Pearl Island Project goals and objectives. The project team used the conceptual model to identify opportunities to increase recreational usability of the project site and then generated strategy options. We identified five potential strategies, though we created results chains of two.

Strategy Number	Strategy Name/ Descriptions	Impact Rating	Feasibility Rating	Summary Rating
S.01	Lowland Forest: Replanting of water-tolerant plant species that are suitable for sandy soils	High	Medium	Medium
S.02	Lowland Forest: Establish pathways that are resistant to erosion and are lower maintenance	High	Medium	Medium
S.03	Riparian Buffer: Increase abundance of native species along the Mill Race	High	High	High

S.04	Decatur Lake: Build community capacity for volunteer work	Medium	High	High
S.05	Decatur Lake: Increase adjacent landowner participation	Medium	High	Medium

Our team's brainstorming strategies were based on discussion and weighing the strategies impacts , feasibility's, efficiencies, and overall effectiveness.

Feasibility

Would your project team be able to implement the strategy within likely time, financial, staffing, ethical, and other constraints?

☒ **Not Specified**

☐ **Low** The strategy is not ethically, technically, OR financially feasible.

☐ **Medium** The strategy is ethically feasible, but either technically OR financially difficult without substantial additional resources.

☐ **High** The strategy is ethically and technically feasible, but may require some additional financial resources.

☐ **Very High** The strategy is ethically, technically, AND financially feasible.

Close

Figure: Miradi .41 Feasibility.

Potential Impact

To track the confidence of your evidence that the strategy will achieve its desired goals and/or objectives, use the following scale:

☒ **Not Specified**

☐ **Low** The strategy is unlikely to meaningfully contribute to project goals and/or objectives.

☐ **Medium** The strategy could meaningfully contribute to project goals and/or objectives, but would need pilot-testing to ensure it is effective under this project's conditions.

☐ **High** The strategy is likely to meaningfully contribute to project goals and/or objectives, but would need effectiveness monitoring to ensure it is effective under this project's conditions.

☐ **Very High** The strategy is very likely to meaningfully contribute to one or more project goals and/or objectives and can be implemented at scale with only implementation monitoring.

Figure: Miradi .41 Potential impact.

8.3.2 Strategies and Intermediate Objectives

8.3.2.1. Strategy 1: Build community capacity for volunteer work.

8.3.2.1.1. Description of the strategy

This strategy is meant to focus on the lack of management/work capacity that negatively impacts Pearl Island. This strategy centers on increasing community awareness of the property and then gaining community direct community support for property management projects

8.3.2.1.2. List of conservation targets that the strategy will impact.

This strategy will impact all conservation targets throughout the project.

- The Lowland Forest ecosystem
- The Riparian Buffer ecosystem along the Mill Race banks
- The Decatur Lake ecosystem

8.3.2.1.3. List of direct threats that the strategy will address.

This strategy addresses the Landscape Management Decisions direct threat, which translates to contributing factors of a lack of community support/work capacity within the Project, as well as a lack of consistent funding. Activities will address reducing the threat by surveying the community, hosting awareness workshops to build public support and creating a friend's group, thereafter using that workforce to draft a restoration plan for areas of the biodiversity targets.

8.3.2.1.4.

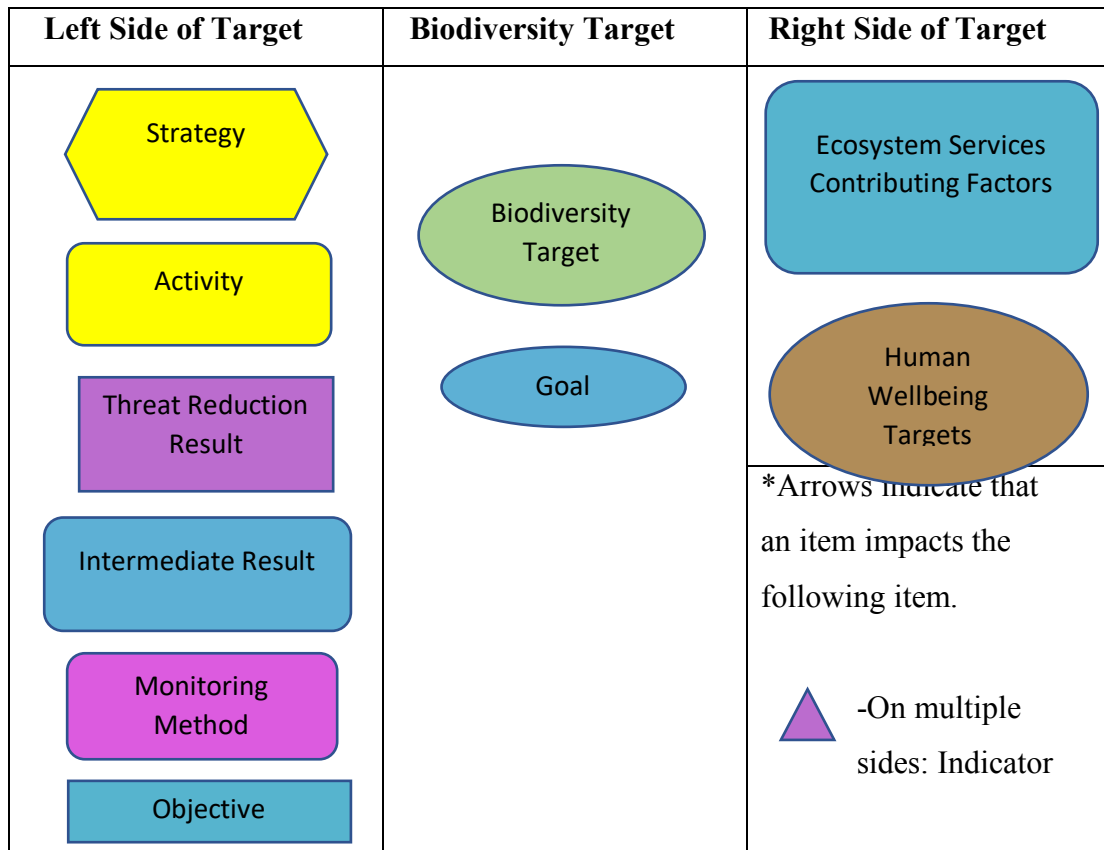


Figure 8 Results Chain Key

8.3.2.1.4.Results Chain

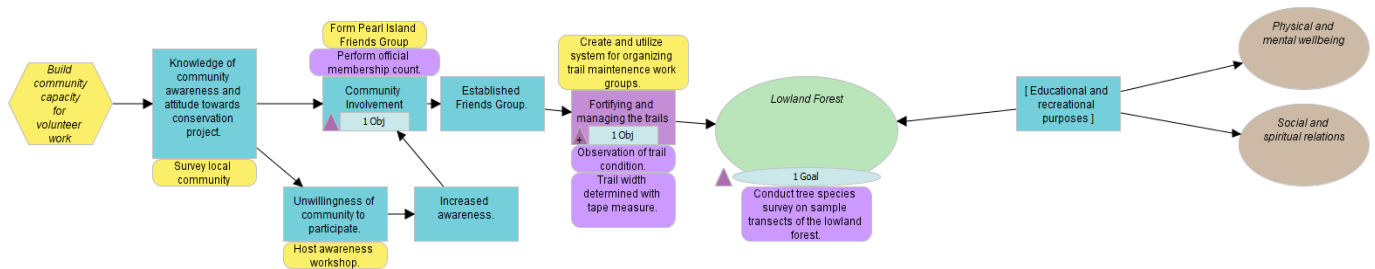


Figure 9 Results Chain for Strategy 1

8.3.2.1.5.

The theory of change this strategy reflects on is the importance and lack of management and specialist capacity within the team. Improving the number of involved community/professional members would increase the number of activities and objectives that could be completed over time. It would also improve the objective results of these actions, offering increased expert opinion and more cost-effective management. If we “Survey the community,” with the goal of increasing knowledge and awareness of the Pearl Island Project, then we will hope to “Form a Pearl Island Friend’s Group” and increase the “Community Involvement.” If “Community involvement” increases and there is an “Established Friend’s Group,” then the team can “Create and utilize a system for organizing trail maintenance groups.” If a system for organizing and utilizing those work groups is formed, then we expect work groups to begin “Fortifying and managing the trails.” We expect the management actions and evaluations that follow to improve the quality and usability of the trails within the biodiversity target ecosystem “Lowland Forest.”

8.3.2.1.6. & 8.3.2.1.7.

Strategy 1: Build community capacity for volunteer work			
Conservation Targets: Lowland forest			
Intermediate Objectives:			
1. Have 25 Friend's Group members by 2025.			
2. Have an established water resilient trail with width of 8-10ft by 2025.			
Activity	Start Date	Activity Lead	Comments
S1.1 Survey the community	2019	Jeff Peterson/Rich Vogel	To better understand current knowledge of and attitudes towards the Pearl Island Recreation Area project, a survey of the surrounding community of Brodhead should be conducted. This survey could establish general awareness of the property, attitudes towards its current described goals and ideas of community members on management and functionality.
S1.2 Form Pearl Island Friend's Group	2019	Jeff Peterson/Rich Vogel	If community awareness and attitude, as hopefully established by the survey, is positive, then additional active community engagement should be cultivated. To increase the community involvement with the property and increase the capacity and relative expertise of active property managers, a Friend's Group should be formed.
S1.3 Host awareness workshop	2019	Jeff Peterson/Rich Vogel and/or Friends group member	If the results of the community survey indicate a lack of interest, awareness or support for the property and its management plan, gaining additional buy-in is critical. A workshop, led by Project Managers, will be held to provide a forum for the community to hear further information and ideas about the property, and the vision for its future. This would also provide an opportunity for those who are aware, but in disagreement with project plan components, to voice concerns and possible solutions.
S1.4 Create and utilize a system for organizing trail maintenance work groups	2019	Conservation specialist and Friends group members	Create and utilize a system for organizing trail maintenance work groups – Once community awareness and support for the property have been achieved, a system for organizing work groups to actively manage the trails on the property should be created. This system could be as casual as a weekly Facebook post on a Friend's Group page, or act as a sub-component of a website focusing on the property and its management goals. Ideally, a combination of both these avenues will be explored. Regardless, this system should provide a space for organizers to seek, gain and inform volunteers about upcoming management needs.

8.3.2.2 Strategy 2: Increase abundance of native species in the riparian buffer zone along the Mill Race.

8.3.2.2.1 Description of the strategy

The second strategy is to increase abundance of native species in the riparian buffer zone along the Mill Race. Invasive species are direct threats to the health of the Mill Race so this strategy outlines how the project team will reduce invasive species and increase native species in the buffer zone. This strategy also touches on creating a restoration plan resulting from the creation of the friend's group. This will impact the second direct threat of landscape management decisions as this plan will dictate future restoration activities on the project site.

8.3.2.2.2 List of conservation targets that the strategy will impact.

This strategy will impact two of the three conservation targets throughout the project.

- The Lowland Forest ecosystem
- The Riparian Buffer ecosystem along the Mill Race banks

8.3.2.2.3 List of direct threats that the strategy will address.

Two of the plan's direct threats will impact the targets ecosystems. Invasive species will affect both the riparian buffer and the lowland forest. Landscape management decisions will also affect the riparian buffer and lowland forest. For this strategy specifically, activities will address reducing the invasive species direct threat. This will be done by creating a friend's group and using that workforce to do the invasive removal and plant more native vegetation. The landscape management direct threat will also be addressed by the creation of the friend's group because it will involve creating a restoration plan that will more effectively manage the vegetation in each conservation target.

8.3.2.2.4 Results Chain

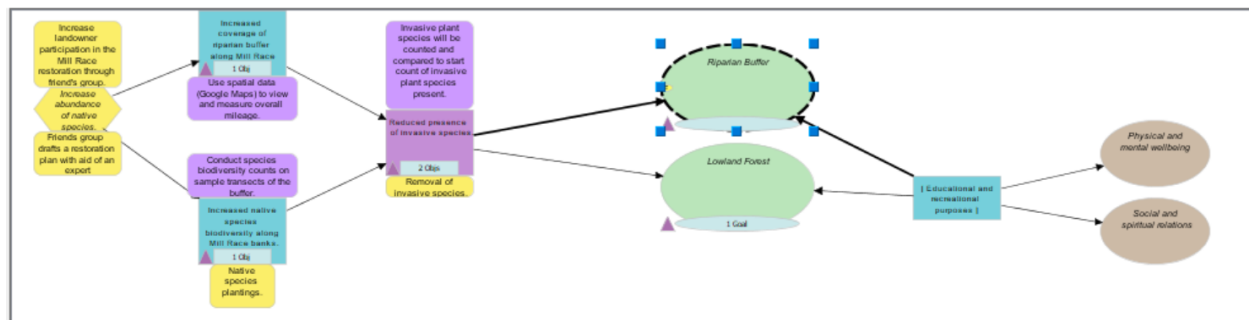


Figure 10 Results Chain for Strategy 2

8.3.2.2.5

The theory of change this strategy reflects on increased management and restoration of the project site. Increased restoration of the site would lead to increased recreational usage of the property. If we increase abundance of native species, this would lead to “Increased coverage of riparian buffer along the Mill Race”. The objective is to increase the buffer two miles from its current status by 2025, therefore increasing native species composition would increase the buffer zone, which would be key to helping reduce runoff. If we increase abundance of native species, then we would also “Increase native species biodiversity along the Mill Race”. This will include directly planting native species to increase their abundance. The objective is to increase native species biodiversity 25% by 2025. If we increase coverage of the riparian buffer and increase native species biodiversity along the Mill Race, then we would “Reduce presence of invasive species”. This will include direct removal of invasive species, such as wild honeysuckle and common buckthorn. Invasive species are a direct threat to two of the biodiversity targets: the riparian buffer and the lowland forest. If invasive species are reduced, the riparian buffer and lowland forest area will have increased native species biodiversity and greater ecological health.

8.3.2.2.6 & 8.3.2.2.7

Strategy 2: Increase abundance of native species			
Conservation Targets: Riparian buffer and lowland forest			
Objectives: <ol style="list-style-type: none"> 1. Increase riparian buffer by 2 miles from current status along Mill Race banks by 2025. 2. Increase native plant species biodiversity within Mill Race riparian buffer by 25% by 2025. 3. Reduction of presence of invasive species with Lowland Forest by 25% by 2030. 4. Reduction in presence of invasive species along Mill Race banks by 25% by 2030. 			
Activity	Start Date	Activity Lead	Comments
S2.1 Increase landowner participation in the Mill Race Restoration through friend's group	2019	Friends group member	A "Friends of Pearl Island" group will be created to generate a large enough work force to tackle restoration work.
S2.2 Friends group drafts a restoration plan with aid of an expert	2019	Friends group member	Will be needed to address and reevaluate landscape management decisions (direct threat)
S2.3 Native species plantings	2019	Friends group member	Will ideally occur in spring or fall depending on the seeds
S2.4 Removal of invasive species	2019	Friends group member	Specific removal will be needed (direct threat)

8.3.3 Strategy Timeline and Budget

The timeline and budget for Strategy One (Build community capacity for volunteer work) will extend from 2019 into 2030. Activities, tasks and monitoring actions have their own more granular timelines within this larger strategy. Total cost for the monitoring activities in this strategy is \$60,120, which represents around 41% of the total strategy budget (\$148,345). Below is a table of the relevant activities, associated workforce and monitoring components.

Strategy	Activity	Workforce	Monitoring	Total Budget
Build community capacity for volunteer work				\$148,345
	Survey community	Project Managers	N/A – one-time and transferrable representation from Membership counts.	
	Form Pearl Island Friend's Group	Project Managers	Membership counts.	
	Host awareness workshop	Project Managers/Friend's Group Members	N/A - one-time and transferrable representation from Membership counts.	
	Create/Utilize system for organizing work groups	Project Managers/Friend's Group Members	Trail condition observation and trail width measurement.	

Figure 11 Work Plan Activity, Workforce, Monitoring and Budget Summary, Strategy 1: Pearl Island Project

9. Monitoring Plan

The purpose of the monitoring plan is to lay out how the objectives of the intermediate results and the threat reduction results as well as the goals of the biodiversity targets will be met by determining what is being measured, how, by who, where, and when. The strategy we chose to display a Monitoring Plan for in this section is *Increase Abundance of Native Species*. This specific strategy is linked to two biodiversity targets, as you can see the two green circles in the diagram below. Please note that there are two objectives listed for the Threat Reduction Result, seen below in the purple box. The “what” columns in the following tables list the measurement indicators of all goals and objectives. Indicators are depicted in the diagram below by purple triangles. The blue boxes below are the intermediate results and the purple rounded boxes are the methods. Methods can also be found in the tables below within the “how” columns. Actions are displayed in yellow boxes below but will not be discussed in this specific section. The monitoring approach, whether Time Series or Pre-Post, for each goal or objective is also included in the following monitoring plan tables.

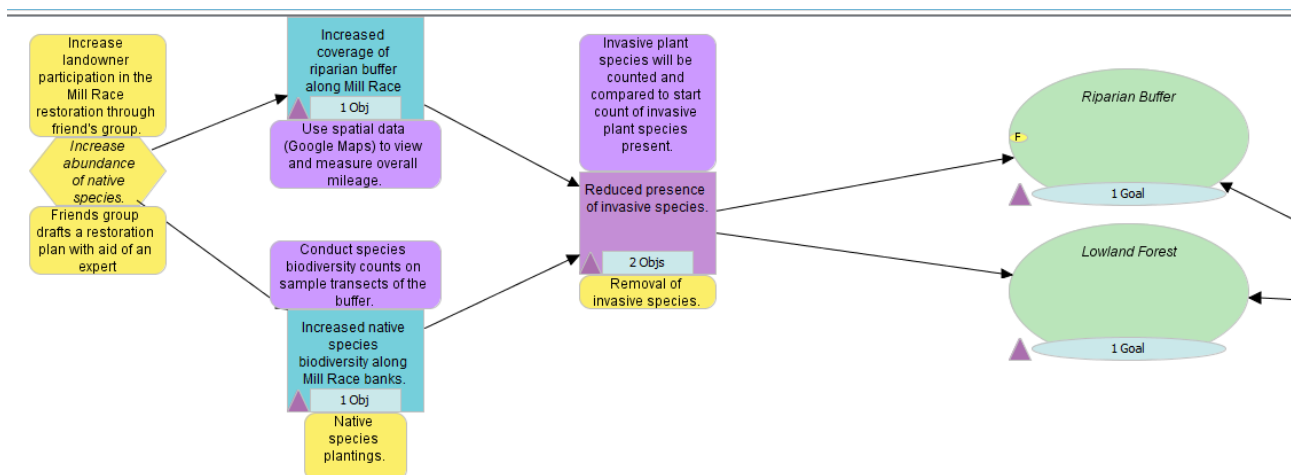


Figure 12 Results Chain for Strategy 2

9.1 Biodiversity Goals

(A) Biodiversity Target: *Lowland Forest*

What (Indicator)	How (Method)	When	Who	Where	Comments
Goal: Improve percentage of water-tolerant tree species per acre to greater than or equal to 75% by 2030 within the lowland forest ecosystem located west of the Mill Race.					
Monitoring Approach: Pre-Post					
Percentage of target area with water tolerant species present.	Conduct tree species survey on sample transects of the lowland forest.	Spring 2030	Conservation specialist (Paul Roemer, from Applied Ecological) with assistance from volunteers from Friends Group, schools, churches etc.	Lowland Forest west of the Mill Race, specifically where trails have been noted to flood most frequently.	*Will need to determine water-tolerant tree species first. *Consider affordability *Frequent flooding sites should be marked.

(B) Biodiversity Target: *Riparian Buffer*

What (Indicator)	How (Method)	When	Who	Where	Comments
Goal: Riparian Buffer: Establish connected riparian buffer composed of native species along 4-6 miles of the eastern and western banks of the Mill Race by 2030.					
Monitoring Approach: Time Series					
Miles of connective native species along stretch of habitat.	Observational and spatial analysis.	Monthly during viable planting seasons (MJJA).	Conservation specialist (Paul Roemer) with help of volunteers & possible hired drone pilot.	All currently managed sections- Approx. 2 miles of shoreline (Old Power Plant → Decatur Lake Dam) Eventually expand to as much of banks as is reachable.	Measurement at the beginning of the chosen planting cycle, and at the end would offer an excellent indication of overall progress and reinforce positive impact.

9.2 Threat Reduction Objectives

Threat Reduction Result: *Reduced presence of invasive species.*

What (Indicator)	How (Method)	When	Who	Where	Comments
Objectives: (1) Reduction in presence of invasive species along Mill Race banks by 25% by 2030. (2) Reduction of presence of invasive species with Lowland Forest by 25% by 2030.					
Monitoring Approach: Time Series					
Number of invasive plant species.	Invasive plant species will be counted and compared to start count of invasive plant species present.	Spring/summer months, MJJ. At least twice a week while seed dispersal and active colonization are likely taking place. May depend on the life cycle of noted invasives/targets.	Work party volunteers.	<i>Mill Race:</i> Currently managed sections- Approx. 2 miles of shoreline (Old Power Plant → Decatur Lake Dam) Eventually expand to as much of banks as is reachable. <i>Lowland Forest:</i> Trails area near Sugar River.	*Locations of particularly dense clusters of invasives (ex honeysuckle in lowland forest) should be marked for consistent return/removal. *Opportunity for education and stakeholder involvement.

9.3 Intermediate Objectives

(A.) Intermediate Result: *Increased native species biodiversity along Mill Race banks.*

What (Indicator)	How (Method)	When	Who	Where	Comments
Objective: Increase native plant species biodiversity within Mill Race riparian buffer by 25% by 2025.					
Monitoring Approach: Time Series					
Observed number of different native species within riparian buffer.	Conduct species biodiversity counts on sample transects of the buffer.	Weekly MJJA OR Bimonthly MJJA & Monthly in March, April and September. *Consider timing of scheduled planting days.	Paul Roemer, from Applied Ecological, with assistance from volunteers from Friends Group, schools, churches etc.	All currently managed sections- Approx. 2 miles of shoreline (Old Power Plant → Decatur Lake Dam) Eventually expand to as much of banks as is reachable.	*Starting points of restoration to be suggested by and under supervision of Paul Roemer, area naturalist. *Opportunity for education and stakeholder involvement.

(B.) Intermediate Result: *Increased coverage of riparian buffer along Mill Race banks.*

What (Indicator)	How (Method)	When	Who	Where	Comments
Objective: Increase riparian buffer by 2 miles from current status along Mill Race banks by 2025					
Monitoring Approach: Time Series					
Miles of connected riparian buffer.	Use spatial data (Google Maps) to view and measure overall mileage. OR Friend's Group members walk bank to measure and record overall length of riparian buffer coverage along the Mill Race.	Monthly during viable planting seasons (MJJA). A measurement at the beginning of the chosen planting cycle, and at the end would offer an excellent indication of overall progress and reinforce positive impact.	Friend's Group Volunteer(s)	All currently managed sections- Approx. 2 miles of shoreline (Old Power Plant → Decatur Lake Dam) Eventually expand to as much of banks as is reachable.	*Consider investing in a lightweight/relatively inexpensive drone, which can fly over the buffer strip on each side, recording video of the plant composition. *Time efficient, as attention to detail is not necessarily needed.

10. Recommendations for Adaptive Management: Analyze, Use, and Adapt

It is recommended that the managers of the Pearl Island Recreational Corridor complete quarterly reviews of progress towards activity and monitoring implementation beginning in April 2019 through December 2021 and an annual review from January 2021. Listed below are strategies and activities to be implemented and monitored for progress. A record should be kept of actions and activities for each strategy. Project managers should review progress on a quarterly basis and use the indicators to test if the strategies are working or not.

These questions should be discussed in the quarterly meetings: What actions did we take? Did we do what we said we would, if not, why? Did we achieve what we hoped to achieve, if not, why? Are we following the monitoring plan and measuring outcomes? What type of results are we seeing? What is working and what is not? How should we adapt our theory of change, goals and objectives? Which of our assumptions have held strong and which have not?

Developing a workforce (Friends of Pearl Island volunteer work group) to remove invasive species, plant native species, and restore the trail systems in the lowland forest is an imperative strategy. The workforce goal is to reach a membership of 25 by 2025. This membership number is a critical assumption and needs to be monitored for progress.

Additionally, to ensure that the Friends of Pearl Island volunteer organization maintains and builds membership, we recommend reviewing membership enrollment on a bi-annual basis. New members should be recruited through membership drives, a membership enrollment page, (website) and Facebook page. Membership can also be promoted at annual festivals, community gatherings, and other special events in Brodhead and in Green County.

The riparian buffer restoration should be monitored for native species abundance beginning in April 2020. Monitoring activities and results should be recorded and the data from this recording should be reviewed bi-annually to chart progress beginning in fall 2020. It is further recommended that a conservation specialist be consulted to generate timelines for work parties, species to be planted and where the most biologically significant location is to initiate the restoration project.

Management of the trail system in the lowland forest ecosystem includes a goal to maintain the trail width from 8 – 10 feet. This trail width goal is a critical assumption and needs to be monitored to test results. A conservation or ecology specialist should be consulted for the restoration of the lowland forest ecosystem as soon as it is feasible. A professional assessment is necessary for the management of this ecosystem.

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Glossary of Terms

(1) Category- a class or division of people or things regarded as having particular shared characteristics.

(2) Conservation Biodiversity Target – An element of biodiversity at a project site, which can be a species, habitat/ ecological system, or ecological process that a project has chosen to focus on. All targets at a site should collectively represent the biodiversity of concern at the site.

(3) Direct Threat- A human action that immediately degrades one or more conservation targets. For example, “logging” or “fishing.” Typically tied to one or more stakeholders. Sometimes referred to as a “pressure” or “source of stress.”

(4) Goal- A formal statement detailing a desired impact of a project, such as the desired future status of a target. A good goal meets the criteria of being linked to targets, impact oriented, measurable, time limited, and specific.

(5) Indicator- A unit of information measured over time that documents changes in a specific condition (here, changes in a KEA).

(6) Indirect Threat- A factor identified in an analysis of the project situation that is a driver of direct threats. Often an entry point for conservation actions. For example, “logging policies” or “demand for fish.” Sometimes called a root cause or underlying cause. *Miradi uses the term *Contributing Factor*.

(7) Initial Team- The specific people who initially conceive of and initiate the project. They may or may not go on to form the core project team

(8) Key Ecological Attribute (KEA)- An aspect of a target’s biology or ecology that, if missing or altered, would lead to the loss of that target over time.

(9) Nested Target- Is an ecosystem, species, or ecological process that is also conserved if the broader target within which it is found is conserved.

(10) Objective- profoundly shape where and how limited conservation resources are spent

(11) Project Advisors- People who are not on the project team, but to whom the team members can turn for honest feedback and counsel and who can champion your cause.

(12) Project Leader- Although leadership responsibilities are often shared between team members, one individual is usually appointed as the overall project leader. Specific roles that leader often plays include managing the performance of other team members, relations with key stakeholders, and the process of going through the project cycle

(13) Scope- Defines the broad parameters of the project – can be thematic or geographic

(14) Stresses- Attributes of a conservation target's ecology that are impaired directly or indirectly by human activities. *Miradi uses the term *Biophysical Factor*.

(15) Viability-Broadly, the status or “health” of a population of a specific plant or animal species. In particular, viability indicates the ability of a conservation target to withstand or recover from most natural or anthropogenic disturbances and thus to persist for many generations or over long time periods. Technically, the term “integrity” should be used for ecological communities and ecological systems. In the interest of simplicity, however, we use viability as the generic term for all targets.

(16) Vision- the desired state or ultimate condition that the project is working to achieve.

Appendix 1.A

Pearl Island Flora and Fauna Observation List

Plants:

Ground Nut Spotted, Touch-
Me-Not, Wild Iris, Prairie
Trillium, Jack in the Pulpit
Tall Bellflower, Thistle
(Finches and Butterflies love
it) White Aster, Violets,
Birdfoot Violet, Butter and
Eggs Lilies, Milkweed,
Birdfoot Trefoil, Chickory,
Great Blue, Lobelia Blue,
Nightshade, Phlox Salsify
Evening Primrose, Goldenrod
Wild Chamomile, Bergamot
Marsh Marigold, Hoary
Puccoon, White Starflower

Butterflies:

Eastern Tiger Swallowtail
Black Swallowtail Giant
Swallowtail Clouded Sulphur
Orange Sulphur Dainty
Sulphur Cabbage White
Harvester American Copper
Bronze Copper Banded
Hairstreak Striped Hairstreak

Hickory Hairstreak Gray
Hairstreak Eastern Tailed
Blue Spring Azure (both
summer and spring types)
American Snout Variegated
Fritillary Aphrodite Fritillary
Great Spangled Fritillary
Meadow Fritillary Red-
spotted Purple Hackberry
Emperor Tawny Emperor
Gorgone Checkerspot Pearl
Crescent Monarch Common
Buckeye Question Mark

Eastern Comma, Milbert's
Tortoiseshell, Red Admiral
Viceroy, Mourning Cloak
Painted Lady, American Lady
Eyed Brown, Common
Wood-Nymph, Northern
Pearly Eye, Common
Sootywing, Sachem Tawny-
edged Skipper, Crossline
Skipper, Delaware Skipper,
Fiery Skipper, Peck's Skipper,
Silver-Spotted Skipper,
Checkered Skipper, Least
Skipper

Moths:

Polyphemus moth, Big poplar
sphinx, Nessus sphinx
Snowberry Clearwing
Hummingbird Clearwing
Armyworm Moth, Eight-
spotted Forester, Grapevine
Epimenis, Yellow-collared
Scape Moth

Chickweed Geometer White
Striped Black Moth Squash
Vine Borer Clymene Moth
Confused Eusarca Moth
Large Lace-Border Moth

Reptiles:

Northern Watersnake
Western Fox Snake Brown
Dekay Snake Garter Snake
Painted Turtle Spiny Softshell
Turtle Snapping Turtle
Blandings Turtle

Amphibians:

Bullfrog Boreal Chorus Frog
Copes Gray Treefrog Green
Frog Northern Leopard Frog
Spring Peeper

Animals:

White tailed deer Fisher
Mink Woodchuck Beaver
Muskrat Martin

Fish:

Panfish Walleye Northern
Pike Large Mouth Bass Small
Mouth Bass Rock Bass
Catfish Bullheads Carp
Suckers

Spiders:

Six Spotted Fishing Spider
Marbled Orb Weaver Garden
Spider Wolf Spider Harvester
Jumping Spider Ghost Orb
Weaver

Appendix 1.B

Bird Species – Pearl Island

Canada Goose
Blue-winged Teal
Hooded Merganser
Great Blue Heron
Great Egret
Sandhill Crane
Killdeer
Spotted Sandpiper
Solitary Sandpiper
Greater Yellowlegs
Lesser Yellowlegs
Least Sandpiper
Mourning Dove
Barred Owl
Chimney Swift
Ruby-throated Hummingbird
Belted Kingfisher
Red-bellied Woodpecker
Yellow-bellied Sapsucker
Downy Woodpecker
Hairy Woodpecker
Northern Flicker
Eastern Phoebe
Warbling Vireo

Dark-eyed Junco
Northern Cardinal
Rose-breasted Grosbeak
Red-winged Blackbird
Common Grackle
Brown-headed Cowbird
Baltimore Oriole
American Goldfinch

Blue Jay
American Crow
Northern Rough-winged Swallow
Black-capped Chickadee
Tufted Titmouse
White-breasted Nuthatch
Brown Creeper
House Wren
Blue-gray Gnatcatcher
Ruby-crowned Kinglet
Eastern Bluebird
American Robin
Gray Catbird
Brown Thrasher
European Starling
Cedar Waxwing
Northern Waterthrush
American Redstart
Blackburnian Warbler
Palm Warbler
Yellow-rumped Warbler
Eastern Towhee
American Tree Sparrow
Chipping Sparrow
Field Sparrow
Song Sparrow
White-throated Sparrow
White-crowned Sparrow

Appendix 1C: Native plantings list for riparian buffer/Mill Race banks – Paul Roemer, Applied Ecological

Native wild flowers of Putnam Park



Taylor Creek Restoration Nurseries

17921 W. Smith Road • Brodhead, WI 53520
Phone: (608) 897-8641 • Fax: (608) 897-2044
E-mail: info@appliedeco.com • www.appliedeco.com

Order Confirmation

Quote NO. 14-0417 Paul Roemer spring order DATE May 20, 2014

BUYER Paul Roemer

SHIP TO same

SHIPPING METHOD		DELIVERY DATE			
customer pickup		5/16-5/23			
Species	Common Name	Qty	Unit	Price per Unit	Extension
Putnam Park					
40 ④ Sporobolus heterolepis	Prairie dropseed	547	32s	\$ 0.89	\$ 488.20
40 ③ Schizachyrium scoparium	Little bluestem	544	32s	\$ 0.99	\$ 538.36
① Carex scoparia	Broom sedge	64	32s	\$ 0.99	\$ 57.12
① Ruellia humilis *	Wild petunia, Hairy ruellia	64	32s	\$ 1.79	\$ 114.24
① Symphyotrichum oolentangense	Sky-blue aster	64	32s	\$ 0.99	\$ 63.36
① Geum triflorum	Prairie smoke	128	32s	\$ 1.25	\$ 159.04
① Asclepias tuberosa	Butterfly weed	128	32s	\$ 1.07	\$ 137.06
① Baptisia bracteata	cream indigo	64	32s	\$ 1.09	\$ 67.84
① Symphyotrichum sericeum	Stiff aster	13	32s	\$ 1.18	\$ 15.14
① Coreopsis palmata	Prairie coreopsis	64	32s	\$ 1.16	\$ 74.53
① Dalea purpurea	Purple prairie clover	64	32s	\$ 0.99	\$ 63.10
① Coreopsis lanceolata	Sand coreopsis	128	32s	\$ 0.89	\$ 114.24
① Eryngium yuccifolium	Rattlesnake master	32	32s	\$ 0.99	\$ 31.68
① Tradescantia ohnensis	Spiderwort	32	32s	\$ 1.03	\$ 32.96
46 ① Echinacea pallida	Pale purple coneflower	54	galions	\$ 0.89	\$ 48.20
① Echinacea pallida	Pale purple coneflower	10	38s	\$ 0.89	\$ 8.90
① Liatris espere	Rough blazing star	64	32s	\$ 1.03	\$ 65.82
① Parthenium integrifolium	Wild quinine	64	32s	\$ 0.99	\$ 63.10
① Astragalus canadensis	Canadian milk vetch	64	32s	\$ 2.00	\$ 128.00
① Amorpha canescens	Leadplant	64	32s	\$ 1.21	\$ 77.25
① Packera paupercula	Balsam ragwort	64	38s	\$ 1.03	\$ 65.92
① Solidago speciosa	Showy goldenrod	64	32s	\$ 0.99	\$ 63.10
	subtotal Putnam Park	2384			\$ 2,478.11
Totals:				SUBTOTAL	\$ 2,478.11
				SALES TAX	136.19
				TOTAL	\$ 2,614.30

Rudbeckia hirta

Terms and Conditions: Prices are valid until 05/30/2014 and do not include shipping. All items are subject to availability. Terms are not 30.

Allium cernuum
Heuchera richardsonii
Helopsis helianthoides
Agastache ~~scrophulariifolia~~ foeniculana
Thalictrum dasycarpum
Monarda fistulosa
Dichanthelium plicosanthes
Penstemon digitalis

Lycopus americanus
~~Sambucus canadensis~~
Eutrochium maculatum
Boehmeria cylindrica
Urtica dioica
Mirabilis nyctaginea
Asclepias incarnata
Coreopsis tripteris

Rhynchospora virginicum
Rudbeckia subtomentosa
Rudbeckia triloba
Chamaecrista fasciculata
Pulsatilla patens - Pasque
Aquiloxia canadensis
Baptisia alba
Solidago ulmi folia

About UniverCity Year



UniverCity Year is a three-phase partnership between UW-Madison and one community in Wisconsin. The concept is simple. The community partner identifies projects that would benefit from UW-Madison expertise. Faculty from across the university incorporate these projects into their courses, and UniverCity Year staff provide administrative support to ensure the collaboration's success. The results are powerful. Partners receive big ideas and feasible recommendations that spark momentum towards a more sustainable, livable, and resilient future. Join us as we create **better places together**.



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