



(Ozaukee Washington Land Trust Website: Shannon Preserve)

Building a Community Whilst Restoring a Landscape: Shannon Preserve Land Restoration & Management Plan

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Contents:

A. Introduction

- a. Overview
- b. Site Description
- c. Human & Non-Human Community
- d. Vision

B. The Past to the Present

- a. Historical Context
- b. Images
- c. Physical Conditions Needing Repair & Constraints

C. Possible Future

- a. Guiding Principles
- b. Benefiting Fauna & Community
- c. Reference Models & Key Species

D. Methods

- a. Invasive Species Management
- b. Transitioning the Pine Plantation to a Northern Dry Mesic Forest
- c. Transforming the Corn Field to Shrubland and Mesic Prairie
- d. Facilitating Succession to the Desired Target Community
- e. Key Steps

E. Monitoring & Management

- a. Measurable Goals & Monitoring
- b. Survey Sites & Repeat Photography
- c. Management Team
- d. Community Engagement

F. References

A. Introduction

Overview

Restoring the ecological integrity of Shannon Preserve is not just a project; it is a testament to our commitment to preserving the natural heritage and biodiversity that makes this land so precious. At the heart of this endeavor lies the desire to heal and rejuvenate a degraded landscape, allowing it to flourish once again as a thriving habitat for both humans and non-human inhabitants.

Shannon Preserve, though small in size, plays a crucial role as part of one of the largest natural habitat patches in the region. However, over the years, this once vibrant landscape has experienced degradation and damage, leaving the field on the east side fallow and lacking the diverse cover that sustains wildlife. The sparse canopy of the lowland hardwoods on the North side and the marsh edges has been impacted by the loss of ash trees and rising water levels, allowing invasive species to gain a foothold. To safeguard the unique biodiversity and ecological richness of this area, the need for an Ecological Restoration (ER) plan becomes evident.

The Site

Nestled just north of Cedarburg Bog, Shannon Preserve is a gem situated in Ozaukee County, Wisconsin. The significance of this small property cannot be overstated, as it contributes to a larger, interconnected ecological landscape. The preserve's location is adjacent to a marsh, an Ozaukee County Park, and an SEWRPC environmental corridor. The corridor highlights its importance as a wildlife hotspot and a critical link for various species. Sadly this crucial and once flourishing habitat has been disconnected from the greater landscape by highway 33. However, a silver lining to the presence of the highway is its ability to attract eyes. With the current corn field situated right along the highway, the restored prairie would capture the hearts, eyes, and imagination of all that pass by it.

Understanding the preserve's position within the watershed and its connectivity to other ecological landscapes is essential for informed restoration efforts. By recognizing the interdependence of these areas, we can strengthen our commitment to preserving the ecological balance that extends beyond Shannon Preserve boundaries.

The Human and Non-Human Community

This restoration plan is a collaborative effort that seeks to include the diverse human community connected to, inspired by, and reliant on Shannon Preserve. Our approach embraces principles of justice, equity, and community. Moreover, our considerations extend to the non-human inhabitants, including the Hine's Emerald Dragonfly and other species whose well-being is tied to the health of this ecosystem.

Vision

My vision for the future of Shannon Preserve is one of renewal and flourishing. We envision a landscape where native trees, such as red maple, paper birch, white spruce, and elderberry, join the existing white pine and gracefully stand tall in the canopy, creating a Northern Mesic Forest that thrives harmoniously with the conifer stands. Understory plants like wood anemone, wild sarsaparilla, and Canada May flower will carpet the forest floor, delighting visitors with a sense of coherence. This vision is not only about ecological restoration but also about fostering a deep connection with the land, where human and non-human communities coexist in harmony.



(wood anemone: Christopher Noll)



(Canada mayflower: Christopher Noll)

By embarking on this journey of ecological restoration, we hope to honor the legacy of Shannon Preserve, preserving its natural splendor for generations to come. This restoration plan, shaped by science, community engagement, and shared love for the land, will serve as a guiding light toward a future where the ecosystem thrives and the spirit of conservation endures.

B. Past to the present

Historical Context

Shannon Preserve has a diverse land use history, transitioning from agricultural activities, including an old cornfield, to the establishment of a white pine plantation under the Managed Forest Law (MFL) program. These changes have altered the original natural plant community, degrading the native ecosystems. For reference, the original 1836 survey describes a completely different landscape from the one that exists today. When the surveyors crossed today's highway 33 (Originally a well-used Native American thoroughfare) they saw Beech, Birch, and Ash trees.

Furthermore, when they walked between lines 17 and 20 (first Easterly & then Westerly) they saw more Beech, Paper Birch, Elms, and Sugar Maples.

(UW search libraries: Plat from 1836 survey)



39
T11 N. R 21 E 4th Mer. Mic. Len
North Between sections 20 & 21
11.38 Tamarack 8 in dia
20.99 do 6
31.98 Cedar 40 in dia
40.00 Set of section Post
B. Ash 16 S33 W 10 } Bearings
Birch 16 N60 E 21 }
52.00 Leave Swamp E W
53.23 Birch 8 in dia
62.40 Trail E. E S E
62.83 Sugar 6 in dia
71.00 Intersect Lake & Set Post
W. Oak 17 S54 E 124
Dr 22 East 146
Offset East 5.00 chains
North 9 chains to E & W line
80.00 Section cor in Lake
cor of Sects 16, 17, 20, 21
Land Mostly Swamp
Tamarack Birch Sugar
B. Ash. Elm Lym Cedar
W Oak

33
T11 N. R 21 E. 4th Mer. Mic. Len
East Random Between Sect 17 & 20.
45.00 Trail E. S E
46.81 Intersect Lake W side
80.50 Intersected at Cor. or line
Set Sect 16 & 21
Land Rolling 2 Rate
Birch Sugar Lym
W & B Oak &c
33 69 West Marked line Back of Sect 17 & 20
33 69 West Side of Lake Set Post
Birch 12 S64 W 44 } Bearings
W Oak 13 N52 1/2 W 52 }
40.25 Set of Section Post
Birch 11 S40 E 279 } Bearings
do 13 N 8 W 43 }
50.98 W Birch 7 in dia
62.49 Birch 8 in dia
71.13 Elm 18 in dia
80.50 Set cor
NB. Offset South & measured
East to section line for
Length of Random line &c

Section Line Content List: 17 & 20 W and 20 & 21 N)

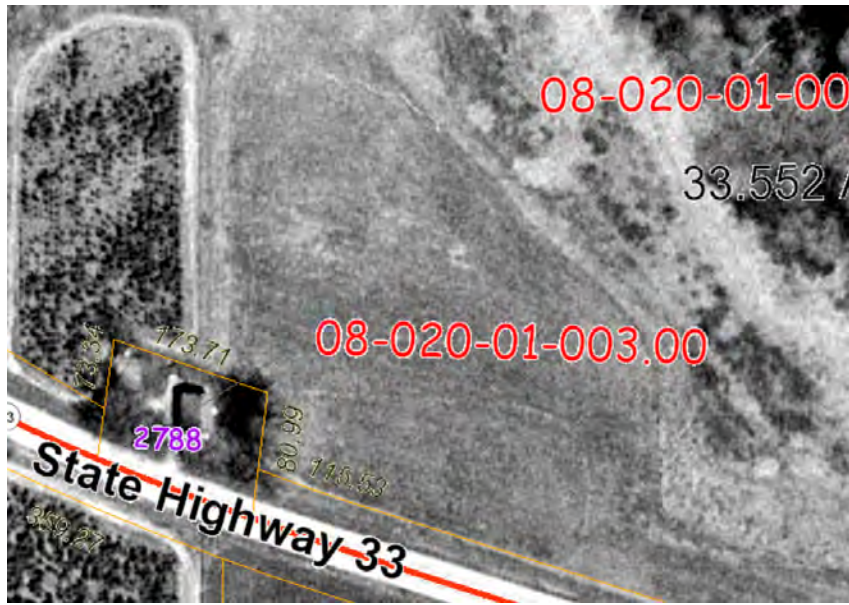
To properly understand the condition at present, it is necessary to analyze the development and evolution of the site. The first historical image of the site was captured in 1941 and can be found on Ozaukee County parcel GIS. In the 1941 image, it is clear that the present white pine plantation was simply another farm field. Which begs the question, when did the pine plantation emerge? Further examining the Ozaukee County parcel GIS, it can be noted that the first image of the pine plantation appears sometime prior to 1970 or sometime after the 1963. From the year 1970 all the way to today, it appears that the pine plantation and farm field remain unchanged.

The ecological condition at present reveals the need for restoration as the farm field, once used for conventional agriculture, is now yielding inconsistent harvest. This field has the potential to be transformed into a thriving shrubland and/or Mesic prairie ecosystem. The white pine plantation, previously harvested and now overstocked, is slowly succumbing to a swarm of aggressively spreading honeysuckle and buckthorn that occupy two thirds of the plantation's ground layer.

Historical Images



(The first historical image of the site, 1941)



(First GIS image indicating the emergence of the pine plantation, 1970)



(Modern Day Aerial Photo Illustrating no significant change from 1970)

Physical Conditions Needing Repair and Constraints:

The main focus of restoration is the conversion of the corn field into a vibrant shrubland and/or mesic prairie. Thinning of the white pine plantation is essential to create ecological buffers and improve species diversity within the forest. Addressing the invasive woody species, such as glossy buckthorn, common buckthorn, and honeysuckle, is crucial to restoring the site's natural balance.



(Map of existing conditions)



(Pine Plantation Understory Displaying Invasive Species Density)



(Pine Plantation Canopy Illustrating White Pine Overstock & Density)

Constraints to restoration efforts may include potential fragmentation and external factors such as main motorways. Non-ecological constraints, such as funding availability, time limitations, and the need for sustained community support, may also affect the restoration process.

C. Possible Future

Guiding Principles:

The restoration efforts at Shannon Preserve are grounded in three guiding principles that embody the spirit of this endeavor. First and foremost, we embrace diversity and inclusivity, recognizing that ecological restoration is a collective responsibility that transcends human boundaries of age, background, and experience. We aim to create a space that welcomes and values every individual's unique connection with nature, fostering a sense of belonging for all. Second, we strive to cultivate resilient habitats that can withstand the challenges posed by a changing climate. By integrating adaptive management practices and ecological foresight, we ensure that the restored ecosystems have the capacity to thrive in the face of uncertainty. Last, we are driven by a deep reverence for the environment, seeking to inspire environmental stewardship in all who interact with Shannon Preserve. Through education, art, and community engagement, we aim to instill a profound appreciation for the interconnectedness of all living beings and the importance of safeguarding our natural heritage.

Benefiting Fauna and Community:

Our restoration goals at Shannon Preserve go beyond mere ecological transformations; they are rooted in a profound desire to benefit both fauna and community. As the land is restored to part shrubland and part mesic prairie, it will become a thriving sanctuary for native wildlife, contributing to the health and biodiversity of the ecosystem. Simultaneously, the restoration project seeks to create spaces for community engagement and celebration. By weaving art, education, and interactive experiences into the site, we intend to foster a profound sense of connection between people and the natural world. Shannon Preserve will become a place where families can explore, artists can draw inspiration, and environmentalists can unite in their dedication to protecting our planet.

Reference Models and Key Species:

As we envision the future of Shannon Preserve, we draw inspiration from reference models found across the state. Within the Northern Dry Mesic forest, the dominant trees, such as eastern white pine, will create a soaring canopy, providing potential refuge for northern flying squirrels, and other elusive mammals. Raptors like Bald Eagles, Northern Goshawks, and Red-shouldered Hawks could grace the skies above, while songbirds will fill the air with their melodious calls. In the mesic prairie, the presence of key species such as big bluestem, little

bluestem, and wild rose will sway in the breeze, additionally, colorful wildflowers such as prairie rosinweed, rough blazing-star, and purple prairie-clover will paint the landscape, attracting pollinators in abundance. The shrubland will be home to gray dogwood, hazelnut, New Jersey Tea, early wild rose, juneberry, providing essential habitat for various bird species and small mammals.

Through the careful selection and cultivation of these key species, we aim to recreate the splendor and biodiversity of these reference ecosystems within the unique context of Shannon Preserve. As the restored habitats flourish and intertwine, the vision of a resilient, diverse, and ecologically vibrant landscape will come to life, inspiring generations to cherish and protect our natural world.



(Joshua G. Cohen: Northern Dry Mesic Forest reference model)



(Aaron Carlson: Mesic Prairie reference model)

In two years, the corn field at Shannon Preserve will bloom into a vibrant mosaic of shrubland and mesic prairie, teeming with native plants and pollinators. The transitioning pine plantation will start to show a diverse canopy, attracting wildlife and community members alike.

In ten years, the Northern Dry Mesic forest will have matured, providing a thriving habitat for a multitude of species, including elusive mammals and diverse bird populations. The prairie will be a sight to behold, alive with the colors and textures of native grasses and wildflowers.

In forty years, Shannon Preserve will stand as a beacon of ecological restoration and community engagement. A place of wonder and education, where people come together to celebrate nature and cherish its diversity. The restoration journey will be a testament to the dedication and collaboration of all who contributed to making this vision a reality.



(Map of envisioned future)

D. Methods

Invasive Species Management

Invasive plants are a priority at the Shannon Preserve due to their disruptive impact on the ecological processes and the overall health of the ecosystem. The pine plantation, evaluated by the author and a trusty assistant using a 100 m quadrat, is predominantly composed of woody shrubs and small trees, with a limited representation of forbs or graminoids. Within the woody species, a concerning finding is that approximately two-thirds are invasive, dominated primarily by buckthorn. This invasion by non-native species is out-competing native plants, disrupting ecological succession, and hindering the establishment and growth of native flora.

To effectively manage and control the invasive species, two potential methods have been evaluated: manual removal using the cut stump (cut and dab) approach and the forestry mower method. An experimental sample test to compare these methods at Shannon Preserve pine plantation using the cut stump method demonstrated that an area of 100 square meters can be cleared in about an hour and twenty minutes. Scaling this method, it is estimated that approximately 79 and a half hours would be required to clear and treat all non-local invasive beings from the approximately 6000 square meters of the pine plantation. This approach not only removes the woody invasives but also allows for targeted herbicide treatment, ensuring precise application and minimizing damage to native plants.

On the other hand, using a forestry mowing approach would result in quicker removal of woody invasive species, but at the cost of the native plant life. This method may lead to indiscriminate removal, affecting native plants in addition to invasive species, potentially compromising the overall ecological integrity of the site. Furthermore, even after using the forestry mower method, herbicide application would still be necessary to address the remaining invasive plants. However, distinguishing between the woody invasives and native plants after the mowing process would be challenging, potentially leading to unintended consequences for the native flora.

Based on the findings, the recommended approach to managing invasive plants is to utilize the cut stump method. This approach ensures the selective removal of invasive species while preserving native plant life. Once the invasive beings have been cleared, the removal of the white pines will create an ecosystem that fosters native plant growth and opens up space for the introduction of new and diverse native species. Over time, this restoration process will enhance biodiversity, support ecological processes like succession, and create a healthier and more resilient natural habitat at Shannon Preserve.

My restoration plan for Shannon Preserve includes carefully designed successional processes that will guide the site from its current state to the envisioned future state. These successional stages are not only instrumental in achieving the desired ecological outcomes but also hold significant value for wildlife, the community's experience, and the understanding of restoration ecology.

Transitioning the Pine Plantation to a Northern Dry Mesic Forest:

The current state of the pine plantation, dominated by invasive woody species, calls for a strategic approach toward the restoration of a Northern Dry Mesic Forest. As we progress towards this future state, the intermediate stage will involve the progressive removal of invasive plants through the experimental cut stump method. After the understory is saved from invasive species, a forester I spoke to recommends reducing the canopy cover from its current 85% to a more modest 70 or 65%. I recommend a bi-modal approach for thinning the canopy: One method is to simply cut down the most dire looking pines to create larger sun patches whilst also nourishing the forest floor. The other method is girdling some trees to create snags, offering valuable habitat to encourage the arrival of Northern flying squirrels and various bird and mammal species associated with this type of ecosystem. This step will pave the way for the establishment of a diverse understory, consisting of native saplings and key species like red maple, paper birch, black cherry, and elderberry. This intermediate stage holds immense value as it fosters the return of native flora and creates essential habitat niches for wildlife.

Transforming the Corn Field to Shrubland and Mesic Prairie:

The current state of the corn field presents an opportunity to create a dynamic landscape of shrubland and mesic prairie. The first intermediate stage in this transformation involves planting cover crop species like annual rye, oats, or buckwheat.

Moving forward, we progress to the mesic prairie intermediate stage, introducing iconic grasses such as big bluestem, little bluestem, and prairie panic grass, along with wildflowers like yarrow, wild plains indigo, and rough blazing star. This vibrant stage attracts a plethora of pollinators, butterflies, and native bees, enhancing the site's ecological value and fostering the return of native prairie fauna. As the prairie begins to establish itself through our assistance, we will turn our efforts to the shrubland. The slow emergence of key shrubland species such as: gray dogwood, hazelnut, New Jersey Tea, early wild rose, juneberry will provide an essential cover for ground-nesting birds and provide food sources for pollinators, contributing to the overall ecological health of the site. Moreover, both the mesic prairie and shrubland will serve as educational tools, allowing visitors to connect with and appreciate the beauty and importance of native grassland ecosystems.

Facilitating Succession to the Desired Target Community:

The intermediate stages play a pivotal role in facilitating the progression toward the desired target communities of the Northern Dry Mesic Forest, shrubland, and mesic prairie. As we implement strategic thinning and selective planting, these stages create a favorable environment for the establishment and growth of diverse native species. The early establishment of key plant species and shrubland communities ensures the foundation for the future, while the mesic prairie enriches the site with native grasses and wildflowers, supporting a flourishing ecosystem.

Through each progressive stage, wildlife will find niches and resources essential for their survival, while the community will witness the unfolding beauty and resilience of restored habitats. The intermediate stages also provide valuable learning opportunities for understanding restoration ecology, allowing us to observe the intricate connections between plant communities, wildlife, and ecological processes.

To achieve these desired outcomes a careful and meticulous process must be followed. A process that adheres to seasonal conditions and the natural limitations of time. The key steps of this restoration plan are outlined below.

Key Steps:

Year 1

Fall: In the first year of the restoration plan, the focus will be on clearing the invasive woody species from the pine plantation. Using the successfully demonstrated cut stump method, we will commence the removal process during the early spring, targeting areas of the highest invasion density. This step aims to create a foundation for the subsequent restoration efforts and will be completed by the end of spring.

Winter: With the invasive beings cleared, we will progress to the thinning of the pine plantation canopy. The thinning process will allow more sunlight to penetrate the forest floor, fostering the establishment of a diverse understory. This stage will continue through the winter months.

Year 2

Fall: As fall approaches, we will seize the opportunity to introduce the first wave of native tree species to the pine plantation. Key species like red maple, paper birch, black cherry, and elderberry will be carefully planted. This will be done through the planting of bare root seedlings. Bare root seedlings are young trees with their roots exposed, ready to be planted directly into the ground. This method is efficient, cost-effective, and allows for better

establishment and early growth of the trees. Initiating the transition towards a Northern Dry Mesic Forest. After our key tree species are planted, our attention will shift to the restoration of the corn field. The remaining corn will be harvested in the fall

Spring: The focus of the second year is still on the corn field by preparing the ground for planting the cover crop. Furthermore, the cover crop will also be sown during this time of year.

Year 3

Fall: As the cover crop enhances the soil condition, we will take the next step in the restoration process by introducing the first round of native species for the shrubland and mesic prairie. Early successional species such as big bluestem, little bluestem, and prairie panic grass will be planted.

Spring: In the third year, after the establishment of wild grasses we will turn towards planting more charismatic species like: Wild rose (*Rosa sp.*), rough blazing star (*Liatris aspera*), plains wild indigo (*Ceanothus americanus*), smooth blue aster (*A. laevis*), and yarrow (*Achillea millefolium*) to support pollinators and enhance biodiversity. Additionally, bare root shrub species like gray dogwood and hazelnut will provide an essential cover for ground-nesting birds.

Summer: Throughout the summer, we will observe and monitor the progress of the restoration efforts. This phase is crucial for evaluating the success of the previous plantings and ensuring the desired vision is on track to be realized. If it appears that invasive species emerge trying to compete with the native grassland species, selective mowing will be employed to halt their progress. The mowing process will continue for two to three years, after which prescribed burns will be utilized as the alternative management method (not including shrubland designated zone).

Year 6 and Beyond: Establishing the wild Apple Orchard

Preparing the Designated Area: In the sixth year, we will meticulously prepare the designated area for the apple orchard. The site will be thoroughly assessed to ensure it meets the necessary criteria for successful apple tree cultivation. Proper soil testing will be conducted to determine soil composition, pH levels, and nutrient content. Based on the soil analysis, any necessary amendments will be made to optimize the growing conditions for the apple trees. Additionally, the site will be cleared of any remaining invasive species or potential barriers to tree growth.

Planting the Apple Trees: In the seventh year, we will start planting the apple trees in the prepared orchard area. To establish a thriving orchard, we will opt for planting young apple trees. These young trees will be sourced from reputable nurseries, ensuring healthy and vigorous

saplings. By choosing this approach, we can carefully select apple tree varieties that are well-suited to the local climate and soil conditions, promoting long-term growth and fruit production. Within a few years of planting, the apple trees will flourish, enriching the ecosystem and providing a vital food source for local fauna. The orchard will be treated as a wild orchard with minimal maintenance and no use of herbicides or pesticides. It will serve as a beacon of biodiversity, drawing in wildlife and the community alike to enjoy the fruits of our restoration efforts.

With these meticulous preparations and sustainable practices, the apple orchard at Shannon Preserve will become a valuable asset in the ecosystem, adding to the diverse habitats and benefiting both wildlife and the community. The introduction of the orchard marks the culmination of our restoration journey, creating a place of beauty and significance that will be cherished by future generations.

E. Monitoring & Management

Measurable Goals and Monitoring:

In this ecological restoration plan, we are committed to establishing measurable goals that will allow us to closely monitor the progress and success of our restoration efforts over time. To ensure effective monitoring, we will conduct regular ecological assessments and surveys at Shannon Preserve. These assessments will include tracking changes in populations of key plant and animal species, as well as monitoring shifts in community composition and increases in overall biomass. By implementing this systematic approach, we will be able to gather valuable data that will inform our decision-making and guide adaptive management strategies. Regular assessments will help us stay on track, make informed adjustments when necessary, and ensure that our restoration efforts continue to move the preserve toward our desired ecological vision.

Permanent Survey Sites and Repeat-Photography:

To effectively evaluate long-term changes in the restored habitats, we will establish permanent survey sites at various locations across the site. These sites will be revisited year-over-year to compare data and assess the effectiveness of restoration strategies. Additionally, we will implement repeat photography at specific locations to capture visual evidence of habitat development over many years. These photographs will serve as valuable tools to showcase the progress of the restoration efforts and provide insights into the changes occurring at Shannon Preserve.

Ideal Management Team:

The success of the restoration and long-term management of Shannon Preserve will rely on a well-organized and dedicated management team. While the landowner, OWLT, will play a central role in overseeing the project, the involvement of volunteers and community members will be crucial to maintaining the site's ecological integrity. We envision engaging a group of passionate volunteers who will be trained to conduct seasonal assessments of conditions and continually re-evaluate priorities.

Seasonal Assessment and Re-evaluation:

The volunteer team will conduct regular seasonal assessments of the habitats, keeping an eye on the progress of the shrubland, prairie, and forest restoration. They will record changes in plant and animal populations, note any signs of invasive species resurgence, and assess the overall health and biodiversity of the ecosystems. This information will be used to adapt and fine-tune the management strategies as needed to ensure the restoration goals are being met effectively.

Community Engagement:

The restoration project will be an opportunity to engage the community in the conservation and restoration efforts at Shannon Preserve. We will organize educational workshops, guided walks, and art sessions. We will host field watercolor workshops, inviting local artists to capture the beauty of the evolving landscape. Artistic expressions will complement scientific monitoring, fostering a deeper connection to nature. The artwork will be showcased at community events, promoting stewardship and celebrating the Preserve's transformation. Through science, community involvement, and the arts, we aim to create a thriving and interconnected ecosystem, preserving Shannon Preserve's natural heritage for generations to come. This engagement will not only provide valuable input and support but also ensure the long-term sustainability of the project.

By actively monitoring the ecological changes and involving the community in the management process, we will create a dynamic and adaptive restoration program that can respond to emerging challenges and capitalize on opportunities to enhance the ecological health of Shannon Preserve.

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