

Spirit Lake Preserve as a Place of Restoration Ethos
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Introduction

Definition: non-local being (NLB) is an alternative way of describing exotic plants.

The vision for Spirit Lake Preserve is based upon this: the site is suitable to become an educational center, event space, and used generally for community engagement. It is situated in the Milwaukee River watershed, about one mile from the river, its highest point roughly sixty feet above the low water line. See Figure 1 below: On the property is a wet-mesic southern forest with a buckthorn problem (1), a plantation-style old field of five-year-old white pine, spruce, and oak (2), a wet sedge meadow in a wetland system south from a shallow pond overrun by non-local cattails (3), a lake (4) scruffy with reed canary grass (RCG), some higher quality mesic meadow (5), a shrub-land containing dogwood, ninebark, many ash saplings, boxelder, crab-apple, and some rare autumn olive (6), multiple old fields with strong non-local beings (7), and 48 acres of conventional farmland (8). (Kline & Ziegler 2023) Evidence of deer is seen throughout the site. According to eBird (2023), 157 species of birds have been observed on the property. There is a single driveway leading to an area ringed with a planting of conifers. Regarding infrastructure, a cottage and garage exist. Spirit Lake Preserve is adjacent to Rotary Park and a Milwaukee Area Technical College (MATC) campus is nearby. Much of the surrounding area is either farmland or developed residences.

To summarize: the ecosystems on the property are in a range of degradation levels and successional stages. The property is not cohesive. The focus in this report is restoring and expanding the woodland, following the guidelines of the Bradley Method. (Fuller & Barbie)

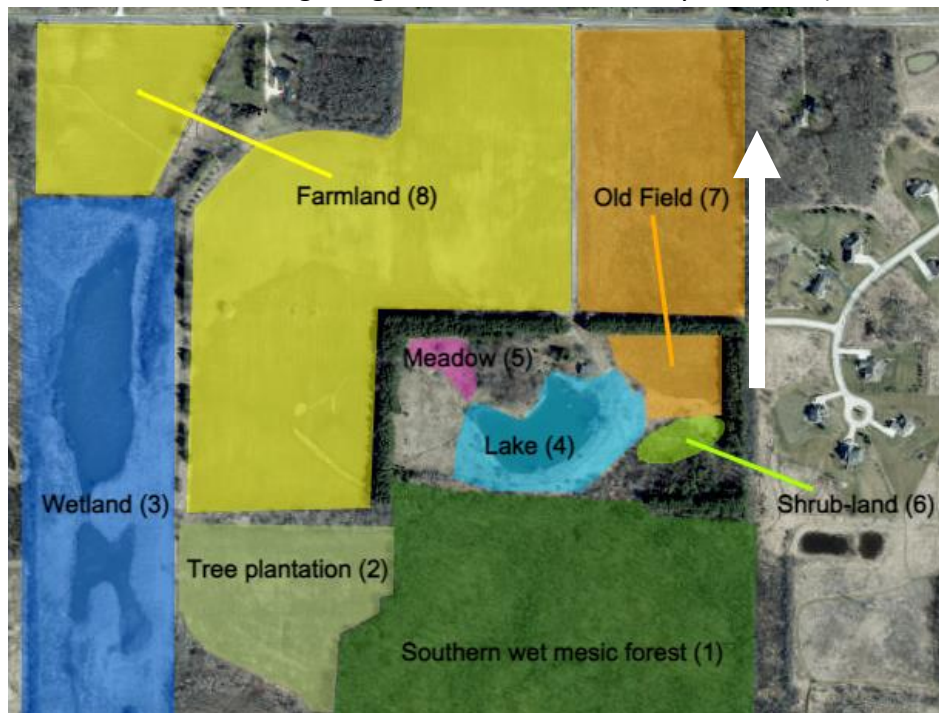


Figure 1: A rough map of the current areas on the property. The arrow points North.

Site History

In 1836, the area was surveyed by the Commission of Public Lands. In the surveyor notes, observers wrote that the area was rolling and slightly hilly, in my interpretation, the topography was likely a result of glaciation. See Figure 6 in the appendix for an example of surveyors' notes stating the soil in the area was loam, and the forest was composed of Sugar Maple, Beech, Basswood, Elm, Hickory, Burr Oak, and Ironwood. As it stands today, the woodland on the property has the same tree species and the soil is loam, a duff layer present. Figure 8 in the appendix shows an aerial image taken in 1937 of what is now Spirit Lake Preserve. In this image most of the land has been converted to farmland. The forest in the south-eastern part of the property remained standing, though it was not as dense as today, a sign of grazing? I noted several open-grown oaks in the woodland.

When Ozaukee Washington Land Trust (OWLT) purchased the property from the Sisterhood of Sorrowful Mother (SSM) in 2015, an exchange of information took place in the form of a face-to-face meeting. It is unclear when the property was purchased by SSM, but in the 1950's the organization commissioned the construction of the lake that sits adjacent to the cabin. Stated in the meeting notes is that the lake originally did not hold water. To stop the water from draining, the lake was lined with plastic and then covered with clay gathered from the wetland to the west. A prairie restoration, area 5 displayed in figure 1, also took place under SSM ownership. (Bohn et al 2015)

In these meeting notes and bolstered by pictures, is a short description of a sacred gathering on the land. An indigenous people's organization named Flowering Tree hosted this event. The notes suggest the first gathering took place in the early 2000's and ran annually for up to seven years. It was a multi-tribal gathering and people traveled from all over the Midwest. (Bohn et al 2015) Furthermore, historical indigenous use of this land is probable. Green Bay Road, originally a well-used thoroughfare used by local tribes, is nearby. See figure 7 in the appendix to examine the 1836 land survey map.

OWLT purchased the Spirit Lake Preserve with partnership of the Milwaukee Audubon Society (MAS) and the Milwaukee Metropolitan Sewage District (MMSD). The land trust received a stewardship grant from the Wisconsin Department of Natural Resources (WIDNR). MMSD contributed funding and incorporated part of the property into their Greenseams program, a conservation easement initiative designed to protect waterways. MAS partnered in this acquisition with the intention of taking ownership. (Behm 2015) After tree and shrub planting within the first year of purchase, MAS has taken no action moving forward with acquiring ownership. (Bohn 2023)

Communities & Restoration Proposals

To start any restoration process, long term goals must be considered. Thus, the idea of Spirit Lake Preserve as an education center is relevant. The recent plantings inform decisions. The land use history and pre-settlement vegetation information play into defining future goals.

Restoration work will be ongoing and could facilitate learning and practicing methods of ER. The variety of habitat and ecosystems on the property would serve as examples of different stages of succession and restoration processes. This is the reason why Spirit Lake Preserve is suitable as an educational center.

In addition to ER and community engagement, agriculture is part of OWLT's mission. In this plan, I suggest that a restoration agriculture system be created in unison with the educational center. Though agriculture is typically associated with degradation of biodiversity, there is research and work being done to farm in a more ecologically sustainable way. The options for this are many, and that lends itself to resilience. A farm with multiple and varied crops is less risky than a farm with one crop. As a center for learning, restoration agriculture could be implemented and studied on part of the land.

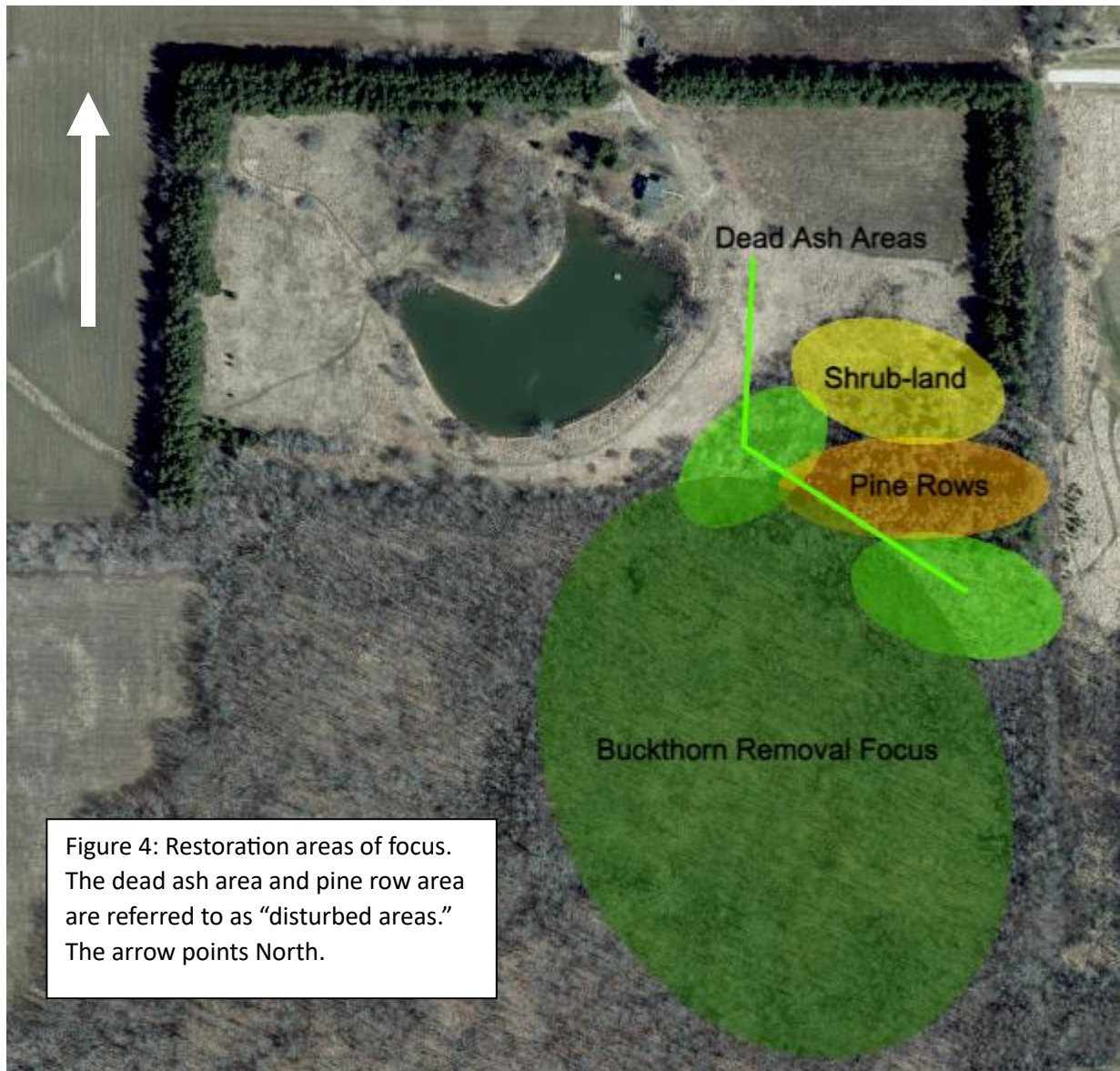
This proposal focuses on restoration of the Southern wet mesic forest. The existing woodland is comprised of Sugar Maple, Beech, Basswood, Hickory, Ironwood, and Oak. Much of the shrub layer plants are non-local beings, in order of most prevalent to least: buckthorn, honeysuckle, and multiflora rose. *Ribes* and *Rubus sp.* are sparse but present. The ground layer is well formed with waterleaf, enchanters' nightshade, agrimony, jumpseed, mayapple, sarsaparilla, sedges, fowl manna grass, and more. I even found a lone *Lobelia inflata* (Indian tobacco) and a patch of ditch stonecrop. North and adjacent to the woodland are a couple of dead ash zones where the buckthorn is thick (see Figure 2). It is reasonable to infer the emerald ash borer is present on site. An area with pine rows and small buckthorns is between both dead ash zones. To begin restoration, the non-local beings buckthorn and multiflora rose need to be removed. This proposal also asserts that the pine in the area between the forest and shrub-land be removed. The pine has no ground layer besides buckthorn (see Figure 3) and is not part of the southern wet-mesic tree community. Propagating plants on site and introducing new species in the disturbed areas where NLB removal happened will increase biodiversity and resilience while providing competition against NLB. This process of seeding, live staking, and planting plugs is planned in stages: a continual effort to establish native plants.



Figure 2: A picture taken onsite of dead ash trees. There is a white oak on the left side of the picture.



Figure 3: This is a picture of some mature pine plantings. The plants on the ground are all buckthorns.



Methods

Non-Local Being Removal – This is timed to be done in the fall or winter for best success. Buckthorn can be chopped and treated with stump herbicide blotting. Stick and branch debris can be piled strategically around future planting locations as a deer fence. Yes, I am proposing that deer exclosures be made from buckthorn piles. Ideally, nearby landowners and other interested parties would conduct non-local buckthorn removal simultaneously. Reducing nearby populations should reduce local migration. The removal efforts should focus on certain areas and slowly push outward. Generally, the eastern part of the forest has a higher buckthorn density than the west and would be the area to focus removal work on. See Figure 4 for a map of the buckthorn removal areas and note that the dead ash and pine row zone will also be subject to buckthorn removal. After the protected areas have been thoroughly cleared of

buckthorn, multiflora rose, and other woody NLB, monitoring and maintenance will be an ongoing process.

Conifer Removal – The rows of conifers create confusion in the landscape. Soil acidification caused by the dead needles prevents southern forest herbaceous plants from growing. It is suggested that the needles be removed from the area. Removing these mature trees may reduce habitat in the short run, but in the long term will facilitate expanding and making legible the Southern wet mesic woodland. This proposal puts forth a couple of options to consider. An educational center would benefit from having infrastructure like a classroom or housing. As these are mature pines, they could be structurally assessed by an engineer, dried & processed on site, and used in building. The trees could also be used in the forest regeneration as nurse logs on the ground and bird boarding house habitat if girdled and left standing. Alternatively, the timber could be sold, or given as payment to a contractor. To transport the wood, a path would need to be created, from the end of the driveway to the pine stand. This path could be an addition to the walking trail system already on the property. Connecting the trails in Rotary Park to Spirit Lake Preserve should be considered when designing the trail. Consider slow removal, removing one third of the trees for three years paired with leaving some as nurse logs and boarding houses.

Establish Vegetation – Paired with NLB removal, establishing native plants will be vital to the restoration process. The desired plant community defined in Table VIII-5 in Curtis's Vegetation of Wisconsin (Curtis 1987) and what is pre-existing on site informs the planting & seeding decisions. Some suggested new plants, displayed in Table 1 in the appendix, were chosen from the writer's personal preference, based on their experiences and observations. Some plants listed as absent may be present and by no means is this inventory complete. Seed collection from plants already established on the property will aid in the restoration of the disturbed areas. In addition, colonies of sedges, mayapple, and sarsaparilla can be propagated by root in early spring. Softwood cuttings can be taken from dogwood (Jamie) and ninebark (Panter 2019) to fill that niche in the disturbed area. Propagation of plants already present on site is an alternative to purchasing seed and/or plugs for planting. A water buffalo tank or 55-gallon drum can be placed near and uphill of the plantings. A simple solar powered pump can transport water through a pipe from the lake to the water tank. The close proximity of tank supplied water & hose will create an easy situation to nurse the young beings.

- In the existing woodland where the canopy cover is significant, it may be beneficial to thin the overstory in areas where plantings are planned. Creating light release in the canopy allows for the planted shrubs to take advantage of the resource, aiding in its establishment. Other beings will take advantage of the light availability, so it is recommended that ground cover species be seeded around the shrubs. Regardless, three "openings" will be established, the idea is that the debris of the buckthorn removal be strategically placed to surround and protect the new plants from deer browse. The shrubs Elderberry and Black Currant will be planted, three of each, in the

openings, see figure 5 for a map. As these shrub species establish and start to reproduce, they will provide shrub-layer competition to non-local beings.

- Where the ash trees are and with the removal of the pine rows, the light availability to the ground layer is much higher. In these areas, disturbance has/will create an early successional ecosystem. As the canopy becomes established, shrubs and herbaceous plants will thrive. To provide competition in these areas, raspberry and elderberry is suggested to fill the niche. Plant these shrubs with the same protection technique using the buckthorn branches. At minimum, one buckthorn enclosure in each area is recommended, with three of each shrub planted. While the herbaceous layer under the dead ash trees is strong, under the pines is a different story. It is recommended that the pine area be seeded with a cover crop in addition to local and Curtis suggested species. This will provide competition against pioneer species germinating in the absence of the conifers. In addition, cover crops will aid in soil rehabilitation, moving away from conifer influenced soil back to loam. It is suggested that the cover crop be composed of buckwheat, linseed, and oats. In these early successional areas, there is potential for creativity. These areas of sun and partial shade could make good habitat for pollinators. Plants like giant purple hyssop (Sheahan 2012), vervain (White Vervain 2023), and upland joe-pye weed (Sweet Joe-Pye Weed 2023) would be for the bugs. Finally, nearby ninebark and dogwood plants can be propagated using softwood cuttings. Facilitating the migration of these shrubs into the disturbed areas will help the process of succession while providing competition against non-local beings.

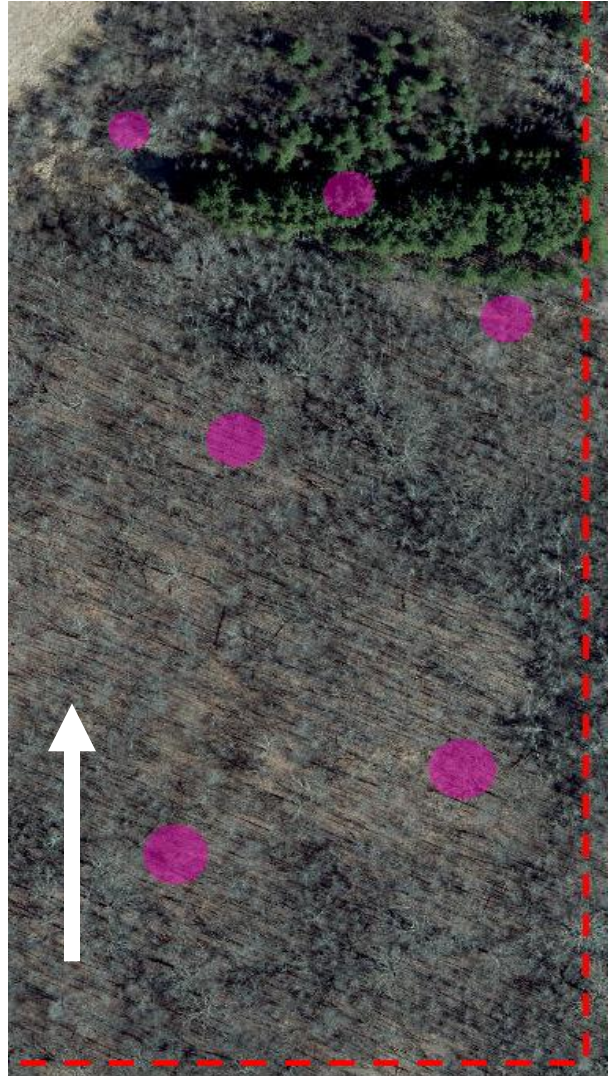


Figure 5: This map displays the SE corner of the Spirit Lake Preserve property, the arrow points North. The property line is roughly designated by the red dashed line. The purple circles are suggested buckthorn enclosures, "protected areas."

Next Steps

Moving forward with this restoration will require a more in-depth evaluation. Forest characteristics such as species composition and distribution of tree diameters will help to gauge the health and biodiversity of the existing woodland. A detailed survey of the herbaceous layer informs the future seeding and planting projects. These can be accomplished using random sampling in a plot-based survey. If reasonable, a song meter should be installed. If the buckthorn removal was postponed, it would be interesting to note changes from pre-removal to post. The same mentality should be applied to an annual point count, installing trail cameras, and amphibian monitoring, just to name a few. Creating a site-specific baseline so that further monitoring has data to be compared with is invaluable to restoration. These observation methods come in handy for community outreach, education, and gauging habitat health. In addition to ecological data, time studies can be done, providing information about cost of removal and NLB density.

Nearby landowners should be contacted regarding a collective effort to remove woody non-local beings from the area. The Thiensville-Mequon Rotary Club and the horticulture program at MATC are also potential partners in this effort. Volunteers of OWLT should be mustered as well.

The Flowering Tree and another local indigenous organization(s) should be contacted and included in discussion. They will have insights as to land use, historical use, and vegetation.

Being that I propose this property to become a learning center, a trail system will be key to future restoration efforts, teaching access, and maintenance. This ER plan focuses on the SE corner of the property, which is adjacent to Rotary Park, owned by the City of Mequon. Designing a pathway to access the restoration areas should include discussion of connection with them.

Timeline

Year 1

- Fall/Winter: Non-local removal by cutting buckthorn low and applying herbicide to stump. Pile branches in strategic locations. Possible seeding of cover crop and native species in disturbed areas depending on conditions.
- Winter: Remove one third of the conifers. Transport the timber out of the area and use some as habitat and nurse logs.

Year 2

- Early Spring: Seed cover crops and perennials in disturbed areas (if not already done). Plant Elderberry, *Ribes sp.*, and *Rubus sp.* in protected areas. Bring water to water the plants in with.

- Mid Spring to early Summer: Perform transects to remove garlic mustard and dame's rocket. Propagate sedges via division and strategically plant in protected areas as ground cover for the shrub plantings. Woodland seed collection.
- Early to mid-Summer: Softwood cuttings of the ninebark and dogwood species should be done mid-summer. I suggest a quantity of 27 of each species harvested. The cutting can be treated with rooting hormones and placed into a sand-moss mixture. The cuttings will need to be kept moist until they are transplanted into bare soil. Woodland seed collection.
- Late Summer to Fall: By late summer the shrub cuttings will have grown roots. They can be transplanted into the disturbed areas with a mindful layout. Propagate mayapples and sarsaparilla when the plants have gone dormant. Roots can be dug up carefully and then transplanted in a desirable location within the existing woodland. Like the shrubs, water in. Check on the bare root plantings of Elderberry, Ribes & Rubus sp. as a monitoring routine. Check on native seed germination and discuss further seeding. Woodland seed collection and potential dispersal before snow.
- Fall/Winter: Conifer removal, leave some as nurse logs and habitat. Buckthorn reduction and protected area bolster.

Year 3

- Early Spring: Seed cover crops and natives into disturbed areas.
- Mid Spring to early Summer: Perform transects to remove garlic mustard and dame's rocket. Potentially a good time to include looking for buckthorn germination and removing sprouts. Woodland seed collection and dispersal. Evaluate if more cuttings of ninebark and dogwood would be beneficial.
- Late Summer to early Fall: Monitor for woody non-local, especially in the disturbed areas. Monitor area where seed was distributed. Monitor protected areas. Monitor areas where herbaceous root propagation happened. If further colony propagation is desired, allow a couple years in between divisions. Woodland seed collection and dispersal.
- Fall/Winter: Conifer removal – there will be no more remaining conifers in the area after this harvest. Leave some as habitat and for the forest. Continue NLB removal.

*As time progresses, decisions can be made about further seeding, continued NLB removal, and planting. Maintaining protected areas is the goal and when possible, should be expanded, maybe on a three-year cycle – rest, protect, expand. Monitoring for sugar maple, basswood, oak, beech, and hickory reproduction in the disturbed areas will need to be at a tree's pace. A record will be kept of what was done, when it was done, how it was done, and where it was done. Use one notebook and perform all documentation in ink.

Appendix

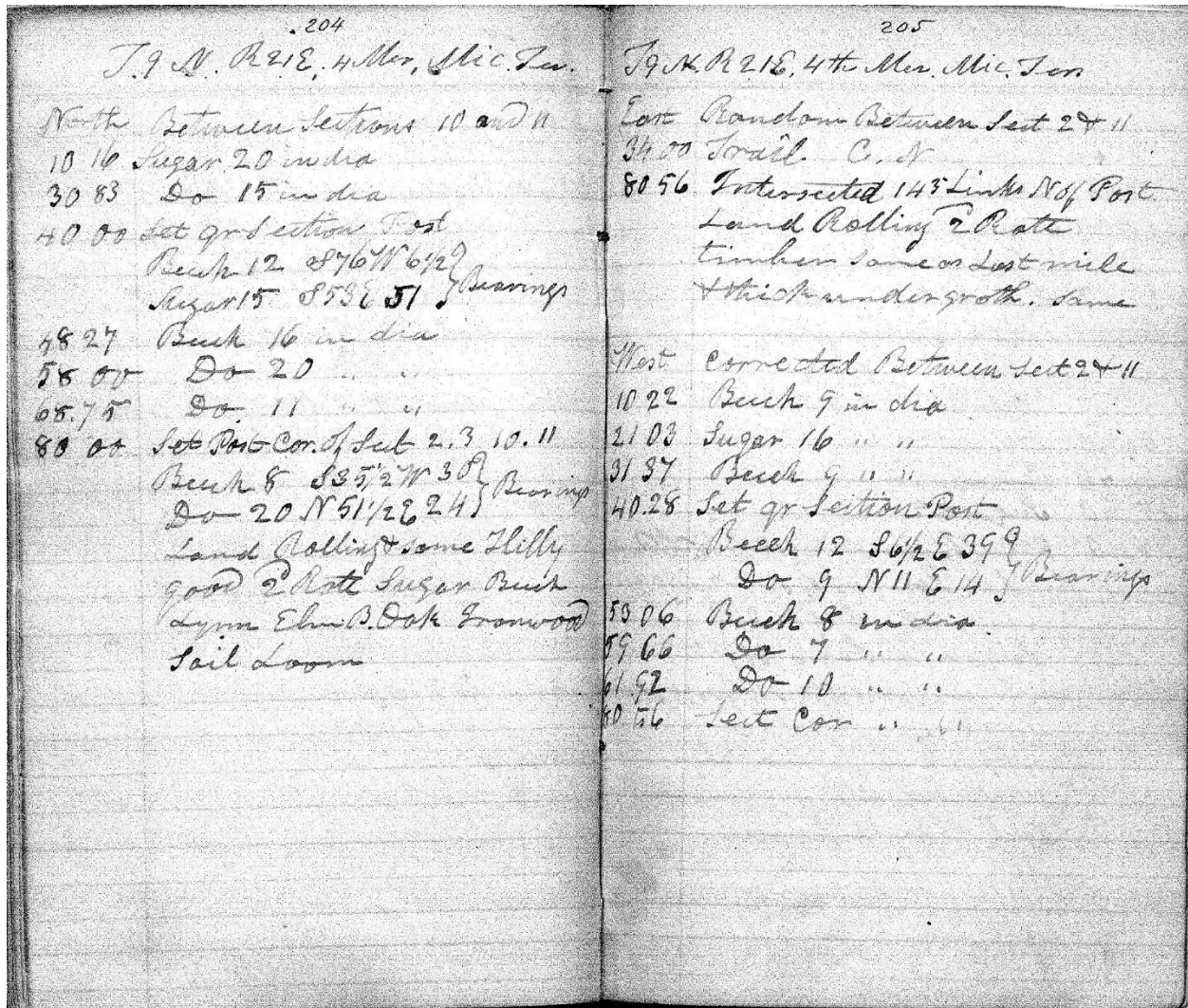


Figure 6: This digitized notebook of a surveyor in Wisconsin in 1836 contains information about what species of trees were where, the soil type, and topographical observations. The right page in this photo documents the Northern property border at what is now Spirit Lake Preserve.

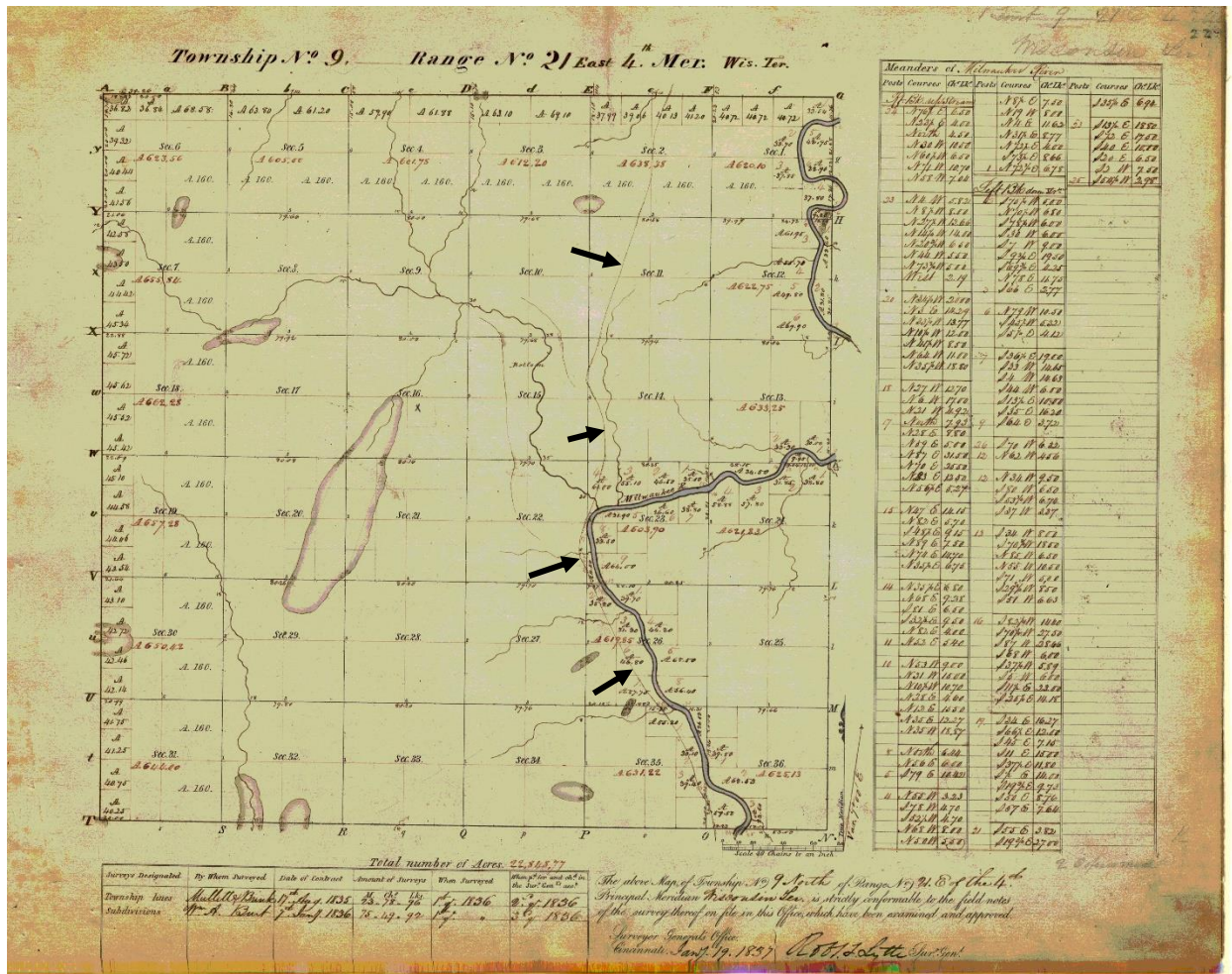


Figure 7: This image is a map drawn by the survey team that traversed through present-day Spirit Lake Preserve. The Property is the NE square in Section 11. The line that the black arrows are pointing to is an indigenous people's thoroughfare, being used at the time of survey.

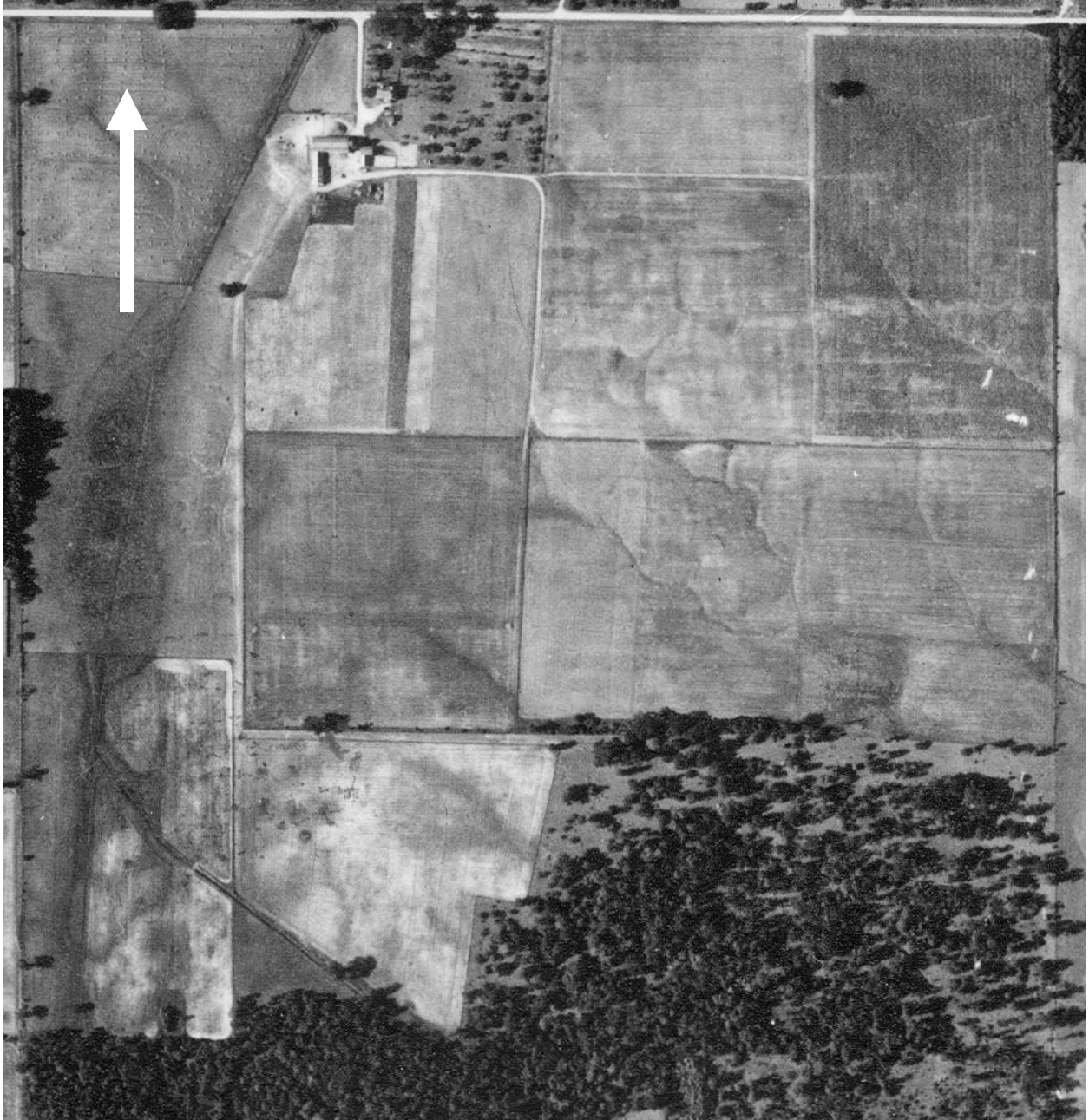


Figure 8: This aerial photograph from 1937, commissioned by the USDA, shows the property as it was 86 years ago. The arrow points North.

Table 1: Plant Community		
Tree species	Sugar Maple Basswod Beech Hickory Oak	<i>Acer saccharum</i> <i>Tilia americana</i> <i>Fagus grandifolia</i> <i>Carya ovata</i> <i>Quercus sp.</i>
Understory species	Elm Ironwood	<i>Ulmus americana</i> <i>Ostrya virginiana</i>
Shrub species	Currant/Gooseberry Raspberry Prickly ash Elderberry*	<i>Ribes sp.</i> <i>Rubus sp.</i> <i>Zanthoxylum americanum</i> <i>Sambucus canadensis</i>
Ground-layer species	Canadian honewort Jumpseed Carrion flower Enchanter's nightshade Avens Mayapple Sarsaparilla Violets False Solomon's Seal Jack-in-the-pulpit Fowl manna-grass Indian tobacco Solomon's Seal Poison ivy Long-beaked sedge? Sedge 2 Trillium Sensitive fern Jewel weed Giant purple hyssop* Sweet Joe-Pye-weed* White vervain* Blue cohosh* Hog peanut* Cleavers* Wood nettle* Fringed-loosestrife*	<i>Cryptotaenia canadensis</i> <i>Persicaria virginiana</i> <i>Smilax herbacea</i> <i>Circaea lutetiana</i> <i>Geum sp.</i> <i>Podophyllum peltatum</i> <i>Aralia nudicaulis</i> <i>Viola sp.</i> <i>Smilacina stellata</i> <i>Arisaema triphyllum</i> <i>Glyceria striata</i> <i>Lobelia inflata</i> <i>Polygonatum pubescens</i> <i>Toxicodendron rydbergii</i> <i>Carex sprengelii</i> <i>Carex sp.</i> <i>Trillium sp.</i> <i>Onoclea sensibilis</i> <i>Impatiens biflora</i> <i>Agastache scrophulariifolia</i> <i>Eutrochium purpureum</i> <i>Verbena urticifolia</i> <i>Caulophyllum thalictroides</i> <i>Amphicarpa bracteata</i> <i>Galium sp.</i> <i>Laportea canadensis</i> <i>Lysimachia ciliata</i>
<p>*species with asterisk indicate these were not observed onsite and are proposed to be introduced. ?species with a question mark are best-guess identifications. All species were identified by the author.</p>		

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