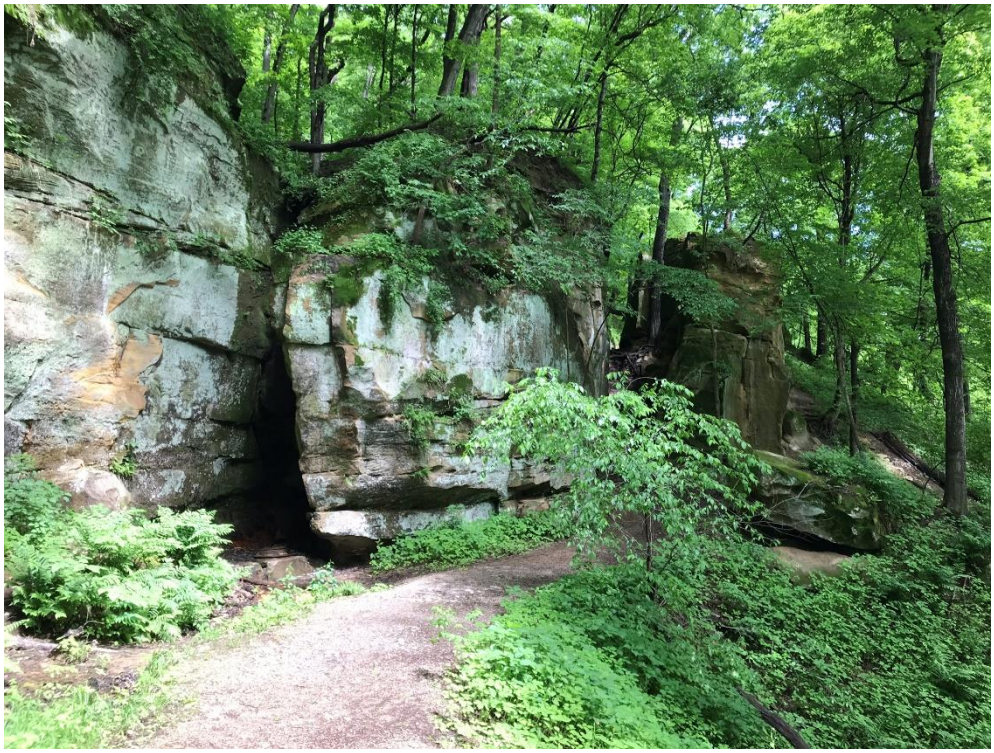
# State Parks Management Plan

## Wildcat Den State Park
## Muscatine County



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## Table of Contents

## Introduction

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In the 1850s, Muscatine county was surveyed by the U.S. Government Land Office. The survey indicated that the county had a mixture of "prairie" and "timber", interspersed with "fields", "marshes" and "ponds". The area now known as Wildcat Den State Park was depicted in an area of the county described as "timber". Historical records indicate that the earliest settlement in Muscatine County occurred only a short distance from the park at the confluence of Pine Creek and the Mississippi River. Benjamin and Stephen Nye, cousins, constructed cabins on both sides of what was then referred to as "Pine River". This settlement was referred to in early records as the town of "Iowa".

In 1837, Benjamin Nye built a grist mill on a site just upstream from the present mill and on the same side of the creek. Nye had also built a sawmill nearby. A larger mill was constructed in 1848 and operated until the early 1920s. In 1927, the mill was purchased by the state from the Missel family, the last owners. Over the course of its existence, the mill and adjacent dam have been damaged by Pine Creek floods, requiring repair work. The mill dam was rebuilt in the mid-1980s. Although much of the mill's machinery is still present, the unimproved interior requires that the mill be open on a limited basis. In 1979, the Pine Creek Grist Mill was placed on the National Register of Historic Places. The 1877-era Melpine country school was brought to the park and placed near the mill in the early 1970s. An 1878 iron bridge spans Pine Creek just downstream of the mill and provides an excellent view point for the mill as well as pedestrian access to the other side of the creek.

Reference in the 1919 report was made to a pending donation of the first 60 acres by Emma C and Clara L Brandt, two elderly sisters who wished the property to be enjoyed by the public. Because of their concern for the area's natural beauty and features, they had not allowed their land to be grazed or timbered. A bronze tablet, placed in the park in 1935, commemorates their contribution. The bulk of the existing park was acquired by the Board of Conservation in the mid-20's, although additional parcels were purchased in 1935, 1940, and 1979. The park now encompasses 417 acres. Formal park dedication was reserved until 1935 when the original land acquisition goals were reached.

Surveys of park resources were conducted in 2019 and 2020. The resulting data was analyzed after the survey was complete. From this survey, the park property was divided into a number of stands. Each stand represents a unit of land which will be managed in a specific way. Stand maps with stand descriptions and management recommendations were developed after discussions with the Park Manager and Area Forester.

### Major Plant Communities

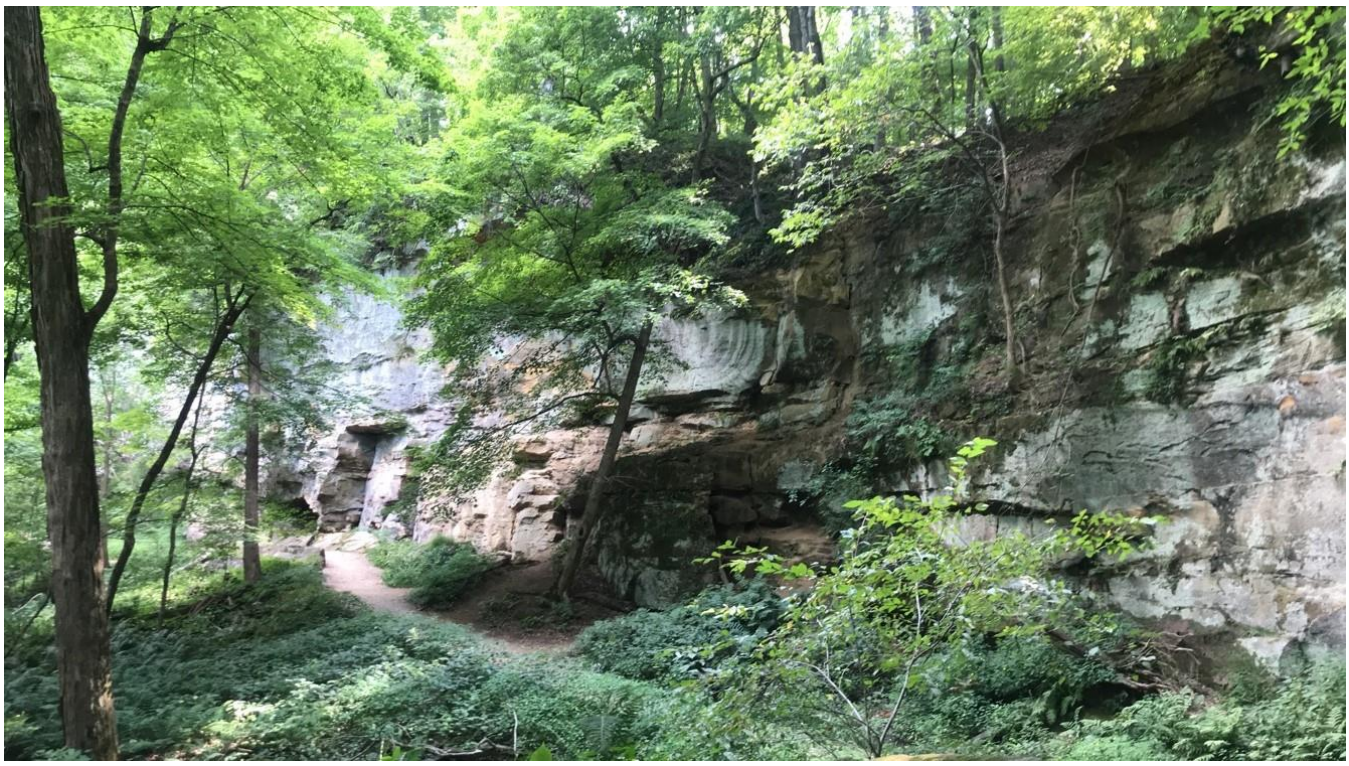
The first glimpse of vegetation in Wildcat Den State Park is from aerial photographs taken in the 1930s. Forest is still the predominant vegetation in the photograph, but open fields are also evident on broad, gently rolling uplands of the state park. When contrasted with the current vegetation aerial photograph, it is obvious that almost all openings have become forested.

In the mature forest in the park, the dominant trees species are white oak, red oak, sugar maple, and basswood. Large diameter oaks typically form a tall canopy of woods. In the bottomland areas, walnut, cottonwood, hackberry, and bitternut hickory dominate the forest canopy. Ironwood, bitternut hickory, basswood, and maple are the common understory trees of woody vegetation between the forest canopy and the forest floor. The mid-successional forest that developed on old fields after acquisition for the park is characterized by a diverse mixture of tree species in the canopy, including, black locust, ash, elm, red oak, walnut, black cherry and hackberry. Scattered pine plantations were also established in the old fields.

**Park Soils**

The U.S. Department of Agriculture (USDA) conducted soil survey work throughout Muscatine County, Iowa in the mid-80s and the names for the soil types was approved in 1989. After analyzing the data, they placed all of the county's soils into map units that, in-turn, were placed within soil series associations. The soil survey contains information that can be used in land-planning programs in Muscatine County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment. This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment. Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

## Natural Resources Management Concerns



**Forest succession**

Forest Succession is the process of orderly changes in a plant community over time due to a relative lack of major disturbances. In Iowa, this process typically occurs slowly over many decades. Early successional species specialize in colonizing highly disturbed sites. Prior to European settlement, the major disturbance factor that created opportunities for early successional colonizing species was periodic fires. Examples of early successional forest species within the park include eastern red cedar, aspen, oak, walnut, and many shrubs. As time progresses, plants that can grow with less and less sunlight move into a site until the climax community has been reached, which is the end of the line for succession. You can witness this process throughout the park since fire has been suppressed for many decades. Common climax forest species for the park includes sugar maple, basswood, white ash, green ash, elm, bitternut hickory and ironwood. Once a forest reaches the climax stage, there tends to be very little vegetation, other than spring ephemerals, in the understory. In Iowa, the early to mid-successional forest stages tend to support far greater plant and animal species diversity. That is the main reason why natural resource managers often work to create or maintain a stand at the early successional Oak-Hickory forest stage verses the late successional Maple-Basswood stage.

**Loss of Oak**

Oaks are the official State Tree of Iowa and are considered by many to be an important "keystone" species within Iowa's forest ecosystems. As a keystone species, oaks play a unique and critical role in the ecosystem that other plants cannot provide. A nearly total lack of recruitment of oak trees is a serious problem within the park, and is largely blamed on the lack of disturbances (e.g. fire and harvesting) which kept this slow-growing species competitive. With no fire to set back the encroachment of competing shade tolerant species, oak seedlings do not persist and are replaced by shade tolerant trees such as ash, elm, sugar maple, basswood, and ash. These tree species have relatively lower wildlife value compared to oak. U.S. Forest Service inventory data suggests the state is losing around 5,000 acres of oak forest per year. The natural lifespan of oak trees varies by species. A healthy mature oak tree's life expectancy within the white oak group (i.e. bur, white, swamp-white) can to be as high as 250 years; species in the red oak group (i.e. black, red, and pin) can reach ages as high as 150

years. While there is some diversity throughout the park, many of the oak trees throughout the park are rapidly approaching their natural life expectancy.

**Impacts of White-tailed Deer on Forest Vegetation & Wildlife**

Just like oak trees are Iowa's keystone tree species, white-tail deer are Iowa's keystone wildlife species. Not too long ago deer were nearly absent from this state and viewing one was considered a rare privilege. Today, thanks to the establishment of hunting rules and their enforcement, deer have become an abundant wildlife resource - a true success story! There is evidence of deer having an impact on some of the understory vegetation, but with proper forest management there can be plenty of understory to go around. The goal when trying to establish oak regeneration is to have at least 2,000 oak seedlings per acre. This should overwhelm the wildlife and ensure an oak population in the future.

**Emerald Ash Borer**

Emerald Ash Borer (EAB) is an exotic pest native to Asia. It is believed that it hitched a ride in packing material and it was first discovered in southeastern Michigan in 2002. The larvae bore into the ash tree and feed on trees xylem tubes, leaving "S" shaped galleries visible underneath the bark. The larval feeding interferes with the trees ability to transport water and nutrients. At some point in the future, staff will need to address ash trees that have died due to EAB. For now, the impacts of EAB is limited.

**Oak Wilt Disease**

Oak Wilt is a systemic vascular wilt disease of oak trees causes by the fungus *Ceratocyctis fagacearum*. Oaks in the red oak group, like northern red oak, pin oak and black oak, are highly susceptible to this disease. Oaks in the white oak group, such as white oak, bur oak, chinquapin oak and swamp white-oak, can get this disease but tend to be more resistant to it. This disease travels through a tree's *xylem* tubes. Xylem is what conducts water and minerals from roots up to the leaves. This fungus blocks these xylem tubs which lead to rapid mortality. Most trees will die within the year in which they first show symptoms. Sap feeding *Nitidulid* beetles are the primary vector that spreads the disease from sick trees to healthy ones. Once established in one tree, the disease can spread to nearby trees via tree-to-tree root grafts. Root grafting can only occur between trees within the same species. As the disease spreads it tends to form pockets of mortality. Breaking root grafts between trees is the most effective way to control this disease. Oak wilt tends to be more of a problem in stands with older red oak trees like those found throughout the park.

**Exotic Invasive Species**

Sometimes exotic (non-native) plant species introduced into an ecosystem can become invasive and disruptive to the balance of a natural ecosystem. Exotic plant and animal species have the ability to out-compete native species and subsequently can cause a decline in biodiversity and ecosystem health. Such is the case with a host of non-native invasive species within the park including: garlic mustard, autumn olive, bush honeysuckle, multiflora rose, and black locust are the most prevalent. There are some areas where bush honeysuckle has taken over the understory, preventing regeneration of desired species. Management of invasive species could be prescribed in just about any area of the park. This plan does not prescribe any invasive species control management, but it is known that these should be controlled when time allows, any time of the year.

**Hazard Tree management**

Hazard trees carry a higher risk of structural failure which could cause property damage or personal injury. To be considered hazardous, a tree must have the following: 1) major structural defect(s) that make it more prone to failure and 2) a nearby target that it could land on such as a building, picnic table, parked car, campsite, bench, high use trail, etc. Larger, taller trees bear more weight and need to be monitored more frequently for structural decline in high-use areas.

**Wildlife Concerns**

Forest management activities such as timber harvesting, thinning, burning and tree planting can have both beneficial and/or detrimental effects to wildlife. The conscious decision to do no forest management (i.e., *hands off* management) can also affect wildlife. Such tradeoffs can be hard to quantify and understand due to the complexity of natural ecosystems. Iowa's Wildlife Action Plan (available at www.iowadnr.gov) identifies 296 *Species of Greatest Conservation Need* which are species that are rare, threatened, endangered, or declining in numbers in the state. Before any activities described in the plan are implemented, they will be studied by DNR environmental review staff to determine potential impacts to State and Federal threatened and endangered species. Management activities will not be prescribed or initiated until the environmental review staff is satisfied that threatened and endangered species will not be threatened or negatively impacted. The appendix summarizes the habitat information from the Iowa Wildlife Action Plan for these species in Eastern Iowa. The activities recommended in this plan are meant to optimize the overall diversity and quality of wildlife habitat for both common wildlife species as well as those that are in need of habitat protection and restoration.

**Special Archaeologist Significance**

A review of records maintained by the State Historical Society of Iowa disclosed no recorded archeological sites within Wildcat Den State Park.

**Harvesting**

Wildcat Den State Park has a wonderful oak resource that is by all accounts mature. Large areas have been identified as mature and could have harvesting done at any time. The harvest areas will be in five year cutting increments. Harvest areas will remain in the 7-10 acre size range in order for staff to be diligent on the necessary management to maximize oak regeneration and establishment. If there are areas of tree mortality as a result of over maturity or health problems, some more intensive management could and should be performed. In areas identified as even age management, the rotation age for oak is 150 years. This means that after clearcutting (regeneration cut), with proper management, it could be harvested in 150 years again. This is the process of creating a forest that will sustain the oak resource for many generations and beyond. Failure to manage on an even age objective will lend the forest to converting to climax species.

## Natural Resource Management Objectives

Natural resource management systems are ways of establishing big picture, long-term management goals and objectives that will be placed on stands so that appropriate short-term and long-term management activities can be determined. Figure 2 in the map section of this plan shows the locations where these systems will be employed. What follows is a brief description of the management systems that will be used within the park. In this plan there is also mention of limited management areas. Low impact management activities, like prescribed burns, invasive species control, trial maintenance, etc., are permitted as long as they have limited impacts or improvement of the area. This plan has management activities planned for the next 20 years and should be considered a **working document**. This is because trees are a long term objective and pests, diseases, environment, climate, etc. do affect the outcome of some management decisions.

**Even Age Management: (255.4 Acres)**

Even-aged management refers to management activities used to create a forest stand that grows for a period of time until it reaches a desirable harvest age or size. At this point the harvesting options become shelterwood or clearcut harvesting, depending on the amount of natural regeneration present. If the stand contains a desired amount of regeneration, a clearcut should be implemented. Lack of regeneration would necessitate a shelterwood harvest, weed tree eradication and/or prescribed woodland burn in order to open up the canopy and increase chances for natural

regeneration. Once the regeneration has been established the shelterwood trees can be removed. Even-aged management is used to insure that shade intolerant species such as oak will remain as a component of the future forest stand. Forest stand improvement is very necessary to keep the forest system and the individual trees in that system vigorous and healthy.

**Un Even Age Management: (53.9 Acres)**

Uneven-aged management refers to an area containing several different age classes within the same stand. These areas may be managed unevenly because of site or species characteristics. An area especially suited to this type of management would be a riparian buffer area or a forest stand comprised of shade tolerant hardwoods. Conifer stands not designated as visual corridors or aesthetic areas will receive uneven-aged management until conversion to native hardwoods is complete. Selective harvesting will occur leaving several different age classes available. Forest stand improvement will be used to eradicate undesirable species and increase the health, vigor, and mast production of the stand.

**Limited Management: (66.1 Acres)**

This management class should be considered light management. Examples of limited management areas are riparian areas, visual corridors, ponds, streams, archeological areas, campgrounds, steep slopes, or unique communities that need special protection. Management activities will take careful planning with water quality and/or public perception in mind. Forest stand improvement will be implemented to sustain health and vigor as well as remove undesirable woody vegetation. Harvesting activities will involve selective tree removal, or in some cases salvage cutting, in order to maintain adequate understory and forest floor vegetative cover. Certain species of wildlife may benefit from the small amount of management that is done.

**Non Forest Management: (35.6 Acres)**

Developed areas, paved roads, agriculture fields, prairie, and savanna are included in this management class. Developed areas and paved roads will only receive maintenance and upkeep in order to keep them functioning properly. Agricultural fields will be utilized to the area's potential until the area is ready to be converted to trees or prairie. Prairie and savanna areas will be managed with prescribed fire and inter-seeding native vegetation as needed. Some wildlife species may benefit from non-forest areas because it adds some diversity to the landscape.

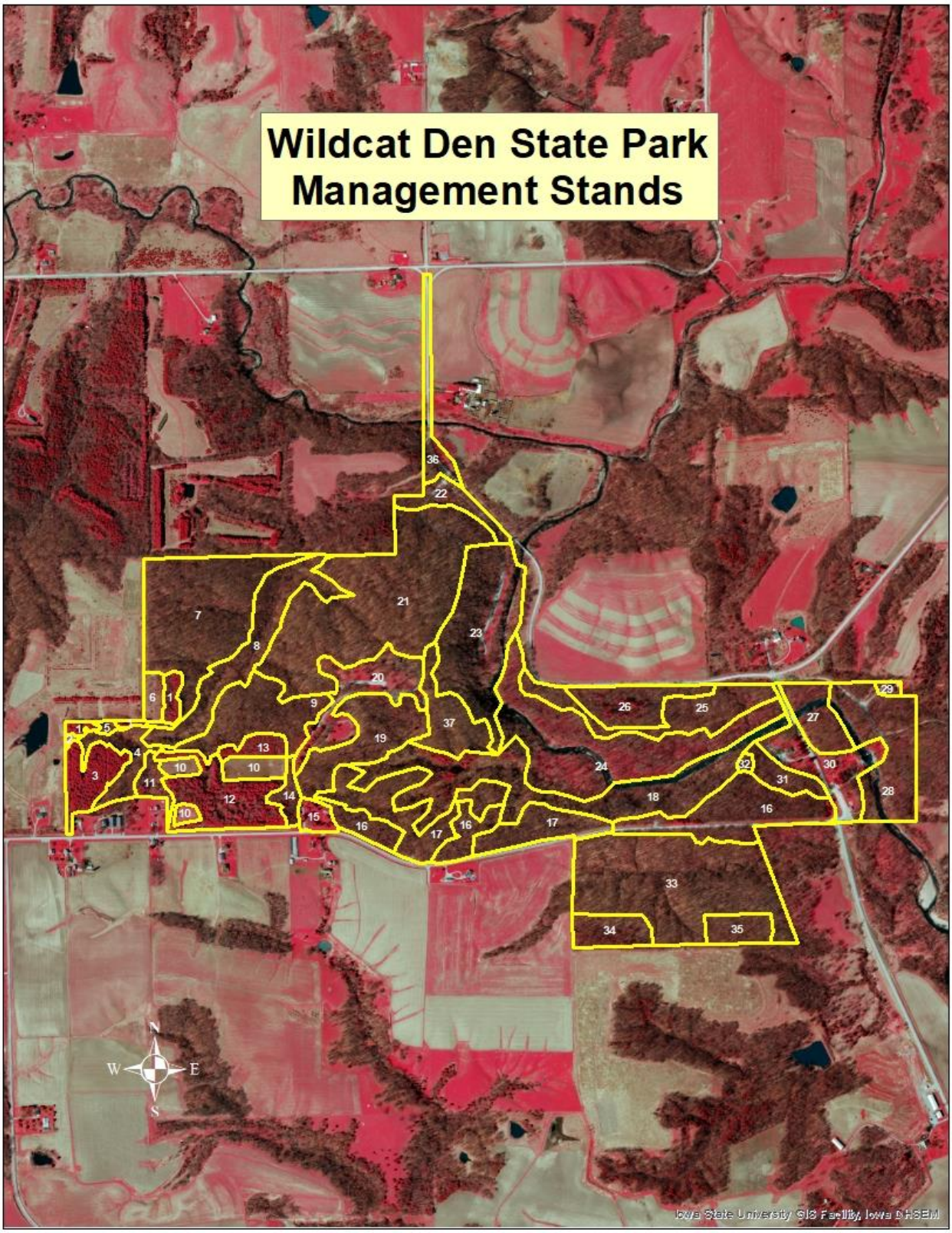



**Figure 1. This image shows stand boundaries and labels overlying a color infrared satellite aerial photo that was taken in 2016.**

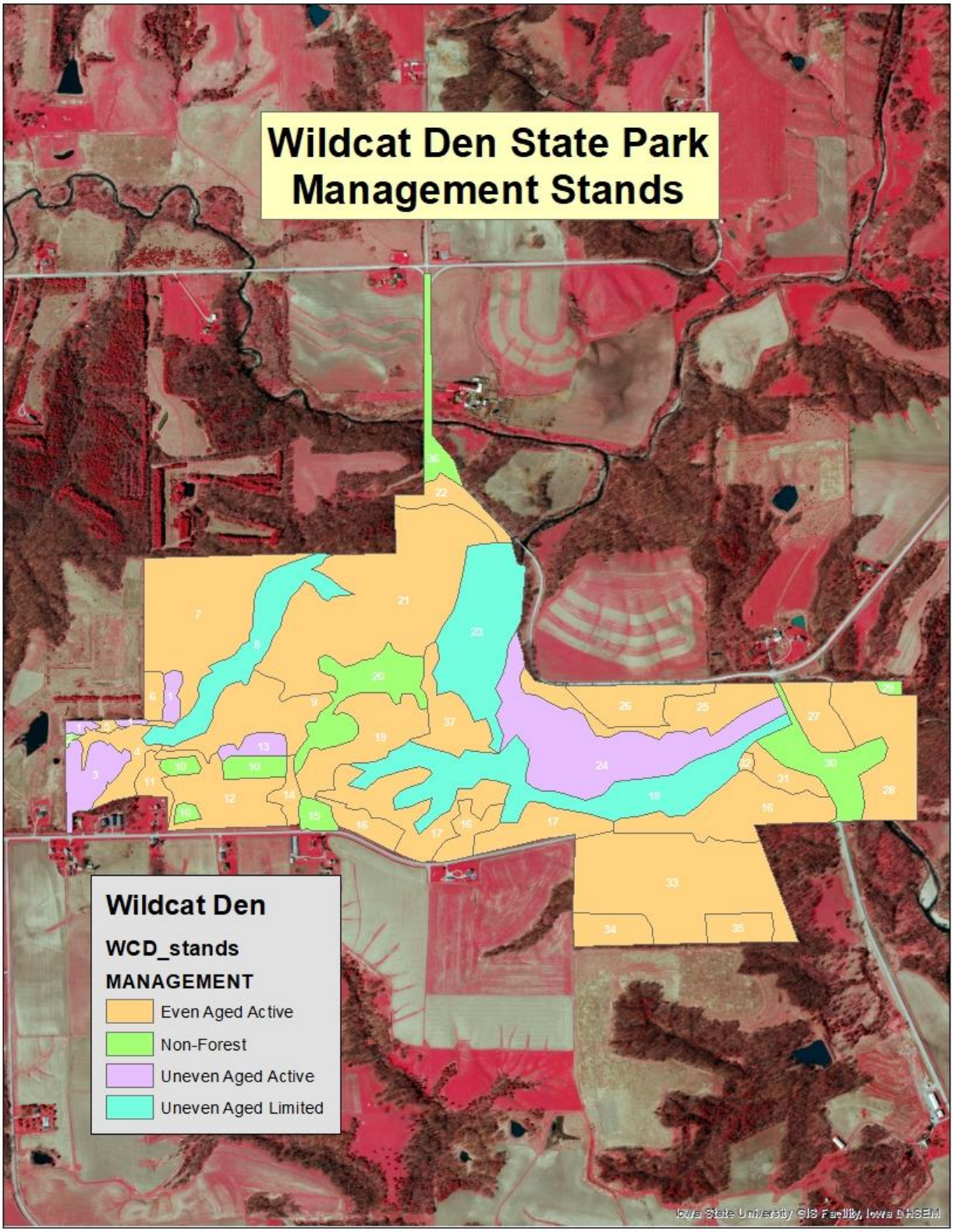



**Figure 2. This image depicts management objectives that have been established for each stand. Management objectives help us determine the treatments for each stand. The specific treatment recommendations are described in detail in the descriptions for individual stands section.**

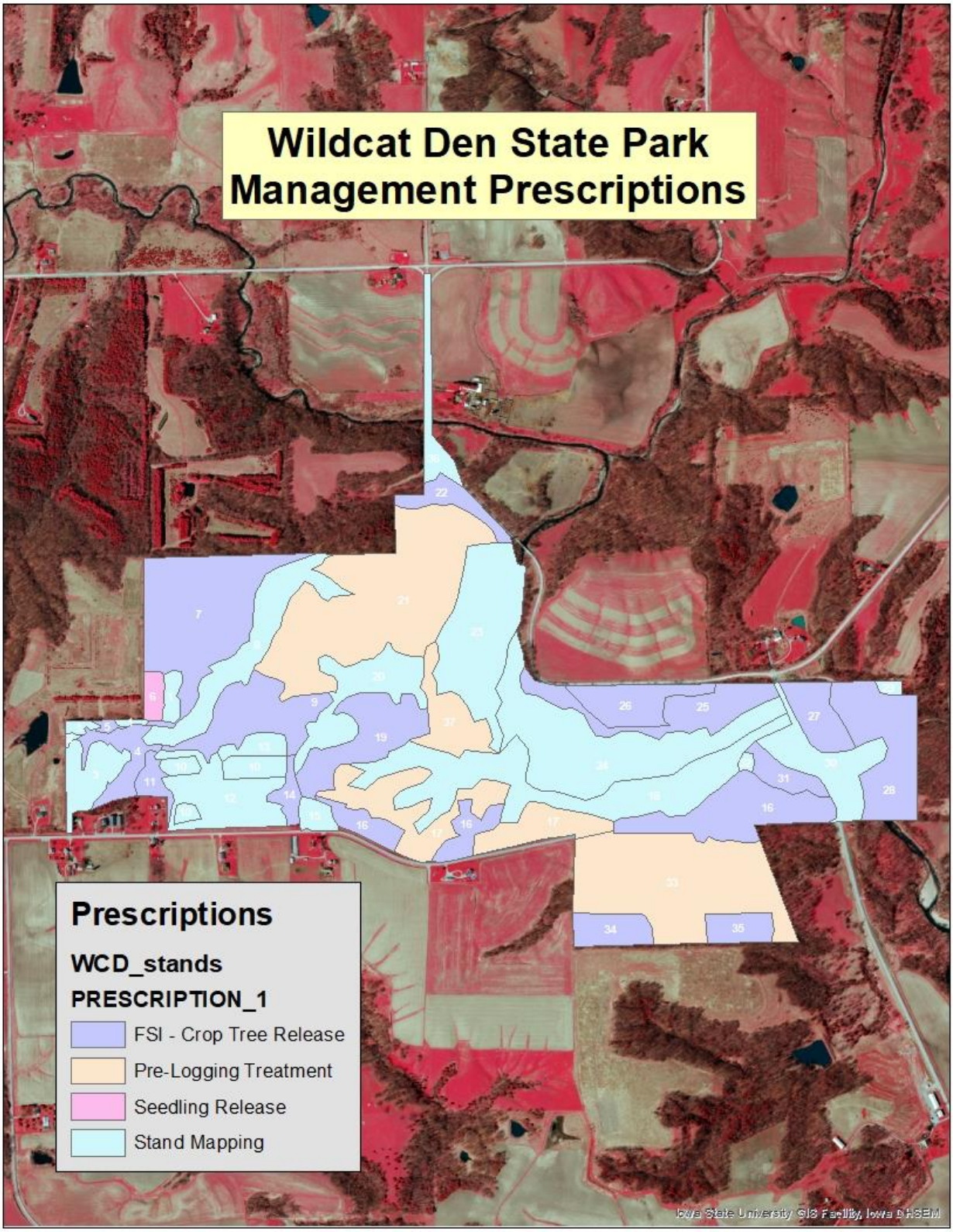



**Figure 3. This image shows the management prescriptions for each stand. Each stand has a timeline of when the management will take place. Pre-Logging treatment (understory release) will only be done if a harvest is prescribed.**

## Descriptions & Recommendations for Individual Stands

**Stand 1: 2.8 acres/ BA: 180**

**Stand Description:** Stand 1 is located in the west corner of the property. (See Figure 1 for stand locations.) The area consists of pole and small sawtimber sized (10-16") white pine. Other species in the stand is an occasional walnut. Understory is cherry, elm, ash, and some honeysuckle. Regeneration mainly consists of cherry. The soil is Rozetta and Fayette silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have healthy white pine stand for added diversity to the park. There is also an aesthetic benefit as well.

**Recommendations/Prescriptions (Uneven aged Management):** This area should be monitored for health problems to ensure that the white pine is not declining. There is a trail going by this stand so health problems should be detected early. If there is a significant amount of mortality in the future, then other management options can be implemented.

**Stand 2: .25 acres/ BA: N/A**

**Stand Description:** Stand 2 is located in the west part of the park. The western edge of the stand is the property line. The area is an open grassy space. The soil is Rozetta silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area for grass in order to prevent erosion. This area is the start of a waterway and is doing a good job of soil stabilizing.

**Recommendations/Prescriptions (Non forest Management):** Continue to maintain the grass in this stand. Shortly after the stand it becomes the start of a big ravine.

**Stand 3: 6.5 acres/ BA: 200**

**Stand Description:** Stand 3 is located in the west corner of the property. The area consists of pole and small sawtimber sized (10-16") white pine. Other species in the stand is elm. There is a line of elm running from the parking area along the trail. Understory is hackberry, elm, and some honeysuckle. Regeneration mainly consists of elm and honeysuckle, but is pretty scare due to density of the tree canopy. The soil is Rozetta and Fayette silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have healthy white pine stand for added diversity to the park. There is also an aesthetic benefit as well.

**Recommendations/Prescriptions (Uneven aged Management):** This area should be monitored for health problems to ensure that the white pine is not declining. There is a trail going by part of this stand so health problems should be detected early. If there is a significant amount of mortality in the future, then other management options can be implemented.

**Stand 4: 5.3 acres/ BA: 110**

**Stand Description:** Stand 4 is located in the western part of the park. This stand encompasses a ditch and the southern part of this stand is the property boundary. The area consists of sawtimber sized (10-26") red oak. Other species in the stand are black oak, bur oak, cottonwood, elm, black locust, cherry, cedar, bitternut hickory, white oak, mulberry, and an occasional osage orange and white pine. Understory is hackberry, elm, red oak, cherry, mulberry, and ironwood. Regeneration mainly consists of boxelder, hickory, cherry, and honeysuckle. The soils are Gale silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have healthy oak and hickory for future generations. The high amount of red oak needs to be watched for mortality from oak wilt.

**Recommendations/Prescriptions (Even age Management):** This area is a **low** priority for crop tree release due to the composition of the stand and the size of the trees. There is a lot of red and black oak in the stand so there must always be a look out for oak wilt problems. The best crop tree species to select for management in this area is white oak, bur oak, black oak, and red oak. Areas with bigger trees will receive less thinning. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. This will help to keep them growing fast and healthy.

**Stand 5: .5 acres/ BA: 70**

**Stand Description:** Stand 3 is located in the western part of the park next to the park boundary. The area consists of pole sized (8-14") black locust. Other species in the stand are bitternut hickory and cherry. Understory is bitternut

hickory, cherry, and mulberry. Regeneration mainly consists of honeysuckle, hackberry, hickory, and elm. The soils are Rozetta and Gale silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have oak and walnut for future generations. With black locust in the stand this objective will take time and patience to achieve.

**Recommendations/Prescriptions (Even age Management):** This area is a **low** priority for crop tree release due to the abundant amount of black locust in the stand. There are not many desirable species in this stand so there should be no management at this time. In the future, this stand will go through a phase of shade tolerant trees inhabiting the stand when the locust starts dying. When several locust trees start to die, hand planting desirable species should be implemented in order to change the composition of the stand. Active competition control will be key to the survival of the planted trees. More than likely the hand planting will be 20+ years from now, but the stand is next to the trail so it should be monitored regularly.

**Stand 6: 2 acres/ BA: 30**

**Stand Description:** Stand 6 is located in the western part of the park next to the park boundary. The area consists of small pole sized (3-8") walnut. Other species in the stand are red cedar, ash, and honey locust. Understory is pretty thin but does contain some autumn olive. Regeneration mainly consists of grass and a few miscellaneous shrubs. The soils are Rozetta and Fayette silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area for the walnut that was planted. In the near future it is projected that the trees will fill in and shade out the grass and other competition.

**Recommendations/Prescriptions (Even age Management):** This area is a **medium** priority for plantation maintenance. The walnut in the planting are in need of some spraying in order to set back the grass competition. This should allow the trees to grow faster and be healthier in the future. If there are some undesirable species (honey locust) competing with the walnut, they should be removed. If the undesirable species are not competing with the walnut, then they could be left to help train the walnut and shade out the grass competition. Some oak could be planted in the stand if there are big enough gaps that would allow ample sunlight for them to get established. If deer damage becomes a problem, then there might have to be some protection cages put around the trees.

**Stand 7: 27 acres/ BA: 90**

**Stand Description:** Stand 7 is located in the south central part of the park. This stand is located next to the road and by a storage space. The area consists of pole and small sawtimber sized (12-22") red oak. Other species in the stand are ash, cherry, black oak, basswood, bur oak, bitternut hickory, mockernut hickory, white oak, and an occasional cottonwood, aspen, and osage orange. Understory is bitternut hickory, elm, sugar maple, and ironwood. Regeneration mainly consists of ash, bitternut hickory, and elm. The soils are Fayette, Rozetta, and Gale silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have healthy oak and hickory for future generations. The high amount of red oak needs to be watched for mortality from oak wilt.

**Recommendations/Prescriptions (Even age Management):** This area is a **low** priority for crop tree release due to the composition of the stand and the size of the trees. There is a lot of red oak in the stand so there must always be a look out for oak wilt problems. If time allows to do management, the best crop tree species to select for management in this area is white oak, bur oak, mockernut hickory, red oak, and black oak. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. This will help to keep them growing fast and healthy.

**Stand 8: 14.5 acres/ BA: 90**

**Stand Description:** Stand 8 is located in the western part of the park and is very scenic. This stand is a really steep ravine running northeast to southwest. The area consists of sawtimber sized (14-22") red oak. Other species in the stand are river birch, sugar maple, cherry, bitternut hickory, ash, elm, cottonwood, and basswood. Understory is sugar maple, elm, ironwood, ash, cherry, and bitternut hickory. Regeneration mainly consists of honeysuckle. This stand is very steep and the management should be limited. The soil is Gale silt loam.

**Management Objectives and Future Conditions:** The objectives for this stand include watching the trees for health problems. Maintain tree cover to reduce erosion.

**Recommendations/Prescriptions (Un-even Age Limited Management):** Management activities are limited to removing hazard trees and maintaining tree cover on the steep slope.

**Stand 9: 13 acres/ BA: 110**

**Stand Description:** Stand 9 is located in the west central part of the park. Parts of the east border of the stand is along the road. The area consists of sawtimber sized (12-22") black oak and red oak. Other species in the stand are ash, cherry, cedar, mockernut hickory, bitternut hickory, basswood, and an occasional aspen, bur oak, and walnut. Understory is ash, elm, bitternut hickory, cherry, honeysuckle, and ironwood. Regeneration mainly consists of ash and hickory. The soils are Fayette and Gale silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have healthy oak and hickory for future generations. The high amount of red oak and ash needs to be watched for mortality from oak wilt and Emerald Ash Borer.

**Recommendations/Prescriptions (Even age Management):** This area is a **low** priority for crop tree release due to the composition of the stand and the size of the trees. There is a lot of red oak in the stand so there must always be a look out for oak wilt problems. If time allows to do management, the best crop tree species to select for management in this area is white oak, bur oak, mockernut hickory, red oak, and black oak. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. This will help to keep them growing fast and healthy.

**Stand 10: 5 acres/ BA: N/A**

**Stand Description:** Stand 10 is located in the west central part of the park. The area consists of mixed grass. The area was farmed for a few years to slow down the spread of invasive autumn olive and honeysuckle. The soils are Fayette, Traer, and Stronghurst silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area as an open area. There are some invasive species that will need to be removed from time to time.

**Recommendations/Prescriptions (Non Forest Management):** This area will remain in grass, but there is a chance that invasive autumn olive and honeysuckle could encroach on the site. Occasionally burning or spraying the invasive species should keep them at bay.

**Stand 11: 2.4 acres/ BA: 70**

**Stand Description:** Stand 11 is located in the southwest part of the park. The property line is the southern border. The area consists of pole sized (6-16") elm and boxelder. Other species in the stand are mulberry and cherry. Understory is mulberry, elm, honeysuckle, and hackberry. Regeneration mainly consists of mulberry, hackberry, and elm. The soils are Fayette and Gale silt loam.

**Management Objectives and Future Conditions:** The objective is to utilize the diversity of the stand since there is no/or very scattered oak. When tree start to die, oak and other desirable species could be planted.

**Recommendations/Prescriptions (Even age Management):** This area is a **low** priority for crop tree release due to the lack of oak trees in the stand. Hackberry, mulberry, and boxelder are decent trees for wildlife and could be managed for when higher priority stands get done. In this area the best crop tree species to select for management in this area is mulberry, hackberry, and any oak if they can be found. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. Once the trees start to decline, gaps could be made big enough for oak to be planted.

**Stand 12: 12.3 acres/ BA: 180**

**Stand Description:** Stand 12 is located in the south central part of the park. The area consists of small sawtimber sized (12-18") white pine. Other species in the stand are elm, cottonwood, cherry, and an occasional red pine. Understory is cherry, elm, and honeysuckle. Regeneration mainly consists of honeysuckle, elm, and boxelder. The soils are Fayette, Traer, and Stronghurst silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have healthy white pine stand for added diversity to the park.

**Recommendations/Prescriptions (UnEven age Management):** This area should be monitored for health problems every 10 years to ensure that the white pine is not declining. If there is a significant amount of mortality in the future, then other management options can be implemented.

**Stand 13: 2.5 acres/ BA: 170**

**Stand Description:** Stand 13 is located in the south central part of the park. The area consists of pole and small sawtimber sized (8-18") red pine. Other species in the stand are cottonwood, cherry, and an occasional walnut. Understory is hackberry and honeysuckle. Regeneration mainly consists of honeysuckle, hickory, and elm. The soils are Fayette, Traer, and Stronghurst silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have healthy red pine stand for added diversity to the park.

**Recommendations/Prescriptions (UnEven age Management):** This area should be monitored for health problems every 10 years to ensure that the red pine is not declining. If there is a significant amount of mortality in the future, then other management options can be implemented.

**Stand 14: 2.2 acres/ BA: 100**

**Stand Description:** Stand 14 is located in the south central part of the park next to the south entrance to the park. The area consists of pole and small sawtimber sized sized (14-20") walnut. Other species in the stand are black oak, hackberry, red cedar, elm, cherry, honey locust, ash, and boxelder. The western part of the stand contains more of the boxelder and elm and not as much walnut and oak. Understory is black oak, redbud, honeysuckle, elm, and mixed shrubs. Regeneration mainly consists of ash, honeysuckle, and elm. The soils are Stronghurst and Rozetta silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak and walnut healthy.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the amount of walnut and oak in the stand. The best crop tree species to select for management in this area is walnut and any oak that can be found. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. Forest management will help to keep residual trees healthy and growing fast.

**Stand 15: 2.1 acres/ BA: N/A**

**Stand Description:** Stand 15 is located in the west central part of the park and is the south entrance. This stand is a mostly open area with some large pole sized white pine. This area is mowed and has a tower located in the eastern part of the area.

**Management Objectives and Future Conditions:** The objectives for this stand include watching the trees for health problems. It is also possible if there are several trees dying that some saplings could be planted to replace the dead ones.

**Recommendations/Prescriptions (Non-Forest Management):** Management activities are basically limited to taking care of hazard trees and replanting trees when they die.

**Stand 16: 22.6 acres/ BA: 90**

**Stand Description:** Stand 16 is located in the southern part of the park in three separate areas. The area consists of small pole and small sawtimber sized (12-18") black locust, walnut, and red oak. Other species in the stand are hackberry, cherry, ash, bitternut hickory, elm, honey locust, sugar maple, and scattered cedar. Understory is hackberry, ash, honeysuckle, elm and mulberry. Regeneration mainly consists of ash, honeysuckle, and hickory. The soils are Fayette silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak and walnut healthy. Oak and walnut will remain after black locust dies.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the abundant amount of oak and walnut in the stand. There are areas where some oak wilt has managed to kill a few trees but it is not overwhelming death. The best crop tree species to select for management in this area is walnut and any species of oak. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. Forest management will help to keep residual trees healthy.

**Stand 17: 20.7 acres/ BA: 90**

**Stand Description:** Stand 17 is located in the southern part of the park. The area consists of sawtimber sized (14-24") white oak, red oak, and basswood. Other species in the stand are ash, walnut, sugar maple, elm, cherry, bitternut hickory, and shagbark hickory. Understory is bitternut hickory, cherry, elm, sugar maple, and ironwood. Regeneration mainly consists of bitternut hickory, cherry, elm, sugar maple, and ironwood. The soils are Fayette silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have oak for future generations. There are several areas similar to this in Wildcat Den that could be harvested. When deciding on harvest only part of this stand will be harvested when based on the annual harvest. When the harvest area is determined, that harvested area will become a new stand to indicate the changes.

**Recommendations/Prescriptions (Even age Management):** This area should be on the list for shelterwood harvesting. The trees are mature and at a good stage to be able to drop seed to establish the next stand of oak. Since there is not much oak regeneration, all understory trees size 1" to 10" should be removed in order to provide more light to forest floor and give new oak seedlings a chance to grow. This will also help new seedlings to become established by seed during a moderate acorn production year. If there are multiple years without a moderate acorn crop, then prescribed fire could be used to eliminate small caliper understory vegetation. The high amounts sugar maple in the stand could mean more prescribed fire might be needed to keep it at bay. Once the shelterwood harvest is done this stand should be clear cut harvested when it is determined there is enough oak seedlings to ensure it will be an oak stand in the future. Typically, the clear cut harvest is done at least 10 years after the shelterwood harvest.

**Stand 18: 29.5 acres/ BA: 90**

**Stand Description:** Stand 18 is located in the southern part of the park. This stand is a really steep ravine running east to west with some fingers in the western part of the ravine. The area consists of sawtimber sized (14-22") red oak. Other species in the stand are white oak, basswood, sugar maple, shagbark hickory, and an occasional black locust. Understory is sugar maple. Regeneration mainly consists of sugar maple and elm. This stand is very steep and the management should be limited. The soil is Gale silt loam.

**Management Objectives and Future Conditions:** The objectives for this stand include watching the trees for health problems. Maintain tree cover to reduce erosion.

**Recommendations/Prescriptions (Un-even Age Limited Management):** Management activities are limited to removing hazard trees and maintaining tree cover on the steep slope.

**Stand 19: 12.5 acres/ BA: 80**

**Stand Description:** Stand 19 is located in the south central part of the park. The area consists of pole and small sawtimber sized (12-18") red oak and ash. Other species in the stand are cherry, ash, walnut, black oak, white oak, bitternut hickory, elm, hackberry, black locust, and scattered cedar. Understory is hackberry, ash, and elm. Regeneration mainly consists of ash, honeysuckle, and hickory. The soils are Fayette silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak and walnut healthy. This stand will contain oak in the future with forest management.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the abundant amount of oak and walnut in the stand. There are areas where some oak wilt has managed to kill a few trees but it is not overwhelming death. The best crop tree species to select for management in this area is walnut, any species of oak, and species that can benefit wildlife. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. Forest management will help to keep residual trees healthy.

**Stand 20: 11.7 acres/ BA: N/A**

**Stand Description:** Stand 20 is located in the central part of the park. This area is the campground and picnic area for recreation at Wildcat Den State Park. The trees in this area should be maintained for health and as trees die they should be removed so they do not pose a hazard to users. There could be some planting done in the area if there is significant tree mortality. When planting new trees remember to plant a diverse mix of species in case of future pests/disease. This area is mowed and maintained as a campground and picnic area. The soil is Fayette silt loam.

**Management Objectives and Future Conditions:** The major objectives for this stand include watching the trees for health problems and removing them as needed. It is also possible if there are several trees dying that some saplings could be planted to replace the dead ones.

**Recommendations/Prescriptions(Non Forest Management):** Management activities are basically limited to taking care of hazard trees, buildings, and maintaining as a recreation area.

**Stand 21: 44.8 acres/ BA: 90**

**Stand Description:** Stand 21 is located in the north central part of the park. The area consists of sawtimber sized (14-24") white oak, red oak, and black oak. Other species in the stand are sugar maple, basswood, bitternut hickory, and shagbark hickory. Understory is bitternut hickory, cherry, hackberry, elm, sugar maple, and ash. Regeneration mainly consists of sugar maple and elm. The soils are Fayette and Gale silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have oak for future generations. There are several areas similar to this in Wildcat Den that could be harvested. When deciding on harvest only part of this stand will be harvested when based on the annual harvest. When the harvest area is determined, that harvested area will become a new stand to indicate the changes.

**Recommendations/Prescriptions (Even age Management):** This area should be on the list for shelterwood harvesting. The trees are mature and at a good stage to be able to drop seed to establish the next stand of oak. Since there is not much oak regeneration, all understory trees size 1" to 10" should be removed in order to provide more light to forest floor and give new oak seedlings a chance to grow. This will also help new seedlings to become established by seed during a moderate acorn production year. If there are multiple years without a moderate acorn crop, then prescribed fire could be used to eliminate small caliper understory vegetation. The high amounts sugar maple in the stand could mean more prescribed fire might be needed to keep it at bay. Once the shelterwood harvest is done this stand should be clear cut harvested when it is determined there is enough oak seedlings to ensure it will be an oak stand in the future. Typically, the clear cut harvest is done at least 10 years after the shelterwood harvest.

**Stand 22: 4.3 acres/ BA: 80**

**Stand Description:** Stand 22 is located in the northern part of the park next to the north entrance to the park. This mostly a bottomland. The area consists of pole and small sawtimber sized sized (12-18") walnut. Other species in the stand are basswood, elm, cherry, bitternut hickory, cottonwood, and an occasional sycamore. Understory is ash, hackberry, and mulberry. Regeneration mainly consists of ash, hackberry, and elm. The soils are Orthents, loamy.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing walnut healthy.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the amount of walnut in the stand. The best crop tree species to select for management in this area is walnut and any oak that can be found, or good wildlife species, such as hackberry. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. Forest management will help to keep residual trees healthy and growing fast.

**Stand 23: 22.1 acres/ BA: 40**

**Stand Description:** Stand 23 is located in the northern part of the park. This stand is a picnic area and parking lot to access trails. This area also contains bluffs and very steep slopes that are have great aesthetics. The area consists of pole and sawtimber sized (14-22") red oak. Other species in the stand are white oak, basswood, sugar maple, shagbark hickory, and an occasional black locust. Understory is sugar maple. Regeneration mainly consists of sugar maple and elm. This stand is very steep and the management should be limited. The soil is Gale silt loam.

**Management Objectives and Future Conditions:** The objectives for this stand include watching the trees for health problems. Maintain tree cover to reduce erosion.

**Recommendations/Prescriptions (Un-even Age Limited Management):** Management activities are limited to removing hazard trees and maintaining tree cover on the steep slope. The planted trees by the parking area should be maintained with pruning, mulching, and protected from wildlife.

**Stand 24: 29.8 acres/ BA: 110**

**Stand Description:** Stand 24 is located in the central part of the park. This stand is the riparian area running along Pine Creek. The area consists of sawtimber sized (14-24") walnut. There are 24"+ cottonwood and walnut trees scattered

throughout the area. Other species in the stand are elm, hackberry, ash, silver maple, and scattered black locust. Understory is elm, ash, and hackberry. Regeneration is pretty thin. The soils are Radford-Hanlon and Zwingle silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing walnut healthy. This stand has walnut and other bottomland hardwoods reaching maturity and could have harvesting done in the next 10-20 years.

**Recommendations/Prescriptions (Un-even age Management):** For now, this area should just be monitored for forest health concerns and re-inventoried in 10 years. This stand has several mature trees that, mostly, do not look like they are declining at this point. Sometime in the next 10-20 years it would be beneficial to utilize some of the trees with a selective harvest. A selective harvest will afford the opportunity to remove the most mature and unhealthy trees. With the removal of the trees there will be some site prep implemented in order to encourage walnut regeneration.

**Stand 25: 11.1 acres/ BA: 90**

**Stand Description:** Stand 25 is located in the north central part of the park. This stand is the slope and upland part of the riparian area of Pine Creek. The area consists of pole and small sawtimber sized (12-18") white oak, ash, and shagbark hickory. Other species in the stand are walnut, bur oak, elm, hackberry, red oak, black oak, basswood, and sugar maple. Understory is honeysuckle, sugar maple, ash, shagbark hickory, and hackberry. Regeneration mainly consists of ash and honeysuckle. The soils are Zwingle silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak, walnut, and hickory healthy. This stand will have good diversity for many years with forest management.

**Recommendations/Prescriptions (Even age Management):** This area is a **medium** priority for crop tree release due to the amount of walnut and oak in the stand. The best crop tree species to select for management in this area is white oak, walnut, red oak, black oak, bur oak, and shagbark hickory. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. There are scattered trees throughout the area that are 22"+ in diameter. These areas with bigger trees should receive less thinning management because they are already close to maturity. Forest management will help to keep residual trees healthy.

**Stand 26: 8 acres/ BA: 80**

**Stand Description:** Stand 26 is located in the north central part of the park. This stand is along the gravel road next to the property border. The area consists of pole sized (8-16") ash, basswood, and shagbark hickory. Other species in the stand are walnut, bur oak, elm, hackberry, red oak, black oak, bitternut hickory, sugar maple, and white pine, and aspen. Understory is elm, ash, shagbark hickory, and hackberry. Regeneration mainly consists of hackberry, elm, ash and honeysuckle. The soils are Zwingle silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak, walnut, and hickory healthy. This stand will have good diversity for many years with forest management.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the amount of walnut and oak in the stand. The best crop tree species to select for management in this area is walnut, red oak, black oak, bur oak, and shagbark hickory. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. Forest management will help to keep residual trees healthy.

**Stand 27: 6.2 acres/ BA: 100**

**Stand Description:** Stand 27 is located in the eastern part of the park. This stand is the riparian area running along Pine Creek. The area consists of pole and small sawtimber sized (12-20") walnut and red oak. There are 22"+ red oak trees scattered throughout the area. Other species in the stand are bur oak, white oak, ash, cherry, hackberry, and an occasional cedar. Understory is elm, shagbark hickory, and hackberry. Regeneration mainly consists of honeysuckle, ash, and elm. The soils are Radford-Hanlon and Zwingle silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak, walnut, and hickory healthy. Forest management will help to keep this stand stocked with oak and walnut.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the amount of walnut and oak in the stand. The best crop tree species to select for management in this area is white

oak, walnut, bur oak, red oak, and shagbark hickory. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. There are scattered trees throughout the area that are 22"+ in diameter. These areas with bigger trees should receive less thinning management because they are already close to maturity. Forest management will help to keep residual trees healthy.

**Stand 28: 16.3 acres/ BA: 90**

**Stand Description:** Stand 28 is located in the eastern part of the park next to the property border. This stand is the riparian area running along Pine Creek. The area consists of pole and small sawtimber sized (12-20") walnut. There are 22"+ cottonwood trees scattered throughout the area. Other species in the stand are bur oak, red oak, black oak, ash, cherry, shagbark hickory, black locust, basswood, silver maple, honey locust, and an occasional sycamore. Understory is ash, honeysuckle, and hackberry. Regeneration mainly consists of honeysuckle, hackberry, and elm. The soils are Radford-Hanlon and Zwingle silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak, walnut, and hickory healthy. Forest management will help to keep this stand stocked with oak and walnut.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the amount of walnut and oak in the stand. The best crop tree species to select for management in this area is white oak, walnut, bur oak, red oak, and shagbark hickory. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. There are scattered trees throughout the area that are 22"+ in diameter. These areas with bigger trees should receive less thinning management because they are already close to maturity. Forest management will help to keep residual trees healthy.

**Stand 29: .7 acres/ BA: N/A**

**Stand Description:** Stand 27 is located in the eastern part of the park. This area contains the park ranger's house. The trees in this area should be maintained for health and as trees die they should be removed. There could be some planting done in the area if there is significant tree mortality. The soil is Fayette silt loam.

**Management Objectives and Future Conditions:** The major objectives for this stand include watching the trees for health problems and removing them as needed. It is also possible if there are several trees dying that some saplings could be planted to replace the dead ones.

**Recommendations/Prescriptions (Non Forest Management):** Management activities are basically limited to taking care of hazard trees, buildings, and maintaining as a housing.

**Stand 30: 10.9 acres/ BA: N/A**

**Stand Description:** Stand 30 is located in the eastern part of the park. This stand is located along Wildcat Den road and covers the picnic area, parking lot, park office, and the Pine Creek Grist Mill. The trees in this area should be maintained for health and as trees die they should be removed. There could be some planting done in the area if there is significant tree mortality.

**Management Objectives and Future Conditions:** The objectives for this stand include watching the trees for health problems and maintaining the facilities for recreation. It is also possible if there are several trees dying that some saplings could be planted to replace the dead ones.

**Recommendations/Prescriptions (Non-Forest Management):** Management activities are basically limited to taking care of hazard trees, buildings, and maintaining as a recreation area.

**Stand 31: 3.7 acres/ BA: 70**

**Stand Description:** Stand 31 is located in the western part of the park. This stand is a bottomland area next to the park headquarters. The area consists of large pole to sawtimber sized (12-18") ash. Other species in the stand are red oak, walnut, and sugar maple. Understory is bitternut hickory and ash. Regeneration mainly consists of ash, hickory, and sugar maple. The soils are Fayette and Zwingle silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak and walnut healthy. Forest management of this stand will keep the desirable oak and walnut dominate.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the amount of walnut and oak in the stand. The best crop tree species to select for management in this area is walnut

and red oak. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. Areas with bigger trees should receive less thinning management because they are already close to maturity. Forest management will help to keep residual trees healthy.

**Stand 32: .5 acres/ BA: 130**

**Stand Description:** Stand 32 is located in the eastern central part of the park. The area consists of sawtimber sized (14-28") white oak. This stand is small but contains some really nice white oak. Other species in the stand are ash and shagbark hickory. Understory is ironwood, sugar maple, and ash. Regeneration mainly consists of ironwood. The soils are Zwingle silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have oak for future generations.

**Recommendations/Prescriptions (Even age Management):** This area should be monitored for forest health and re-inventoried in 10 years to see how the white oak is doing. If there starts to be a problem with some of the oaks dying, a harvest should be considered so this stand does convert to sugar maple.

**Stand 33: 35.8 acres/ BA: 90**

**Stand Description:** Stand 33 is located in the southern part of the park. The area consists of sawtimber sized (14-24") white oak. Other species in the stand are red oak, hackberry, sugar maple, basswood, walnut, elm, bitternut hickory, shagbark hickory, and an occasional mockernut hickory and black locust. Understory is ironwood, hackberry, elm, sugar maple, and ash. Sugar maple is thick in spots. Regeneration mainly consists of sugar maple, ash, hackberry, and cherry. The soils are Fayette and Gale silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have oak for future generations. There are several areas similar to this in Wildcat Den that could be harvested. When deciding on harvest only part of this stand will be harvested when based on the annual harvest. When the harvest area is determined, that harvested area will become a new stand to indicate the changes.

**Recommendations/Prescriptions (Even age Management):** This area should be on the list for shelterwood harvesting. The trees are mature and at a good stage to be able to drop seed to establish the next stand of oak. Since there is not much oak regeneration, all understory trees size 1" to 10" should be removed in order to provide more light to forest floor and give new oak seedlings a chance to grow. This will also help new seedlings to become established by seed during a moderate acorn production year. If there are multiple years without a moderate acorn crop, then prescribed fire could be used to eliminate small caliper understory vegetation. The high amounts sugar maple in the stand could mean more prescribed fire might be needed to keep it at bay. Once the shelterwood harvest is done this stand should be clear cut harvested when it is determined there is enough oak seedlings to ensure it will be an oak stand in the future. Typically, the clear cut harvest is done at least 10 years after the shelterwood harvest.

**Stand 34: 4.9 acres/ BA: 80**

**Stand Description:** Stand 34 is located in the southern part of the park next to the property border. The area consists of pole and small sawtimber sized (10-18") walnut and cherry. Other species in the stand are ash, red oak, elm, cedar, and mulberry. Understory is ash, cherry, honeysuckle, sugar maple, and shrubs. Regeneration mainly consists of honeysuckle, cherry, and ash. The soils are Fayette silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak and walnut healthy. Forest management will help to keep this stand stocked with oak and walnut.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the amount of walnut and oak in the stand. The best crop tree species to select for management in this area is walnut and red oak. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. Forest management will help to keep residual trees healthy.

**Stand 35: 3.9 acres/ BA: 80**

**Stand Description:** Stand 35 is located in the southern part of the park next to the property border. The area consists of pole and small sawtimber sized (12-18") walnut and black oak. Other species in the stand are ash, red oak, elm, cherry, black locust, sugar maple, and bitternut hickory. Understory is ash, bitternut hickory, elm, sugar maple, and hackberry. Regeneration mainly consists of elm, hackberry, and ash. The soils are Fayette silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to keep existing oak and walnut healthy. Forest management will help to keep this stand stocked with oak and walnut.

**Recommendations/Prescriptions (Even age Management):** This area is a **high** priority for crop tree release due to the amount of walnut and oak in the stand. The best crop tree species to select for management in this area is walnut and red oak. Tree form, health, and dominance must also be considered. Trees that are dominant or co-dominant should be the majority of the trees selected for release. Areas with bigger trees should receive less thinning management because they are already close to maturity. Forest management will help to keep residual trees healthy.

**Stand 36: 4.9 acres/ BA: N/A**

**Stand Description:** Stand 36 is located in the north part of the park and is the north entrance. This stand is the gravel road on the north side of the park, leading to the park entrance. There are some sawtimber sized white oak, red oak, basswood, and shagbark hickory right at the entrance.

**Management Objectives and Future Conditions:** The objectives for this stand include watching the trees for health problems. There could be some tree removal in the future if there are mortality issues.

**Recommendations/Prescriptions (Non-Forest Management):** Management activities are basically limited to maintaining the gravel road for access and watching the sawtimber sized trees for hazards.

**Stand 37: 7.7 acres/ BA: 100**

**Stand Description:** Stand 37 is located in the central part of the park. The area consists of sawtimber sized (14-24") white oak. Other species in the stand are sugar maple, basswood, ash, red oak, and an occasional walnut. Understory is cherry, sugar maple, and ironwood. Regeneration mainly consists of ironwood, hickory, and cherry. The soils are Fayette and Gale silt loam.

**Management Objectives and Future Conditions:** The objective is to manage this area in order to have oak for future generations. There are several areas similar to this in Wildcat Den that could be harvested. When deciding on harvest only part of this stand will be harvested when based on the annual harvest. When the harvest area is determined, that harvested area will become a new stand to indicate the changes.

**Recommendations/Prescriptions (Even age Management):** This area should be on the list for shelterwood harvesting. The trees are mature and at a good stage to be able to drop seed to establish the next stand of oak. Since there is not much oak regeneration, all understory trees size 1" to 10" should be removed in order to provide more light to forest floor and give new oak seedlings a chance to grow. This will also help new seedlings to become established by seed during a moderate acorn production year. If there are multiple years without a moderate acorn crop, then prescribed fire could be used to eliminate small caliper understory vegetation. The high amounts sugar maple in the stand could mean more prescribed fire might be needed to keep it at bay. Once the shelterwood harvest is done this stand should be clear cut harvested when it is determined there is enough oak seedlings to ensure it will be an oak stand in the future. Typically, the clear cut harvest is done at least 10 years after the shelterwood harvest.

**Table 1. Proposed project completion schedule**

| Stand | Forest Type | Management System | Management Prescription | Work Acres | Implementation Year (approximate) |
|---|---|---|---|---|---|
| 2, 10, 15, 20, 29, 30, 36 | Recreational Areas/ open areas | Non Forest | No Forestry management in these areas. There is maintenance and upkeep needed from time to time. | 35.5 | 2021 |
| 26, 27, 28, 31 | Walnut-oak | Even Age | Forest Stand Improvement - Crop Tree Release | 34.2 | 2021 |
| 33 | Oak-hickory | Even Age | Forest Stand Improvement - Pre-logging Treatment | 10 | 2021 |
| 14, 16, 19 | Walnut-oak | Even Age | Forest Stand Improvement - Crop Tree Release | 37.3 | 2022 |
| 22, 25, 34, 35 | Walnut -oak | Even Age | Forest Stand Improvement - Crop Tree Release | 24.2 | 2023 |
| 6 | Walnut | Even Age | Plantation Maintenance | 2 | 2023 |
| 7 | Red oak | Even Age | Forest Stand Improvement - Crop Tree Release | 27 | 2024 |

| Stand | Forest Type | Management System | Management Prescription | Work Acres | Implementation Year (approximate) |
|---|---|---|---|---|---|
| 4,5 | Oak-black locust | Even Age | Forest Stand Improvement - Crop Tree Release | 5.8 | 2025 |
| 17 | Oak | Even Age | Forest Stand Improvement - Pre-logging Treatment | 9 | 2026 |
| 33 | Oak-hickory | Even Age | Shelterwood Harvest | 10 | 2026 |
| 9, 11 | Oak-elm | Even Age | Forest Stand Improvement - Crop Tree Release | 15.4 | 2027 |
| 26, 27, 28, 31 | Walnut-oak | Even Age | Forest Stand Improvement - Check girdled trees mortality | 34.2 | 2028 |
| 33 | Oak-hickory | Even Age | Prescribed Fire Harvest if necessary | 10 | 2028 |
| 14, 16, 19 | Walnut-oak | Even Age | Forest Stand Improvement - Check girdled trees mortality | 37.3 | 2029 |
| 22, 25, 34, 35 | Walnut-oak | Even Age | Forest Stand Improvement - Check girdled trees mortality | 24.2 | 2030 |
| 21, 28, 56, 57 | Oak-hickory | Even Age | Forest Stand Improvement - Crop Tree Release | 62 | 2029 |
| 17 | Oak | Even Age | Shelterwood Harvest | 9 | 2031 |
| 21 | Oak | Even Age | Forest Stand Improvement - Pre-logging Treatment | 8 | 2031 |
| ALL STANDS | | | Re-Inventory/Stand Map | 411 | 2031 |
| 26, 27, 28, 31 | Walnut-oak | Even Age | Forest Stand Improvement - Crop Tree Release | 34.2 | 2032 |
| 14, 16, 19 | Walnut-oak | Even Age | Forest Stand Improvement - Crop Tree Release | 37.3 | 2033 |
| 17 | Oak-hickory | Even Age | Prescribed Fire Harvest if necessary | 10 | 2033 |
| 22, 25, 34, 35 | Walnut -oak | Even Age | Forest Stand Improvement - Crop Tree Release | 24.2 | 2034 |
| 6 | Walnut | Even Age | Plantation Maintenance | 2 | 2035 |
| 21 | Oak | Even Age | Shelterwood Harvest | 8 | 2036 |
| 33 | Oak-hickory | Even Age | Clearcut Harvest | 10 | 2036 |
| 37 | Oak | Even Age | Forest Stand Improvement - Pre-logging Treatment | 8-10 | 2036 |
| 21 | Oak-hickory | Even Age | Prescribed Fire Harvest if necessary | 10 | 2038 |
| 17 | Oak | Even Age | Clearcut Harvest | 9 | 2041 |
| 37 | Oak | Even Age | Shelterwood Harvest | 8-10 | 2041 |
| 33 | Oak-hickory | Even Age | Forest Stand Improvement - Pre-logging Treatment | 8-10 | 2041 |
| 37 | Oak-hickory | Even Age | Prescribed Fire Harvest if necessary | 10 | 2043 |
| 21 | Oak | Even Age | Clearcut Harvest | 8 | 2046 |

The proposed project completion table is a recommendation of when management activities should be performed. The environment can go through changes which can create different strategies for when dealing with climate, disease, pests, and human interactions. Natural regeneration of oak is of the utmost importance in the forest management. If, after 2-3 years of harvesting, there is not adequate oak regenerating then prescribed fire should be used to knock down the shade tolerant tree species to allow oak the most sunlight. Oak is a fire adapted species that will take advantage of the other species mortality.

## Appendix

**Species of Greatest Conservation Need for Muscatine County, Iowa**

The Iowa DNR's *Iowa Wildlife Action Plan (IWAP*) identifies certain wildlife species as species of "greatest conservation need". Management activities must always take into consideration these Species of Greatest Conservation Need, and also to "keep common species common."

**Table 2. *Iowa Wildlife Action Plan (IWAP*) identifies the species below as species of greatest conservation need in Muscatine Iowa.**

| County | Common Name | Scientific Name | Class | State Status | Federal Status |
|---|---|---|---|---|---|
| MUSCATINE | Central Newt | Notophthalmus viridescens | AMPHIBIANS | T | |
| MUSCATINE | Bald Eagle | Haliaeetus leucocephalus | BIRDS | S | |
| MUSCATINE | Barn Owl | Tyto alba | BIRDS | E | |
| MUSCATINE | King Rail | Rallus elegans | BIRDS | E | |
| MUSCATINE | Red-shouldered Hawk | Buteo lineatus | BIRDS | E | |
| MUSCATINE | Blacknose Shiner | Notropis heterolepis | FISH | T | |
| MUSCATINE | Bluntnose Darter | Etheostoma chlorosoma | FISH | E | |
| MUSCATINE | Chestnut Lamprey | Ichthyomyzon castaneus | FISH | T | |
| MUSCATINE | Freckled Madtom | Noturus nocturnus | FISH | E | |
| MUSCATINE | Grass Pickerel | Esox americanus | FISH | T | |
| MUSCATINE | Lake Sturgeon | Acipenser fulvescens | FISH | E | |
| MUSCATINE | Pirate Perch | Aphredoderus sayanus | FISH | S | |
| MUSCATINE | Pugnose Minnow | Opsopoeodus emiliae | FISH | S | |
| MUSCATINE | Weed Shiner | Notropis texanus | FISH | E | |
| MUSCATINE | Western Sand Darter | Ammocrypta clara | FISH | T | |
| MUSCATINE | Butterfly | Ellipsaria lineolata | FRESHWATER MUSSELS | T | |
| MUSCATINE | Creeper | Strophitus undulatus | FRESHWATER MUSSELS | T | |
| MUSCATINE | Higgin's-eye Pearly Mussel | Lampsilis higginsii | FRESHWATER MUSSELS | E | E |
| MUSCATINE | Pistolgrip | Tritogonia verrucosa | FRESHWATER MUSSELS | E | |
| MUSCATINE | Purple Wartyback | Cyclonaias tuberculata | FRESHWATER MUSSELS | T | |
| MUSCATINE | Round Pigtoe | Pleurobema sintoxia | FRESHWATER MUSSELS | E | |
| MUSCATINE | Sheepnose | Plethobasus cyphyus | FRESHWATER MUSSELS | E | E |
| MUSCATINE | Spectaclecase | Cumberlandia monodonta | FRESHWATER MUSSELS | E | E |
| MUSCATINE | Yellow Sandshell | Lampsilis teres | FRESHWATER MUSSELS | E | |
| MUSCATINE | Baltimore | Euphydryas phaeton | INSECTS | T | |
| MUSCATINE | Byssus Skipper | Problema byssus | INSECTS | T | |
| MUSCATINE | Dion Skipper | Euphyes dion | INSECTS | S | |
| MUSCATINE | Pipevine Swallowtail | Battus philenor | INSECTS | S | |
| MUSCATINE | Regal Fritillary | Speyeria idalia | INSECTS | S | |
| MUSCATINE | Zebra Swallowtail | Eurytides marcellus | INSECTS | S | |
| MUSCATINE | Northern Long-eared Bat | Myotis septentrionalis | MAMMALS | | T |
| MUSCATINE | Plains Pocket Mouse | Perognathus flavescens | MAMMALS | E | |
| MUSCATINE | Southern Bog Lemming | Synaptomys cooperi | MAMMALS | T | |
| MUSCATINE | Bent Milk-vetch | Astragalus distortus | PLANTS (DICOTS) | S | |
| MUSCATINE | Bigroot Prickly-pear | Opuntia macrorhiza | PLANTS (DICOTS) | E | |

| County | Common Name | Scientific Name | Class | State Status | Federal Status |
|---|---|---|---|---|---|
| MUSCATINE | Black Huckleberry | Gaylussacia baccata | PLANTS (DICOTS) | T | |
| MUSCATINE | Buckbean | Menyanthes trifoliata | PLANTS (DICOTS) | T | |
| MUSCATINE | Cleft Phlox | Phlox bifida | PLANTS (DICOTS) | S | |
| MUSCATINE | Cliff Conobea | Leucospora multifida | PLANTS (DICOTS) | E | |
| MUSCATINE | Creeping Bush-clover | Lespedeza repens | PLANTS (DICOTS) | S | |
| MUSCATINE | Crossleaf Milkwort | Polygala cruciata | PLANTS (DICOTS) | E | |
| MUSCATINE | Curved-pod Corydalis | Corydalis curvisiliqua ssp grandibracteata | PLANTS (DICOTS) | E | |
| MUSCATINE | Cutleaf Water-milfoil | Myriophyllum pinnatum | PLANTS (DICOTS) | S | |
| MUSCATINE | Dwarf Dandelion | Krigia virginica | PLANTS (DICOTS) | E | |
| MUSCATINE | Earleaf Foxglove | Tomanthera auriculata | PLANTS (DICOTS) | S | |
| MUSCATINE | Eastern Jointweed | Polygonella articulata | PLANTS (DICOTS) | E | |
| MUSCATINE | Flax-leaved Aster | Aster linariifolius | PLANTS (DICOTS) | T | |
| MUSCATINE | Forked Aster | Aster furcatus | PLANTS (DICOTS) | T | |
| MUSCATINE | Globe Mallow | Malvastrum hispidum | PLANTS (DICOTS) | S | |
| MUSCATINE | Golden Corydalis | Corydalis aurea | PLANTS (DICOTS) | T | |
| MUSCATINE | Hill’s Thistle | Cirsium hillii | PLANTS (DICOTS) | S | |
| MUSCATINE | Humped Bladderwort | Utricularia gibba | PLANTS (DICOTS) | S | |
| MUSCATINE | James Cristatella | Polanisia jamesii | PLANTS (DICOTS) | E | |
| MUSCATINE | Kitten Tails | Besseya bullii | PLANTS (DICOTS) | T | |
| MUSCATINE | Lake Cress | Armoracia aquatica | PLANTS (DICOTS) | S | |
| MUSCATINE | Lance-leaved Violet | Viola lanceolata | PLANTS (DICOTS) | S | |
| MUSCATINE | Large-leaf White Violet | Viola incognita | PLANTS (DICOTS) | E | |
| MUSCATINE | Low Hairy Ground-cherry | Physalis pubescens | PLANTS (DICOTS) | S | |
| MUSCATINE | Marsh Mermaid-weed | Proserpinaca palustris | PLANTS (DICOTS) | S | |
| MUSCATINE | Meadow Beauty | Rhexia virginica | PLANTS (DICOTS) | T | |
| MUSCATINE | Missouri Lambsquarters | Chenopodium missouriensis | PLANTS (DICOTS) | S | |
| MUSCATINE | Orange Grass St. John’s Wort | Hypericum gentianoides | PLANTS (DICOTS) | E | |
| MUSCATINE | Pale False Foxglove | Agalinis skinneriana | PLANTS (DICOTS) | E | |
| MUSCATINE | Pickering Morning-glory | Stylisma pickeringii | PLANTS (DICOTS) | E | |
| MUSCATINE | Pink Milkwort | Polygala incarnata | PLANTS (DICOTS) | T | |
| MUSCATINE | Poppy Mallow | Callirhoe triangulata | PLANTS (DICOTS) | E | |
| MUSCATINE | Purple Angelica | Angelica atropurpurea | PLANTS (DICOTS) | S | |
| MUSCATINE | Queen-of-the-prairie | Filipendula rubra | PLANTS (DICOTS) | T | |
| MUSCATINE | Ragwort | Senecio pseudaureus | PLANTS (DICOTS) | S | |
| MUSCATINE | Rose Turtlehead | Chelone obliqua | PLANTS (DICOTS) | S | |
| MUSCATINE | Rough Buttonweed | Diodia teres | PLANTS (DICOTS) | S | |
| MUSCATINE | Roundleaf Goldenrod | Solidago patula | PLANTS (DICOTS) | E | |
| MUSCATINE | Roundstem Foxglove | Agalinis gattingeri | PLANTS (DICOTS) | T | |
| MUSCATINE | Sand Cherry | Prunus pumila | PLANTS (DICOTS) | S | |
| MUSCATINE | Sand Pigweed | Amaranthus arenicola | PLANTS (DICOTS) | S | |
| MUSCATINE | Schreber’s Aster | Aster schreberi | PLANTS (DICOTS) | E | |

| County | Common Name | Scientific Name | Class | State Status | Federal Status |
|---|---|---|---|---|---|
| MUSCATINE | Slender Copperleaf | Acalypha gracilens | PLANTS (DICOTS) | S | |
| MUSCATINE | Small Morning Glory | Ipomoea lacunosa | PLANTS (DICOTS) | S | |
| MUSCATINE | Spring Avens | Geum vernum | PLANTS (DICOTS) | S | |
| MUSCATINE | Sweet Indian Plantain | Cacalia suaveolens | PLANTS (DICOTS) | T | |
| MUSCATINE | Toothcup | Rotala ramosior | PLANTS (DICOTS) | S | |
| MUSCATINE | Violet | Viola macloskeyi | PLANTS (DICOTS) | S | |
| MUSCATINE | Virginia Snakeroot | Aristolochia serpentaria | PLANTS (DICOTS) | T | |
| MUSCATINE | Water Shield | Brasenia schreberi | PLANTS (DICOTS) | S | |
| MUSCATINE | Water Starwort | Callitriche heterophylla | PLANTS (DICOTS) | S | |
| MUSCATINE | Waxyfruit Hawthorn | Crataegus pruinosa | PLANTS (DICOTS) | S | |
| MUSCATINE | Winged Monkey Flower | Mimulus alatus | PLANTS (DICOTS) | T | |
| MUSCATINE | Wooly Milkweed | Asclepias lanuginosa | PLANTS (DICOTS) | T | |
| MUSCATINE | Yellow Monkey Flower | Mimulus glabratus | PLANTS (DICOTS) | T | |
| MUSCATINE | Blue Mud-plantain | Heteranthera limosa | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Bulrush | Scirpus pedicellatus | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Bur-reed | Sparganium androcladum | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Clandestine Dropseed | Sporobolus clandestinus | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Deep Green Sedge | Carex tonsa | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Drooping Bluegrass | Poa languida | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Eastern Prairie Fringed Orchid | Platanthera leucophaea | PLANTS (MONOCOTS) | E | T |
| MUSCATINE | False Hop Sedge | Carex lupuliformis | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Glomerate Sedge | Carex aggregata | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Grass Pink | Calopogon tuberosus | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Grassleaf Rush | Juncus marginatus | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Great Plains Ladies'-tresses | Spiranthes magnicamporum | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Green Adder's Mouth | Malaxis unifolia | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Hall Bulrush | Scirpus hallii | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Large-leaf Pondweed | Potamogeton amplifolius | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Nuttall Pondweed | Potamogeton epihydrus | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Oval Ladies'-tresses | Spiranthes ovalis | PLANTS (MONOCOTS) | T | |
| MUSCATINE | Pale Green Orchid | Platanthera flava | PLANTS (MONOCOTS) | E | |
| MUSCATINE | Purple Fringed Orchid | Platanthera psycodes | PLANTS (MONOCOTS) | T | |
| MUSCATINE | Purple Spike Rush | Eleocharis atropurpurea | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Sand Bluestem | Andropogon hallii | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Sedge | Carex gracilescens | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Shallow Sedge | Carex lurida | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Showy Lady's Slipper | Cypripedium reginae | PLANTS (MONOCOTS) | T | |
| MUSCATINE | Slender Crabgrass | Digitaria filiformis | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Slender Dayflower | Commelina erecta | PLANTS (MONOCOTS) | T | |
| MUSCATINE | Slender Fimbry | Fimbristylis autumnalis | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Slender Ladies'-tresses | Spiranthes lacera | PLANTS (MONOCOTS) | T | |
| MUSCATINE | Slender Sedge | Carex tenera | PLANTS (MONOCOTS) | S | |

| County | Common Name | Scientific Name | Class | State Status | Federal Status |
|---|---|---|---|---|---|
| MUSCATINE | Small Green Woodland Orchid | Platanthera clavellata | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Small White Lady's Slipper | Cypripedium candidum | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Soft Rush | Juncus effusus | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Tall Cotton Grass | Eriophorum angustifolium | PLANTS (MONOCOTS) | S | |
| MUSCATINE | Yellow-eyed Grass | Xyris torta | PLANTS (MONOCOTS) | E | |
| MUSCATINE | Cinnamon Fern | Osmunda cinnamomea | PLANTS (PTERIODOPHYTES) | E | |
| MUSCATINE | Crowfoot Clubmoss | Lycopodium digitatum | PLANTS (PTERIODOPHYTES) | S | |
| MUSCATINE | Ledge Spikemoss | Selaginella rupestris | PLANTS (PTERIODOPHYTES) | S | |
| MUSCATINE | Long Beechfern | Thelypteris phegopteris | PLANTS (PTERIODOPHYTES) | E | |
| MUSCATINE | Meadow Spikemoss | Selaginella eclipes | PLANTS (PTERIODOPHYTES) | E | |
| MUSCATINE | Northern Adder's-tongue | Ophioglossum pusillum | PLANTS (PTERIODOPHYTES) | S | |
| MUSCATINE | Royal Fern | Osmunda regalis | PLANTS (PTERIODOPHYTES) | T | |
| MUSCATINE | Blanding's Turtle | Emydoidea blandingii | REPTILES | T | |
| MUSCATINE | Bullsnake | Pituophis catenifer sayi | REPTILES | S | |
| MUSCATINE | Common Musk Turtle | Sternotherus odoratus | REPTILES | T | |
| MUSCATINE | Copperbelly Water Snake | Nerodia erythrogaster neglecta | REPTILES | E | |
| MUSCATINE | Diamondback Water Snake | Nerodia rhombifer | REPTILES | T | |
| MUSCATINE | Eastern Massasauga | Sistrurus catenatus | REPTILES | E | T |
| MUSCATINE | Ornate Box Turtle | Terrapene ornata | REPTILES | T | |
| MUSCATINE | Smooth Green Snake | Liochlorophis vernalis | REPTILES | S | |
| MUSCATINE | Yellow Mud Turtle | Kinosternon flavescens | REPTILES | E | |

**Endangered,** an **endangered species** is an animal or plant that is seriously at risk of extinction.
**Threatened,** a **threatened species** likely, in the near future, to become endangered within all or much of its range.
**Special concern,** a **special concern species** is not endangered or threatened, it is extremely uncommon, or has unique or specific habitat requirements and deserves careful monitoring.

## Conducting Timber Sales on State Lands

Iowa Department of Natural Resources

Timber sales may be conducted on state owned forested lands in accordance with an approved Forest Management Plan. Once an area has a plan in place, forest management activities (including timber harvesting) may be scheduled and implemented according to the plan.

**Management Planning**

The Area Forester will meet with the Area Manager, stand map and inventory the area, and develop a management plan based upon the Area Manager's management objectives and the current, science based forestry practices that will meet those objectives. Once a plan is developed, it will be sent to the Area Supervisor, Bureau Chief, State Forester and Lands and Waters staff *(currently send to John Pearson, Mark Leoschke and Kelly Poole)* for distribution and review. Once the plan is reviewed and approved by the State Forester, it will be posted on the respective Bureau's website.

**Public Meeting**

The management plan will be presented at a public meeting.

**Natural Areas Review**

Planned timber sales must be sent to Land and Waters Bureau staff for review to determine if a natural areas inventory needs to be conducted (*currently send to John Pearson, Mark Leoschke and Kelly Poole for distribution and review*). Land and Waters staff will complete a natural areas review and identify any species of concern; or determine that no inventory is necessary.

**Timber Sale Checklist**

A timber sale checklist must be completed for the sale using the current template from the Forestry Bureau. The checklist must be completed and signed by appropriate staff (or email confirmation must be attached) before the sale can proceed.

**Timber Marking**

The Area Forester will mark and scale the trees in the timber sale area. A tally of board foot volume and number of trees by species will be completed.

**Bid Solicitation**

The Area Manager, with the assistance of the Area Forester will prepare a "Notice of Timber for Sale". The Area Forester will provide a list of Bonded Timber Buyers to whom bid notices can be sent. (*The contract routing process will begin here. Legal approval of the bid notice is needed before it is sent out.*) The bid opening date will be set at least 4 weeks from the date the bid notices are sent. Bids will be opened locally, and the results will be sent to the Area Supervisor.

**Additional Public Meeting**

If the timber sale is in a state park or preserve, a public hearing must be conducted prior to the sale if the amount of timber sold exceeds 10,000 board feet in volume, or $5000 in value. Once the public hearing has been conducted, the sale may proceed (Code of Iowa 461A.31A).

**NRC Approval**

If the winning bid is $25,000 or more, the sale must be approved by the Natural Resource Commission prior to executing a contract. The Area Supervisor will prepare the project brief for the NRC agenda if approval is necessary. Once the NRC has either approved the sale, or the sale is under $25,000 and does not need approval, a contract may be executed.

**Execution of Contract**

The Area Forester will assist the Area Manager with drafting of the timber sale contract. (The current contract routing process must be followed, including legal approvals and the use of the current timber sale contract template from the Forestry Bureau.) Once legal has approved the contract, **the timber buyer must sign the contract and pay for the sale in full before any trees are cut**. The timber buyer may proceed with the harvest once the full payment has been received and the contract is signed by the timber buyer and the appropriate DNR signatory.

**Follow-up Management**

Once the harvest is completed, the Area Forester will meet with the Area Manager and assist with implementing the plan for reforestation. Post-harvest work, tree planting, or any other prescribed work will commence during the first year following completion of the harvest.

## Checklist for Conducting Timber Sales

| Item | Description | Date Completed |
|---|---|---|
| Management Plan | Area Manager and Area Forester develop a Forest Management Plan | |
| Public Meeting | Forest Management Plan is presented at a public meeting | |
| Natural Areas Review | Land and Waters Bureau staff will review site and conduct a natural areas inventory if required | |
| Timber Sale Checklist | Checklist is completed and approval signatures or emails are obtained | |
| Timber marking | Area Forester marks and scales the timber and provides volume estimates | |
| Bid Solicitation | Area Manager and Area Forester prepare bid notice, bid notices are sent out and bids are received | |
| Additional Public Meeting | For state parks and preserves only if sale is over 10,000 board feet or $5000 | |
| NRC Approval | Required for sales over $25,000 | |
| Execution of Contract | Contract is drafted, reviewed, and signed by both parties | |
| Follow-up Management | Reforestation and follow -up work completed following harvest | |

**Glossary of Forestry Terms**

**Acre:** An area of land containing 43,560 square feet, roughly the size of a football field, or a square that is 208 feet on a side. A "forty" of land contains 40 acres and a "section" of land contains 640 acres.

**Basal area:** The cross sectional area of the base of any object. In forestry it means the cross sectional area of a tree at a point 4.5 feet above the ground line expressed in square feet. The sum of all the trees on an acre is a measure of the density of the population of trees growing on the acre and is useful for making forest management decisions. A helpful way to think of basal area is to imagine all the trees on an acre cut off with 4.5 foot stumps. Basal area on the acre could be measured by measuring and totaling the cross sectional area of all stumps. Fortunately, it is not necessary to cut trees to measure basal area. It can be calculated from tree diameter or can be easily measured with an angle gauge when certain relationships are known. Basal area will commonly range from 20 to 70 square feet per acre for poorly stocked stands to more than 200 square feet per acre for dense stands of conifers.

**Board foot:** A unit of measure wood 1" thick and 1 foot on each side equaling 1/12 cubic foot of wood. In practice, a board foot seldom contains 1/12 of a cubic foot due to loss from surfacing such as planning and sanding. For example, an 8 foot 2x4 would be said to have 5 and 1/3 board feet, but would actually be more like 4.08 board feet after losses from surfacing.

**Clearcut:** A method of regenerating a forest in which all trees on a given area are cut. Clearcutting results in conditions which allow the greatest amount of sunlight to reach the forest floor, a desirable condition for the re-growth of certain valuable tree species which need a lot of sunlight to grow, such as oaks and walnut. Clearcutting also confers certain benefits for many wildlife species.

**Climax species:** Also called late-successional or equilibrium species, are plant species that will remain essentially unchanged in terms of species composition for as long as a site remains undisturbed. They are the most shade tolerant species of tree to establish in the process of forest succession. The regeneration of climax species can grow in the shade of the overstory parent trees, ensuring their dominance.

**Competition:** The struggle between trees to obtain sunlight, nutrients, water, and growing space. Every part of the tree, from the roots to the crown, competes for space and food.

**Cover type**: Expressed as the tree species having the greatest in a forest stand. A stand where the major species is oak would be called an oak cover type.

**Crop tree release:** Natural stands of trees start out with thousands of trees per acre. Planted stands may contain 500 to 1500 trees per acre. At maturity, due to constraints of space, nutrient availability and the increased size of individual trees, there can be only 50 to 70 trees per acre. Crop tree release is the practice of selecting the individual trees that are to remain in the stand until maturity and then removing the trees competing with them. Crop trees could be selected on the basis of any of the values associated with trees such as aesthetics or wildlife values, but are almost always selected on an economic basis. In Iowa selected trees would mostly likely consist of walnut and red and white oak. Selected trees would be straight with long, clear boles and would be the trees bringing the best dollar return upon maturity.

**Cull:** Refers to a tree having no commercial value, usually from having rot, holes, large knots or being crooked rather than from being too small or of a non-merchantable species. It is important to note that a cull, though having no commercial value may have wildlife, aesthetic or other value.

**Cultural practice:** The manipulation of vegetation to meet objectives of controlling stand composition or structure, such as site improvement, forest tree improvement, increased regeneration, increased growth, or measures to control insects or disease.

**DBH:** Stands for diameter at breast high. Always taken as 4.5 feet above the ground, that being a convenient height at which to measure a tree's diameter. For trees on a slope, dbh is taken at 4.5 feet from the ground on one of the two sides of the tree that is at right angles to the direction of slope.

**Dominant (trees):** individuals or species of the upper layer of the forest canopy.

**Early successional forest:** The forest community that develops immediately following the removal or destruction of vegetation in an area. Plant succession is the progression of plants from bare ground (e.g., after a forest fire or imber harvest) to mature forest consisting primarily of long-lived species such as sugar maple and white pine. Succession consists of a gradual change of plant and animal communities ove time. Early ssuccession forests commonly depend on and develop first following disturbance eevents (e.g. fire, windstorm, or timber havest). Examples of early successional forest tree species are asspen, paper birch,and jack pine. Each stage of succession provides different benefits benefits for a variety of species.

**Endangered species:** A plant or animal species that is threatened with extinction throughout all or a significant portion of its native range.

**Even-aged stand:** A stand of trees composed of a single age class.

**Floodplain Forest:** Characterized by species such as silver maple, cottonwood, walnut, green ash, elm, hackberry and willows. This habitat factor will benefit wildlife such as songbirds and woodpeckers, furbearers, raptors, reptiles and amphibians on relatively level areas inundated by water periodically.

**Forest:** A forest is an ecosystem, an association of plants and animals. Trees are its dominant feature. They provide many of the benefits of forests like habitat, quality water, recreation, climatic amelioration and wood products. The plants and animals that make up a forest are inter-dependent and often essential to its integrity.

**Forester:** A professional engaged in the science and profession of forestry- note foresters are commonly credentialed by states or other certifying bodies, e.g., the Society of American Foresters, and may be licensed, certified, or registered indicating specific education and abilities; the requirements for credentialing differ and usually include earning a baccalaureate degree in forestry, sometimes equivalent experience, and usually passing a comprehensive examination.

**Forest floor:** The accumulated organic matter at the soil surface, including litter and unincorporated humus.

**Forest inventory:** A set of objective sampling methods designed to quantify the spatial distribution, composition, and rates of change of forest parameters within specified levels of precision for the purposes of management. The listing (enumeration) of data from such a survey- synonym cruise, forest survey- note inventories may be made of all forest resources including trees and other vegetation, fish, insects, and wildlife, as well as street trees and urban forest trees- see dynamic sampling, point sampling

**Forest management:** The practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization, and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest. Forest management includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, and other forest resource values.

**Forest stand** - A stand may loosely be defined as a contiguous group of trees sufficiently uniform in species composition, arrangement of age classes and general condition to be a homogeneous and distinguishable unit. A stand is usually treated as a basic silvicultural unit, but it seldom represents a natural ecological unit. Its composition and structure are most strongly affected by management, other disturbances and chance factors affecting seed distribution, germination and seedling survival.

**Forest Stand Improvement:** A practice in which the quality of a residual forest stand is improved by removing less desirable trees and large shrubs to achieve the desired stocking of the best quality trees or o improve the reproduction, composition, structure, condition, and volume growth of a stand.

**Fully-stocked stand:** A forest stand in which all growing space is effectively occupied but having ample space for development of the crop trees.

**Gap:** The space occurring in forest stands due to individual tree or groups of trees mortality or blown down. Gap management uses timber harvest methods to emulate his type of forest spatial pattern.

**Hardwood:** Hardwood as opposed to softwood is a relative term. Hardwoods are generally defined as the woods of deciduous trees, i.e., trees which shed their leaves in the winter.

**Harvesting vs. silvicultural treatment:** The meanings of these two terms are often confused by lay people and sometimes by professionals. Many silvicultural treatments involve harvesting, but not all harvesting is silvicultural treatment. Harvesting is a silvicultural treatment. Harvesting is a silvicultural treatment when its purpose is to shape the residual stand or to affect regeneration. Often the two purposes are accomplished simultaneously. Of course, harvesting can be done simply to remove an existing crop, but this is not management and therefore the operation cannot be called a silvicultural treatment.

**Landform:** Any physical, recognizable form or feature of the earth's surface having a characteristic shape and produced by natural causes. Examples of major landforms are plains, plateaus, and mountains. Examples of minor landforms are ills, valleys, slopes, eskers, and dunes. Together, landforms make up the surface configuration of the earth.

**Landscape:** A general term referring to geographic areas that are usually based on some sort of natural feature or combination of natural features. They can range in scale from very large to very small.

**Management goals:** Overall purpose for controlling (managing) the composition and structure of forest land. For example, to protect land from erosion, to maintain wildlife habitat, to grow wood for profit, etc.

**Management objectives:** Defined conditions for the property, or segments of property (e.g. stands or management units), that will achieve management goals. For example, maintenance of continuous forest cover may be the only objective if watershed protection is the primary goal. Another objective may be to grow tree species with highest yields in order to maximize returns from wood production.

**Management plan:** A plan outlining the objectives for individual management units and describing steps for achieving them. Silvicultural procedures are identified in broad terms, but detailed prescriptions are developed in the field.

**Mast:** Nuts, seeds, catkins, flower buds, and fruits of woody plants that provide food for wildlife.

**Mature tree**: A tree that has reached the desired size or age for its intended use. Size or age will vary considerably depending on the species and the intended use

**Multiple use:** Using and managing a forested area to provide more than one benefit simultaneously. Common uses may include wildlife, timber, recreation, and water.

**Natural regeneration:** The growth of new trees from one of the following ways: (a) seeds naturally dropped from trees or carried by wind or animals, (b) seeds stored on the forest floor, or(c) stumps that sprout or roots that sucker.

**Non-forest land:** Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses such as crops, improved pasture, residential areas, city parks, improved roads, and power line clearings.

**Overstory:** The canopy in a stand of trees.

**Plantation:** A stand composed primarily of trees established by planting or artificial seeding.

**Pole or pole timber:** A young tree or stand of young trees between 3.5 inches and 12.9 inches in diameter at a point 4.5 feet above the ground. In referring to a stand of trees the upper limit holds, however, when referring to processed round wood, pieces larger than 12.9 inches in diameter could be correctly referred to as poles.

**Prairie:** An extensive tract of level or rolling land that was originally treeless and grass covered. A prairie is generally characterized by deep fertile soil.

**Prescribed burn:** To deliberately burn wild lands in either their natural or their modified state under specified environmental conditions, which allows the fire to be confined to a predetermine area and produces the fire line intensity and spread required to attain planned resource management objectives.

**Pruning:** The practice of removing tree limbs so that a straight, bole, free of limbs, will develop. Several years after pruning the resulting wound will have grown over and the wood that grows over the site of the former branch will be clear, that is knot free. Pruning is a component of FSI.

**Recreation:** Leisure activities involving the enjoyment and use of natural resources. This habitat factor will favor hunting activities while taking into consideration secondary activities such as wildlife watching, mushroom picking, photography, and hiking.

**Recreation facility:** The improvements within a developed recreation site offered for visitor's enjoyment.

**Regeneration:** The act of renewing tree cover by establishing generation usually maintaining the same forest type forest was removed. Regeneration may be artificial (direct seeding or planting) or natural (natural seeding, or planting).

**Release (release operation):** A treatment designed to free young trees from undesirable, usually over topping, competing vegetation.

**Riparian:** Related to, living, or located in conjunction with a wetland, on the bank of a river or stream but also at the edge of a lake.

**Riparian Buffer**- Woodland next to streams, lakes and wetlands that is managed to enhance and protect aquatic resources from adjacent fields. This habitat factor will provide a woody cover buffer to enhance soil and water conservation while providing wildlife habitat.

**Rotation age:** The period of years between when a forest stand (i.e., primarily even-aged) is established (i.e., regeneration) and when it receives its final harvest. This time period is an administrative decision based on economics, site conditions, growth rates, and other factors.

**Salvage cut:** A harvest made to remove trees killed or damaged by fire, wind, insects, disease, or other agents. The purpose of salvage cuts is to use available wood fiber before further deterioration occurs to recover value that otherwise would be lost.

**Sapling:** A young tree larger than a seeding but smaller than a pole. When a tree has grown to a diameter of a 3.5 inches in diameter at a point 4.5 feet above the ground it is no longer a sapling, having become a pole.

**Saw log:** A log large enough to produce lumber or other products that can be sawed. Its size and quality vary with the utilization practices of the region.

**Sawtimber:** Trees that yield logs suitable in size and quality for the production of lumber.

**Seedling:** A baby plant. In forestry the term usually used to refer to young trees that have grown beyond the stage where they have just emerged from the soil up to the point that they become saplings.

**Selective harvest:** Removal of single scattered trees or small groups of trees at relatively short intervals. The continuous establishment of reproduction is encouraged and an all-aged stand is maintained. A management option used for shade-tolerant species.

**Shade tolerance:** Relative ability of a tree species to reproduce and grow under shade. The capacity to withstand low-light intensities caused by shading from surrounding vegetation. Tolerant species tolerate shade, while intolerant species require full sunlight.

**Shelterwood:** A method of regenerating a forest whereby a portion of the stand is harvested and the rest of the stand is evenly distributed over the area to protect the site and provide seed to reseed the area. After the new stand is well established, the residual trees are harvested. This method is used to regenerate species not tolerate of shading.

**Shelterwood harvest:** A harvest cutting in which trees in the harvest area are removed in a series of two or more cuttings to allow the establishment and early growth of new seedlings under partial shade and protection of older trees. Produces an even-aged forest.

**Silviculture:** The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

**Silvicultural prescription:** Specific steps prescribed to achieve specific management objectives. Examples: If the management objectives is to maintain an oak component in a mixed stand, the silvicultural prescription may include opening up the forest canopy to initiate the establishment of seedlings of shade-intolerant oaks. If undesirable species are dominating the canopy and a desirable species is becoming in the understory, the silvicultural prescription may be to remove over story trees to release the suppressed species. Thinning and planting are other examples

**Site index:** A measure of the productive quality of an area where trees grow. Site index is based on the height of dominant and co-dominate trees at age 50. That is to say, if the average height of dominant and co- dominate trees on a site was 70 feet at age 50, 70 would be the site index. Graphs are developed to enable determination of site index over a range of tree ages.

**Stand:** a contiguous group of trees similar in age, species composition, and structure, and growing on a site of similar quality, to be a distinguished forest unit. One stand will usually have characteristics that will distinguish it from other stands. Difference could be species, average diameter, density and location.

**Succession:** The natural replacement, over time, of one plant community with another.

**Sucker:** A shoot rising from below ground level from a root. Aspen regenerates from suckers.

**Suppressed:** The condition of a tree characterized by low growth rate and low vigor due to competition from overtopping trees or shrubs.

**Sustainability:** Protecting and restoring he natural environment while enhancing economic opportunity and community well-being. Sustainability addresses three related elements: the environment, the economy, and the community. The goal is to maintain all three elements in a healthy state indefinitely. Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

**Thinning**: A silvicultural treatment made to reduce the density of trees within a forest stand primarily to improve growth, enhance forest health, or recover potential mortality. Row thinning is where selected rows are harvested, usually the first thinning, which provides equipment operating room for future selective thinning. Selective thinning

is where individual trees are marked or specified (e.g., by diameter, spacing, or quality) for harvest. Commercial thinning is thinning after the trees are of merchantable size for timber markets. Pre-commercial thinning is done before the trees reach merchantable size, usually done in overstocked (very high stems per acre) stands to provide more growing space for crop trees that will be harvested in future years.

**Threatened species:** A plant or animal species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

**Tolerance (shade tolerance):** A plant's ability to tolerate conditions under a forest canopy. Normally thought of as tolerance to low light conditions, but other understory conditions, such as root competition for water and nutrients, are also factors.

**Under-stocked:** A stand of trees so widely spaced that even with full growth potential realized, crown closure will not occur.

**Under-story:** The shorter vegetation (shrubs, seedlings, saplings, small trees) within a forest stand that forms a layer between the over-story and the herbaceous plants of the forest floor.

**Uneven-aged stand:** A stand with trees of three or more distinct age classes, either intimately mixed or in small groups.

**Uneven-aged management:** A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes. Uneven-aged (selection) methods will maintain a multi-aged structure by removing some trees in all sizes classes either singly, in small groups, or in strips-synonym all-aged methods

**Viewshed:** A physiographic area composed of land, water biotic and cultural elements which may be viewed from one or more viewpoints and which has inherent scenic qualities and/ or aesthetic values as determined by those who view it. Viewshed's are a habitat factor that will be primarily a "hands-off" area for aesthetics, proper soil and water conservation, along with providing special wildlife habitats.

**Volume**: Refers to the amount of wood in a tree or log. Expressed as board feet, cords or other measures.

**Well-stocked:** The situation in which a forest stand contains trees spaced widely enough to prevent competition yet closely enough to utilize the entire site.

**Woodland:** A plant community in which, in contrast to a typical forest, the trees are often small, characteristically short-boled relative to their crown depth, and forming only an open canopy with intervening area occupied by lower vegetation, commonly grass.

**Woodland edge:** An area of habitat transition that consists of vegetation (herbaceous and woody) of different heights and densities. This habitat factor will favor early successional vegetation for wildlife benefiting from edge cover.

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