Donald Park Forest Management Plan[1]

Donald Park
Township 06N, Range 07E
Sections 28, 29, 32, 33, 34
Town of Springdale
Dane County, Wisconsin

Plan acreage: 423 acres

Prepared for:
Friends of Donald Park
Dane County, WI

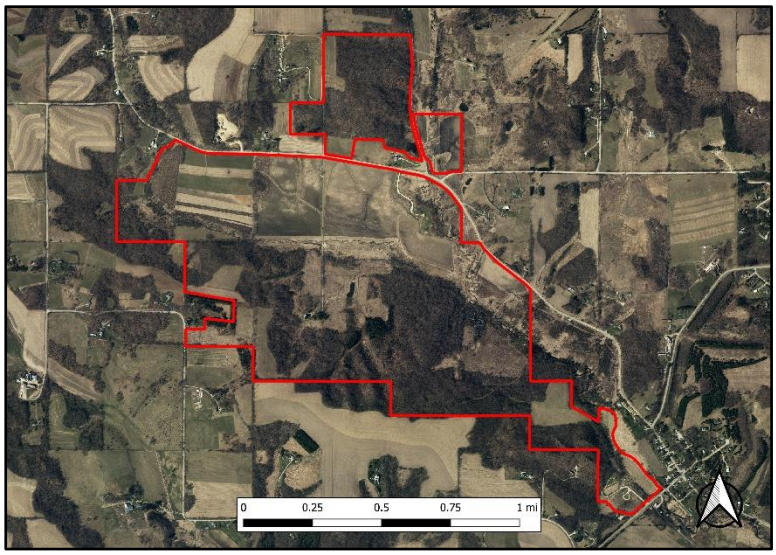


Figure 1: Donald Park Property Outline (2020 Baselayer)

Prepared by:
Jake Livingston & James Budiac
Adaptive Restoration LLC
8864 Offerdahl Road
Mount Horeb, WI 53572
Adaptiverestoration.com

Reviewed by:

[1] This plan serves as WDNR form 2400-111. A version of this management plan has been entered into the WDNR WisFIRS database, where this plan is included as an attachment for reference purposes.

Table of Contents

Introduction

This forest management plan is based on a forest inventory conducted in April 2020 by Jake Livingston, Forester with Adaptive Restoration LLC. The 780-acre property owned by Dane County is in Town of Springdale in Dane County, Wisconsin. Approximately 423 acres are addressed in this plan, having at least some tree cover. The remainder of the property is non-forested: prairie, wetland and row crop and is not covered in the extent of this plan.

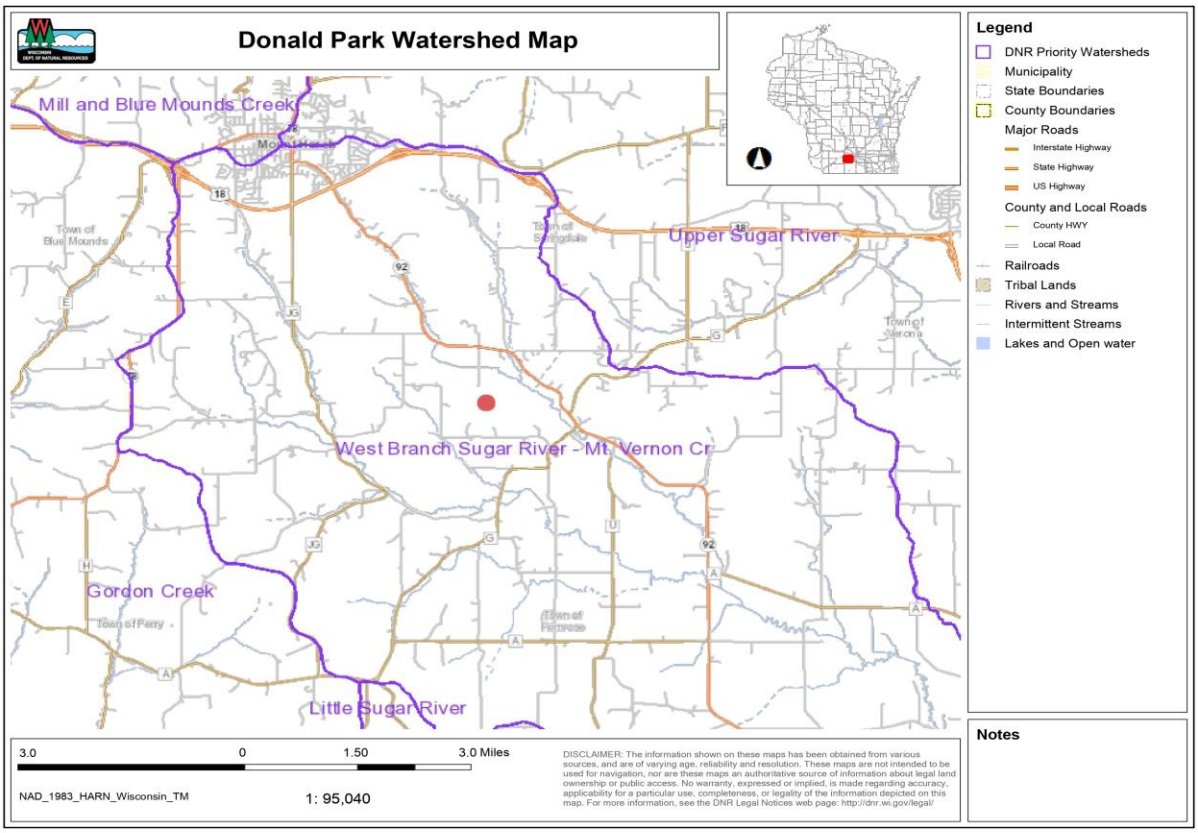


Figure 2. Denoted by the red dot, the Donald Park property is located within the Mt Vernon Creek Watershed.

This report provides an assessment of current conditions for the property, based upon observations made during a forest inventory. Though this plan is written from a forestry perspective, some of this area historically was oak savanna and oak woodland, and management goals may be shaped by that reality.

Natural resource management plans need to be flexible because the resources they seek to manage are constantly changing, because new information can be obtained, new technologies developed, and new insights reached. Management of these forested acres may require changes due to flux in tree species, tree stocking, damage from weather (wind, ice, snow), insects and disease, flooding, land management goals, new management information (silviculture science), invasive species, fire management, riparian management zones, or presence of endangered, threatened or high conservation value species and/or communities. Consequently, neither this nor any other management plan should be viewed as either

conclusive or absolute. Instead, it should be viewed as a blueprint providing information, guidance, and a starting point for the ongoing process of ecologically based, thoughtful land stewardship.

We offer the recommendations in this plan within the context of ecological restoration. Restoration does not necessarily mean bringing the flora and fauna of your property back to a pre-settlement state. Rather, it refers to restoring ecosystem processes and services, which will allow your land to support a high level of plant and animal diversity.

Property Goals

This forest management plan integrates site characteristics, ecological history and goals for the property to guide recommendations for current and future management. Goals for the forested portions of property and adjacent land are also informed by the overall goals of the Dane County Parks, and the 2006 Donald Park Management Plan.

- Practice responsible land stewardship by improving ecosystem resiliency, preventing the spread of invasive species, and promoting forest, woodland, prairie, and riparian zone health.
- Provide an inclusive space for all Dane County residents, regardless of age, race, gender or gender identity, national origin, ethnicity, culture, religion, sexual orientation, political affiliation, place of residence, veteran status, physical ability, cognitive capacity, or family, marital, or economic status.
- Provide opportunities for land stewardship and stewardship education to Dane County residents of all ages and backgrounds.
- Restore and maintain the structure and function of Southern Dry Mesic Forest, Oak Woodland, Oak Openings, Pine Relict, Dry Mesic Prairie, Springs and Spring Runs natural communities, and encourage regeneration of fire-adapted oaks, where appropriate.
- Protect and improve the water quality of Deer Creek, Mount Vernon Creek, Frye's Feeder and other water resources in and around and downstream of the park.
- Offer educational opportunities to inform the public on restorative forestry practices, the importance of working forests, and the local ecology.
- Generate revenue through sustainable silviculture practices to fund ecological restoration, forestry and land stewardship in the park.
- Provide a space for passive recreational opportunities, linking and preserving environmental and historic resources through education and recreation.
- Protect and provide critical habitat for threatened and endangered species, including the Rusty Patched Bumblebee, which has been observed in the park.
- Showcase best management practices for forestry, ecological restoration, and land stewardship.

General Property Description

Location and History

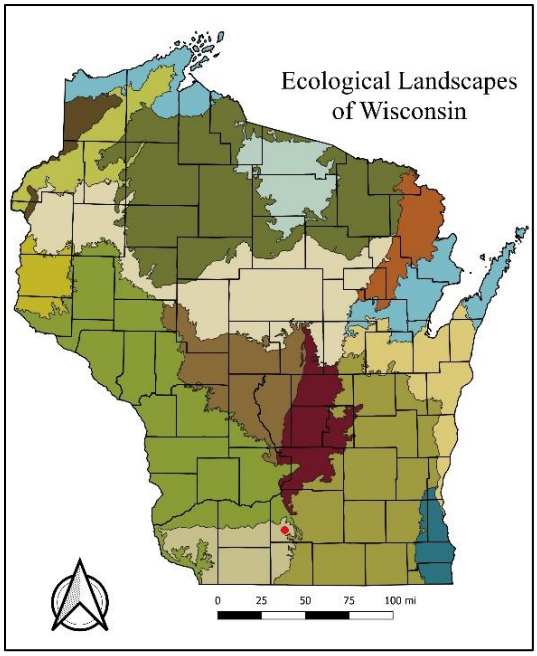


Figure 3. Ecological Landscapes of Wisconsin. The Donald Park property, denoted by the red dot, lies on the eastern edge of the Southwest Savanna.

The Wisconsin Department of Natural Resources has identified 16 Ecological Landscapes in the State of Wisconsin. Donald Park lies just within a landscape known as Southwest Savanna. For more details about the, see the link to the WDNR Ecological Landscapes website in Appendix F. You can find an overview of the landscapes, species of greatest conservation need, management opportunities and much more.

During the first government land survey in 1833, surveyor John H. Mullet described the line between sections 26 and 35. In the notes it describes the land as hilly with bur oak "third rate timber" potentially indicating savanna trees of which often of poor timber quality. On another page, he indicates the land as rolling with second rate oak timber, again likely referring to the tree structure of oak savanna or oak woodlands. See Appendix D for copies of these survey notes, and refer to the reference in Appendix F, *See Wisconsin Through the Eyes of the 19th Century Surveyors* for an excellent description of history, use, and interpretation of the original survey notes.

The earliest available aerial imagery from 1937 (see Appendix C) shows a complex of closed canopy forests, savanna and/or woodland as well as row cropping and grazing areas. North of Donald rock was a closed canopy forest, similar to its current condition. The area south of pops knoll appears to have been an oak opening, or oak savanna. Similar features are located across the property. South of Mt. Vernon Creek was closed canopy forest, again similar to its current state. Once open areas have converted to brush or black walnut. Based on the original survey notes and remnant populations of legacy trees, this area was dominated by oak. However, over time, and with the exclusion of frequent fire, mesophication has led the forests to increase in the stocking of mesic tree species and brush, reduce oak recruitment and lower ground layer diversity.

Soils

Understanding the soil allows us to determine the potential suitability of the land for uses such as agriculture, building, or ecological restoration. Donald Park is set upon a variety of soils influenced by aspect, slope, parent material and moisture. The forested portions of the property have predominantly silt soils, grading to richer silt loams in lower elevations.

According to a Web Soil Survey conducted using USGS data, the currently forested portions of the Donald Park property include the following soil types:

- New Glarus-Dunbarton silt loam (20%)
- Elkmound sandy loam (17%)
- Seaton silt loam (13%)
- Newglarus silt loam (9%)
- Otter silt loam (8%)
- Elevs sandy loam (6%)
- Elkmound-Northfield complex (6%)
- Orion silt loam (5%)
- <5% per soil series of the following: Huntsville silt loam, Gales silt loam, Festina silt loam, Churchtown silt loam, Troxel silt loam, Virgil silt loam

See Appendix B for a detailed soil map of the property, with a simplified key describing the soil types. A detailed Soil Report will be submitted to NRCS as a supporting document for this plan.

Endangered, Threatened, and Special Concern Species and Plant Communities

Natural Heritage Inventory (NHI) searches determine if your plan may affect endangered, threatened, or special concern animals, plants or plant communities. To learn about rare plants, animals and natural plant communities in Wisconsin visit https://dnr.wi.gov/topic/endangeredresources/etlist.html.

Table 1: Table of rare, endangered, or threatened species/groups/communities potentially present

Scientific Name	Common Name	WI Status	US Status	Habitat	Group
Centronyx henslowii	Henslow's Sparry	Threatened	Species of Concern	Open grasslands, wet meadows.	Bird
N/A	Rusty Patched Bumble Bee Potential Range	N/A	High Potential Range	Sandy prairies & woodlands	Range

Archeological and Historical Resources

Historical and Archeological review is necessary before any practices that could unearth or damage resources that are held as important to understanding our history on the landscape. This includes but is not limited to historical homesteads, burial mounds, trash dumps, sights where pottery has been discovered, and many other similar resources. According to the DNR, these resources **do exist** on the property. Perform this review again before doing any harvesting, or activities that could cause ground disturbance.

Opportunities, Constraints, and Threats

Opportunities

- Existing oaks in the park, some over 100 years old, provide the necessary structure for oak savanna and oak woodland communities, as well as a seed source for oak regeneration
- Sandstone ridges and rock outcroppings, historically dominated by oaks with open canopies, may harbor rare plant communities.
- Size of property allows for landscape-level conservation and restoration of oak woodland, oak savanna, prairie and wet meadow.
- Volunteer groups and neighbors are engaged in park maintenance and management.
- Excellent interpretive opportunities exist for public engagement to learn about ecological restoration and local cultural and natural history.
- Agricultural activities in the park may provide revenue to fund restoration and non-commercial forestry practices.
- Areas of the park currently in row crop agriculture could be planted to oak woodland, oak savanna and prairie, improving access to these areas for park visitors, enhancing habitat connectivity and quality, and reducing sediment and nutrient inputs into the park's cool and coldwater streams.

Constraints

- Non-native invasive plant species are well-established and present a threat to species diversity while hindering access for passive recreation and land management
- If fire is not restored as an ecological process, then fire-intolerant mesic species such as black walnut and central hardwoods will dominate the next generation of trees. These tree species are associated with lower overall plant diversity and reduced pollinator and wildlife habitat quality.
- Areas of steep and rocky terrain limit access for performing forestry and land management activities.
- Row crop agricultural land use in the park limits habitat quality, connectivity and ecosystem services provided by oak woodland, oak savanna and prairie.
- Public opinion may be averse to certain forestry activities, such as timber harvesting, herbicide application, and prescribed burning, in the absence of public notification and education prior to conducting these activities.

Threats

- Benign neglect or passive management will lead to continued spread and establishment of invasive species, reducing habitat quality within the current and future forested areas
- Row-crop agricultural land use within the park limits habitat quality, habitat connectivity and access for park visitors.
- Disease, storm damage, drought, and other environmental factors may adversely affect forest health.
- Invasive species may be introduced to the park from park visitors and wildlife entering the park from adjacent properties

Forest Stands

Foresters combine areas of land with similar vegetative and non-vegetative characteristics for management purposes and call these areas “stands”. This plan distinguishes 12 stands, which can be viewed in the stand maps in Appendix A.

- **Stand 1** (185 acres), “Oak and Central Hardwood”, covers a large area in the central and southeast parts of the property.
- **Stand 2** (25 acres), “Walnut”, stand dominated by sawlog walnut.
- **Stand 3** (47 acres), “Oak and Walnut”, stand is primarily oak with mix of central hardwoods and walnut.
- **Stand 4** (23 acres), “Oak Savanna”, areas with remnant open grown oaks.
- **Stand 5** (6 acres), "Northern Hardwoods”, Mesic, north aspect stand dominated by maple.
- **Stand 6** (21 acres), “Black Oak”, forested areas with high stocking of black oak.
- **Stand 7** (17 acres), “Bottomland Hardwoods”, floodplain forests adjacent to Mt. Vernon Creek or other small creeks.
- **Stand 8** (8 acres), “Rocky Oak”, sandy, dry, steep rock outcroppings with oak canopy
- **Stand 9** (7 acres) “Pine”, plantation of pine.
- **Stand 10** (4 acres) “Mesic Draw”, Stand of poorly formed, non-desirable mesic canopy species.
- **Stand 11** (5 acres), “Aspen”, young developing aspen.
- **Stand 12** (76 acres), “Early Successional”, early successional areas adjacent or between stands.

See additional documents for basic forest inventory data summary for all stands on Wisconsin DNR form 2450-128, Land Exam and Practices Report. Detailed stand descriptions and management recommendations follow for each stand.

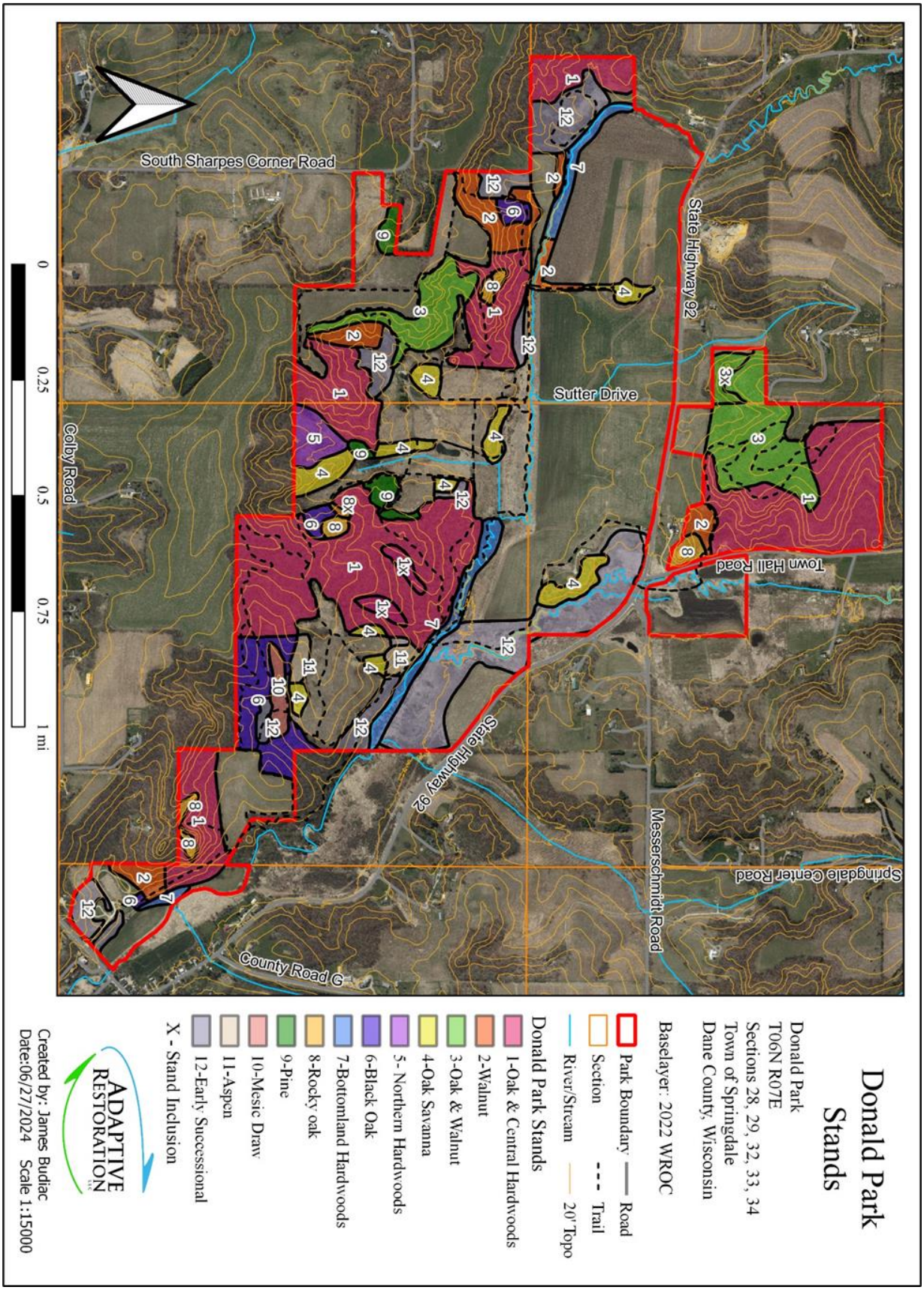


Figure 4: Donald Park Stand Map

Stand 1: "Oak and Central Hardwood", 185 acres

Average Basal Area (square feet/acre): 94
Trees per acre: 92
Board feet per acre: 4,000
Cords per acre: 9
Quadratic Mean Diameter : 13"

Stand Age (years): 125
Site Index: 55
Stocking: 73%
Soil: Silt loam, sandy loam
Aspect: Variable

Table 2: Stand 1 natural community and WDNR Timber Type (see appendix G for Natural Communities Description).

Current Natural Community	Desired Natural Community	Primary Timber Type	Secondary Timber Type	Understory Type
Southern Dry Mesic Forest	Oak Woodland	*O 15+*[3]	*CH 5-11* [1]	*CH 0-5* [1]
		Moderate stocking of oak large sawtimber	Low stocking of central hardwood small sawtimber	Low stocking of central hardwoods seedlings and saplings

Table 3: Stand 1 timber type size classes, stocking levels, with species listed in order of abundance by size class.

Seedlings	Saplings	Pole Sized Timber (5-11")	Small Sawlog Timber (12-15")	Large Sawlog Timber (15"+)
451/acre	*299/acre*	*18 sq ft*	*18 sq ft*	*53 sq ft BA*
Black Cherry	Black Cherry	White Oak	White Oak	White Oak
Boxelder	Hop Hornbeam	shagbark hickory	Black Oak	Black Oak
American Elm	Boxelder	Black Cherry	Black Cherry	Black Cherry
	Black Walnut	Boxelder	shagbark hickory	Black Walnut
	Red Maple	Basswood	Black Walnut	Bur Oak
	Shag Bark Hickory	Black Oak	Red Maple	Red Maple
	Sugar Maple	Black Walnut	Black Locust	shagbark hickory
	White Oak	Hophornbeam	Bur Oak	Basswood
		Red Maple	Paper Birch	Sugar Maple
		Sugar Maple	Basswood	American Elm
		Black Locust	Sugar Maple	

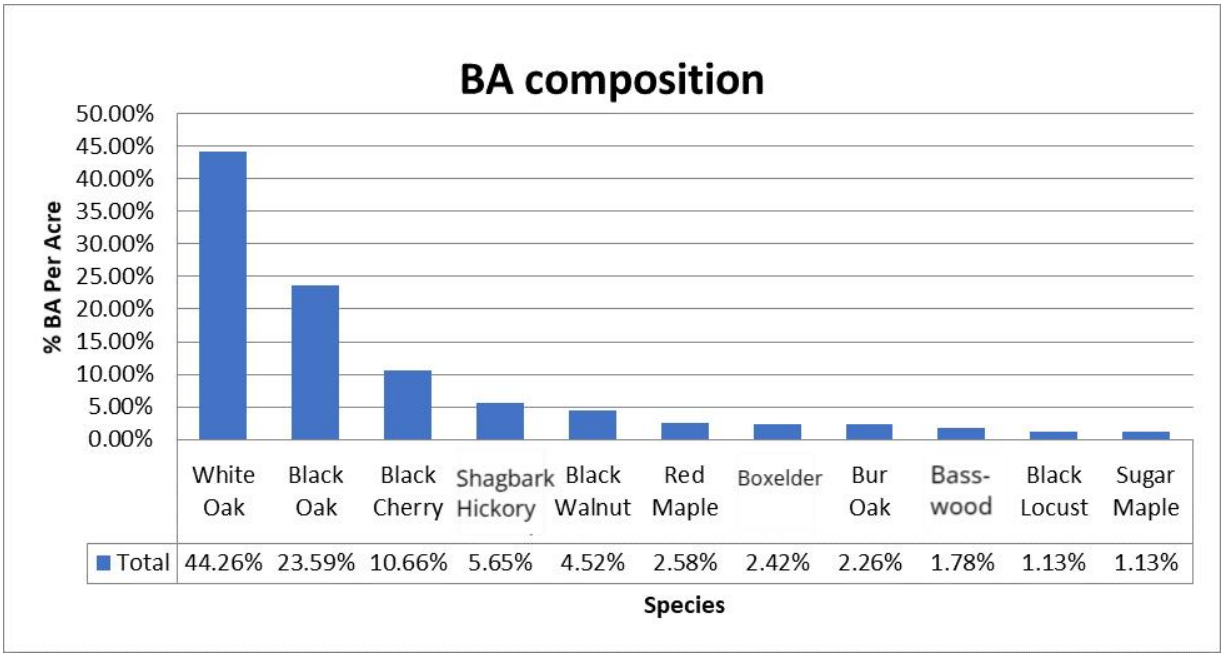


Chart 1: Stand 1 tree species composition, as percentage of total basal area (BA).

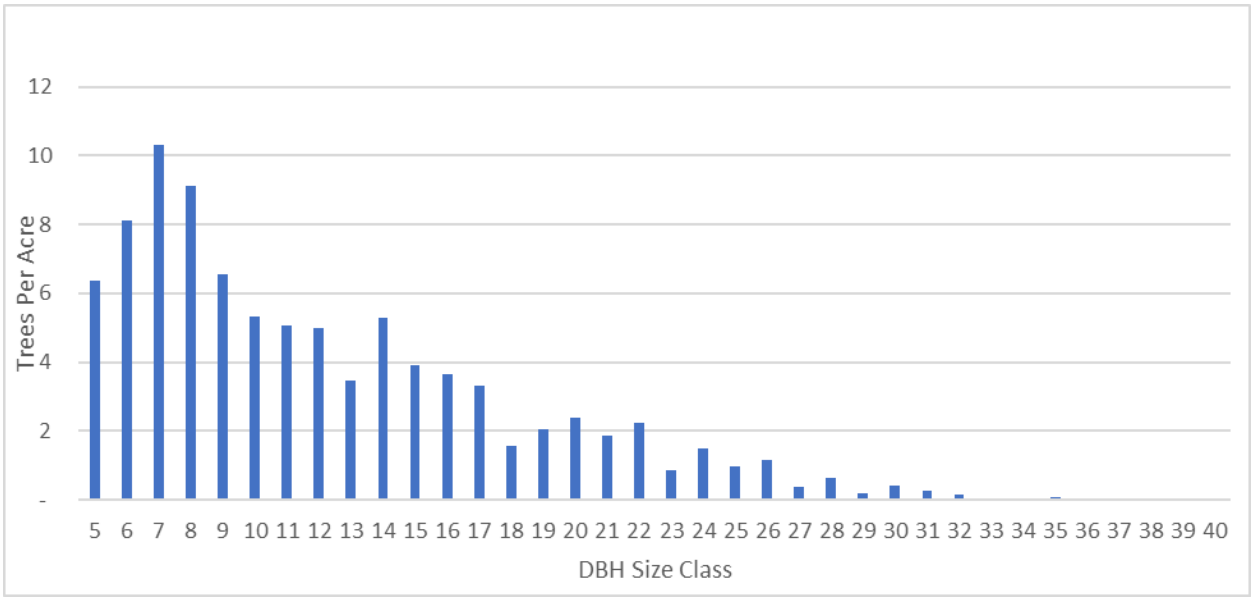


Chart 2: Stand 1 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class)

Stand Description

Stand 1 is a southern dry-mesic forest and the largest stand on the property. It is characterized by moderate to good timber quality, an oak dominant canopy and has a high restoration potential. Regeneration layer is limited to mesic species and lacks oak recruitment. Soil type is silt loam, aspect is variable. These areas have been forested for most of recent history and can be seen as closed canopy forest in the 1937 aerial.

Tree Composition and Size Class Distribution

Stand 1 has the highest tree diversity with 20 species captured in the inventory. The canopy is predominantly white and black oak in all timber size classes (67%) though this stand exhibits signs of mesophication. Due to lack of frequent, low intensity disturbance, such as fire, the stocking levels of central hardwood species and black walnut has increased over time.

Areas within the stand possess higher stocking densities of mesic species, likely due to lower topography, aspect (north, east) and silt loam soils. Areas of steeper slopes and rocky, or dry soils, have been slower to transition into a mesophytic community. The trees in these areas are shorter and have a form indicative of being more open grown in woodland conditions.

Invasive Species

Stand 1 has the highest density of invasive species in Donald Park. In some areas, honeysuckle and buckthorn are frequent in dense clumps and are present at 75% cover with dense patches around an acre in size. Other areas with high invasive shrub density include stand edges that border areas that were previously open (i.e. Stand 2 & 12). Other invasive species present include garlic mustard, Japanese barberry, and multiflora rose.

Shrub and herbaceous Layers and Natural Community

Stand 1 has a high level of oak savanna & woodland indicator species, particularly in areas with steep slopes and canopy openings from a quarter to half an acre in size. Species observed include bottlebrush grass, wild bergamot, and goldenrod. Parts of the stand that were historically dense woodland have moderate diversity in woodland forbs such as mayapple, hog peanut, white snakeroot, and Pennsylvania sedge. Areas with high invasive brush cover have a lower diversity in forbs and grasses.

Management Objectives

The management objective for Stand 1 is to restore to oak woodland conditions with attention to canopy structure and increasing understory plant diversity. Target conditions include both open and closed oak woodland with consideration to factors such as current stocking, indicator species, slope, aspect and soil type. This will be accomplished via invasive species management, timber harvesting and/or timber stand improvement, prescribed fire and seeding of native species.

Recommended Practices:

1. **2025 Fire Break Planning & Establishment**: Using current trail system, plan out prescribed burn units and review where additional firebreaks will be needed. Where necessary, install permanent or temporary strips of ground cleared to bare soil or planted with mowed fire-resistant vegetation meant to stop the spread of fire during prescribed burns. Design firebreaks to consist of non-fire adapted species, bare ground, or a combination. Firebreaks should be of sufficient width to contain the type of fire expected: 15'+ mowed grass break; 5'+ cleared woodland break. Locate firebreaks to minimize risk of damage to resources and infrastructure. Use natural anchor points where possible.

2. **2025-2035 Invasive Species Management:** Removal of non-native species such as common buckthorn, bush honeysuckle, garlic mustard and multiflora rose and native but locally invasive species such as prickly ash and *Rubus* species is critical to reduce competition for native forbs and tree seedlings, restore soil health and maintain access for management activities. Brushy invasive species are best controlled by mechanical removal (brushsaw, chainsaw, forestry mower) and treatment of the stumps with herbicides such as triclopyr or glyphosate. Follow up

treatments in subsequent growing seasons after the initial removal will be required. Herbaceous weeds can be controlled via foliar application.

3. **2025-20XX Prescribed Burning:** Annual or semiannual burning is recommended to return a historic fire regime for the desired oak community. Prescribed burning will consume leaf litter and reduce woody species density and structure. This management action selects for the stimulated growth of native fire-adapted forbs, grasses, trees, and shrubs. Utilize professional and adequately trained burn crews to assist with planning and conducting these burns when necessary. Burn frequency may be adjusted to 3-5 years should the presence of woody and herbaceous invasive species substantially decrease (<10% distribution). Prescribed burning may also be used as a site prep tool for activities such as planting or seeding. For successful oak regeneration to occur, a fire free period of 5 up to 15 years may be required - continual monitoring as well as desired stand structure will guide this decision. Additionally, 1-3 growing seasons may be required to build adequate fuel loads. To assist in the establishment of a diverse plant community, consider the timing of each burn – alternative between seasons (spring/fall) and timing (early/late) within each season.

4. **2027-2030 Oak Woodland Restoration Harvest:** Restore this stand by creating favorable light conditions for natural oak regeneration and to promote the conditions needed for native woodland grasses, sedges, and forbs. Target open oak woodland conditions with favor towards decreased canopy cover and stocking. Measurable targets include the following metrics: 40-85% canopy coverage, 40-100 BA, 40-100 Trees per Acre (TPA), 30-75% stocking. Remove trees of non-desirable species, high-risk, of poor quality, overtopping advanced oak regeneration or to increase canopy openings and spacing. Release dominant and co-dominant oaks on 2-3 sides. Create heterogeneous canopy conditions by selecting removal of trees in patches, implementing intentional spacing, or group retention. Favor the retention of oak with preference for white, bur and red oak along with healthy legacy trees. The need for fine fuels (leaf litter, thatch, etc.) to carry prescribed fire should be considered. Take care to exclude harvesting during oak wilt season; traditional DNR guidance is to avoid harvesting in areas with oak from April to July 15th, although a wider window is recommended if possible. *Rule of thumb:* a decrease in canopy cover and an increase in canopy heterogeneity, or structure, will lead to an increase in understory plant diversity potential.
    a. **Note**. All merchantable black walnut, mature black oak and some red and white oak may be harvested to reach target canopy conditions. However, this harvest will include a high degree of non-commercial thinning targeting small diameter and/or non-merchantable mesic tree species. Removal of all non-oak species would result in ~60 BA, well within the acceptable range. Some removal of large oaks may be required to reach desired canopy conditions.

5. **2029-2032 Native Species Planting**: Broadcast seed native woodland grasses and forbs at a minimum rate of 25 seeds per square foot in either the spring or fall. Select species (40+) appropriate to the site considering factors such as: light availability, moisture regime, climate, microclimate, soil type, slope, aspect, fire adaptation, species diversity, forage capability, seed or fruit production, bloom period (early, mid, late growing season) and others. Seed can either be purchased and/or collected from the site or nearby areas that allow seed collection. In areas where feasible, mow 2-3 times during the first and second growing season. As a by-product of harvesting, brush management, prescribed fire and invasive species management, site preparation should be adequate, however further site preparation may be needed and should be assessed prior to implementation. Before designing seed mix, assess the current diversity and distribution of the plant community.

Stand 2: “Walnut”, 25 acres

Average Basal Area (square feet/acre): 94
Trees per acre: 130
Board feet per acre: 5,000
Cords per acre: 8
Quadratic mean diameter : 11”

Stand Age: 79
Site Index: 58
Crown Competition Factor: 165
Soil: Silt loam, sandy loam
Aspect: North, east

Table 4: Stand 2 natural community and WDNR Timber type.

Current Natural Community	Desired Natural Community	Primary Timber Type	Secondary Timber Type	Understory Type
Southern Dry Mesic Forest	Southern Dry Mesic Forest	*W 15+*[2]	*CH 5-11* [1]	*CH 0-5* [1]
		Low/moderate stocking of walnut large sawtimber	Low stocking of central hardwood Poles	Low stocking of central hardwoods seedlings and saplings

Table 5: Stand 2 timber type size classes and stocking levels with species listed in order of abundance.

Seedlings	Saplings	Pole Sized Timber (5-11”)	Small Sawlog Timber (11-15”)	Large Sawlog Timber (15+”)
171/acre	*279/acre*	*22 sq ft*	*30 sq ft*	*43 sq ft*
Black Cherry	American elm	Black Walnut	Black Walnut	Black Walnut
Red Maple	Black Walnut	Sugar Maple	Black Oak	Black oak
American Elm	Boxelder	White Ash	White Oak	White Oak
	Black Cherry	Black Oak	Black Cherry	Black Cherry
	White Ash	White Oak	Sugar Maple	Boxelder
		Shagbark Hickory	Red Pine	Bur Oak
			Hackberry	

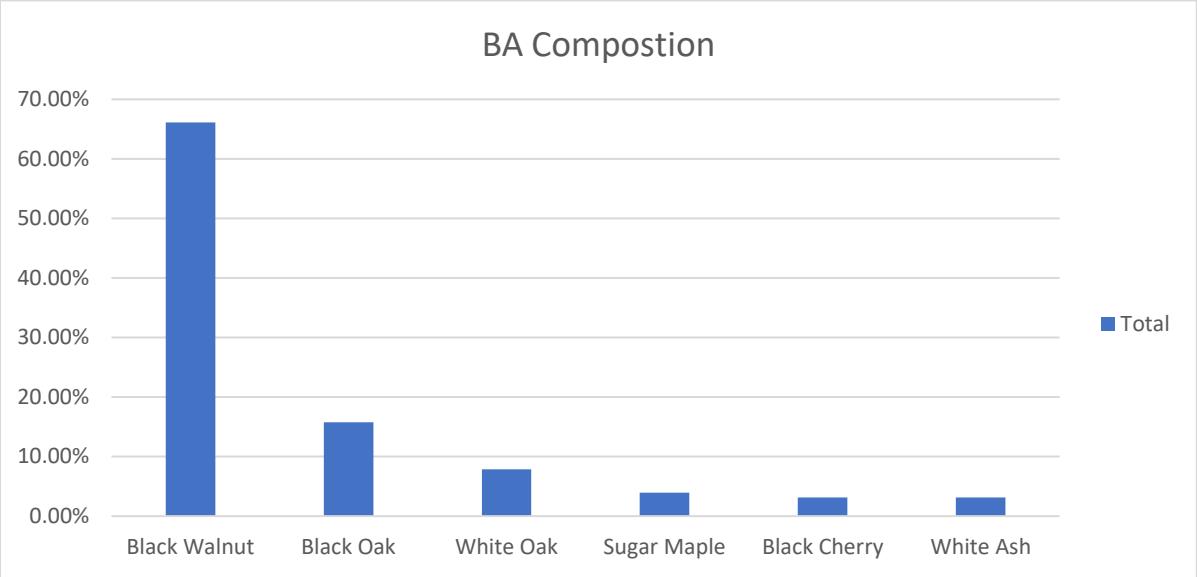


Chart 3: Stand 2 tree species composition, as percentage of total basal area

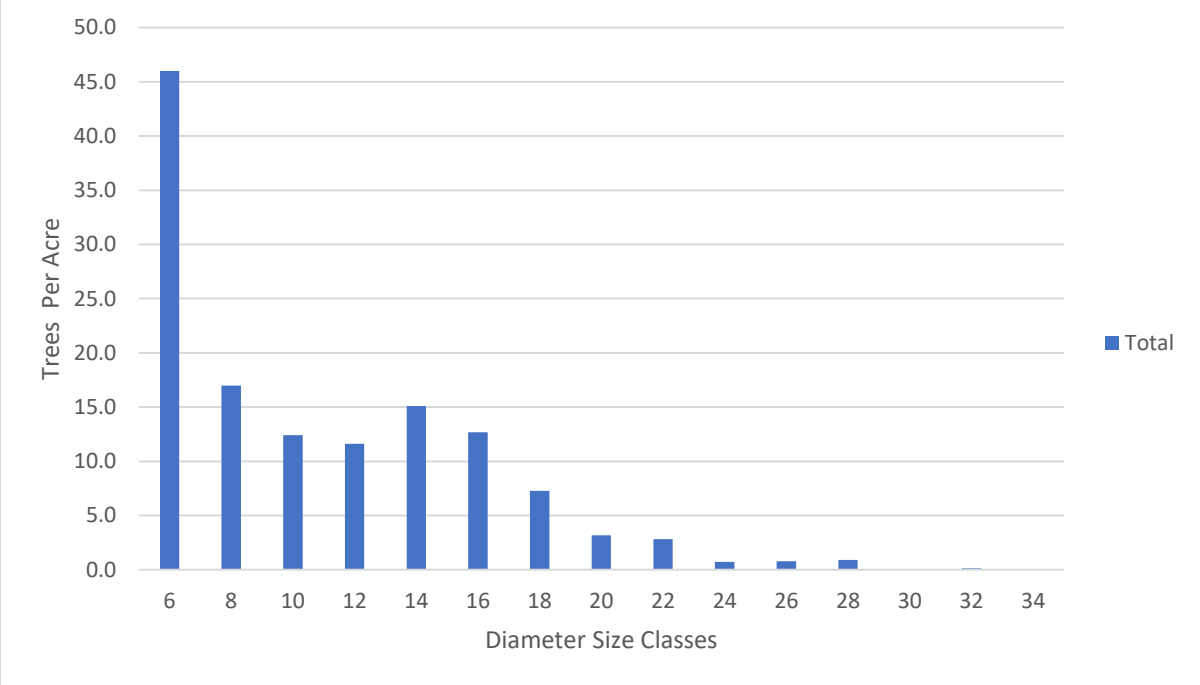


Chart 4: Stand 2 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class)

Stand Description

Stand 2 is southern dry-mesic forest, primarily on north and east facing slopes with silt loam and sandy loam soils. These areas, once open and used for grazing, have converted to a stand largely comprised of black walnut. Timber quality is variable but on average moderate to good. The regeneration layer is limited to central hardwood species. Conducting silviculture to promote black walnut regeneration will be required to maintain cover type.

Tree Composition and Size Class Distribution

Stand 2 has a primary cover type of black walnut with varying size and age classes set across several units within the park. The next dominant species are white and black oak which are prevalent on ridges. The walnuts is two-aged, with a cohort of large sawtimber (20”+) and a second age class of small sawtimber. Black locust is also common in the southernmost portion of these units and generally has poor form; this may have been planted.

Areas of the stand north of Highway 92 are stocked with large sawlog black walnut. These trees are shorter and have form indicative of being grown in open conditions. Though stems have a large diameter, timber quality remains in mid to lower due to stunted form; classically known as a “wolf” tree, often short in stature with wide spreading crowns. However, while it may negatively affect timber production, it may offer wildlife habitat, forage and may serve as a valuable ecological feature.

Invasive Species

Stand 2 has a high invasive species cover. Honeysuckle is present at 70% cover. Garlic mustard and multiflora rose area also present but occur in lesser amounts (5-20%), their prevalence suppressed by the dense honeysuckle cover.

Shrub and herbaceous Layers and Natural Community

Native species coverage and diversity is low in this stand. Largely due to the allelopathic nature of black walnut, black locust, and cover by invasive species. Species observed in this stand are common woodland forb species such as Virginia creeper, blackberry, grape vine, Jack-in-the-pulpit. Native shrub diversity is also low, but patches of hazelnut were noted in the far western units. Prickly ash is also common, however a factor in suppressing the ground layer diversity.

Management Goals

The goal for this stand is to reduce invasive brush cover and to promote the regeneration and stem health of black walnut for timber production. This can be accomplished via invasive brush control, timber harvesting and tending.

Practice Recommendations:

1. **2026-2036 Invasive Species Management:** Removal of non-native species such as common buckthorn, bush honeysuckle, garlic mustard and multiflora rose and native but locally invasive species such as prickly ash and *Rubus* species is critical to reduce competition for native forbs and tree seedlings, restore soil health and maintain access for management activities. Brushy invasive species are best controlled by mechanical removal (brushsaw, chainsaw, forestry mower) and treatment of the stumps with herbicides such as triclopyr or glyphosate. Follow up treatments in subsequent growing seasons after the initial removal will be required. Herbaceous weeds can be controlled via foliar application.
    a. **Note:** special attention should be given to harvest areas, pre- (1-2 years) and post-harvest (1-5 years) to reduce potential increase in invasive species cover.

2. **2027 Patch Selection Harvest:** A silvicultural method designed to regenerate and maintain uneven-aged stands of shade intolerant or mid-tolerant species by removing patches of trees at regular intervals. Canopy openings are 0.5-2+ acres in size and should be placed in areas with advanced regeneration, mature trees, and undesirable species. Target removal of 20-33% of the total stand area. An uneven-aged stand is maintained by periodically regenerating new age classes while manipulating the overstory structure to facilitate continual development of quality growing stock. Stand regeneration is achieved by periodically manipulating the overstory and

understory to create conditions favorable for the establishment and survival of desirable tree species. Generally, most regeneration is seed origin (high forest method), although a component can be vegetative.

3. **2030 Regeneration Check**. Conduct a follow-up field survey to determine the success of regeneration in a stand. This practice will inform future management and the potential need for planting.

4. **2042, 2054 Thinning:** Remove trees to reduce stand density thereby improving tree growth and enhancing forest health, or to utilize trees that are at risk of mortality. Thin the stand to reduce stocking and concentrate growth on trees that are more desirable by following the order of removal and tree retention guidelines. Early and frequent thinning in stand development phase can lead to increased stand quality over time. Target areas with high number of stems in harvest areas and conduct crop tree release. If enough volume exist in other parts of the stand, conduct commercial harvest. Also, considering expanding the harvest gaps if mature trees are present on the edge and regeneration is present.

Stand 3: "Oak and Walnut", 47 acres

Average Basal Area (square feet/acre): 84
Trees per acre: 101
Board feet per acre: 4,300
Cords per acre: 7
Quadratic Mean Diameter: 12"

Stand Age: 115
Site Index: 55
Stocking: 65%
Soil: Silt loam, sandy loam
Aspect: South, southwest

Table 6: Stand 3 natural community and WDNR Timber Type

Current Natural Community	Desired Natural Community	Primary Timber Type	Secondary Timber Type	Understory Type
Southern Dry-Mesic Forest	Open Oak Woodland	*O 15+*[2]	*CH 5-11* [1]	*CH 0-5* [1]
		Low/Moderate stocking of oak large sawtimber	Low stocking of Central hardwood poles	Low stocking of oak seedlings and saplings

Table 7: Stand 3 timber type size classes and stocking levels with species listed in order of abundance

Seedlings	Saplings	Pole Sized Timber (5-11")	Small Sawlog Timber (11-15")	Large Sawlog Timber (15+")
390/acre	*985/acre*	*21 sq ft*	*18 sq ft*	*45 sq ft*
Sugar Maple	American Elm	Black Walnut	Black Walnut	White Oak
Black Cherry	Bitternut Hickory	Shagbark Hickory	White Oak	Black Oak
American Elm	Black Cherry	White Oak	Black Cherry	Black Walnut
Bitternut Hickory	Black Walnut	Black Cherry	Shagbark Hickory	Bur Oak
	Hackberry	Hackberry	Black Oak	Hackberry
	Shagbark Hickory	Sugar Maple	American Elm	E. Cottonwood
	Sugar Maple	Bitternut Hickory	Bur Oak	American Elm
		Black Oak	Bigtooth Aspen	Bigtooth Aspen
		American Elm		
		Hophornbeam		

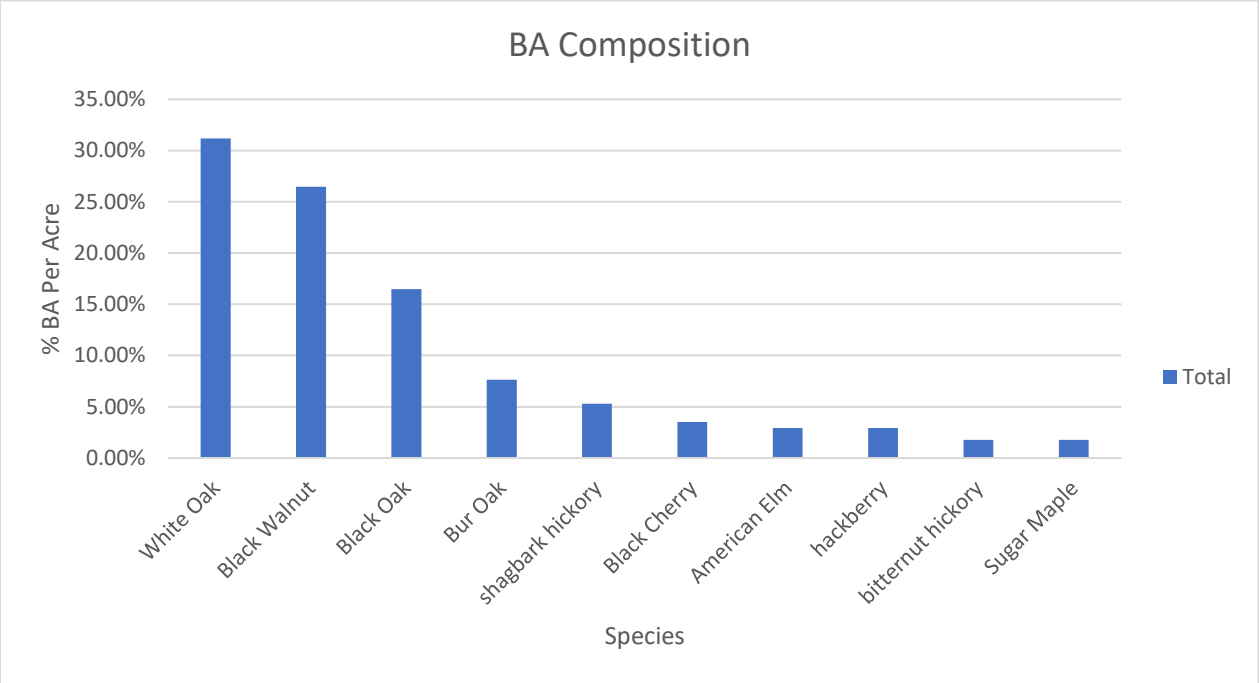


Chart 5: Stand 3 tree species composition, as percentage of total basal area

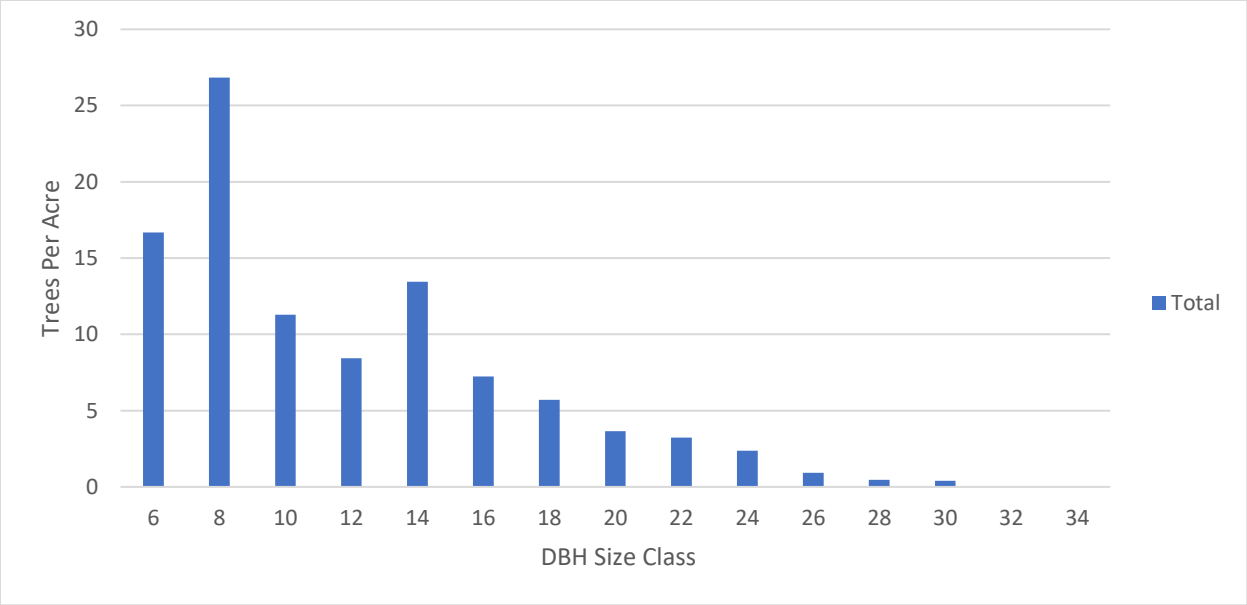


Chart 6: Stand 3 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class)

General Stand Description

Stand 3 is a southern dry-mesic forest characterized by a dominance of oak and black walnut. It sits on south to southwest facing slopes undlerain by silt loam and sandy loam soils. Timber quality is moderate to good with scattered high quality black walnut. Oak decline was noted in several pockets across the north stand unit. An inclusion of pine exists along the southern boarder of the north unit. This area should be managed in conjunction with the rest of the stand.

Tree Composition and Size Class Distribution

Stand 3 is predominantly large sawlog white oaks. The stand also has a high stocking of walnuts. The walnut is uneven aged, with most of the large sawtimber between 15-20" DBH. Walnuts are in the highest density in mesic areas. Tree form is good. The remainder of the canopy is central hardwoods including hackberry, cherry, hickory, elm and maple.

The regeneration layer is species diverse but lacks the presence of oak.

Invasive Species

Invasive coverage is moderate in this stand. Honeysuckle covers about 20-35% of the stand. Particularly in the north unit, invasive species cover is the densest at the southern and northern edges of the stand and becomes increasingly sparse toward the center. Garlic mustard is also prevalent, located in small patches throughout the stand.

Shrub and herbaceous Layers and Natural Community

The ground cover in the stand is moderately diverse. An array of common woodland forbs including hog peanut, white snake root, Pennsylvania sedge, *Rubus spp.*, and mayapple. Ground cover is reduced by thick invasive cover in some locations and the heavy presence of black walnut (allelopathic) in the stand.

Management Objectives

The management objective for Stand 3 is to restore to oak woodland and savanna conditions with attention to increasing understory plant diversity and canopy structure. Target conditions include both open oak woodland and oak savanna with consideration to factors such as current stocking, indicator species, slope, aspect and soil type. This will be accomplished via invasive species management, timber harvesting, prescribed fire and seeding of native species.

Practice Recommendations:

1. **2025 Fire Break Planning & Establishment**: Using current trail system, plan out prescribed burn units and review where additional firebreaks will be needed. Where necessary, install permanent or temporary strips of ground cleared to bare soil or planted with mowed fire-resistant vegetation meant to stop the spread of fire during prescribed burns. Design firebreaks to consist of non-fire adapted species, bare ground, or a combination. Firebreaks should be of sufficient width to contain the type of fire expected: 15'+ mowed grass break; 5'+ cleared woodland break. Locate firebreaks to minimize risk of damage to resources and infrastructure. Use natural anchor points where possible.

2. **2025-2035 Invasive Species Management:** Removal of non-native species such as common buckthorn, bush honeysuckle, garlic mustard and multiflora rose and native but locally invasive species such as prickly ash and *Rubus* species is critical to reduce competition for native forbs and tree seedlings, restore soil health and maintain access for management activities. Brushy invasive species are best controlled by mechanical removal (brushsaw, chainsaw, forestry mower) and treatment of the stumps with herbicides such as triclopyr or glyphosate. Follow up treatments in subsequent growing seasons after the initial removal will be required. Herbaceous weeds can be controlled via foliar application.

3. **2025-20XX Prescribed Burning:** Annual or semiannual burning is recommended to return a historic fire regime for the desired oak community. Prescribed burning will consume leaf litter

and reduce woody species density and structure. This management action selects for the stimulated growth of native fire-adapted forbs, grasses, trees, and shrubs. Utilize professional and adequately trained burn crews to assist with planning and conducting these burns when necessary. Burn frequency may be adjusted to 3-5 years should the presence of woody and herbaceous invasive species substantially decrease (<10% distribution). Prescribed burning may also be used as a site prep tool for activities such as planting or seeding. For successful oak regeneration to occur, a fire free period of 5 up to 15 years may be required - continual monitoring as well as desired stand structure will guide this decision. Additionally, 1-3 growing seasons may be required to build adequate fuel loads. To assist in the establishment of a diverse plant community, consider the timing of each burn – alternative between seasons (spring/fall) and timing (early/late) within each season.

4. **2027-2030 Oak Woodland Restoration Harvest:** Restore this stand by creating favorable light conditions for natural oak regeneration and to promote the conditions needed for native woodland grasses, sedges, and forbs. Target open oak woodland conditions with favor towards decreased canopy cover and stocking. Measurable targets include the following metrics: 40-85% canopy coverage, 40-100 BA, 40-100 Trees per Acre (TPA), 30-75% stocking. Remove trees of non-desirable species, high-risk, of poor quality, overtopping advanced oak regeneration or to increase canopy openings and spacing. Release dominant and co-dominant oaks on 2-3 sides. Create heterogeneous canopy conditions by selecting removal of trees in patches, implementing intentional spacing, or group retention. Favor the retention of oak with preference for white, bur and red oak along with healthy legacy trees. The need for fine fuels (leaf litter, thatch, etc.) to carry prescribed fire should be considered. Take care to exclude harvesting during oak wilt season; traditional DNR guidance is to avoid harvesting in areas with oak from April to July 15th, although a wider window is recommended if possible. *Rule of thumb:* a decrease in canopy cover and an increase in canopy heterogeneity, or structure, will lead to an increase in understory plant diversity potential.
    a. **Note:** if future commercial harvesting is desired, consider leaving black walnut crop trees that will not interfere with meeting the management objective.

5. **2029-2032 Native Species Planting**: Broadcast seed native woodland and savanna grasses and forbs at a minimum rate of 25-50 seeds per square foot in either the spring or fall. Select species (40+) appropriate to the site considering factors such as: light availability, moisture regime, climate, microclimate, soil type, slope, aspect, fire adaptation, species diversity, forage capability, seed or fruit production, bloom period (early, mid, late growing season) and others. Seed can either be purchased and/or collected from the site or nearby areas that allow seed collection. In areas where feasible, mow 2-3 times during the first and second growing season. As a by-product of harvesting, brush management, prescribed fire and invasive species management, site preparation should be adequate, however further site preparation may be needed and should be assessed prior to implementation. Before designing seed mix, assess the current diversity and distribution of the plant community.

Stand 4: “Oak Savanna”, 23 acres

Average Basal Area (square feet/acre): 73
Trees per acre: 58
Board feet per acre: 2,100
Cords per acre: 6
Quadratic Mean Diameter: 15”

Stand Age (years): 166
Site Index: 35
Stocking: 40%
Soil: Sandy loam, silt loam, rocky
Aspect: N/A

Table 8: Stand 4 natural community and WDNR Timber Type

Current Natural Community	Desired Natural Community	Primary Timber Type	Secondary Timber Type	Understory Type
Southern Dry Forest	Oak Opening	*O 15+*[2]	*O 5-11*[1]	*CH 0-5* [2]
		Low/Mid stocking of oak large sawtimber	Low stocking of Oak small sawtimber	Moderate stocking of Northern hardwoods seedlings and saplings

Table 9: Stand 4 timber type size classes, stocking levels, with species listed in order of abundance by size class

Seedlings	Saplings	Pole Sized Timber (5-11")	Small Sawlog Timber (11-15")	Large Sawlog Timber (15"+)
730/ acre	*240/ acre*	*10 sq ft BA*	*6 sq ft BA*	*57 sq ft BA*
Black Cherry	Black Walnut	White Oak	Black Oak	White Oak
Red Maple	Black Oak	Black Oak	White Oak	Bur Oak
American Elm	Black Cherry	Black Walnut	Paper Birch	Black Oak
Sugar Maple	Red Maple	Paper Birch	Bigtooth Aspen	Black Walnut
Boxelder		Bigtooth Aspen	Bur Oak	Sugar Maple
Black Walnut		Bur Oak		Boxelder
				Basswood
				Black Cherry

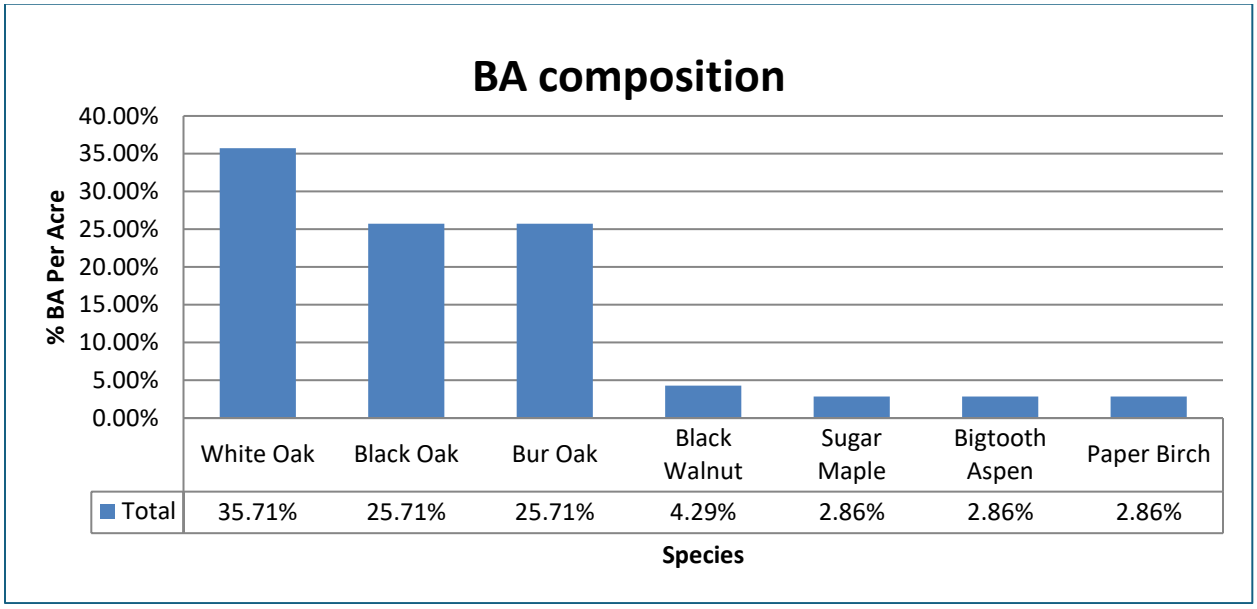


Chart 7: Stand 4 tree species composition, as percentage of total basal area.

Chart 8: Stand 4 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class).

Stand Description

Stand 4 has an oak dominant canopy, lower trees per acre and basal area, and higher ground cover diversity compared to similar stands. The stand is broken into several units that are either isolated clumps of trees, on ridges and/or adjacent to areas that were once open. Canopy openings, ¼ acre to an acre in size, are frequent. Stand consists of rocky soils and outcroppings and/or sandy or silt loam soils. Trees height is stunted and many of the oaks have a live crown ration of 50-75%, indicative of open grown conditions. The process of mesophication is early in development with mesic tree species only in the pole timber size class at varying densities.

Tree Composition and Size Class Distribution

Stand 4 has low overstory diversity. Oaks are dominant in all three size classes. White, bur, and black oak comprise 75% of the stocking. Most of the oaks are in the large sawtimber size class, timber volume and quality are low due to stunted growth and poor form. However, these features, attributed to the open grown conditions and thin, rocky soils, provide the necessary structure for the desired natural community.

Regeneration is central hardwoods, primarily black cherry (~25%) and a mix of shade tolerant species including maples.

Invasive Species

Overall, likely due to poor soil conditions, invasive species cover is low to moderate. Multiflora rose is the most prevalent invasive species (20-35%). Bush honey suckle is also established but at lower coverage (5-20%).

Shrub and herbaceous Layers and Natural Community

Stand 4 has a diversity of native savanna species. Species observed include: common and whorled milkweed, goldenrod, Indiangrass, and little bluestem. Native brambles (*Rubus spp.*) are well established but have decreased native plant cover.

Management Objective

The objective for Stand 4 is to restore to oak savanna conditions with attention to ground layer diversity. This will be accomplished through invasive species control, prescribed fire, removing non-savanna trees via harvesting or timber stand improvement and seeding native species.

Recommended Practices

1. **2025 Fire Break Planning & Establishment**: Using current trail system, plan out prescribed burn units and review where additional firebreaks will be needed. Where necessary, install permanent or temporary strips of ground cleared to bare soil or planted with mowed fire-resistant vegetation meant to stop the spread of fire during prescribed burns. Design firebreaks to consist of non-fire adapted species, bare ground, or a combination. Firebreaks should be of sufficient width to contain the type of fire expected: 15'+ mowed grass break; 5'+ cleared woodland break. Locate firebreaks to minimize risk of damage to resources and infrastructure. Use natural anchor points where possible.

2. **2025-2035 Invasive Species Management:** Removal of non-native species such as common buckthorn, bush honeysuckle, garlic mustard and multiflora rose and native but locally invasive species such as prickly ash and *Rubus* species is critical to reduce competition for native forbs and tree seedlings, restore soil health and maintain access for management activities. Brushy invasive species are best controlled by mechanical removal (brushsaw, chainsaw, forestry mower) and treatment of the stumps with herbicides such as triclopyr or glyphosate. Follow up treatments in subsequent growing seasons after the initial removal will be required. Herbaceous weeds can be controlled via foliar application.

3. **2025-20XX Prescribed Burning:** Annual or semiannual burning is recommended to return a historic fire regime for the desired oak community. Prescribed burning will consume leaf litter and reduce woody species density and structure. This management action selects for the stimulated growth of native fire-adapted forbs, grasses, trees, and shrubs. Utilize professional

and adequately trained burn crews to assist with planning and conducting these burns when necessary. Burn frequency may be adjusted to 2-5 years should the presence of woody and herbaceous invasive species substantially decrease (<10% distribution). Prescribed burning may also be used as a site prep tool for activities such as planting or seeding. Additionally, 1-3 growing seasons may be required to build adequate fuel loads or until additional inputs (i.e. thatch) are created. To assist in the establishment of a diverse plant community, consider the timing of each burn – alternative between seasons (spring/fall) and timing (early/late) within each season.

4. 2026 Oak Savanna Restoration Harvest: Restore this stand by creating favorable light conditions for natural oak regeneration and to promote the conditions needed for native woodland grasses, sedges, and forbs. Measurable targets include the following metrics: 10-35% canopy coverage; 20-40 BA; 5-40 Trees per Acre (TPA) but greater than 1; 20-30% stocking. Remove trees that are of non-desirable species, high-risk, poor quality and/or overtopping advanced regeneration. Release dominant and co-dominant oaks on 3-4 sides to stimulate open-grown tree characteristic. Favor the retention of oak with preference for white, bur and legacy trees. Poorly formed or suppressed oaks 2-6" DBH and <65 years old, can be cut and will commonly stump sprout leading to a greater chance of success than new seedling to become a dominant canopy tree. Create heterogeneous canopy conditions by selecting the removal of trees in patches, implementing intentional spacing, and/or group retention. The need for fine fuels (leaf litter, thatch, etc.) to carry prescribed fire should be considered. Take care to exclude harvesting during oak wilt season; traditional DNR guidance is to avoid harvesting in areas with oak from April to July 15th, although a wider window is recommended if possible.

5. **2027 Native Species Planting:** Broadcast seed native savanna grasses, sedges and forbs at a minimum rate of 50 seeds per square foot in either the spring or fall. Select species (40+) appropriate to the site considering factors such as: light availability, moisture regime, climate, microclimate, soil type, slope, aspect, fire adaptation, species diversity, forage capability, seed or fruit production, bloom period (early, mid, late growing season) and others. Grasses should comprise no more than 60% of the seed mixture; warm season grasses seeding rates should be low (1-3 oz/acre). Seed can either be purchased and/or collected from the site or nearby areas that allow seed collection. In areas where feasible, mow 2-3 times during the first and second growing season. Note: As a by-product of harvesting, brush management, prescribed fire and invasive plant control, site preparation should be adequate, however further site preparation may be needed and should be assessed prior to implementation. For information on species selection refer to Oak Savanna Planting Guide – For use with Oak Savannas: Characteristics, Restoration, and Long-term Management by Thomas D. Brock for a species guidance based on canopy cover. Before designing seed mix, assess current species diversity

Stand 5: “Northern Hardwoods ”, 6 acres

Average Basal Area (square feet/ acre): 80
Trees per acre: 112
Board feet per acre: 1500
Cords per acre: 10
Quadratic Mean Diameter : 11”

Stand Age (Years): 56
Site Index: 61
Stocking: 75%
Soil: Sandy loam, silt loam
Aspect: North

Table 10: Stand 5 natural community and WDNR Timber Type

Current Natural Community	Desired Natural Community	Primary Timber Type	Secondary Timber Type	Understory Type
Southern Mesic Forest	Southern Mesic Forest	*NH 11-15*[2]	*CH 5-11* [1]	*NH 0-5*[3]
		Low/moderate stocking of small sawlog northern hardwoods	Low stocking of central hardwood poles	High stocking of northern hardwood seedlings

Table 11: Stand 5 timber type size classes and stocking levels, with species listed in order of abundance.

Seedlings	Saplings	Pole Sized Timber (5-11”)	Small Sawlog Timber (11-15”)	Large Sawlog Timber (15+”)
6,000/acre	*0/acre*	*30 sq ft*	*33 sq ft*	*17 sq ft*
Sugar Maple		Sugar Maple	Sugar Maple	Sugar Maple
		Red Maple	Red Maple	Red Maple
		Black Oak	Black Cherry	Black Cherry
				White oak

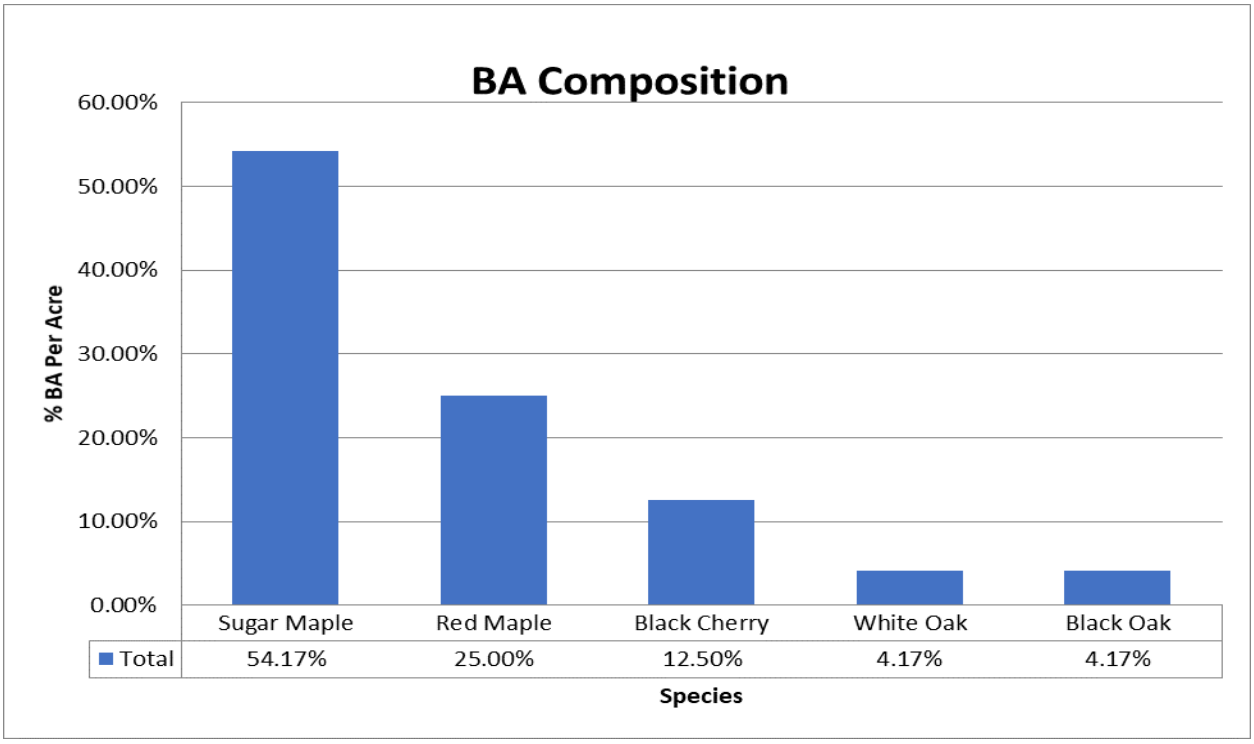


Chart 9: Stand 5 tree species composition, as percentage of total basal area

Chart 10: Stand 5 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class)

General Stand Description

Stand 5 is located at the south end of the property on a north facing slope between two ravines on sandy loam to silt loam soil. It is only located in one area within the property. Historically this area was open. With the absence of grazing or frequent disturbance, it has since filled in with shade tolerant, sugar maple.

Tree Composition and Size Class Distribution

Stand 5 is dominated by small sawlog and pole sized sugar maple (60%). This stand was historically grazed pasture and succeeded into sugar and red maple ~40 years ago. The stand is even aged with a few large sawlog central hardwoods.

Invasive Species

Due to the dense canopy of sugar maple stands, invasives species coverage in the stand is low. Garlic mustard (<5%) is sparsely scattered across the stand.

Shrub and herbaceous Layers and Natural Community

The ground cover in this stand is low in diversity. White snakeroot was the only abundant species observed. This low diversity is due to the dense canopy produced by maples, blocking out necessary light for forbs and grasses. Regeneration, however, is dense in this stand with 6,000 seedlings/acre. The regeneration layer is entirely comprised of sugar maple seedlings. Increasing ground cover diversity in this stand is not a goal for this stand. Low diversity is common of these forest types.

Management Objectives

The management objective for Stand 5 is to maintain adequate tree form, stand health and to monitor for invasive species.

Practice Recommendations:

1. **2025-20XX Invasive Species Monitoring:** Invasive species presence is currently low (<5%). However, consistent monitoring should be conducted to ensure invasive populations do not establish, particularly after harvesting. If invasive species do establish, conduct the appropriate management treatment.

2. **2030 Timber Stand Improvement – Crop Tree Selection:** Reduce stand density by releasing potential crop trees on 2-3 sides, selecting 50-75 tress per acre – a more accurate target of crop trees per acre should be assessed at the time of implementation. Select trees with that are of low risk, have good form, a healthy crown and bole and of a desired species while providing adequate spacing for residual tree growth.

3. **2045 Group Selection** Regenerate this stand by harvesting to create canopy group openings from 75 feet (1/10 acre) to 160 feet (1/2 acre) in diameter. This group selection regeneration method sets up natural conditions that benefit different tree species. The smaller openings benefit more shade tolerant species and the larger openings encourage growth of those species that do well in less shade. The stand might require site preparation such as invasive control before a harvest. Thin the remainder of the stand to reduce stocking and concentrate growth on trees that are more desirable by following the order of removal and tree retention guidelines.
    a. **Note:** This practice is not required, sugar maple stands can often be passively managed. Practice may only be feasible if other areas have went unharvested and additional volume can be added to the timber sale.

Stand 6: “Black Oak”, 21 acres

Average Basal Area (square feet/acre): 105
Trees per acre: 108
Board feet per acre: 3,500
Cords per acre: 11
Quadratic Mean Diameter: 11”

Stand Age (years): 90
Site Index: 61
Stocking: 75%
Soil: Silt loam, sandy loam
Aspect: North, west

Table 12: Stand 6 natural community and WDNR Timber Type

Current Natural Community	Desired Natural Community	Primary Timber Type	Secondary Timber Type	Understory Type
Southern Dry Mesic Forest	Oak Woodland	*O 15+*[3]	*CH 5-11* [1]	*CH 0-5* [1]
		Moderate stocking of oak large sawtimber	Low stocking of central hardwood small sawtimber	Low stocking of central hardwoods seedlings and saplings

Table 13: Stand 6 timber type size classes, stocking levels, with species listed in order of abundance by size class

Seedlings	Saplings	Pole Sized Timber (5-11”)	Small Sawlog Timber (11-15”)	Large Sawlog Timber (15+”)
220/acre	*130/acre*	*16 sq ft*	*26 sq ft*	*63 sq ft*
Black Cherry	Black Cherry	Black Cherry	Black Oak	Black Oak
Boxelder	Black Oak	Black Oak	Black Cherry	White Oak
	Shagbark Hickory	Boxelder	White Oak	Black Cherry
		Hophornbeam	Shagbark hickory	

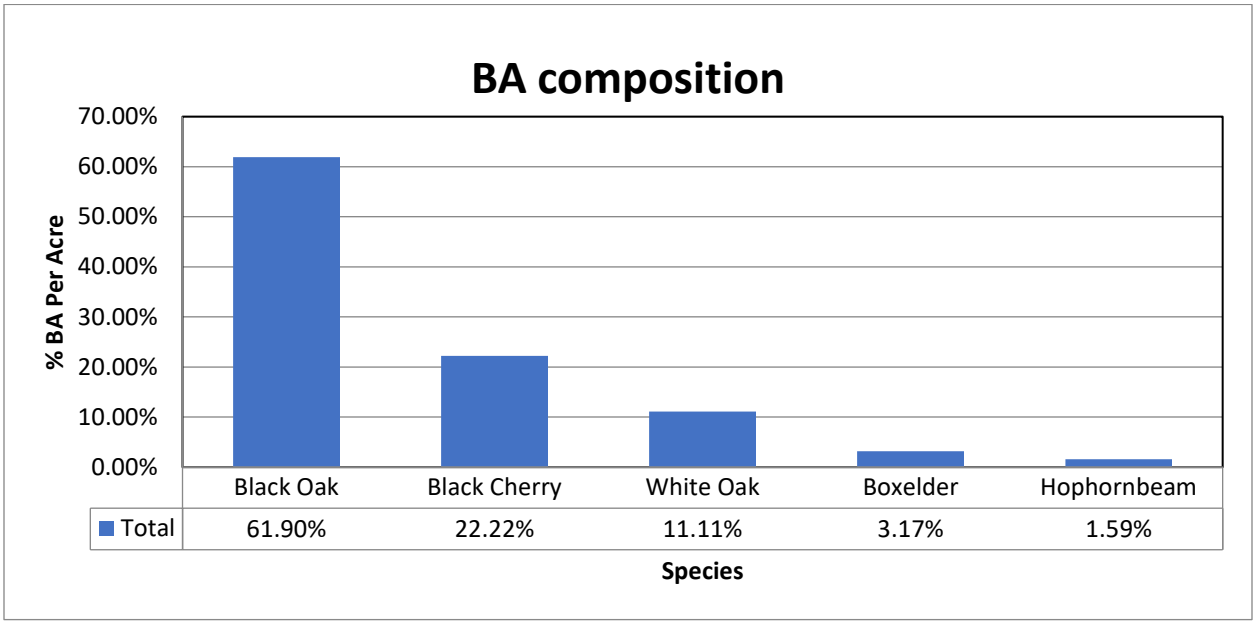


Chart 11: Stand 6 tree species composition, as percentage of total basal area.

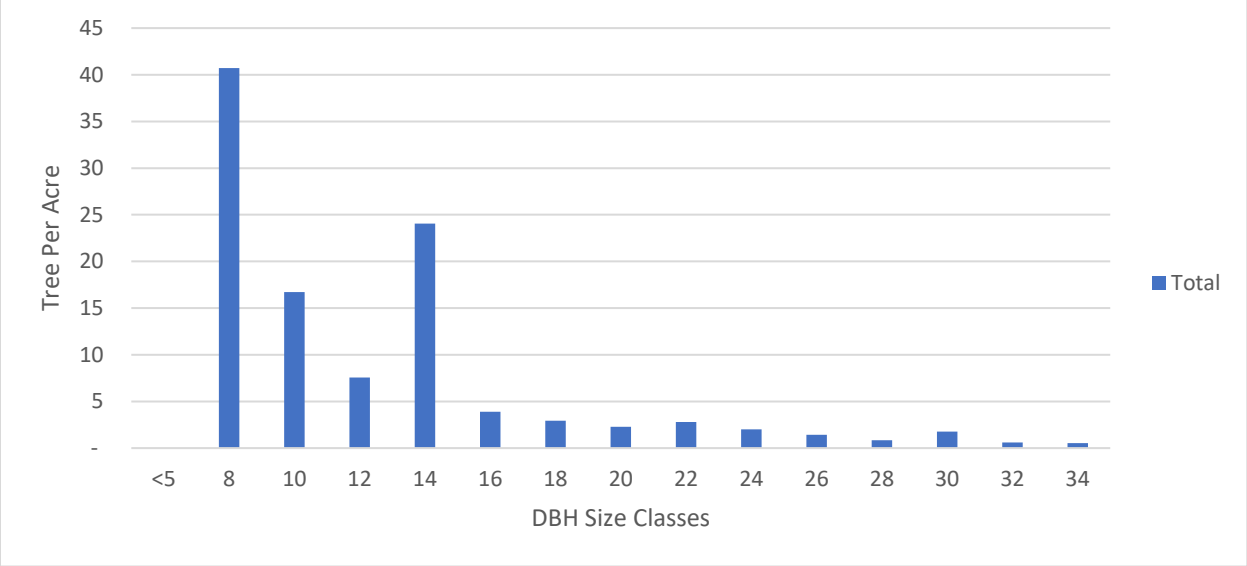


Chart 12: Stand 6 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class).

General Stand Description

Stand 6 consists of areas with a higher stocking percentage of black oak compared to other stands. Predominantly occurring on north and east facing slopes on top of silt loam soils. Historically, these areas were primarily open or had some tree cover. Many of the black oak are in decline and near the end of their life stage.

Tree Composition and Size Class Distribution

Stand 6 has low canopy diversity. Stand is uneven aged with basal area spread throughout the three size classes but with the highest stocking in the large sawtimber size class. Black Oak (60%) is tall with poor form: rot, splits, and low lying branches. Other species observed include black cherry, boxelder, and hop hornbeam. Maple, birch, elm, and ash were noted during the inventory but not captured by the inventory.

Invasive Species

Invasive species are dense throughout most of the stand. Invasive brush species is >50% coverage, primarily by honey suckle and common buckthorn. Patches of garlic mustard (5-20%) are present.

Shrub and herbaceous Layers and Natural Community

Stand 6 has very low ground cover diversity due to the high coverage of invasive shrubs. However, small patches of common woodland forbs are present, Jack-in-the-pulpit, mayapple, *Rubus spp.*, gooseberry, and Virginia creeper.

Management Objectives

The management objective for Stand 6 is to restore to oak woodland conditions with attention to increasing understory plant diversity and canopy structure. Target conditions include oak woodland and oak savanna with consideration to adjacent stand management. This will be accomplished via invasive species management, timber harvesting, prescribed fire and seeding of native species.

Recommended Practices:

1. **2025 Fire Break Planning & Establishment**: Using current trail system, plan out prescribed burn units and review where additional firebreaks will be needed. Where necessary, install permanent or temporary strips of ground cleared to bare soil or planted with mowed fire-resistant vegetation meant to stop the spread of fire during prescribed burns. Design firebreaks to consist of non-fire adapted species, bare ground, or a combination. Firebreaks should be of sufficient width to contain the type of fire expected: 15'+ mowed grass break; 5'+ cleared woodland break. Locate firebreaks to minimize risk of damage to resources and infrastructure. Use natural anchor points where possible.

2. **2025-2035 Invasive Species Management**: Removal of non-native species such as common buckthorn, bush honeysuckle, garlic mustard and multiflora rose and native but locally invasive species such as prickly ash and *Rubus* species is critical to reduce competition for native forbs and tree seedlings, restore soil health and maintain access for management activities. Brushy invasive species are best controlled by mechanical removal (brushsaw, chainsaw, forestry mower) and treatment of the stumps with herbicides such as triclopyr or glyphosate. Follow up treatments in subsequent growing seasons after the initial removal will be required. Herbaceous weeds can be controlled via foliar application.

3. **2025-20XX Prescribed Burning:** Apply prescribed fire on a 1-2 year rotation to set back woody invasives, consume leaf litter and favor oaks and associated fire-dependent natural community. Burn frequency may be adjusted to 2-5 years should the presence of woody and herbaceous invasive species decrease (<5% distribution). Install and maintain fire breaks on divisions of Stands and along property boundaries. When necessary, hire professional fire crews to plan and conduct prescribed burns. Oak woodlands and savanna are fire-dependent ecosystems, with native forbs and grasses well-adapted to burning of leaf litter and dry vegetative fuel.

4. **2028-2031 Oak Woodland Restoration Harvest:** Restore this stand by creating favorable light conditions for natural regeneration of oak, and promotes the conditions needed for native woodland grasses, sedges and forbs. Target 40-85% canopy coverage; 40-100 BA; 40-100 Trees per Acre (TPA); 30-75% stocking. Remove trees that are less vigorous, of poor quality, overtopping advanced regeneration, and of non-desirable species. Release dominant and co-dominant oaks on 2-3 sides. Poorly formed oaks 2-6" DBH, can be cut and will commonly stump sprout leading to a greater chance of success than a new seedling to become a dominant canopy

tree. Favor the retention of oak with preference for white, bur and red oak and legacy trees. Create heterogeneous canopy conditions by selecting removal of trees in patches, intentional spacing, or group retention. The need for fine fuels (leaf litter, thatch, etc.) to carry prescribed fire should be considered. Take care to exclude harvesting during oak wilt season; traditional DNR guidance is to avoid harvesting in areas with oak from April to July 15th, although a wider window is recommended if possible.

   a. **Note:** Areas with a high stocking of poor quality, high risk black oak may be removed in patches to create larger canopy gaps resembling savanna conditions.

5. **2030-2033 Native Species Planting**: Broadcast seed native woodland and savanna grasses and forbs at a minimum rate of 25-50 seeds per square foot in either the spring or fall. Select species (40+) appropriate to the site considering factors such as: light availability, moisture regime, climate, microclimate, soil type, slope, aspect, fire adaptation, species diversity, forage capability, seed or fruit production, bloom period (early, mid, late growing season) and others. Seed can either be purchased and/or collected from the site or nearby areas that allow seed collection. In areas where feasible, mow 2-3 times during the first and second growing season. As a by-product of harvesting, brush management, prescribed fire and invasive species management, site preparation should be adequate, however further site preparation may be needed and should be assessed prior to implementation. Before designing seed mix, assess the current diversity and distribution of the plant community.

Stand 7: "Bottomland Hardwoods", 17 acres

Average Basal Area (square feet/acre): 40
Trees per acre: 43
Board feet per acre: 400
Cords per acre: 4
Mean tree diameter at breast height : 13"
Stand age (years): 74
Site Index: 61
Stocking: N/A
Soil: Silt loam, sandy loam
Aspect: N/A

Table 14: Stand 7 natural community and WDNR Timber Type

Current Natural Community	Desired Natural Community	Primary Timber Type	Secondary Timber Type	Understory Type
Floodplain Forest	Floodplain Forest	*BH 15+*[2]	*CH 5-11* [1]	*CH 0-5* [1]
		Low/moderate stocking of bottomland hardwoods	Low stocking of central hardwood poles	Low stocking of central hardwood seedlings and saplings

Table 15: Stand 7 timber type size classes and stocking levels with species listed in order of abundance.

Seedlings	Saplings	Pole Sized Timber (5-11")	Small Sawlog Timber (11-15")	Large Sawlog Timber (15+")
125/acre	*313/acre*	*9 sq ft*	*9 sq ft*	*21 sq ft*
Black Cherry	Black Cherry	Basswood	Basswood	Black Willow
	Black Walnut	Black Cherry	Black Cherry	Silver Maple
	America Elm	Boxelder	Boxelder	Basswood
	Boxelder	Hophornbeam	Swamp White Oak	Bur Oak
	Hackberry		American Elm	Swamp White Oak
	Hophornbeam			White Oak

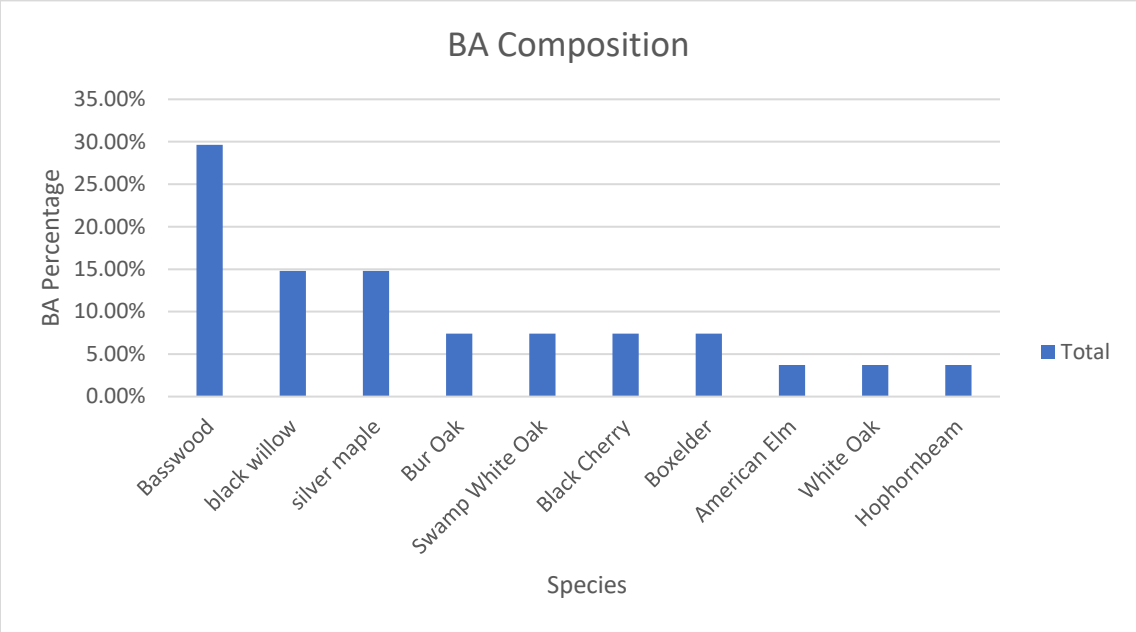


Chart 13: Stand 7 tree species composition, as percentage of total basal area

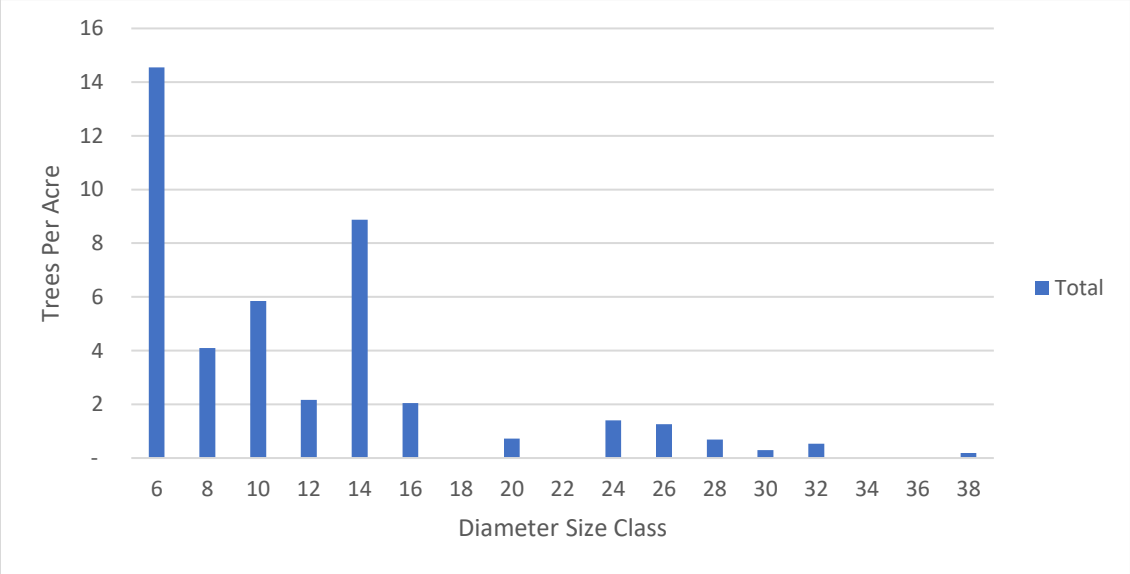


Chart 14: Stand 7 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class)

General Stand Description

Stand 7 are areas with tree cover adjacent to Deer Creek and Mt. Vernon Creek. The stand is variable in structure and species composition. The management of these areas should be consistent with adjacent stands.

Tree Composition and Size Class Distribution

Stand 7 is made of large sawlog bottomland hardwoods. This includes black willow, silver maple, swamp white oak, and cottonwoods. The stand was historically sparsely forested and likely grazed. Canopy cover diversity varies across the stand. The east end is sparse with tree cover dominated by with oaks and willows. The west unit is small sawlog walnuts, central hardwoods and willow. A high number of snags dot the canopy, and trees have poor form with a high amount of rot.

Regeneration is also low and comprised of mesic central hardwood species such as black cherry and American elm.

Invasive Species

Invasive coverage is high, but species composition differs. The far east unit is over 85% reed canary grass. Reed canary grass is the predominant ground cover in the central unit as well (50-75%), but the cover is sparser due to denser canopy. The far west unit is a mix of honey suckle (20-35%) and reed canary (5-20%). The recommendation of this plan is to avoid treating the reed canary and concentrate on other invasives species throughout the park. The reed canary is a watershed issue on this creek and will continue to resprout and reseed from upstream, even after multiple treatments.

Shrub and herbaceous Layers and Natural Community

The ground cover diversity in this stand is low but variable. The species diversity is affected by multiple factors in this stand including allelopathy by black walnut, shading by canopy trees, invasive species and ground water levels.

Management Objectives

The management objective for Stand 7 is to limit the spread of invasive species into adjacent stands and release desirable tree species such as oaks. This will be accomplished through invasive species management, thinning and harvesting merchantable trees.

Practice Recommendations:

1. **2028-2038 Invasive Species Management:** Removal of non-native species such as common buckthorn, bush honeysuckle, garlic mustard and multiflora rose and native but locally invasive species such as prickly ash and *Rubus* species is critical to reduce competition for native forbs and tree seedlings, restore soil health and maintain access for management activities. Brushy invasive species are best controlled by mechanical removal (brushsaw, chainsaw, forestry mower) and treatment of the stumps with herbicides such as triclopyr or glyphosate. Follow up treatments in subsequent growing seasons after the initial removal will be required. Herbaceous weeds can be controlled via foliar application.

2. **2033 Timber Stand Improvement - Thinning**: This practice is primarily intended to release oak trees and reduce stand density by removing trees to improve tree growth and enhance forest health. Thinning could also take place to reduce undesirable canopy cover, or to increase continuity between grassland areas.

Stand 8: “Rocky Oak”, 8 acres

Average Basal Area (square feet/acre): 103
Trees per acre: 103
Board feet per acre: 3,500
Cords per acre: 11
Quadratic Mean Diameter : 12”

Stand Age (years): 114
Site Index: 35
Stocking: 75%
Soil: Sandy loam
Aspect: Variable

Table 16: Stand 8 natural community and WDNR Timber Type.

Current Natural Community	Desired Natural Community	Primary Timber Type	Secondary Timber Type	Understory Type
Southern Dry Forest	Open Oak Woodland/Oak Barrens	*O 15+*[3]	*O 5-11* [1]	*O 0-5* [1]
		High stocking of oak large sawtimber	Low stocking of oak poles	Low stocking of oak seedlings and saplings

Table 17: Stand 8 timber type size classes and stocking levels with species listed in order of abundance.

Seedlings	Saplings	Pole Sized Timber (5-11”)	Small Sawlog Timber (11-15”)	Large Sawlog Timber (15+”)
2,800/acre	*700/acre*	*20 sq ft*	*33 sq ft*	*50 sq ft*
White Oak	Sugar Maple	White Oak	White oak	Black oak
Sugar Maple	White Oak	Black Oak	Red Oak	White Oak
American Elm		Red Oak	Sugar Maple	Sugar Maple
Red Pine		Bur Oak	Black Oak	
Black Cherry			Bur Oak	
Black Oak			Big Tooth Aspen	
			Red Maple	

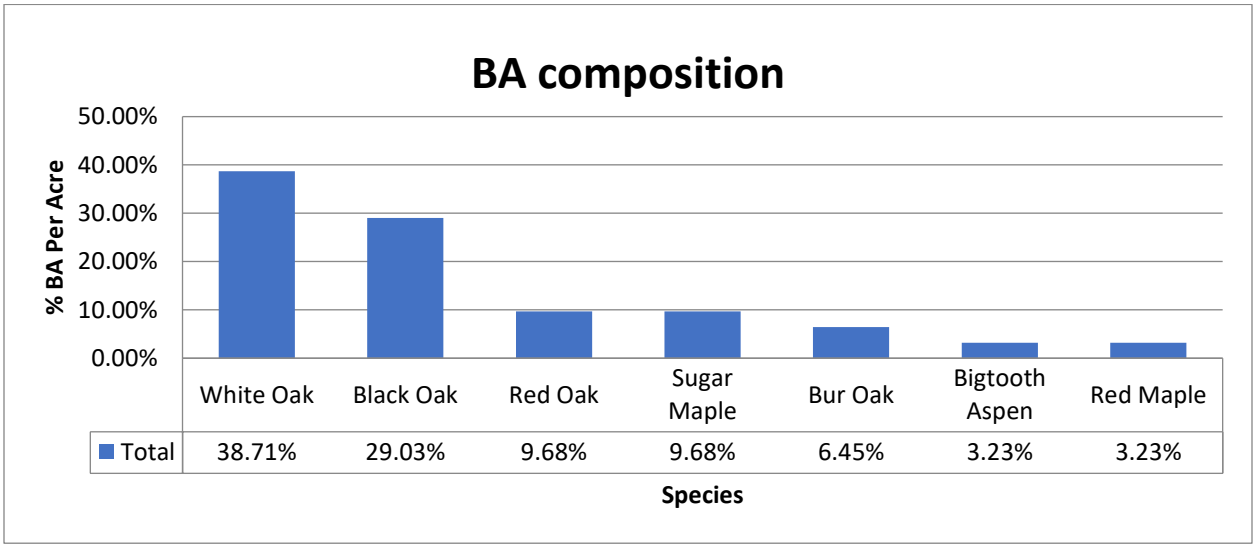


Chart 15: Stand 8 tree species composition, as percentage of total basal area.

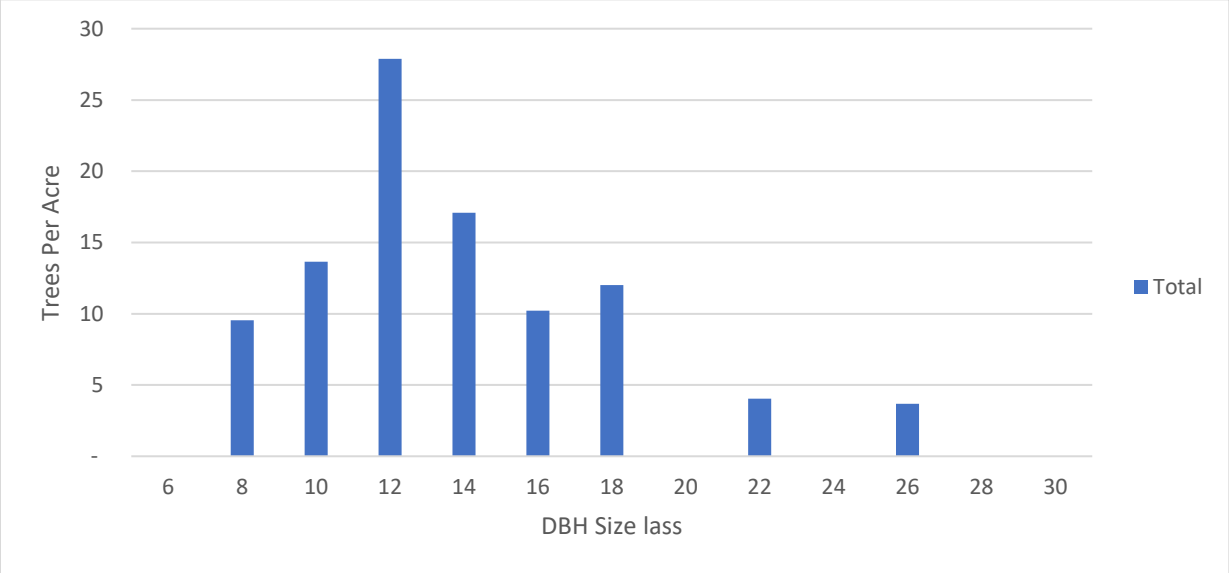


Chart 16: Stand 8 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class).

General Stand Description

Stand 8 is comprised of several units that all share similar geology, soil type, topographic location and plant community. The stand is located around dry cliffs, ridges or outcroppings through out Donald Park. The stands have high oak regeneration, sandy soils and a more xeric plant community. The unit in the southeast has an inclusion of red pine that can be managed in conjunction with adjacent stands

Tree Composition and Size Class Distribution

Stand 8 has low overstory diversity. The canopy is dominated by white and black oak (80%). Though the stand is uneven aged, small sawtimber has the greatest level of stocking. Other species identified are red maple, sugar maple, and aspen, in the small sawtimber and pole sized timber size class. Form for all size classes is poor, with low lying branches and stunted height growth (average ~45ft). Little variation among the units was observed.

Invasive Species

Invasive coverage is low in this stand. Honeysuckle (<5%) was the only species observed in the east unit. Although bare mineral soil is prevalent throughout the stand, the dry sandy soils may not be conducive to invasives species establishment. Monitoring should be done to ensure invasive species do not establish.

Shrub and herbaceous Layers and Natural Community

Stand 8 has a high diversity in xeric forb and grass species. Though this inventory concentrated on trees and invasive species, several indicator species of high-quality habitat are present including: bottle brush grass, common milkweed. Regeneration is very high (>3000 stems/acre) in these units, particularly oak species, but most remain suppressed under the existing canopy.

Management Objectives:

The management objective for Stand 8 is to restore to open oak woodland and/or barrens community. Since the units are small, and each unique, the result after implementation may differ between each unit. The overall goal is to manage for understory diversity and maintain uncommon, native plant communities. This will be accomplished via prescribed burning, harvesting and monitoring for invasive species.

Recommended Practices:

1. **2025-20XX Invasive Species Monitoring:** Invasive species presence is currently low (<5%). However, consistent monitoring should be conducted to ensure invasive populations do not establish, particularly after harvesting. If invasive species do establish, conduct the appropriate management treatment.

2. **2025-20XX Prescribed Burning** Apply prescribed fire on a 1-2 year rotation to set back woody invasives, consume leaf litter and favor oaks and associated fire-dependent natural community. Burn frequency may be adjusted to 2-5 years should the presence of woody and herbaceous invasive species decrease (<5% distribution). Install and maintain fire breaks on divisions of Stands and along property boundaries. When necessary, hire professional fire crews to plan and conduct prescribed burns. Oak woodlands and savanna are fire-dependent ecosystems, with native forbs and grasses well-adapted to burning of leaf litter and dry vegetative fuel.

3. **2028 Oak Community Restoration Harvest:** Restore this stand by creating favorable light conditions to enhance the understory plant community. Target conditions shall be dictated by the species and age of the trees, current understory plant community and management in adjacent stands. Target the removal of non-desirable tree species and poor quality, low vigor trees in the red oak group (black oak, N. red oak, N. pin oak); retain members of the white oak group (white oak, bur oak). Aim to release advanced oak regeneration where present.
    a. **Note:** The intent of this harvest is not necessarily to comply with any oak ecosystem but instead to reduce canopy cover and mature black oaks to release oak regeneration and encourage understory diversity. Maintain some poorly formed black oaks as structures for wildlife (i.e. snags).

Stand 9: “White Pine”, 7 acres

Average Basal Area (square feet/acre): 160
Trees per acre: 114
Board feet per acre: 15,000
Cords per acre: 11
Mean tree diameter at breast height : 16”

Stand Age (years): ~40
Site Index: 60
Stocking: 65%
Soil: Sandy loam, silt loam
Aspect: Variable

Table 18: Stand 9 natural community and WDNR Timber Type.

Current Condition	Desired Condition	Primary Timber Type	Secondary Timber Type	Understory Type
White Pine plantation	White Pine/ OR Prairie	*PW 15+*[3]	-	*CH 0-5*[1]
		Moderate stocking of large sawlog white pine		Low stocking of central hardwood seedlings and saplings

Table 19: Stand 9 timber type size classes and stocking levels with species listed in order of abundance.

Seedlings	Saplings	Pole Sized Timber (5-11")	Small Sawlog Timber (11-15")	Large Sawlog Timber (15"+)
200/ acre	*0 / acre*	*10 sq ft BA*	*30 sq ft BA*	*55 sq ft BA*
Sugar Maple		White Spruce	White Pine	White Pine
			Whie Spruce	Black Walnut

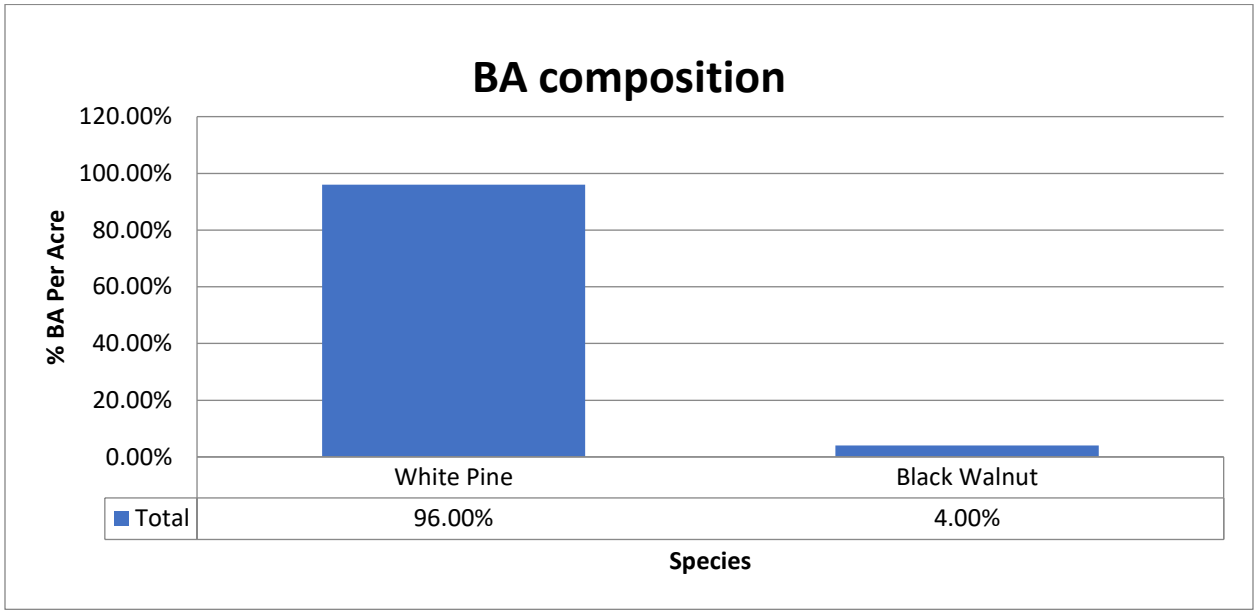


Chart 17: Stand 9 tree species composition, as percentage of total basal area

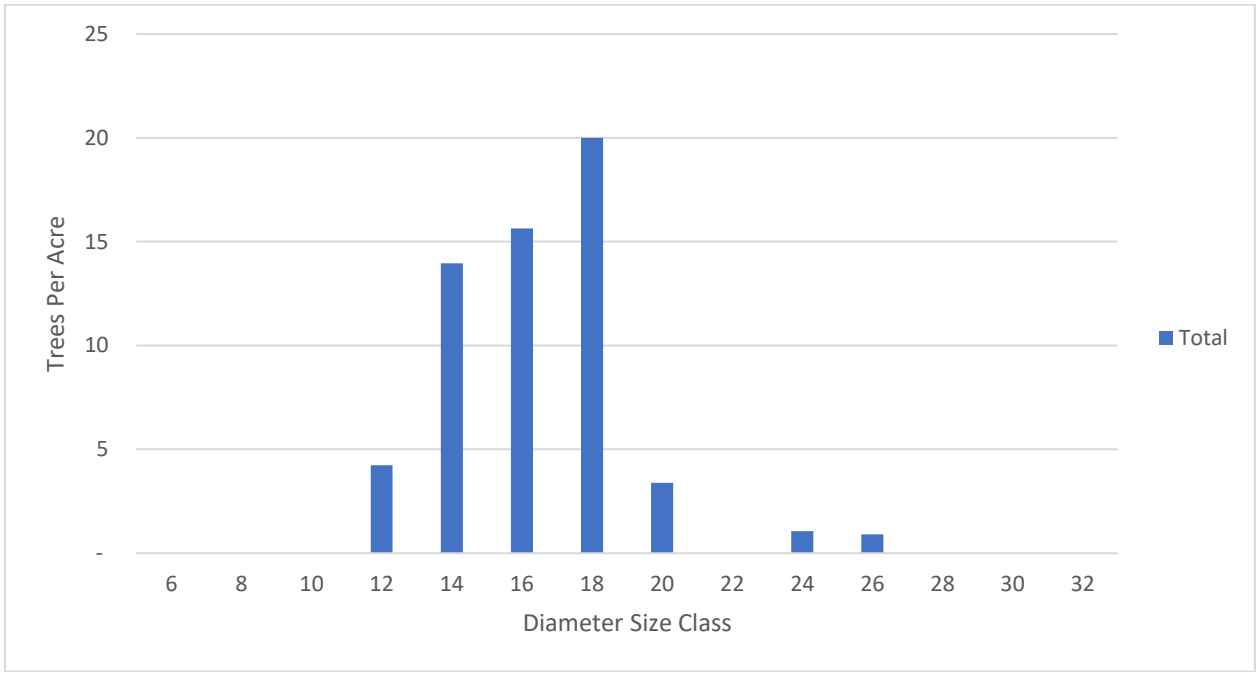


Chart 18: Stand 9 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class)

General Stand Description

Stand 9 is consists of serval areas that had been planted with white pine and spruce at various intervals between 1975-1985. It sits on silt loam soils with variable aspect orientation. The area was historically used for row cropping or pasture.

Tree Composition and Size Class Distribution

Stand 9 is comprised of large sawlog white pine. Overall, the quality of the pine is moderate to good. The eastern plantation has irregular canopy openings filled with central hardwoods and black walnut. Very few of these trees are of good form, but some large black walnut and black cherry trees are merchantable.

Invasive Species

Invasives coverage in the stand is particularly low. Garlic mustard was noted at <5% coverage.

Shrub and herbaceous Layers and Natural Community

The ground cover in this stand is notably sparse. Scattered patches of *Rubus spp*. and other woody species do occur. Diversity is extremely low due to low light conditions caused by dense pine canopy and altered soil conditions from pine litter. Regeneration is also low with little to no seedlings or saplings present.

Management Objectives:

The management objective for Stand 9 is to convert to prairie with some canopy retention. This will be accomplished by harvesting, retaining ~10 BA to act as future legacy trees, site preparation and native plant seeding.

Practice Recommendations:

1. **2025-20XX Prescribed Burning**: Conduct prescribed burns at the same frequency as the surrounding stands. A prescribed burn in this stand to reduce pine litter and assist in site preparation. Before burning, inspect stand for hazard trees, ladder fuels, or a high abundance of snags and take appropriate action. After prairie has been established, continue with annual burns or biannual burns for up to 10 years. Fire frequency can be reduce to 1-3 years after desired plant community has established.

2. **2028 Clearcut with Reserves:** Harvest all standing timber in this stand while retaining a few (~10 BA/acre) to act as vertical structure and refugia for wildlife. Retention trees should be scattered and be selected based on the presence of a full canopy (live crown ratio >30%), healthy bole and good vigor. It can be expected that some trees may fall due to blow over, to minimize damage, consider leaving some trees in clumps and remove trees adjacent to trails.

3. **2029 Woody Residue Treatment:** A greater proportion of basal area will be reduced in this stand and preparation for prairie planting will require special attention to the remaining woody residue following harvest operations. Slash will be piled and burned. Mechanical treatment with chainsaws and heavy equipment will best assist in meeting this specific goal. This action will prepare the stand for planting.

4. **2029 Site Prep:** Site preparation is the creation of a favorable growing environment for tree seeds or seedlings. The main objective is to reduce newly planting seedling competition. A successful planting establishment depends on accurate assessment of the site, biotic and abiotic factors, and the site-specific prescription. Conduct site prep by either fire, and/or mechanical (tilling, disking, plowing, etc.) or chemical means. Herbicide mix should be specific to what is currently present.

5. **2030 Native Species Planting:** Broadcast or seed drill seed native prairie grasses, sedges and forbs at a minimum rate of 40-60 seeds per square foot (seed drill 40 seeds/sq ft, broadcast 60 seeds/sq ft) in either spring or fall depending on method chosen. Select species (40+) appropriate to the site considering factors such as: light availability, moisture regime, climate, microclimate, soil type, slope, aspect, fire adaptation, species diversity, forage capability, seed

or fruit production, bloom period (early, mid, late growing season) and others. Grasses should not comprise more than 60% of the seed mix.

6. **2030-2031 Prescribed Mowing:** To reduce weed competition and to prevent seeding by non-desirable species, mow at least three times throughout the growing season (early, mid, late growing season) or up to 7 times after initial establishment. Mow to 10-12" each cutting cycle. Mow 1-2 times in year 2.

Stand 10: “Mesic Draw”, 4 acres

Average Basal Area (square feet/acre): 80
Trees per acre: 76
Board feet per acre: 1050
Cords per acre: 8
Quadratic Mean Diameter: 16”

Stand Age (years): 79
Site Index: 60
Stocking: 75%
Soil: Sandy loam
Aspect: Silt loam

Table 20: Stand 10 natural community and WDNR Timber Type

Current Natural Community	Desired Natural Community	Primary Timber Type	Secondary Timber Type	Understory Type
Southern Dry-Mesic Forest	Southern Dry-Mesic Forest	*CH 11-15*[2]	*CH 5-11* [1]	*CH 0-5*[1]
		Low/moderate stocking of small sawlog central hardwood	Low stocking of central hardwood poles	Low stocking of central hardwood seedlings and saplings

Table 21: Stand 10 timber type size classes and stocking levels with species listed in order of abundance.

Seedlings	Saplings	Pole Sized Timber (5-11")	Small Sawlog Timber (11-15")	Large Sawlog Timber (15"+)
300/ acre	*0 / acre*	*15 sq ft BA*	*18 sq ft BA*	*45 sq ft BA*
Black Cherry		Black Cherry	Black Cherry	Black Oak
		Boxelder	Boxelder	Boxelder
		Silver Maple	Silver Maple	Black Cherry
				Silver Maple
				White Oak

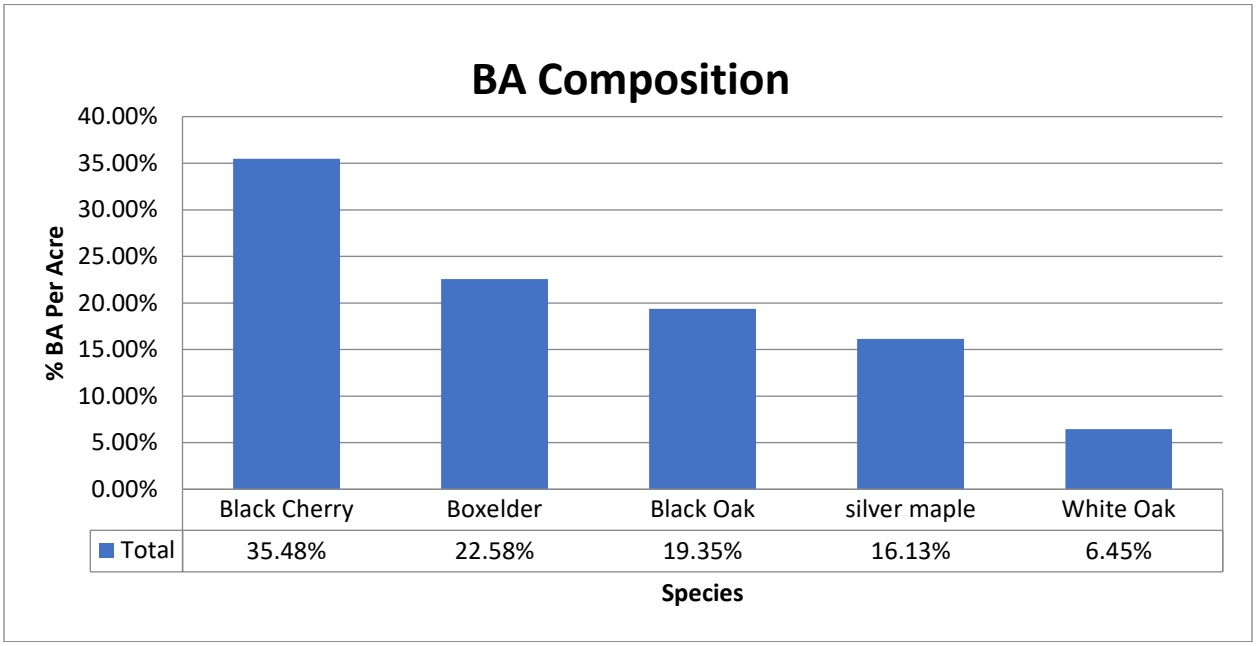


Chart 19: Stand 10 tree species composition, as percentage of total basal area

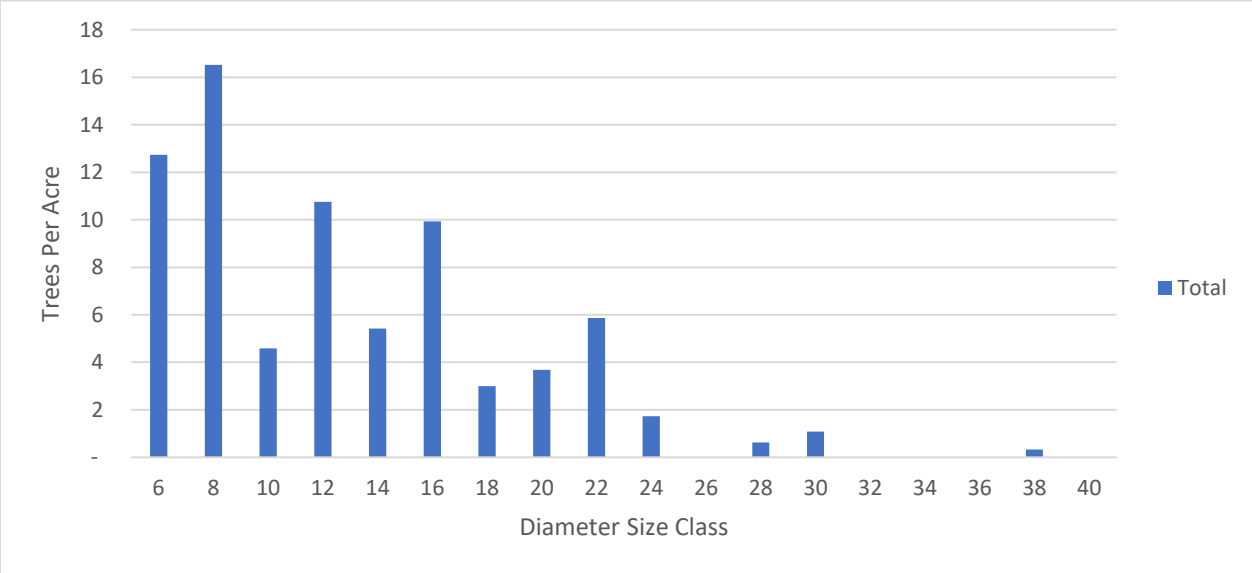


Chart 20: Stand 10 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class)

General Stand Description

Stand 10 is in the flat of a wide ravine at the southeast end of the property. It is a natural mesic drainage that flows into Mt. Vernon Creek providing suitable habitat for tree species such as silver maple and boxelder. Timber quality is of poor form, rot and splits were commonly observed in all species. Soils are silt loam.

Tree Composition and Size Class Distribution

Stand 10's canopy is dominated by large sawtimber mesic hardwoods and black oak. Hardwoods include silver maple, boxelder, and black cherry. While not captured during inventory, crab apple trees were observed in the stand.

Invasive Species

Stand 10 is densely covered by honeysuckle (>75%). Cover by honeysuckle is the densest at east end of the stand and decreases in abundance moving west. Small patches of garlic mustard, multiflora rose, and common buckthorn are all present.

Shrub and herbaceous Layers and Natural Community

Stand 10 that has particularly low ground cover diversity and regeneration. This is due to the dense cover of invasive brush inhibiting understory development.

Management Objectives

The management objective for this stand is to simply reduce invasive species cover. This stand is a low priority. Should the objectives of the other stands be met, further management consideration for this stand could occur.

Practice Recommendations:

1. **2025-20XX Prescribed Burning:** While it is unlikely that fire will carry through this stand, include it into the larger burn units of the adjacent stands.

2. **2032-2042 Invasive Species Management:** Removal of non-native species such as common buckthorn, bush honeysuckle, garlic mustard and multiflora rose and native but locally invasive species such as prickly ash and *Rubus* species is critical to reduce competition for native forbs and tree seedlings, restore soil health and maintain access for management activities. Brushy invasive species are best controlled by mechanical removal (brushsaw, chainsaw, forestry mower) and treatment of the stumps with herbicides such as triclopyr or glyphosate. Follow up treatments in subsequent growing seasons after the initial removal will be required. Herbaceous weeds can be controlled via foliar application.

Stand 11: "Aspen ", 5 acres

Average Basal Area (square feet/acre): 40
Trees per acre: 76
Board feet per acre: 1,050
Cords per acre: 8
Mean tree diameter at breast height : 16"

Stand Age (years): 39
Site Index:
Stocking:
Soil:
Aspect:

Table 22: Stand 11 natural community and WDNR Timber Type

Current Condition	Desired Condition	Primary Timber Type	Secondary Timber Type	Understory Type
Aspen	Aspen	*A 5-11*[1]	*O 15+*[1]	*A 0-5* [1]
		Low stocking of aspen poles	Low stocking large oak sawlog	Low stocking of aspen seedlings and saplings

Table 23: Stand 11 timber type size classes and stocking levels with species listed in order of abundance.

Seedlings	Saplings	Pole Sized Timber (5-11")	Small Sawlog Timber (11-15")	Large Sawlog Timber (15"+)
0/ acre	*500 / acre*	*20 sq ft BA*	*10 sq ft BA*	*10 sq ft BA*
	Bigtooth Aspen	Bigtooth Aspen	Big Tooth Aspen	White Oak

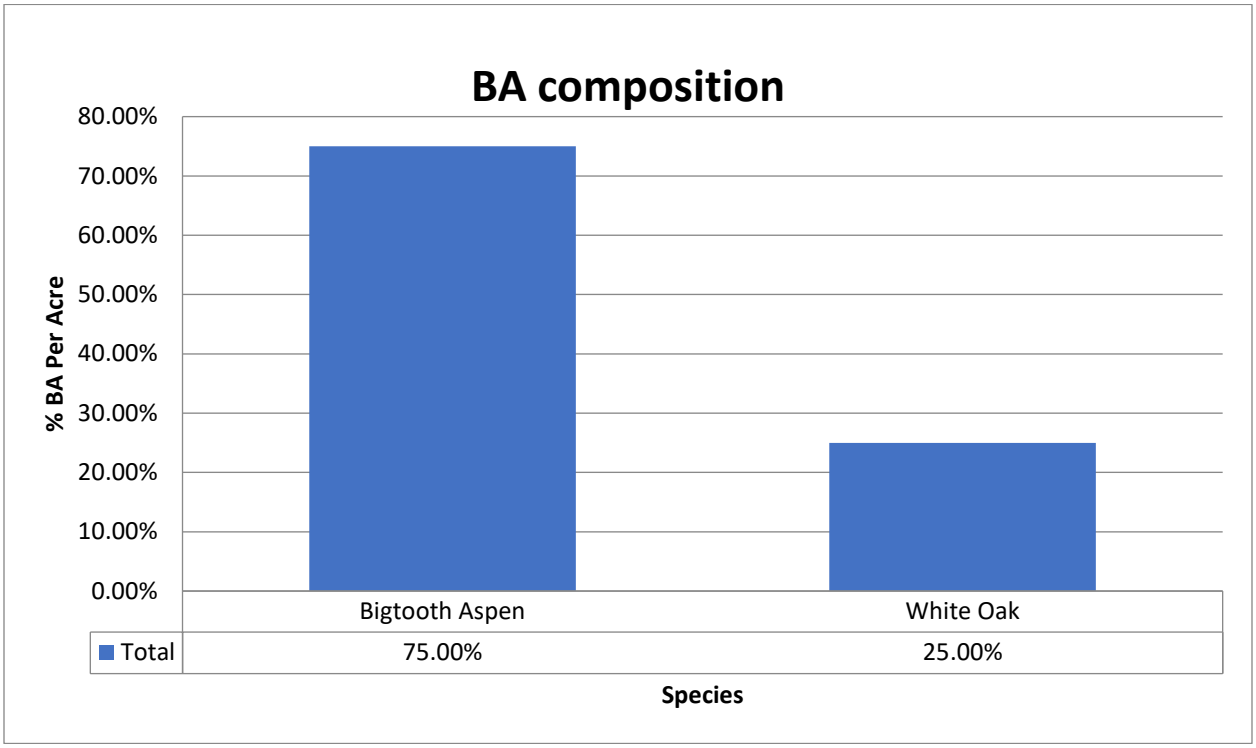


Chart 21: Stand 11 tree species composition, as percentage of total basal area.

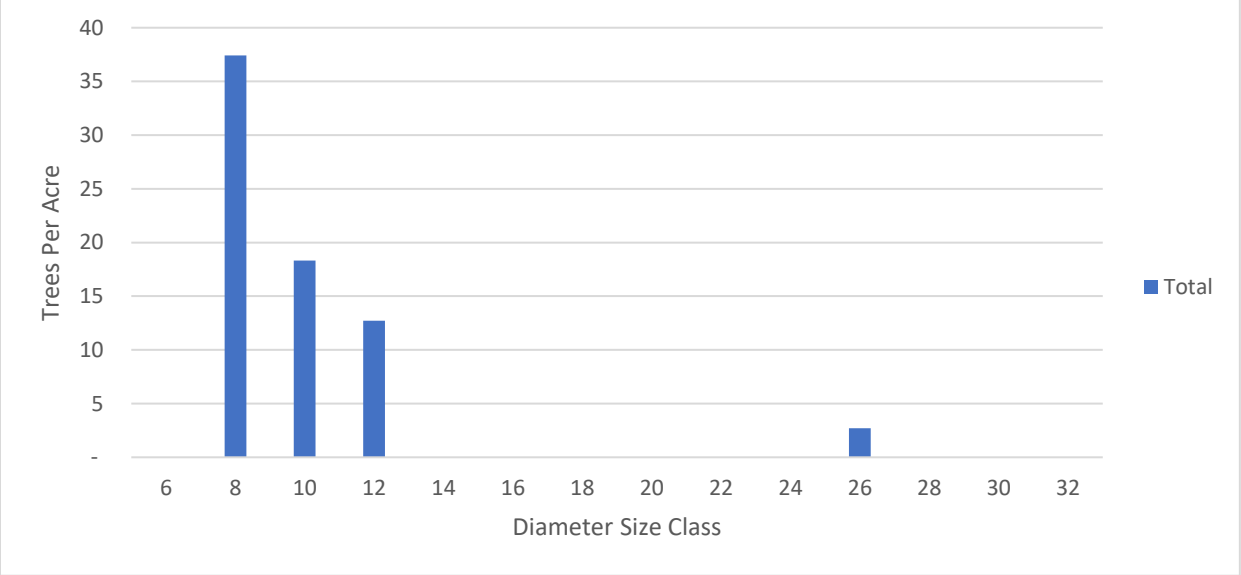


Chart 22: Stand 11 tree diameter distribution (trees per acre by diameter at breast height (dbh) size class).

General Stand Description

Stand 11 is two separate patches of aspen on the east end of the property. Stand has both north and south aspects, originating 30-40 years ago in areas that were formerly pastured. These areas began development when farming practices ceased.

Tree Composition and Size Class Distribution

Stand 11 is comprised of small diameter aspen poles and scattered white oak. The aspen is short in stature (55-65 ft) but of good form. Tree form is due to high light conditions from adjacent a prairie.

These high light conditions suppress the height of the trees but is consequently made up in diameter growth.

Invasive Species

Cover by invasive species in this stand is moderate. Small patches of garlic mustard are scattered throughout the stand and present at 5-20% cover. Honeysuckle is also established and densest along the edges present at 20-35% cover.

Shrub and herbaceous Layers and Natural Community

Stand 11 has low ground cover diversity and tree regeneration. This is due to dense canopy of aspen preventing adequate sunlight from reaching the forest floor for the growth of native forbs and grasses.

Management Goals

The goal for this stand is to convert to prairie to create a larger continuum of the adjacent land use. This will be accomplished by girdling, invasive species control, site prep and native plant seeding.

Recommended Practices

1. **2025-2035 Invasive Species Management:** Removal of non-native species such as common buckthorn, bush honeysuckle, garlic mustard and multiflora rose and native but locally invasive species such as prickly ash and *Rubus* species is critical to reduce competition for native forbs and tree seedlings, restore soil health and maintain access for management activities. Brushy invasive species are best controlled by mechanical removal (brushsaw, chainsaw, forestry mower) and treatment of the stumps with herbicides such as triclopyr or glyphosate. Follow up treatments in subsequent growing seasons after the initial removal will be required. Herbaceous weeds can be controlled via foliar application.

2. 2**029-2030 Aspen Girdle:** Girdle all aspen stems with two cuts around the circumference of the stem and treat at least one cut with herbicide. Basal bark or hack-n-squirt stems smaller than 6" DBH. This practice dis-encourages suckering by the aspen clone. Prepare for follow up treatment via foliar spray of newly emerging stems within, or outside, of the units. Avoid mowing as this can excite root suckering. Once stems have completely died (usually within 2 years), fell stems and either utilize or pile and burn the material.
    a. **Note:** This practice does create a potential hazard if working within unit and may not be applicable directly adjacent to the walking trails. Girdled stems may also pose a hazard when felling.

3. **2030 Woody Residue Treatment:** A greater proportion of basal area will be reduced in this stand and preparation for prairie planting will require special attention to the remaining woody residue following harvest operations. Slash will be piled and burned. Mechanical treatment with chainsaws and heavy equipment will best assist in meeting this specific goal. This action will prepare the stand for planting.

4. **2030 Site Prep:** Site preparation is the creation of a favorable growing environment for tree seeds or seedlings. The main objective is to reduce newly planting seedling competition. A successful planting establishment depends on accurate assessment of the site, biotic and abiotic factors, and the site-specific prescription. Conduct site prep by either fire, and/or mechanical (tilling, disking, plowing, etc.) or chemical means. Herbicide mix should be specific to what is currently present.

5. **2031 Native Species Planting:** Broadcast or seed drill seed native prairie grasses, sedges and forbs at a minimum rate of 40-60 seeds per square foot (seed drill 40 seeds/sq ft, broadcast 60 seeds/sq ft) in either spring or fall depending on method chosen. Select species (40+) appropriate to the site considering factors such as: light availability, moisture regime, climate, microclimate, soil type, slope, aspect, fire adaptation, species diversity, forage capability, seed or fruit production, bloom period (early, mid, late growing season) and others. Grasses should not comprise more than 60% of the seed mix.

6. **2031-2032 Prescribed Mowing:** To reduce weed competition and to prevent seeding by non-desirable species, mow at least three times throughout the growing season (early, mid, late growing season) or up to 7 times after initial establishment. Mow to 10-12" each cutting cycle. Mow 1-2 times in year 2.

Stand 12: “Early Successional”, 76 acres

General Stand Description

Stand 12 is comprised of several units varying in size, spread out across the property. These areas are variable in structure and plant communities but are located adjacent to other stands and early in successional development. The management of these areas should be consistent with adjacent stands or maintained for wildlife cover.

Management Goals

The goal for Stand 12 is to reduce invasive species cover, and function as a transitionary zone between adjacent stands and/or continuous open areas such as prairie. Specific unit management will be decided based on location, proximity to other stands and the vegetation present within each unit.

Recommended Practices

1. **2025-20XX Invasive Species Management**: Removal of non-native species such as common buckthorn, bush honeysuckle, garlic mustard and multiflora rose and native but locally invasive species such as prickly ash and *Rubus* species is critical to reduce competition for native forbs and tree seedlings, restore soil health and maintain access for management activities. Brushy invasive species are best controlled by mechanical removal (brushsaw, chainsaw, forestry mower) and treatment of the stumps with herbicides such as triclopyr or glyphosate. Follow up treatments in subsequent growing seasons after the initial removal will be required. Herbaceous weeds can be controlled via foliar application.

2. **2029 Timber Stand Improvement - Thinning**: Reduce stand density by removing trees to improve tree growth, enhance forest health or recover potential mortality. Thin to reduce stocking and concentrate growth on trees that are more desirable. This practice will be done non-commercially.

If converting to prairie:

3. **2029 Site Prep:** Site preparation is the creation of a favorable growing environment for tree seeds or seedlings. The main objective is to reduce newly planting seedling competition. A successful planting establishment depends on accurate assessment of the site, biotic and abiotic factors, and the site-specific prescription. Conduct site prep by either fire, and/or mechanical (tilling, disking, plowing, etc.) or chemical means. Herbicide mix should be specific to what is currently present.

4. **2030 Native Species Planting:** Broadcast or seed drill seed native prairie grasses, sedges and forbs at a minimum rate of 40-60 seeds per square foot (seed drill 40 seeds/sq ft, broadcast 60 seeds/sq ft) in either spring or fall depending on method chosen. Select species (40+) appropriate to the site considering factors such as: light availability, moisture regime, climate, microclimate, soil type, slope, aspect, fire adaptation, species diversity, forage capability, seed or fruit production, bloom period (early, mid, late growing season) and others. Grasses should not comprise more than 60% of the seed mix.

5. **2030-2031 Prescribed Mowing:** To reduce weed competition and to prevent seeding by non-desirable species, mow at least three times throughout the growing season (early, mid, late growing season) or up to 7 times after initial establishment. Mow to 10-12” each cutting cycle. Mow 1-2 times in year 2.

Summary

This forest management plan addresses a varied forest landscape heavily influenced by human intervention, land use and management over time. Some forested areas, especially in Stand 1, retain important indicator herbaceous plants and legacy trees; specifically white oaks and red oaks. Other areas possess bur oaks and positive indicator plants characteristic of oak savanna and oak woodland. In its current state, many parts of this property are converting to mesophytic cover types and are gradually losing diversity in the ground layer vegetation due to a lack of disturbance (i.e. fire) and canopy cover. Many invasive plant species continue to spread across the landscape; benign neglect as a management strategy should be considered a threat.

The property goals for Donald Park are to take proactive management including community engagement to take steps that promote forest health and resilience, while balancing resource limitations. This plan outlines several treatments that are only possible with persistent commitment to the management of the property. Conducting tree removals will not be sufficient alone to promote desired conversion of cover types, or to improve forest quality in general. Controlling invasive species and less desirable tree regeneration will be critical components of restoring the health of these forest fragments.

This plan is again meant to serve as an outline for how to manage the property. If resource constraints exist, identify high quality areas to focus efforts and follow the steps outlined in successive order. If large scale restoration and harvesting of the property is not conducive due to public perception and logistics, at a minimum: 1) apply prescribed fire across as much of the landscape as possible 2) manage invasive species populations in areas of high quality remnant vegetation 3) conduct midstory removal of non-fire adapted species.

We have drafted these recommended management practices with the knowledge that some method variants may be more successful than others in the restoration of appropriate natural communities on this property. Documentation of stand conditions, both before and after implementation of practices, will be critical to assessing outcomes. Proper planning and action will protect Donald Park from negative influences and build upon the strong ecological legacy that remains on the landscape.

Recommended Practices for Entire Property

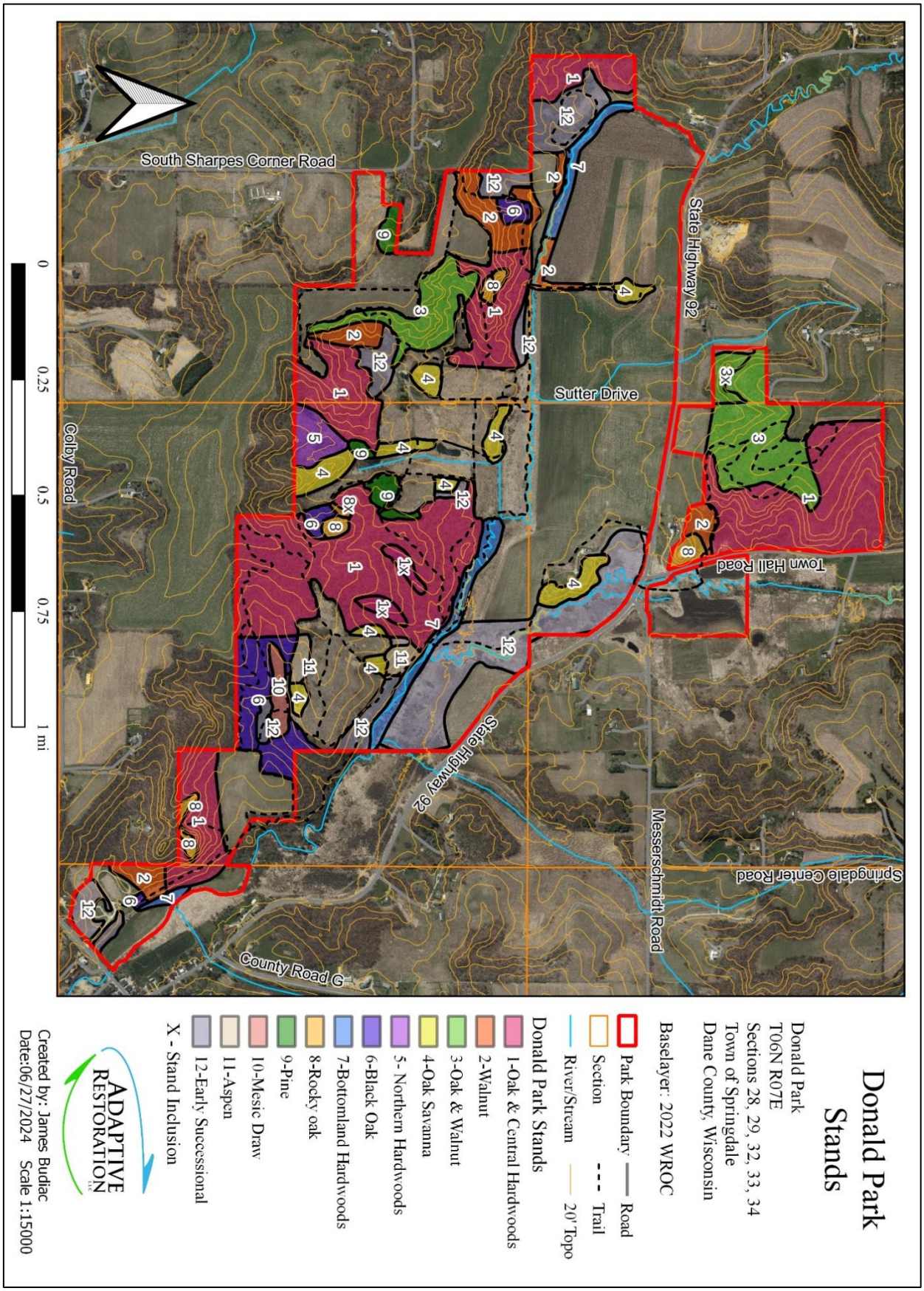
- Continue to develop ways in which the ecological knowledge and awareness of the Donald Park community can be educated.
- Conduct periodic ecological assessments. This report only offers a snapshot of the condition of your land, at a few points in the growing season. Periodic monitoring is an important part of determining what natural communities are present on your land, and how best to manage them. Conducting an ecological inventory in the spring (list of species present and where they are located) would aid understanding which ground layer species are present in the woodland and adjacent areas.
- Consider mapping areas of invasive species to help guide management decisions and assess efficacy of removal tactics.
- Begin seed collection efforts from populations of well-established species to be utilized on other parts of the property.

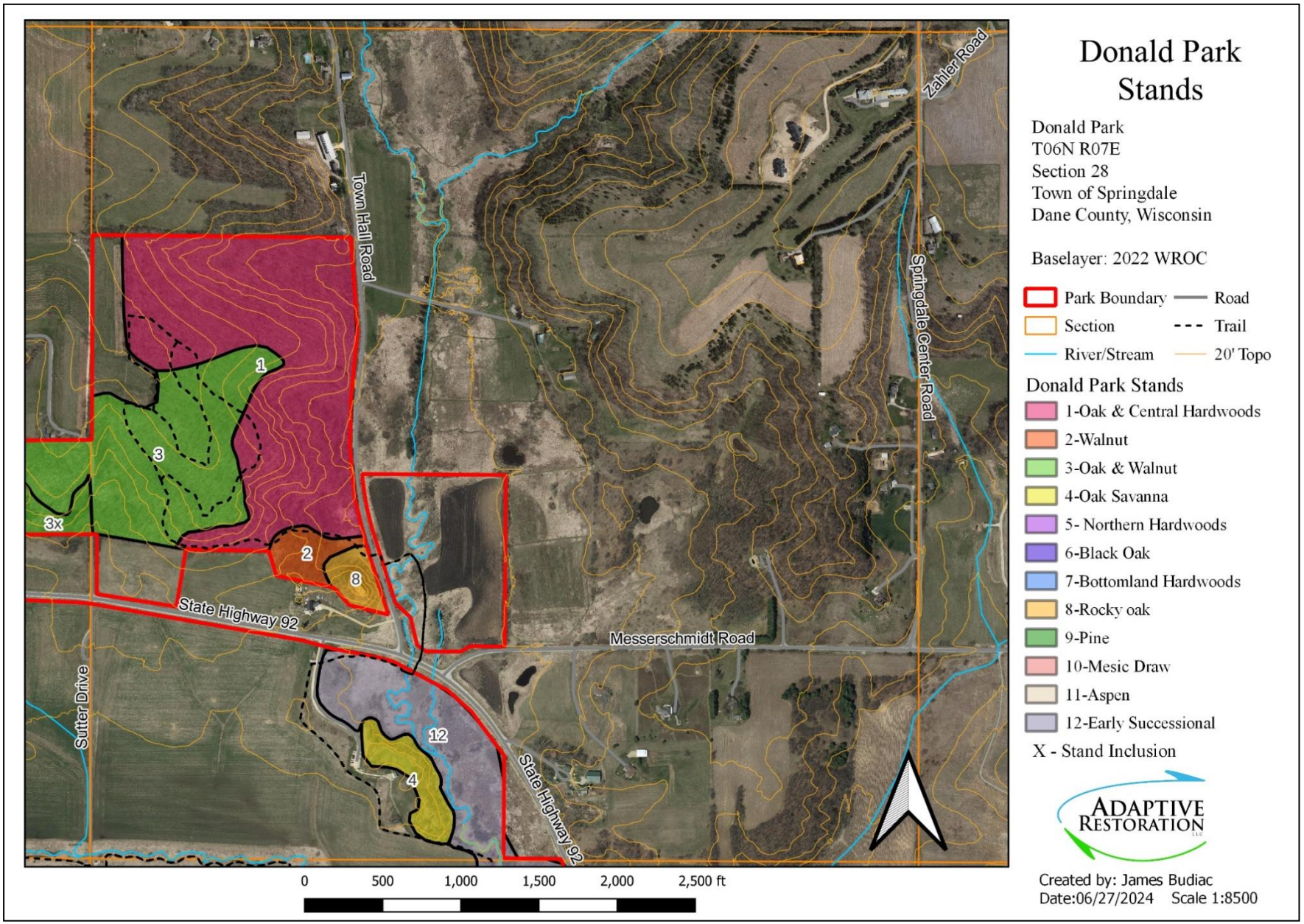
Notes and Management Records

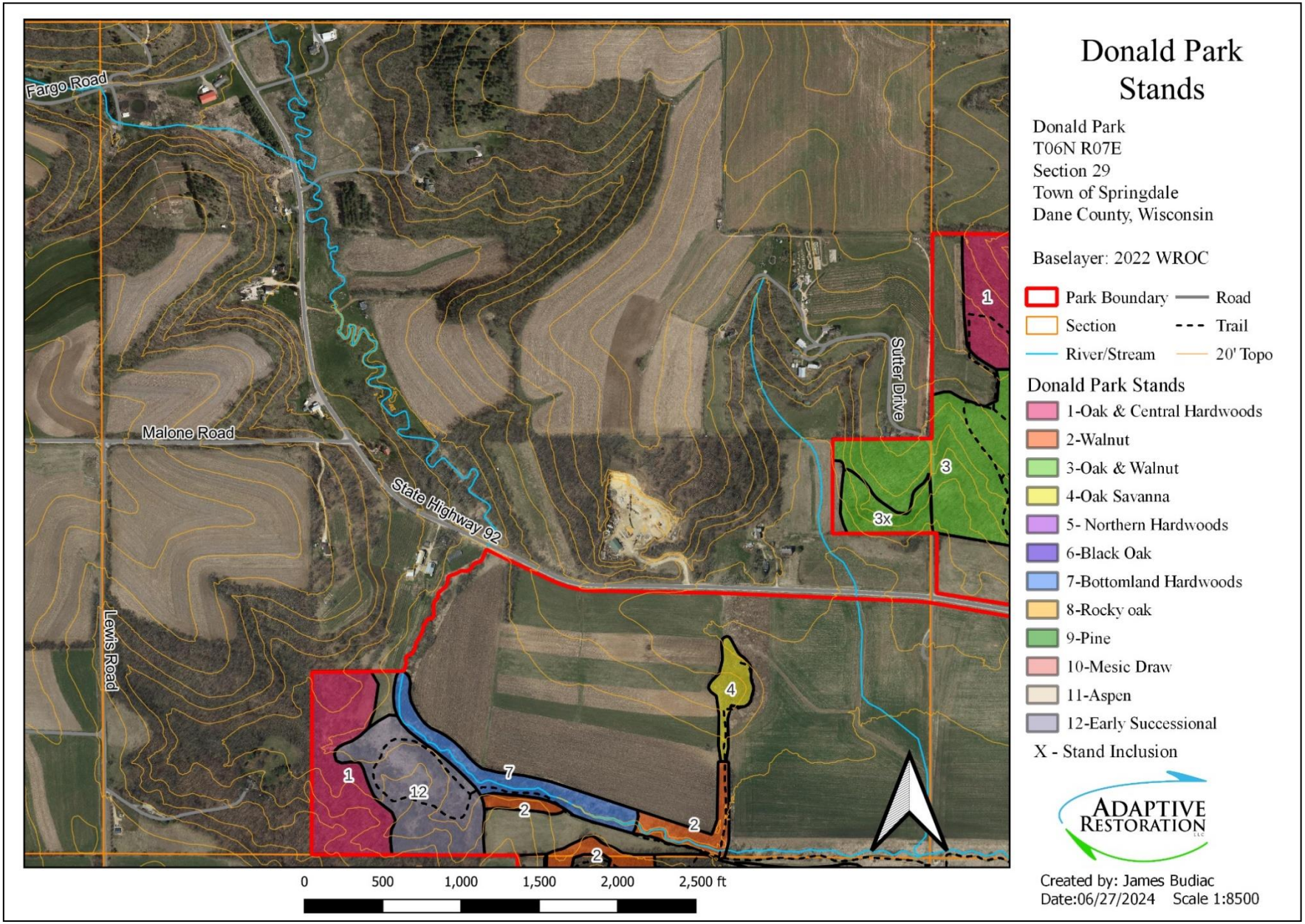
Management Practices Summary

Table 23: Management Practices Summary				
Year	**Management Practice**	**NRCS Code**	**Stand**	**Amount**
2025-2035	Invasive Species Management	314, 315	1, 3, 4, 6, 11, 12(?)	281 +x acres
2025	Fire Break Planning & Establishment	394	1, 3, 4, 6	~12,000 feet
2025-20XX	Prescribed Burning	394, 338	1, 3, 4, 6, 8, 9, 10	295 acres
2025-20XX	Invasive Species Monitoring	n/a	5, 8	14 acres
2026	Oak Savanna Harvest	666	4	23 acres
2026-2036	Invasive Species Management	314, 315	2	25 acres
2027-2030	Oak Woodland Harvest	666	1, 3	232 acres
2027	Patch Selection Harvest	666	2	232 acres
2028-2031	Oak Woodland Harvest	666	6	21 acres
2028	Oak Community Harvest	666	8	8 acres
2028	Clearcut with Reserves	666	9	7 acres
2028-2038	Invasive Species Management	314, 315	7	17 acres
2029	Woody Residue Treatment	384	9	7 acres
2029-2032	Native Species Planting	n/a	1	232 acres
2029	Site Prep	n/a	9	7 acres
2029-2030	Aspen Girdling	666	11	5 acres
2029	Timber Stand Improvement	666	12	Unknown
2030	Native Species Planting	420	9	7 acres
2030	Regeneration Check	n/a	2	25 acres
2030	Timber Stand Improvement	666	5	6 acres
2030	Woody Residue Treatment	384	11	7 acres
2030-2031	Prescribed Mowing	n/a	9	7 acres
2030	Site Prep	n/a	11	7 acres
2030-2033	Native Species Planting	n/a	6	21 acres
2031	Native Species Planting	420	11	7 acres
2031-2032	Prescribed Mowing	n/a	11	7 acres
2032-2042	Invasive Species Management	314, 315	10	4 acres
2033	Timber Stand Improvement	666	7	17 acres
2042	Thinning	666	2	25 acres
2045	Group Selection	666	5	6 acres
2054	Thinning	666	2	25 acres

Appendix A: Stand Maps




Donald Park
Stands
Donald Park
T06N R07E
Section 28
Town of Springdale
Dane County, Wisconsin
Baselayer: 2022 WROC
Park Boundary
Road
Section
Trail
River/Stream
20' Topo
Donald Park Stands
1-Oak & Central Hardwoods
2-Walnut
3-Oak & Walnut
4-Oak Savanna
5- Northern Hardwoods
6-Black Oak
7-Bottomland Hardwoods
8-Rocky oak
9-Pine
10-Mesic Draw
11-Aspen
12-Early Successional
X - Stand Inclusion
Town Hall Road
Zahler Road
Springdale Center Road
State Highway 92
Messerschmidt Road
Sutter Drive
1
3
3x
2
8
12
4
0
500
1,000
1,500
2,000
2,500 ft
ADAPTIVE RESTORATION
Created by: James Budiac
Date:06/27/2024 Scale 1:8500



Donald Park Stands

Donald Park
T06N R07E
Section 29
Town of Springdale
Dane County, Wisconsin

Baselayer: 2022 WROC

Park Boundary
Road
Section
Trail
River/Stream
20' Topo

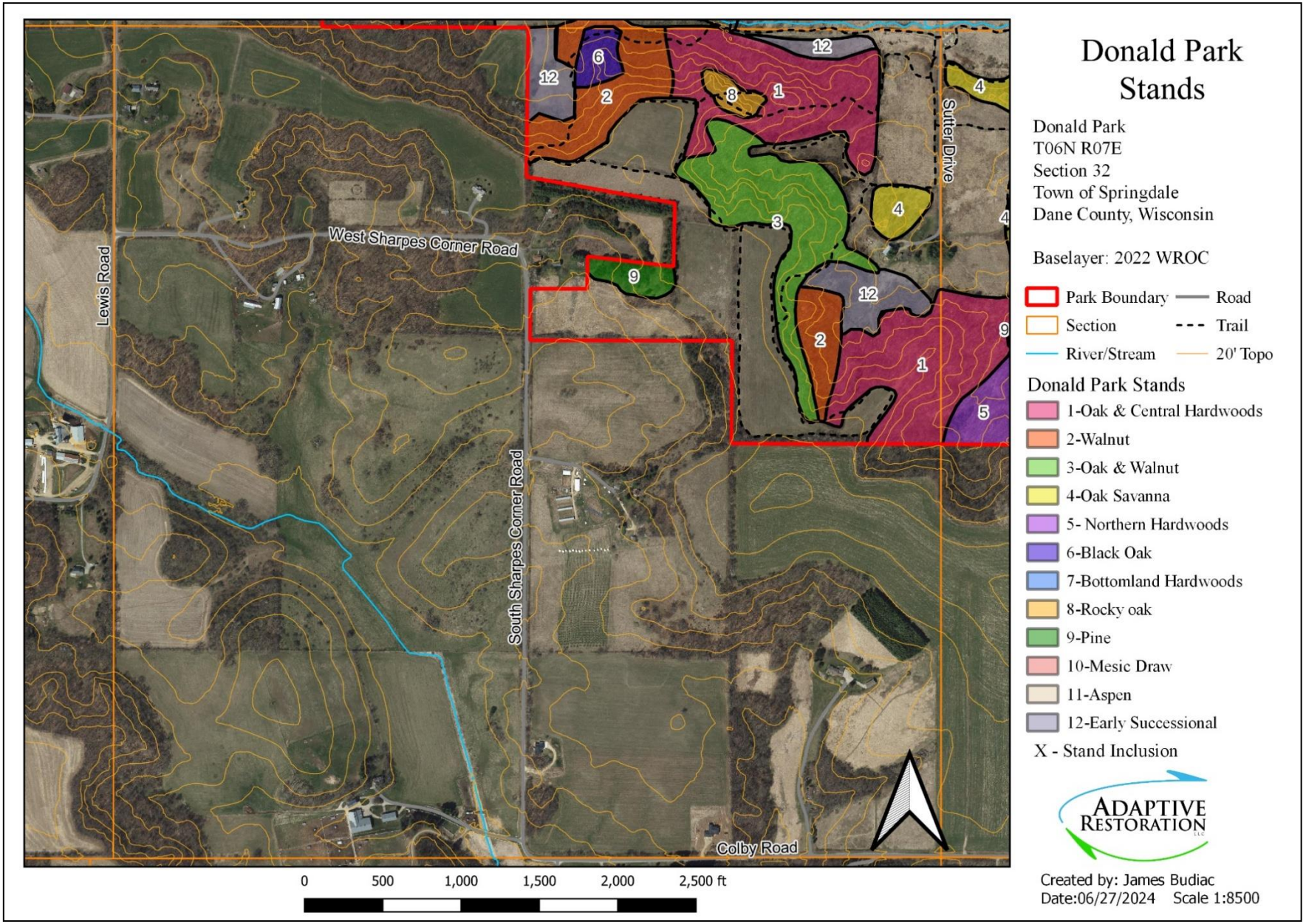
Donald Park Stands

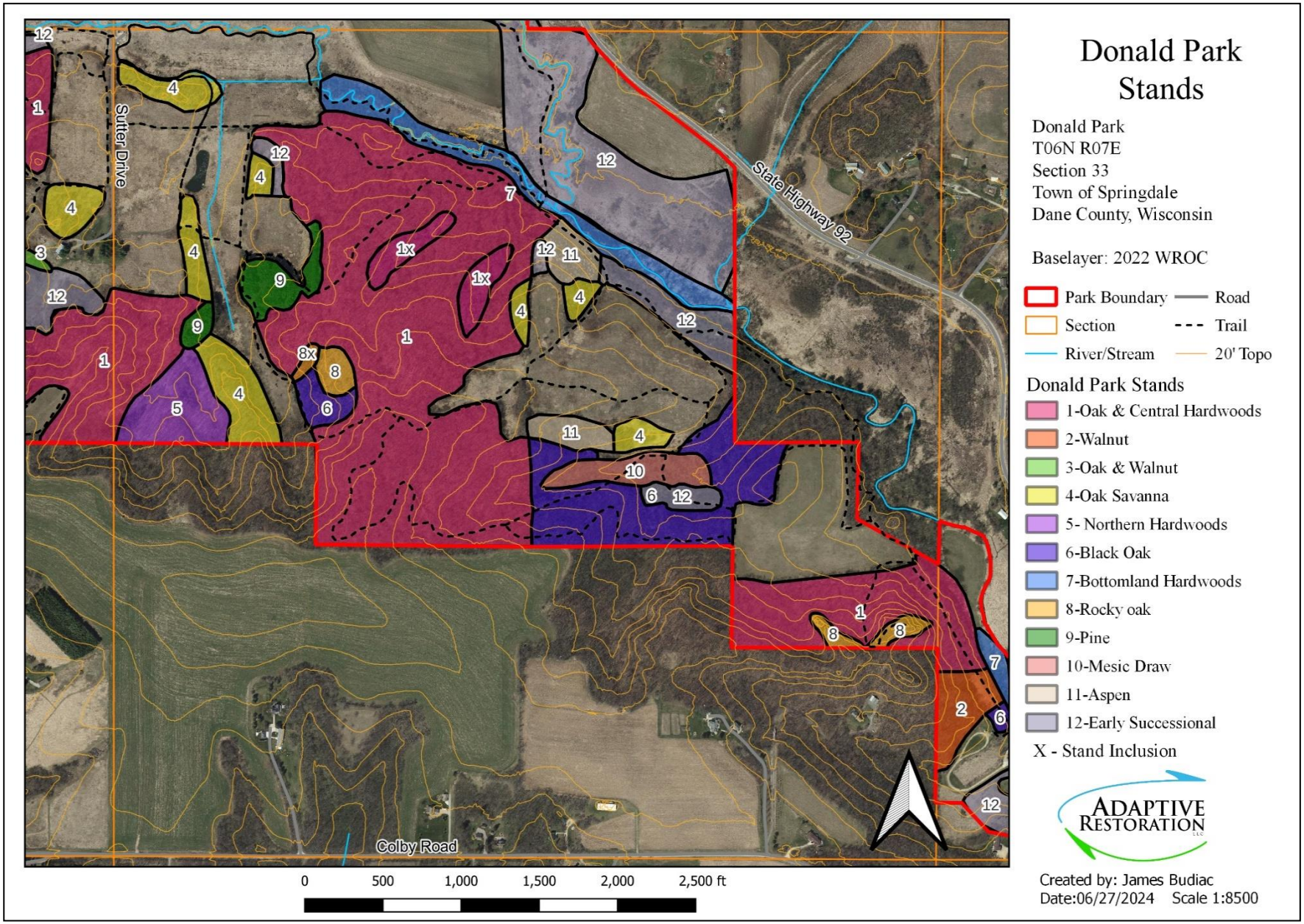
1-Oak & Central Hardwoods
2-Walnut
3-Oak & Walnut
4-Oak Savanna
5- Northern Hardwoods
6-Black Oak
7-Bottomland Hardwoods
8-Rocky oak
9-Pine
10-Mesic Draw
11-Aspen
12-Early Successional

X - Stand Inclusion

ADAPTIVE RESTORATION LLC

Created by: James Budiac
Date:06/27/2024 Scale 1:8500


Donald Park Stands
Donald Park
T06N R07E
Section 32
Town of Springdale
Dane County, Wisconsin
Baselayer: 2022 WROC
Park Boundary
Road
Section
Trail
River/Stream
20' Topo
Donald Park Stands
1-Oak & Central Hardwoods
2-Walnut
3-Oak & Walnut
4-Oak Savanna
5- Northern Hardwoods
6-Black Oak
7-Bottomland Hardwoods
8-Rocky oak
9-Pine
10-Mesic Draw
11-Aspen
12-Early Successional
X - Stand Inclusion
West Sharpes Corner Road
South Sharpes Corner Road
Lewis Road
Sutter Drive
Colby Road
0
500
1,000
1,500
2,000
2,500 ft
ADAPTIVE RESTORATION LLC
Created by: James Budiac
Date:06/27/2024 Scale 1:8500



Donald Park Stands

Donald Park
T06N R07E
Section 33
Town of Springdale
Dane County, Wisconsin

Baselayer: 2022 WROC

Park Boundary
Road
Section
Trail
River/Stream
20' Topo

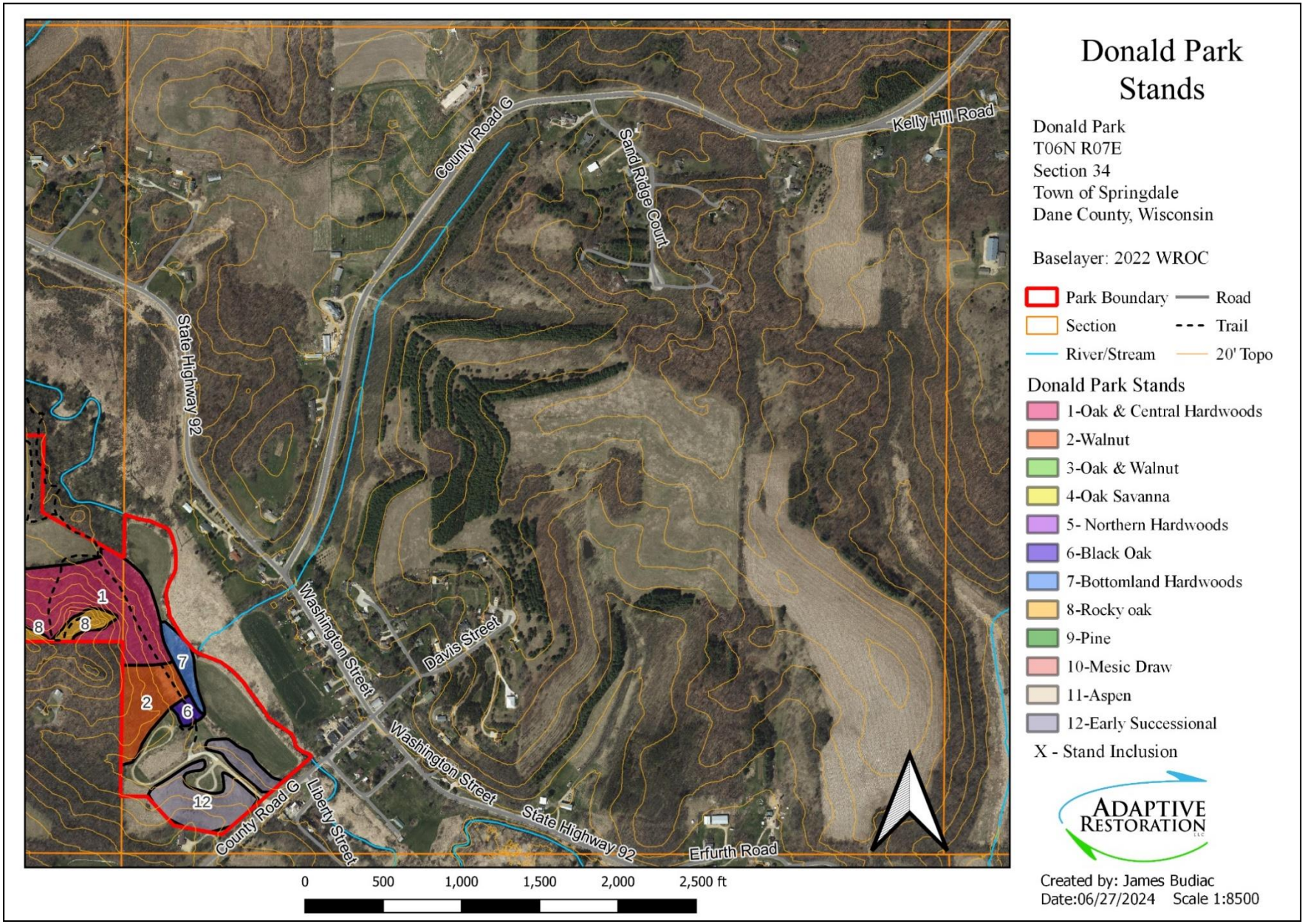
Donald Park Stands

1-Oak & Central Hardwoods
2-Walnut
3-Oak & Walnut
4-Oak Savanna
5- Northern Hardwoods
6-Black Oak
7-Bottomland Hardwoods
8-Rocky oak
9-Pine
10-Mesic Draw
11-Aspen
12-Early Successional

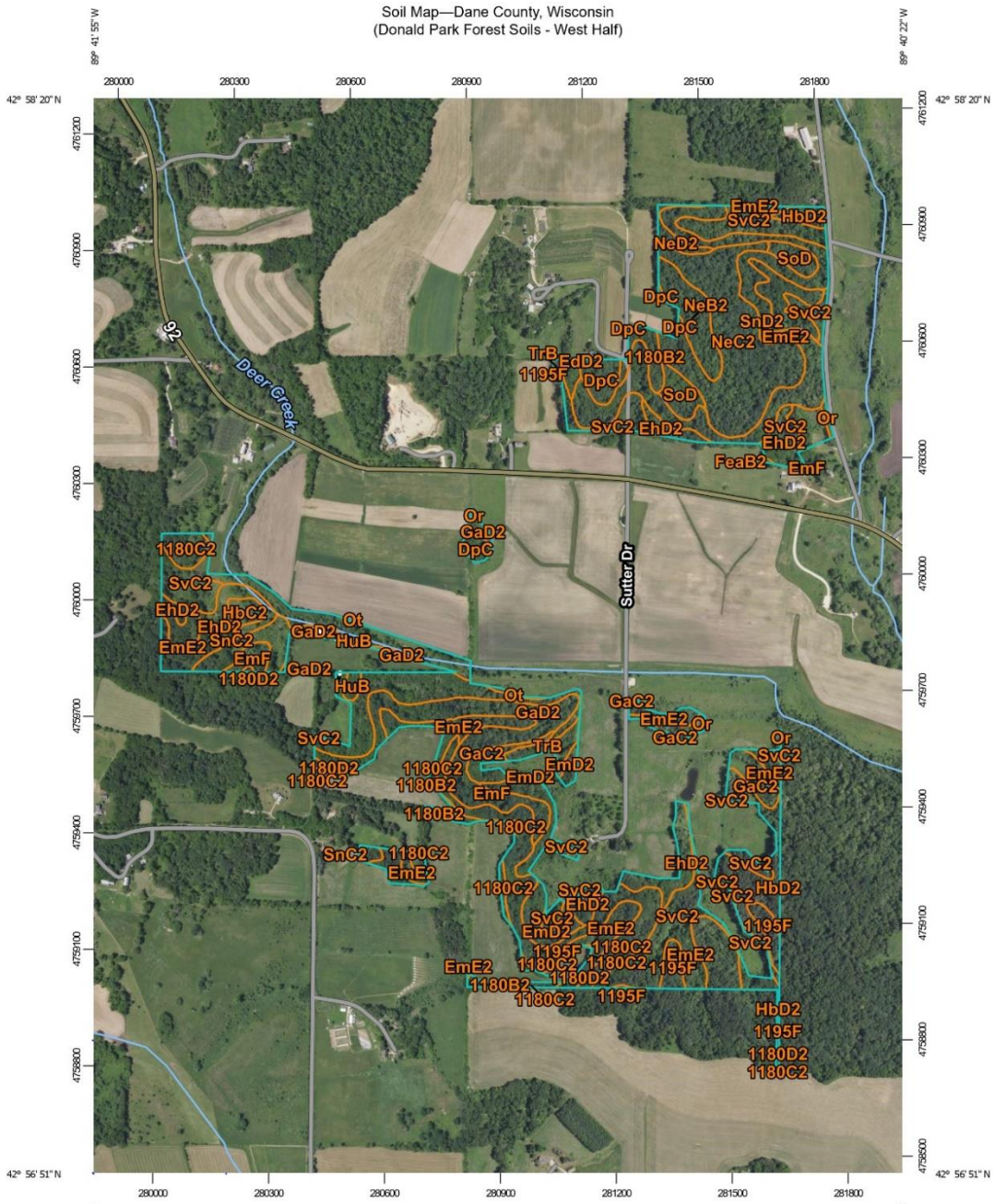
X - Stand Inclusion

ADAPTIVE RESTORATION LLC

Created by: James Budiac
Date:06/27/2024 Scale 1:8500


Donald Park
Stands
Donald Park
T06N R07E
Section 34
Town of Springdale
Dane County, Wisconsin
Baselayer: 2022 WROC
Park Boundary
Road
Section
Trail
River/Stream
20' Topo
Donald Park Stands
1-Oak & Central Hardwoods
2-Walnut
3-Oak & Walnut
4-Oak Savanna
5- Northern Hardwoods
6-Black Oak
7-Bottomland Hardwoods
8-Rocky oak
9-Pine
10-Mesic Draw
11-Aspen
12-Early Successional
X - Stand Inclusion
ADAPTIVE RESTORATION
Created by: James Budiac
Date:06/27/2024 Scale 1:8500
County Road G
Kelly Hill Road
Sand Ridge Court
State Highway 92
Washington Street
Davis Street
Washington Street
County Road G
Liberty Street
State Highway 92
Erfurth Road
1
8
8
7
2
6
12
0
500
1,000
1,500
2,000
2,500 ft

Appendix B: Soil Map & Soil Series Information


Soil Map—Dane County, Wisconsin
(Donald Park Forest Soils - West Half)
89° 41' 55" W
89° 40' 22" W
42° 58' 20" N
42° 56' 51" N
280000
280300
280600
280900
281200
281500
281800
4761200
4760600
4760000
4759700
4759400
4759100
4758800
92
Deer Creek
Sutter Dr
EmE2
SvC2
HbD2
NeD2
SoD
DpC
NeB2
SnD2
NeC2
TrB
EdD2
1180B2
1195F
FeaB2
EmF
Or
GaD2
1180C2
EhD2
HbC2
Ot
HuB
SnC2
1180D2
GaC2
TrB
EmD2
Map Scale: 1:13,500 if printed on A portrait (8.5" x 11") sheet.
Meters
0
200
400
800
1200
N
Feet
0
500
1000
2000
3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84
USDA
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
3/2/2024
Page 1 of 4

Soil Map—Dane County, Wisconsin
(Donald Park Forest Soils - East Half)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dane County, Wisconsin
Survey Area Data: Version 22, Sep 8, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 13, 2020—Jun 18, 2020

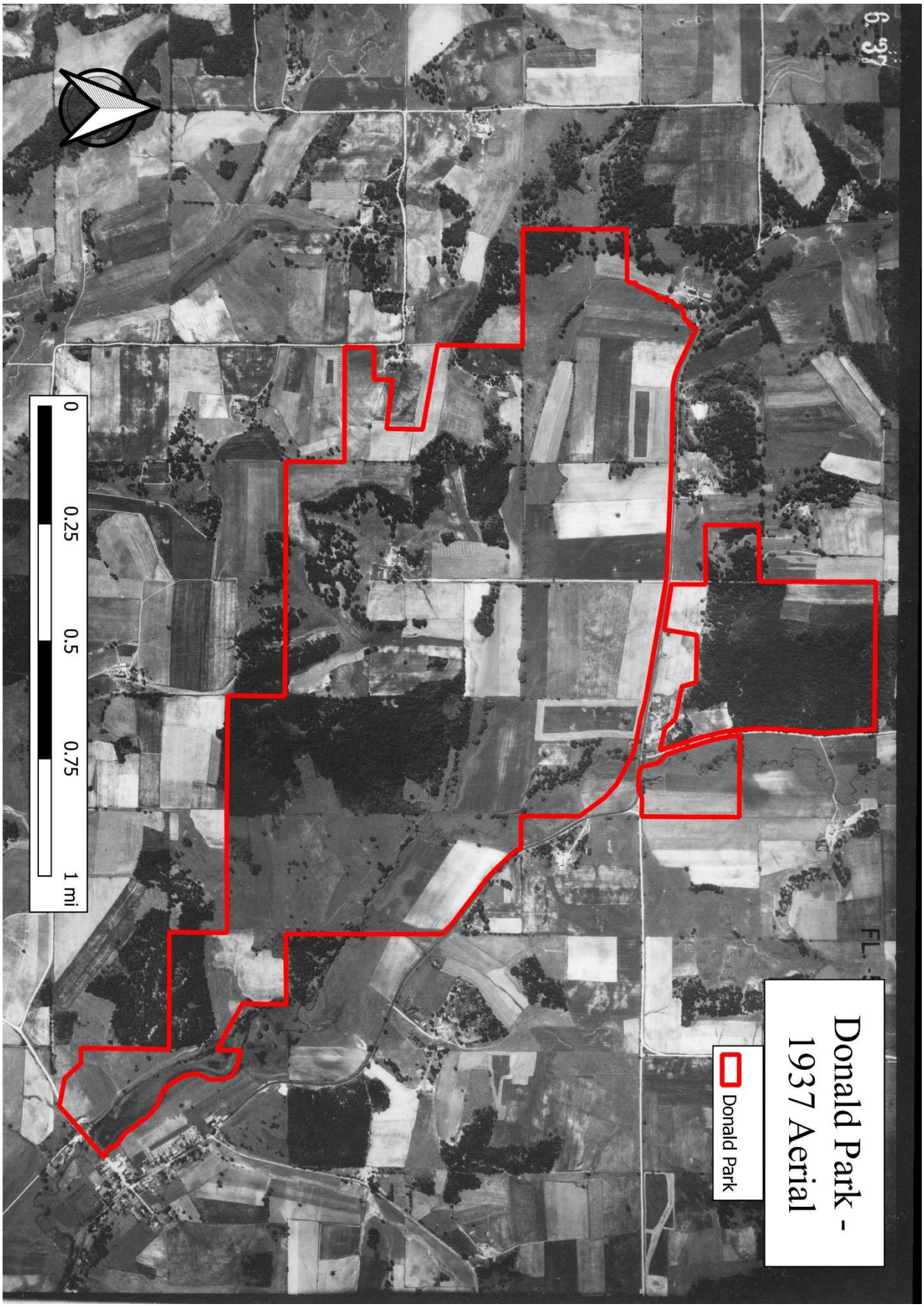
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

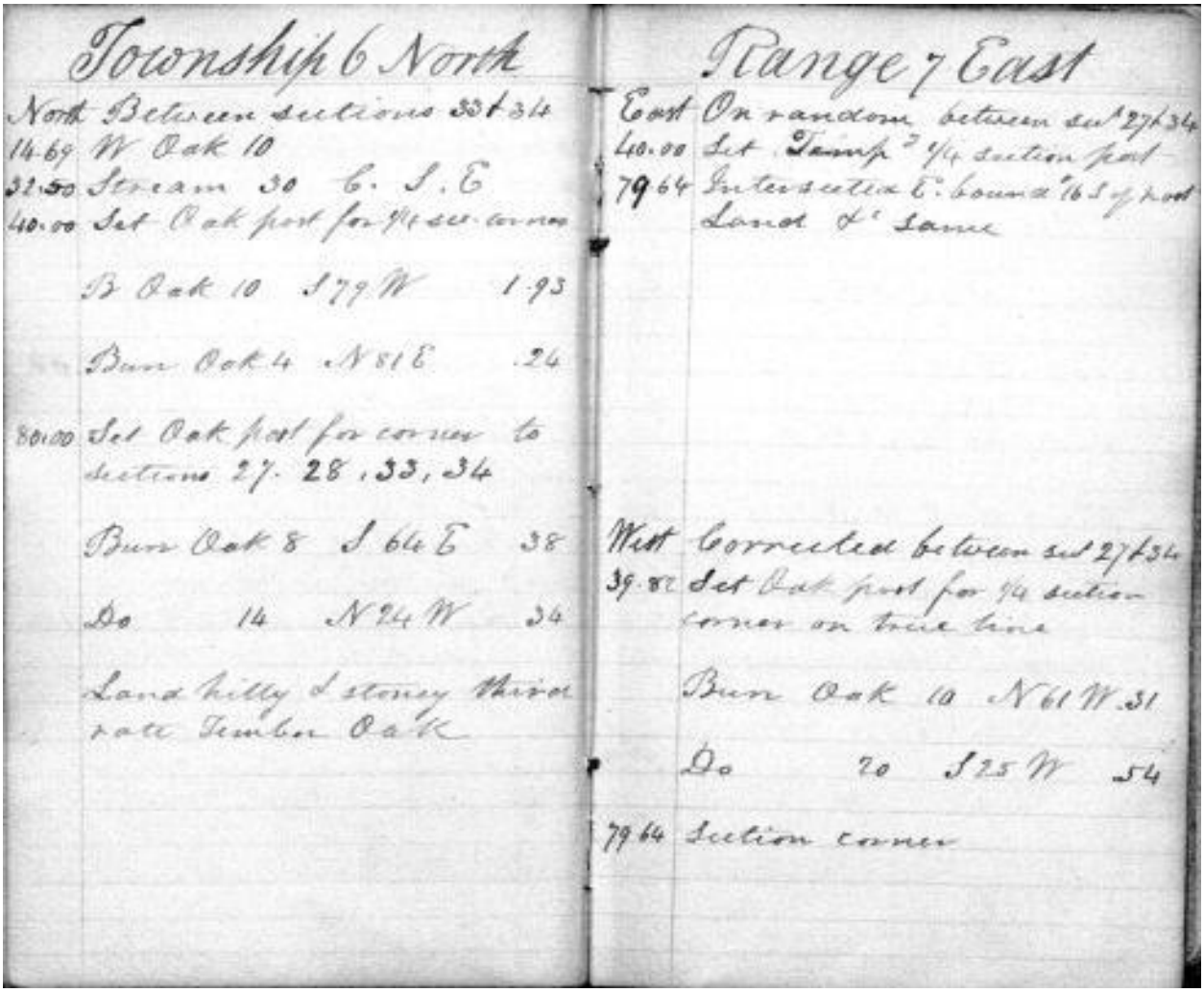
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1180B2	Newglarus-Dunbarton silt loams, 2 to 6 percent slopes, moderately eroded	2.7	0.7%
1180C2	Newglarus-Dunbarton silt loams, 6 to 12 percent slopes, moderately eroded	28.5	7.3%
1180D2	Newglarus-Dunbarton silt loams, 12 to 20 percent slopes, moderately eroded	45.1	11.5%
1195F	Elkmound-Northfield complex, 30 to 60 percent slopes, very rocky	23.2	5.9%
DpC	Dodgeville silt loam, 6 to 12 percent slopes	3.6	0.9%
EdD2	Edmund silt loam, 12 to 20 percent slopes, eroded	0.0	0.0%
EhC2	Eleva sandy loam, 6 to 12 percent slopes, eroded	4.9	1.2%
EhD2	Eleva sandy loam, 12 to 20 percent slopes, eroded	18.8	4.8%
EmD2	Elkmound sandy loam, 12 to 20 percent slopes, eroded	6.6	1.7%
EmE2	Elkmound sandy loam, 20 to 30 percent slopes, eroded	44.3	11.3%
EmF	Elkmound sandy loam, 30 to 60 percent slopes	16.6	4.2%
FeaB2	Festina silt loam, 1 to 6 percent slopes, moderately eroded	3.4	0.9%
GaC2	Gale silt loam, 6 to 12 percent slopes, moderately eroded	6.7	1.7%
GaD2	Gale silt loam, 12 to 20 percent slopes, moderately eroded	11.2	2.9%
HbC2	Hixton loam, 6 to 12 percent slopes, moderately eroded	1.4	0.4%
HbD2	Hixton loam, 12 to 20 percent slopes, moderately eroded	12.2	3.1%
HuB	Huntsville silt loam, 2 to 6 percent slopes	0.7	0.2%
NeB2	Newglarus silt loam, moderately deep, 2 to 6 percent slopes, moderately eroded	5.3	1.4%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
NeC2	Newglarus silt loam, moderately deep, 6 to 12 percent slopes, moderately eroded	30.8	7.8%
NeD2	Newglarus silt loam, moderately deep, 12 to 20 percent slopes, moderately eroded	1.2	0.3%
Or	Orion silt loam, 0 to 3 percent slopes, occasionally flooded	19.9	5.1%
Ot	Otter silt loam	33.9	8.6%
PrC	Port Byron silt loam, 6 to 12 percent slopes	0.1	0.0%
SnC2	Churchtown silt loam, 6 to 12 percent slopes, moderately eroded	4.3	1.1%
SnD2	Churchtown silt loam, 12 to 20 percent slopes, moderately eroded	8.8	2.2%
SoD	Sogn silt loam, 2 to 20 percent slopes	4.1	1.0%
SvC2	Seaton silt loam, driftless valley, 6 to 12 percent slopes, moderately eroded	48.7	12.4%
SvD2	Seaton silt loam, driftless valley, 12 to 20 percent slopes, moderately eroded	3.0	0.8%
TrB	Troxel silt loam, 0 to 3 percent slopes	2.0	0.5%
VwA	Virgil silt loam, gravelly substratum, 0 to 3 percent slopes	0.7	0.2%
Wa	Wacousta silty clay loam, 0 to 2 percent slopes	0.1	0.0%
Totals for Area of Interest		**392.6**	**100.0%**

Appendix C: Historical Air Photo



Appendix D: Original Land Survey Notes



Township 6 North

North
14.69 W Oak 10
32.50 Scream 30 L. S. E
40.00 Set Oak post for ¼ sec. corner

B Oak 10 S 79 W 1.93

Burr Oak 4 N 81 E .24

80.00 Set Oak post for corner to sections 27. 28. 33, 34

Burr Oak 8 S 64 E 38

Do 14 N 24 W 34

Land hilly & stony third rate Timber Oak

Range 7 East

East
40.00 On random between sec 27 & 34
79 64 Set Temp. ¼ section post
Intersection E. bound 165 yds
Land & same

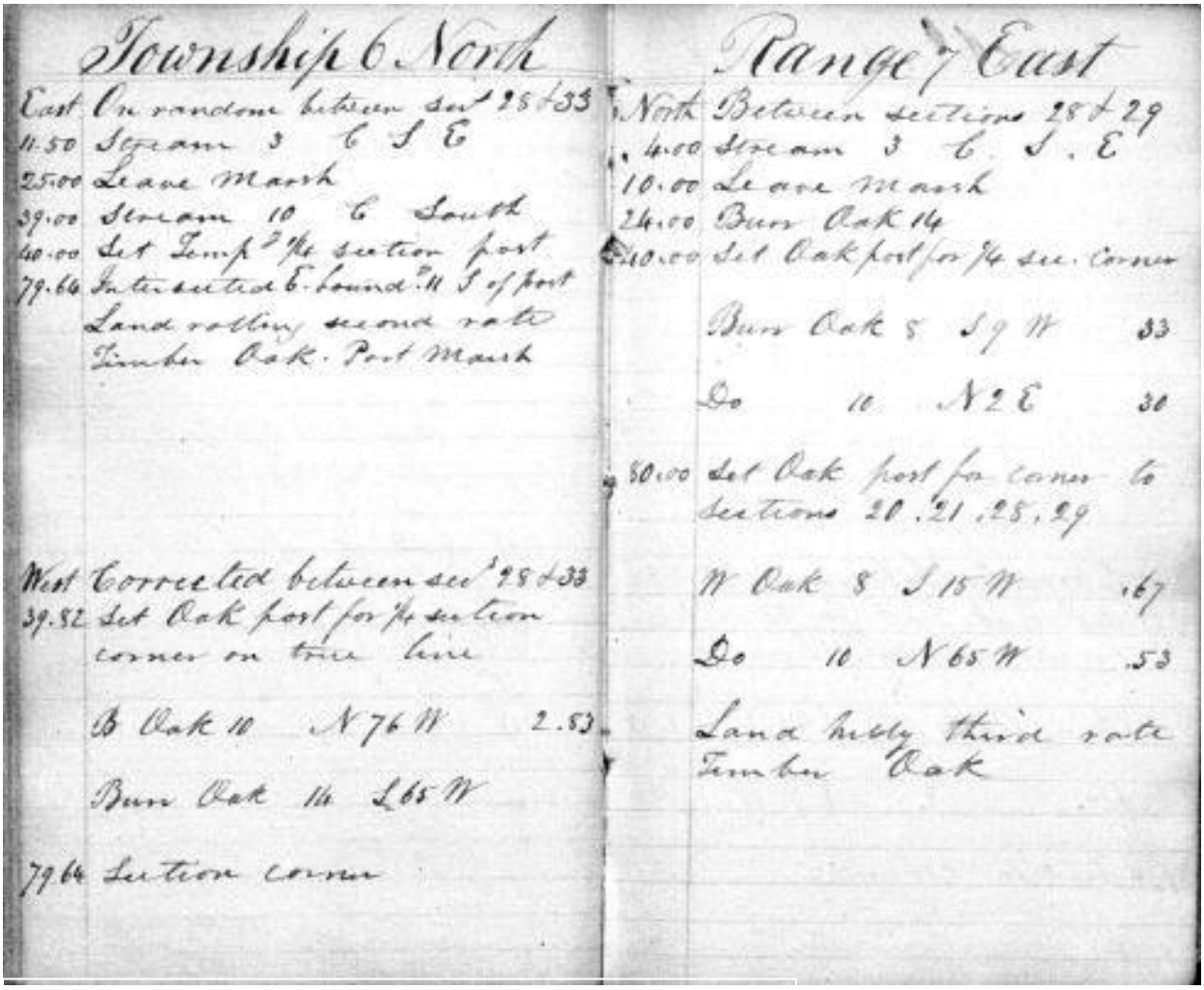
West
39.82 Corrected between sec 27 & 34
Set Oak post for ¼ section corner on true line

Burr Oak 10 N 61 W 31

Do 20 S 25 W 54

79 64 Section corner

Figure 5: T06N R07E Between Sections 33 & 34 (North)



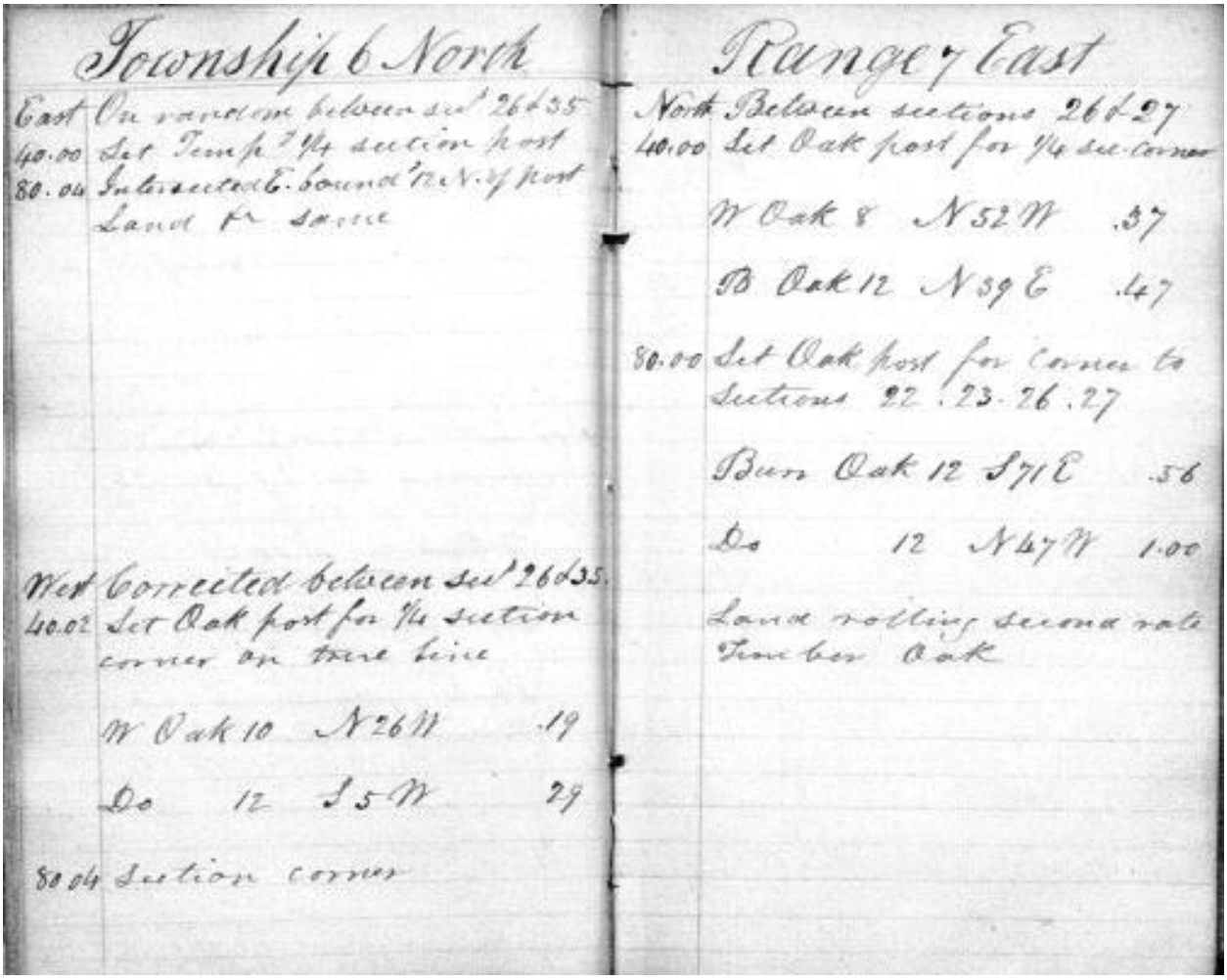
Township 6 North — Range 7 East

East — On random between sec 28 & 33
11.50 Stream 3 ch S E
25.00 Leave Marsh
39.00 Stream 10 ch South
40.00 Set Temp 2 for ¼ section post
79.64 Intersected S. bound 11 S of post
Land rolling second rate
Timber Oak. Post Marsh

West — Corrected between sec 28 & 33
39.82 Set Oak post for ¼ section corner on true line
B Oak 10 N 76 W 2.53
Burr Oak 14 L 65 W
79.64 Section corner

North — Between sections 28 & 29
4.00 Stream 3 ch S. E
10.00 Leave marsh
24.00 Burr Oak 14
40.00 Set Oak post for ¼ sec. Corner
Burr Oak 8 S 9 W 33
Do 10 N 2 E 30
80.00 Set Oak post for corner to sections 20. 21. 28. 29
W Oak 8 S 15 W .67
Do 10 N 65 W .53
Land hilly third rate
Timber Oak

Figure 6: T06N R07E Between Sections 25-33 West Corrected



Township 6 North

East
40.00 Set Temp. ¼ section post
80.04 Intersected E. bound ¼ N. ¼ post
Land & same

On random line between sec. 26 & 35

West
40.02 Set Oak post for ¼ section corner on true line

Corrected between sec. 26 & 35.

W Oak 10 N 26 W .19

Do 12 S 5 W .29

80.04 Section corner

Range 7 East

North
40.00 Set Oak post for ¼ sec. corner

Between sections 26 & 27

W Oak 8 N 52 W .37

B Oak 12 N 39 E .47

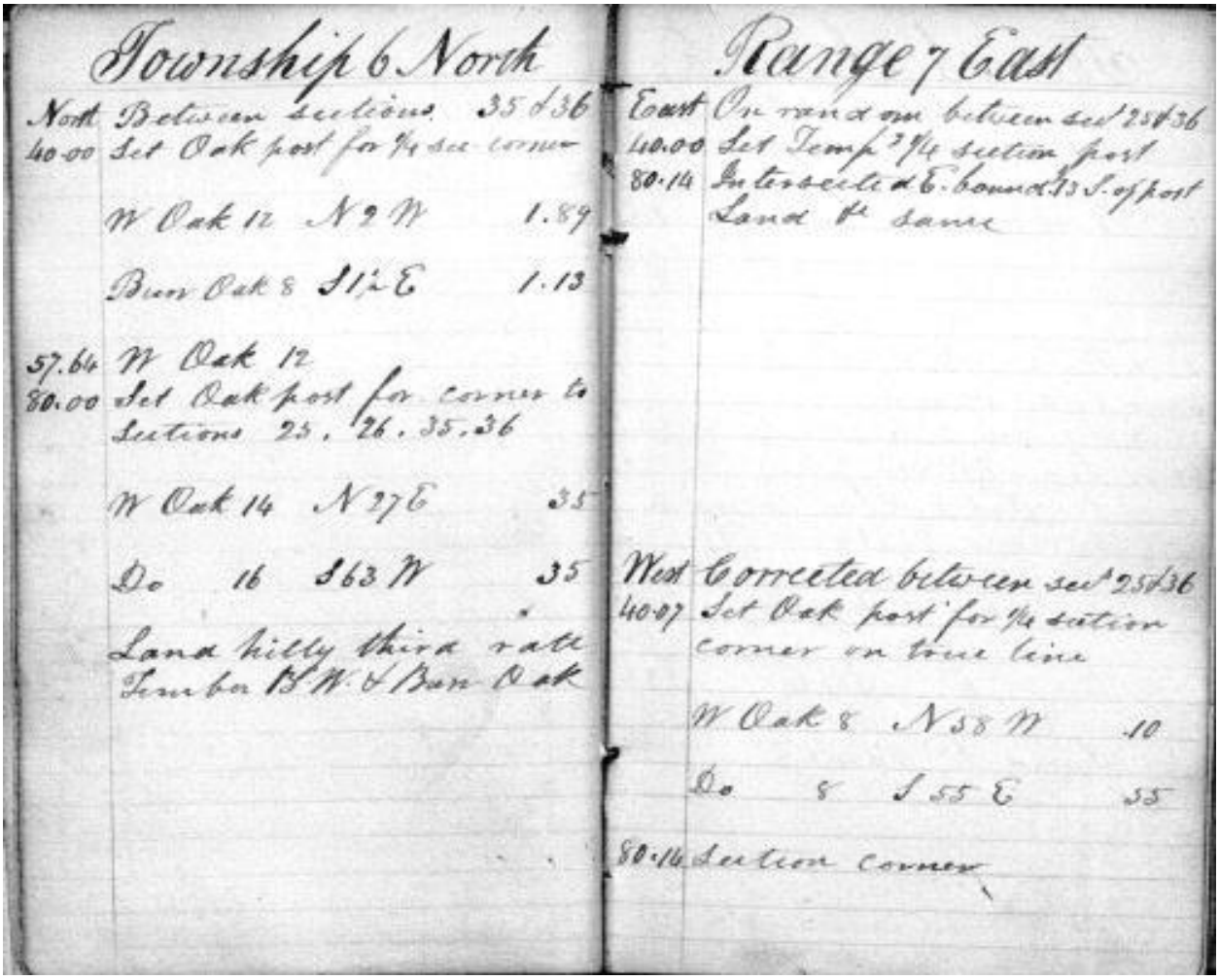
80.00 Set Oak post for corner to sections 22. 23. 26. 27

Burr Oak 12 S 71 E .56

Do 12 N 47 W 1.00

Land rolling second rate
Timber Oak

Figure 7: T06N R07E between sections 26-35



Township 6 North

North 40.00 Between sections 35 & 36
Set Oak post for ¼ sec corner

W Oak 12 N 2 W 1.89

Burr Oak 8 S 1½ E 1.13

57.64 W Oak 12
80.00 Set Oak post for corner to Sections 25. 26. 35. 36

W Oak 14 N 2 E 35

Do 16 S 63 W 35

Land hilly third rate
Timber W.O. & Burr Oak

Range 7 East

East 40.00 On road on between sec 25 & 36
Set Temp. ¾ section post
80.14 Intersected E. boundary 33 S. of post
Land the same

West 40.07 Corrected between sec 25 & 36
Set Oak post for ¼ section corner on true line

W Oak 8 N 38 W .10

Do 8 S 55 E 35

80.14 Section corner

Figure 8: T06N R07E Sections 25-36

Appendix E: Donald Park- Natural Communities of Wisconsin

Southern Dry-Mesic Forest

Red oak (*Quercus rubra*) is a common dominant tree of this upland forest community type. White oak (*Quercus alba*), American basswood (*Tilia americana*), sugar and red maples (*Acer saccharum and A. rubrum*), white ash (*Fraxinus americana*), shagbark hickory (*Carya ovata*), and wild black cherry (*Prunus serotina*) are also important. The herbaceous understory flora is diverse and includes many species listed under southern dry forest plus jack-in-the-pulpit (*Arisaema triphyllum*), enchanter's-nightshade (*Circaea canadensis*), large-flowered bellwort (*Uvularia grandiflora*), interrupted fern (*Osmunda claytoniana*), lady fern (*Athyrium filix-femina*), tick-trefoils (*Desmodium* spp.), and hog-peanut (*Amphicarpaea bracteata*).

Southern dry-mesic forest occurs on loamy soils of glacial till plains and moraines, and on erosional topography with a loess cap, south of the tension zone. This community type was common historically, although white oak was considerably more dominant than red oak, and the type is still common today. However, to the detriment of the oaks, mesophytic tree species are becoming increasingly important under current management practices and fire suppression policies. Oak forests are succeeding to more mesic species (e.g., central and northern hardwood forest types), or to brush.

Southern Mesic Forest

This upland forest community occurs on rich, well-drained loamy soils, mostly on glacial till plains or loess-capped sites south of the tension zone. The dominant tree species is sugar maple (Acer saccharum), but American basswood (Tilia americana), and near Lake Michigan, American beech (Fagus grandifolia) may be co-dominant. Many other trees are found in these forests, including those of the walnut family, ironwood (Carpinus caroliniana), northern red oak (Quercus rubra), red maple (Acer rubrum), white ash (Fraxinus americana), and slippery elm (Ulmus rubra). The understory is typically open, or sometimes brushy with species of gooseberry (Ribes spp.) on sites with a history of grazing, and supports fine spring ephemeral displays. Characteristic herbs are spring-beauty (Claytonia virginica), trout-lilies (Erythronium spp.), trilliums (Trillium spp.), violets (Viola spp.), bloodroot (Sanguinaria canadensis), blue cohosh (Caulophyllum thalictroides), may-apple (Podophyllum peltatum), and Virginia waterleaf (Hydrophyllum virginianum).

Historically, southern mesic forests were quite common throughout southern Wisconsin. For example, forests dominated by sugar maple or beech occupied 41% of the Southern Lake Michigan Coastal, 25% of the Southeast Glacial Plains, and 18% of the Western Coulees and Ridges Ecological Landscapes (Finley 1976). Most of these forests were cleared for agriculture because the soils are very fertile.

Southern Dry Forest

Oaks are the dominant species in this upland dry forest community. White oak (Quercus alba) and black oak (Quercus velutina) are dominant, often with northern red and bur oaks and black cherry. In the well-developed shrub layer, brambles (Rubus spp.), gray dogwood, and American hazelnut are common. Frequent herbaceous species are wild geranium, false Solomon's-seal, hog-peanut, and rough-leaved sunflower. This community type intergrades with oak woodland, which has similar canopy composition but a more open forest floor due to relatively frequent ground fires and perhaps grazing by elk, bison, or deer prior to European settlement.

Oak Savanna (Oak Opening)

Oak opening is an open savanna community with a heavy prairie component. Oak openings tend to be dominated by members of the white oak group, especially bur oak (*Quercus macrocarpa*), sometimes white oak (*Q. alba*), and locally in southwestern Wisconsin, chinquapin oak (*Q. muhlenbergii*). Black oak (*Q. velutina*) and shagbark hickory (*Carya ovata*) may also be present. Canopy closure can vary widely. The best quality sites have a canopy with 5-40% closure but can be as high as 60% closure, often with large canopy gaps in between trees. "Canopy closure" is the proportion of shrub and ground layer that is covered in shade or shade flecks at noon on a sunny day. Canopy trees tend to have short, thick trunks with wide-spreading crowns, unlike the tall straight trunks and narrower crowns of forest-grown trees.

Oak openings historically experienced near-annual surface fires. As a result, the subcanopy is essentially absent in good quality sites. Tall shrubs are also sparse, though may include American hazelnut (*Corylus americana*) and shrubby oak saplings, also known as oak grubs. The ground layer of oak openings is typically dominated by a matrix of native grasses and sedges, especially little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), needlegrass (*Hesperostipa spartea*), and Leiberg's panic grass (*Dichanthelium leibergii*). Where oak openings occur on wet-mesic sites, sedges (e.g., *Carex pellita*) or bluejoint grass (*Calamagrostis canadensis*) may dominate.

Typical forbs are numerous and have significant overlap with prairies, barrens, bedrock glades, and oak woodlands. Some of the best indicators include leadplant (*Amorpha canescens*), white camas (*Anticlea elegans*), Canada milkvetch (*Astragalus canadensis*), kitten-tails (*Besseya bullii*), bastard toadflax (*Comandra umbellata*), prairie coreopsis (*Coreopsis palmata*), veiny pea (*Lathyrus venosus*), whorled loosestrife (*Lysimachia quadrifolia*), prairie phlox (*Phlox pilosa*), Seneca snakeroot (*Polygala senega*), eastern shooting-star (*Primula meadia*), and early buttercup (*Ranunculus fascicularis*). Additional oak opening indicator species can be found in the Coarse-level Monitoring Protocol for Oak Openings (Carter et al, 2023).

Today, oak opening is one of the rarest plant communities in the Upper Midwest with very few high-quality sites in existence. Sites that were not converted to agriculture or settlements were quickly degraded by grazing resulting in the loss of prairie and savanna flora. When grazing declined fire suppression became the norm, causing a rapid growth of trees and shrubs. Oak openings historically occurred in a variety of landscape settings. The best remaining sites are found in the Driftless Region on steep west- to south-facing slopes where they are associated with dry prairies on bluffs. In glaciated southern Wisconsin, they occur on gravelly kames, eskers, and along end moraines, especially in the southern Kettle Moraine region. A variant of oak openings can also occur on sandy alluvial terraces and islands associated with large river systems, such as the Wisconsin, Black, and Chippewa Rivers, where they are sometimes also referred to as floodplain savannas. Historically, oak openings also occurred on mesic sites, but these have essentially been extirpated by fire suppression, intense grazing, and conversion to other land uses.

Oak Woodland

Oak woodland is a type of savanna that is intermediate between more open oak opening and more closed canopied oak forests. It tends to be dominated by members of white oak group, especially white oak, sometimes with bur oak, and locally in southwestern Wisconsin, chinquapin oak. Red oak, black oak, and shagbark hickory may also be present and can sometimes account for 50% relative cover or more of the tree layer. Canopy closure can vary widely. The best quality sites have a canopy 41-65% closure but can vary from 30-80% closure. "Canopy closure" is the proportion of shrub and ground layer that is covered in shade or shade flecks at noon on a sunny day.

Oak woodlands historically experienced near-annual surface fires. As a result, the subcanopy is very sparse in good quality sites, though fire-suppressed sites often contain mesophytic species such sugar maple, red maple, ironwood, hackberry, American elm, and bitternut hickory. The shrub layer is also typically sparse but may include low growing species like low bush honeysuckle (Diervilla lonicera), snowberry (Symphoricarpos albus or S. occidentalis), blueberry (Vaccinium spp.), huckleberry (Gaylussacia baccata), New Jersey tea (Ceanothus americanus), and lead plant (Amorpha canescens).

The groundlayer in oak woodlands is often dominated by a matrix of sedges like Pennsylvania sedge and savanna running sedge (Carex siccata), sometimes also with a variety of other graminoids that thrive under dappled light conditions such as bottlebrush grass (Elymus hystrix), silky wild-rye (Elymus villosus), and wide-leaved panic grass (Dichanthelium latifolium). Forbs overlap significantly with oak openings and oak forest, but some of the best indicators include upland boneset (Eupatorium sessilifolium), prairie alumroot (Heuchera richardsonii), two-flowered Cynthia (Krigia biflora), veiny pea (Lathyrus venosus), pale vetchling (Lathyrus ochroleucus), blunt-leaved sandwort (Moehringia lateriflora), wood betony (Pedicularis canadensis), eastern shooting-star (Primula meadia), yellow-pimpernel (Taenidia integerrima), Culver's-root (Veronicastrum virginicum), Carolina vetch (Vicia caroliniana), and Short's aster (Symphyotrichum shortii). Additional oak woodland indicator species can be found in the Coarse-level Monitoring Protocol for Oak Woodlands (Carter et al, 2023).

Oak woodlands can occur in a variety of landscape settings, usually in sites that allowed them to persist with frequent fire but not so severe as to convert them to prairie or oak opening. Examples include cooler slope aspects adjacent to prairies and oak openings, knolls and ridgetops surrounded by mesic to dry-mesic forest, and upland islands surrounded by wetlands.

Oak Barrens

Black oak (*Quercus velutina*) is often the dominant tree in this fire-adapted savanna community of xeric sites, but white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), northern pin oak (*Quercus ellipsoidalis*), and occasionally red oak (*Quercus rubra*), may also be present. Canopy is variable but is typically between 5% and 60% in good-quality sites.

The tall shrub layer is often dominated by oak saplings. American hazelnut (*Corylus americana*) and serviceberries (*Amelanchier* sp.) are also frequently present, while smooth sumac (*Rhus glabra*), gray dogwood (*Cornus foemina*), and prickly-ash (*Zanthoxylum americanum*) may be present in more degraded sites. The low shrub layer often contains members of the heath family such as huckleberry (*Gaylussacia baccata*), blueberries (*Vaccinium angustifolium and V. myrtilloides*), and bearberry (*Arctostaphylos uva-ursi*) along with species such as sweet-fern (*Comptonia peregrina*). Bracken fern (*Pteridium aquilinum*) may also be common at some sites.

The groundlayer is typically dominated by graminoids such as Pennsylvania sedge (*Carex pensylvanica*), savanna running sedge (*Carex siccata*), poverty grass (*Danthonia spicata*), June grass (*Koeleria macrantha*), little bluestem (*Schizachyrium scoparium*), and panic grasses (*Dichanthelium* spp.) along with sand-loving species such as three-awn grasses (*Aristida* spp.), fall witch grass (*Digitaria cognata*), and love grasses (*Eragrostis capillaris* and *E. spectabilis*). In sites with a lack of fire, Pennsylvania sedge may become so dense it forms a near monoculture and excludes other species. Indicator forbs in good quality sites include leadplant (*Amorpha canescens*), false toadflax (*Comandra umbellata*), western sunflower (*Helianthus occidentalis*), stiff sunflower (*H. pauciflorus*), round-headed bush-clover (*Lespedeza capitata*), rough blazing star (*Liatris punctata*), wild lupine (*Lupinus perennis*), dotted horsemint (*Monarda punctata*), goat's rue (*Tephrosia virginiana*) and spiderwort (*Tradescantia ohioensis*). Additional indicator species can be found in the Coarse-level Monitoring Protocol for Oak

Barrens (O'Connor et al, 2019).

Distribution of this community is mostly in southwestern, central, and west central Wisconsin. Barrens communities occur on several landforms, especially outwash plains, lakeplains, and on the broad sandy terraces that flank some of the major rivers of southern Wisconsin. Soils are usually excessively well-drained sands, though thin-soiled, droughty sites over bedrock can also support this community.

Floodplain Forest

This lowland hardwood forest community type occurs along large rivers--usually 3rd order streams or higher. Most of these rivers originate in northern Wisconsin and flow southward, growing in size as the volume of water they carry increases. As the stream gradients diminish, the floodplains become broader. Periodic floods, particularly in the spring, are the key natural disturbance event to which species of this community have adapted. Silt deposition and development of microtopography during flood events create suitable sites for tree germination and establishment. Floods also carry seeds and propagules of plant species. The most extensive occurrences of floodplain forest are found along the large rivers of southern Wisconsin, but the community also occurs at scattered locations in the north. This community was uncommon historically, occupying only about 3% of the Western Coulees and Ridges Ecological Landscape and even smaller percentages of other ecological landscapes (Finley 1976). Canopy dominants vary, but may include silver maple (*Acer saccharinum*), river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), black ash (*Fraxinus nigra*), hackberry (*Celtis occidentalis*), swamp white oak (*Quercus bicolor* and its hybrids with bur oak), and eastern cottonwood (*Populus deltoids*). Black willow (*Salix nigra*), basswood (*Tilia americana*), red oak (*Quercus rubra*), and red maple (*Acer rubrum*) are associated species found in these forests. Historically, elms were highly significant components of the floodplain forests, but Dutch elm disease has eliminated most large elm trees that formerly provided supercanopy structure, snags and den sites, and large woody debris. Northern occurrences of this type tend to be less extensive, are often discontinuous, and relatively species-poor compared to those in the south. Silver maple and green ash are still dominant, but balsam-poplar (*Populus balsamifera*), bur oak (*Quercus macrocarpa*), and box elder (*Acer negundo*) replace some of the southern tree species.

Understory composition is also quite variable and follows the pattern exhibited by the canopy species-the most extensive stands and highest plant species diversity occur in southwestern Wisconsin. Buttonbush (*Cephalanthus occidentalis*) is a locally dominant shrub that may form dense thickets on the margins of oxbow lakes, sloughs, and ponds, which are often important aquatic habitats in these forests. Wood nettle and stinging nettle (*Laportea canadensis, Urtica dioica*), sedges (e.g., *Carex grayi, C. lupulina, C. hystericina, C. tuckermanii*), native grasses (e.g., *Cinna arundinacea, Elymus villosus, Leersia virginica*), ostrich fern (*Matteuccia struthiopteris*), and green-headed coneflower (*Rudbeckia laciniata*) are important understory herbs, and lianas such as Virginia creeper (*Parthenocissus quinquefolia*), grapes (*Vitis* spp.), Canada moonseed (*Menispermum canadense*), and poison-ivy (*Toxicodendron radicans*) along with the shrub form of poison ivy (*T. rydbergii*) are often common. Among the more striking herbs of this community are cardinal flower (*Lobelia cardinalis*), fringed loosestrife (*Lysimachia ciliata*), and green dragon (*Arisaema dracontium*).

The sprawling floodplains found along the largest rivers sometimes consist of several terraces capable of supporting forests that are subject to floods with differing frequencies and levels of inundation, and support patches of varying floristic composition depending upon local elevation differences, edaphic factors, and disturbance history. The lower terraces experience the most frequent, severe, and long-lasting floods while the uppermost terraces flood infrequently, and the rich alluvial soils can support mesophytic trees species and rich groundlayers similar to those of the mesic hardwood forests.

Appendix F: Forestry Terms

- **Age Class –** the grouping of trees by age used for describing management type (even-aged or uneven aged).
- **Aspect** – the directional orientation (north, south, east, west) of a particular point on the landscape.
- **Basal Area (BA)** - Basal area in forestry refers to the cross-sectional area of trees at breast height (DBH) (4.5 feet above ground level) within a defined area, typically measured in square feet per acre. It is an important metric used to estimate the density and productivity of a forest stand, providing insights into tree stocking, growth rates, and potential timber yield.
- **Biodiversity** – a metric of overall species richness (the number of species) and evenness (the distribution of the species).
- **Board feet per acre (bf/acre)**– a metric to measure the volume of sawlogs timber volume per acre of forested land. A board foot is defined as a 1' x 1' x 1" volume of wood.
- **Canopy Cover** – a measure of the amount of sunlight that is blocked by the forest canopy. A canopy cover of 0% is entirely open (i.e. field), a canopy cover of 100% is entirely closed (i.e. dense cedar forest). This metric is used to help guide regeneration, restoration, and ground layer diversity objectives.
- **Cohort** – in forestry, a grouping of trees into size and age classes, often used for regeneration and harvest purposes.
- **Cords** – a measure of timber volume of non-sawlog trees. A cord in forestry is a unit of measurement for stacked firewood, typically equal to 128 cubic feet or a stack of wood measuring 4' x 4' x 8'.
- **Cover Type** – refers to the dominant tree cover (by groups or species), size and density within a forested stand. Broken into three categories, primarily is the dominant cover type, secondary is the next dominant cover type and understory represents the regeneration layer. Examples of a cover type include: central hardwoods, aspen, oak, black walnut, northern hardwoods, bottomland hardwoods.
- **Crown –** the branches and leaves extending from the trunk or main stems of a tree.
- **Crown Competition Factor (CCF)** –like stocking, this metric is used for Black Walnut.
- **Diameter Breast Height (DBH) –** the diameter of a tree at 4.5' up from the base of the tree.
- **Diversity** – a measure of species richness (the number of species) and evenness (the distribution of species). Often used to described the health of an ecosystem, or to define a target goal. For example, "our goal is to increase plant diversity by 50% in the restored oak savanna."
- **Evenness –** a measure of how the number of species (richness) is distributed. For example, a plant community with a low evenness may have 100 species, but only 5 species are dominant. A high evenness could be a community with only 20 species, but there are equal numbers of all. Part of the formula for *Diversity.*
- **Even-age –** A stand of trees that are of the same age (think aspen).
- **Fire Regime –** the term given to the general pattern in which fires naturally occur in a particular ecosystem over an extended period. The metrics used to classify fire regimes include: frequency, intensity, size, pattern, season, and severity.
- **Heterogeneity –** the opposite of homogeneity (homogenous). For a forest, a state of being diverse in vertical and horizontal structure.

- **Legacy Tree –** An old, often large, tree that is a remnant of an ecosystem, forest, or community at a previous point in time. In oak savannas, these are large fire-tolerant trees that have persisted through land use changes and forest succession over the past century. (For the purposes of this plan a legacy tree is >20" DBH).
- **Live Crown Ratio (LCR)** – a measure, expressed as a percentage, of the length of a trees living crown as compared to the total height of a tree. A high LCR example is a bur oak growing in an oak savanna, short with low hanging branches. A low LCR example is a suppressed red pine in a plantation, tall with little living crown at the top.
- **Percent Cover –** an estimate, expressed as a percentage, of the total area covered by a specific species within a given unit or stand.
- **Quadratic Mean Diameter (QMD)** – the average diameter of trees in a stand, calculated by taking the square root of the sum of squared diameters divided by the number of trees.
- **Recruitment –** the process of establishing regeneration.
- **Regeneration –** the culmination of seedlings and saplings expressed as *stems/acre.*
    - Advanced regeneration is regeneration that is present before a harvest occurs.
- **Release –** removing competition (i.e. Other trees) away from a desired trees canopy via complete removal or girdling.
- **(Species) Richness –** a measure of the total number of species. Part of the formula for *Diversity*.
- **Sapling –** A small tree that is 1-5" diameter at 4.5' (DBH) up from the base.
- **Seedling –** a small tree that is <1" diameter at 4.5' (DBH) up from the base of the stem.
- **Site Index** – a measure of site quality, indicating a site's ability to support tree growth. It typically represents the height of dominant or codominant trees at a specified base age, aiding in forest management decisions and predicting timber productivity.
- **Slope** – a measure of the angle of a land's surface expressed as a percentage.
- **Stocking** – refers to the density or number of trees in a given area, often expressed as a percentage of the maximum number of trees that the site can support sustainably. It's a key factor in assessing forest health, productivity and aids in harvest decisions.
- **Stump Sprout –** a sapling or tree that emerges from a recently cut, or broken, stump. This is why we treat woody stems after cutting. Although, it can be used as a regeneration method.
- **Trees per acre (TPA)** – the number of trees per acre within a forested area or stand.
- **Wolf Tree** – a large dominant tree that suppresses surrounding vegetation and regeneration of new trees. It is often short in stature with wide spreading crowns. However, while it may negatively affect timber production, it may offer wildlife habitat, forage and may serve as a valuable ecological feature.