

WOODLAND STEWARDSHIP PLAN

FOR

BACKBONE STATE PARK AND FOREST

A plan that will increase the diversity of forest types & wildlife habitat, improve tree health, preserve aesthetics, and foster recreational opportunities.



Developed by:

Dave Asche, District Forester

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Forest Stewardship Plan for Backbone State Park

MANAGER: Park Manager
Backbone State Park
1347 129th St
Dundee, IA 52038
563-924-2527

LOCATION: Sections 4, 5, 8, 9, 10, 15, & 16, Richland Township, T90N-R6W, Delaware County

TOTAL ACRES: 1966.1

INTRODUCTION

The Iowa Department of Natural Resources (DNR) is the state government agency whose vision is to lead Iowans in caring for their natural resources. Conservation and enhancement of natural resources to ensure a legacy for future generations is part of the DNR's mission. Within the DNR, the State Parks Bureau works to manage state operated parks, preserves, and forests.

There are 68 state parks in Iowa, the oldest and one of the most unique being Backbone State Park. The state park system manages resources for a variety of public users. Beyond recreation, parks contain critical wildlife habitat in the form of forests, prairies, and wetlands. Backbone State Park is primarily forested and if properly managed, provides a unique opportunity for the DNR to carry out its mission by publicly demonstrating sustainable forest management and the enhancement of these valuable resources for wildlife.

The DNR is also the agency responsible for the stewardship of indigenous and migratory wildlife species found in the state. The DNR recognizes the need for forest wildlife stewardship plans (FWSPs) to properly manage the forest resources. Forests are not static systems, even though changes occur relatively slowly over a long period of time. A hands-off or "preservation" philosophy will ensure that the forest of 100 years from now will be much different and likely less diverse than the forest of today. These changes will negatively impact wildlife species. Some forest stands may take more than 120 years to mature, a time span that may extend through the careers of several managers. This slow but constant change requires managers to plan over the long term and leave a written record of these plans and management activities in the form of FWSPs. This process will help ensure the wise management of our forests and will aid future managers with decision making.

There is no single type of forest stand that can provide all of the requirements for all forest wildlife species. Different species require different (and sometimes quite specific) forest types and age classes. Some generalist wildlife species use all of the forest age classes, while some specialist species have such specific requirements that only one or two particular forest types are needed to survive.

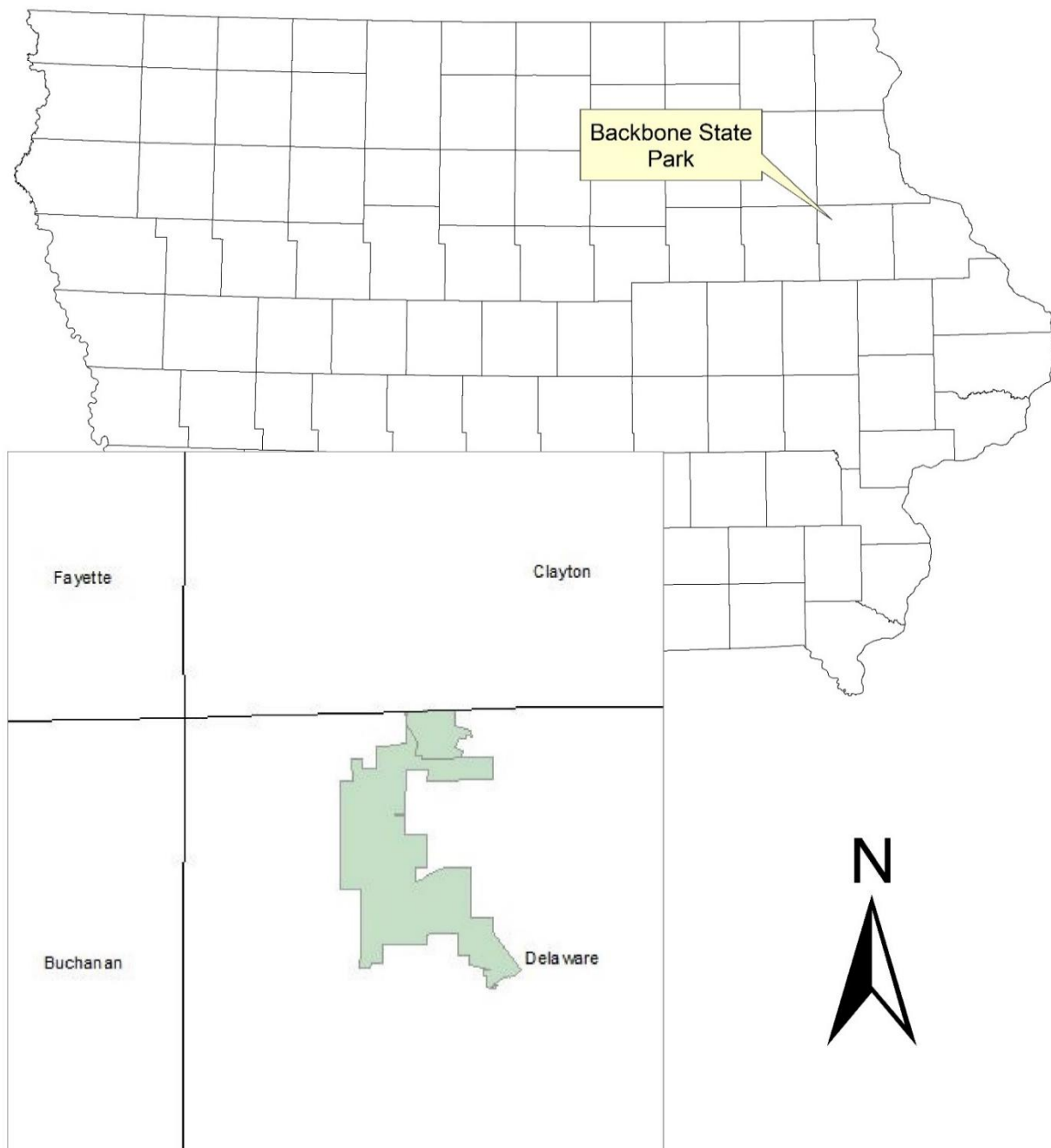
Oak forests are indisputably important in Iowa. The pre-settlement forests across the state were dominated by a mixture of oak species. Wildlife species adapted to the oak forests and thrived amidst their diversity. Today, the forests of Iowa are changing at alarming rates. It is estimated that Iowa loses approximately 5,800 acres of oak dominant forest each year. These losses are due to several factors, including both natural and human controlled. This pronounced loss of oak leads to a reduction in the quality of habitat and food sources available to wildlife, as well as the economic value and quality of the forest. The importance of managing forests for oak cannot be overstated, and the Iowa DNR has made this a priority across much of the state.

DESCRIPTION OF AREA

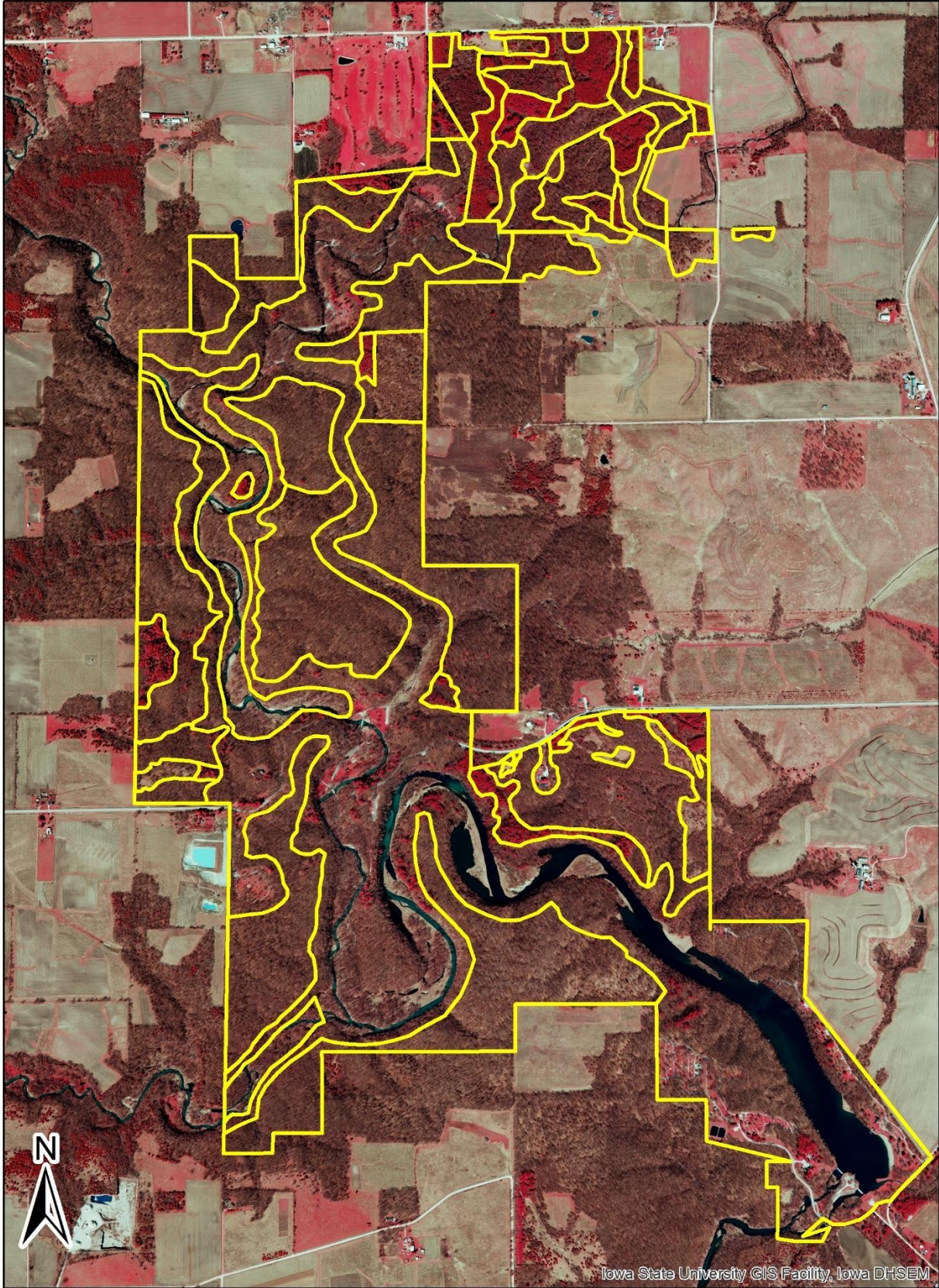
Backbone State Park is located on the edge of the geographic region known as the *Driftless Area*, which is characterized by karst topography that features steep bluffs and ravines, rocky outcrops, numerous large sinkholes, springs and cold-water streams. Much of the park features this steep, rocky terrain.

The Maquoketa River runs right through the park, fed by many small streams and tributaries. A cold water trout stream, fed by Richmond springs, drains into the river as well. At the south side of the park sits Backbone Lake, at nearly 63 acres. There are many roads, trails, cabins, and campgrounds winding throughout the park. One of the parks distinguishing features is the trail known as the Devils Backbone. This trail shows off the parks steep terrain and limestone bluffs. All of these recreational and geologic features are nestled among the forest. The forest addressed in this plan is divided into 58 different stands. Stands were delineated based on a combination of species composition, size class, topography, and management recommendations. Each stand is outlined in detail in this plan with forest management recommendations provided.

Landscape Position



Backbone State Park and State Forest Stand Map



Sec. 3, 4, 5, 8, 9, 10, 15, 16
Richland Township
T-90N R-6W
Delaware County

0 0.5 1 Miles

HOW THE FOREST WILDLIFE STEWARDSHIP PLAN WAS DEVELOPED

Objectives address the habitat needs of a diverse array of wildlife species and the woodland condition of each area. Forest management is essential to the long-term conservation of the native plant communities occurring on these areas. Actively managing the forest is also critical to improving these areas for wildlife and wildlife-related recreation.

Management of state parks is a cooperative effort by both the Parks Bureau and Wildlife Bureau to enhance state owned areas for a diversity of wildlife species and recreation opportunities. Stands are identified by tree species, tree size, topography, and management system. Stands are walked and identified by the forester. The park ranger, park manager and forester discuss the options for each stand and how management of that stand will fit into the overall management for the area. Forester recommendations are designed to manage the stand to reach the goals and objectives, while utilizing strategic and sound forest management practices.

The FWSP will be the guiding document that prioritizes management activities to meet the needs of forest wildlife species. The DNR's comprehensive Iowa Wildlife Action Plan identifies wildlife "species of greatest conservation need" (SGCN). Habitat needs of these wildlife species will be considered when determining forest management decisions. One of the primary goals will be to maintain quality habitat that will support abundant and diverse wildlife populations.

FOREST MANAGEMENT OBJECTIVES

The primary objectives for the area are as follows:

- Maintaining diverse, high quality forest habitats for the benefit of diverse wildlife populations
 - Emphasis on oak management
 - Emphasis on diversity of age classes
 - Emphasis on promoting SGCN habitats
- Promote high quality wildlife-dependent recreational opportunities

The DNR recognizes that it is difficult, if not impossible, to manage for all species at the same time on any given tract or area. However, this plan operates under the assumption that creating and maintaining diverse forest habitats will benefit the most wildlife species possible, regardless of their protective status. In other words, game and nongame species alike will benefit from good habitat management practices.

Oak Management

Oaks are a critical component to Iowa's forests. Iowa's wildlife species adapted, coexisted, and eventually became dependent on the benefits that oaks provided. The acorns of the oak provide a high level of fat and protein to wildlife at a time of year that food resources are low and high quality nutrients are critical. While the mast that oaks provide are a staple food source for many wildlife species, other characteristics of the oak are extremely beneficial as well. Some of those characteristics include deeply furrowed bark that host insects and invertebrates creating foraging opportunities for insect eating birds, reptiles, and mammals. The rigor and architecture of the branches provide structure for nesting, roosting, and perching. The leaves provide an important food source for many moths and butterflies, with oaks supporting higher diversity and richness of caterpillars than any other native tree family (Narango et al. 2020). Pollinators also benefit from the nectar and over wintering habitat provided by the oak. Because of the critical role that oak trees play in the ecosystem, they are emphasized heavily in this forest wildlife stewardship plan.

Iowa's oak forests are faced with many threats. There are a variety of factors that contribute to the decline of oak forests. Native and non-native pests, pathogens, and diseases contribute to the mortality of oak. The succession of shade-tolerant species creates a shaded forest floor that is not conducive to the regeneration of shade intolerant oak seedlings. Fragmentation of the landscape and invasive species also play a role in the degradation of our oak forest. In order to combat these circumstances, active forest management is essential.

The even aged management of oak described in this plan is used to promote the ecological niche in which oaks thrive. Oak trees use a specific strategy to regenerate that requires full sunlight. This is why harvest techniques that provide high levels of sunlight to the forest floor such as shelterwoods or clearcuts are used to promote the successful

regeneration of oak. These harvest techniques simulate natural disturbances that occurred on the landscape historically such as forest fires and windstorms.

Harvests

Harvesting is conducted primarily to regenerate stands of desirable species, thin stands to a more desirable stocking, or to achieve a diversity of tree size classes. Harvests are an essential tool for simulating natural disturbances and creating suitable growing conditions for desirable shade intolerant tree species. Harvests are scheduled based on an individual stand's rotation age. The rotation age is determined based on a variety of factors.

The forest type that is present influences the rotation age of the stand. There are a variety of forest types on any given area, with each forest type reaching biological maturity at different times. Biological maturity is the point at which a stand's volume reaches a plateau or starts to decline based on natural factors such as mortality, breakage or rotting. A species such as quaking aspen will reach biological maturity many years before a species such as white oak.

Along with forest type, site productivity influences the point of biological maturity. High site productivity will increase the growth rate, vigor, and health of the stand. This will likely extend the biological maturity of the stand.

Forest health can influence the point at which a stand is harvested. Insects, disease, and pathogens can infect a stand unexpectedly. An event like this can alter the rotation age of the stand.

Landscape level considerations also influence rotation age. Wildlife objectives may require certain age structures in targeted locations across the area due to how the stand fits in among the broader landscape. This may either increase or decrease the rotation age of the stand.

A variety of regeneration techniques will be used in this forest stewardship plan. Each of them has been selected to achieve a targeted outcome. The timing of and results of these techniques will influence the point at which a stand is harvested.

Economics and logistics can alter the timing, scope, and size of a harvest. A harvest is implemented based on a silvicultural prescription designed to reach a wildlife management or forest health objective. Any financial return is purely a byproduct of proper management and not a driving factor. Income from harvests will be reinvested into the area to complete the recommended projects within the plan. Those projects include: tree planting, thinning young stands, removing undesirable and invasive species, converting areas to more desirable species, and completing early successional cuts.

Sustainable forestry aims to manage a forest for maximum distribution of age and size classes and gives an indication of the amount of acreage or volume that can be harvested from a given geographical area periodically, without ever running out of volume or growing stock. Generally speaking, with even aged management the sustainable harvest is the total acreage of the forest divided by the rotation age. Rotation ages for stands vary by the dominant species in each stand, but are generally set at the point of biological maturity. The majority of actively managed even-aged stands use a 120-year rotation, on average. The rotation age calculations reflect only the annual allowable harvest. In actual practice, these figures will fluctuate over and under the allowable harvest periodically.

Stands managed under an uneven aged system have no rotation age because regeneration in these systems is ever-present and different age classes occur within the same stand. Sustainable harvest volume is estimated by calculating the growth in volume over a period of time, generally 20 years.

Invasive Species

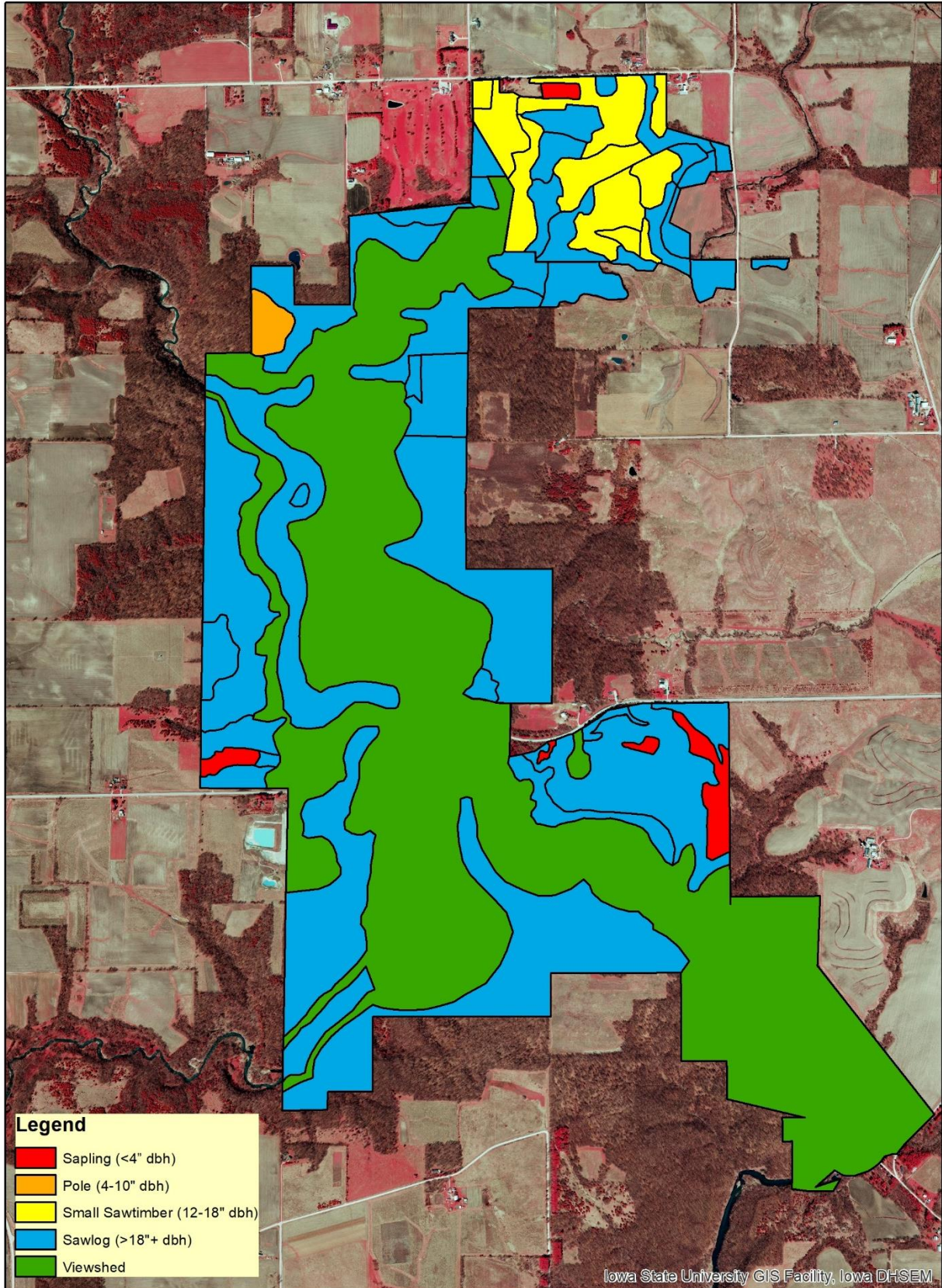
Several exotic, invasive species are found throughout Backbone State Park and Forest. Some of the most common invasive species found at Backbone include oriental bittersweet, bush honeysuckle, and reed canary grass, among others. Control efforts must be taken prior to or alongside any management scheduled for a particular stand. This is particularly important in the northern area of the Park and in the State Forest due to the abundance of the aggressive oriental bittersweet vine found there.

Control methods will vary by species and new methods may be tested for effectiveness.

Current Distribution of Tree Size on the area
***dbh = diameter at breast height**

Tree Size	Forested Acres	% of Total Area
Sapling (<4" dbh)	26.2	2.5%
Pole (4-10" dbh)	10.8	1.0%
Small Sawlog (12-18" dbh)	114.9	10.9%
Sawlog (>18+" dbh)	904.6	85.6%
Totals	1056.5 (excludes viewshed)	100%

Backbone State Park and State Forest Diameter Distribution



Sec. 3, 4, 5, 8, 9, 10, 15, 16
Richland Township
T-90N R-6W
Delaware County

0 0.5 1 Miles



PROPOSED MANAGEMENT SYSTEMS FOR THE AREA

Recommendations for each stand were based on whether the area will be managed to create early successional growth, an even aged system, an uneven aged system, or viewshed. The decision on which management system would be used was based on the objectives for the area to create a certain structural cover, maintain an oak component where feasible, develop a diverse woodland landscape, protect fragile sites, and increase the acres of early successional growth.

Based on forester recommendations for Backbone State Park, the acres under each management system are as follows:

Management System	Acres	% Total
Early successional	37.6	3.6 %
Even aged	717.4	67.9 %
Uneven aged	301.5	28.5 %
Actively managed acres	1056.5	100 %
+ Viewshed areas (no intensive management, parking lots, roads, lake, beach, mowed areas, etc.)	909.6	

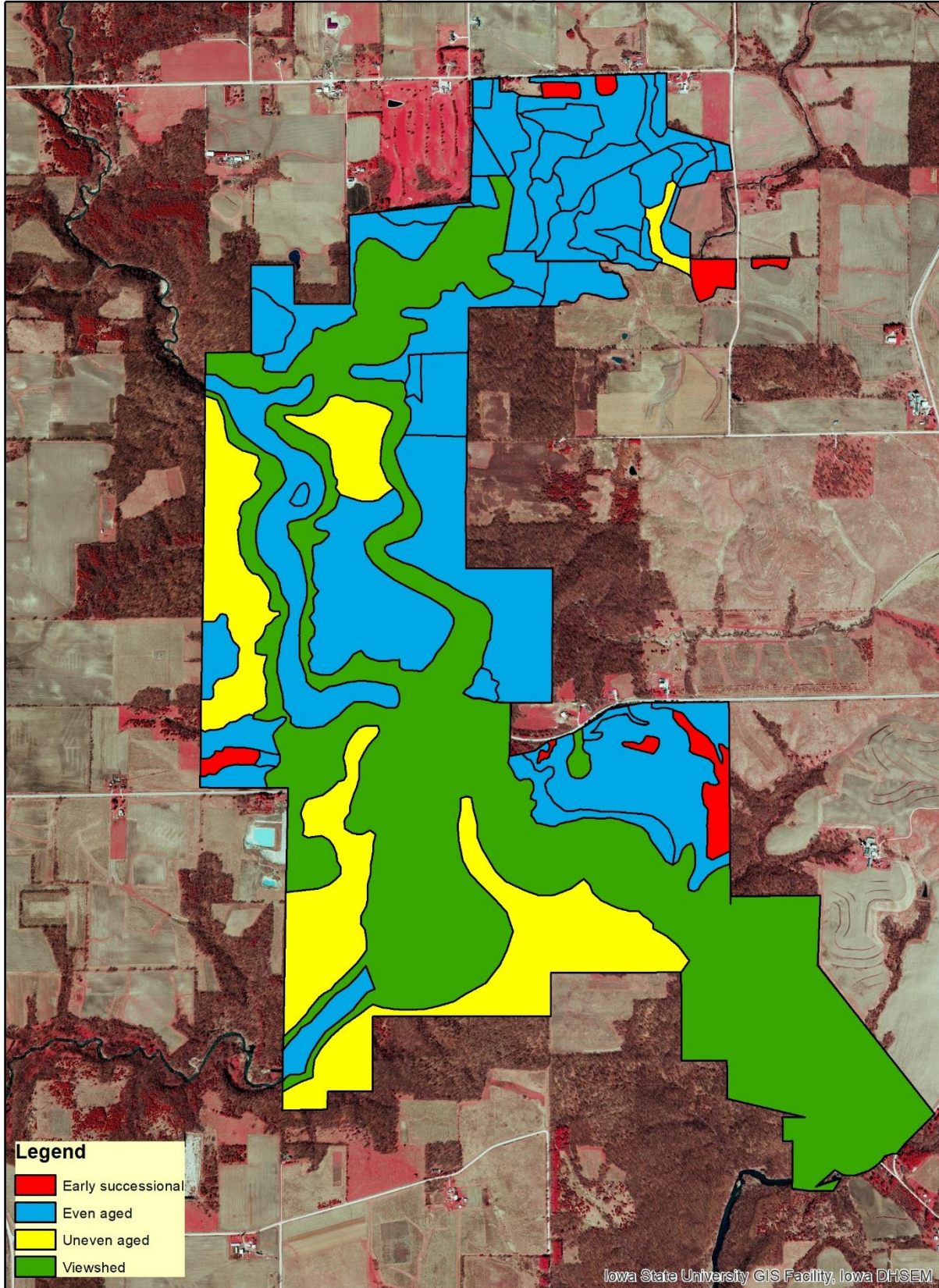
Landscape Considerations

Forest wildlife management plans should take into consideration factors beyond the target property. Wildlife do not recognize property lines, and move freely to satisfy their life cycle needs. Land managers need to think on a broader scale to maximize benefits to local wildlife populations. Current and future conditions on surrounding properties may directly affect the planning and effective results of management actions carried out on the park.

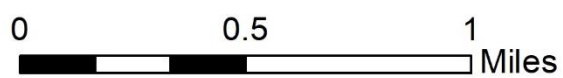
The cumulative effect of early successional management and the regeneration management (clearcuts) in stands managed as even aged will create and maintain an ever-shifting patchwork of young forest that varies spatially and temporally. This mosaic will provide critically important habitat to vast array of wildlife that depend on or prefer early successional forest types. Young forest is a habitat type that is often considered a limiting factor in forested landscapes in Iowa.

The cumulative effect of uneven aged management and viewshed management will be to ensure a significant portion of the park remains in relatively undisturbed, mature forest. This is of particular significance when the larger landscape around the park is taken into consideration. Surrounding the park is a uniquely large expanse of predominantly mature forest habitat. This forest complex spans several square miles, which is unique in Iowa. Landscape level forests provide critically important habitat to wildlife that depend on or prefer forest interior or large expanses of mature forest habitat.

Backbone State Park and State Forest Management Systems



Sec. 3, 4, 5, 8, 9, 10, 15, 16
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Delaware County



Early Successional Management

Many species of birds such as American woodcock, blue-winged warbler, black-billed cuckoo, yellow-billed cuckoo, and eastern towhee are dependent on the early stages of woody growth for breeding. Many mature-forest birds also use early successional forests during the post-fledging and migratory periods. The high stem density of both trees and shrubs provides suitable foraging and/or nesting habitat, and protection from predators. One way that this habitat can be created is by cutting a stand and allowing all of the desirable species to re-sprout. Many tree and shrub species stump sprout vigorously after being cut, especially when cut at a younger stand age.

The majority of early successional management is recommended for the woodland edges adjacent to open habitats. Keeping the woody species growth “low and dense” in these areas will create more attractive habitat for shrubland and “edge” wildlife species. This will “feather” the edges and make a gradual transition from the grassland/agricultural field edges to the larger trees. Feathering or softening the woodland edges creates attractive cover for many species and often results in less nest parasitism of interior forest bird species by brown-headed cowbirds.

The early successional management areas will be managed on a 10-15-year rotation. In other words, every 10-15 years the area will be cut to rejuvenate the desirable species and create areas with high stem density.

Backbone State Park has 37.6 acres (3.6% of all actively managed woodland acres) scheduled for early successional management. Applying sustainable forestry guidelines, 7.5 acres could be cut every 5 years.

Even Aged Management

Even aged management is essential for wildlife species depending on oak/hickory forests. Even though large blocks of forest are needed for some wildlife species, each stage of an even aged stand provides habitat for wildlife. For example, regenerating stands (1-10 years old) benefit the same species of birds as does early successional stands, such as the blue-winged warbler, black-billed cuckoo, yellow-billed cuckoo, eastern towhee and American woodcock.

Sapling to small pole-sized stands between 10 and 20 years old, may be used by species such as the Kentucky warbler. From age 20-60 years, pole to medium-sized trees tend to be used by canopy nesters such as the scarlet tanager, and ground nesters such as the ovenbird. Mature stands of 60 to 125 years of age are used by birds such as the wood thrush, Acadian flycatcher, ovenbird and scarlet tanagers. All size classes are important for many game species such as bobcat, deer, squirrel, and wild turkey.

As forest stands age, they constantly lose trees to shading, insects, disease and other factors. The dead and dying trees provide habitat for cavity nesters such as wood ducks, woodpeckers, nuthatches and titmice. Over 30 species of Iowa nesting birds nest in the cavities of trees. Iowa’s seven species of woodpeckers (including two SGCN) are the primary cavity builders and nesters, and these woodpeckers are the keystone species that provide the cavities for so many other secondary nesting birds, as well as providing homes for flying squirrels, gray and fox squirrels, bats, and a host of other species. In northeast Iowa, federally threatened northern long-eared bats use loose-barked, live trees such as shagbark hickory as well as the sloughing bark from dying trees for their maternity colonies.

Even aged management involves growing a stand of trees which are close to the same age. At some point in the stand’s life, the area is clearcut which creates the even aged structure. Even aged management creates excellent habitat for deer and turkey, and is essential to the regeneration of oak which require full sunlight. The only way that oak can be maintained as a component of the forest is by practicing some form of even aged management.

Common forms of even aged management in Iowa include clearcutting and planting, clearcutting with regeneration already established, or a shelterwood system to develop desirable seedlings on the ground.

Shelterwood is a form of even aged management. The final cut is a clearcut, but several thinnings are done prior to the final cut. The large, healthy trees are left to provide seed for naturally reseeding the stand, and to create partial shade to inhibit the growth of weeds and brush until the desirable seedlings are well established. The final cut, or clearcut, is normally done when there are a sufficient number of desirable trees that are 3-5 ft. tall. The shelterwood system can take many years to develop a good stocking of desirable young trees. You may have to kill the undesirable species

several times to favor the species you want. The final clearcut should not be made until you are satisfied with the stocking of desirable young trees.

Clearcutting to create full sunlight is essential at some point in the stand's life to successfully regenerate oak. If stands are not clearcut, the oak component of the forest will be lost to shade tolerant species such as sugar maple and basswood. Clearcuts also provide additional early successional habitat in the early stages. The area is in the brushy stage for a very short period, normally 10-15 years. After that time, the trees will totally shade the ground, and the area becomes a pole-sized (4-10" dbh) stand of trees.

Prescribed fire can be an important tool in managing oak stands. Frequent burning of the leaf layer in the woodland will kill thin barked species such as hard maple, cherry, elm, bitternut hickory, and ironwood. Fire will expose mineral soil and open up the ground to sunlight. These conditions favor the natural regeneration of oak. Oak seedlings will tolerate light fires. The top will be killed by the fire, but the deep root systems survive and sprout. Fire will be utilized on a limited scale to encourage oak regeneration in oak stands. Once an adequate number of oak seedlings are present, the over story will need to be removed or the young oak will die from lack of sunlight.

Fire is also an important tool in promoting a more diverse herbaceous plant community on the forest floor. The conditions that favor oak regeneration also favor many native plants that thrive on periodic disturbance. Fire can combat invasive species such as garlic mustard and multiflora rose that crowd out desirable native plants. Periodic fire, coupled with the practices to provide more sunlight through the canopy, will set the stage for more diversity across even aged stands. It has become apparent that fire is not used frequently enough in many upland forests. It seems to be a novelty practice that is used more as a singular event or for promotional status than as a routine part of forest management.

Backbone State Park has 717.4 (67.9% of all actively managed woodland acres that will be managed as even aged. Applying sustainable forestry guidelines, approximately 29.9 acres could be clearcut every 5 years assuming a 120-year rotation age.

Uneven Aged Management

Uneven aged management develops a stand of trees with multiple tree ages and sizes represented. The stand structure is developed by selectively harvesting mature and defective trees, and removing unwanted small trees that are damaged or defective. Because uneven aged stands always have large trees present, this system favors species that will grow in shade such as sugar maple and basswood.

Uneven aged management will maintain blocks of forest that will always have larger trees. Uneven aged management is desirable where the understory is mainly sugar maple, on steep slopes, and on areas where always having large trees is important.

Uneven aged management areas will provide continuous tracts of forest with minimal disturbance. Large tracts of uneven aged management will provide necessary habitat for nesting Neotropical migratory bird species such as eastern wood-pewee, Acadian flycatcher, wood thrush, cerulean warbler, worm-eating warbler, Kentucky warbler, and for migrant Neotropical migratory species such as golden-winged warbler, bay-breasted warbler, and Canada warbler. Selective harvesting will create small openings in the canopy, which will increase ground cover, and enhance stand structure. Den trees will be left to provide cavities for wildlife such as woodpeckers, bats, raccoons and squirrels. Retaining live loose bark tree species (e.g., shagbark hickory) whenever possible and 6-10 snags per acre benefits bats and other wildlife. Timber stand improvement and selective harvesting, along with allowing some natural tree mortality, will create woody debris on the forest floor that will serve as important habitat for reptiles, amphibians and small mammals.

Backbone State Park has 301.5 acres (28.5% of all forest acres) that will be managed as uneven aged forest. Applying sustainable forestry guidelines, approximately 75.4 acres can be selectively harvested (single tree or group selection) every 5 years assuming a 20-year re-entry harvest cycle. Selective harvests may be used on this area (in conjunction with other management practices) as an important step in the process of creating more species diversity in the forest stand.

Viewshed Management

Viewshed areas are typically steep slopes, areas along streams which are fragile and are best left to naturally progress through succession, or other particularly sensitive sites (ecologically or socially). Areas where endangered plant or animal species exist may also be under the viewshed system of management. Management can take place on these areas where desirable, but the primary objective is to have very minor disturbance if any. Such management typically includes lower impact practices such as prescribed fire and invasive species control. Managers will monitor these stands and may choose to implement these practices when they integrate with management of surrounding stands or when degradation threatens the entire stand or surrounding areas.

Viewshed management is an important component of the overall forest management in many localized areas in Iowa. Some landform regions, such as the Paleozoic Plateau, experience a greater need for this system of management than do other regions. Like uneven aged forest management, viewshed areas provide an important core area of relatively stable natural habitat. Many Neotropical birds benefit greatly from the areas designated as viewshed. Algific slopes and moderate slopes under viewshed management protect several of Iowa's rarest species and SGCN.

Backbone State Park has 909.6 acres that will be managed as viewshed area.

SOILS

All forested acres of this plan are located within the Iowan Surface landscape feature. This landform is dominated by gently rolling hills and exposed glacial boulders. Unique areas of loess formed in long ridges, called pahas, are also present in this area.

Soil is the medium for plant growth and can dictate current and future forest composition. Soil type is a variable that is considered for all forest management decisions. The common soil types found in this forest management plan are Fayette and Nordness series. Spillville-Coland, Chelsea, and Backbone soils are also present to a lesser extent.

The Fayette series consists of very deep, well drained soils formed in loess. These soils are on convex crests, interfluvies and side slopes on uplands and on treads and risers on high stream terraces. Slope ranges from 0 to 60 percent.

The Nordness series consists of shallow, well drained soils formed in loamy or silty material and a paleosol over limestone bedrock. These soils are on high structural benches, crests, and convex side slopes on uplands

The Spillville-Coland complex consists of very deep, poorly drained soils. This soil type is located on floodplains and gentle foot slopes. This complex is composed of alluvium; silt, sand, and clay deposited by flowing water and known for generally being fertile. Slope ranges from 0 to 5 percent.

The Chelsea series is deep, excessively well drained soils and have a high sand content throughout the soil profile. These soils can be found on convex summits, side slopes, and crests of escarpments. Slope ranges from 0 to 45 percent.

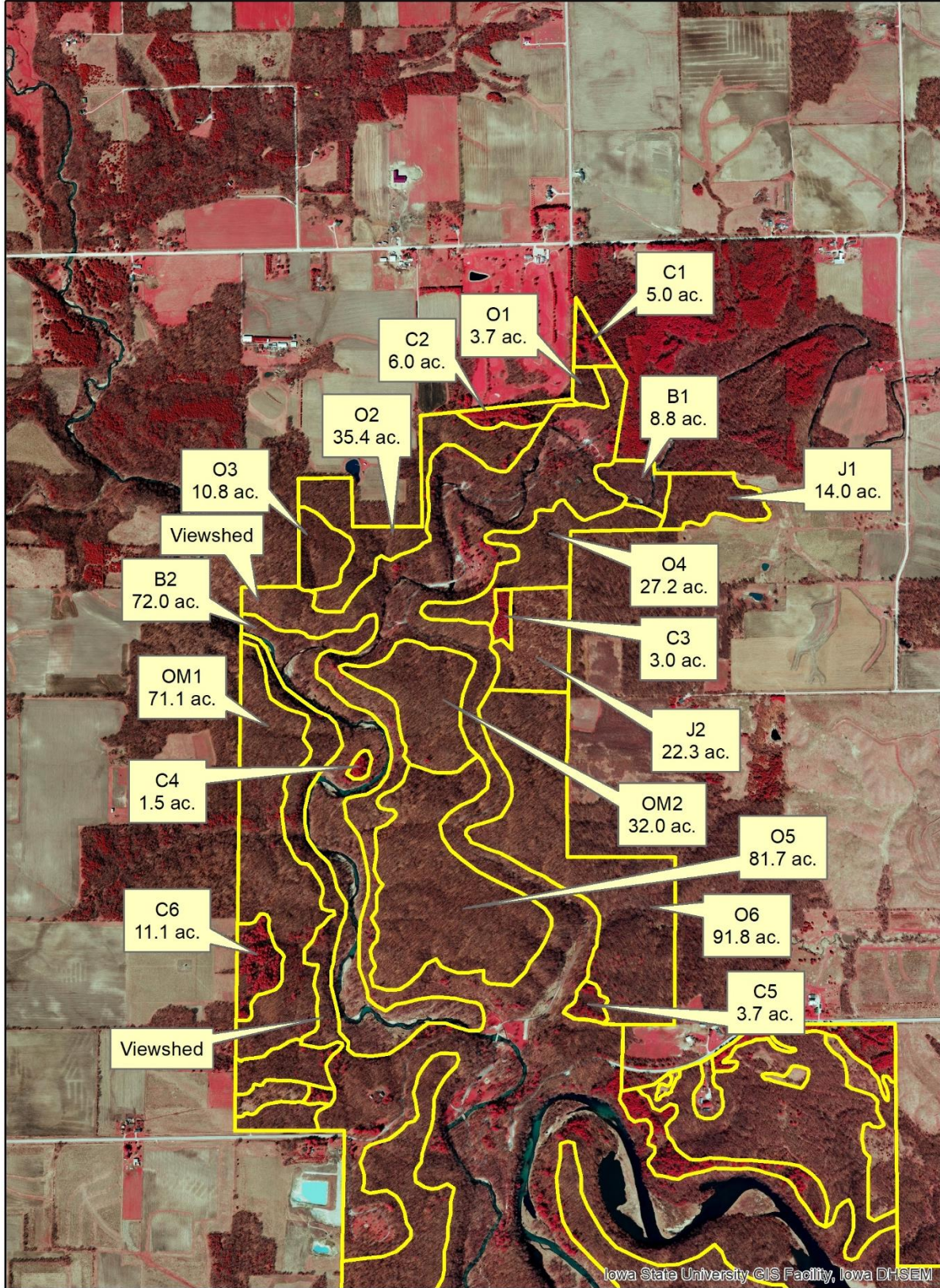
The Backbone series consist of moderately deep and well drained soils. Bedrock can typically be found close to the soil surface. These soils are on convex ridges and upland back slopes. Slope ranges from 2 to 18 percent.

WORK PLAN FOR BACKBONE STATE PARK

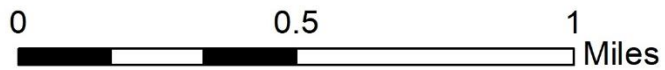
This is the "working plan" for the Backbone State Park designed to aid professional biologists, foresters, and park managers in the implementation of forest management practices. It is written with the understanding that these professionals have a basic understanding of forest management principles and techniques. Every detail has not been outlined in the plan because the plan would become too long to be of practical use. This plan is intended to get work accomplished on the ground.

Before implementation of any prescribed harvests, the project plan will be reviewed internally to determine potential impacts to both state and federal threatened or endangered species. Harvests will not be initiated until this review has been completed and all T/E comments/concerns have been addressed.

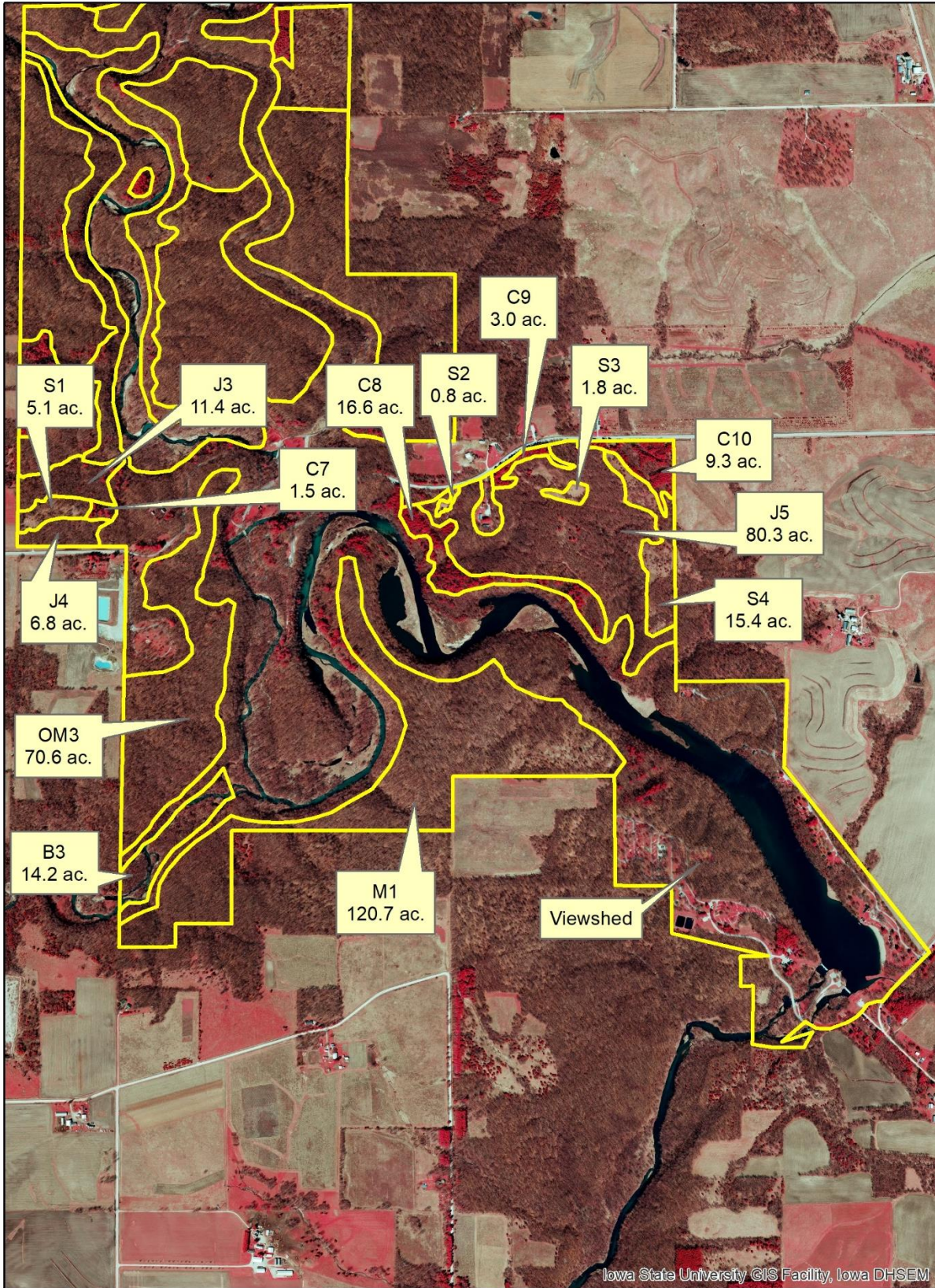
Backbone State Park North Portion



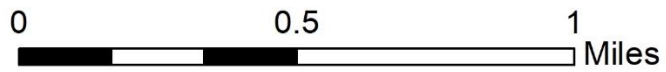
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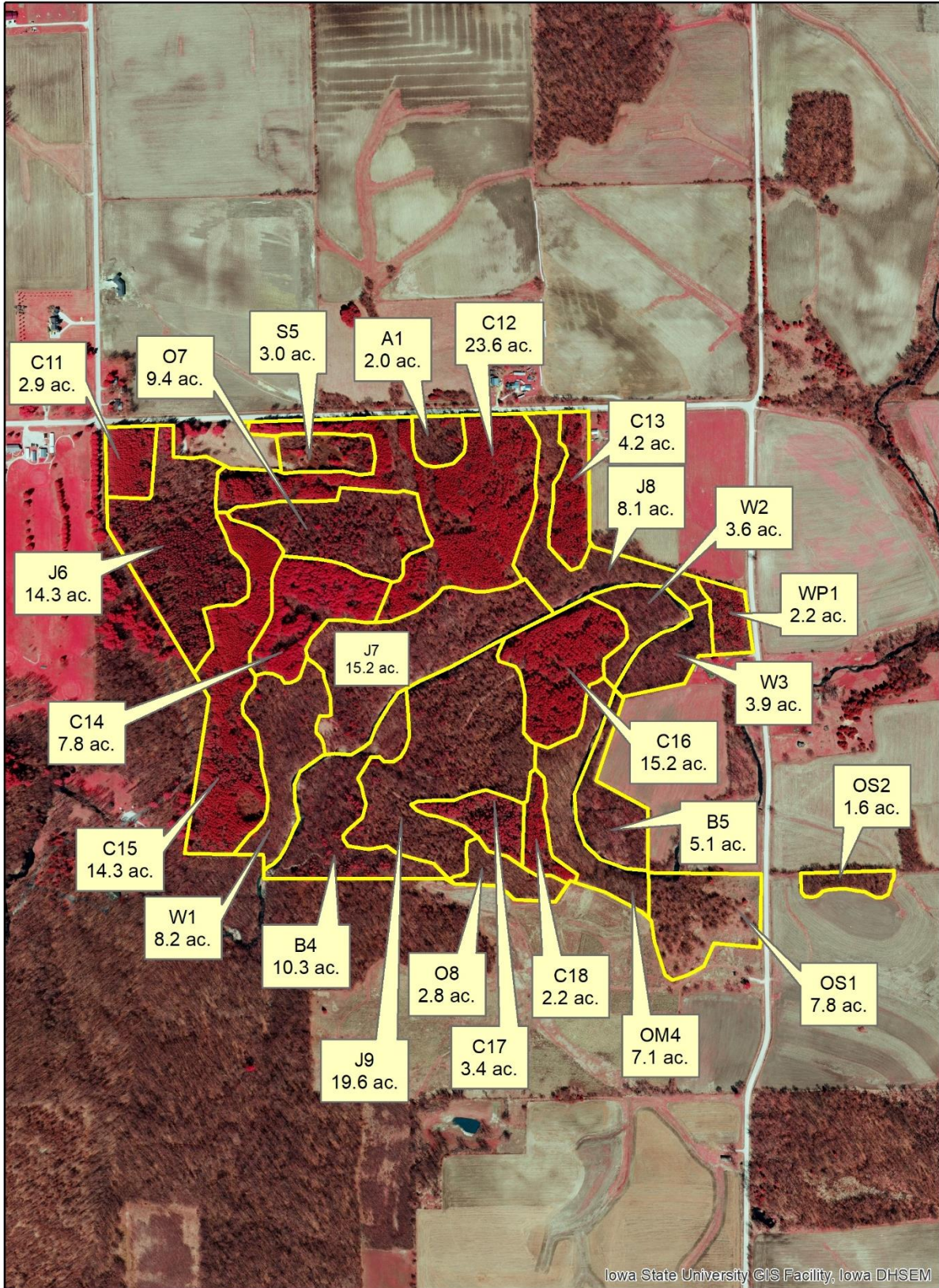
Backbone State Park South Portion



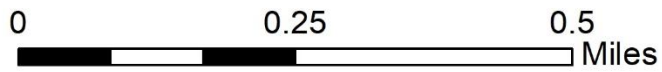
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Delaware County



Backbone State Forest



Sec. 3, 4
Richland Township
T-90N R-6W
Delaware County



STAND SUMMARIES & RECOMMENDATIONS

Stand	Acres	Overstory	Intermediate/ Understory	Size Class	Management System	Prescription	Priority	Year	Stand Comments
A1	2.0	Red oak, bur oak, bigtooth aspen	Elm, shagbark hickory, bur oak, cherry, ironwood	Sawlog	Early successional	Weed tree removal, coppice all aspen	Medium		
B1	8.8	Silver maple, boxelder, cottonwood, hackberry, ash, cherry, walnut, scattered oak	Ironwood, boxelder, elm, hackberry, cherry	Sawlog	Even aged	Weed tree removal	Low		
B2	72.0	Silver maple, boxelder, cottonwood, hackberry, ash, cherry, walnut, scattered oak	Ironwood, boxelder, elm, hackberry, cherry	Sawlog	Even aged	Weed tree removal	Low		
B3	14.2	Silver maple, boxelder, cottonwood, hackberry, ash, cherry, walnut, scattered oak	Ironwood, boxelder, elm, hackberry, cherry	Sawlog	Even aged	Weed tree removal	Low		
B4	10.3	Silver maple, walnut, elm, hackberry, bur oak, boxelder	Boxelder, hackberry, elm, bitternut hickory, cherry	Sawlog	Even aged	Weed tree removal	Low		
B5	5.1	Cottonwood, silver maple, walnut, willow, basswood, black oak	Elm, hackberry, walnut, boxelder	Sawlog	Even aged	Weed tree removal	Low		
C1	5.0	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C2	6.0	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C3	3.0	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C4	1.5	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		

Stand	Acres	Overstory	Intermediate/ Understory	Size Class	Management System	Prescription	Priority	Year	Stand Comments
C5	3.7	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C6	11.1	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C7	1.5	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C8	16.6	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C9	3.0	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C10	9.3	White pine	Elm, boxelder, bitternut hickory, basswood, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C11	2.9	Red pine	Hackberry, cherry, elm	Small sawlog	Even aged	Basal area thinning	Low		
C12	23.6	Red Pine, white pine, Norway spruce	Elm, boxelder, cherry, hackberry, mulberry	Small sawlog	Even aged	Weed tree removal, basal area thinning	Low		
C13	4.2	Red pine	Hackberry, cherry, elm	Small sawlog	Even aged	Basal area thinning	Low		
C14	7.8	White pine	Elm, boxelder, bitternut hickory, shagbark hickory, walnut, red oak, white oak	Sawlog	Even aged	Weed tree removal, basal area thinning	Medium		
C15	14.3	Red pine	Hackberry, cherry, elm	Small sawlog	Even aged	Basal area thinning	Low		
C16	15.2	Red pine	Cherry, hackberry, elm, mulberry, ironwood	Small sawlog	Even aged	Weed tree removal, basal area thinning	Low		

Stand	Acres	Overstory	Intermediate/ Understory	Size Class	Management System	Prescription	Priority	Year	Stand Comments
C17	3.4	Scotch pine, red pine, hackberry, basswood, cherry, black oak, walnut	Ironwood, boxelder, elm, hackberry, cherry, bitternut hickory, walnut	Small sawlog	Even aged	Weed tree removal	Low		
C18	2.2	Red pine	Cherry, hackberry, elm, mulberry, ironwood	Small sawlog	Even aged	Weed tree removal, basal area thinning	Low		
J1	14.0	Sugar maple, basswood, elm, cherry, hackberry, red oak	Ironwood, sugar maple, elm, basswood, hackberry	Sawlog	Even aged	Weed tree removal, planting	Medium		
J2	22.3	Sugar maple, basswood, elm, cherry, hackberry, red oak	Ironwood, sugar maple, elm, basswood, hackberry	Sawlog	Even aged	Weed tree removal, planting	Medium		
J3	11.4	Sugar maple, basswood, elm, cherry, hackberry, red oak	Ironwood, sugar maple, elm, basswood, hackberry	Sawlog	Even aged	Weed tree removal, planting	Medium		
J4	6.8	Sugar maple, basswood, elm, cherry, hackberry, red oak	Ironwood, sugar maple, elm, basswood, hackberry	Sawlog	Even aged	Weed tree removal, planting	Medium		
J5	80.3	Sugar maple, basswood, elm, cherry, hackberry, red oak	Ironwood, sugar maple, elm, basswood, hackberry	Sawlog	Even aged	Weed tree removal, planting	Medium		
J6	14.3	Jack pine (dead/dying), hackberry, elm, ash	Ironwood, mulberry, boxelder, ash, bitternut hickory, elm	Small sawlog	Even aged	Stand conversion	High	2023	
J7	15.2	Hackberry, elm, ash, basswood, red oak, white oak, walnut	Ironwood, mulberry, boxelder, ash, bitternut hickory, elm, hackberry	Small sawlog	Even aged	Weed tree removal, planting	Low		
J8	8.1	Basswood, hackberry, cherry, shagbark hickory, bitternut hickory, red oak, bur oak	Shagbark hickory, ironwood, hackberry, basswood, cherry, elm, mulberry	Sawlog	Even aged	Weed tree removal	Medium		
J9	19.6	Hackberry, elm, ash, basswood, red oak, white oak, walnut	Ironwood, mulberry, boxelder, ash, bitternut hickory, elm, hackberry	Small sawlog	Even aged	Weed tree removal, planting	Low		
M1	120.7	Sugar maple, basswood, scattered red/white oak	Sugar maple, elm, ironwood	Sawlog	Uneven aged	Weed tree removal	Medium		
01	3.7	Red oak, white oak, elm, walnut, shagbark hickory	Elm, bitternut hickory, basswood, cherry, ironwood, hackberry	Sawlog	Even aged	Shelterwood harvest	High		May need additional underplanting

Stand	Acres	Overstory	Intermediate/ Understory	Size Class	Management System	Prescription	Priority	Year	Stand Comments
O2	35.4	Red oak, white oak, elm, walnut, shagbark hickory	Elm, bitternut hickory, basswood, cherry, ironwood, hackberry	Sawlog	Even aged	Shelterwood harvest	High		May need additional underplanting
O3	10.8	Red oak, walnut, cherry, ironwood, bitternut hickory		Pole	Even aged	Oak and walnut release	High	2023	
O4	27.2	Red oak, white oak, elm, walnut, shagbark hickory	Elm, bitternut hickory, basswood, cherry, ironwood, hackberry	Sawlog	Even aged	Shelterwood harvest	High		May need additional underplanting
O5	81.7	Red oak, white oak, elm, walnut, shagbark hickory	Elm, bitternut hickory, basswood, cherry, ironwood, hackberry	Sawlog	Even aged	Shelterwood harvest	High		
O6	91.8	Red oak, white oak, elm, walnut, shagbark hickory	Elm, bitternut hickory, basswood, cherry, ironwood, hackberry	Sawlog	Even aged	Shelterwood harvest	High		
O7	9.4	Red oak, white oak, bur oak, walnut, red pine, cottonwood, cherry, elm	Hackberry, elm, cherry, ironwood, mulberry, walnut	Sawlog	Even aged	Shelterwood harvest	Medium		
O8	2.8	Black oak, white oak, cherry	Ironwood, elm, hackberry, cherry, shagbark hickory, bitternut hickory	Sawlog	Even aged	Weed tree removal	High		Heavy stocking, oak wilt risk
OM1	71.1	Sugar maple, basswood, elm, walnut, cherry, red oak, white oak	Elm, hackberry, bitternut hickory, sugar maple, basswood, ironwood, cherry	Sawlog	Uneven aged	Weed tree removal	High		
OM2	32.0	Sugar maple, basswood, elm, walnut, cherry, red oak, white oak	Elm, hackberry, bitternut hickory, sugar maple, basswood, ironwood, cherry	Sawlog	Uneven aged	Weed tree removal	High		
OM3	70.6	Sugar maple, basswood, elm, walnut, cherry, red oak, white oak	Elm, hackberry, bitternut hickory, sugar maple, basswood, ironwood, cherry	Sawlog	Uneven aged	Weed tree removal	High		
OM4	7.1	Red oak, white oak, sugar maple, basswood, bur oak	Ironwood, sugar maple, basswood, elm, cherry	Sawlog	Uneven aged	Weed tree removal	Medium		
OS1	7.8	Bur oak, white oak, red oak, shagbark hickory	Mulberry, elm, ironwood, ash, sugar maple	Sawlog	Early successional	Canopy reduction, prescribed burn	Medium		
OS2	1.6	Bur oak, basswood, red oak, white oak, cherry	Cherry, hackberry, elm	Sawlog	Early successional	Canopy reduction, prescribed burn	Medium		

Stand	Acres	Overstory	Intermediate/ Understory	Size Class	Management System	Prescription	Priority	Year	Stand Comments
S1	5.2	Semi-open brush		Sapling	Early successional	Weed tree removal, tree planting	Low		Convert to high quality grassland or woodland
S2	0.8	Semi-open brush		Sapling	Early successional	Weed tree removal, tree planting	Low		Convert to high quality grassland or woodland
S3	1.8	Red oak, white oak, swamp white oak, cherry, walnut, shagbark hickory		Sapling	Early successional	Mow, spray, tube removal	High	Ongoing until established	
S4	15.4	Semi-open brush		Sapling	Early successional	Weed tree removal, tree planting	Low		Convert to high quality grassland or woodland
S5	3.0	Semi-open brush		Sapling	Early successional	Weed tree removal, tree planting	Low		Convert to high quality grassland or woodland
W1	8.2	Walnut, bur oak, hackberry, basswood	Hackberry, elm, ironwood, bitternut hickory, boxelder	Sawlog	Even aged	Weed tree removal	Medium		
W2	3.6	Walnut, hackberry, basswood	Walnut, hackberry, basswood, elm, ironwood, cherry	Sawlog	Even aged	Weed tree removal	Medium		
W3	3.9	Walnut hackberry, basswood	Walnut hackberry, basswood, elm, ironwood, cherry	Sawlog	Even aged	Weed tree removal	Medium		
WP1	2.2	Walnut, red pine (dead/dying), elm, cherry	Cherry, elm, hackberry, walnut	Sawlog	Even aged	Weed tree removal	Medium		
V	909.6	Varies	Varies	Varies	Viewshed				Limited management activities: hazard tree removal, salvage harvest, and protection

THREATENED AND ENDANGERED SPECIES FOR DELAWARE COUNTY

The following list is taken from the Iowa DNR Natural Areas Inventory webpage

Common Name	Scientific Name	Class	State Status*	Federal Status*
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Birds	S	
Barn Owl	<i>Tyto alba</i>	Birds	E	--
Henslow's Sparrow	<i>Ammodramus henslowii</i>	Birds	T	
Red-shouldered Hawk	<i>Buteo lineatus</i>	Birds	E	
American Brook Lamprey	<i>Lampetra appendix</i>	Fish	T	
Black Redhorse	<i>Moxostoma duquesnei</i>	Fish	T	
Blacknose Shiner	<i>Notropis heterolepis</i>	Fish	T	
Least Darter	<i>Etheostoma microperca</i>	Fish	E	
Creek Heelsplitter	<i>Lasmigona compressa</i>	Freshwater Mussels	T	
Creeper	<i>Strophitus undulatus</i>	Freshwater Mussels	T	
Cylindrical Papershell	<i>Anodontooides ferussacianus</i>	Freshwater Mussels	T	
Slippershell Mussel	<i>Alasmidonta viridis</i>	Freshwater Mussels	E	
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Mammals		E
Plains Pocket Mouse	<i>Perognathus flavescens</i>	Mammals	E	
Alderleaf Buckthorn	<i>Rhamnus alnifolia</i>	Plants (Dicots)	S	
Bunchberry	<i>Cornus Canadensis</i>	Plants (Dicots)	T	
Earleaf Foxglove	<i>Tomanthera auriculata</i>	Plants (Dicots)	S	
Golden Saxifrage	<i>Chysosplenium iowense</i>	Plants (Dicots)	T	
Hill's Thistle	<i>Cirsium hillii</i>	Plants (Dicots)	S	
Kitten Tails	<i>Besseyia bullii</i>	Plants (Dicots)	T	
Limestone Rockcress	<i>Arabis divaricarpa</i>	Plants (Dicots)	S	
Low Bindweed	<i>Calystegia spithamea</i>	Plants (Dicots)	S	
Mountain Maple	<i>Acer spicatum</i>	Plants (Dicots)	S	
Muskroot-	<i>Adoxa moschatellina</i>	Plants (Dicots)	S	
Northern Black Currant	<i>Ribes hudsonianum</i>	Plants (Dicots)	T	
Northern Monkshood	<i>Aconitum noveboracense</i>	Plants (Dicots)	T	T
One-sided Pyrola	<i>Pyrola secunda</i>	Plants (Dicots)	T	
Prairie Bush Clover	<i>Lespedeza leptostachya</i>	Plants (Dicots)	T	T
Prickly Rose	<i>Rosa acicularis</i>	Plants (Dicots)	E	
Ricebutton Aster	<i>Aster dumosus</i>	Plants (Dicots)	E	
Rock Sandwort	<i>Minuartia michauxii</i>	Plants (Dicots)	S	
Rough Bedstraw	<i>Galium asprellum</i>	Plants (Dicots)	S	
Sage Willow	<i>Salix candida</i>	Plants (Dicots)	S	
Sand Cherry	<i>Prunus pumila</i>	Plants (Dicots)	S	
Shadbush	<i>Amelanchier sanguinea</i>	Plants (Dicots)	S	
Shining Willow	<i>Salix lucida</i>	Plants (Dicots)	T	
Shrubby Cinquefoil	<i>Potentilla fruticose</i>	Plants (Dicots)	T	
Small Sundrops	<i>Oenothera perennis</i>	Plants (Dicots)	T	
Sweet Indian Plantain	<i>Cacalia suaveolens</i>	Plants (Dicots)	T	
Toothcup	<i>Rotala ramosior</i>	Plants (Dicots)	S	

Common Name	Scientific Name	Class	State Status*	Federal Status*
Valerian	Valeriana edulis	Plants (Dicots)	S	
Violet	Viola macloskeyi	Plants (Dicots)	S	
Woolly Milkweed	Asclepias lanuginose	Plants (Dicots)	T	
Bog Bluegrass	Poa paludigena	Plants (Monocots)	S	
Carey sedge	Carex caryana	Plants (Monocots)	S	
Dry-spike Sedge	Carex foenea	Plants (Monocots)	S	
Glomerate Sedge	Carex aggregata	Plants (Monocots)	S	
Great Plains Ladies'-tresses	Spiranthes magnicamporum	Plants (Monocots)	S	
Hidden Sedge	Carex umbellata	Plants (Monocots)	S	
Hooker's Orchid	Platanthera hookeri	Plants (Monocots)	T	
Intermediate Sedge	Carex media	Plants (Monocots)	S	
Meadow Bluegrass	Poa wolfii	Plants (Monocots)	S	
Mountain Ricegrass	Oryzopsis asperifolia	Plants (Monocots)	S	
Nodding Onion	Allium cernuum	Plants (Monocots)	T	
Northern Panic-grass	Dichanthelium boreale	Plants (Monocots)	E	
Richardson Sedge	Carex richardsonii	Plants (Monocots)	S	
Rosy Twisted Stalk	Streptopus roseus	Plants (Monocots)	T	
Showy Lady's Slipper	Cypripedium reginae	Plants (Monocots)	T	
Slender Fimbrly	Fimbristylis autumnalis	Plants (Monocots)	S	
Slender Sedge	Carex tenera	Plants (Monocots)	S	
Smith Bulrush	Scirpus smithii	Plants (Monocots)	S	
Soft Rush	Juncus effuses	Plants (Monocots)	S	
Spotted Coralroot	Corallorhiza maculate	Plants (Monocots)	T	
Tall Cotton Grass	Eriophorum angustifolium	Plants (Monocots)	S	
Cinnamon Fern	Osmunda cinnamomea	Plants (Pteridophytes)	E	
Crowfoot Clubmoss	Lycopodium digitatum	Plants (Pteridophytes)	S	
Dwarf Scouring-rush	Equisetum scirpoides	Plants (Pteridophytes)	S	
Ledge Spikemoss	Selaginella rupestris	Plants (Pteridophytes)	S	
Limestone Oak Fern	Gymnocarpium robertianum	Plants (Pteridophytes)	S	
Long Beechfern	Thelypteris phegopteris	Plants (Pteridophytes)	E	
Northern Adder's-tongue	Ophioglossum pusillum	Plants (Pteridophytes)	S	
Prairie Moonwort	Botrychium campestre	Plants (Pteridophytes)	S	
Rock Clubmoss	Lycopodium porophilum	Plants (Pteridophytes)	T	
Royal Fern	Osmunda regalis	Plants (Pteridophytes)	T	
Woodland Horsetail	Equisetum sylvaticum	Plants (Pteridophytes)	T	
Blanding's Turtle	Emydoidea blandingii	Reptiles	T	
Ornate Box Turtle	Terrapene ornate	Reptiles	T	
Wood Turtle	Clemmys insculpta	Reptiles	E	
Bluff Vertigo	Vertigo meramecensis	Snails	E	
Iowa Pleistocene Snail	Discus macclintocki	Snails	E	E
Variable Pleistocene Vertigo	Vertico hubrichti variabilis	Snails	T	

*E= Endangered / T= Threatened / S= Special Concern

LITERATURE CITED

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