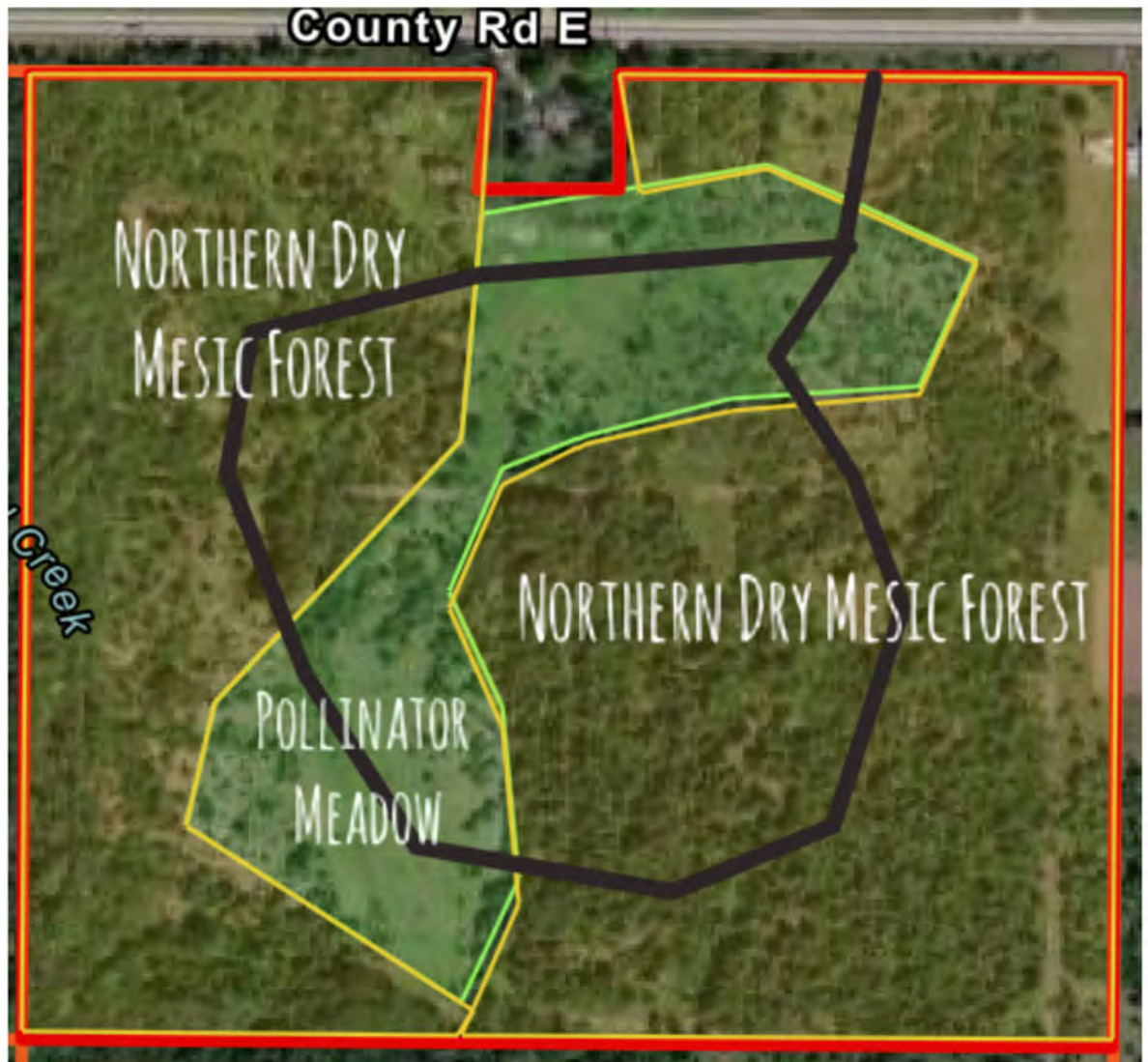


# Peninsula Sanctuary

A succession of sanctuaries

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Alanna Fabian



## A. Introduction

Peninsula Sanctuary is 158 acres currently owned by the University of Wisconsin and under management of the Green Bay (UWGB) campus. It resides in Peninsula Center, an unincorporated community in the town of Baileys Harbor in Door County, Wisconsin. I wanted to restore this site because it is owned and managed by the university that I graduated from, which is the University of Wisconsin Green Bay (UWGB). Humans are an integral part of the ecosystem just like everything else that exists, so I think the individual ecological restoration process could benefit from starting within a community that you know and trust because it will be those people who will be there to help you and it's those people whose lives will most be affected by the restoration of that degraded ecosystem.

## B. The Past to the Present

Since the donation of PS to the institution by Judson Fuller (in memory of his wife, Jesse) in 1975, the property has been untouched, save for the first bird and vegetation survey done in 1993 by UWGB student researchers (the second set to be completed in the summer of 2023). The property is an old agricultural field and is showing the signs of early succession.

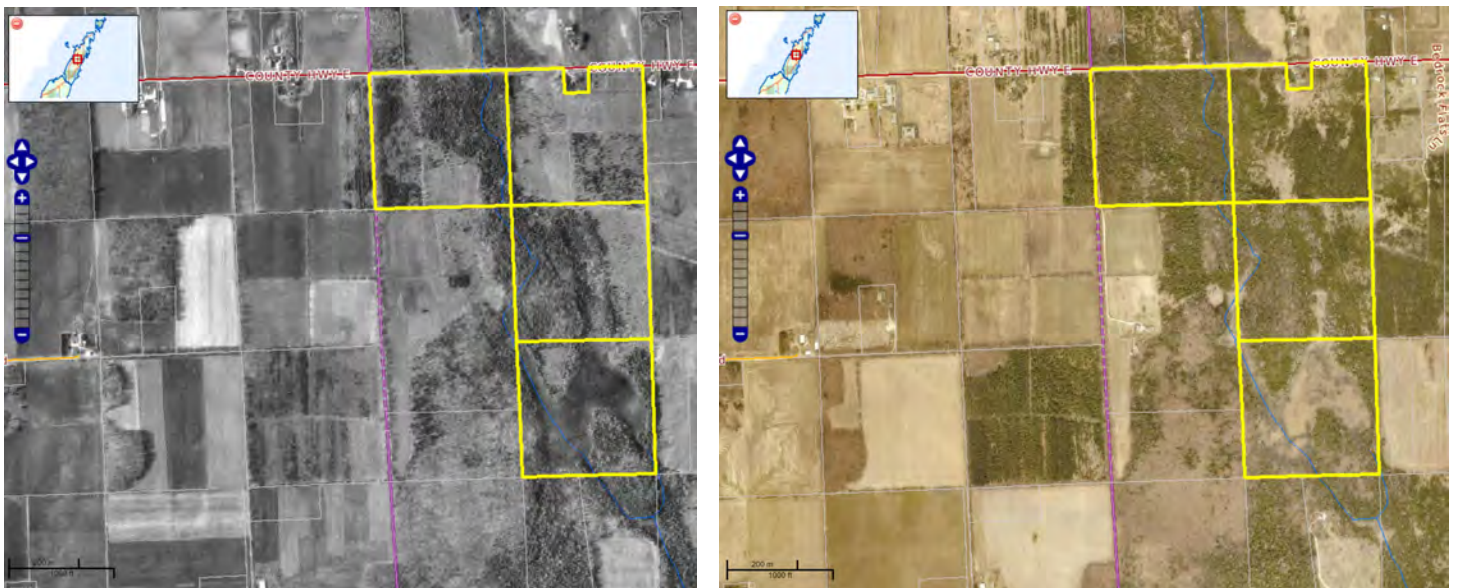


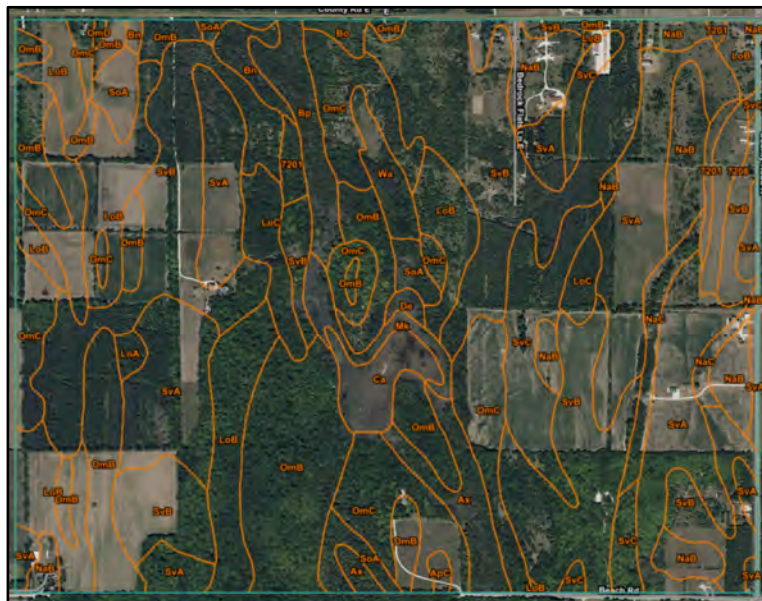
Figure 1 & Fig. 2: (Left) aerial photo from 1992. (Right) aerial photo from 2021.

From the earliest aerial photo from 1992, the property was cleared and used for agriculture. The monoculture of white cedar had started to slink in, pursuing the watershed corridor of Hibbards Creek. From 1992 until 2021, the white cedar population bled into the rest of the 158 acres, leaving a few large patches of meadow. For this project, I will be focusing on the top right 40 acres.

The 40- acre site is an old field and currently the white cedar community has still seemed to favor the southeast corner and western half due to the watershed. These coniferous forested areas are extremely dense, with trees only four to ten inches in diameter, but still prohibiting almost all undergrowth due to shading and the abundance of needles sheathing the soil. The trees themselves are bare, except for the upper canopy. There are a substantial amount of grassland/shrubland pockets within the forested areas in the northeast corner and southwest corners, with a slim amount of non-local vegetation. There are two main patches of grassland in the southwest corner and one in the north center.

As for the surrounding area, Hibbards Creek, a small (15 feet wide) ephemeral stream, enters from the northern edge of the property and flows into a shallow pond at the southern edge- then from the pond, flows southeast for 5.4 miles before it enters into Lake Michigan, north of Jacksonport. To the east of PS is Kangaroo Lake State Natural area partially owned by the Nature Conservancy and the Door County Land Trust. To the northwest is Thorp Pond State Natural area owned by the Wisconsin Department of Natural Resources (DNR) and White Cliff Nature Preserve owned by the Door County Land Trust. I also want to acknowledge that PS is traditionally within the Menominee Nation territory.

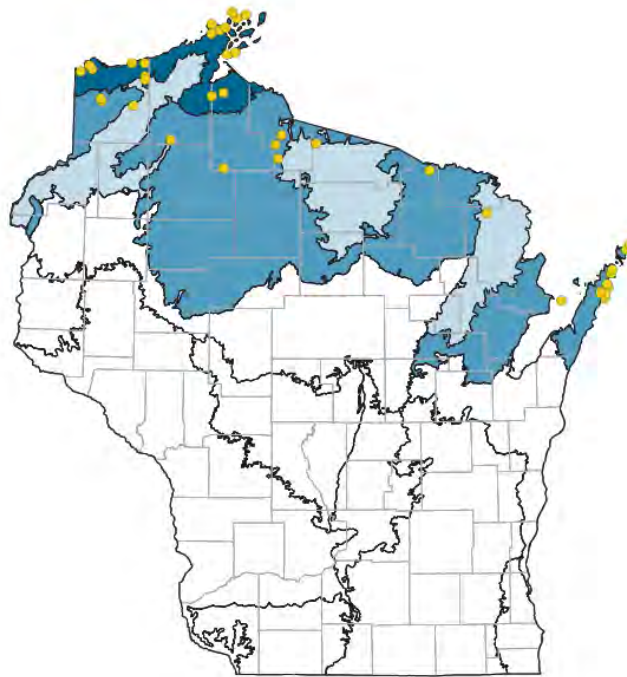
According to the soil maps for this site, the northeastern corner is made of well-draining SvB soils (Summerville loam) with a parent material of loamy drift over dolomite and 10-20 inches of soil to lithic bedrock. The northwestern corner is primarily made of OmB and OmC (Omena sandy loam) with a parent material of loamy till. The southwestern portion is in the wetland area and is made of Wa (Wainola loamy fine sand) with a parent material of sandy glaciofluvial deposits as well as SoA (Solona loam) with a parent material of loamy till. The southeastern corner is made of well-draining LoB (Longrie loam) with a parent material of loamy till over residuum weathered from limestone and 25-35 inches to lithic bedrock. Generally, the soil is thin and rugged (rocks on the surface). There is little to no undergrowth, but there was a healthy society of mosses and lichens on top of the soil.



**Fig. 3: Soil distribution map of Peninsula Sanctuary.**

Door County (DC) has a karst topography with a limestone bedrock, gravelly soils and is very susceptible to erosion and groundwater contamination because limestone is easily dissolved by water; this also makes the soil more alkaline because of the calcific properties of limestone. Because DC is in a unique position of being a peninsula between the bay of Green Bay and Lake Michigan, the cool and moist climate year-round and plus the unique shallow mineral soils creates a rich environment for a boreal ecosystem. However, due to human intervention, most specifically burning, deforestation, and agriculture, most of these boreal forests transitioned into mesic forests- although some retain remnant species of a more boreal ecosystem. For example, The soil closer to Hibbards Creek watershed (although off-site of the 40 for this project) is still suitable for a boreal forest, and some of the species that were there did confirm that- such as white cedar (*Thuja occidentalis*), balsam poplar (*Populus balsamifera*), quaking aspen (*Populus tremuloides*), dwarf scouring rush, *Carex eburnea*, bracken fern (*Pteridium aquilinum*), and running ground pine (*Lycopodium clavatum*).

Unfortunately, many of these historic boreal forests are much too degraded and fragmented to sustain a boreal ecosystem and much of the wildlife that once relied on it has been extirpated from the area (like the woodland caribou, Canada lynx, American marten, or moose). These boreal ecosystems thrived when they had the structure of co-dominated conifer and hardwood old growth trees, but now, at Peninsula Sanctuary, it is dominated by a young and dense population of white cedar. Although a boreal forest relies on the coniferous trees such as white spruce, balsam fir, eastern white pine, and of course, northern white-cedar, a monoculture of one does not provide the resilience and stability of a diversified forest. Although this property historically could have been and does have potential to be a boreal forest, the human intervention and destruction of soil and hydrology left to the whims of succession has potentially given rise to hysteresis- a point at which the ecosystem has been too destroyed to ever return to what it used to be.



**Fig. 4: Pre- Euro-American settlement, there were around 670,000 acres of boreal forest in Wisconsin.**

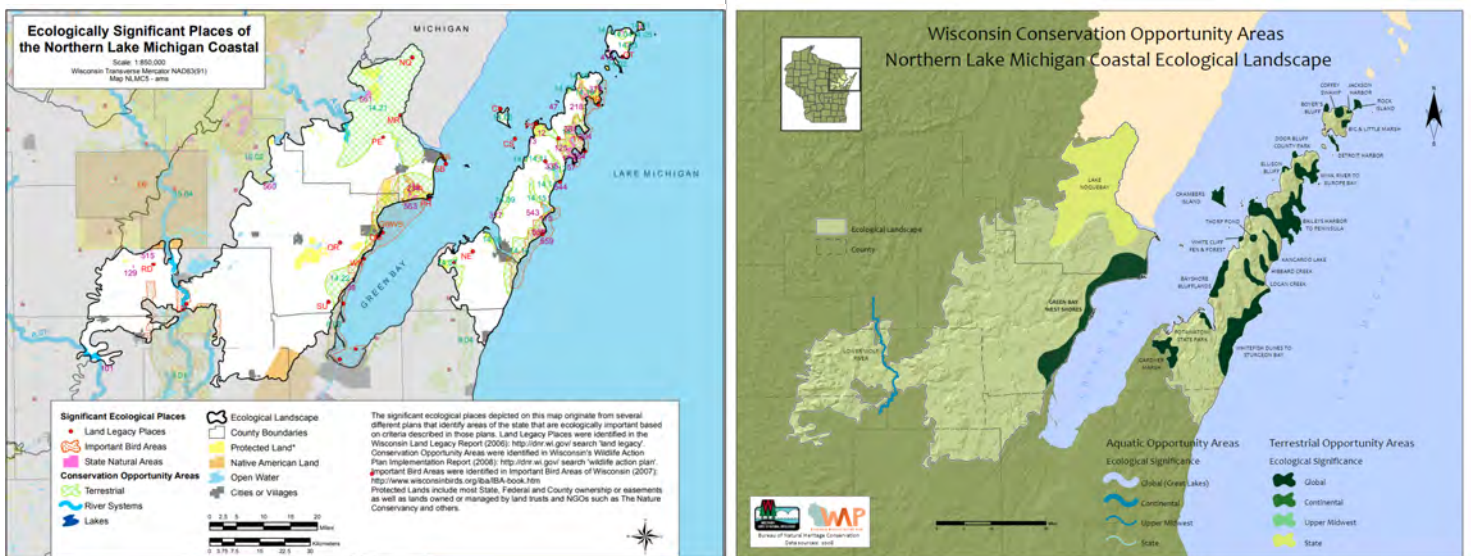
## C. The Possible Future

### Stable State

The white cedar regeneration is a secondary-successional process caused by years of agricultural abuse so I cannot confidently rely on the theory that this white cedar monoculture would succeed into a northern mesic forest itself if it remains unmanaged. The density of the trees and the duff is far too great to allow the growth of other species, and intervention is needed to help guide the property into a suitable and orderly habitat. Although this property could be ushered in the direction of a boreal forest, the realistic constraints of management (and staffing for management) and budget render this dream futile.

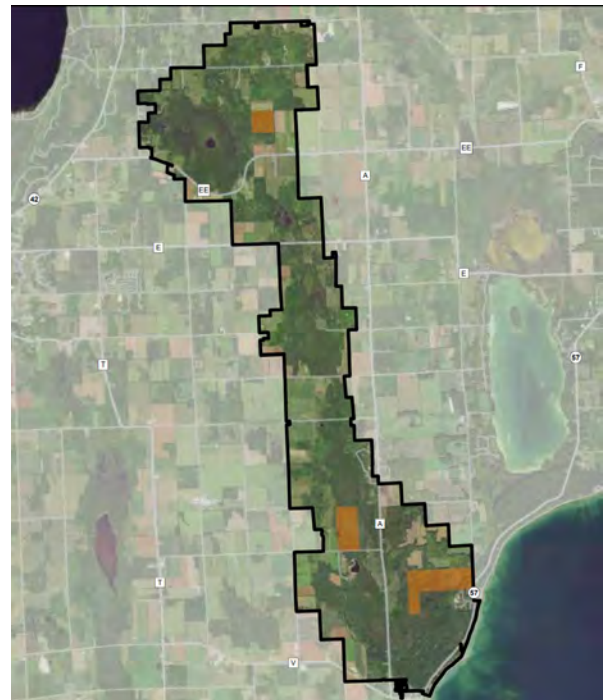
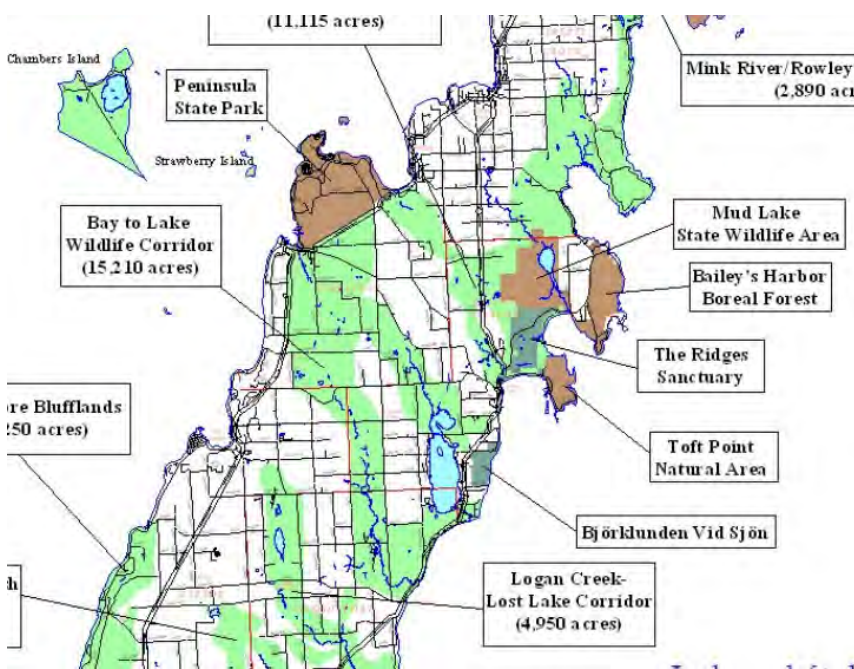
My vision for this site was initially built on hope, hope that this property had the potential to return back to a boreal ecosystem, because boreal ecosystems are cool and I want to see a Canada lynx in real life. Hope was lost when I saw that the old field was in fact, an old field, and succession had seized its destiny. Hope did remain as I saw there was very little presence of non-local vegetation, and I could skip right to the fun part. The goal of this stable state plan is to create a simple and sustainable design that requires little maintenance and a joy of waiting. Since this site is owned and managed by UWGB, they do not and will not always have the adequate funding or support for large restoration projects. Ensuring the methodology is cost-effective and repeatable is important.

Firstly, the data. Hibbards Creek is labeled by the DNR as an Ecologically Significant Place within the Northern Lake Michigan Coastal Landscape within their Wildlife Action Plan (from 2015-2025). Hibbards Creek Corridor is a primary location of stopover habitat for birds and could be a great location for consistent use of more permanent species. This corridor could theoretically extend and spread from west by the bay from White Cliff Nature Preserve or from Peninsula State Park, through Thorp Pond State Natural Area, connect with Peninsula Sanctuary, and continue on to Kangaroo Lake Nature Preserve and Heins Creek Nature Preserve.



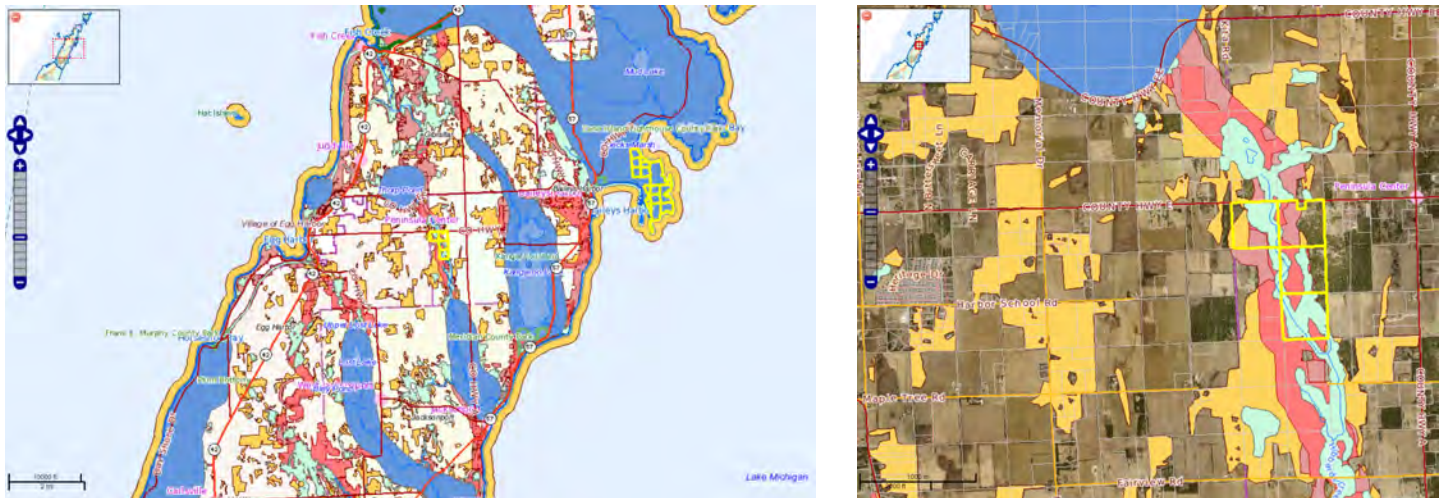
**Fig. 5 & Fig. 6: (Left) shows the Ecologically Significant Places. Hibbard Creek is labeled as 14.14. (Right) shows the Conservation Opportunity Areas determined by the DNR (Hibbard Creek).**

Additionally, the DNR has published a document titled “A Guide to Significant Wildlife Habitat and Natural Areas of Door County, Wisconsin” (2003) and subtitled “A Collaborative Community Project” has determined a Bay to Lake Corridor which would have two extensions starting from Peninsula State Park. The first would continue to Thorp Pond, to Hibbards Creek and Peninsula Sanctuary, and end south of Kangaroo Lake. They label this corridor as significant because it is a major connection from Green Bay to Lake Michigan, as well as just being a major wildlife corridor amidst the fragmentation from roads, infrastructure, and agriculture that clutter the Door Peninsula. Habitat corridors are extremely important for conservation as it facilitates movement of plants and animals and increases biodiversity and resilience in the ecosystem. Additionally, many species require territories and use different areas for foraging, mating, or raising young and this may be a major player in climate change as species may need to relocate to find a more suitable home. Of course, these also are a great opportunity for community engagement, as it gives people a space to connect and immerse themselves with the local environment and truly get to treasure the place they are in. Another DNR published document, "A Planning Tool for Migratory Bird Conservation along Lake Michigan" (2019) determines the same corridor as an important conservation opportunity.



**Fig. 7 & Fig 8: (Left) the “Bay to Lake Wildlife Corridor” outlined in A Guide to Significant Wildlife Habitat and Natural Areas of Door County, Wisconsin. (Right) the corridor outlined by “A Planning Tool for Migratory Bird Conservation along Lake Michigan”.**

More supplementary and redundant data to prove my point that this is an important area of conservation:



**Fig. 9 & Fig. 10: (Left) Peninsula Sanctuary is outlined in the four yellow grid squares south of Peninsula Center. In 2015, local governmental agencies of Door County collaborated to develop the Door County Greenprint model which was a GIS software that identified and tracked critical lands for resource protection and management. The opaque blue is labeled as “Conservation Opportunity Areas” which was determined by the DNR’s Wildlife Action Plan. The red and orange polygons represent the habitat criteria (i.e. migratory bird habitat, coastal wetlands, riparian habitat) that are high concern to moderate concern (respectively) in terms of the habitat being extremely degraded to moderately degraded. (Right) a closer view of the specific habitat criteria that resides within Peninsula Sanctuary. The light green and the red corridor that begins at Thorp Pond (the blue at the top of the map) and follows Hibbards Creek south are both showing critical habitat corridor opportunity areas determined by the Greenprint model. As it shows, the property is a critical piece to creating a wildlife corridor.**

It is clear that many important stakeholders view Hibbards Creek and therefore PS as an ideal and critical piece to reconnecting natural areas in DC. Migratory birds of the Mississippi Flyway depend on stopover habitat on their migration, and the Door Peninsula is the last and/or first stop for some species when flying between Canada and the United States. All permanent resident species of DC rely on these corridors and may become isolated or extirpated from the area if there are no large connections of natural areas for them to travel through. Again, there is an encroaching need for increased habitat area as climate change and various developmental stakeholders may influence the ecosystems in ways we may not predict, such as more “natural” disturbances or disease outbreaks. There was a study done in 2022 that found through AI literature searches that 58% of all global infectious diseases were aggravated by climatic hazards including warming, precipitation, floods, drought, storms, natural cover change, ocean climatic change, fires, heatwaves, and sea level (stated in level of potency).

This site, in the process of restoration, will also provide student researchers an opportunity to witness and analyze the succession of vegetation and wildlife in an old field, a type of ecosystem this world could never have enough research on (as of 2021, the United States consists of 52% agricultural land- which will no doubt inevitably become old fields). Because DC is a very popular tourist destination,

The Bay to Lake Corridor would bring alive the ecosystem that was destroyed after European colonization and give an opportunity for humans to immerse themselves in nature. There also is the Ramsar site, which is a “Wetland of International Importance”. Although the Door Peninsula Coastal Wetlands Ramsar site doesn’t include Peninsula Sanctuary, the reason why wetlands are of international importance is the same. Having a healthy and functional watershed system is even more crucial for DC as it helps to mitigate flooding and increase resilience to climate change in an already isolated and fragile karst ecosystem. Keeping a clean and biodiverse wetland system within DC can also help filter through the polluted runoff and sediment coming from Green Bay before it reaches Lake Michigan.

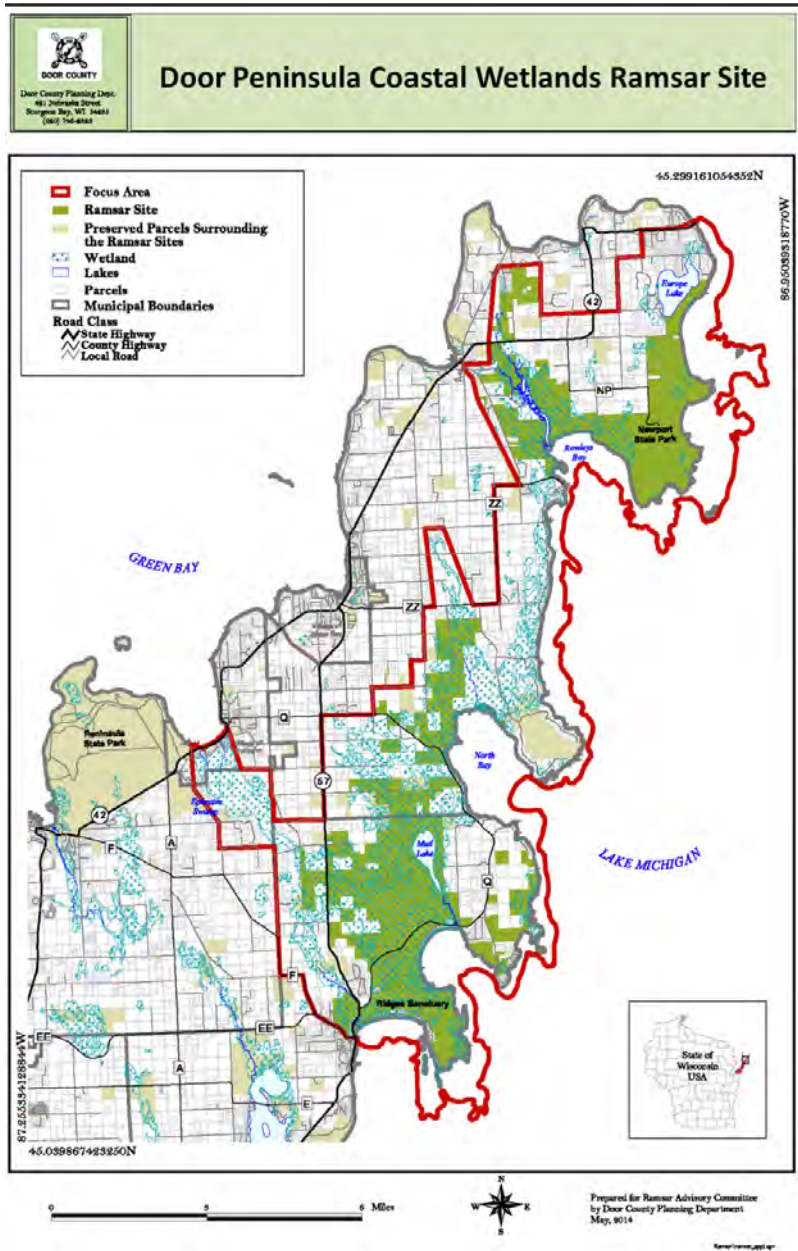


Fig. 11: The Door Peninsula Coastal Wetlands Ramsar site map



## **Alternate State**

However, as PS has evolved to be somewhat stable in the sense that the non-local plant diversity is surprisingly low (although native diversity is also low) and it still provides structure and homes to at least a few types of animals and plants, I feel like this site could be used in a more unusual way that will provide more long-term benefits for education and research.

The inspiration occurred when I thought about how to incorporate Canada yew into the ecosystem without the deer inhaling them all. I read that deer don't browse any fragrant plants such as herbs, and I considered the idea that if I planted Canada yew encircled in herbs, would the deer browse it? Then I thought about the thinning of the cedar monoculture; they could be consciously placed in brush or habitat piles or formations to create structure for wildlife and fungi. The meadow could be converted into an experimental regenerative agriculture field where students could explore and apply known or unknown practices. Another example: mycorrhizae is a fundamental participant in ecological restoration, but fungi is often lacking in old field sites due to the heavy fertilizer and herb/pesticide use. Some studies have shown that by inoculating a sterile sample of soil with mycorrhizae (in lab settings), they were able to increase (general) productivity of the plant. Replicating an experiment like this and implementing it in the field could be a pivotal step in the realm of restoration.

Also, in honor of the native peoples of this land, it is important we consider how they've gained their traditional ecological knowledge of how to steward the land. It wasn't through various levels of research and analyzed data or filtered through countless political stakeholders (although these all do have their value in today's society). It was through awareness, intuition, and an intimate and spiritual relationship with the land and its beings that they were able to understand it. With the Anthropocene upon us, it feels imminent that nature may collapse around us all too soon, and restoration work will ultimately become more weird and more necessary. Having a place for (methodical) trials and hypotheses to be tested in the field with no detrimental repercussions could be a transformative process for scientists to explore their creativity and intuitions.

## **D. The How**

### **Model Site**

The model site is 60 acres a couple miles east of PS owned by The Nature Conservancy. It is a northern dry mesic forest, with species such as red oak, white pine, sugar maple, american beech, hemlock, ash, and ironwood with an understory of beak hazelnut, bracken fern, lily of the valley, Pennsylvania sedge, and wood's sedge. The soil type is Longrie Series, which is a sandy loam, similar to PS. The topography is very hummocky and shows the signs of the pillow-and-cradle effect when trees uproot and tip over, leaving the root mass and uprooted soil to lie in a "pillow"-like formation and leaving a large hole in the ground, or the "cradle". This creates many types of microhabitats within the change in topography, increases nutrients to the soil via duff and decaying, and the down logs can act as "nurse" logs which allow other organisms to grow and live in and around it.

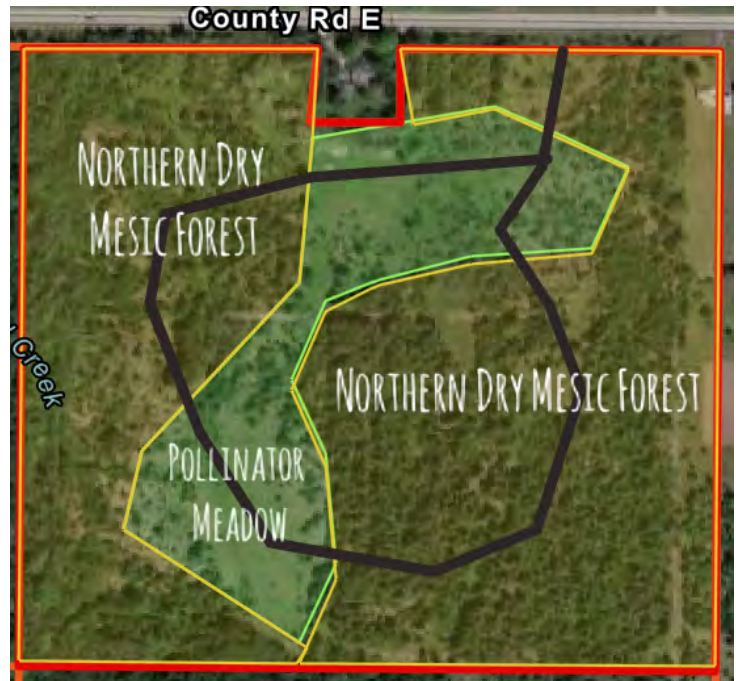
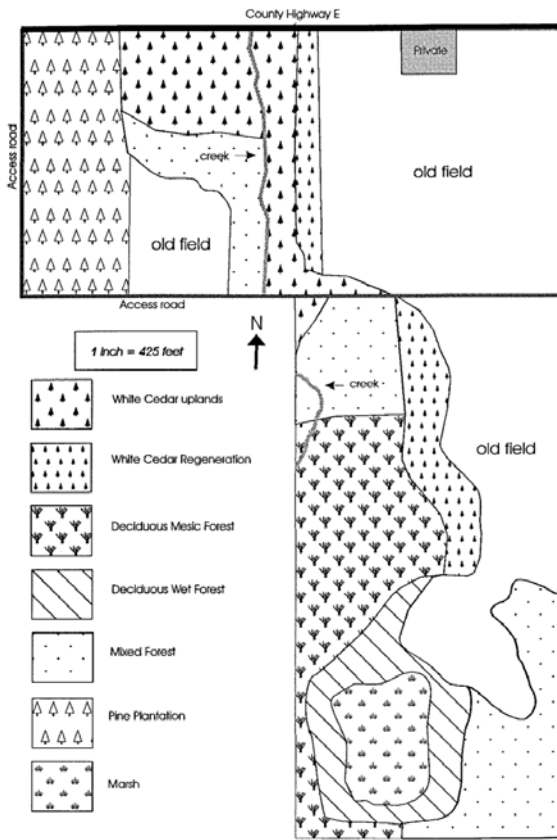
I had a conversation with Mike Grimm, an ecologist from Sturgeon Bay, and he recommended this site. According to him, the northern dry mesic forest is gradually becoming less represented in the DC landscape. Upon further investigation, this is accurate, as after Euro-American immigrants migrated to the area in the late 1800's, these types of forests, specifically ones with eastern white and red pines (called

“pineries”), were logged because the lumber was light enough to float down rivers to sawmills. These forests were gone by the end of the 19th century. Many northern mesic forests nowadays are second-growth forests, which occur when they naturally regenerate after human-caused disturbances such as agriculture clearing or logging. This implies that they may be dominated by larger northern dry mesic deciduous trees (red oak, sugar maple) and early successional trees (quaking aspen, white birch) which grow densely and shade out the light-demanding red and white pine and other understory vegetation. The restoration of these pineries is important for the reestablishment of old-growth forests which provide the structure and resilience that young forests do not have.

Although this model site is not dominated by coniferous trees as it “should” be in this geographic region, the forest is diverse, relatively open, and has a substantial understory with a lot of organic matter, and the successional processes that are happening here seem like a reasonable target for PS.



## Peninsula Sanctuary- The Vision



**Fig. 12 & Fig. 13: (Left) a map of PS created by Patrick Robinson in his research paper titled “Vegetation of Peninsula Center Sanctuary, Door County, Wisconsin”. The site for this project is the north eastern old field forty acres. (Right) The restoration plan for the old field site.**

Obviously, a (pictorial) ode to succession





## The White Cedar Monoculture- Goal: DIVERSIFY



Northern white cedar is a native tree of Wisconsin and is an important tree species for northern Wisconsin and northern mesic forests as it is a resilient species and can withstand a lot of environmental conditions and diseases and have the capacity to live for hundreds of years, creating old growth forests. The reason for this monoculture of cedars is somewhat unknown but it could be hypothesized that because they are a resilient species, they took advantage of the empty old field and were able to easily regenerate here due to lack of competition. Also, Door County has a karst landscape, which means the bedrock is made of soluble carbonate rock, in this case limestone, which makes the soil alkaline which cedars love. Thirdly, deer do love white cedar, but maybe not upland old field cedars. It could also be that the deer were and are browsing on these trees which stunt their growth and give space and time for more cedars to regenerate around it, which creates the density that I see at Peninsula Sanctuary.

The monoculture of cedars will be addressed as such:

1. Thinning of cedars via whatever tool is available (chainsaw, field mower, machete). There are large thickets of cedars intermingled with a few white pine, black cherry, scotch pine, and black spruce. Within these thickets, there are openings of sparse vegetation where succession hasn't yet reached all the way through. As Dan Collins suggested, making "fjords of intervention", or cutting fingers about 10-20 feet in diameter into the cedar thicket will be an easier method than trampling through and cutting large holes. Cutting the fjords north to south may provide more sunlight throughout the day for the saplings. The cut trees can be tossed on top of the remaining monoculture to reduce the spread of cedar needles and to allow



more open soil to give the seed bank a chance to regenerate as well as for the newly planted plants.

- a. Girdling can also be done on larger trees, preferably on Scotch pine or Norway spruce as they aren't local but would function as a snag for habitats. However, these trees could also remain standing until the newly planted trees mature to provide structure in the habitat.
2. Planting bare-root trees and shrub species (around 100 or so each)- done all in one season (spring or fall), not in stages. Because there is little to no non-local vegetation, not much clearing of the soil needs to be done. The goal is to diversify the site, so planting a diverse set of species right away will be ideal as we want these to be established yesterday. These can be planted directly into the soil and the use of cardboard with a hole in the center to place the plant within and surrounded by mulch or other organic material laid on top of the cardboard could be a great method to provide moisture and nutrients as it becomes acclimated. Preferred species will be early successional ones such as quaking aspen, big-tooth aspen, black cherry, sugar maple, red pine, and white pine. Late successional species could be hemlock, basswood, and white oak. Closer to the watershed, planting white spruce and balsam fir could potentially do well as the soil and vegetation is still boreal-esque. The shrub species would be beaked hazelnut, witch hazel, chokecherry, American fly honeysuckle, nannyberry, Canada yew, and mountain maple. Some of these which are preferred by wildlife (mostly deer and rabbits) should be caged.

The aforementioned pockets of bare/sparse soil:



## Meadow- Goal: Better Meadow



Fun fact: DC doesn't actually have true prairies because the soil is so shallow- instead, they have meadows. Prairie plants have a deeper root system because they are typically found in drier climates and need to reach the water table during dry periods, whereas meadows are found mostly in wetter climates so they don't need deep soil or root systems. However, both are considered grasslands, and grassland species of birds are in a high decline due to the loss of proper grassland habitat. According to the American Bird Conservancy, as of 2023, there has been a 53% reduction in the grassland bird population since 1970. Birds and pollinators are dependent on native vegetation, and so planting as many species as possible seems to be the best route. It is important to have plants that are fruiting in every season as well to provide food sources throughout the year, so having a diverse species list for vegetation is essential. There are two separate meadow sections within this site and I plan to connect them to increase fluidity of the "grassland" habitat. Removal of trees and stumps would be the heavy work for this portion, but after this, seeds can be broadcasted on top the soil, and the waiting game can begin.

The last bird survey was done in 1993, and the species list from the paper did not provide any critical or vulnerable species relevant to today, but I was told from Bobbie Webster that there was an upland sandpiper on this old field site recently which could be used as an indicator that this property is and could be an ideal habitat for grassland birds. Bird boxes and bat houses could be a great addition to the property once it is known which species are frequenting at the site.

The grassland is mostly dominated by smooth brome, beebalm, and goldenrod. There are a couple apple and plum trees, as well as some autumn olive that should be removed as it is not local. I have used the species list provided by Nancy and Dan that they use at Landscapes of Place (pictured below). These seeds would just be broadcasted into the soil as the vegetation is still stunted and relatively sparse.

<b>Working List</b>				
<b>Door County Meadow species / Aten / Landscapes of Place / 2019</b>				
	<b>Latin Name</b>	<b>Common Name</b>	<b>Wetland Indicator</b>	<b>C</b>
grass/sedge	<i>Bromus kalmii</i>	Kalm's Brome	FAC	8
grass/sedge	<i>Danthonia spicata</i>	Poverty Oat Grass		4
Grass/sedge	<i>Elymus canadensis</i>	Canada Wild Rye	FAC-	4
grass/sedge	<i>Elymus trachycaulus</i>	Slender Wheat Grass		4
grass/sedge	<i>Elymus villosus</i>	Silky Wild Rye	FACU	6
grass/sedge	<i>Elymus virginicus</i>	Virginia Wild Rye		6
grass/sedge	<i>Anthoxanthum hirtum</i>	Sweetgrass		
grass/sedge	<i>Juncus tenuis</i>	Path Rush	FAC	3
grass/sedge	<i>Koeleria macrantha</i>	Junegrass		7
grass/sedge	<i>Muhlenbergia mexicana</i>	Leafy Satin Grass	FACW	3
grass/sedge	<i>Schizachyrium scoparium</i>	Little Bluestem		
grass/sedge	<i>Sorghastrum nutans</i>	Indian Grass	FACU+	5
grass/sedge	<i>Stipa spartea</i>	Porcupine Grass		9
forb	<i>Allium cernuum</i>	Nodding Wild Onion		7
forb	<i>Anaphalis margaritacea</i>	Pearly Everlasting		3
forb	<i>Anemone cylindrica</i>	Thimbleweed		6
forb	<i>Anemone virginiana</i>	Tall Thimbleweed		5
forb	<i>Antennaria neglecta</i>	Field Pussytoes		
forb	<i>Antennaria plantaginifolia</i>	Plantain-leaved Pussytoes		
forb	<i>Apocynum androsaemifolium</i>	Dogbane		2
forb	<i>Aquilegia canadensis</i>	Wild Columbine	FAC-	5
forb	<i>Asclepias syriaca</i>	Common Milkweed		1
forb	<i>Asclepias tuberosa</i>	Butterfly Milkweed		6
forb	<i>Asclepias verticillata</i>	Whorled Milkweed		2
forb	<i>Astragalus canadensis</i>	Canadian Milkvech	FAC+	8
forb	<i>Campanula rotundifolia</i>	Harebell	FAC-	5
forb	<i>Comandra umbellata</i>	Bastard-toadflax	FACU	6
forb	<i>Coreopsis lanceolata</i>	Coreopsis	FACU	8
forb	<i>Doellingeria umbellata</i>	Flat-topped Aster	FACW	6
forb	<i>Epilobium angustifolium</i>	Great Willow-herb	FAC	3
forb	<i>Erigeron strigosus</i>	Daisy Fleabane		
forb	<i>Fragaria virginiana</i>	Wild Strawberry	FAC-	1
forb	<i>Heliopsis helianthoides</i>	False Sunflower		5
forb	<i>Hieracium umbellatum</i>	Narrow-leaved Hawkweed		5
forb	<i>Lilium philadelphicum</i>	Wood-lily	FAC-	9
forb	<i>Monarda fistulosa</i>	Wild Bergamot	FACU	3
forb	<i>Monarda punctata</i>	Dotted Horsemint	UPL	3
forb	<i>Oenothera biennis</i>	Common Evening Primrose	FACU	1



forb	<i>Packera paupercula</i>	Northern Meadow Groundsel	FAC+	4
forb	<i>Pedicularis canadensis</i>	Wood Betony	FACU+	8
forb	<i>Potentilla arguta</i>	Prairie Cinqufoil	FACU+	7
forb	<i>Ratibida pinnata</i>	Yellow Coneflower		4
forb	<i>Rudbeckia hirta</i>	Black-eyed Susan	FACU	4
forb	<i>Rudbeckia triloba</i>	Brown-eyed Susan	FAC-	4
forb	<i>Solidago juncea</i>	Early Goldenrod		4
forb	<i>Solidago nemoralis</i>	Old-field Goldenrod		
forb	<i>Solidago rigida</i>	Stiff Goldenrod	FACU-	5
forb	<i>Symphyotrichum ciliolatus</i>	Northern Heart-leaved Aster		4
forb	<i>Symphyotrichum ericoides</i>	Heath Aster	FACU-	4
forb	<i>Symphyotrichum laeve</i>	Smooth Blue Aster		6
forb	<i>Symphyotrichum lateriflorum</i>	Calico Aster	FACW-	
forb	<i>Symphyotrichum novae-angliae</i>	New England Aster	FACW	3
forb	<i>Symphyotrichum oolentangiensis</i>	Sky-blue Aster		5
forb	<i>Symphyotrichum urophyllum</i>	Arrow-leaved Aster		4
forb	<i>Synphiotrichum pilosum</i>	Hairy Aster		
forb	<i>Taenidia integerrima</i>	Yellow Pimpernel		7
forb	<i>Verbena hastata</i>	Blue Vervain	FACW+	3
forb	<i>Zizia aurea</i>	Golden Alexanders	FAC+	7
fern	<i>Pteridium aquilinum</i>	Bracken Fern	FACU	2
shrub	<i>Ceanothus americanus</i>	New Jersey Tea		9
shrub	<i>Comptonia peregrina</i>	Sweet-fern		4
shrub	<i>Juniperus communis</i>	Old-field Juniper		3
shrub	<i>Physocarpus opulifolius</i>	Ninebark	FACW-	6
shrub	<i>Rhus aromatica</i>	Fragrant Sumac		10
shrub	<i>Rhus hirta</i>	Staghorn Sumac		2
shrub	<i>Ribes cynosbati</i>	Gooseberry		3
shrub	<i>Rosa blanda</i>	Early Wild Rose	FACU	4
shrub	<i>Rosa carolina</i>	Carolina Rose	FACU-	4
shrub/tree	<i>Hawthorn spp</i>	Hawthorn		

## Trail

At some point, the trail shown on my vision map could be implemented. It could begin by flagging trees and ensuring everyone follows the flags as a route to help establish the trail by use. The trail would be a great way for visitors to witness succession and experience a diverse ecosystem (hopefully). The trail would also be functional for maintenance, volunteer work, and research.

## **Alternate State- GOAL: Rediscover our Connection to Earth**

As for the alternate state, the site would undergo the same transformation, although some spaces could just be cleared or left alone to solely experiment upon. In this dream world, UWGB would offer a land restoration certificate available to anyone of any age, size, or color, and they could study at the site and implement safe and deliberate experiments to try to understand the land in a tactile way. They could be rudimentary or sophisticated experiments, but everyone who uses the site would be cognizant of the basic fundamentals of every trial to reduce redundancy, neglectance, and potential negative consequences or interactions. Facilities and a parking lot could be built, but I think the idea of having a simple and natural design is kind of the point. The point is to pretend you are a naive kid with a sponge for a brain, and all you want to do is use all your senses and figure out how things work. PS feels like an ideal space to have these trial and error adventures because it would all be localized in one area that is currently surrounded by other agricultural fields and roads, and there is less chance that these experiments could become disruptive and contaminate nearby natural areas. Also, the “stable state” restoration would still be undergoing, which would help balance the ecosystem itself and be able to withstand some unconventional activities. These experiments also would be approved by faculty of UWGB, so PS could remain true to its name and be a sanctuary of intuitive yet calculated brainchildren.

### **E. Monitoring and management**

Monitoring the site will hopefully be fairly simple. Although there are not many non-local species onsite, the thinning of the cedars will provide space and sunlight for non-local plants to grow, so monitoring the site for these and removing them when found will be important. Continuing to cut fingers into the monoculture of white cedars will need to be done until there are a proportional amount of species and diversity.

Monitoring the bare root trees and shrubs will be vital as well, because it is unknown how they will fare on the relatively thin and barren soil. Deer browsing will most likely be an issue, so caging trees may become a (tedious) priority.

The meadow is surrounded by a stone fence which can be used as a fire-break when using prescribed fire, which could happen every 1-5 years in spring or fall, depending on circumstance.

Continuing to monitor the site in terms of surveys and research could be really valuable in the wake of the Anthropocene, as climate change is continuing to change the way nature behaves and degraded lands are becoming more abundant. Education and research entities are the spokespersons for the environment, and we must make our voices heard and our data seen to protect and preserve the ancient, complex, and magnificent planet that we all call home.

## References

Land Acknowledgement: <https://wisconsinfirstnations.org/map/>

Site description: <https://www.uwgb.edu/natural-areas/peninsula-center/>

Soil map with orange contours: <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

Mycorrhizal fungi inoculation lab: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5461296/>

Agricultural land statistic: <https://www.ers.usda.gov/topics/farm-economy/land-use-land-value-tenure/>

Door County GIS Maps: <http://map.co.door.wi.us/map/>

WI Wildlife Action Plan: <https://dnr.wisconsin.gov/topic/WildlifeHabitat/ActionPlan>

A Planning Tool for Migratory Bird Conservation along Lake Michigan: <https://static1.squarespace.com/static/61bea46911492018fbca31c2/t/64bedb508325e1686b5df001/1690229777001/NH0945.pdf>

A Guide to Significant Wildlife Habitat and Natural Areas of Door County, Wisconsin: <https://www.co.door.wi.gov/DocumentCenter/View/739/Guide-to-Significant-Wildlife-Habitat-and-Natural-Areas-of-Door-County-WI-PDF>

Door County Boreal Forest article: <https://doorcountypulse.com/last-days-door-countys-boreal-forests/>

WI DNR Boreal Forest: <https://dnr.wi.gov/topic/landscapes/documents/elowch7/CTFOR040WI.pdf>

Ramsar Map: <https://rsis.ramsar.org/ris/2218>

Plants Not Favored by Deer: <https://learningstore.extension.wisc.edu/products/plants-not-favored-by-deer-p379>

Climate change and human disease: <https://www.nature.com/articles/s41558-022-01426-1>

Grassland bird statistic: <https://abcbirds.org/blog/declining-grassland-birds/#:~:text=Grassland%20birds%20as%20a%20group,significant%20drops%20in%20their%20numbers.>

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Site photo credit: Nancy Aten and Alanna Fabian

