Natural Resources Management Plan

White Pine Hollow State Preserve and Wildlife Management Area

Dubuque County

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All Photos provided by Brian Gibbs

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INTRODUCTION

The first purchase of land, which would eventually become White Pine Hollow State Preserve, took place in 1927. Over the years, parcels have been added until now the preserve includes 708 total acres. (Figure 7 in the map section of this plan shows an aerial photo with the year each parcel was purchased.) In 1989 and 1994, two parcels adjacent to the preserve were purchased and designated as State Forest lands. In 1991, another adjacent parcel was purchased and designated as a Wildlife Area of the Maquoketa Wildlife Management Unit. For the purposes of this plan, all of these 938 total contiguous acres will be covered under this one document.

In April of 1933, Dr. Ross Harris of Senior High School in Dubuque convened a meeting of local conservation enthusiasts. At this meeting, the group formed the *Dubuque County Conservation Society*. According to a local newspaper account, "Mr. Harris explained the purposes of the gathering, to form a society to preserve and protect desirable tracts of the county. An area near Luxemburg known as Pine Hollow was principally discussed, as it is hoped that this rare tract of white pine and natural woodland can be preserved for the use and enjoyment of this and future generations." In 1934, this society raised the funding to purchase an 80 acre tract of land that would eventually become the core of the future preserve. It was originally called, *White Pine Hollow Forest Reserve*. In 1968, it was dedicated as a Biologic and Geological State Preserve and renamed *White Pine Hollow State Preserve*. It was designated as a National Natural Landmark in 1972.

An initial management plan for the preserve was completed in 1989. In 2000, an updated Ecosystem Management Plan was completed. In this new plan it was stated:

The goal of the State Preserves System is to protect and maintain examples of quality archaeological, historical, geological, biological, and scenic areas for present and future generations. Areas nominated for preserves status must be high quality examples of one or more of these types of area. White Pine Hollow has been designated a Geological and Biological Preserve to reflect its most outstanding qualities. The management philosophy at White Pine Hollow has evolved/changed over the decades. The presence of Iowa's largest natural population of white pine, coupled with the area's spectacular scenery, provided the impetus for acquisition. In October, 1952, the then Iowa Conservation Commission supported a staff recommendation that the management goal was to perpetuate the white pine population there; that "selective cuttings of competing species be made under supervision'' to ensure that end. It had thus become apparent that some type of management is necessary if a significant white pine presence is to remain within the area.

Geology

The following text can from the *State Preserves Guide* which can be found on the Iowa DNR State Preserves web page:

> Located along the western edge of the Paleozoic Plateau landform region, the deeply dissected, bedrock-dominated topography of this preserve lies on the prominent Silurian Escarpment. This line of steep rock bluffs marks the eroded edge of hard, resistant Silurian-age dolomite. Terrain is typical of the Silurian Escarpment, with numerous large rock outcrops, slump blocks, cliffs, sinkholes, caves, algific talus slopes, springs, and steep-walled valleys. The deep valley of Pine Hollow Creek and three extensive branches cut through the preserve. The "hogsback," a nearly isolated narrow upland ridge formed by the meandering creek, can be found in the southeastern portion of the preserve. A "rock city" of separated massive slump blocks occurs just north of the hogsback. Precipitous bluffs occur throughout the preserve. The preserve's highest point, at 1,140 feet, is about 320 feet above its lowest elevation. This unique geology is driving force which has led to the development of the preserve's unique plant and animal communities.

Soils

In 1982, The U.S. Department of Agriculture (USDA) conducted soil survey work throughout Dubuque County. This survey updated an earlier survey that was completed back in 1923. After analyzing all the data, they placed the county's soils into *map units* which, in-turn, were placed within *soil series associations*. The soils within White Pine Hollow State Preserve fall under the *Fayette-Nordness Association*. The parent materials for the soils of this association consist of glacial till, residuum and wind-deposited loess. All the soils within this association developed, over thousands of years, under a forest cover.

In 1837, the U.S. Government Land Office (GLO) surveyed the townships and sections that would later become the preserve. The surveyors were instructed to collect vegetation data as part of their survey. The vegetation that was recorded within the preserve they called, "Timber/Scattering/Openings." Today, this description is interpreted to be akin to what we now call *savanna,* or open-woodland.

This combination of soil and historic vegetation information is being used to inform our natural resource management decisions.

Major Plant Communities

Bottomland Hardwood forest cover includes the woody species found in lowland floodplains. This type of community is extensively impacted by flooding, alluvial deposition, scour-erosion, stream-bank erosion and highly variable water-tables. Only those species adapted to these dynamic conditions can flourish. Common bottomland hardwood species within the preserve include willows, cottonwood, rock elm and boxelder. Species that are only somewhat well-adapted to these harsh conditions include bur oak, black ash, white elm, black walnut, basswood and hard maple.

Oak-Hickory forest cover was once very abundant throughout much of the Midwest. Today, many of our Oak-Hickory forest stands have transitioned into Maple-Basswood forest cover as a result of natural ecological succession. Despite this, you can still see many acres of Oak-Hickory forest cover throughout the preserve. Within the preserve, common species associated with Oak-Hickory include northern red oak, white oak, black oak, bur oak, shagbark hickory, bitternut hickory and black walnut. Periodic fires are necessary to maintain Oak-Hickory forest at its defined successional stage. Due to decades of fire suppression, the Oak-Hickory stands within the preserve now have an understory populated with shade-tolerant climax community species like hard maple, white ash, ironwood and basswood.

Natural resource professionals know that Oak-Hickory forest cover will support a greater abundance and diversity of wildlife as compared to other types of forest cover. One reason for this is because Oak-Hickory stands produce a greater abundance of hard mast which is a high value source of wildlife food. Additionally, the canopy of Oak-Hickory forest transmits a greater amount of sunlight as compared to Maple-Basswood cover. This additional sunlight energy leads to the development of a relatively diverse and abundant understory shrub and herbaceous layer.

Oak-Hickory/Pine forest cover is more common farther north such as the central region of Wisconsin to the north-central region of Minnesota. This cover is similar to Oak-Hickory forest cover but also contains a component of pines and other conifers. White Pine Hollow contains the largest stand of this type of forest cover in the whole state.

Maple-Basswood forest cover is fairly uncommon in White Pine Hollow. However, that is going to change fairly quickly as most of the oak trees in the preserve are reaching the end of their natural lifespans. Currently, wherever canopy gaps occur, these gaps are filled-in with shade tolerant species especially hard maple, white ash and basswood. You can find Maple-Basswood cover in the preserve on some of the steep north facing slopes. Common species of this cover type includes hard maple (both sugar maple and black maple), basswood, white ash, black ash and ironwood. Other species often encountered includes white elm, red elm, hackberry, black cherry and bitternut hickory.

Scrub-Oak forest cover can be found on a very small portion of the preserve. It includes the trees uniquely adapted to growing on hot and droughty sites. These sites typically occur on steep south and west-facing aspects. Species that are found to do well under these conditions tend to have a "scrubby" looking appearance such as bur oak, black oak, chinquapin oak and eastern red cedar. It is fairly common to find bits-and-pieces of native prairie remnants mixed-in.

Glade communities consist of smaller openings found within larger forested areas. In White Pine Hollow, glades occur at the edges of steep drop-offs and rock outcroppings. These glades have remained free of trees due to their thin and droughty soils. The vegetation on glade communities is mostly native prairie adapted to droughty conditions. This type of cover is rare within the preserve and provides a home for unique collection plant and animal species. Even though the soil is very thin and droughty, woody vegetation will eventually encroach. Therefore, periodic vegetation management is necessary to maintain these rare glade communities.

Natural Features

Many of Iowa's oldest known trees can be found within the preserve. In 1981, researchers from Oak Ridge National Laboratory looked at tree cores from many old-looking trees. They located a number of trees that were over 300 years old and even some that were over 400 years old! Most of these older trees are located within Stand 15 which can be located on Figure 2 in the map section of this plan.

The preserve has a rare habitat found on *Algific Talus Slopes*. Researchers have identified a total of six separate areas within the preserve that contain algific talus slopes. Some of the unique plant and animal species found on these slopes include the Iowa golden saxifrage, Hubricht's vertigo snail, Northern monkshood and the Iowa pleistocene snail. The following text comes from the State Preserves web page. *Algific slopes are found within the preserve. These are unique habitats occurring where broken chunks of limestone lay downslope from the vent or vents of caves where ice forms in late winter or early spring. Ice results from melting snow flowing through sinkholes into the fractured limestone. Ice melts throughout the summer and bathes the slopes in cool air. This phenomenon creates habitat for plants and animals most often found hundreds of miles away in the northern forests of Minnesota or Wisconsin.*

NATURAL RESOURCES MANAGEMENT CONCERNS

As was stated in the 2000 Ecosystem Management Plan:

Ecosystem management recognizes that natural systems are not static; that, in the absence of management, change is inevitable. Simply put, "doing nothing will result in something." Succession is a primary driving force for change. Management can act to reverse, to slow, or to accelerate the process of natural selection and can introduce components into a natural system not ordinarily found there or that may have been "lost" from the original system as a result of human activity. Ecosystem management recognizes this and utilizes the successional process within its "palette" of available management tools.

Management intervention can create conditions favorable for white pine and oak regeneration. Representative upland oak and pine management locations can be identified, however, perhaps keyed to those portions of the site where the majority of public activity takes place. Remaining areas of the preserve can then be subject to inactive management, with the realization that oak dominance will gradually give way to a maple and basswood "old forest" situation.

Forest succession

Forest succession is also called, *ecological succession*. It is the process of orderly changes in a plant community over time due to a relative lack of major man-made or natural 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 colonizers was periodic fires. Examples of early successional forest species within White Pine Hollow include eastern red cedar, aspen, oak, walnut and many shrubs. With few major disturbances, over time plants that can tolerate less-and-less sunlight move-in to a stand until the *climax community* has been reached, which is the end-of-the-line when it comes to the process of succession. You can witness this process throughout the preserve because fire has been suppressed for so many decades. Common climax forest species found within the preserve includes hard maple (sugar & black), basswood, white ash, bitternut

hickory and ironwood. Once a forest reaches the climax stage, there tends to be very little vegetation other than spring ephemerals found on the forest floor. In Iowa, the early to mid-successional forest stages tend to support a greater diversity of plants and animals. That is the main reason why natural resource managers often work to create and maintain a stand in the early-successional Oak-Hickory forest stage verses the late-successional Maple-Basswood stage.

Loss of Oak Forest

Oaks are the official State Tree of Iowa and are considered by many to be an important "keystone" species in 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 young oak trees is a serious problem throughout White Pine Hollow, and is largely blamed on the lack of disturbances (e.g. fire) which kept this slow-growing species competitive, and on over-browsing by white-tailed deer. Without fire to set back the encroachment of competing shade-tolerant species, oak seedlings will not persist and will be replaced by shade-tolerant trees such as hard maple, basswood, and ash. These tree species have relatively lower wildlife value compared to oak. U.S. Forest Service inventory data suggests the Iowa is losing around 5,000 acres of oak forest every year. The natural lifespan for 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. A majority of the oak trees throughout the preserve are rapidly approaching their natural life expectancy.

Foresters have been carefully monitoring the health of the oak trees within the preserve. As a tree gets older, it takes proportionally less stress to cause them to decline and die. A major stressor that has been thoroughly documented within the preserve is the frequent occurrence of a condition called *oak tatters*. An oak tatters study was conducted on a stand of white oak near the east parking lot from 2002 through 2008. Oak tatters damage was documented to have occurred every year during that time span. We are now confident that the cause of oak tatters is herbicide drift off of nearby fields that comes from volatilization from the soil from herbicides containing the active ingredient, *Acetochlor.*

Loss of Eastern White Pine

There are many small extant stands of eastern white pine (*Pinus strobus*) scattered throughout Northeast Iowa. No doubt Iowa's largest stand is in White Pine Hollow State Preserve. These pines are essentially relic populations from when the local climate was more like it currently is in Northern Minnesota and Wisconsin. These extent stands were left behind as glaciers as they retreated north starting around 12,000 years ago.

Eastern white pine is often labeled a "disturbance dependent" species. That means it needs disturbances like fires, erosion and severe storms to create the soil and sunlight conditions for trees to regenerate and develop. Pine seeds prefer to fall on bare mineral soil in order to germinate. Bare soil conditions can be found on steep erodible slopes or after fires have consumed the heavy duff layer on the forest floor. Eastern white pine regeneration typically occurs into abandoned fields, after stand-replacing wildfires and along eroded slopes and ridges. Currently, the only places where you can see young pine trees within White Pine Hollow are along its steep slopes and ravines. There are no abandoned fields the understory in the uplands is now totally covered by years of duff accumulation and many young hard maple seedlings and saplings. It will require some intensive forest management, properly timed, for white pine regeneration to take hold.

Impacts of White Tail Deer on Forest Vegetation & Wildlife

Just as oak trees are Iowa's keystone tree species, white-tailed deer are Iowa's keystone wildlife species. Not too long ago deer were nearly absent from the 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! In order to maintain the overall health of the forest ecosystem, it will be necessary to balance deer numbers in the preserve through regular deer hunting. Hunting is permitted within White Pine Hollow State Preserve.

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 found within the preserve including: garlic mustard, autumn olive, bush honeysuckle, multiflora rose, white mulberry, Siberian elm and reed canary grass along with others.

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 cars in a parking lot. 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.

NATURAL RESOURCE MANAGEMENT OBJECTIVES

Natural resource management systems are ways of establishing big-picture long-term management goals and objectives that will be applied to stands so that appropriate short-term and long-term management activities can be established. Figure 4 in the map section shows the locations where various management systems will be implemented. What follows is a brief description of each of these management systems.

Old-Growth Management: The objective of *old-growth* management is to have lots of old, stately, mature trees. Over time, the overstory trees will gradually die from natural causes leaving gaps in the canopy for shade tolerant species to fill-in. As a result of this process, the species composition will shift toward the climax stage of ecological succession. Low impact management activities such as prescribed fire, invasive species control, disease control, etc., are permissible activities. It may be determined, on a case-by-case basis, to conduct a timber harvest but only in cases where severe and extensive storm damage has occurred.

The total area cover by this plan is **938 acres**. There are **668 acres** designated for *old-growth* management, which equals approximately **71%** of the preserve's area.

Open-Woodland Management: The *open-woodland* management system is used to restore and/or create forest habitat that contains between 50% to 70% overstory canopy cover. This management system is used to create *savanna-like* open woodland cover which is a type of habitat that is in steep decline throughout the Midwest and has now become quite rare. This system is also used to promote natural regeneration of Oak-Hickory type forest. Prescribed fire is typically used under this system. Periodic prescribed fires help to improve conditions for natural reproduction of oak and eastern white pine. Additionally, it is typically necessary to fell or harvest a portion of trees in the overstory and understory in order to reach the target canopy density.

There are **113 acres** designated for *open-woodland* management, which equals approximately **12%** of the total acres.

Riparian Management: A *riparian ecosystem* consists of the plants and animals that inhabit the streams, stream banks and flood plains of a water course. Management activities can vary from stream-to-stream and are dependent on the hydrologic factors impacting the stream and its watershed. Because of the unpredictable nature of our weather, it is necessary to take an adaptive management approach when managing riparian zones.

There are **74 acres** designated under *riparian* management which is about **8%** of the preserve's acres.

Early Successional - Woody Management: The objective of *early successional – woody* management is to perform cultural practices that will hold ecological succession at a certain stage or even to set it back to an earlier stage. Practices like clearcutting, edge-feathering and heavy weeding/cleaning are examples of treatments that will accomplish this objective.

There are **43 acres** of the forest within the White Pine Hollow Wildlife Management Area that will be managed for early-successional woody habitat. This equals approximately **5%** of all the preserve's acres.

Early Successional - Prairie Management: The objective of *early successional – prairie* management is intended to maintain grassland habitat in a prairie-like condition. The primary management tool is prescribed fire. Periodic fire will also hold back woody encroachment and encourage native warm-season grasses and forbs over non-native cool-season grasses and forbs.

There are **40 acres** of *early successional – prairie* management all within the wildlife management area which equals approximately **4%** of the total acres.

MAPS SECTION

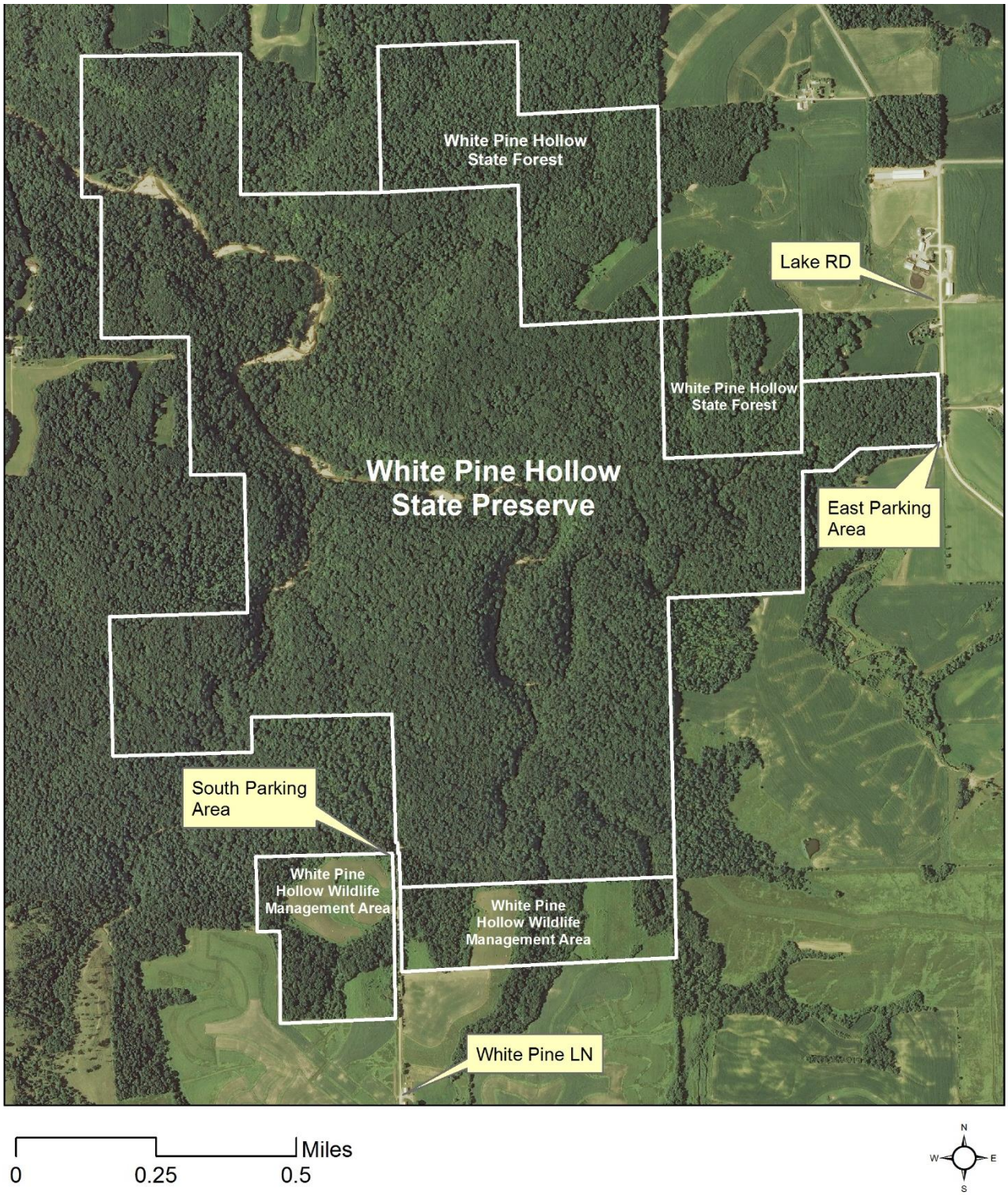

Figure 1. This image shows the boundaries of the State lands covered under this management plan. This color aerial photo was taken in 2013.

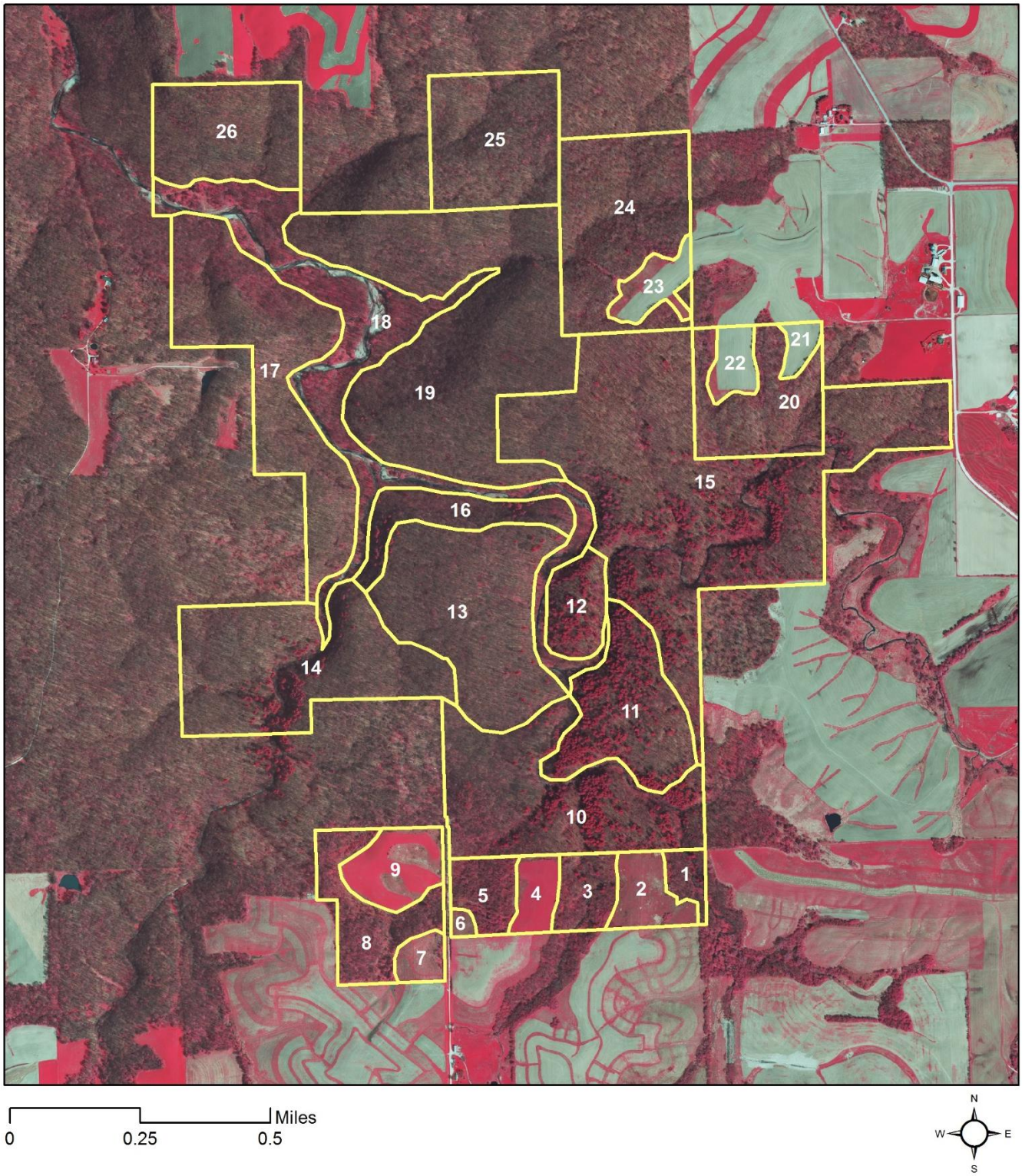

Figure 2. This photo shows the stand boundaries overlying a color infrared satellite aerial photo that was taken in 2010. Each stand is described in detail in the *Descriptions and Recommendation of Individual Stands* section of this plan.

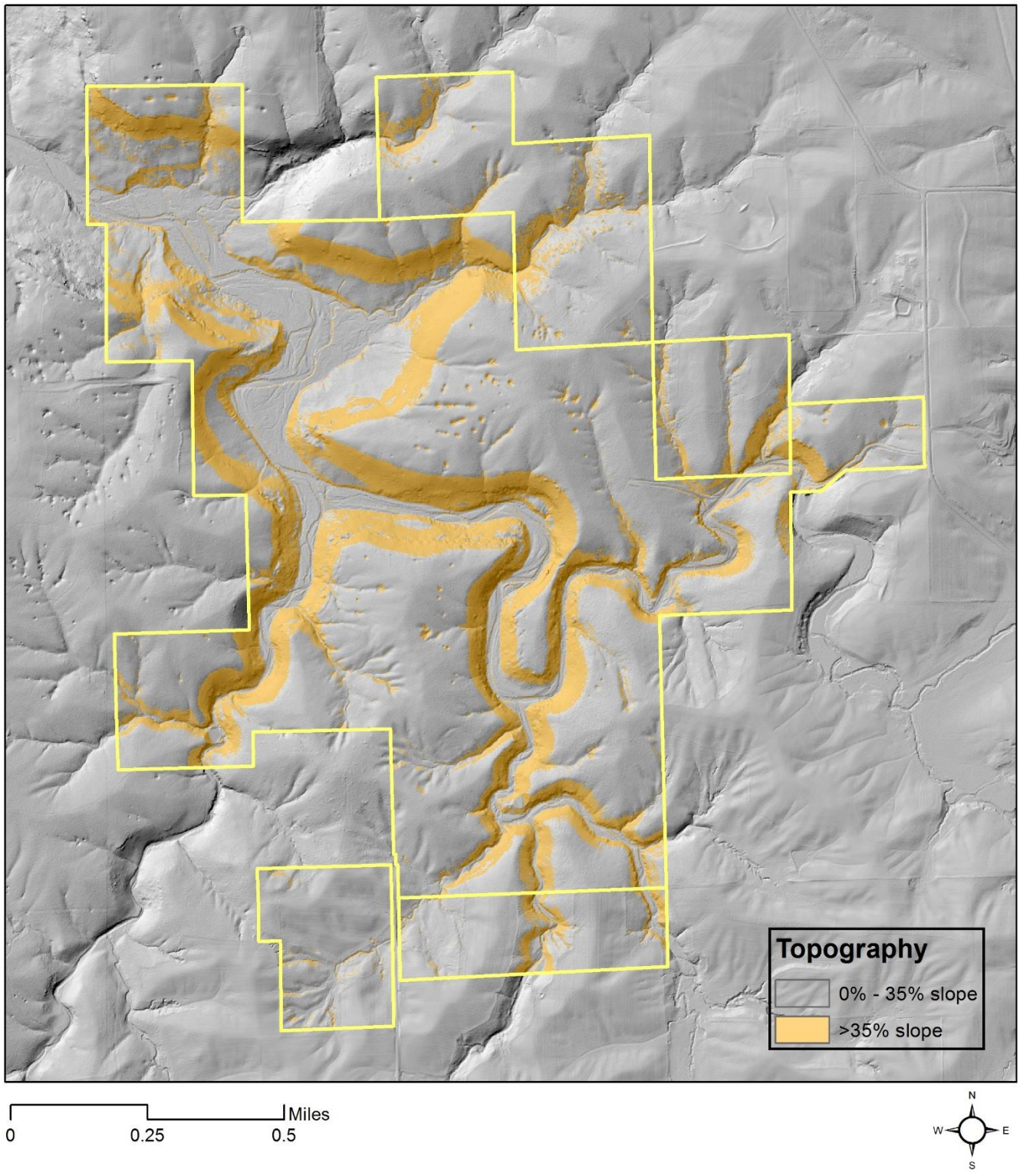

Figure 3. This image shows the preserve boundaries on a hillshade topographic relief image that was generated from LIDAR data. It provides a way to visualize the general topographic features. The orange shaded portion highlights areas where the slopes are greater than 35%.

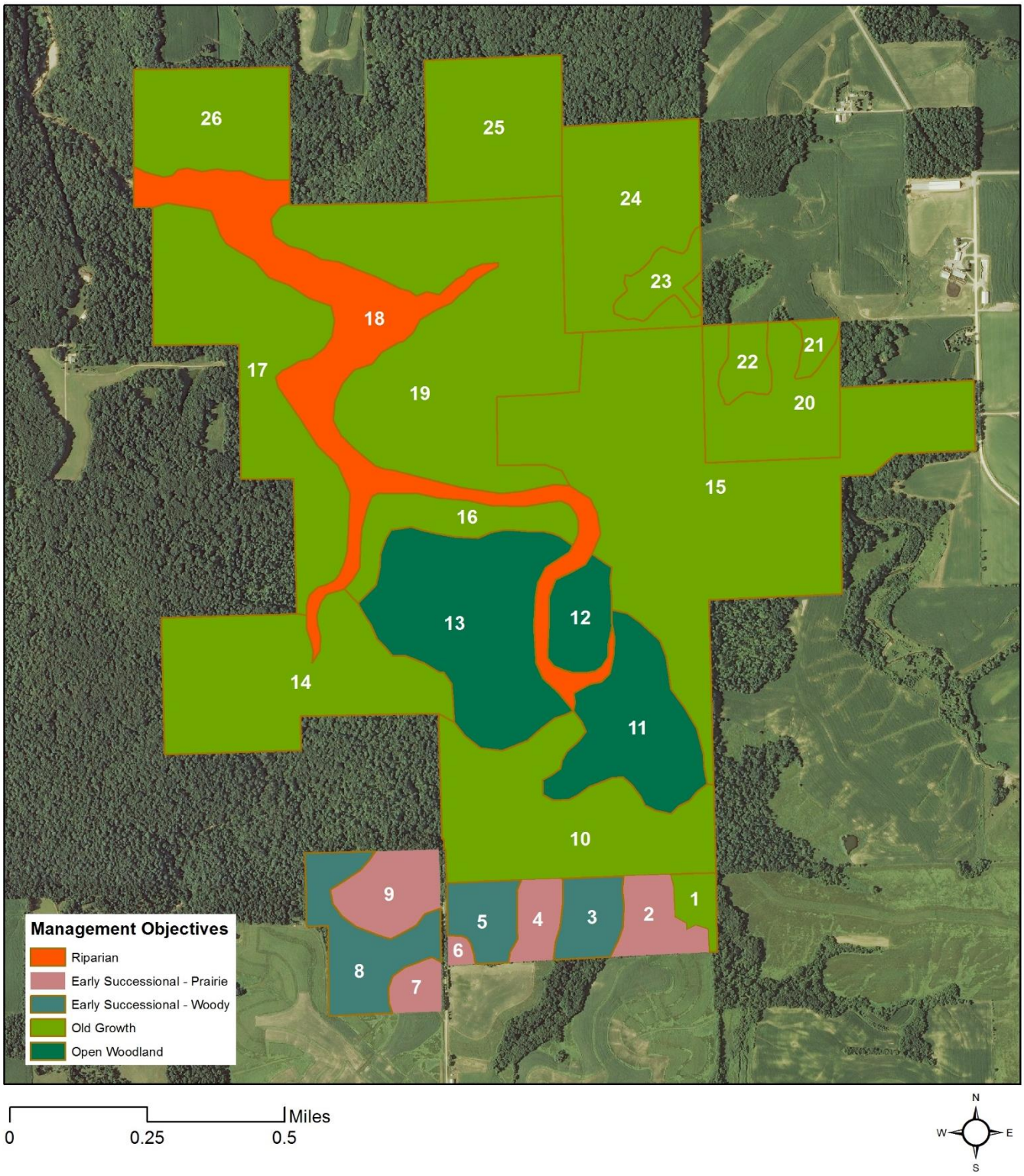

Figure 4. This image depicts the management objectives prescribed for each stand. Management objects are established to determine any stand treatments. Specific treatment recommendations are described in detail in next section. This aerial photo was taken in 2013.

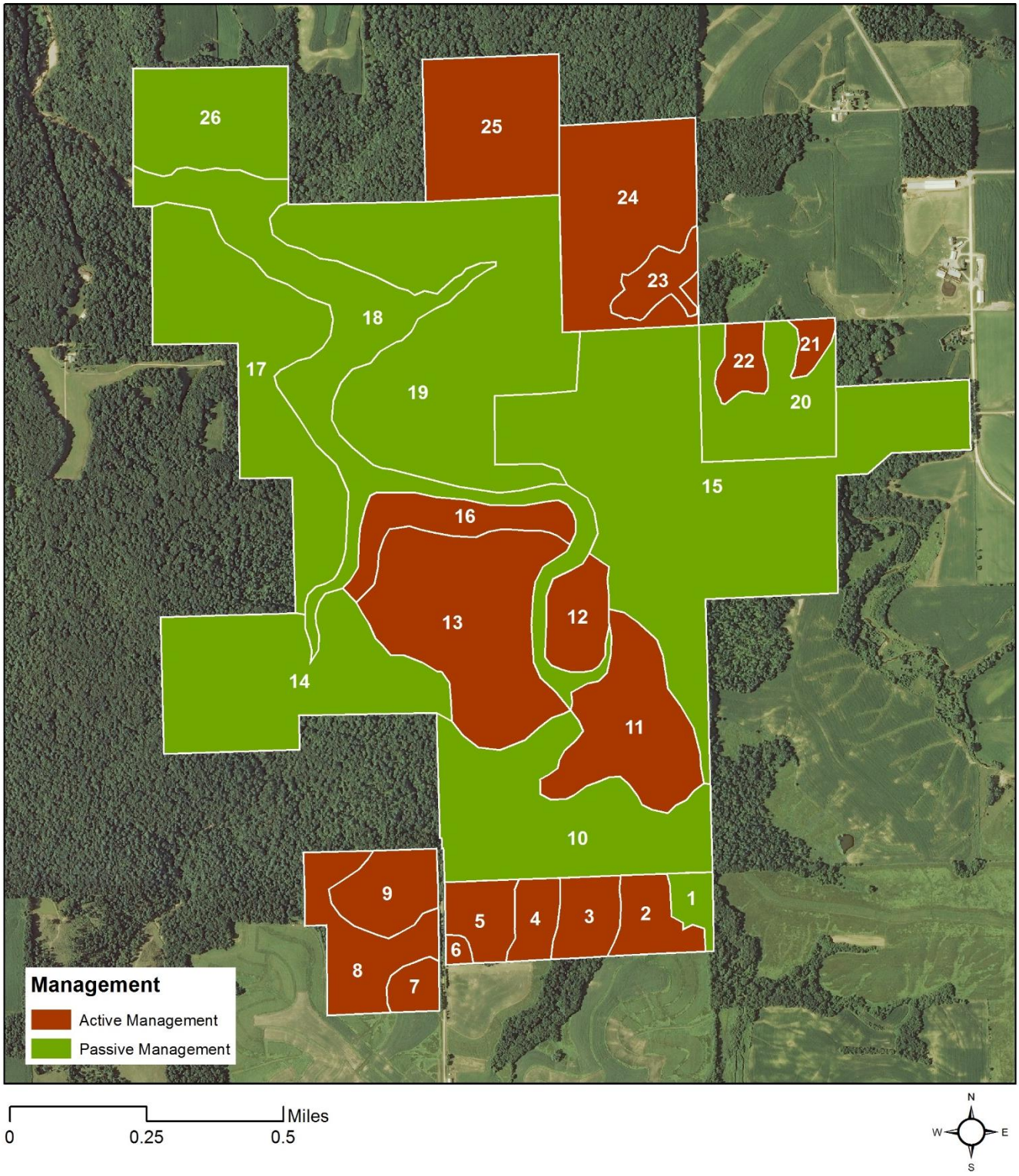

Figure 5. This image depicts stands that will be actively or passively managed. Active management areas have prescriptions requiring more intensive, hands-on work activities. Passive management areas will have little or no work activities prescribed. The aerial photo was taken in 2013.

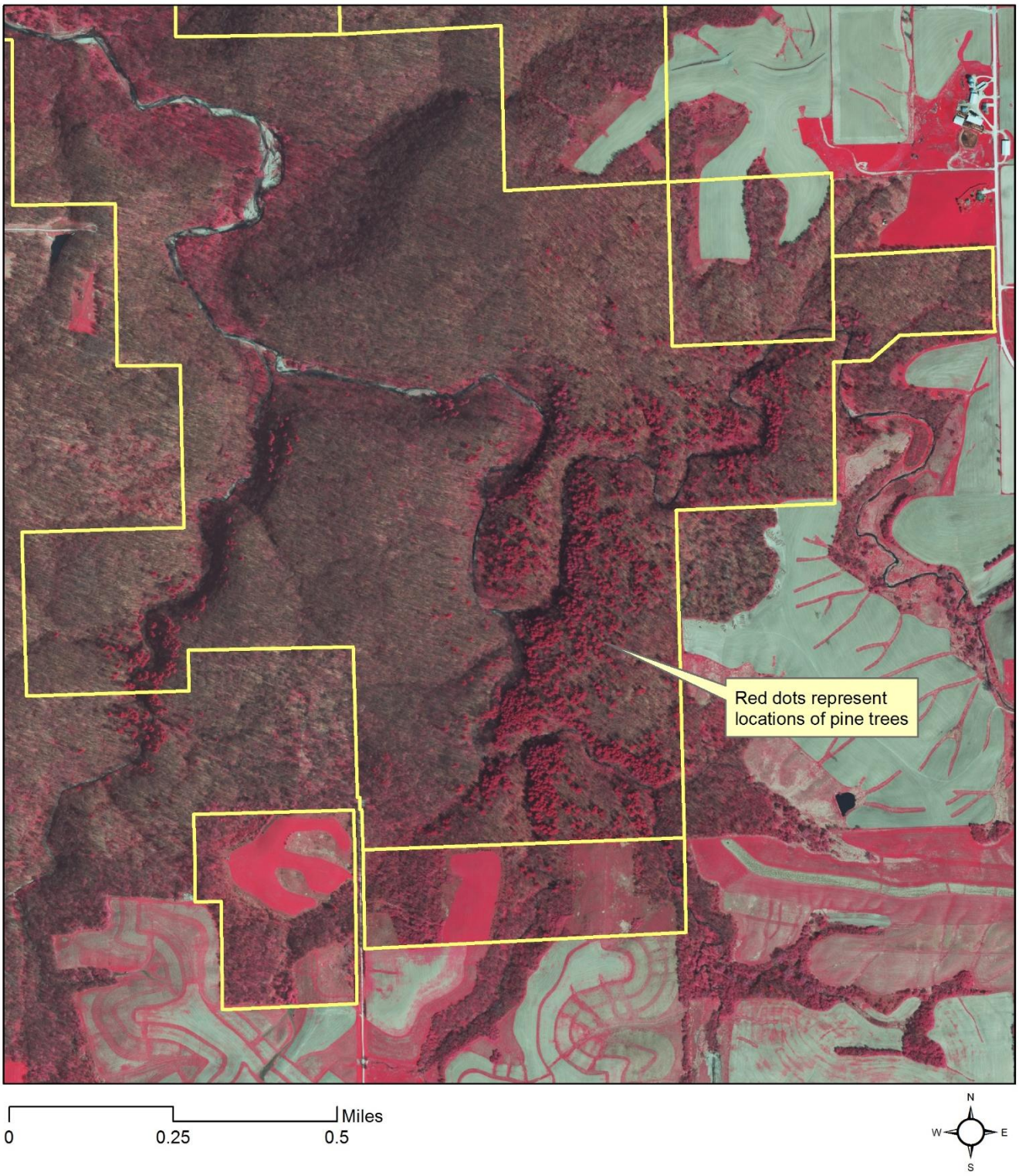

Figure 6. This color infrared aerial photo was taken in 2010. The deeper red-colored dots indicate the locations individual larger native eastern white pine trees which are the namesake for this preserve.

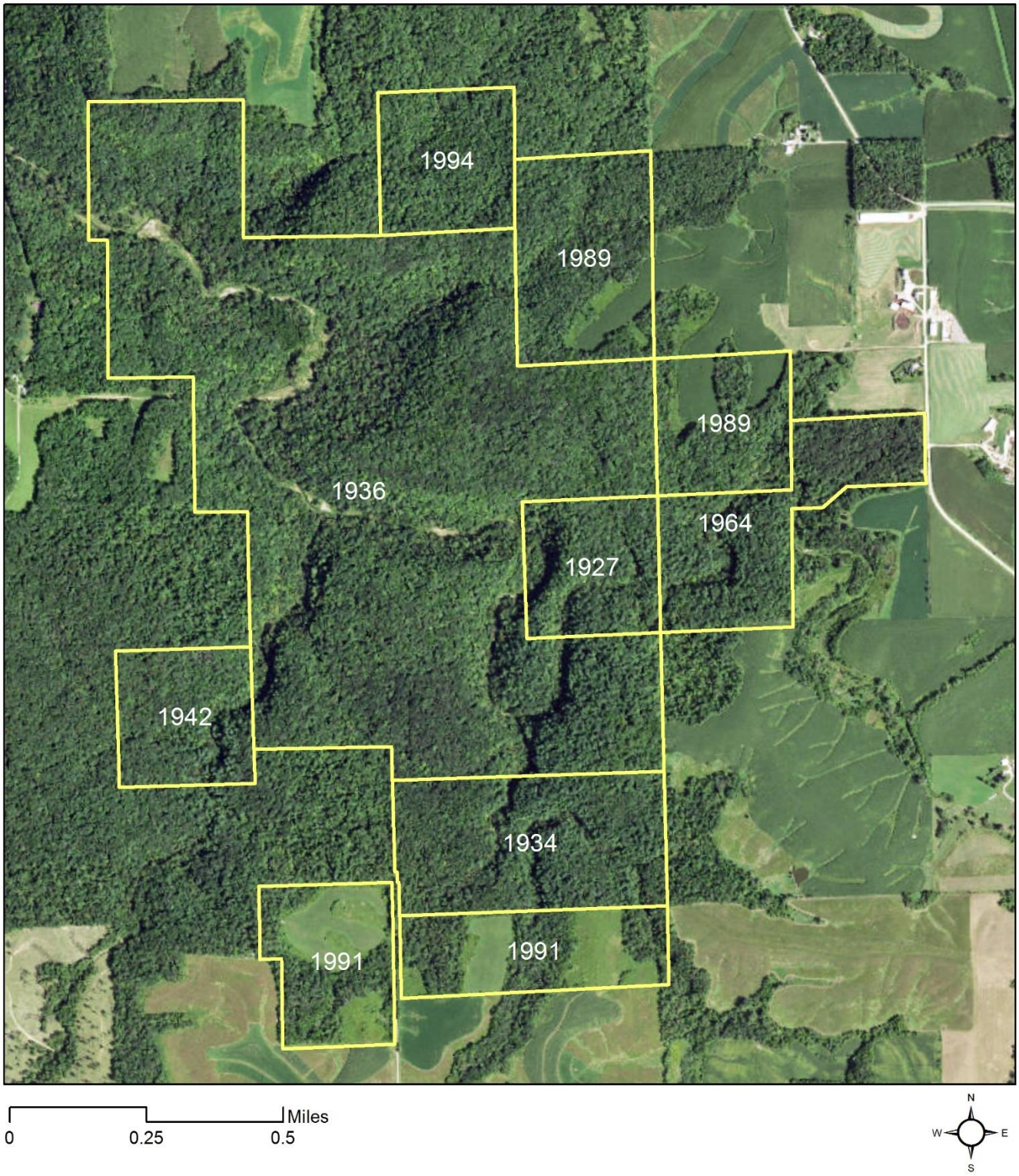

Figure 7. This color aerial photo was taken in 2013 and shows the year parcels were added to the preserve.

Figure 8. This is a 1970s aerial photo of stands 1-9. The land was being heavily grazed at the time it was taken. Compare the level of forest cover from 1970 a modern photo like Figure 7.

Stand 1: 5.2 acres

- **Stand Description:** Stands 1-9 are all part of the White Pine Hollow Wildlife Management Area (WMA) of the Maquoketa Wildlife Management Unit (See Figure 8 above). Stand 1 consists of Central Hardwoods forest on either side of a steep ravine. It was pastured until the time of purchase in 1991. The soils are mostly rocky-Nordness silt loam on the steep slopes and Dorchester-Volney silt loam at the base of the ravine. Central Hardwoods forest cover is transitional between shade-intolerant early-successional Oak-Hickory forest and shade-tolerant, late-successional Maple-Basswood forest. There are some scattered larger mixed oak and white pine in the overstory but most of the forest canopy consists of shade tolerant species like hackberry, elm, ash, ironwood and boxelder. Other scattered overstory trees include black cherry, black oak, white oak, red oak, white pine, shagbark hickory and black walnut. The understory contains mostly ironwood, elm, ash, boxelder and hackberry.
- **Management Objectives and Future Conditions:** The objective here is to let nature take its course and watch how the canopy develops into old-growth forest. Over time shade tolerant tree species will become more common.
- **Recommendations/Prescriptions (Old-Growth Management):** No treatments are recommended at this time. We will monitor the condition of the stand and prescribe treatments as necessary.

Stand 2: 11 acres, Stand 4: 7.5 acres, Stand 6: 1.5 acres, Stand 7: 5.2 acres & Stand 9: 15 acres

- **Stand Description:** All of these stands were in crop production until several years ago. They are no longer in crop lease and have been planted to mixed native grasses and forbs. The soils are Fayette and Exette silt loam, and Lindley loam. These soils developed under forest and savanna-like conditions.
- **Management Objectives and Future Conditions:** The primary objective is to provide quality wildlife habitat. Prairie habitat will add to the overall diversity of the preserve and vicinity.
- **Recommendations/Prescriptions (Early Successional - Prairie):** There are some scattered undesirable boxelder trees that will be felled and their fresh cut stumps treated with an herbicide to prevent stump sprouting. Additionally, all of these stands will have prescribed fire applied every 3 to 5 years on a staggered schedule.

Stand 3: 10.5 acres, Stand 5: 10.5 acres & Stand 8: 22 acres

- **Stand Description:** These three stands are all fairly similar. They were heavy pastured prior to State acquisition in 1991 (see Figure 8). They consist of diverse young forest that is uneven-aged with trees averaging from 4 to 24 inches DBH. Common overstory species include: boxelder, white elm, black walnut, white ash, hackberry and

ironwood. Black cherry, black oak, red elm, wild apple, butternut, eastern red cedar (planted), white oak, shagbark hickory and eastern white pine are present but more scattered. Common shrub species include: elderberry, bush honey suckle (exotic), wild plum, hawthorn, grey dogwood, nannyberry, American hazelnut, prickly ash and gooseberry. A couple rows of eastern red cedar were planted around the perimeter of the crop fields in the spring of 1997. At the same time, trees were cut along the edge of the field in a 50 foot wide swath to create young brushy early successional habitat through coppice stump sprouting and adventitious root suckering.

- **Management Objectives and Future Conditions:** The primary objective is to maintain and improve these stands for wildlife habitat. A portion of each of these three stands will be maintained in early successional habitat.
- **Recommendations/Prescriptions (Early Successional - Woody):** To create and maintain early successional habitat, it is necessary from time-to-time to fell blocks of trees to force them to re-grow from stump sprouts or adventitious root-suckers. At the same time, undesirable species will be treated with an herbicide (e.g. boxelder and bush honeysuckle). This process will create young, dense, brushy habitat preferred by many wildlife species. Approximately, one quarter of the acres will be felled every 5 years to maintain this habitat in an early successional stage.

Stand 10: 64 acres

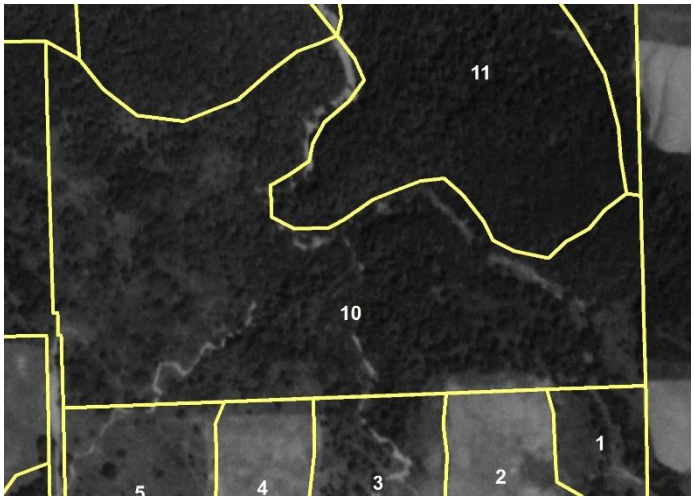

Figure 9. This aerial photo shows Stand 10 around 1935, one year after state acquisition.

- **Stand Description:** Stand 10 was purchased in 1934. You can see from the aerial photo at the left that portions of this stand had a fairly open overstory back in 1935. This was probably a result of timber harvesting and livestock grazing. Today, the forest cover is uneven-aged Central Hardwoods. Common overstory species includes: white oak, red oak, hard maple, eastern white pine, basswood and white ash. Other species includes: black walnut, elm, hackberry, bitternut hickory, shagbark hickory, ironwood and black cherry. The understory layer is dominated by shade tolerate hard maple, white ash, ironwood and basswood.
- **Management Objectives and Future Conditions:** The objective here is to let nature take its own course and watch how the canopy develops into old-growth forest. Over time, shade tolerant tree species will become more common.
- **Recommendations/Prescriptions (Old-Growth Management):** Very little needs to be done to this stand at this time. There may be a few widely scattered younger eastern white pine trees that could be located and released from canopy competition. Trees like elm, ash, maple and hackberry that are shading the pine would be girdled or felled to give these suppressed pine trees more sunlight so they can grow more vigorously. We will continue to monitor the condition of the stand and prescribe treatments as necessary.

Stand 11: 37 acres

- **Stand Description:** This stand contains many mature eastern white pine trees (see Figure 2 and Figure 6). This stand contains some of the largest eastern white pine in the state. Other overstory species includes red oak, black walnut, white oak, white ash, basswood and hard maple. The understory is dominated by shade tolerant

hard maple, white ash, ironwood, elm and basswood. It was treated with low intensity prescribed fire in the spring of 2017.

- **Management Objectives and Future Conditions:** The primary objective is to regenerate eastern white pine. This will safeguard both this species genetics and the preserve's namesake.
- **Recommendations/Prescriptions (Open Woodland Management):** Eastern white pine has specific requirements that must be met in order for its small seed to germinate and develop into large trees. White pine is considered intermediate on the range of shade tolerance. That means white pine trees can grow and persist under partial shade but they need lots of sunlight in order to develop into large trees. The first step to successfully regenerating white pine is to create conditions that will encourage white pine natural regeneration. After that is accomplished, it will be necessary to protect the young seedlings from deer browsing. The following step is to release seedlings from overstory canopy competition. All of these steps will be accomplished using an *adaptive management* approach through the use of silvicultural practices potentially including prescribed fire, scarification, tree shelters, thinning and timber harvesting. Adaptive management requires constant monitoring for progress and requires management decisions to be made according to the current set of conditions.

Stand 12: 13.1 acres

- **Stand Description:** This stand is often referred to as the *hogs back*. It consists of steep and rocky slopes along a narrow upland ridge. The vegetation is very diverse due to east, south and west aspects and the inevitable disturbances on this steep, exposed and erosive terrain. Pine Hollow Creek sweeps around the base and is prone to frequent flash flooding. Many years from now, the creek may cut through narrowest part of this ridge to create what is called a *cut-off meander*. The ridge top contains Nordness and Fayette silt loams while the steep slopes are rocky-Nordness silt loam. The overstory vegetation includes very old trees of white oak, red oak, white pine and hard maple. Other overstory species includes shagbark hickory, chinquapin oak, bur oak, black oak, bitternut hickory, black cherry, white ash, basswood, hackberry, white elm, red elm and hackberry. The understory is fairly diverse with shade tolerant trees and shrubs. Near the stream there is a small patch of rare leatherwood and witch hazel.
- **Management Objectives and Future Conditions:** The objective is to maintain the stand's overall species diversity and richness. It would be preferable to set back ecological succession by using an adaptive management approach.
- **Recommendations/Prescriptions (Open Woodland Management):** The primary management tool will be to utilize prescribed fire every 3 to 10 years. Additionally, select trees will be released from canopy competition to insure the target tree's survival and vigor. Most of the target trees for release will be younger pole-sized eastern white pine and chinquapin oak. Trees such as hard maple, basswood, elm, ash, ironwood and hackberry that are crowding the target trees will be girdled or felled to release them.

Stand 13: 63 acres

- **Stand Description:** This stand contains lots of mature white oak, red oak and hard maple along with other shade-tolerant hardwood species. It also has some scattered mature eastern white pine. The understory is mostly shade-tolerant hard maple, white ash and basswood. This is an upland site with lots of Fayette, Lindley, Nordness and Nordness-rocky silt loams.
- **Management Objectives and Future Conditions:** The objective here is to create open-woodland/oak savanna-like conditions which will be conducive to the perpetuation of Oak-Hickory type forest cover.
- **Recommendations/Prescriptions (Open Woodland Management):** Currently, the canopy is too shady to regenerate shade intolerant species such as oak, shagbark hickory and eastern white pine. We will be using an adaptive management approach for this stand, similar to Stand 11. In order to reduce shade, it will be necessary to clean/weed out the hard maple, ironwood, ash, elm, hackberry and basswood in the understory. It will also be necessary to harvest enough merchantable-sized (trees > 14 inches DBH) hard maple, basswood, elm, hackberry and ash to reach partial shade conditions. Additionally, we will apply prescribed fire every 2 to 5 years. Over-time, scattered oak and hickory trees will begin to build up in numbers at which time we will apply fire less often, on approximately 10 to 15 year intervals.

Stand 14: 65.6 acres, Stand 17: 67 acres, Stand 19: 115.8 acres & Stand 26: 34.8 acres

- **Stand Description:** These four stands all have similar species composition, terrain and histories. Most of the trees on the less steep upland acres were harvested prior to State purchase in the 1930's and 1940's (see Figure 2 and Figure 7). Trees in the harvested areas have a more even-aged appearance than unharvested areas on the steeper side slopes. (At the time, the trees would have been harvested using horses.) Therefore, the steep side slopes tend to have a more uneven-aged appearance. The overstory is similar in all four stands with lots of red oak, white oak, bur oak, hard maple, basswood, white ash and aspen in the overstory. Other scattered trees include hackberry, bitternut hickory, shagbark hickory, black cherry and elm. The understory is dominated by shade tolerant hard maple, white ash and basswood. The upland soils are mostly Fayette, Lindley and Nordness silt loams. The steep side slopes consist of rocky-Nordness and Fayette-Dubuque-Schapville complex silt loams.
- **Management Objectives and Future Conditions:** The objective here is to let nature take its own course and watch how the canopy develops into old-growth forest.
- **Recommendations/Prescriptions (Old-Growth Management):** Very little needs to be done to these stands at this time. There may be a few widely scattered younger eastern white pine trees in Stand 14 that could be located and released from canopy competition. We will monitor the condition of the stand and prescribe treatments as necessary.

Stand 15: 155.9 acres

- **Stand Description:** Many of the preserve's important natural features can be found within this stand. It contains many of the preserves oldest trees. It has been estimated that timber harvesting has not taken place here since before the 1870's. It contains many giant eastern white pine. The area just north of the hogback is where researchers from Oak Ridge National Laboratory located some trees that were over 400 years old at the time. The ravine just north of this hogback contains examples of some very large black walnut. Pine Hollow Creek runs through the center and has created a narrow canyon with vertical walls. The soils are mostly Fayette, Nordness and rocky-Nordness silt loams. Near the east parking area there is an area with many larger white oaks. Most of the white pines are accompanied by many mature northern red oak and white oak. Other overstory species includes hard maple, basswood, white ash, red elm, white elm, shagbark hickory, bitternut hickory, hackberry, black oak, bur oak and chinquapin oak. The dominant understory species throughout consists of shade tolerant hard maple, white ash, ironwood, hackberry and basswood.
- **Management Objectives and Future Conditions:** The objective here is to let nature take its own course and watch how the canopy develops into old-growth forest. Over time, shade tolerant tree species will become more common.
- **Recommendations/Prescriptions (Old-Growth Management):** No management activities are planned at this time. This stand will be frequently monitored for any issues that need to be addressed.

Stand 16: 18 acres

- **Stand Description:** This stand comprises a steep and rocky north facing slope. The soil is rocky-Nordness silt loam. This stand contains two fairly large and diverse algific talus slopes. The overstory is diverse with lots of hard maple, white ash, red oak, white oak, ironwood, hackberry and mixed elm. Less common species includes paper birch, yellow birch, black cherry and bitternut hickory. The understory is shade tolerant northern hardwood species.
- **Management Objectives and Future Conditions:** The primary management objective is to protect the rare plant and animal communities of the algific talus slopes.
- **Recommendations/Prescriptions (Old-Growth Management):** No management activities are planned at this time. This stand will be frequently monitored for any issues that need to be addressed.

Stand 18: 73.8 acres

- **Stand Description:** This stand includes the main stem of Pine Hollow creek. It consists of bottomland forest and the stream's riparian zone. This area is subject to frequent flash flooding. The impact from flooding has become more severe and destructive recent years. This is no doubt due to land use changes in the watershed and heavier rain events that have been recorded. The forest cover is mostly white elm, rock elm, hard maple, cottonwood, boxelder, willow and other mixed hardwoods.

- **Management Objectives and Future Conditions:** The management objective here is to let nature take its course. It would be preferable to see some watershed improvements made to help ameliorate flooding.
- **Recommendations/Prescriptions (Riparian Management):** No management activities are scheduled for this stand.

Stand 20: 29.3 acres

- **Stand Description:** This stand is part of the White Pine Hollow State Forest designated area. It was purchased in 1989. The less steep upland portion contains mostly younger 8 to 16 DBH trees of shade tolerant species like hard maple, basswood, white ash, bitternut hickory, elm and ironwood. Most of the mature white oak and red oak can be found on the steep slopes. The understory is mostly shade tolerant hard maple, ironwood, white ash and basswood.
- **Management Objectives and Future Conditions:** The objective here is to let nature take its course and watch how the canopy develops into old-growth forest.
- **Recommendations/Prescriptions (Old-Growth Management):** No management activities are scheduled for this stand at this time.

Stand 21: 3.7 acres, Stand 22: 6.9 acres & Stand 23: 8.8 acres

- **Stand Description:** These threes stands are currently being leased under a crop rotation. The cover is mostly crop residue. The soil is Fayette silt loam which developed under a forest canopy.
- **Management Objectives and Future Conditions:** The objective is to take these fields out of row crop production and plant them to mixed hardwood trees. This will help to increase the acres of hard mast producing trees (e.g. oak, hickory and walnut) which is beneficial to a host of wildlife species.
- **Recommendations/Prescriptions** (**Old-Growth Management):** These three fields will be planted to mixed hardwood trees using the direct seeding broadcast method. The seed will be sown in the fall in a year with a good locally abundant seed crop. Species that will be planted includes northern red oak, white oak, shagbark hickory and black walnut.

Stand 24: 51.8 acres

- **Stand Description:** This stand includes land that was purchased in 1989. The timber was harvested periodically over the decades by previous landowners. Today, the forest cover consists of cohorts (small groups) of trees of similar ages. The steeper, rockier ground contains most of the older uneven-aged white oak and red oak. Timber harvesting typically speeds up the process of ecological succession. This is why a majority of the overstory in the harvested areas contains mostly shade tolerant hard maple, basswood, white ash, bitternut hickory, hackberry and ironwood. Species like shagbark hickory, black cherry and black walnut are quite rare in these areas.
- **Management Objectives and Future Conditions:** The main objective here to maintain and enhance the overall species diversity and to allow the stand to develop into old-growth forest.
- **Recommendations/Prescriptions** (**Old-Growth Management):** There are some scattered desirable younger trees that would benefit from being released from canopy competition. This trees include shagbark hickory, oak, black cherry and black walnut. There are approximately 10 target trees per acre, that could be located and released. On average, 2 to 3 competing trees would need to be girdled or felled to fully release each target tree.

Stand 25: 41 acres

- **Stand Description:** This stand has a similar history to Stand 24. It was purchased by the State in 1994. It had been extensively harvested prior to being purchased. All of the acres that were suitable for logging equipment to operate on were clearcut. There are only a few scattered larger trees, but they occur only on the very steep areas. Today, this is mostly an even-aged stand of 25 year old hard maple, bitternut hickory, basswood and ash. I did not see a single oak tree in the heavily cut-over areas. Black walnut, shagbark hickory, black cherry and hackberry are present but more scattered.
- **Management Objectives and Future Conditions:** The main objective here to maintain and enhance the overall species diversity and to allow the stand to develop into old-growth forest.
- **Recommendations/Prescriptions** (**Old-Growth Management):** There are some scattered desirable younger trees that would benefit from being released from canopy competition. This includes some shagbark hickory,

black cherry and black walnut. There are approximately 5 target trees per acre which could be located and released. On average, 2 to 3 competing trees would need to be girdled or felled to fully release each target tree.

APPENDIX

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 1. Forest Breeding Birds of Greatest Conservation Need in NE Iowa

Common Name	Scientific Name	State Status	Federal Status
Bald eagle	*Haliaeetus leucocephalus*	SC	--
Red-shouldered hawk	*Buteo lineatus*	E	--
Broad-winged hawk	*Buteo platypterus*	--	--
Peregrine falcon	*Falco peregrinus*	SC	--
Eastern screech owl	*Otus asio*	--	--
Ruffed grouse	*Bonasa umbellus*	--	--
American woodcock	*Scolopax minor*	--	--
Black-billed cuckoo	*Coccyzus erythropthalmus*	--	--
Yellow-billed cuckoo	*Coccyzus americanus*	--	--
Long-eared owl	*Asio otus*	T	--
Whip-poor-will	*Caprimulgus vociferus*	--	--
Eastern wood-pewee	*Contopus virens*	--	--
Red-headed woodpecker	*Melanerpes erythrocephalus*	--	--
Acadian flycatcher	*Empidonax virescens*	--	--
Willow flycatcher	*Empidonax traillii*	--	--
Least flycatcher	*Empidonax minimus*	--	--
Brown creeper	*Certhia americana*	--	--
Veery	*Catharus fuscescens*	--	--
Wood thrush	*Hylocichla mustelina*	--	--
Blue-winged warbler	*Vermivora pinus*	--	--
Cerulean warbler	*Dendroica cerulea*	--	--
Black-and-white warbler	*Mniotilta varia*	--	--
Prothonotary warbler	*Protonotaria citrea*	--	--
Worm-eating warbler	*Helmitheros vermivorus*	--	--
Louisiana waterthrush	*Seiurus motacilla*	--	--
Kentucky warbler	*Oporornis formosus*	--	--
Hooded warbler	*Wilsonia citrina*	--	--
Eastern towhee	*Pipilo erythrophthalmus*	--	--

Table 2. Forest Migratory Birds of Greatest Conservation Need in NE Iowa

Common Name	Scientific Name	State Status	Federal Status
Golden-winged warbler	*Vermivora chrysoptera*	--	--
Canada warbler	*Wilsonia canadensis*	--	--

Table 3. Forest Mammals of Greatest Conservation Need in NE Iowa

Common Name	Scientific Name	State Status	Federal Status
Northern Long-eared bat	*Myotis septentrionalis*	--	T
Indiana bat	*Myotis sodalis*	E	E
Silver-haired bat	*Lasionycteris noctivagans*	--	--
Evening bat	*Nycticeius humeralis*	--	--
Tri-colored bat	*Perimyotis subflavus*	--	--
Red squirrel	*Tamiasciurus hudsonicus*	--	--
Woodland vole	*Microtus pinetorum*	--	--
Spotted skunk	*Spilogale putorius*	E	--
Southern Flying Squirrel	*Glaucomys volans*	--	--
Gray fox	*Urocyon cinereoargenteus*	--	--
Bobcat	*Lynx rufus*	--	--
Ermine	*Mustela erminea*	--	--

Table 4. Forest Reptiles and Amphibians of Greatest Conservation Need in NE Iowa

Common Name	Scientific Name	State Status	Federal Status
Cricket Frog	*Acris crepitans*	--	--
Eastern Gray treefrog	*Hyla versicolor*	--	--
Cope's Gray treefrog	*Hyla chrysoscelis*	--	--
Tiger salamander	*Ambystoma tigrinum*	--	--
Northern Prairie Skink	*Eumeces septentrionalis*	--	--
Bullsnake	*Pituophis catenifer sayi*	SC	--
(Prairie) Ringneck Snake	*Diadophis punctatus*	--	--
Eastern Hognose Snake	*Heterodon platirhinos*	--	--
Fox Snake	*Pantherophis ramspotti*	--	--
Black Rat Snake	*Pantherophis obsoletus*	--	--
Timber Rattlesnake	*Crotalus horridus*	--	--

Table 5. Forest Land Snails of Greatest Conservation Need in NE Iowa. (Restricted to Algific Talus Slopes and Moderate Slopes)

Common Name	Scientific Name	State Status	Federal Status
Iowa Pleistocene Snail	*Discus macclintocki*	E	E
Frigid Ambersnail	*Catinella gelida*	--	--
Minnesota Pleistocene Succinea	*Novasuccinea n. Sp. Minnesota a*	E	--
Iowa Pleistocene Succinea	*Novasuccinea n. Sp. Minnesota b*	E	--
Briarton Pleistocene Snail	*Vertigo brierensis*	--	--
Hubricht's Vertigo	*Vertigo hubrichti*	T	--
Iowa Pleistocene Vertigo	*Vertigo iowaensis*	--	--
Bluff Vertigo	*Vertigo occulta*	E	--

Table 6. Forest Butterflies of Greatest Conservation Need in NE Iowa

Common Name	Scientific Name	State Status	Federal Status
Pepper and Salt Skipper	*Amblyscirtes hegon*	SC	--
Sleepy Duskywing	*Erynnis brizo*	SC	--
Dreamy Duskywing	*Erynnis icelus*	SC	--
Columbine Duskywing	*Erynnis lucilius*	SC	--
Silvery Blue	*Glaucopsyche lygdamus*	T	--
Hickory Hairstreak	*Satyrium caryaevorum*	SC	--
Edward's Hairstreak	*Satyrium edwardsii*	SC	--
Striped Hairstreak	*Satyrium liparops*	SC	--

Table 7. Proposed project completion schedule

Stand	Stand Acres	Forest Type	Management System	Management Prescription	Work Acres	Implementation Year (approximate)
1	5.2	Central hardwoods	Old-growth	No treatment		
2	11	Native grasses and forbs	Early successional-prairie	Prescribed fire	11	2019
2	11	Native grasses and forbs	Early successional-prairie	Prescribed fire	11	2021
2	11	Native grasses and forbs	Early successional-prairie	Prescribed fire	11	2024
2	11	Native grasses and forbs	Early successional-prairie	Prescribed fire	11	2027
3	10.5	Central hardwoods	Early successional-woody	Edge feathering	3	2018
4	7.5	Native grasses and forbs	Early successional-prairie	Prescribed fire	7.5	2019
4	7.5	Native grasses and forbs	Early successional-prairie	Prescribed fire	7.5	2021
4	7.5	Native grasses and forbs	Early successional-prairie	Prescribed fire	7.5	2024
4	7.5	Native grasses and forbs	Early successional-prairie	Prescribed fire	7.5	2027
5	10.5	Central hardwoods	Early successional-woody	Edge feathering	3	2018
6	1.5	Native grasses and forbs	Early successional-prairie	Prescribed fire	6	2019
6	1.5	Native grasses and forbs	Early successional-prairie	Prescribed fire	6	2021
6	1.5	Native grasses and forbs	Early successional-prairie	Prescribed fire	6	2024
6	1.5	Native grasses and forbs	Early successional-prairie	Prescribed fire	6	2027
7	5.2	Native grasses and forbs	Early successional-prairie	Prescribed fire	7	2020
7	5.2	Native grasses and forbs	Early successional-prairie	Prescribed fire	7	2022
7	5.2	Native grasses and forbs	Early successional-prairie	Prescribed fire	7	2025
7	5.2	Native grasses and forbs	Early successional-prairie	Prescribed fire	7	2028
8	22	Central hardwoods	Early successional-woody	Edge feathering	8	2019
9	15	Native grasses and forbs	Early successional-prairie	Prescribed fire	15	2020
9	15	Native grasses and forbs	Early successional-prairie	Prescribed fire	15	2022
9	15	Native grasses and forbs	Early successional-prairie	Prescribed fire	15	2025
9	15	Native grasses and forbs	Early successional-prairie	Prescribed fire	15	2028
10	64	Central hardwoods	Old-growth	No treatment		
11	37	Oak-Hickory/Pine	Open woodland	Understory cleaning	37	2019
11	37	Oak-Hickory/Pine	Open woodland	Prescribed fire	37	2020
11	37	Oak-Hickory/Pine	Open woodland	Prescribed fire	37	2025

Stand	Stand Acres	Forest Type	Management System	Management Prescription	Work Acres	Implementation Year (approximate)
12	13.1	Oak-Hickory/Pine	Open woodland	Prescribed fire	13.1	2019
12	13.1	Oak-Hickory/Pine	Open woodland	Pine release	13.1	2019
13	63	Oak-Hickory	Open woodland	Prescribed fire	63	2018
13	63	Oak-Hickory	Open woodland	Understory cleaning	63	2020
13	63	Oak-Hickory	Open woodland	Prescribed fire	63	2022
14	65.6	Central hardwoods	Old-growth	No treatment		
15	155.9	Oak-Hickory/Pine	Old-growth	No treatment		
16	18	Maple-Basswood	Old-growth	No treatment		
17	67	Central hardwoods	Old-growth	No treatment		
18	73.8	Bottomland hardwoods	Riparian	No treatment		
19	115.8	Central hardwoods	Old-growth	No treatment		
20	29.3	Central hardwoods	Old-growth	No treatment		
21	3.7	Crop Lease	Old-growth	Tree Planting	3.7	2020
22	6.9	Crop Lease	Old-growth	Tree Planting	6.9	2020
23	8.8	Crop Lease	Old-growth	Tree Planting	8.8	2020
24	51.8	Central hardwoods	Old-growth	Target Tree Release	15	2020
25	41	Central hardwoods	Old-growth	Target Tree Release	30	2020
26	34.8	Central hardwoods	Old-growth	No treatment		

CONDUCTING TIMBER SALES ON STATE LANDS

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

A District 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 District 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 District Forester will prepare a "Notice of Timber for Sale". The District 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 District 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 District 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 District 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	District Forester marks and scales the timber and provides volume estimates	
Bid Solicitation	Area Manager and District 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	

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