Ida Bay: Restoration Hidden in Plain Sight

Prepared for Crossroads at Big Creek

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Introduction

There are few examples of sizeable healthy hemlock forest communities in the country, let alone Wisconsin. Due to logging, slow tree regeneration, deer browse, climate change, and the specialized needs of the forest community they struggle to thrive. Old growth forests like this one offer a sense of time in place and an inherent feeling of stillness and wisdom. These forests are not only beautiful, but they can be extremely diverse, hosting a variety of plant and animal species.

Stepping into this portion of the Crossroads Ida Bay property, you can sense all of these things, and there is a possibility for even more. Restoration of this forest is a significant opportunity to preserve and maintain this habitat type for generations to come. It can also be used as a teaching tool and could bring new community interest to Crossroads at Big Creek.

Although it isn't particularly obvious that there is dysfunction, with the presence of Redback Salamanders, Wood Frogs, some native herbaceous species, large trees, and the absence of invasives, it can be seen through small cues. What I have noticed is a lack of tree regeneration, densely packed trees, and an absence of ground-layer plants. This plan aims to combat competition from deer browse, offer release for saplings that have been waiting to grow into the canopy, and encourage the next generation of seedlings to take hold. Restoration will hopefully allow the system to become more self-sustaining through increased resilience, reversing the potential for a state of irreversible dysfunction.

Site Conditions.

This 18-acre section of woods sits at the southernmost portion of the Ida Bay property, bordering Zenith St. This forest stand serves as a habitat connection between the surrounding forested areas, as shown on the map above. The top constraint is the border of old orchard conditions, and therefore a stopping point for this forest type.

Somewhat densely shaded Hemlocks with light needles that let blotches of light shine through. Some Red oak, White Cedar, Sugar Maple, Beech, and Pines are intertwined with the hemlocks in an even-aged fashion. The mid-story is lacking, with a few hemlock and sugar maple saplings interspersed. The ground cover consists mostly of leaf litter, with pockets of Sugar Maple regeneration near some of the older trees that have a more open canopy. There are some sedges, ferns, spring ephemerals, and other forb species present, but again, in smaller, less frequent pockets of higher light intensity on the forest floor. Soils consist of Longrie Loam, Namur loam, Summerville loam, and Onaway-Ossineke fine sandy loams. All soil types are functional for this ecosystem and do not need to be changed or remediated.

Past to the Present

The property was initially given to The Nature Conservancy by Ida Bay, who it is named after. However, considered too damaged, it was given to crossroads to be taken care of. Most of the surrounding portions of this property were heavily disturbed, resulting in plentiful invasive species. This site was partially chosen due to the old orchard surrounding the stand, which caused these old field, disturbance areas. Yet, invasives don't seem to be a problem in the 18-acre mesic forested region. This is no accident or caused by chance. There was actually a fence surrounding this portion of the property, that was only recently removed. This fence was put in by Ida back when she owned the property and was only recently taken down.

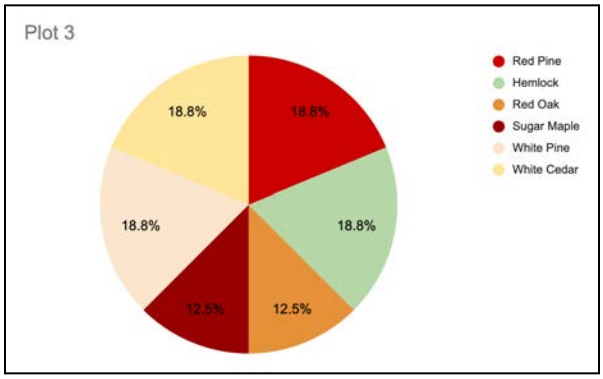
You can read all of these things on the landscape. The old orchard line can be marked by early forest succession on the northernmost side of the 18 acres. It can also be distinctly seen in aerial photos. Old fence posts are still standing on the southernmost portion, mostly along Zenith St. There was another barbed wire fence, dating around the 1900s, about ten feet from where the larger fence posts used to be on the Eastern side of the property. Between the two fences, you could see primary succession and more disturbance that lead to honeysuckle. The most important thing to note about the larger fence is that it was intended to keep animals, especially hungry deer, out. Though well-intentioned, that was not the result. About 25-30 years ago, based on the youngest hemlock sapling ages, we think part of the fence gave way and allowed for a deer enclosure instead. This habitation ensured that there was no natural regeneration to occur when there was a tasty buffet of newly established trees.

Cruise Data.

A basic, preliminary timber cruise was done to get a more accurate picture of overall health, average tree size, volume, and quality. This was done using a simple random sampling method with variable area plots and a Basal Area Factor of 10. Due to time constraints, a total of eight plots, marked below, were able to be measured (though about one per acre would have been ideal). Though this survey was simple, we were able to gain a better understanding of site characteristics and back up our hypotheses about reduced regen from site walk-throughs.

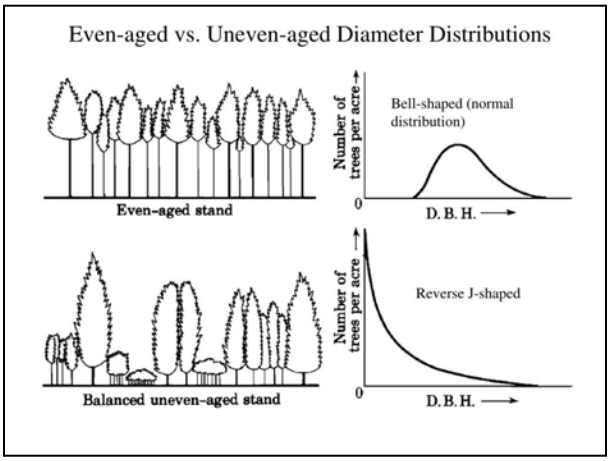
After data collection, plot-level characteristics were compiled to get a better understanding of the stand as a whole. Present tree species are listed below. An example of a plot-level species composition pie chart is also shown below, the rest can be found in the appendix.

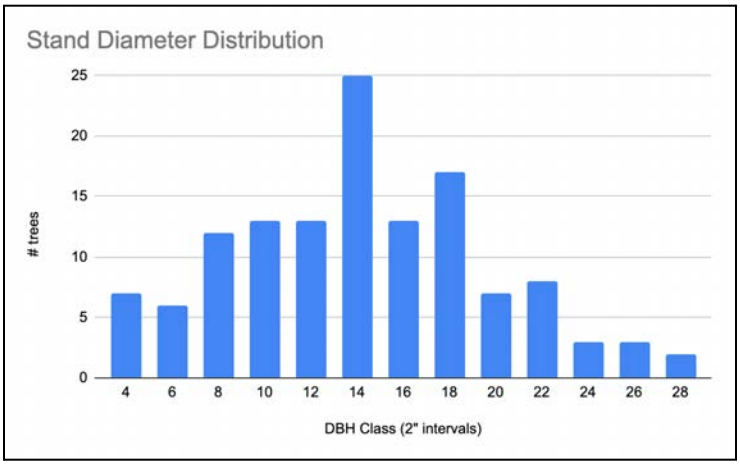
Bigtooth Aspen (*Populus grandidentata*)
Eastern White Cedar (*Thuja occidentalis*)
Red Oak (*Quercus rubra*)
Eastern White Pine (*Pinus strobus*)
Eastern Hemlock (*Tsuga canadensis*)
Red Pine (*Pinus resinosa*)
Sugar Maple (*Acer saccharum*)
Beech (*Fagus grandifolia*)
White Birch (*Betula papyrifera*)



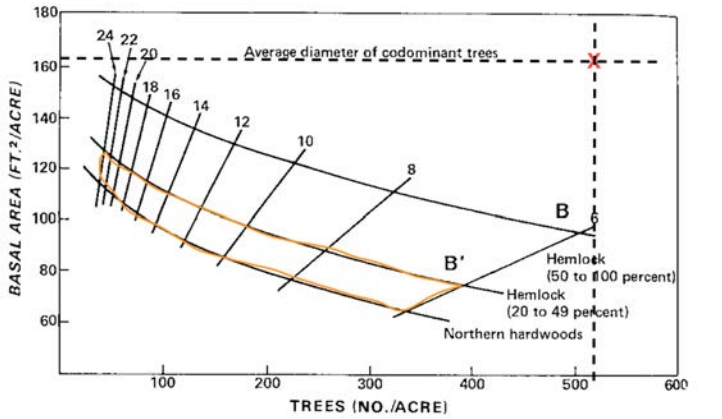
Overall, there is a large presence of Hemlock, Sugar Maple, White Cedar, Red Oak, and Pines. The Red Oak and Sugar Maple tend to be dominant in the canopy when present. Cedars tend to be densely packed together when present, and this can be seen through the health of the trees, as only a few of the highest branches had foliage. Almost all Beech trees are infected with

the Beech Bark disease and could be seen in poor health. When present, Pine species tended to be large, dominant, and healthy. Hemlock sapling regeneration is dense and dying off in the areas it was most predominant near plot 8. When light openings allowed, sugar maple seedling regeneration was rich near plots 4 and 5. Leaflitter is high in all plots.
One metric that can be graphed is the distribution of tree diameters to show the general trend for tree size. A higher quality, ecologically functioning forest, will tend to have a reverse J-shaped curve. This is due to the different tree ages that are present, aiding in the growth and regeneration of smaller trees in the understory. The diameter distribution for this forest stand (in 2" intervals) shows a normal distribution, meaning that it's an even-aged stand. This is not ideal for forest health and is the reasoning behind some of the treatments in the next section.





Stocking charts are used to show how densely spaced trees should be with one another and how many should be thinned in order to maintain stand health. Stand-level data show that the total basal area is about 168 sqft/acre and the number of trees per acre is 517. This would put the stand at the point on the graph marked with a red X below. A healthy location for that mark to be in a Mixed-Hemlock stand like this one would be located somewhere between the Northern Hardwoods and B' lines (outlined in orange). As you can see, there is a clear and large disparity between the two. Based on these data, it would be in the best interest of the system to reduce BA and TPA accordingly. (Tubbs, 1977)



The Possible Future

Joshua Mayer

Restoration Goals.

To encourage regeneration
To increase biodiversity resulting in a more resilient system
To offer an experimental system for regenerative principles
To maintain a declining forest type for future generations
To establish new community engagement

Desired Plant Community.

The desired plant community for this site is a Northern Mesic Forest as defined by the WDNR and Curtis. This is the best match for the site based on current species composition, soils, climate, and topography.

This forest type is defined as being North of the tension zone, on loamy soils in glacial till plains and moraines deposited by the Wisconsin glaciation (WDNR). Glacial formations have also created the necessary moisture microhabitat on site to support the forested community.

Aaron P. Kortenhoven

Community Species Composition.
(Tree species found in cruise are highlighted)

Dominant Tree species (From most to least dominant)	Sugar Maple (*Acer saccharum*) Eastern Hemlock (*Tsuga canadensis*) Eastern White Pine (*Pinus strobus*) American Beech (*Fagus grandifolia*) Yellow Birch (*Betula alleghaniensis*) Basswood (*Tilia americana*) White Ash (*Fraxinus americana*)
Subcanopy Tree species	Balsam Fir (*Abies balsamea*) Ironwood (*Carpinus caroliniana*) American Elm (*Ulmus americana*)
Shrub species	Alternate-leaved Dogwood (*Cornus alternifolia*) Leatherwood (*Dirca palustris*) American Fly Honeysuckle (*Lonicera canadensis*) Gooseberry (*Ribes cynosbati*) Red Elderberry (*Sambucus racemosa*) Maple Leaved Viburnum (*Viburnum acerifolium*) Canada Yew (*Taxus canadensis*)
Forb species	Wood Fern (*Dryopteris intermedia*) Club-mosses (*Lycopodium* spp., *Dendrolycopodium* spp.) Canada Mayflower (*Maianthemum canadense*) Large-Flowered Trillium (*Trillium grandiflorum*),

	Dutchman's-breeches (*Dicentra cucullaria*), Spring Beauty (*Claytonia virginica*), Trout Lilly (*Erythronium* spp.) White Baneberry (*Actaea pachypoda*), downy Solomon's-Seal (*Polygonatum pubescens*), Wild Sarsaparilla (*Aralia nudicaulis*), Rose Twisted Stalk (*Streptopus roseus*) Starflower (*Trientalis borealis*) Maidenhair fern (*Adiantum pedatum*) Lady fern (*Athyrium filix-femina*).

The How

Tread carefully and with intention.

This site could be more fragile than we think. Before any tree removals or disturbances, a professional forester should be contracted to do a full site analysis (by way of intensive timber cruise). This will produce a more thorough understanding of the forest conditions and allow for informed next steps. With this information, we can begin slowly removing select trees of less desirable species for the site. The stand is clearly overstocked based on walkthroughs with the county forester (Jake Schroeder, Door County Forester, personal communication, July 2022), and the limited cruise we were able to do. This should drastically improve forest health in a short amount of time if done properly. It will also be the first step in preparing the forest for regeneration, allowing for a bit more room and light to reach the forest floor.

Give the trees room to breathe.

Silviculture is the art and science of controlling the growth, composition, structure, and quality of a forest to meet values and needs. The silvicultural handbook from the US Forest Service is a great resource for forest restoration work because it's backed by years of research. It should be regularly referenced as the plan progresses. This should guide some of the thinking for regeneration methods, however, it should be noted that we are not managing the stand solely for timber production, meaning some treatments may not be well suited for improving biodiversity on the site.

The normal silvicultural prescription for regeneration in a hemlock forest directly out of the handbook is as follows:

"The shelterwood system is the best method of regenerating hemlock and yellow birch at rotation age because it can provide the warm, moist environment required by hemlock-yellow birch silvics to obtain seed germination and prevent seedling desiccation. The shelterwood system can be implemented with the following sequence:

1. Thin the stand from below to 70 to 80 percent crown closure. Favor the best dominant hemlock and yellow birch trees for high shade and superior genetic seed source potential. Discriminate against tolerant, less desirable hardwood species, i.e., sugar maple or red maple. Avoid making large openings in the canopy.
2. Shallow scarification of at least 50 percent of the ground area, after leaf fall and before cutting, thoroughly mixing humus and mineral soil, provides an optimal seed bed.
3. Kill or remove advanced hardwood (i.e., sugar maple, red maple) reproduction by mechanical or chemical means.
4. Directly seed one-half pound of hemlock seeds per acre. Seeding can be done in early winter to prevent rodent damage and to promote natural seed stratification.
5. When hemlock-yellow birch reproduction is established (3 to 5 ft. tall) partially or completely remove the overstory. Winter logging is preferred to provide protection for hemlock and yellow birch seedlings.
6. Hemlock reaches the western limit of its natural range in Wisconsin; consequently we should expect a certain percentage of regeneration failures when weather conditions are not favorable for seedling germination and establishment. Occasional dry years are normal in a continental climate."

A disturbance of this size and magnitude could work in an area with less deer browse pressure, but that is not the case for this forest.

A guiding quote from George E. P. Box states that "All models are wrong, but some are useful".

The silvicultural methods have been reworked and thought out considering the current system conditions at Ida Bay. After the walkthrough with the county forester, it was suggested that single tree selection would be a beneficial method to open up the canopy and create openings for pockets of regeneration. This would mean that tree species are not included in this step of succession, and other unhealthy or overcrowded trees would be selected to be cut. Instead of removing the logs like is common practice, we would use them for habitat, creating old-growth forest floor conditions. Some portions of the forest were thought to need a more "hands-off" approach, leaving connected space for mistakes if some of the disturbances prove to be too heavy.

This step would be the first in the restoration process. Sections of the forest that are deemed ready for single tree selection will be cut first. This could happen for as many consecutive years as seen fit after the initial trial run of canopy opening and exclosures occur (which will be explained more in-depth in the following paragraphs). Eventually, the stand basal area should be carefully decreased by a maximum of about 30 percent.

Single tree thinning would most likely occur in the winter to allow for the least amount of damage to the soil and other trees or herbaceous species.

Hide Plants in Plain Sight.

As aforementioned, deer browse management is a necessary step in this restoration. It is a tricky process to outsmart deer, especially when they are heavily concentrated, like in Door County. This is why there should be some initial experimental measures taken to ensure effectiveness.

Deer tend not to like being in tight spaces or rubbed up against things like brush. Keeping with this thinking, smaller exclosures and slash fences or nurse logs could be useful.

The small exclosures (similar to the one pictured below) should be placed in canopy openings that would be something like 4'x4' and at least 7' tall. Each would include nurse logs or brush, creating a microhabitat that aids in seedling development while deterring browse and possibly even sight of the seedlings. Reusing the existing fence posts is an opportunity to reduce cost and a more sustainable choice.

Kemp Station UW-Madison

This step would follow the thinning. In the spring after the first tree harvest, the initial set of exclosures would be placed in whatever openings are present at the time. Depending on success rates, small patches of consecutive thinnings could happen starting in the second winter of restoration until stocking levels are considered healthier.

Re-establish regeneration.

In conjunction with the exclosure fences, a combination of seeding, plug planting, and bare root planting should occur within, as seen fit by the restoration implementation team and plant availability. Soil should be prepped based on the silvicultural prescription of soil scarification of at least half of the ground area. The main tree and shrub species to be planted are Eastern Hemlock (*Tsuga canadensis*), Canada Yew (Taxus canadensis), and American Fly Honeysuckle (*Lonicera canadensis*).

There is no intensive forb study that has been done on the site yet, and spring ephemerals are not currently able to be viewed. A survey should be done to help guide additional planting of these types of species in the exclosures along with the tree and shrub species above. If planting has been unsuccessful in some of the earlier implemented exclosures, not due to browse, consider replanting. However, ensure that things are planted with knowledge and care to avoid this issue and unneeded stress on the area.

Monitoring and Management

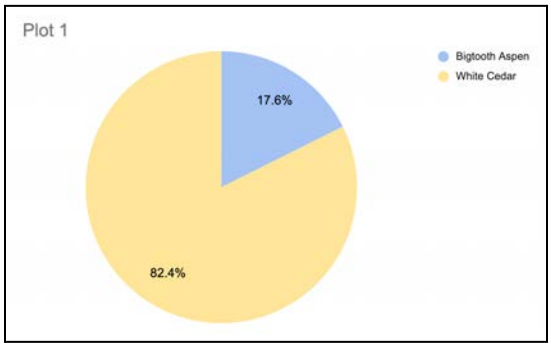
After planting and deer exclosures are established, they should be monitored monthly for at least the first year. This will allow for quick action to be taken if a fence is in need of repair, or browse starts to occur. Regular check-ups could also involve the community and give the public a sense of belonging to the project.

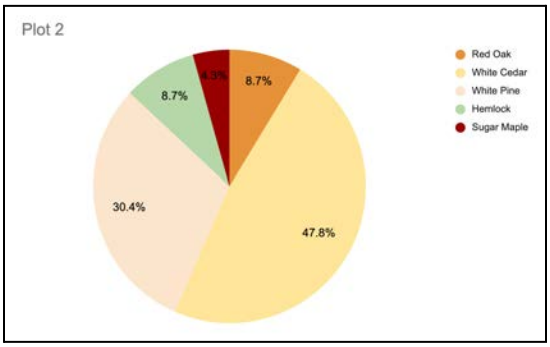
Once restoration seems to be established, in maybe 15 years, another cruise could be done to determine the new forest composition, and the plan should be revised if changes need to be made.

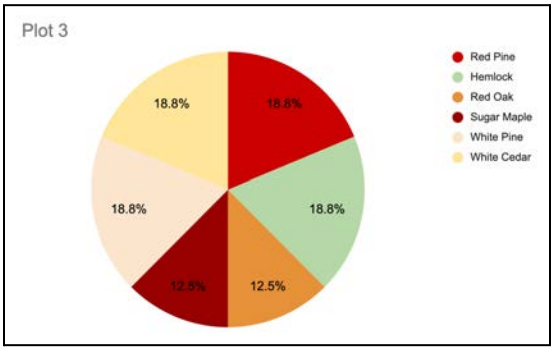
If at any point during the restoration process new information comes up that can be taken as a teaching lesson for better practices, by all means, take those lessons into consideration. This plan is meant as a guideline based on the current understanding of the stand and should not be the end all be all when looking at this restoration.

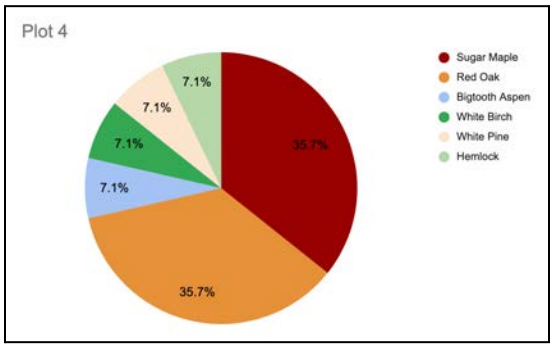
Appendix

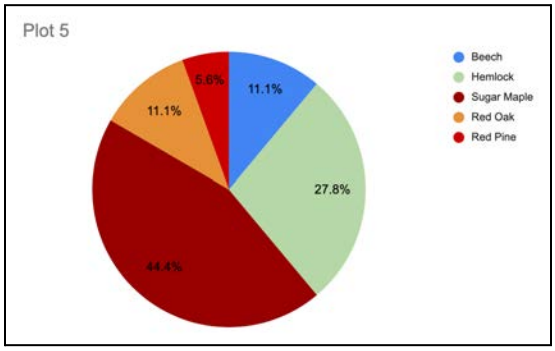
Labelled plot map with the corresponding species composition pie charts.

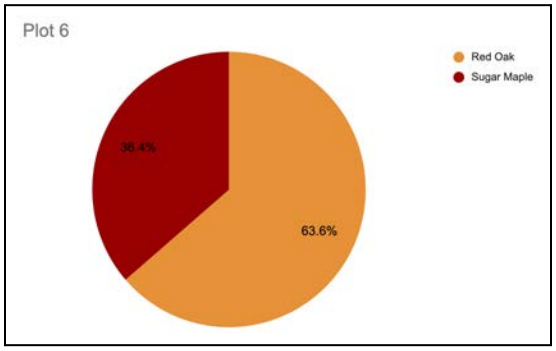


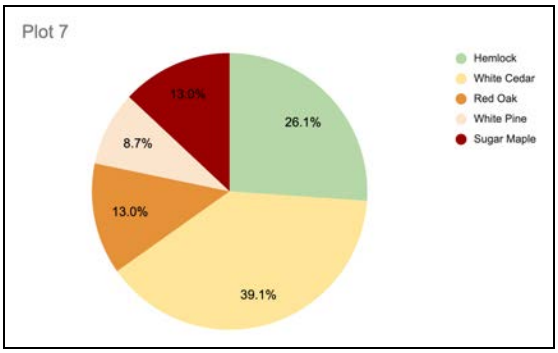


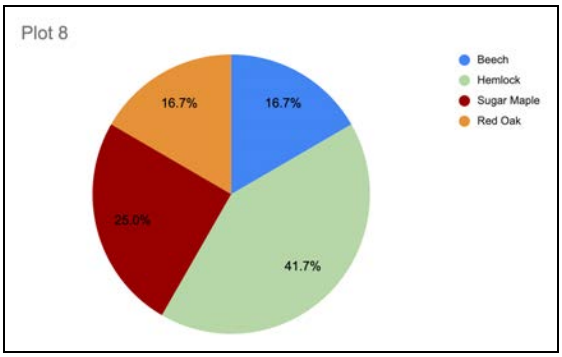












Aerial site photos, 2021 to 1992, with old orchard conditions shaded out.

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