Forest Wildlife Stewardship Plan
for the
Loess Hills Wildlife Area

A plan that will maintain the diversity of forest wildlife and prioritize species of greatest conservation need

Iowa Department of Natural Resources


Photo credit: DJ Vogeler

Developed by Brent Olson CF, Area Forester with Joe Schwartz and Lindsey Barney, District Foresters

FOREST WILDLIFE STEWARDSHIP PLAN (FWSP) DEVELOPMENT

The Wildlife Biologist is the manager of the area and determines the objectives for each wildlife area. Objectives address the habitat needs of "Species of Greatest Conservation Need" and the woodland condition of each area. Seventy-five percent of the total area managed by the Wildlife Bureau is woodland. Managing woodland is essential to improve the areas for wildlife and recreation.

Management of wildlife areas is a cooperative effort by the wildlife and forestry bureaus to enhance state owned areas for a diversity of wildlife species. The property is walked by the biologist and forester. Stands are identified by tree species, tree size, topography, and management system. The biologist 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 of the biologist.

The Wildlife Biologist is the manager of the wildlife area. Foresters are assisting the Wildlife Bureau to implement woodland management practices.

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Forest Wildlife Stewardship Plan for Loess Hills Wildlife Area

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LOCATION: Sec. 3,4,9,10,15,16,17,21,22,28 of Kennebec Township, Township 84 North, Range 44 West Monona County

TOTAL ACRES: 2,685 acres

INTRODUCTION

In Iowa, the Department of Natural Resources (DNR) is the government agency responsible for the stewardship of indigenous and migratory wildlife species found in the state. Many of these species live near and in DNR Wildlife Management Area (WMA) forests, savannas, prairies and riparian areas. Forests are a relatively slow-changing landscape with some stands reaching maturity after a period of 150 years. This time span may extend through the careers of several wildlife managers. The longevity factor emphasizes the need for a Forest Wildlife Stewardship Plans (FWSP) in order to wisely manage our WMA forests. This is the "working plan" for the Loess Hills Wildlife Area designed to aid professional biologists and foresters 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.

There are 3 primary factors emphasizing the need for FWSP's for WMA's:

1. The continued succession of many forest stands past the oak stage to the shade tolerant stands of ironwood, bitternut hickory, hackberry, American elm, and green ash.
2. The loss of early successional forest stands and associated wildlife species.
3. The lack of proper management to secure mature forest stands with proper overstory and understory tree species for associated forest-interior wildlife species.

Some wildlife species use all of the forest size classes but others have very specific needs where one or two of particular forest size classes are needed to survive. Although the over-all change in forest succession is relatively slow, changes in the early stages of forest succession occur relatively fast. For example, some populations of indigenous and migratory bird species, dependent on these short-lived forest size classes, are experiencing dramatic declines. In Iowa, examples of these declining species are the resident ruffed grouse, and the migratory game bird, the American woodcock. Nation-wide declines of both species have been detected. Many migratory non-game birds including the gold-winged warbler, blue-winged warbler, black-billed cuckoo, yellow-billed cuckoo and eastern towhee are also dependent on this early stage of forest growth. Each of these species is showing population declines.

Conversely, some species of Neotropical migratory birds are dependent upon mature, undisturbed woodlands. The acadian flycatcher, cerulean warbler, and the veery are some examples of bird species needing mature forests. Management objectives will attempt to either protect these types of sites or include needed management to secure these necessary habitats for the future.

The DNR's Iowa Wildlife Action Plan, identifies all of the above species and others as species of "greatest conservation need". (Table 1 through Table 5). Generally, the Wildlife Bureau manages state-owned forest for the greatest diversity of forest wildlife, huntable species (deer, turkey, squirrels, and rabbits), and esthetic value. The Forest Wildlife Stewardship Plan (FWSP) will prioritize the "species of greatest conservation need," and game species above wood production. The habitat needs of these wildlife species will be guiding factors to forest management decisions. Forest and wildlife inventories will be conducted on each WMA. This information along with the "FWSP Definitions and Guiding Factors"

(Appendix 3) will be used to make forest management decisions on the WMA's. The primary goal will be to maintain or increase populations of hunted wildlife species and species of greatest conservation need.

DESCRIPTION OF AREA

The 2,685 acres addressed in this plan are outlined on maps included below. The area is divided into 192 stands, labeled 1-192 on the maps. Each stand is described in this plan with recommendations outlined for woodland, savanna, prairies and habitat crop management.

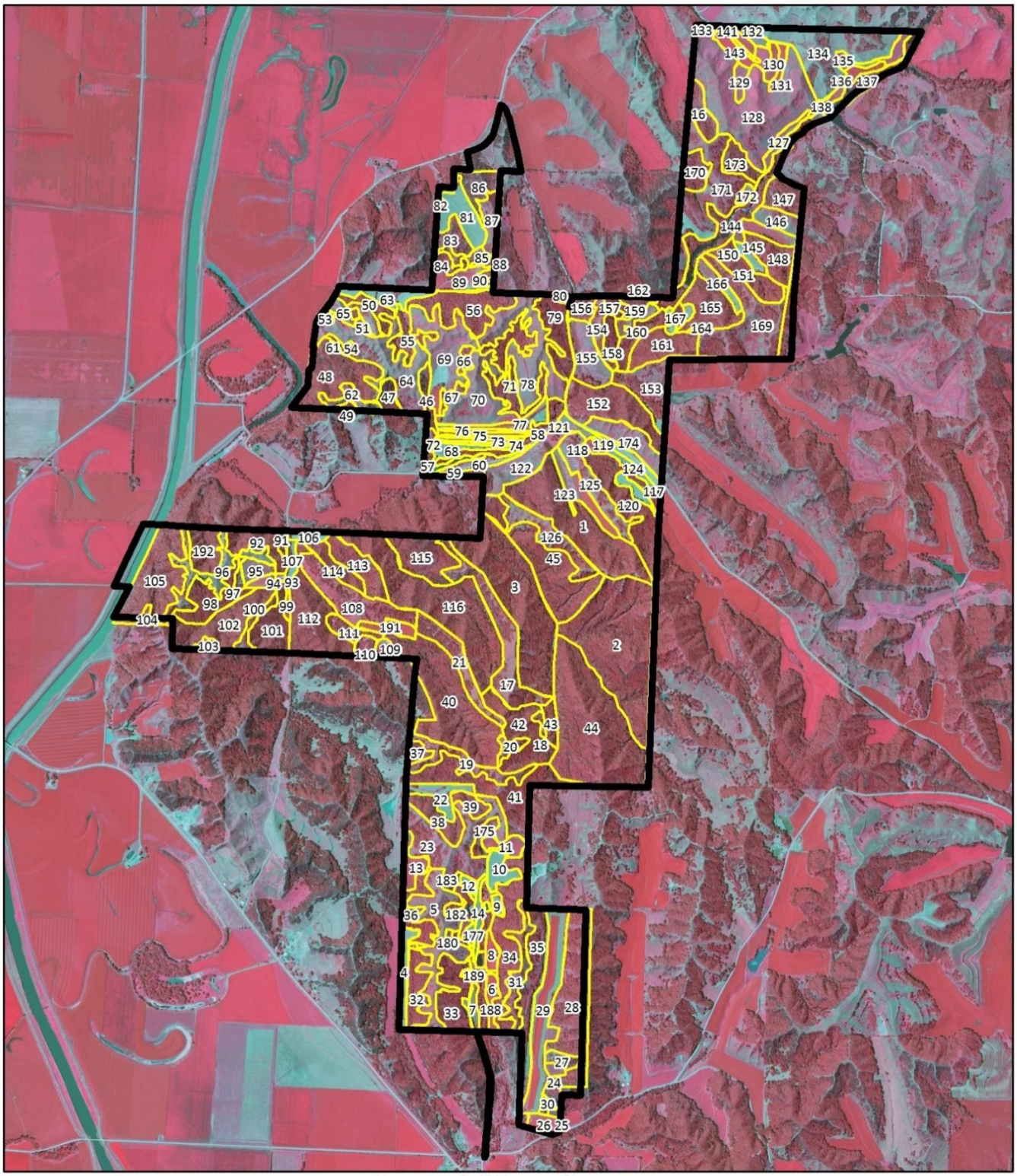
The Loess Hills Wildlife Area is 2,685 total acres in size. With 1,375 acres of woodland or 51%, 592 acres is prairie or 22 %, 275 acres is Savanna or 10%, 279 acres are in crop or 10 %, 67 acres of riparian or 3%, 74 acres of grass or 3%, and the remaining 1% or 23 acres is made up of riparian, shrubs, waterway, ponds and parking areas. The Loess Hills are a unique landform with depths of loess soil up to 300 feet above the Missouri River bottomlands. The area has many threatened and endangered species documented in the Natural Areas Inventory, found in appendix 2.

The area is used extensively by hunters, trappers, fisher people, hikers, nature enthusiasts, botanists, bird watchers, and other low impact users of the resources. The majority of the area is rugged terrain with the far western ridge bluffs being very steep and overlooking over the Missouri River bottomlands where plants like yucca can be found.

The woodland has a good diversity of woodland species. The major overstory species are bur oak, basswood, ash, black walnut, elm, hackberry, and cottonwood. Common mid-story species include ironwood, elm, hackberry, bitternut hickory, and mulberry. Common understory species of coralberry, gooseberry, hazelnut, choke cherry, and prickly ash. The area was once 85-95 % native prairies at the time of settlement. The majority of the area that was woodland at settlement time was logged for firewood, building homes, barns and other farm sheds, long before the state acquired the land. Settlers would harvest the large trees and often removing the largest, highest quality trees results in a high-graded woodland. This left a lot of wooded acres ending up with stagnated, poor quality trees and double and triple stump sprouts. Throughout the area there are still some remaining very large stemmed Bur Oak trees (wolf trees) that were part of the landscape when settlement occurred. These trees are not of any monetary value, but priceless in terms of wildlife food and homes. Proper forest management will improve the species composition and health of the woodland.

Loess Hills Wildlife Management Area

Forest Wildlife Stewardship Plan



Stand Numbers

2,685 Acres

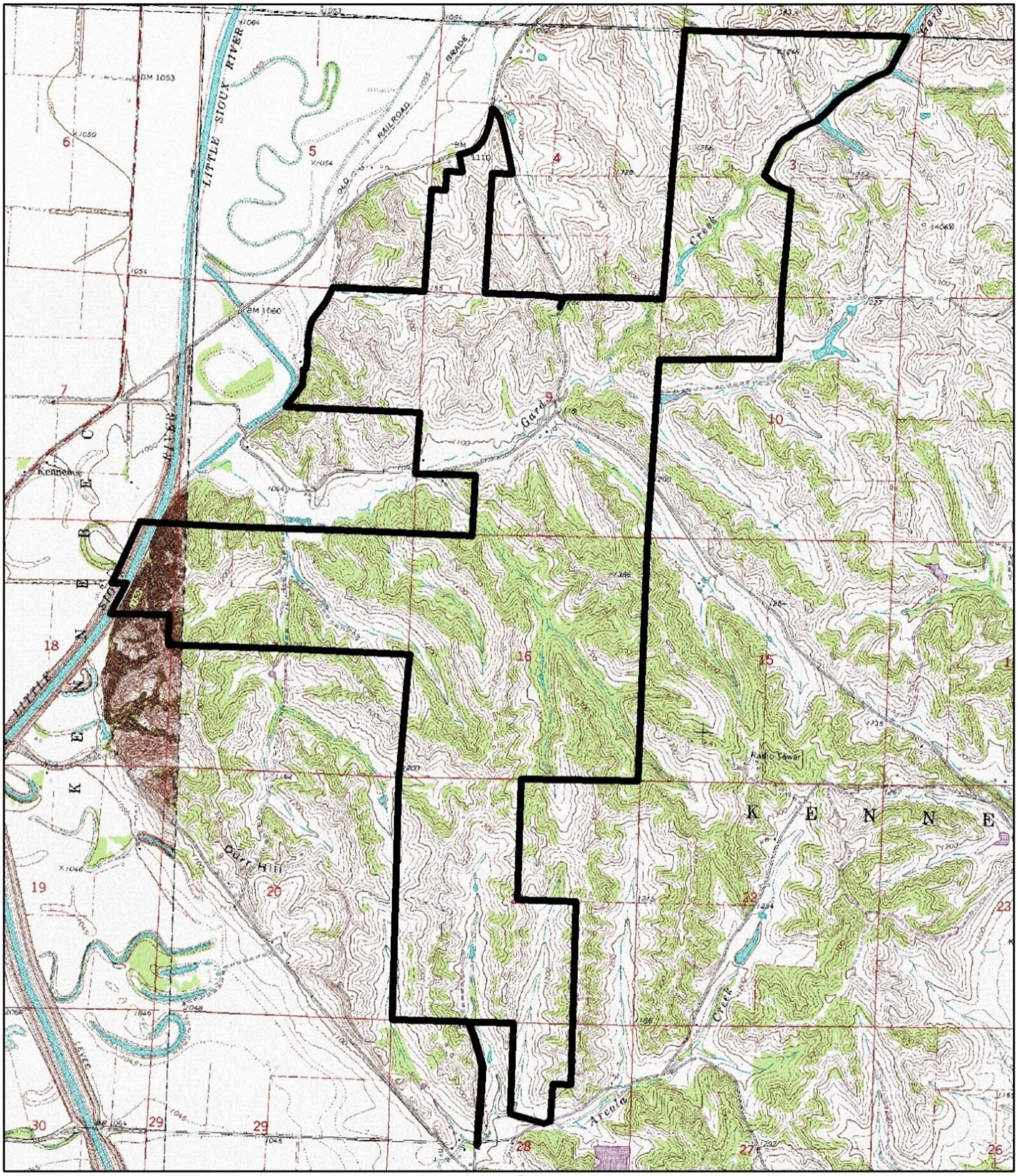
Monona County, Iowa

T84N - R44W

Sections 3-4,8-10,16-18,21,28

Loess Hills Wildlife Management Area

Forest Wildlife Stewardship Plan



N

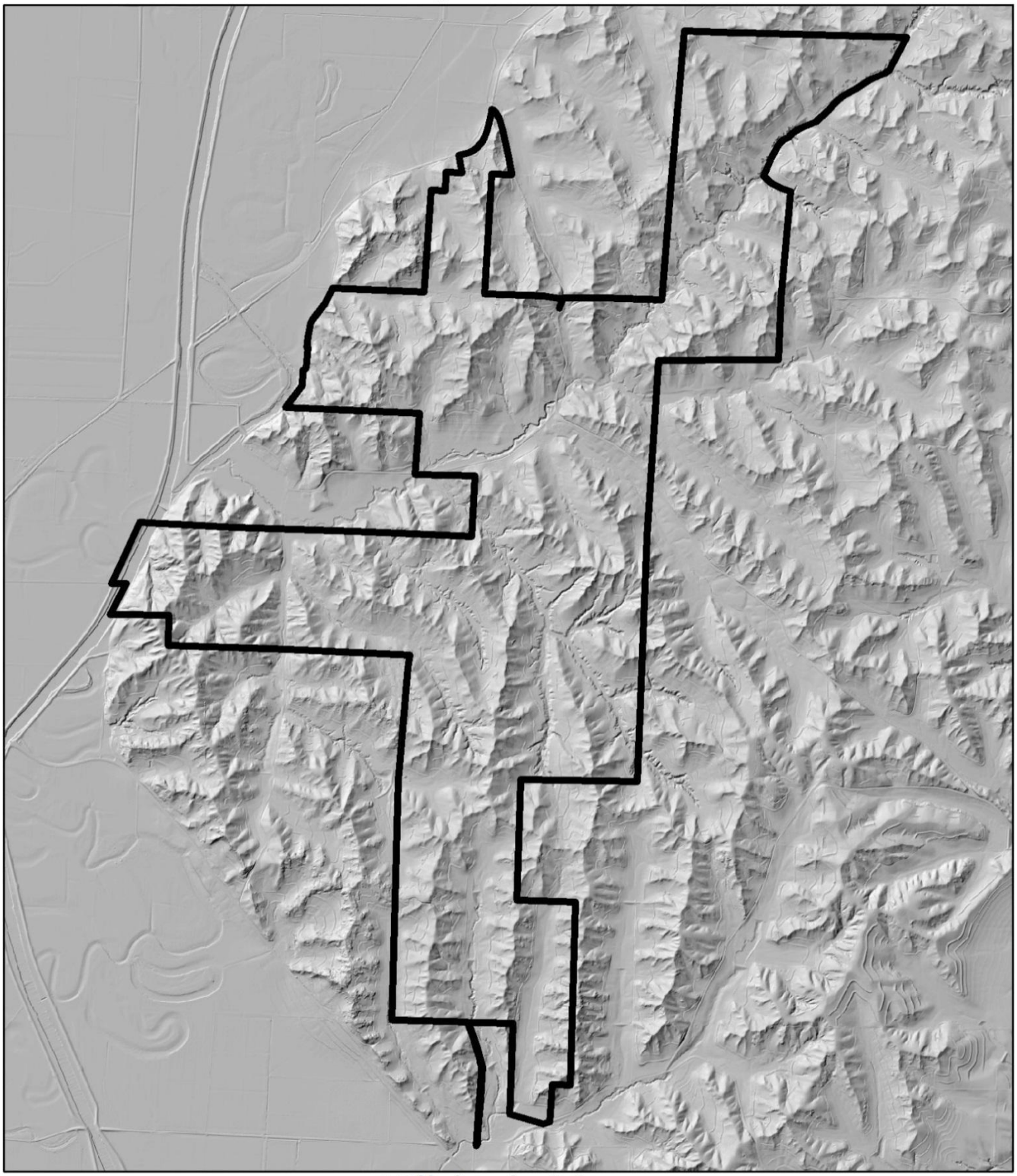
1,500 750 0 1,500
Feet

Topographic Map
2,685 Acres

Monona County, Iowa
T84N - R44W
Sections 3-4,8-10,16-18,21,28

Loess Hills Wildlife Management Area

Forest Wildlife Stewardship Plan



N

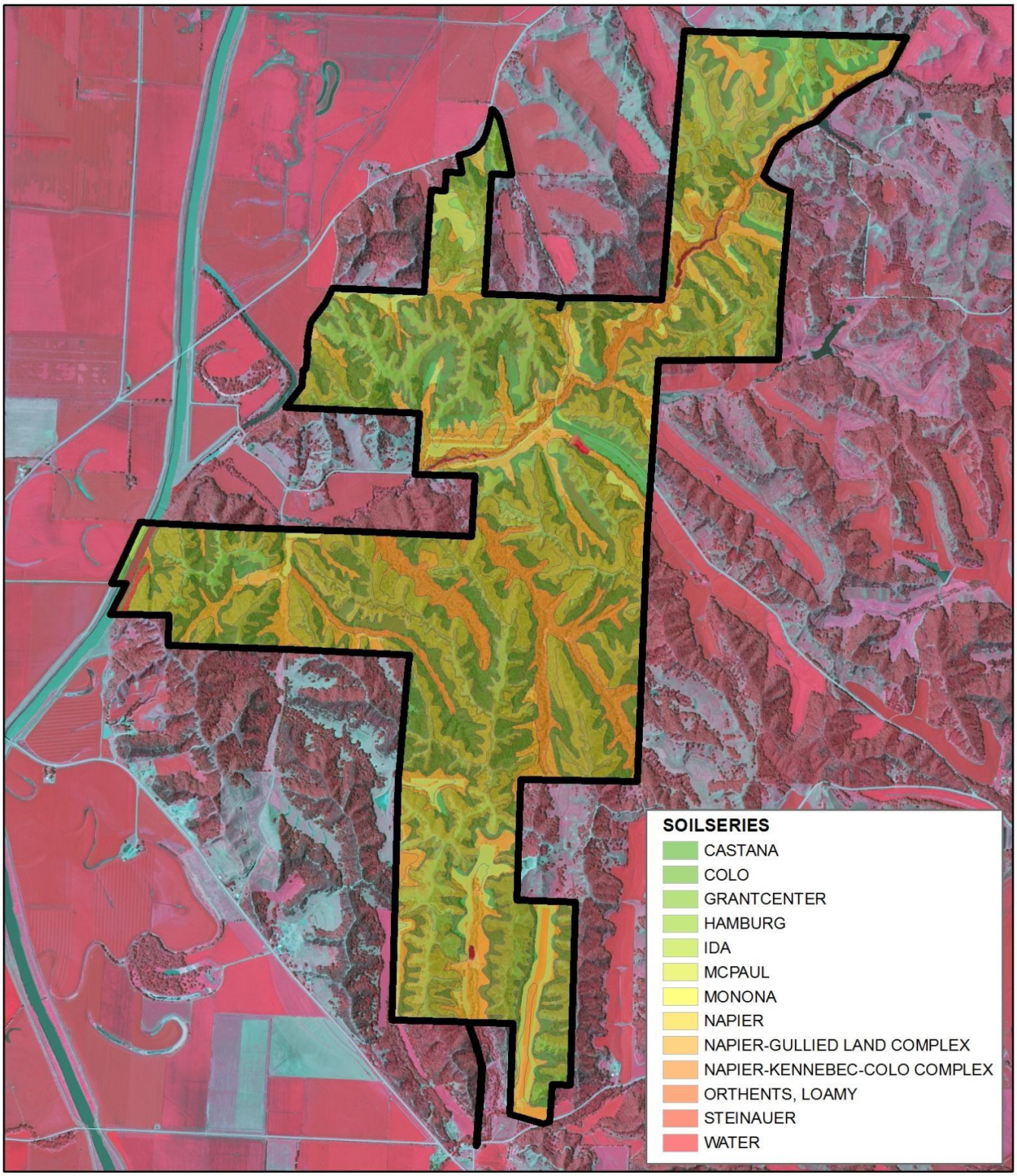
Feet
1,500 750 0 1,500

Hillshade Map
2,685 Acres

Monona County, Iowa
T84N - R44W
Sections 3-4,8-10,16-18,21,28

Loess Hills Wildlife Management Area

Forest Wildlife Stewardship Plan



Soil Series Map
2,685 Acres

Monona County, Iowa
T84N - R44W
Sections 3-4,8-10,16-18,21,28

Objectives and Goals

Primary Forest Habitat Objectives:

a. Provide habitat for a variety of forest, savanna, and shrubland wildlife species.
b. Provide high quality hunting, trapping, and fishing recreational opportunities.
c. Protect greatest conservation need, threatened, and endangered species.

Forest Habitat Goals:

1. Provide a variety of age, size, and density of forest types to meet the habitat need of forest dependent wildlife (den trees, food producing trees, nest cavities, dead snags, etc.)
2. Prioritize habitat management that benefits game species and species of greatest conservation need above wood production.
3. Encourage wildlife food trees that provide hard mast.
4. Forest wildlife targets: white-tail deer, eastern wild turkey, red-headed woodpecker, fox squirrel, black-billed cuckoo, northern bobwhite quail, ring-necked snake, woodhouse toad, whip-poor-will.

The Loess Hills areas is such a unique natural resource ecosystem with many rare, endangered and threatened species of plants and animals that need diverse habitats. This Forest Wildlife Stewardship Plan strives to develop a forest ecosystem that has a diversity of tree age, size, and species. Developing a diverse forest and habitat area that benefits the widest variety of wildlife species will be a take time and patience. Wildlife species have diverse habitat requirements. Even on a Wildlife Management Area, what is a productive habitat for one species may be an unproductive habitat for another species.

Income from Timber Harvests

Harvesting is conducted to regenerate stands to desirable species and to achieve a diversity of tree sizes and species. Income from timber harvesting operations will be reinvested into the area to plant trees, thin young stands, work on invasive species eradication and convert areas to more desirable species due to the soil and aspects of the sites. Harvesting is a very minimal portion of this plan. The majority of work recommended is to thin young stands so that the oak is not shaded out by other trees, remove undesirable species to encourage natural regeneration of desirable trees, remove woody invasive species, burn and harvest deteriorating and insect or diseased pockets of trees, and tree planting.

Proposed Management Systems for the Area

The decision on what system would be used was based on the objectives for the area to maintain an oak woodland component where feasible, develop a diverse woodland landscape where oak is not present, protect fragile sites and soils, improve water quality, and increase the acres of prairie and oak savanna habitats

Based on my recommendations for Loess Hills Wildlife Area, the acres under each management system are as follows -

Cover Type	Acres	% of Total Area
Woodland	1375	51 even aged
Savanna	275	10 uneven aged
Prairie	592	22
Habitat Crop	279	10
Grass	74	3
Riparian	67	3
Waterway, Pond, Parking	23	1
Total	**2685**	**100**

Objectives

Because the Loess Hills WMA is a wildlife management area, the primary focus of the FWSP will be to provide habitat for a wide variety of forest, savanna, prairie, and riparian wildlife species. Unfortunately, there is no one type of forest cover

that can provide all of the requirements for all forest wildlife species. Different species require different (and sometimes quite specific) types of forest species and ages classes. Likewise, some wildlife species require an abundance of forest edge while others need relatively large blocks of un-fragmented forest.

Funding for the acquisition and management of the Loess Hills WMA has been almost exclusively hunter generated monies, i.e. license fees and excise taxes on sporting equipment, REAP open spaces and grants, wildlife habitat stamp monies cost shared with Pittman-Robertson funds. Consequently, a primary objective for management of the area is to improve habitat for hunted species such as deer, turkey, squirrels, and bobwhite quail. On the other hand, the DNR should be obligated to consider the effects of its management actions on non-hunted species as well, particularly those that are threatened, endangered, or species of special concern. The wildlife bureau's "State Comprehensive Wildlife Action Plan" identifies those species it considers in "greatest conservation need" (refer to Appendix 1). Recognizing that it is difficult if not impossible to manage for all of these species at the same time and on one tract, this list will, however, provide an important guideline by which management strategies and decisions will be made.

Management Considerations

There are several considerations that have entered into the formulation of this FWSP for the Loess Hills WMA:

1. The decline of many forest interior bird species such as; thrushes, warblers and other Neotropical migrants. Forest fragmentation and associated cowbird parasitism are considered among the factors causing declines in some of these species. Iowa is a state with exceptionally fragmented forests where addressing the needs of some of these large-block, interior nesting species is particularly difficult, if not impossible. The Loess Hills WMA, however, has a relatively large block (by Iowa standards) of public woodland. It is important to consider the habitat components of this larger landscape when making land management decisions and every attempt should be made to minimize fragmentation of this forest when designing and implementing silvicultural practices. It also has one of the largest amounts of native prairie areas as well which needs to be managed properly.
2. There has been a loss of early successional forest stands and associated wildlife species throughout much of western Iowa. Many of the disturbance factors such as fire, grazing, and cutting have dramatically decreased over the past 40 years. As a result, much of the upland forest in this vicinity has progressed beyond the early successional stage or has been removed. While this may have been beneficial to those wildlife species requiring more mature forests, it has been a negative for species such as bobwhite quail, woodcock, black-billed and yellow-billed cuckoos, and blue-winged warblers that need the earlier successional habitat.
3. There has been a steady decline and projected future decline in oak forest throughout Iowa caused by continuous succession of forest stands to the more shade tolerant species such as hackberry, green ash, elm, ironwood, and bitternut hickory. Oak-hickory forests are extremely important for a wide variety of wildlife species in Iowa. Mast from these species provides an important food resource for many mammal and bird species. The eventual replacement of oak forest with shade tolerant species such as hackberry, green ash, elm, ironwood and bitternut hickory would undoubtedly have a severe negative effect on a huge variety of hunted and non-hunted species.

This FWSP starts with the assumption that it is very important to maintain an oak woodland component to the extent possible. The maintenance of oak-hickory forest on public land becomes even more important in light of likely future trends on privately held forest. Much of this private forest has been subdivided and sold to sportsmen and small acreage holders, many of whom will probably be resistant to implementing the forestry practices necessary to regenerate oak. If this occurs, much of the forest landscape in Iowa will eventually convert to shade tolerant species at the expense of oak.

EXPLANATION OF TIMBER MANAGEMENT PRACTICES

Timber Stand Improvement:
Timber stand improvement (TSI) is the removal of undesirable or low value trees. Removing these unwanted trees will provide more space and sunlight for desirable trees to grow. Timber stand improvement is a "weeding" to increase the growth of your forest.

Weed Tree Removal:
In older timber, the undesirable species can be killed to encourage the natural reseeding of desirable species. The removal of the "weed" trees allows sunlight to reach the ground so that seedlings can become established. The undesirable species can be killed standing by cutting flaps in the trunk and applying using glyphosate, Imazapyr, Triclopyr amine (Garlon 3A), Tordon RTU, Garlon, or Pathway depending on the species into the cuts. The cuts must be in a circle around the trunk and overlapping. The trees can also be cut off and the stumps treated with Tordon RTU or Pathway to prevent re-sprouting. Wet the outer rim of freshly cut stumps. The work can be done anytime except spring during heavy sap flow. Desirable trees such as oak, walnut or Kentucky coffee tree (KCT), that are poor formed or damaged should also be removed. These trees should not be treated with herbicide. The stumps will re-sprout and produce another tree. Cut the stumps close to the ground so that the sprout will originate near the ground level.

Crop-Tree Release:
In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 35-50 trees per acre of which are considered the better quality, healthy, and desirable trees for wildlife values and production. Now you can select the trees you want to compose your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. These trees are typically tallied and marked with paint, and then the trees that touch the canopy of the crop tree are killed to allow the tree to reach maximum growth potential. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meet your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects. Species normally favored are bur oak, black walnut, bitternut hickory, basswood, cherry, and Kentucky coffee tree.

Thinning the understory is a practice also used in even age management. This practice involves removing trees that are below the main canopy to allow more sun light to get to the forest floor. Bitternut hickory, ironwood, basswood, and invasives, and other shade tolerant species warrant this practice if species like oak are wanted in the future. This practice can be conducted on savanna management stands.

Walnut Pruning-
Walnut trees that are 2-12" in diameter can be pruned to promote veneer quality trees. You should prune during the dormant season. Limbs less than 1 inch in diameter are providing foliage which produces food for the tree and should be left. When the limbs approach 1 ½-2" in diameter, they should be removed. Do not remove over 1/3 of the live crown in any one year. At least 50% of the total height of the tree should be maintained in live crown.

HARVESTING

Even Age Management
Even age management is essential for wildlife species depending on oak/hickory forests. Even though large blocks of forest are needed on some Wildlife Management Areas for some wildlife species, each stage of an even age stand provides habitat for wildlife. For example, regenerating stands (1-10 years old) benefit the same species of birds as does early successional stands, bell's vireo, 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 black and white, Kentucky, and worm eating warblers. From age 20-60 years, pole to medium size trees tend to be used by canopy nesters such as scarlet tanagers, wood thrushes, and ground nesters such as ovenbirds and black and white warblers.

Even age management involves growing a stand of trees which are close to the same age. At some point in the stands

life, the area is clearcut which creates the even age structure. Even age management creates excellent habitat for deer, turkey, and some forest birds and is essential for 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 age management.

Even age management involves clearcutting and planting, clearcutting with regeneration already established, group selection, or a shelterwood system to develop desirable seedlings on the ground.

In most woodlands, advanced reproduction is the primary source of regeneration for most tree species. If advanced reproduction is not present in adequate amounts or size, some woodland management practices may be necessary to promote additional regeneration. Most often these practices relate to the light requirements of the desirable species. Often in Iowa the more shade tolerant species (ironwood, bitternut hickory, maple, basswood and invasives) will regenerate adequately. Less shade tolerant species such as oaks require more sunlight, and cultural practices may be required to provide the additional light needed to stimulate natural regeneration

Clearcutting to create full sunlight is essential at some point in the stands life to successfully regenerate oak. If stands are not clearcut, the oak component of the forest will be lost to shade tolerant species. 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 (6-10" dia.) stand of trees.

Fire is a tool in managing oak stands that can be used. Frequent burning of the leaf layer in the woods will kill thin barked species such as hackberry, ash, elm, bitternut hickory, 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 re-sprout. Fire will be utilized on a limited scale to encourage oak regeneration in oak stands. Once a good number of oak seedlings are present (at least 200/ac), these stands will need to be clearcut or the young oak will die from lack of sunlight.

Group Selection Management
Group selection is similar to clearcutting, except it involves cutting small groupings of trees within a larger area. This technique usually results in less regeneration of species such as oak because the openings created are not large enough to reduce the shade effects from adjacent stands. It may be more successful with species more tolerant to shade than the oaks.

Shelterwood:
Shelterwood is a form of even-age management. The final harvest cut is a clearcut, but with several thinning's both commercial and pre-commercial 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 first thinning can be a killing of the undesirable species such as ironwood, elm, bitternut hickory, boxelder, and hackberry. This removes the seed source for the undesirable species and opens up the ground to sunlight. The mature and defective trees can be harvested if additional sunlight is needed for the development of desirable seedlings. The harvest should be lightly done by removing the trees that are deteriorating and leaving the high-quality trees for seed.

The shelterwood system can take many years to develop a good stocking of desirable young trees (at least 200/ac). 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. 5 years prior to shelterwood harvest we do pre-harvest. Pre-harvest removes anything 1-10" and treat the stumps with chemical but do not use chemical on oak or walnut, it is ok if they re-sprout.

When I mark the shelterwood I usually try to remove 30-50% of the canopy to allow some sunlight to reach forest floor. I also concentrate on taking the "worst first" (smaller diameter trees, forked trees, gnarly stuff) and leave the behemoths behind for seed source. 10 years after the shelterwood harvest, if there is appropriate oak regeneration (hopefully 3-

10,000/acre), I will clearcut harvest the stand. If throughout the 10 years of waiting on the clearcut I don't see enough regeneration I will run fire through there to knock down some of the competition coming in and or plant seedlings and protect with tubes and consider opening up stand for light some more before the main harvest. Shelterwood cuts will be used when a stand does not have adequate natural regeneration. Shelterwood harvesting is currently being used in many oak stands on the forest where advanced natural regeneration of oak is lacking. Shelterwood harvesting can be used in conjunction with prescribed burning. Pre or post-harvest treatments improve the conditions for regeneration before or after a harvest by removing undesirable species and/or increasing sunlight availability to oak seedlings. This system produces an even-aged forest.

Even-aged management refers to management activities used to create a forest stand of shade intolerant species, i.e., trees that can only reproduce in open sunlight. The forest stand grows for a period of time until it reaches a desirable age or size. At this point to reproduce young trees of shade intolerant species (such as bur oak) the options become shelterwood or clearcut harvesting, depending on the amount of natural regeneration present. If the stand contains a desired amount of regeneration, a clearcut should be implemented. Lack of regeneration would necessitate a shelterwood harvest, weed tree eradication and/or prescribed woodland burn in order to open up the canopy and increase chances for natural regeneration. Once the regeneration has been established the shelterwood trees can be removed. Even-aged management is used to ensure that shade intolerant species such as oak will remain as a component of the future forest stand.

Uneven Aged Management

Uneven age management develops a stand of trees with all tree 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 age stands always have large trees present, this system favors shade tolerant species that will grow in shade such as ironwood, bitternut hickory, maple and basswood.

Uneven age management areas will provide continuous tracts of woodland with minimal disturbance. Large tracts of uneven age management will provide necessary habitat for neo-tropical migratory bird species such as cerulean, hooded, Canada, and Kentucky warblers. 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 red-headed woodpeckers (SGCN), purple martin (SGCN), American kestrel (SGCN), barn owl (SGCN), northern long-eared bats (SGCN), and squirrels. Timber stand improvement and selective harvesting will create woody debris on the forest floor for reptiles and amphibians.

Uneven-age management can be implemented to manage shade tolerant species.

The timber is selectively harvested to remove mature, damaged, and defective trees. Because large trees are always present in the timber, only species that can grow in the shade can reproduce. Bitternut hickory, hackberry, ash, elm, and basswood can be managed on an uneven-age system of management. Uneven-age management involves maintaining a good distribution of all tree sizes in your timber. It is critical that following a selective harvest, the smaller trees are thinned to remove the trees damaged by logging and poor formed trees. The thinning following the harvest insures that you have high quality trees ready to replace the older trees as they are harvested.

Viewshed Management

Viewshed areas are typically steep fragile slopes of the western edge of the Loess Hills overlooking the Missouri River bottomland, and areas along streams that are best left to naturally progress through succession. Viewshed's may be used to protect areas for endangered plants and animal species. Management can take place on these areas where desirable, but the major objective is to have very minor, if any, disturbance. Certain neotropical migrants will benefit from the areas designated as viewshed as well as the following nesting species: Baltimore oriole (SGCN), black-billed cuckoo (SGCN), wood thrush (SGCN), acadian flycatcher (SGCN), yellow-billed cuckoo (SGCN), and red-shouldered hawk (state endangered).

SUSTAINABLE FORESTRY GUIDELINES

Sustainable forestry is managing a forest to maximize the distribution of age classes on the property, and insure there is a balanced distribution of tree sizes. With even age management, the acres of even age management divided by the rotation age is the allowable cut per year. The target rotation age for the area is 150 years. This insures that large oaks will always be present on the area.

Even Age Management Area

There are 885acres under even age management. By dividing 885 acres by 150 years, yields an allowable cut of 5.9 acres per year, or **29 acres every 5 years**.

Early Successional and Savanna Management

The early successional areas will be managed on a 20-year rotation. There are 290 acres designated for early successional and savanna management. The allowable cut is 14 acres per year. (290 acres divided by 20 yrs.). With a working cycle of 7 years, approximately **98 acres could be cut every 7 years**.

Uneven Age, Riparian and Viewshed Management Area

Stands can be selectively harvested every 30 years to remove mature and defective trees. There are 200 acres under uneven age management. The allowable harvest is **30 acres of selective harvest every 7 years**.

MANAGEMENT STRATEGIES

Several management strategies will need to be used to implement the objectives of the plan within the management considerations mentioned above. Before implementation, the forest management activities described here will be reviewed internally to determine potential impacts to both state and federal threatened or endangered species. Project descriptions accompanied by aerial photos will be provided to the Natural Areas Inventory Program staff for T/E review and comment. Management activities will not be initiated until this review has been completed and all T/E comments/concerns have been addressed.

1. Natural oak regeneration requires sunlight to give the oak seedlings a competitive edge over shade tolerant species. Clearcut, Group Selection and Shelterwood are the typical systems used for regenerating oak. To prevent any potential negative effects on interior nesting species, clear-cuts should be kept as small as possible Clear-cuts should be kept as small as possible (3-10 acres) while still large enough to achieve oak regeneration and be economically feasible. Early succession stages and mature stages of forest both tend to be more productive for a variety of wildlife than the intermediate crowded pole-size stage. Practices such as basal area thinning and crop tree release can be used to minimize the time a stand must spend in this intermediate stage.
2. Fire and grazing disturbance can be used to extend the early succession stage of a forest stand. The mature stage of succession may be able to be extended significantly beyond the typical 150-year rotation age. While this may result in some decline in timber quality and economic return, the trade-off value for certain wildlife species may make it worth it. The longer rotation should tend to reduce the amount of fragmentation needed to regenerate the stand. The limiting factor may be how long the rotation can be extended without jeopardizing natural oak regeneration. Natural regeneration is preferred and planting should be avoided if natural reproduction is present.
3. Some interior nesting bird species seem to select for large spreading “wolf trees” within a given stand. When clear cuts and shelter-wood cuts are marked, these trees should be left standing, especially since they typically have little economic value.
4. Many wildlife species require dead or dying trees to provide insects for food and cavities for nesting. When clear cuts and shelter-wood cuts are marked for harvest, provisions should be made to leave a number (6/ac) of cull trees, snags, cavity trees, and loose-barked live tree species to provide this component for the future stand.
5. This FWSP should be updated regularly as more information becomes available on wildlife use and on the efficacy of various silvicultural/management procedures. If funding is available, wildlife surveys should be done to determine species use to help evaluate success of management decisions.

Early Successional and Savanna Management

Many bird species such as bobwhite quail, American woodcock, blue-winged warbler, black-billed cuckoo, yellow-billed

cuckoo, and eastern towhee are dependent on the early successional stages of woody growth. The high stem density of both trees and shrubs provides suitable nesting habitat and protection from predators.

The majority of early succession management prescribed in this plan is on the woodland edges. This work will "feather" the edges and make a gradual transition from the field edges to the larger trees. Feathering and softening the edges may lessen nest parasitism of interior forest bird species by brown-headed cowbirds. The early succession management areas will be managed on a 15-20-year rotation. The timing of cutting the stands will be staggered to create areas with high stem density that are 0-5 years old, 5-10 years old, 10-15 years old, and 15-20 years old.

Even Age Management

Even age management involves growing a stand of trees which are close to the same age. At some point in a stand's life, the area is clear cut which results in the even age structure. This type of management creates excellent habitat for deer, turkey, squirrels and other hunted and non-hunted wildlife species. It is essential for regeneration of oak, which requires full sunlight. The only way that oak can be maintained as a component of the forest over the long run is by practicing some form of even age management

Each stage or age class of an even age stand provides habitat for a suite of wildlife species. For example, regenerating stands (1-10 years old) benefit the same species as do early succession stands, i.e. blue-winged warblers, black-billed cuckoo, yellow-billed cuckoo, eastern towhee, as well as bobwhite quail and American woodcock.

Sapling to small pole size stands between 10-20 years old may be used by black and white, Kentucky, and worm-eating warblers. Pole size to medium size trees (20-60 years) tend to be used by canopy nesters such as scarlet tanagers, wood thrushes, and ground nesters such as ovenbirds and black and white warblers.

Mature stands of 60-125+ years of age are used by birds such as the wood thrush, Acadian flycatcher, ovenbird, worm eating warbler, and scarlet tanager.

As woodland stands age, they constantly lose trees to shading, insects, disease, etc. The dead and dying trees provide habitat for cavity nesters such as woodpeckers, nuthatches, titmice, and creepers.

Thus, even age management has the potential to provide a large variety of age classes that can meet the needs of a variety of wildlife species.

While there are many methods to open a stand to sunlight, clear cutting and shelter wood harvesting are the most common. Clear cutting is a practice that opens the stand all at once. Regeneration via clear cutting requires there be sufficient oak seedlings or advanced regeneration present. Minus these seedlings, planting may be necessary following clear cutting.

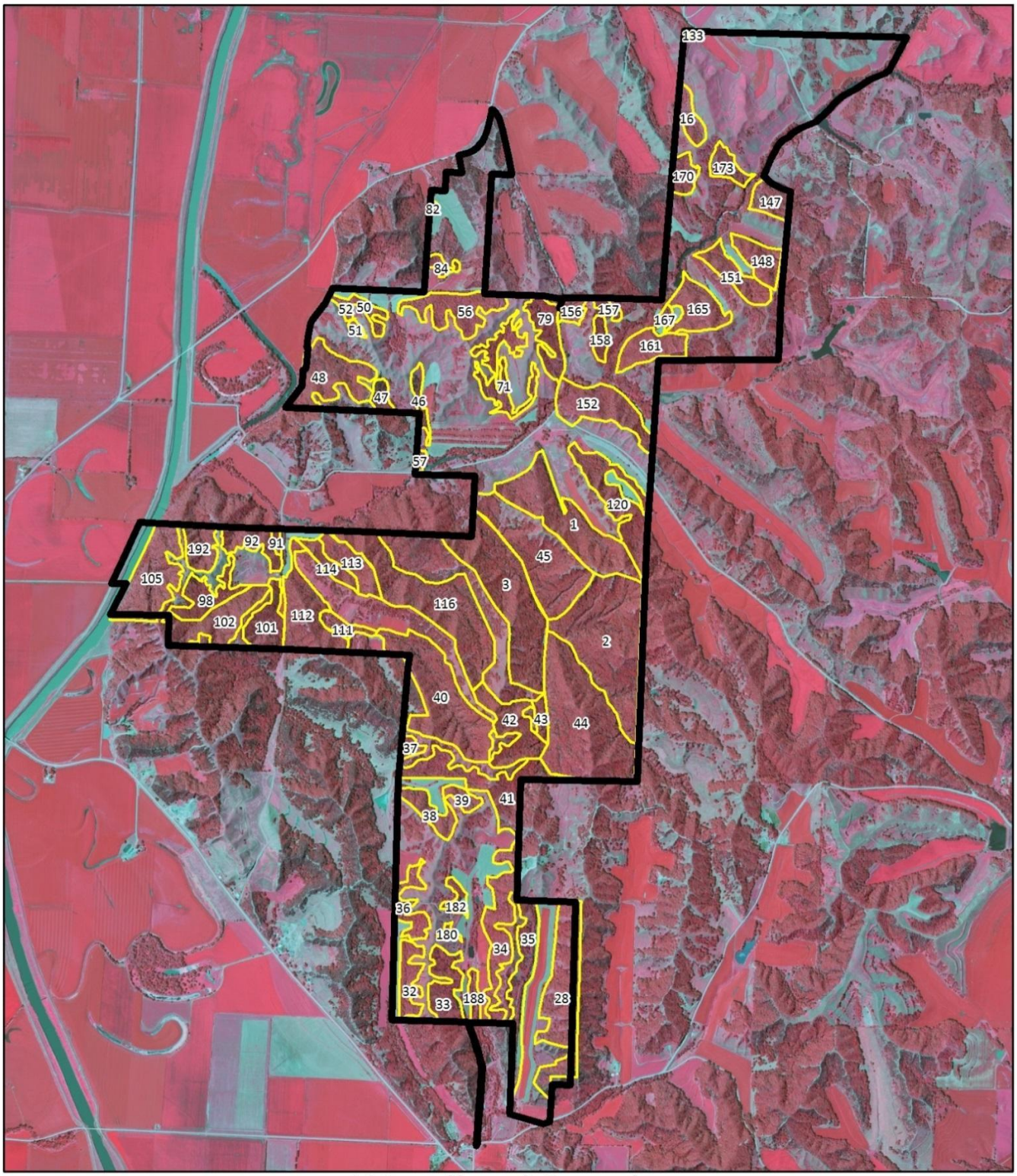
Shelter wood harvests are one way of encouraging seedling production prior to a clear cut. Shelter wood harvests include several thinnings done prior to the final clear cut. If the shelter wood is done correctly, the trees left after the thinnings will provide seed and the forest will be open enough to allow sunlight to reach the forest floor. The trees left will also help provide shade that limits the growth of undesirable or invasive plant species. This method can take many years to create the next oak stand and may need mechanical or fire disturbance to keep out undesirable species. After sufficient seedling or advanced regeneration is present, the stand needs to have the overstory removed to successfully regenerate the oak stand.

Fire is an effective and inexpensive tool that has a long history of use and continues to be studied in managing oak stands. Occasional burning of the leaf layer in the woods will kill or damage thin barked species such as hackberry, ironwood, elm, ash, bitternut hickory, and basswood. Fire will expose mineral soil and open up the ground to sunlight. These conditions favor the natural regeneration of oak. Depending on the extent of root system development, some oak seedlings will tolerate fire better than others, but as a whole, oaks tolerate fire better than other tree species. The top of an oak seedling often will die back following fire, but the roots will send up new growth soon thereafter.


2013/09/18

Loess Hills Wildlife Management Area

Forest Wildlife Stewardship Plan



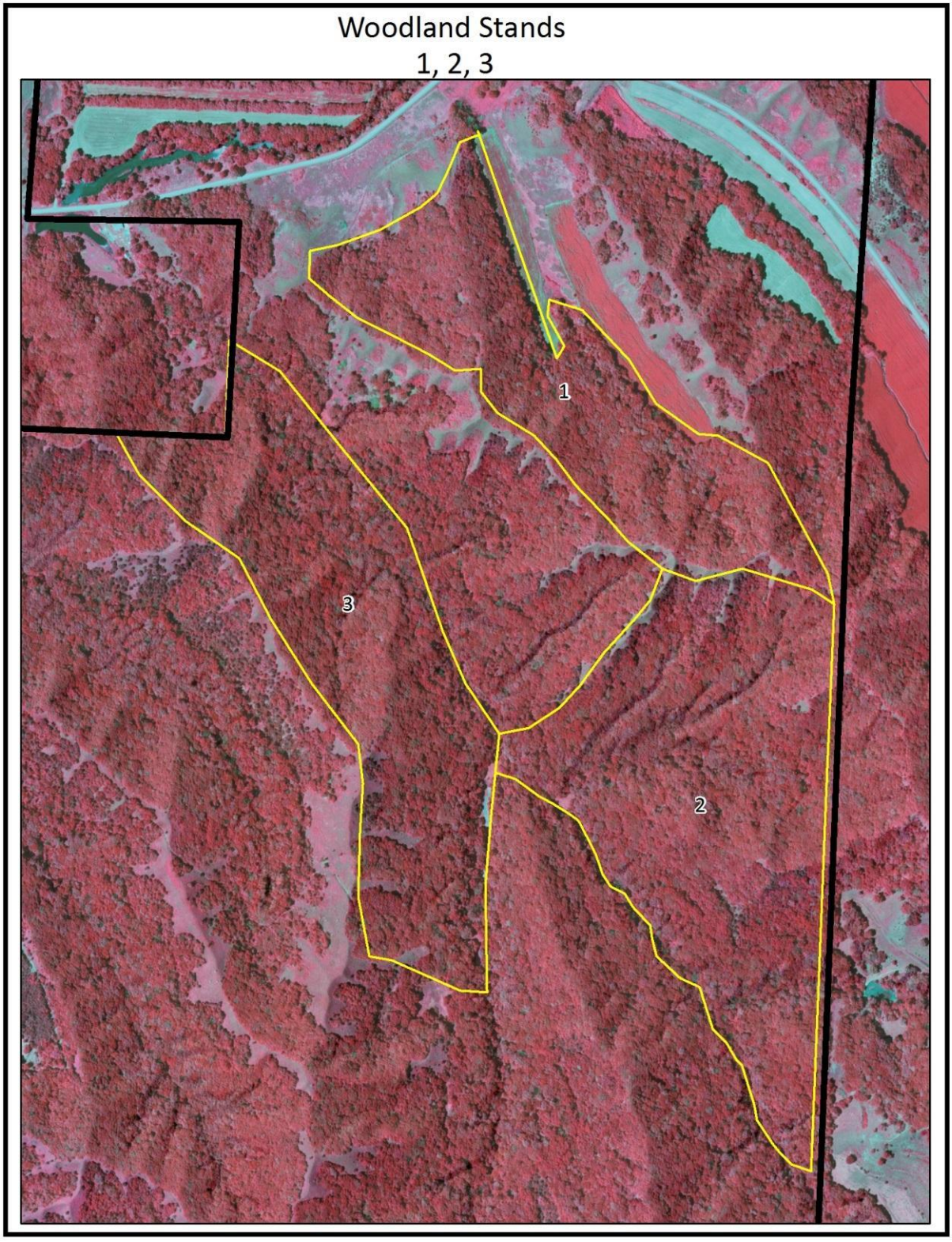
N

Feet
1,500 750 0 1,500

Woodland Stands
1,375 Acres

Monona County, Iowa
T84N - R44W
Sections 3-4,8-10,16-18,21,28

WOODLAND PRESCRIPTION WORK PLANS



Stand 1: 61.8 acre

Site Description:
This stand faces northeast and is at the edge of crop field.

Woodland Description
The overstory is composed primarily of pole to small sawtimber size bur oak, with occasional large wolf mast trees. It also comprises of elm, hackberry, bitternut hickory, ash, in the overstory. Regeneration is mostly elm, hackberry and bitternut hickory.

Management Recommendations:
Weed tree removal and crop tree release (CTR) along with a prescribed burn to help encourage oak regeneration. The weeding and ctr would act as a first phase of a shelterwood harvest system, with the overstory removed 12-15 years from when the first work is done, while leaving the wolf trees for mast and wildlife needs. This would be a good area to burn to establish a quality bur oak woodland. The area should be burned several times, in order to have undesirable species killed in the understory. Years later when oak regeneration is mature enough and a harvest has been done, a periodic prescribed burn should be put in place to help control undesirables without hurting the overstory stems.

Stand 2: 92.3 acres

Site Description:
South and east facing slope on the east boundary of the property.

Woodland Description:
The overstory is composed of pole-small sawlog bur oak, Kentucky coffee tree, hackberry, elm and ash and scattered larger trees. Understory is mostly elm, bitternut hickory and ironwood.

Management Recommendations:
A shelterwood system of management to encourage the development of advanced oak regeneration is recommended. Overmature and lower quality trees in the overstory would be harvested and undesirable trees in the understory would be killed and treated with herbicide to prevent sprouting. A burn would be desirable after stems have been deteriorated enough to burn. This should allow adequate sunlight to the forest floor to enhance natural regeneration and development of oak in the understory. In 10-15 years the overstory in areas with good oak regeneration would have the overstory removed to provide full sunlight to the young oak, which can persist in partial shade for a short period but which need full sunlight for optimum growth and survival.

Stand 3: 78.4 acres

Site Description:
This area is northeast facing hillside to a valley.

Woodland Description:
It is a second-generation multi-stem bur oak stand with a mature draw of bottomland hardwoods with pockets of walnut. There are also scattered bur oak mast trees and some pockets of early successional elm stands. Sizes range from pole to large sawlog. The overstory consists primarily of pole sized to small sawlog bur oak and walnut, with the remaining overstory consisting of bitternut hickory, elm, hackberry and basswood and a few scattered cottonwoods and Kentucky coffee tree, green ash. There are some pockets of nice walnut, some declining oaks and nicely scattered wolf trees throughout the area. Mid-story is primarily elm, bitternut hickory, ash, and ironwood, with very dense (up to 12,000 stems/acre) 1-4” diameters and up to 8” diameter in some places ironwood, and bitternut hickory poles. Understory species are loaded with dense Ironwood (up to 10,000 seedlings per acre), Bitternut Hickory, Prickly Ash, Dogwood, Gooseberry, Raspberry, and sedges.

Management Recommendations:
Work towards getting good oak and walnut regeneration established in the stand for the future is the main objective. This would be done by weeding out the shade tolerant bitternut hickory and ironwood out of the stand, to allow sunlight to the forest floor to allow oak and walnut to regenerate. It would be done as a crop tree release (CTR). Crop trees will

be desirable species with good form and lack of significant defect. Trees with crowns that are touching or overtopping the crown of the crop trees will be killed by felling or double girdling and chemical control. Species normally selected as crop trees are walnut, bur oak, elm, Kentucky coffee tree, or ash. Species diversity is encouraged in selecting crop trees. Selective harvest of some of the most mature trees could be beneficial after regeneration is established. Lots of potential for managing for den trees (cull and declining trees), might also consider type converting some of these areas or possibly taking advantage of some of the openings for shrub plantings or diversity planting some more species of oak for a more diverse food source. Removal of the mid-story and understory ironwood and bitternut hickory would help promote oak regeneration and understory development. Continue to utilize fire to discourage ironwood and hackberry regeneration on fall burns on a 3-7-year rotation as this stand has a great leaf litter to carry fire. Leave snags for wildlife use, identify declining oak patches and treat them as group openings for re-planting or for natural regeneration. One area is heavy in sawlog walnuts and walnut poles and could be harvested to pay for some of the timber stand improvement (TSI) work in the area.

Fall oak savanna prescribed fire.

Woodland Stand 16

Stand 16: 10.4 acres

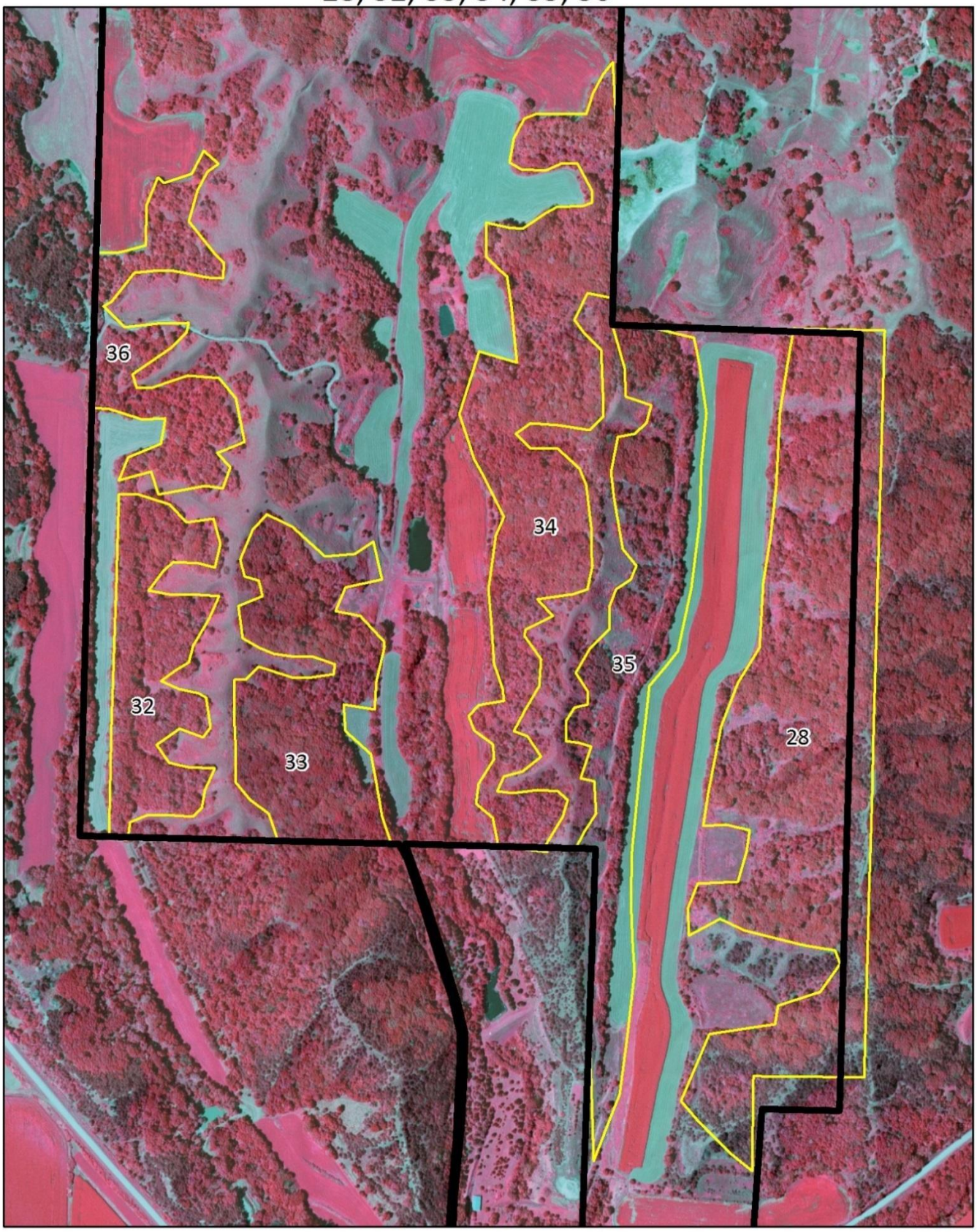
Site Description:
This stand is on a ridge and side slopes along west boundary on the north end of the area.

Woodland Description:
The overstory is composed primarily of small sawlog size bur oak, red oak, and hickory with elm, hickory, basswood, and ironwood understory and very little desirable regeneration.

Management Recommendations:
A shelterwood system of management to encourage the development of advanced oak regeneration is recommended. Overmature and lower quality trees in the overstory would be harvested and undesirable trees in the understory would be killed and treated with herbicide to prevent sprouting. This should allow adequate sunlight to the forest floor to enhance natural regeneration and development of oak in the understory. In 5-7-years the overstory in areas with good oak regeneration would be clearcut to provide full sunlight to the young oak, which can persist in partial shade for a short period but which need full sunlight for optimum growth and survival.

Natural regeneration.

Woodland Stands
28, 32, 33, 34, 35, 36



Stand 28: 56.2 acres

Site Description:
This stand covers many small ridges running east and west with a large ridge running the eastern boundary of the stand.

Woodland Description:
The overstory is dominated by pole to small sawtimber-sized bur oaks with codominant species being green ash, elm, hackberry, bitternut hickory, and walnut toward the lower slopes and in the valleys with cedar on the ridgetops invading the prairie remnants. The understory has regeneration and saplings of hackberry, elm and bitternut hickory.

Management Recommendations:
The stand could use a combination of TSI and weeding. The TSI would be a crop tree on the bur oak, red elm, American elm and black walnut. The weeding would be done throughout the stand by clearing out the bitternut hickory, ironwood, cedar and around a third of the hackberry to allow for regeneration of the mast producing species for wildlife and future generations of stands.

Stand 32: 15.3 acres

Site Description:
West facing slope which sits below many east -west running prairie ridges. This stand will be converted through clearing to prairie.

Woodland Description:
Black walnut is the primary tree species along with elms, Kentucky coffee tree, hackberry, mulberry, and green ash. They have an average tree diameter of 10" dbh. The stand consists of 8"-16" walnut trees with the average walnut diameter being 12" dbh. The average Basal area by prism is 110 square feet per acre. Hackberry trees are scattered throughout the stand and will continue to spread and grow fast. One walnut tree already has fire scars because the field edge is flammable. There are live and dead American elms, mulberry, and green ash, making good den, cavity and food sources for many types of wildlife. Above the highest terrace, walnut range from 3-8 inches with an average diameter of six inches, and a basal area of 90-100. Below some of the terraces, there are large pole trees and small diameter sawlog trees with an understory of mulberry, hackberry, elm, and green ash from 3-6 inches in diameter. Basal area is 120. Site is overstocked. The terrace is covered with mulberry trees. The terrace basin is dead elms, and gray dogwood brush. Above the lowest terrace, you have sapling and small pole walnuts from 3-8 inches in diameter along with hackberry, elms, and green ash as training trees. Average spacing is 6 feet.

Management Recommendations:
Manage the stand for open grassland, salvaging the trees that have some value. There are several walnut trees that ready for harvest, either damaged or are large 20-24" dbh and slowing in growth. Leave scattered bur oak to grow.

Stand 33: 21.5 acres

Site Description:
North and South valleys scattered east of the ridge facing east. The lower third of the stand has good walnut mixed with some Bur oak. The upper 2/3rds changes to bur oak right away. The south fence line is in good shape with a fire break along it. Found a small spot of tall grass prairie of big bluestem and plenty of gray dogwood in the top half, but also found several small patches of crown vetch. Good oak leaf litter base for fall burning. This site was burned about 2010. Also found 2 large black walnuts of decent size and good shape. This area is along the woodland edge and the road coming from the south gate.

Woodland Description:
This stand consists of single and multi-stemmed bur oak, scattered walnut, bitternut hickory and scattered basswood for the overstory with ironwood as the main component of the mid-story. The understory is hackberry and ironwood. The only natural reproduction that could be found was hickory, hackberry and basswood. There is also a group of ponderosa pines around 60 feet tall.

Management Recommendations:
Manage this stand as mixed species oak savanna over the next 50 years with occasional periodic fall fires to keep the ironwood and hackberry contained. Fall cut (late August, September, early October} the ironwood and treat the stumps, this will allow sunlight to reach the woodland floor and allow for some regeneration of oak. Occasional fire will suppress ironwood and hackberry. Leave some bitternut hickory as a mast source. To reduce the amount of hickory, girdle and frill the female trees, by saw and then RTU, in those same months. Check walnuts for harvest based on current condition and the future harvest of walnut trees based on reaching financial maturity, biological maturity and damage assessment. The ponderosa pine and crown vetch will be managed to reduce the nonnative species.

Stand 34: 34.7 acres

Site Description:
This stand area faces west slopes toward the road and crop field.

Woodland Description:
This stand has pole size to small sawtimber located along the long and linear main ridge running north and south with finger ridges running east and west to the main ridge. This stand dominated by valley stands of bur oak, elm, ash and hackberry with a strong mid-story and understory of ironwood, hackberry and bitternut hickory. The pocket valleys with the bur oak are somewhat larger stems with some wolf trees great for mast.

Management Recommendation:
The stand should have the ironwood cleared which would allow sunlight to get to the ground and allow the oaks to regenerate. Girdle and leave 2-6 residual stems (hackberry, hickory) of at least 12" dbh for snags and den trees to reduce the stand density in the oak dominated areas. Burn the stand in order to reduce the woody encroachment on the ridges and maintain a high-quality prairie and reduce the ironwood, bitternut hickory and hackberry reproduction. Clearing will take place adjacent to the existing prairie and field edges. Potential harvest site in 10-15 years.

Stand 35: 28.0 acres

Site Description:
This stand faces east along edge of cropfield with a main ridge running north and south with short finger ridges running east to west, with the valleys filled with trees and ridges with quality prairie underneath the cedar encroachment.

Woodland Description:
This stand of has good pole sized elm-ash and walnut scattered throughout the valleys, with dogwood and cedar along the edges of the woods encroaching onto the prairie ridges.

Management Recommendation:
The encroachment of the cedars and dogwood into the remnant prairie should be eliminated. The cedar removal will open up the prairie ridges and enhance the native prairie ridges. The stand should also have some clearing and expansion of the prairie remnant.

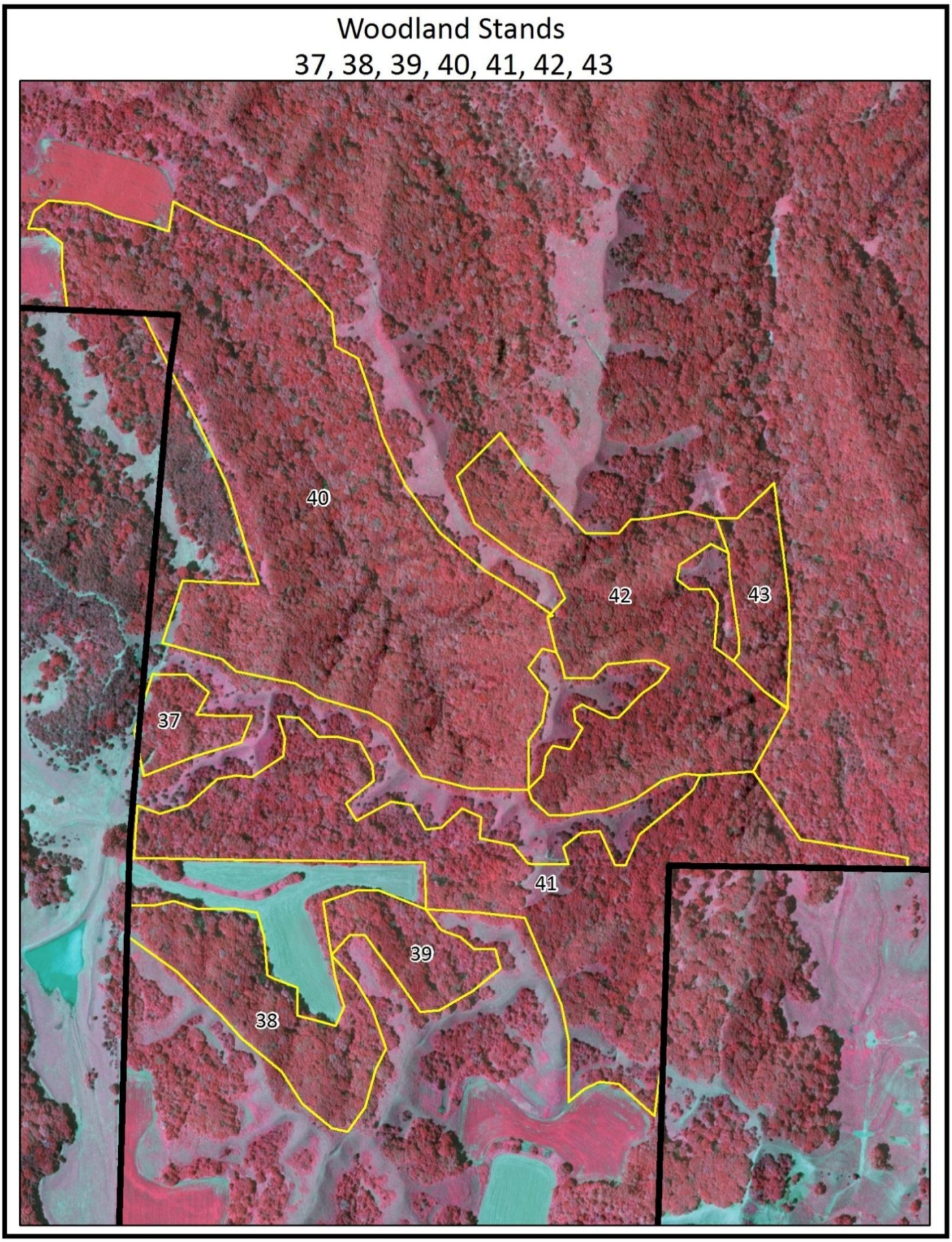
Stand 36: 13.5 acres

Site Description:
This stand is a west facing slope sitting below a prairie ridge

Woodland Description:
The stand is predominantly, Siberian elms and green ash, mulberry, brushy, with many signs of large deer use with an average dbh of 5 inches. A couple of black walnut that are 22" dbh +. The larger one has ice damage and should be harvested. There is also a couple of bur oak at greater than 16" dbh with poor quality, leave for mast etc.

Management Recommendation:
Manage as a prairie: grind all brush, cut remaining trees except the mast producers, followed by regular burning and eventual conversion to prairie. Walnut trees can be harvested because their quality will not get any better and their annual growth will be slower. Convert this stand to native prairie and brush habitat using fire and tree removal. Where

this management has been used, native prairie species respond as soon as light is available from the tree and brush removal.


Woodland Stands
37, 38, 39, 40, 41, 42, 43
40
42
43
37
41
39
38

Stand 37: 3.8 acres

Site Description:
This area is north facing hillside

Woodland Description:
This stand is consists of pole size bur oak, walnut, hackberry, Kentucky coffee tree, American elm, bitternut hickory, Siberian elm, and white mulberry. It has eastern red cedar spread throughout and in clumps. The understory and mid-story has ironwood, choke cherry, plum and dogwood along the edges.

Management Recommendation:
Crop tree release the walnuts, bur oak and Kentucky coffee tree. Remove the ironwood, Siberian elm and mulberry in the areas where the crop tree species reside. Implement a 2 stage shelterwood system in years to come as the crop trees mature in order to get regeneration to the stand.

Stand 38: 13.0 acres

Site Description:
This stand sits facing southwest below a prairie ridge.

Woodland Description:
In general, the stand on the eastern 1/3 is bur oak saplings and pole size trees with a small portion of small sawtimber oaks. Some evidence of clearcutting has been done in the past, which was probably for firewood. The understory is nearly pure hackberry seedlings and saplings from 1-3" in diameter, up to 10 feet tall. The brush and cedar trees are encroaching into native, tallgrass prairie on the upper portion of the stand. The westerly 2/3 of the stand has gray dogwood, elm, green ash, and cedar with majority of the stand consisting of hackberry. There are signs of fires and more is needed. Smooth Patch fungus on the oaks is common

Management Recommendation:
Fire is the only cost-effective management tool. Otherwise, hand clearing with herbicides, or brush cutting machines can do some of the work. Not all brush can or should be removed which provides alternative types of needed habitat for mammals and roosting birds. Find the female hackberry trees and kill them on the stump. Over the next 10 years, keep running fire through the site to reduce the number of hackberry seedlings while increasing the amount of ground forbs for insect production for young birds. If the standing elms are a hazard, cut them down, leave for rotting firewood, or to burn in prescribed fires. The eastern 1/3 of the stand, convert to savanna over a 5-year period. Girdle and chemically frill, or cut down all trees less than 10-12" at DBH.

Stand 39: 5.9 acres

Site Description:
This stand is a small valley draining to the northwest below a prairie ridge containing both a northeast facing slope and a southwest facing slope.

Woodland Description:
The valley portion is elms, hackberry, mulberry, gray dogwood, and boxelder. It is damp with very little grass. The north aspect of the hillside is Bur oak. Some oaks are old-growth and these sections only have a partial understory.

Management Recommendation:
Manage the bur oak as old-growth or bur oak savanna. Use fire whenever possible for working on clearing the understory brush, in order to convert the leafy duff to forbs, for wildlife and birds. Clear or level the valley, scattered the trees and brush. To help carry fire initially in the valley, reseed the cleared area with two bushels of oats/acre.

Stand 40: 68.6 acres

Site Description
This area is north facing hillside. Standing in the crop field and looking north, you are seeing a semi-circular prairie ridgeline from west to east. At the foot of the slope is a fairly flat area of ash, elm, mulberry, walnut, cedars, and gray

dogwood and other brush, and vines. The average trees are saplings and pole-size. The aspect is due south.

Woodland Description:
This stand consists of pole size bur oak, walnut, hackberry, Kentucky coffee tree, American elm, bitternut hickory, Siberian elm, and white mulberry. The stand has eastern red cedar spread throughout and in clumps. The understory and mid-story has ironwood, choke cherry, plum and dogwood along the edges. The timber quality is very poor on site but the site quality is fairly good. Walnut could be interplanted.

Management Recommendation:
Perform a crop tree release thinning on the walnut, bur oak, and Kentucky coffee tree. Remove the ironwood, Siberian elm and mulberry in the areas where the crop tree species reside. Implement a 2-stage shelterwood system in years to come as the crop trees mature in order to get regeneration to the stand.

Stand 41: 40.7 acres

Site Description:
This area is north facing hillside

Woodland Description:
This stand is consists of pole size bur oak, walnut, hackberry, Kentucky coffee tree, American elm, bitternut hickory, Siberian elm, and white mulberry. It has eastern red cedar spread throughout and in clumps. The understory and mid-story has ironwood, choke cherry, plum and dogwood along the edges.

Management Recommendation:
Perform crop tree release the walnuts, bur oak and Kentucky coffee tree. Remove the ironwood, Siberian elm and mulberry in the areas where the crop tree species reside. Implement a 2-stage shelterwood system in years to come as the crop trees mature in order to get regeneration to the stand. The quality is very poor for timber on site but the site quality is fairly good. Walnut could be interplanted.

Tree management is a low priority unless effort is directed towards the walnuts for mast production. Clearing will be very expensive. Fire will not carry through now because of too much brush with flat leaves, high humidity under the brush, and bare soil. The side slopes have a better chance of burning because of less humidity but the fuel load may not be large enough. Three spur ridgelines cut, south, off the main ridgeline. Part way uphill valley, a terrace holds eroding soil and water in place. Trees in this area are hackberry, elm, mulberry etc. in the sapling to pole-size range. From the terrace uphill, ironwood trees fringe the prairie. The understory is Ironwood, Hackberry, and elms. Within these trees is a group of Kentucky coffee trees which had a seed crop in 2011. Also, there are two black walnut are growing: one at 16 inches DBH and lumber grade; and one at 21 inches DBH with 11 feet of veneer needing release. Locate the walnut trees and release them. Use them as seed trees until they are harvested or allow growth into old-age. From the mouth of the valley to the terrace, rogue the ironwood trees.

Stand 42: 29.0 acres

Site Description:
This area is north facing hillside

Woodland Description:
Large open grown bur oak at 60-120 BA/ Ac with American and red elm pole sized trees. The pole size to sawlog walnut and walnut poles are located in a couple of grouping areas in the stand. The mid-story is dense with as many as 10,000 stems per acre of 1-6” ironwood and bitternut hickory. The understory is comprised of gooseberry, choke cherry, sedges and raspberry. There are also many

Management Recommendation:
Mid-story removal of dense ironwood needs to be done in order to help promote oak and walnut regeneration, as to be able to restore a healthier oak woodland stand. Crop tree the walnut, bur oak poles throughout the stand. Use of fire could be used over 5-7-year rotational burns, but will have to work around the crop trees by leaf blowing around the

stems of the crop trees as to not cause damage to them. The fire would work in order to keep the shade tolerant species and hackberry from dominating the understory and not allowing wildlife food species to grow. Utilize the nice stand of walnut to propagate the next stand for the future and work in the declining oak areas by under-planting a diversity of species good for wildlife to improve the area.

Stand 43: 5.6 acres

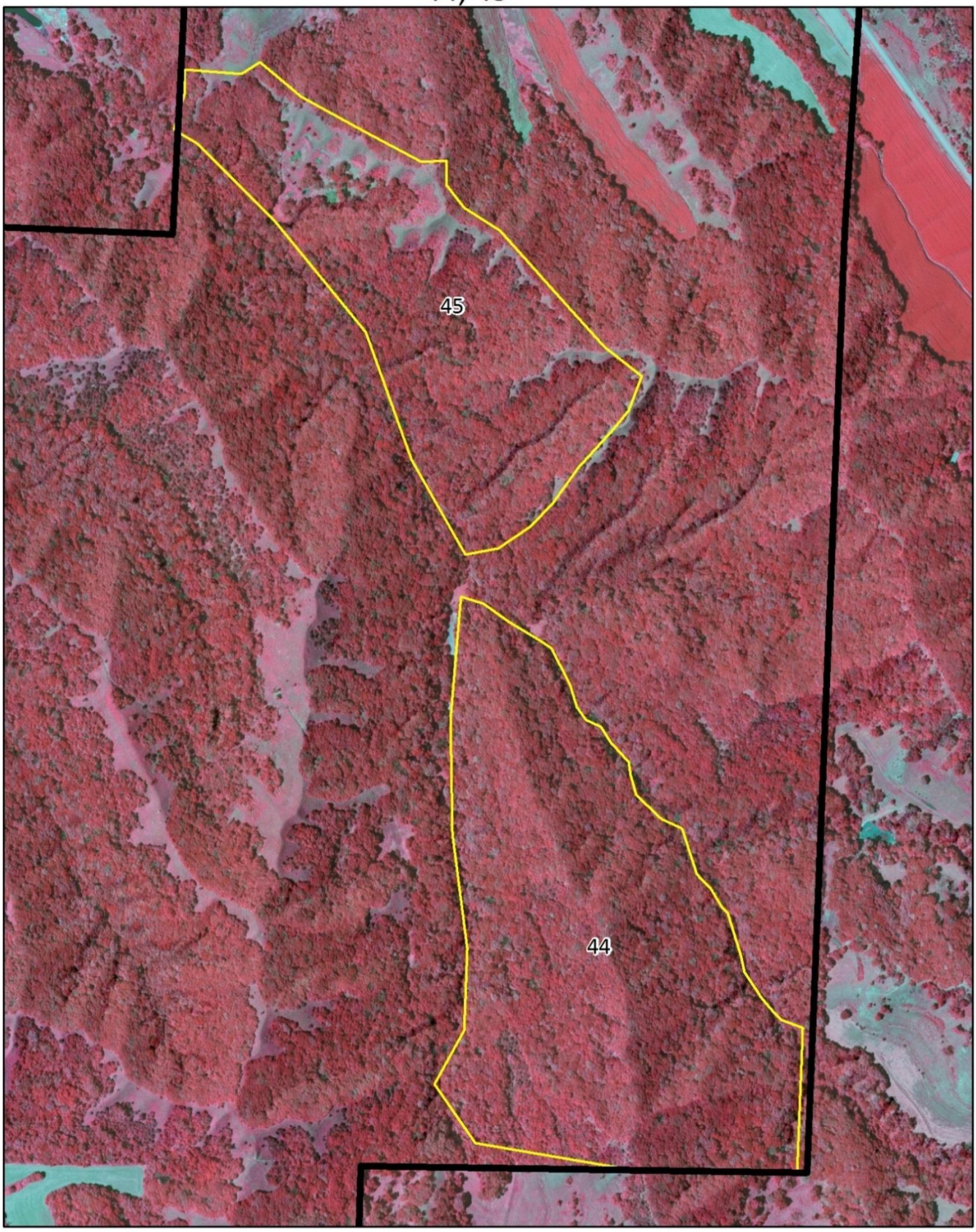
Site Description:
This stand sits easterly facing along a drainage valley heading to the north.

Woodland Description:
This woodland is a pole-small sawtimber stand that has good quality bur oak, walnut and elm, with a hackberry mid-story.

Management Recommendations:
Tree growth and vigor can be promoted in this stand by implementing a crop tree release thinning on walnut and bur oak. Leave snags as they will be used by many wildlife species such as bats and woodpeckers for dens in years to come.

Example of Crop Tree Release (CTR)

Woodland Stands
44, 45



Stand 44: 95.7 acres

Site Description:
This is an old farmstead near the road.

Woodland Description:
A main ridgeline runs through the area from north to south. The east aspect has an average slope of 35% at the highest points. Small areas will have slopes up to 50%. The 2009 CIR photo shows many small side drainages going east. At the foot of these drainages a dozer was used to push and make water catch basins which are shallow. A dozer road was made to install these and segments of the road are still visible and usable, which gives access throughout the stand. In the north and west area is a bur oak timber type, average dbh range of 14-20" dbh, with some trees up to 26 inches. The Bur oak spacing is from 30 to 50 feet apart. The stand consists of lots of diversity of species spread throughout the stand with pole size bur oak, elms, walnut, hackberry, basswood, ironwood, ash, and coffee tree. The timber type is still Bur oak but the amount of slope rises to 45 degrees or 100% (a one to one slope). Bur oak average trunk diameter lowers to 10 inches to as much as 16/18 inches on some trees. Slope effect, soil type, an aspect influences are obvious with small trunks diameters (little available water and low water holding capacity of the soil). Estimated BA is 80-100, with 10-12" diameters, and all species. On the south end of the stand, a dozer line cuts across the ridgeline and a good fence was built. The species present consists of hackberry, elms, basswood, Ironwood, plus a few walnuts, and coffee trees.

From north to south along the main ridge, there are five spots of remnant short grass prairie with some tall grass mixed in. Their general aspect is west with some prairie still growing on the ridgeline. Species are Indian grass, Big Blue stem, Little Blue stem, and sage. These remnant spots have natural regeneration of bur oak, gray dogwood, ironwood and red cedar encroachment.

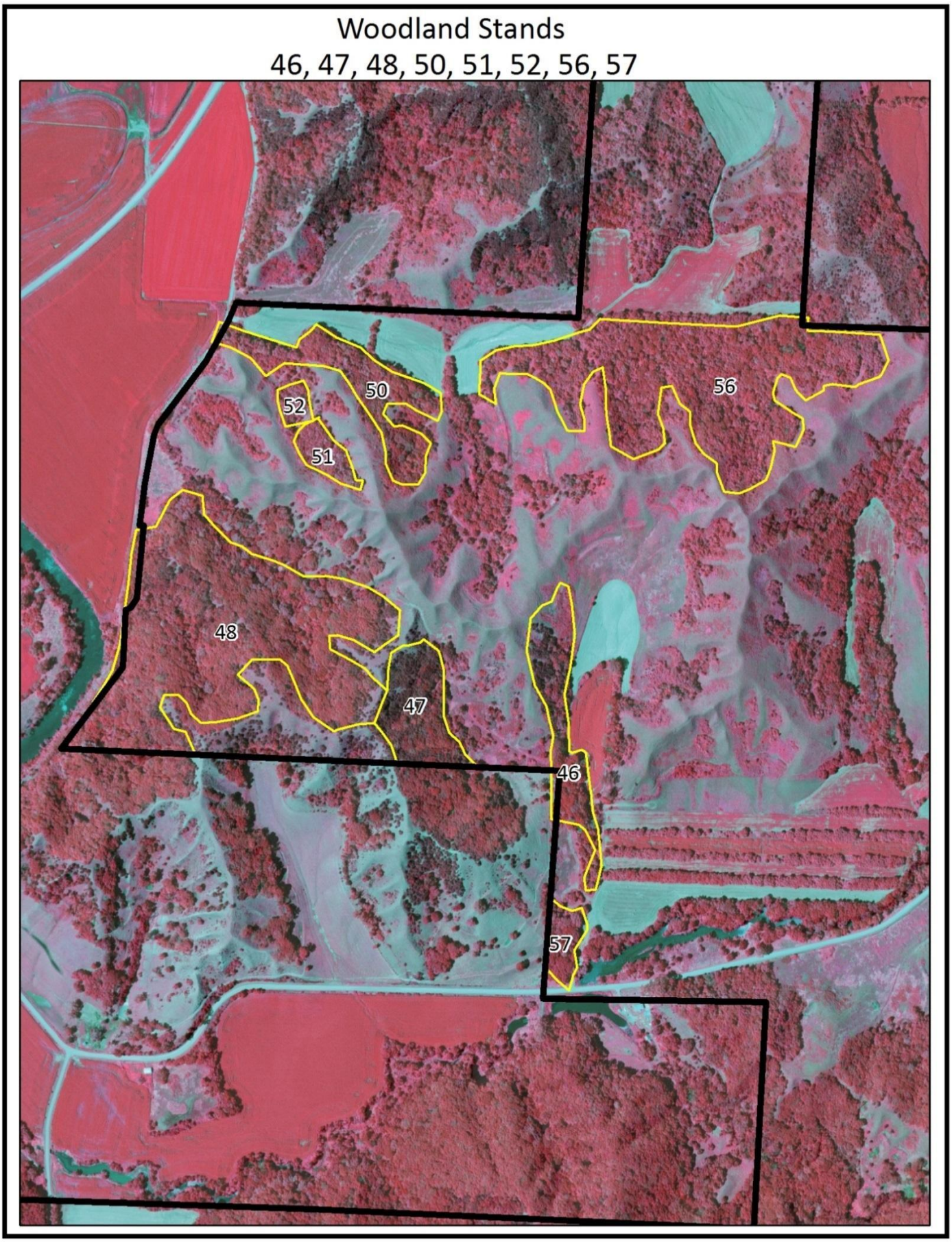
Management Recommendations:
Review area and recheck for merchantable walnut trees and harvest if needed in several years after beginning a burn regime on the site. Clear spur ridgelines and use fire to maintain the prairie ridge tops and finger ridges every 3- 5 years. Accomplish the small amount of understory TSI, and thin the overstory slightly to admit needed sunlight for forb growth, and use regular fall fire to kill the hackberry and ironwood seedlings. The area should be re-examined for regularly to look for salvageable walnut trees. Throughout the stand select best walnut and coffee trees as crop trees and release. Girdle and frill all Siberian elm, and hackberry and ironwood. The north end is conducive to work toward a bur oak Savanna conversion, the clear understory would make very little TSI work BUT the seedling layer is dense Hackberry at 20,000 per acre.

Stand 45: 66.1 acres

Site Description:
This stand sits with a southwest aspect that sits below a prairie ridge.

Woodland Description:
This stand is representative of a degraded prairie and bur oak savanna with wolfy bur oak and numbers of pole to sawlog trees distributed throughout the stand with hackberry and ironwood mid-story and understory. The understory is primarily prickly ash, ironwood and hackberry.

Management Recommendations:
Perform a mid-story removal by cut-stump, girdle, and/or by hack and squirt application of herbicides (use impazapyr or triclopyr amine). Prepare the site for returning to a future savanna site.


Woodland Stands
46, 47, 48, 50, 51, 52, 56, 57
50
52
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56
48
47
46
57

Stand 46: 6.6 acres

Site Description:
This stand is located in a valley drainage that is running north to south along edge of old crop field.

Woodland Description:
This stand consists of elm, hackberry and cedar of pole sized stems

Management Recommendations:
This drainage could be cleared of the woody component and allow for grasslands to be reseeded in the area to help the erosion and be more available for bird species.

Stand 47: 5.7 acres

Site Description:
This stand has a south facing slope sitting below a prairie ridge.

Woodland Description:
The stand consists of pole sized bur oak, cedar, elm and ash.

Management Recommendations:
Clear the cedar and perform a crop tree release around the pole sized bur oak.

Stand 48: 35.2 acres

Site Description:
This stand faces to the south and west with a couple of draws down the middle of it.

Woodland Description:
The overstory of this stand is dominated by pole to small sawtimber-sized bur oak, Kentucky coffee tree, elm, hackberry, ash and basswood species. The mid-story consists of ironwood and cedar.

Management Recommendations:
This stand should have the cedar and ironwood cleared while leaving the bur oaks, walnuts and Kentucky coffee tree for mast production. Also leave the stand intact as a viewshed area overlooking the Missouri River valley. Burn the ridge prairie and allow it to go into this stand where cedars to set back cedar encroachment.

Stand 50: 7.6 acres

Site Description:
This is a north-facing stand.

Woodland Description:
This stand consists of pioneer species, including: elm, ash, cedar and a few bur oaks of pole size.

Management Recommendations:
The stand should have all species but oak removed and restore to a savanna and include in a burn regiment.

Stand 51: 1.8 acres

Site Description:
This stand sits facing northwest along a draw

Woodland Description:
The stand is made up of pole sized bur oak and brush.

Management Recommendations:
This area should have prescribed fire used every 3-5 years to encourage the area to become a quality savanna site.

Stand 52: 1.0 acres

Site Description:
This stand sits facing northwest along a draw

Woodland Description:
The stand is made up of pole sized bur oak and brush.

Management Recommendations:
This area should have prescribed fire used every 3-5 years to encourage the area to become a quality savanna site.

Stand 56: 27.5 acres

Site Description:
The stand is north facing sitting below the large prairie ridge.

Woodland Description:
This stand has scattered pole size and large mast producing oaks with a younger stand of elm, ash and hackberry that have encroached on the area since the 1950'.

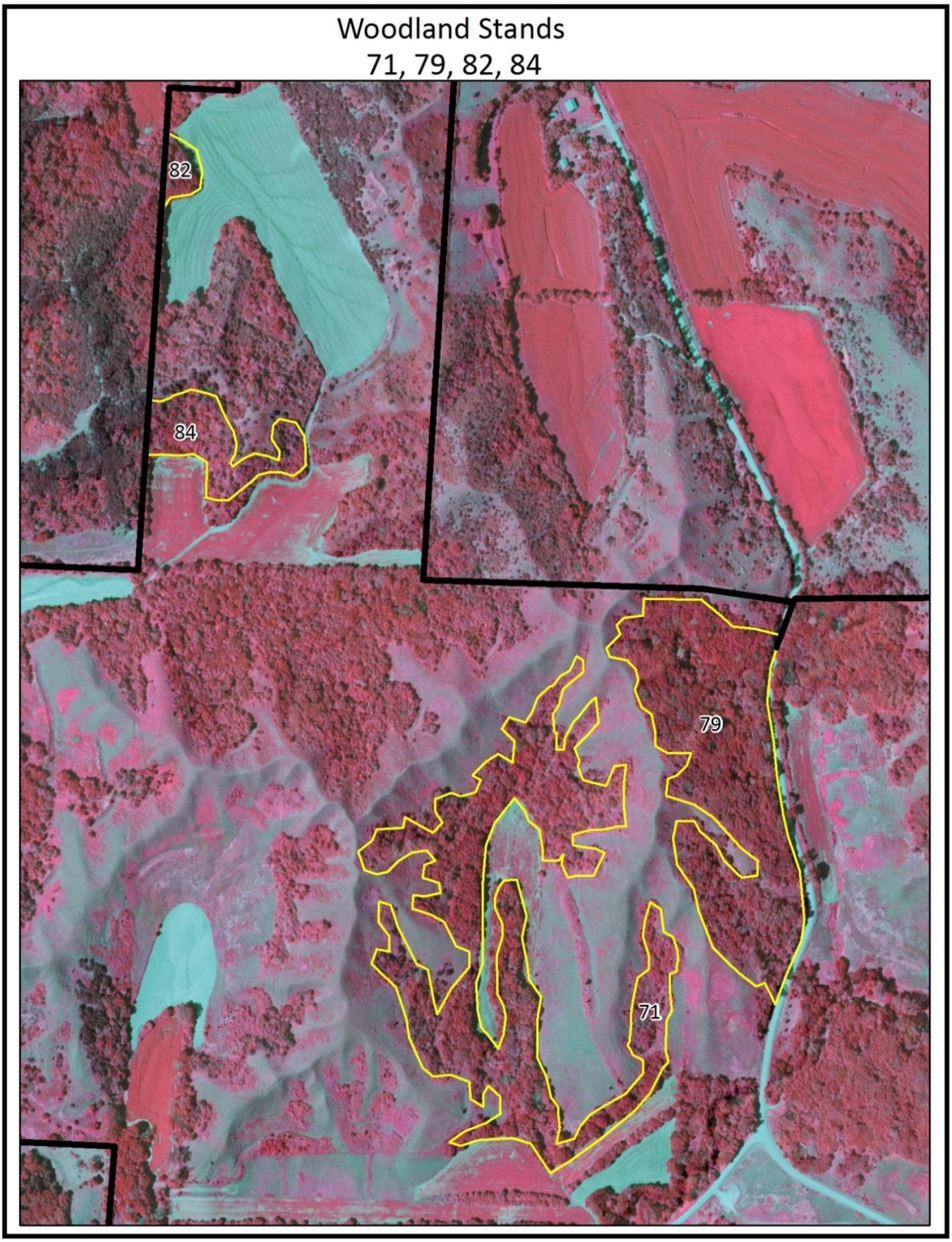
Management Recommendations:
Perform a crop tree release thinning around the oak mast producing stems and reduce the hackberry and elms by half to allow for reproduction of the oaks and have some material for fire to carry through the stand.

Stand 57: 1.9 acres

Site Description:
Stand sits facing north in a drainage area

Woodland Description:
The stand consists of pole sized walnut, elm and ash.

Management Recommendations:
Perform a four-sided crop tree release thinning on walnuts in this stand. Trees killed during the CTR provide wildlife dens and food sources by leaving them standing dead.


Woodland Stands
71, 79, 82, 84
82
84
79
71

Stand 71: 25.4 acres

Site Description:
This stand sits at the base the hill wrapping around the prairie ridge.

Woodland Description:
This stand has pole sized elm, ash, hackberry and some oak and walnut scattered throughout.

Management Recommendations:
Crop tree release around the oak and walnut stems and kill the remaining species while allowing for scattered den trees. Convert area back to a savanna/prairie transitional zone with a few walnuts for wildlife food.

Stand 79: 19.3 acres

Site Description:
The stand faces easterly along the road and drainage.

Woodland Description:
This consists of pole sized elm, ash, hackberry and bur oak and few walnuts.

Management Recommendations:
This stand should be converted back to savanna. This can be accomplished by cutting the elm, ash, and hackberry and other pioneer species. Snags should be retained for cavity nesting birds and den dependent mammals. Healthy bur oak should be retained as a seed source for the next generation of trees. Crop tree release around each bur oak will assist with seed production, and may limit the impacts of bur oak blight, with increased air flow in the stand.

Stand 82: 1.0 acres

Site Description:
This stand faces easterly along a fence to the west and the crop field to the east.

Woodland Description:
The stand is a poor-quality pioneer species stand of pole sized elm, ash, mulberry and hackberry with brush.

Management Recommendations:
The stand should be cut off and reverted back to prairie by cutting the trees and treating the stumps followed by periodic prescribed fire. The native prairie present has responded without addition of seed at other sites.

Stand 84: 4.1 acres

Site Description:
This stand faces south and west along a crop field

Woodland Description:
The stand consists of poor-quality pole sized ash, elm and cedar with dogwood and sumac surrounding the stand.

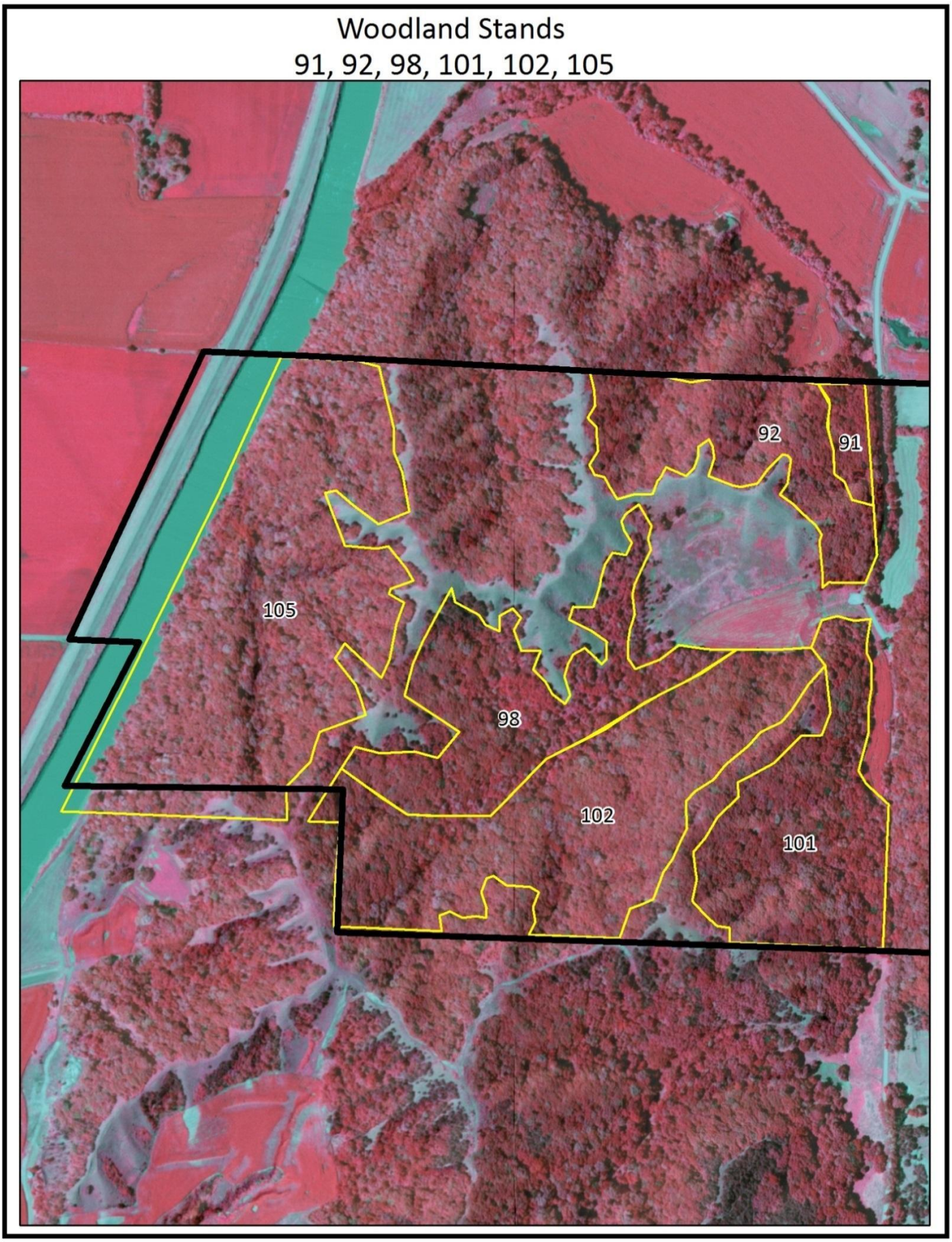
Management Recommendations:
The stand needs to converted back to prairie as it was in the 1950's. Leave some snags for den trees and food sources for the many bird species utilizing dead trees.

Stand 90: 2.1 acres

Site Description:
This stand faces south and west along a crop field.

Woodland Description:
The stand consists of poor-quality pole sized ash, elm and cedar with dogwood and sumac surrounding the stand.

Management Recommendations:
The stand needs to converted back to prairie as it was in the 1950s. Leave some snags for den trees and food sources for the many bird species utilizing dead trees.


Woodland Stands
91, 92, 98, 101, 102, 105
92
91
105
98
102
101

Stand 91: 2.0 acres

Site Description:
This stand faces the road to the East.

Woodland Description:
In the early 1980's, the District Forester put in this management demonstration area for local landowners to watch walnut growth and management. The walnut trees have responded to different amounts of thinning by different rates of growth over the years and the stand is in dire need of release.

Management Recommendations:
Cleanup the site by doing the necessary crop tree release and pruning practices, in order to revitalize the site.

Stand 92: 14.36 Acres

Site Description:
This stand faces a large valley with a due north aspect.

Woodland Description:
The two small drainages that make up this stand are narrow, and create a lot of wind sheltering and shade. The upper 1/3 of the slopes is old-growth Bur oak at 16 inches diameter and larger. The lower 2/3 has the oaks thinning out and being replaced with basswood, hackberry, and bitternut hickory. The small side drainages and coves are thick with hackberry and ironwood seedlings numbering about 20,000 per acre. The smaller spur ridgelines that were once prairie are now small ironwood trees. There is also a very nice stand of pole sized walnut. Above the dirt road and parking lot, there are mature bur oak trees with stems up to 28 inches DBH. Estimated age is 200 years with a very light understory

Management Recommendations:
Some portions of this stand contain walnut trees which would benefit from thinning and pruning. Leave for the mast producing species for wildlife throughout the stand. The spur ridgelines should have the volunteer ironwood trees cut down and burned. The ridgeline to the west is covered with Ironwood which should be cleared and burned. The oak stand above the road should have entire understory of brush and trees removed and burned regularly. Consider using fire prior to the timber stand improvement. The seedlings that survive the fire can be removed later through thinning work.

Stand 98: 18.7 acres

Site Description:
This stand is a north facing slope that sits below a prairie ridge.

Woodland Description:
The stand consists of small sawtimber bur oak, bitternut hickory, hackberry and elm with occasional pole-sized walnut. The mid-story and understory are dominated by ironwood.

Management Recommendations:
A mid-story removal should be considered to increase sunlight to the forest floor. Prescribed fire can be used before and/or after the thinning to set back seedling-sized ironwood.

Stand 101: 18.2 acres

Site Description:
This stand has a north facing aspect

Woodland Description:
The stand consists of small sawtimber-sized bur oak, elm, ash and hackberry, with a strong understory and mid-story of hackberry and ironwood. The bur oaks are in good shape and are scattered throughout the stand.

Management Recommendations:
The stand should be harvested using group selection on a 10-year rotation (using ½ to 2-acre group openings, or where bur oak blight is naturally taking out trees). Follow-up timber stand improvement will need to occur after the harvest, to remove undesirable, non-merchantable trees. If natural regeneration is not present within 3-5 years after harvest, these group opening sites will need to be replanted with seedlings

Stand 102: 30.5 acres

Site Description:
The stand is an older growth north facing aspect.

Woodland Description:
This stand is an older growth small to large bur oak sawtimber stand that is diverse with elm, hackberry, basswood and a few walnuts on the site. Ironwood dominates the mid-story to understory along with hackberry.

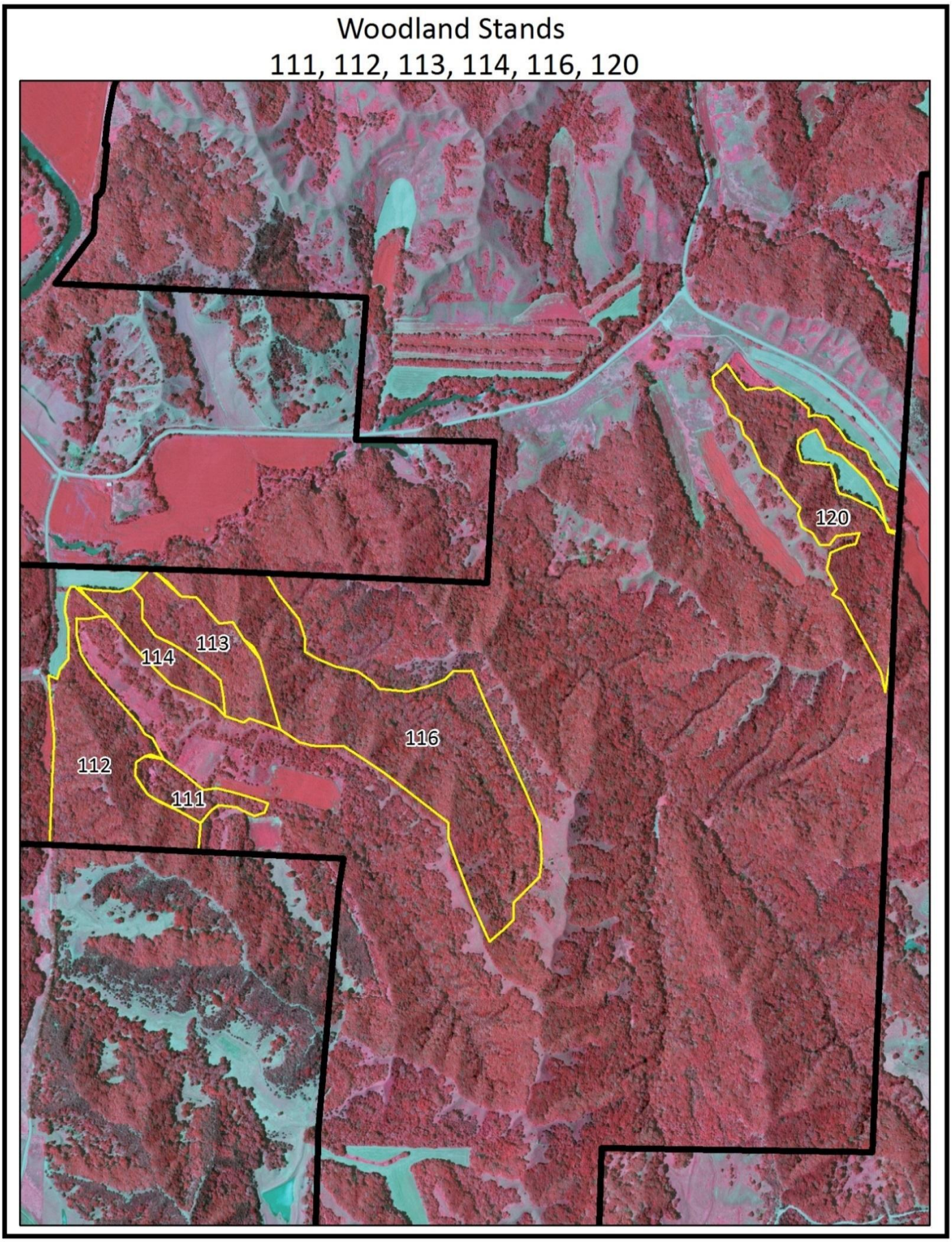
Management Recommendations:
A burn should be done in the fall to set back understory hackberry and ironwood seedlings present. A mid-story removal of the ironwood and hackberry should be done to allow for regeneration of the mast species to occur. Also crop tree release around the oaks and few walnuts should be done to encourage better quality health and condition of the stand.

Stand 105: 42.6 acres

Site Description:
This stand faces west below the prairie ridge out towards the Missouri River bottomlands. This stand is a great viewshed to look out over the Little Sioux River and the Missouri River floodplain to the west.

Woodland Description:
A native prairie ridgeline separates stand 105 and 192. The main valley is much smaller with mixed hardwood trees: Hackberry, ironwood, small bur oak, black walnut, basswood, and bitternut hickory are the mix of species present on the site. The average diameter range is pole-sized. There are some small diameter sawtimber trees. The basal area is 80-120 square feet. Natural reproduction is gray dogwood, ironwood, and hackberry. The reproduction is browsed by deer heavily. There is no oak reproduction.

Management Recommendations:
Find and release any walnut trees to produce more mast and increase their diameter growth. To improve the site, the ironwood and some of the bitternut hickory trees should be cut down in August or September and the stumps treated. You can also chainsaw girdle and chemical frill with an herbicide labeled to prevent re-sprouting in the same months (to reduce the amount of labor and debris on the ground).


Woodland Stands
111, 112, 113, 114, 116, 120
120
113
114
116
112
111

Stand 111: 7.2 acres

Site Description:
Bottomland draw to the north of north slope.

Woodland Description:
The stand consists of pole sized box elder, hackberry, green ash and American elm and Siberian elm. Nice cavity trees in the area. The mid-story and understory consists of choke cherry, hackberry, elderberry and white mulberry.

Management Recommendation:
Retain cavity trees for nesting and food and shelter source for wildlife. Work on killing the Siberian elm and white mulberry through girdling to promote more diverse shrub layer for a better food source.

Stand 112: 37.0 acres

Site Description:
This area is north facing hillside

Woodland Description:
Large open grown bur oak at 60-120 basal area/ Ac with pole-sized American and Red Elm trees. Sawlog walnut and walnut poles are located in a couple of grouping areas in the stand. There is dense ironwood, at more than 10,000 seedlings and stems per acre. 1-6" dbh ironwood and bitternut hickory are present in the mid-story and understory. The understory is comprised of gooseberry, sedges and raspberry.

Management Recommendation:
A mid-story removal of dense ironwood needs to be performed in order to help promote oak and walnut regeneration. Prescribed fire could be used in a 5-7-year rotation in order to keep the shade tolerant species and hackberry from dominating the understory. Utilize the nice stand of walnut to propagate the next stand for the future and work in the declining oak areas by under-planting a diversity of species good for wildlife to improve the area.

Stand 113: 16.9 acres

Site Description:
The area is a ridgetop overgrown savanna

Woodland Description:
This stand consists of an open grown Oak Savanna ridge that has been overgrown with light to moderate density of eastern red cedar and shrubs. The shrubs consist of choke cherry, gooseberry, coralberry, and dogwood with sawlog bur oak and pole sized walnuts. There are also scattered clumps of hackberry, elm, mulberry, Siberian elm and bitternut hickory

Management Recommendations:
Complete a savanna restoration by removing the ironwood and Siberian elm to allow sunlight to get to the ground to encourage native grass remnants to begin growing again and fill the voids of the ridgetop with quality prairie and savanna bur oak trees.

Stand 114: 9.7 acres

Site Description:
This area is north facing hillside

Woodland Description:
This stand consists of open grown bur oak at 60-120 BA/ Ac with American and Red Elm pole sized trees. There are sawlog black walnut and walnut poles in a couple of grouping areas in the stand. There is dense ironwood, at more than 10,000 seedlings and stems per acre. 1-6" dbh ironwood and bitternut hickory are present in the mid-story and understory. The understory is comprised of gooseberry, sedges and raspberry.

Management Recommendation:
A mid-story removal of dense ironwood needs to be performed in order to help promote oak and walnut regeneration. Prescribed fire could be used in a 5-7-year rotation in order to keep the shade tolerant species and hackberry from dominating the understory. Utilize the nice stand of walnut to propagate the next stand for the future and work in the declining oak areas by under-planting a diversity of species good for wildlife to improve the area.

Stand 116: 78.1 acres

Site Description:
This area is northeast facing hillside facing a valley.

Woodland Description
This woodland is a second-generation multi-stem bur oak stand with a mature draw of bottomland hardwoods and with pockets of walnut. There are also scattered bur oak mast trees and some pockets of early successional elm stands. Sizes range from pole to large sawlog. The overstory consists primarily of pole sized to small sawlog bur oak and walnut, with the remaining overstory consisting of bitternut hickory, elm, hackberry and basswood and a few scattered cottonwoods and Kentucky coffee tree, and green ash. There are some pockets of nice walnut, some declining oaks and nicely scattered wolf trees throughout the area. Mid-story is primarily elm, bitternut hickory, ash, and ironwood, with very dense (up to 12,000 stems/acre) 1-4" diameters and up to 8" diameter in some places ironwood, and bitternut hickory poles. Understory species are loaded with dense Ironwood (up to 10,000 seedlings per acre), Bitternut Hickory, Prickly Ash, Dogwood, Gooseberry, Raspberry, and sedges.

Management Recommendations:
Work towards getting good oak and walnut regeneration established in the stand for the future is the main objective. Stand improvement would be done by removing the shade tolerant hackberry and ironwood out of the stand, in order to allow sunlight to the forest floor for oak and walnut to regenerate. In addition, crop tree release will be used to promote the healthiest, best-formed, desirable trees. Trees with crowns that are touching or overtopping the crown of the crop trees will be killed by felling or double girdling and chemical control. Species normally selected as crop trees are bur oak, walnut, elm, Kentucky coffee tree, bitternut hickory or ash. Species diversity is encouraged in selecting crop trees. Selective harvest of some of the most mature trees could be beneficial after regeneration is established. This stand contains potential for managing for den trees (cull and declining trees), might also consider type converting some of these areas or possibly taking advantage of some of the openings for shrub plantings or diversity planting some more species of oak for a more diverse food source. Continue to utilize fire to discourage ironwood and hackberry regeneration on fall burns on a 3-7-year rotation as this stand has a great leaf litter to carry fire. Leave snags for wildlife use, identify declining oak patches and treat them as group openings for re-planting or for natural regeneration. One area is dominated by sawlog walnuts and walnut poles and could be harvested to pay for some of the forest stand improvement work in the area.

Stand 120: 37.7 acres

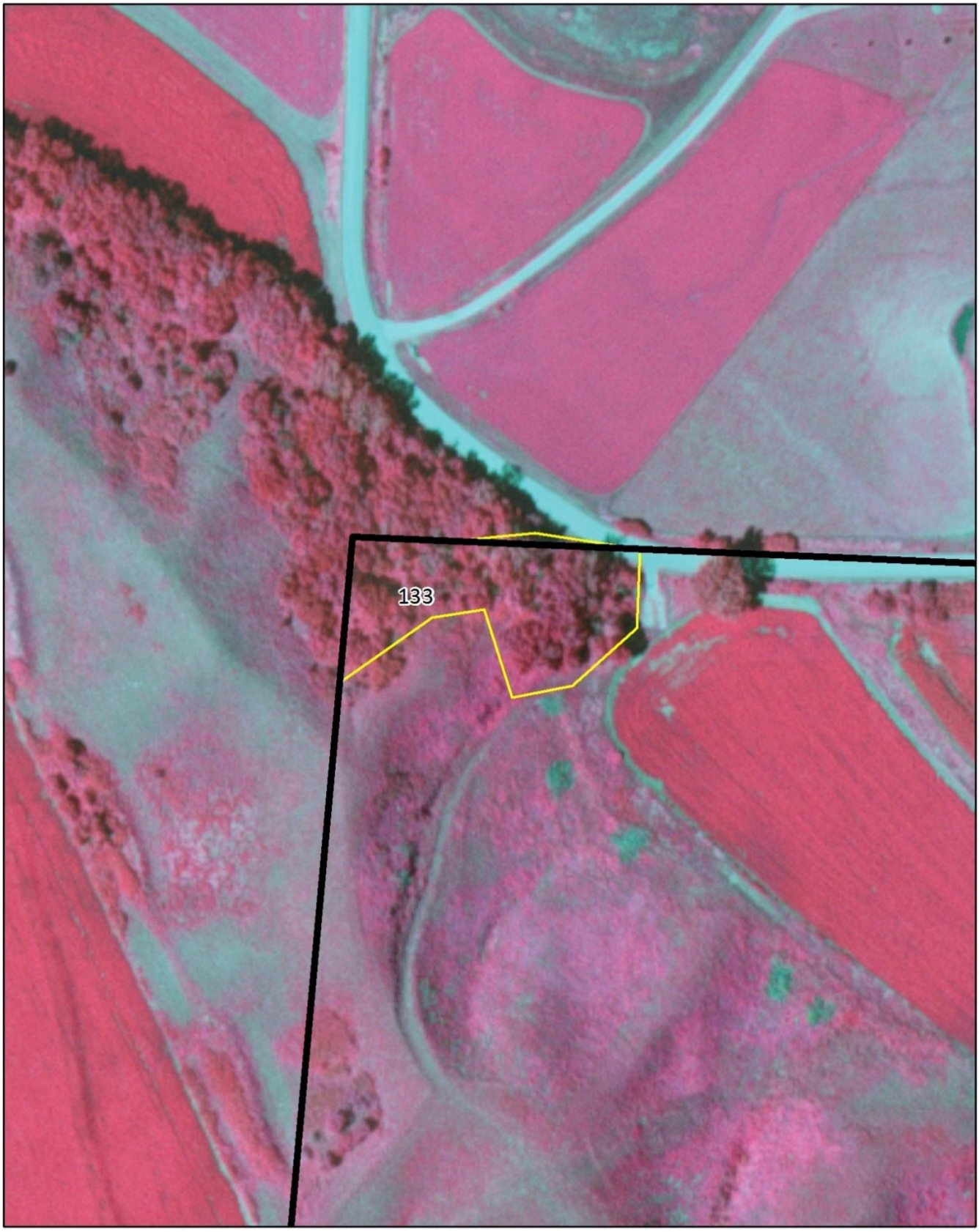
Site Description:
The stand has a north and east aspect facing the oak avenue road.

Woodland Description:
This stand has pockets of nice pole-small sawtimber bur oak and walnut, with the remainder of the stand has elm, ash,

hackberry and ironwood. There are few mulberry and bitternut hickories in some old openings in the stand. The mid-story and understory are densely populated with ironwood and then plum, prickly ash and gooseberry throughout the stand.

Management Recommendations:
The stand should have a mid-story removal of ironwood and crop tree release around the oaks and walnuts for healthier crowns and mast production. This will also allow for future regeneration. Do a fall burn around every 3-7 years to keep the shade tolerant species at a manageable level. Leave the snags for den trees and do some feathering along the edges of the fields to benefit northern bobwhite (SGCN).

Woodland Stand
133

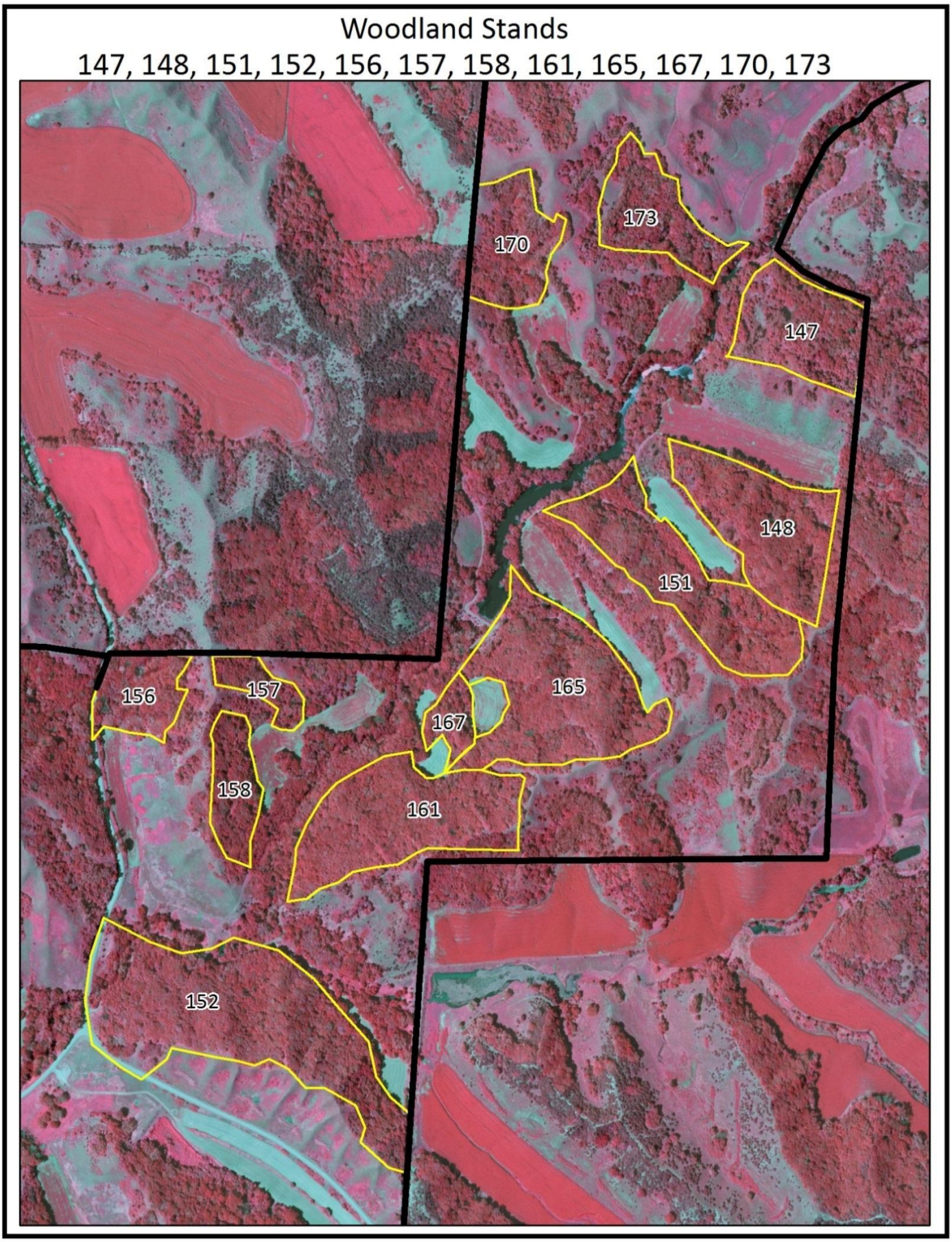


Stand 133: 1.4 acres

Site Description:
This stand faces a south and easterly aspect south of the road.

Woodland Description:
The stand is a pole size pioneer species of elm, ash, hackberry and Kentucky coffee tree with dogwood, sumac, and raspberries in the understory.

Management Recommendations:
This stand should be cleared and allowed to revert back to native prairie using fire disturbance to reduce woody encroachment.


Woodland Stands
147, 148, 151, 152, 156, 157, 158, 161, 165, 167, 170, 173
170
173
147
148
151
165
156
157
167
158
161
152

Stand 147: 11.4 acres

Site Description:
The stand has a southwest aspect.

Woodland Description:
The stand consists of pole size bur oak, hackberry, elm and ash. Ironwood has encroached around the edges and throughout the stand.

Management Recommendations:
Some crop tree release could be done around the oaks in order to improve the mast production and healthier crowns so the oak savanna type stand can thrive. The stand should be burnt once every ten years to keep the ironwood and hackberry at a tolerable level.

Stand 148: 15.3 acres

Site Description:
The stand faces northeast aspect

Woodland Description:
The main drainage and foot slope areas consist of early successional brush and trees. The large section is a wooded hillside on the southeast end while the north end is a brushy, wooded hillside of native prairie. At the far north end, the hillside transitions to cedar trees invading the native prairie. At the top of the slope is the main ridgeline of remnant native prairie. There is a dog-haired stand of ironwood. Toward the center of the stand is a group of very large bur oak trees, old-growth, with trunk diameters up to 24 inches. Some of the valleys within the stand have mixed hardwoods, with their understory consisting of ironwood, bitternut hickory, and hackberry.

Management Recommendations:
Prescription: All cedar trees should be cut down. Burn this stand about every 3-7 years in the fall to reduce the invasion of ironwood, hackberry seedlings. Thinning the overstory and cleaning out the understory would benefit the woodland. Costs and labor are high for these activities. Using fire will help the valleys and ridgetop prairies after clearing the cedar.

Stand 151: 17.4 acres

Site Description:
A steep wooded hillside of mixed hardwood trees that faces northeast.

Woodland Description:
A main ridgeline still contains native prairie. Spur side ridgelines run downhill to the northeast. Bur oak covers the top of the slope. Mid slope and bottom have very few bur oak trees. The tree species changes to basswood and hackberry, primarily. There are very few sprouted bur oaks. There are some thickets of ironwood seedlings and saplings throughout the stand that number around 20,000 per acre. There are green ash and bur oak seedling found scattered throughout the stand.

Management Recommendations:
Eliminate the ironwood by hack and squirt with triclopyr amine (Garlon 3A) in late august early September. Use fire to convert this site to oak savanna and woodland site without the shade tolerant species.

Stand 152: 33.6 acres

Site Description:
The site is accessed from a DNR gate along Oak Avenue. The slope leads up to a prairie ridgeline. Immediately over the ridge, the slope faces slightly northwest to north to slightly northeast. The upper 1/3 of the northeast-facing slope is short stemmed bur oak with ironwood. Spur ridges run laterally away from the main ridge, cutting the oak pockets into segments. A northeast facing aspect and walnut site.

Woodland Description:
The pole to small size bur oak timber type with Hackberry, bitternut hickory, and basswood is dominant. A few black walnuts are also on the site. The average trunk size is small sawtimber. The entire understory is ironwood. A valley cuts the site in two pieces. Hackberry, hickory and basswood are pole size trees. The area along Oak Avenue is mostly brush with volunteer hardwoods and some cedars.

Management Recommendations:
For the segment west of the valley there are walnut trees that need to be thinned by crop tree release. In the same area, a special emphasis should be placed on selection of hackberry and basswood poles as crop trees for mast production and as future harvest trees. Hickories would be a secondary product. First remove any suppressed or over-topped trees in the understory. Then, remove the worst oak crowns from the main over-story. Decide if the amount of sunlight is adequate for walnut replanting and tubing. If not, thin the main over-story down to 35-40%, no more, and evenly as possible.

Stand 156: 6.3 acres

Site Description:
This stand faces south and east below a prairie ridge to the east.

Woodland Description:
The stand consists of younger, pole-sized bur oak, elm, ash and hackberry and with dogwood brush around the perimeter.

Management Recommendations:
The stand should have crop tree release performed around the healthiest hard mast producing trees (oaks, hickory, and walnut) for wildlife.

Stand 157: 3.2 acres

Site Description:
This stand sits facing south and west aspect

Woodland Description:
The stand consists of a smaller pocket of older pole-sized bur oak with the remainder of the stand consisting of ash and elm. The stand has sumac and dogwood around the edges.

Management Recommendations:
Crop tree release thinning should be performed around the best quality oak, and also around quality ash and elm.

Stand 158: 5.8 acres

Site Description:
This stand sits facing easterly aspect

Woodland Description:
The stand consists of a smaller pocket of older pole-sized bur oak with the remainder of the stand consisting of ash and elm. The stand has sumac and dogwood around the edges.

Management Recommendations:
Crop tree release thinning should be performed around the best quality oak, and also around quality ash and elm.

Stand 161: 19.1 acres

Site Description:
This stand sits in a bowl of large pole-sized and small sawtimber-sized mixed hardwoods on an NNW aspect.

Woodland Description:
This stand consists of small-sawtimber-sized second growth walnut with cottonwood, hackberry, bitternut hickory, and basswood as cohorts. The mid-story and understory consists of dense (4000-5000 stems/acre) ironwood. The stand is separated by prairie ridges that include the following species: big bluestem, little bluestem, indiangrass, and sideoats grama.

Management Recommendations:
This stand should be managed for the oak component. Fire is the current best management option with the least amount of cost. After fire has thinned the stand and removed the ironwood seedling layer consider thinning the bur oak canopy by 25-45% to admit needed sunlight for the forb layer, and do crop tree release around the walnuts. Above the terraces, find the walnut trees and provide them room to grow using crop tree release or through a basal area thinning (reducing the overstory by 50%). Consider restoring upper slopes to savanna and prairie.

Stand 165: 22.6 acres

Site Description:
A valley protected by triangular ridgelines on the south and the northeast.

Woodland Description:
The timber type is Bur oak. No intermediate hardwood layer. The sapling layer is Ironwood and elms, primarily. Reproduction is loaded with hackberry and small ironwood seedlings. In one drainage, an old push-up basin terrace was installed. The average stem diameter is 10" dbh. Basal area is 90-120. The spur ridge has cottonwood. The drainages open onto a crop field on the west edge. The main valley, faces NNW and is surrounded by parallel ridgelines. The bur oak trees have an average trunk diameter of 14-16" dbh with basal areas ranging from 80-130. Valley and ridges run NNW to SSE. The valley site is an old clear-cut site occurring about 120-140 years ago. Trees are bur oak poles and 95% of them are stump sprouts from 4-16" dbh. The average stem diameter is 6 inches. Each stump has at least 2 sprouts. The remaining 5% are single stem bur oaks and ironwood. There a few pockets of walnut that need to be thinned for health and mast production. A few old fire scars were found.

Management Recommendations:
Clear spur ridge line of all trees, allowing any residual prairie to respond. Remove the ironwood understory and thin the oak canopy. After treating the understory, reduce the live canopy by 40-50% to admit needed sunlight. Perform crop tree release around the walnuts to allow for mast and healthier crowns. Convert to oak savanna by removing the ironwood by cutting, especially the female ironwood trees. Focus on using crop tree release around single stem bur oak as well. Multi-stem oaks should be triple girdled, without the use of herbicide.

Stand 167: 2.8 acres

Site Description:
This triangular shaped woodland is surrounded by an access road.

Woodland Description:
The stand is dominated by low quality mixed hardwood species with scattered walnut trees.

Management Recommendations:
Perform a crop tree release to promote the highest quality walnut trees.

Stand 170: 9.3 acres

Site Description:
This stand has a southeasterly aspect north of the drainage

Woodland Description:
The stand consists of pole-sized to small sawtimber of cottonwood, Kentucky coffee tree, bur oak and walnut. The mid-story and understory are dominated by elm, and hackberry.

Management Recommendations:
The stand should be harvested and replanted with mast-producing trees.

Stand 173: 9.3 acres

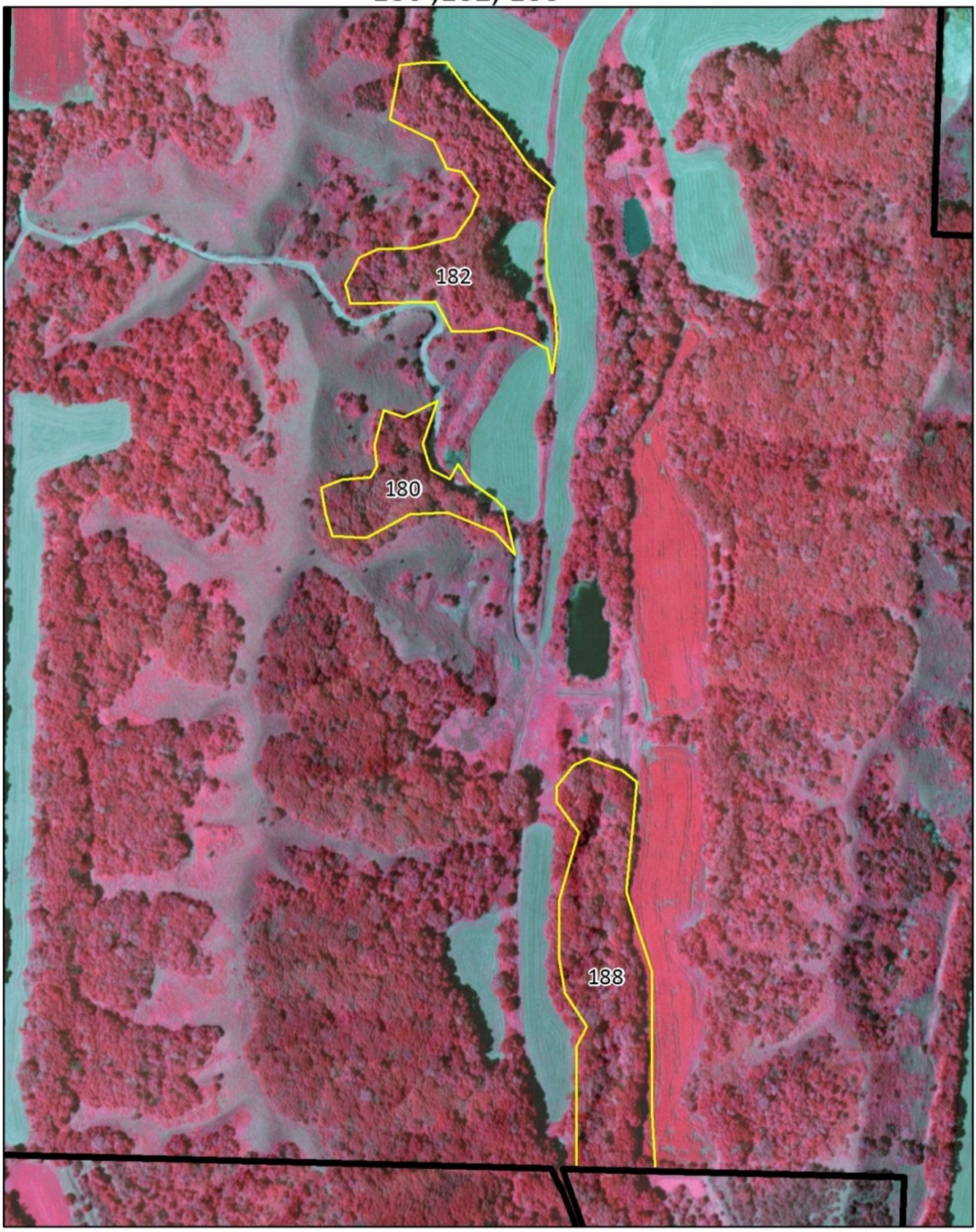
Site Description:
This stand has a southeasterly aspect north of the drainage

Woodland Description:
This stand consists of pole-sized to small sawtimber sized cottonwood, Kentucky coffee tree, bur oak and walnut. The mid-story and understory are dominated by elm and hackberry with lesser amounts of ironwood. Sumac and dogwood are common along the woodland perimeter.

Management Recommendations:
Harvest the stand and replant with mast producing species if inadequate regeneration is available

Planting trees following a harvest.

Woodland Stands
180 ,182, 188



Stand 180: 2.1 acres

Site Description:
This east facing site which has been divided into different zones for water management.

Woodland Description:
Between the field edge and the foot of the terrace are smaller walnut trees and 4 walnut trees needing harvest. Between the lower terrace and the next terrace, Bur oak is more common, a few walnut crop and harvest trees, along with bitternut hickory, hackberry and elms as well as many dogwood plants. Terrace basin is filling with brush, fallen timber, raspberries and other brush. Above the top terrace are many walnut saplings and pole-size. The site is over stocked with small diameter saplings. The average trunk diameter is 4 inches. The average basal area is 120/acre or 450-550 trees per acre.

Management Recommendations:
Manage the stand for long-term walnut production and bur oak while producing some wildlife habitat and plenty of mast. Harvest a few trees along the field edge and thin out the uphill segments. Maintain some trainer trees for straight growth on the walnut trees. Maintain some dogwood for songbird mast and nesting sites. Maintain prairie edges with brush as escape cover for wildlife. Apply crop tree release or a general mid-story removal.

Stand 182: 5.4 acres

Site Description:
The stand is an early successional east facing stand.

Woodland Description:
Siberian elms and Green ash trees dominate the site, with average trunk diameters of 5 inches. One Black walnut at 17" dbh with poor quality, leave for mast etc. The over-story consists of mixed hardwoods, oak, hackberry, elms (some dead), mulberry etc. Red cedar trees are dotted along the south and north edges. Brushy small elms, ash, mulberry, with indication of heavy deer browse and rubbing. There are several mature walnut trees that should be harvested.

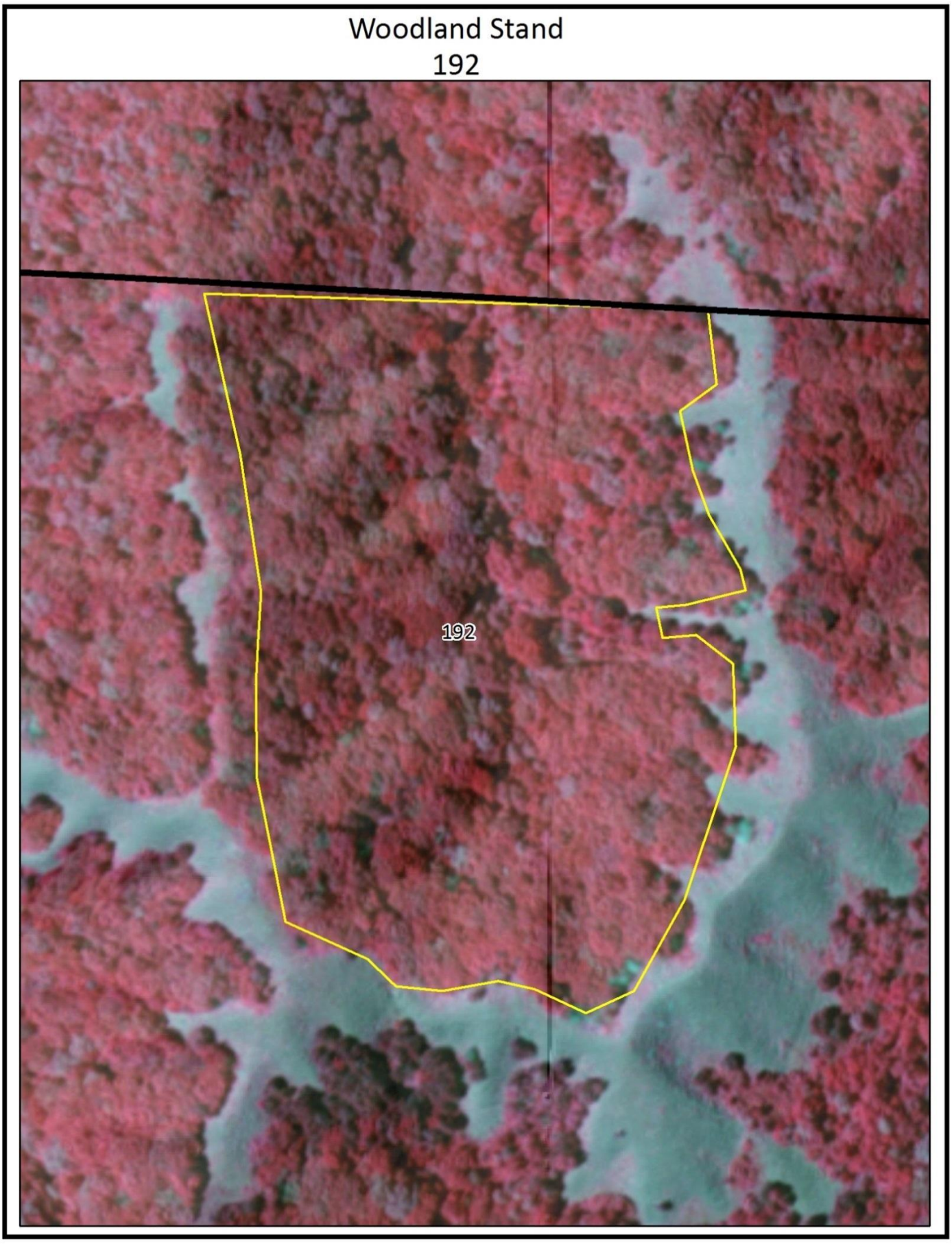
Management Recommendations:
Harvest merchantable walnut trees (if desired) and perform a crop tree release to the residual trees to promote their growth.

Stand 188: 5.5 acres

Site Description:
The stand is a drainage area running north and south

Woodland Description:
The stand is a pole sized to small sawtimber of cottonwood, elm, ash as the dominants and then mulberry and boxelder as the mid-story invading into the prairie ecosystem.

Management Recommendations:
The stand could be managed as a riparian buffer.



Stand 192: 14.4 acres

Site Description:
A large valley also with a north aspect and filled with dead and fallen elm trees.

Woodland Description:
The large side valleys are dominated by mature bur oak trees. Other tree species such as ash, elm, basswood and a few walnuts are mixed into the stand. The mid-story and understory are loaded with hackberry and ironwood. Eastern red cedars are encroaching onto the prairie ridges.

Management Recommendations:
Cut down all cedar trees on the upper slopes. Do a crop tree release around all the mast producing species in order to enhance the wildlife food.

WOODLAND STAND MANAGEMENT PRESCRIPTION TABLE

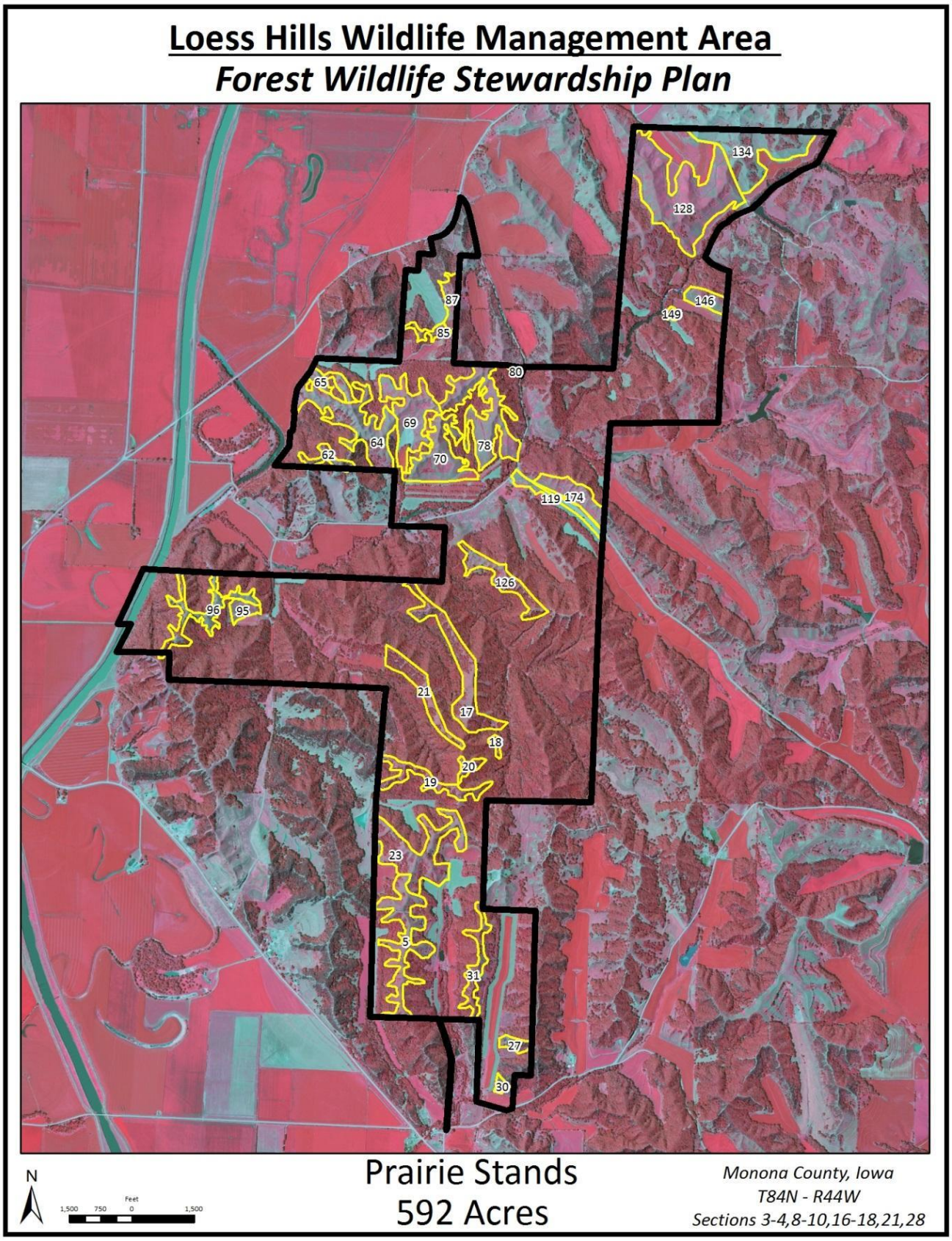
#	Acres	Description	Priority	Prescription	Year
1	61.82	BO-Hack-Elm-KCT	Medium	Clear ironwood- Burn-completed	2023
2	92.27	BO-Hack-Elm-KCT-Iron	Low	Clear ironwood-Burn	2022
3	78.38	W-BO-KCT-Hack-Elm-Bass	High	CTR Walnut-Oak-KCT. Work on Declining oak areas	2019
16	10.43	BO-Elm-Ash	Medium	Harvest-completed TSI	2018
28	56.18	BO-Ash-Elm-Walnut-Hack-Cedar	High	Clear Cedars on Ridges, Burn 4-7 years for regeneration	2019
32	15.32	Walnut-Hack-Ash-Elm-	High	CTR Walnut, Harvest Next rotation	2017
33	21.51	BO-Walnut-Bass-Hack-b hickory-Pines	Medium	Clear ironwood-burn 2-3 years-done	2021
34	34.70	BO-ash-elm-hack	Low	Clear ironwood, allow sunlight for regeneration	2023
35	28.02	BO-Walnut-bass-iron-hack	Medium	Clear cedar ridges-CTR Oak-Walnut, burn 4-7yr	2022
36	13.54	Elm-Ash-Scatter Walnut	High	Ctr walnuts-clear remainder species & treat stumps of other species, not walnut	2019
37	3.79	BO-cedar-elm-hack	Medium	Clear ironwood, cedar and burn	2022
38	13.05	BO-hack	Low	Clear hack and burn	2028
39	5.97	BO-elm-hack-mul-box	Low	Clear all but BO -b urn	2029
40	68.60	BO-b hickory-elm	High	Group selection harvest, remove ironwood and replant	2019
41	40.70	BO-walnut-hack-elm-b hickory-done	High	Ctr walnuts-girdle elms for cavity trees	2018
42	29.06	bur oak-elm-ash-hackberry	Medium	clear ironwood	2021
43	5.56	bur oak-walnut-elm	Medium	ctr walnut	2023
44	95.69	bur oak-walnut-hackberry-basswood-b hickory	High	remove ironwood-burn 3-7yr-ctr & select h walnuts-contracted 2024	2017
45	66.11	bur oak-hackberry-ironwood	High	remove understory-mid-story, leave large bur oaks-completed 2023	2016
46	6.56	elm-hackberry-cedar	Low	clear woody	2023
47	5.74	bur oak-cedar-elm-ash	Medium	clear cedar-completed	2018
48	35.15	bur oak-kct-elm-ash-hackberry-basswood	Medium	clear cedar-ironwood, leave bur oak-kct-walnuts-completed	2018
50	7.56	bur oak-cedar-elm-ash	Low	clear all but oak	2022
51	1.78	bur oak	High	burn	2018
52	0.91	bur oak-elm -ash	Medium	burn	2021
56	27.50	BO-elm-ash-hack	Low	Ctr mast trees-completed	2026
57	1.86	Elm-walnut	Medium	Ctr walnut	2023
71	25.35	Elm-ash-hack-BO-walnut	Low	Ctr walnut-bo, girdle other stems for den tree	2025
79	19.30	Elm-ash-BO-hack	Low	Convert back to savanna	2024
82	0.96	Elm-ash-mh poor	Low	Convert back to savanna	2025
84	4.08	Ash-cedar-elm	Low	Convert back to savanna	2025
91	2.06	Walnut planting	High	Ctr walnuts	2017
92	14.36	Walnut pocket-BO-bass-b hickory	Medium	Ctr walnuts-mid-understory clearing of iron-hack-b hickory	2025
98	18.74	BO-b hickory	Low	Clear b hickory-ironwood- burn	2025

#	Acres	Description	Priority	Prescription	Year
101	18.18	BO-elm-ash-hack	Medium	Small group selection-clear ironwood	2022
102	30.47	BO-elm-hack-bass	Low	Small group selection, clear iron-ctr BO-burn- FY25	2024
105	42.57	BO-ironwood-hack-elm	Low	Clear iron-prepare for repro by small groups	2023
111	7.20	bur oak-walnut-cottonwood	Low	removal of ironwood	2025
112	37.03	bur oak-elm-b hickory-hackberry-walnut	Medium	ironwood removal-burn-ctr walnut clumps	2020
113	16.86	bur oak-b hickory-hackberry-walnut-cedar	Low	remove ironwood ctr walnut oaks	2023
114	9.65	bur oak-walnut-b hickory-hackberry-ash	Low	remove ironwood ctr mast trees	2025
116	78.07	BO-walnut-elm-hack-b hickory-walnuts	Medium	Ctr walnuts-remove iron-burn fall 5-7 years	2020
120	37.66	BO-elm-ash-hack-walnut	Medium	Ctr walnuts-group selection-remove iron	2021
133	1.38	Elm-ash-kct	Medium	Clear	2020
147	11.35	BO-hackberry-elm-ash	Low	clear ironwood, clear around oaks for mast	2026
148	15.25	elm-mulberry-hackberry-bur oak	Low	clear and leave large bur oak	2026
151	17.36	bur oak-ironwood-basswood-hackberry	Low	convert to savanna	2025
152	33.59	hackberry-basswood-walnut-bur oak	Medium	prune and ctr walnut	2019
156	6.34	bur oak-elm-ash-hackberry	Medium	ctr oak	2020
157	3.15	ash-bur oak-elm	Low	ctr oak	2021
158	5.76	elm-bur oak-ash	Medium	ctr oak	2021
161	19.12	BO-cottonwood-elm-ash	Low	Remove iron-burn	2022
165	22.63	BO stump sprouts	Medium	Remove iron-ctr oaks	2023
167	2.82	BO	Low	Clear ridgeline of trees and clear ironwood	2024
170	9.31	Cottonwood-kct-walnut-BO	High	Harvest-replant with mast species	2018
173	9.34	Cottonwood-kct-walnut	High	Harvest - replant-with mast species	2018
180	2.13	BO-b hickory-hackberry-elms-mulberry	Low	Reduce stem density around oak bearing trees- completed.	2026
182	5.37	Elm-ash-hack-cedars	Low	Girdle pioneer species for birds - burn	2027
188	5.50	Cottonwood-elm-ash	Low	Harvest	2026
192	14.42	BO-elm-ash-walnut-bass	Medium	Ctr mast trees	2021

PRAIRIE MANAGEMENT

591.05 Acres

Stands 5,17,18,19, 20, 21,23, 27, 30, 31, 62,64,65,69,70, 78, 80, 85,87, 95,96, 119, 126, 128, 134, 146, 149, 169, 174



Prairie Introduction

The Loess Hills of western Iowa are found within the Central Tallgrass Prairie Ecoregion. While much of this ecoregion has been converted to cropland, the Loess Hills still support large tracts of grassland communities. In Iowa, greater than 99% of the original tallgrass prairie has been converted to agriculture or transformed in some manner that the native biodiversity is no longer present. Thus, the Loess Hills provide an excellent opportunity to protect a large and mostly intact prairie landscape. The Loess Hills WMA is located within a 650,000-acre region of deep loess soils in western Iowa and northwestern Missouri. The Loess Hills WMA is located in the Turin Special Landscape Area (SLA). The Special Landscape Areas were re-identified by the National Park Service in 2002 from a study that was done back in 1950's and documented by the Iowa Conservation Commission.

The steep and rugged topography of the area contains some of the best-known examples of Loess Hills tallgrass prairie and Loess Hills little bluestem prairie. The extensive loess deposits (up to 300 feet deep), the rugged terrain, and the southwestern-facing slopes create habitat for many Great Plains species at the eastern edge of their range. The far northern portion, for example, contains habitat for the prairie rattlesnake (*Crotalis viridis*), while the southern portion harbors populations of Great Plains skink (*Eumeces obsoletus*). The intact prairies also hold populations of Ottoe skipper (*Hesperia ottoe)* and the regal fritillary (*Speyeria idalia)*. Approximately 22,000 acres of remnant prairie have been identified within the Loess Hills landform, representing approximately 75% of Iowa's prairie heritage. Over 50% of the landform is in grass cover, in a combination of prairie and cool-season pastures. The predominant land use has historically been a mix of grazing and row crop agriculture, although today urban development and recreational use are also prevalent, particularly near the Sioux City and Council Bluffs metropolitan areas.

Prairie Restoration Plan

Three major concerns of prairie management in the Loess Hills are:

1. Woody plant encroachment
   a) Control of these species requires multiple methods: cutting, herbicide application, grinding, shearing, girdling, and fire.
2. Invasive plant species control
   a) The methods for invasive plant control include: monitoring, treatment, follow-up treatment, and follow-up monitoring.
3. Maintaining biodiversity of the remnant prairie
   a) Maintain native biodiversity through the restoration of ecological processes. Disturbance such as fire and grazing will be used.
   b) Local ecotype seed will be used in reconstructions to maintain genetic diversity.
   c) Management actions will be varied in time and space (breaking up ridges into multiple burn units).

Prairie Management Techniques and Tools

1. Fire: was an integral part of the pre-settlement Loess Hills landscape helping to maintain prairie communities. Prairie species are adapted to fire and many respond positively to fire (Hulbert 1988, Hulbert 1984, Collins and Wallace 1990). Beneficial effects of fire include: prevention of woody plant invasion (Bragg and Hulbert 1976), control of invasive exotic species (depending on season of burn), removal of duff and excessive litter which may decrease species diversity and productivity, and if used in a manner that mimics the natural fire regime, fire can maintain biodiversity. The use of fire and its impacts on insect diversity is a recent concern that land managers are now considering. It is suggested that prairie remnants should never be entirely burned, instead, remnants should be burned in units - easily accomplished in the Loess Hills with its extensive network of prairie. In addition, by leaving unburned patches within a burn unit, these patches can act as refugia for insects and other fire-intolerant species. This may more closely mimic the natural fire patterns given the ecological interaction of large grazers (i.e. bison) and fire. Historically, grazing would have been a significant component of prairie ecology. Grazing creates a patchy fuel distribution, which would influence fire behavior leaving heavily grazed areas unburned, which in turn could provide refugia for fire-intolerant species. Burning only portions of a remnant at any given time will provide areas for fire-intolerant species to persist.

   The season in which prescribed burns are conducted is important as well. Most prescribed burns have traditionally been conducted during the spring for a variety of reasons. However, historically fires would have occurred in all

seasons including summer (Bragg 1982). Research suggests that controlled burns in other seasons, besides spring, will maintain native biodiversity. Avoidance of uniform fire application will prevent plant community homogeneity.

2. Herbicides: Judicious use of herbicides may be needed to control exotics or woody plant invasions (principally deciduous species). However, broad scale application of herbicides is discouraged because of damage to native species. Spot spraying of individual plants or painting herbicides on freshly cut stumps is preferable, albeit time consuming. Herbicide application rate should be at the minimum level necessary for effective control. The type of herbicide used will depend upon the unwanted species being controlled. This management plan recommends using herbicides only for control of deciduous woody plants. However, if leafy spurge (*Euphorbia esula*) is found on the property, herbicide application may be necessary to control and/or eradicate this invasive exotic. Recommended herbicides on the Little Sioux Scout Ranch (LSSR) property include Roundup, Krenite S, or Garlon 3A. Roundup in a 10 - 20% concentration has been shown to be effective for stump application if applied immediately after the tree has been cut (Solecki 1997). Garlon 3A in 50% or greater concentration can also be applied to stumps, but is best applied during the dormant season to avoid drift injury to desirable species (Solecki 1997). Garlon 3A can be applied up to 3 hours after cutting. Garlon 4 is another herbicide that could be used to treat stumps, however, this chemical must also be applied to the bark of the stump and therefore Garlon 3A is recommended over Garlon 4. Krenite S, a bud inhibitor, can be applied to woody plants between July and September just before leaf changes. Complete coverage is required. The use of Krenite S instead of Krenite is preferred since it includes a surfactant that will ensure complete coverage. Tordon is an effective chemical, however because it is also quite potent and can negatively impact desirable species, its use should be limited to problem areas.

3. Other (mechanical, handcutting, girdling): As slopes and soils will allow, mechanical clearing with a tree shearer, grinder or other similar equipment is an effective means to quickly remove and reduce encroaching trees such as eastern red cedar. Care should be taken with heavy machinery to avoid soil disturbance. In addition, by planning ahead, cut trees can be piled to enhance the effects of prescribed fire (i.e. pushing cut trees into base of larger trees).

   Handcutting and girdling, while time consuming, may be appropriate in areas where the steep slopes and fragile soil are not conducive for using mechanized equipment. Handcutting of deciduous woody plants, however, will also require application of herbicides to prevent re-sprouting. Girdling of larger trees is an alternative to cutting. This alternative has the added benefit of not requiring disposal of the cut trees, nor will the trees re-sprout, thus herbicide is not needed. However, girdling does take longer to kill the tree and the dead tree will stand for many years before decaying, which can be of great benefit for those wildlife species needing dead, decaying woody material for homes and food sources.

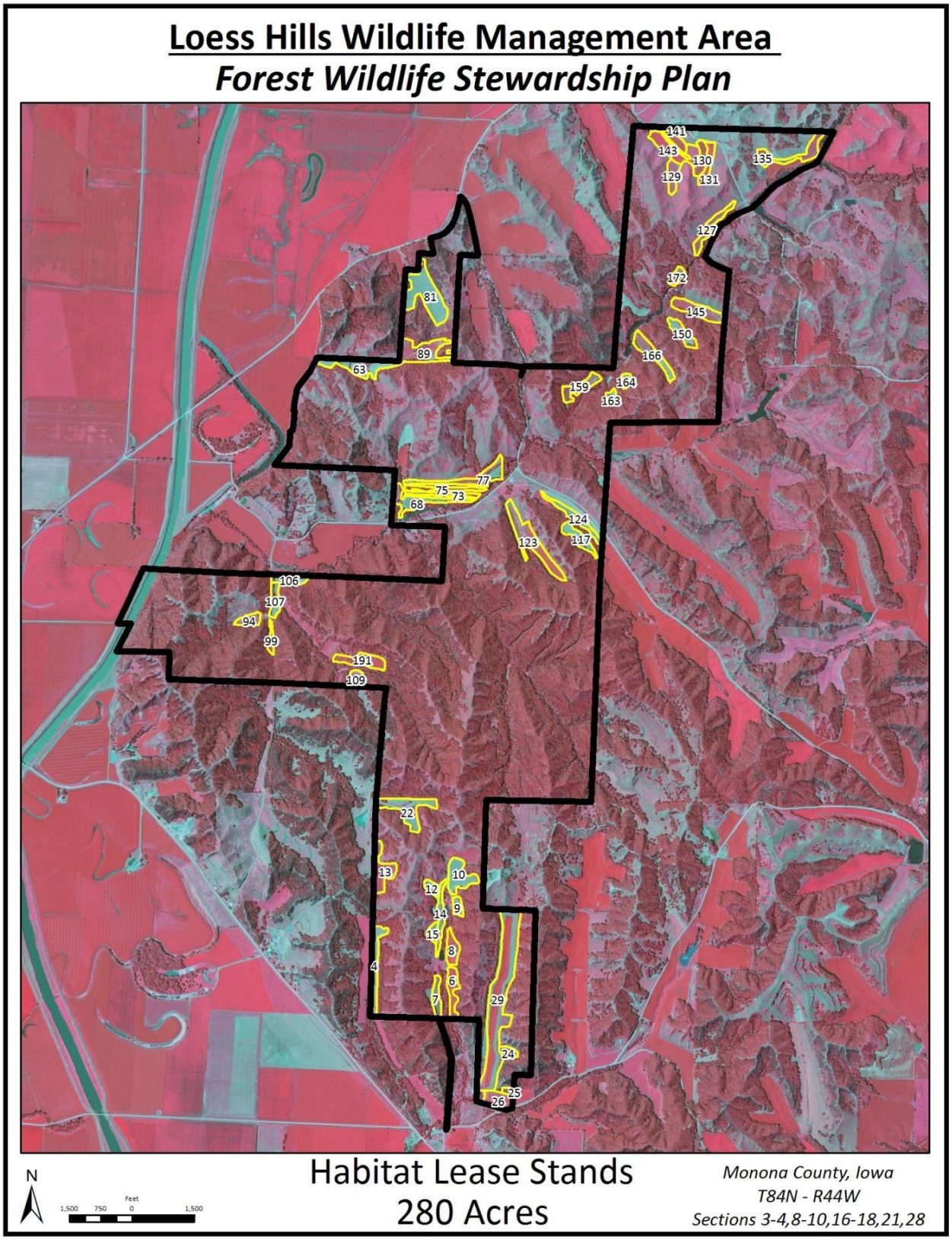
4. Mowing: Moving is an alternative tool that can be used to manage our native prairie remnants if attainable by equipment to keep woody encroachment held back. It can also be used to mimic grazing if only used a few times over the years sporadically.

5. Monitoring: Permanent photo-points should be installed on the management area to help protect the area with photo documentation taken at key locations every two years or following a major change. All management activities will be documented on a yearly basis through management summaries and GIS data. There have been many research studies done on the area which should be all brought together in a document and kept up yearly on the many different aspects of the diversity of the area including such things as; grassland birds, small mammals, butterflies, leafy spurge, butterflies etc. and pollination strategies of yellow flax (*Linum* sp.). In future, repeat species surveys and follow-up on continuing research would be beneficial.

HABITAT LEASE MANAGEMENT

279 acres

Stands:4,6,7,8,9.10.12,13,14,15,22,24,25,26,29,63,68,73,75,77,81,89,94,99,106,107,109,117,123,124,127,129,130,131, 135,141,143,145,150,159,163,164,166,172,191



The Iowa DNR maintains a portion of its public lands in agricultural production as a cost effective and efficient way of achieving wildlife habitat goals and objectives. These lands are planned and managed in cooperation with the USDA-NRCS through an approved Soil and Water Conservation Plan. Land stewardship shares priority for these lands along with wildlife habitat development.

Approximately 10% of the wildlife management area is in some form of crop rotation. Generally, about two thirds of these acres are planted to rowcrops (corn, soybeans) annually with the other third in hay. Wildlife habitat goals for these agricultural lands differ by area, but generally include:

1. provide food, winter cover, and nesting cover.
2. control of natural succession and annual weeds.
3. provide lure crops to help reduce wildlife damage on adjacent private crops.
4. prepare soil for permanent seedings.
5. provide hunting opportunity.
6. demonstrate successful wildlife management on farmed lands to private producers.
7. provide farming opportunities for area producers.

Species such as deer, pheasant, quail, meadowlark, goldfinch, and several furbearers extensively utilize agricultural crops, small grains, and hay as food and cover.

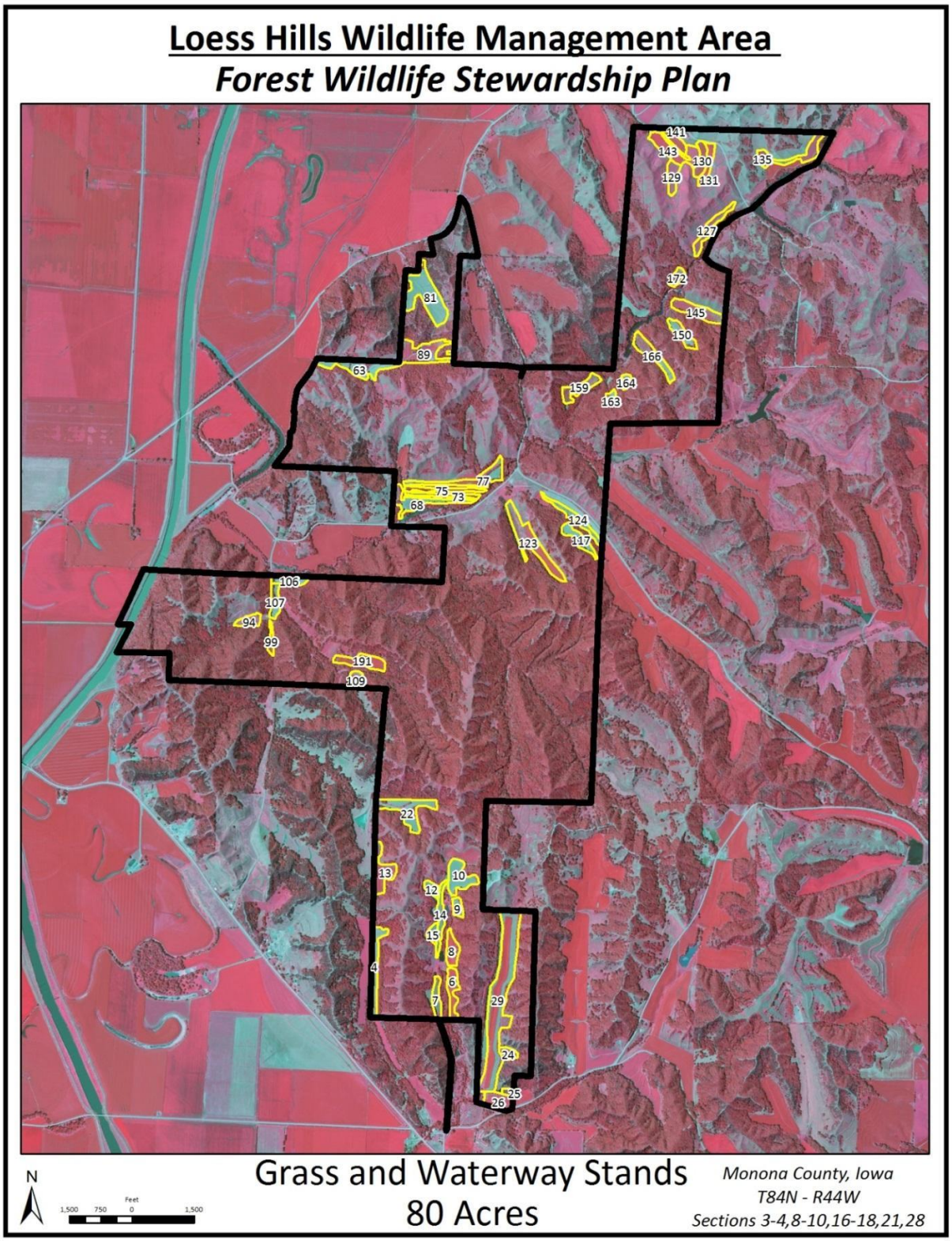
DNR management of croplands is designed to provide a food source that will be available to wildlife during critical times. DNR croplands are managed on long term rotations which incorporate hay, cover crops, and rowcrops. Farming practice on these lands are designed to favor wildlife and include delayed mowing of hay for nesting birds, delaying harvest on 20% of corn and soybeans for winter wildlife food, and the elimination of fall tillage to ensure that waste grain exists on harvested cropland. The farmed land has winter hardy cover crops to provide green browse for wildlife.

GRASS AND WATERWAY MANAGEMENT

80 acres

Stands 11,60,118,122,132,136,138,140,155,168,178,181,183,184,185,187,189,190 and Waterway Stands: 142

The LHWMA will maintain grassland areas on some field edges and along waterways. Mow and or spray for noxious weed control.

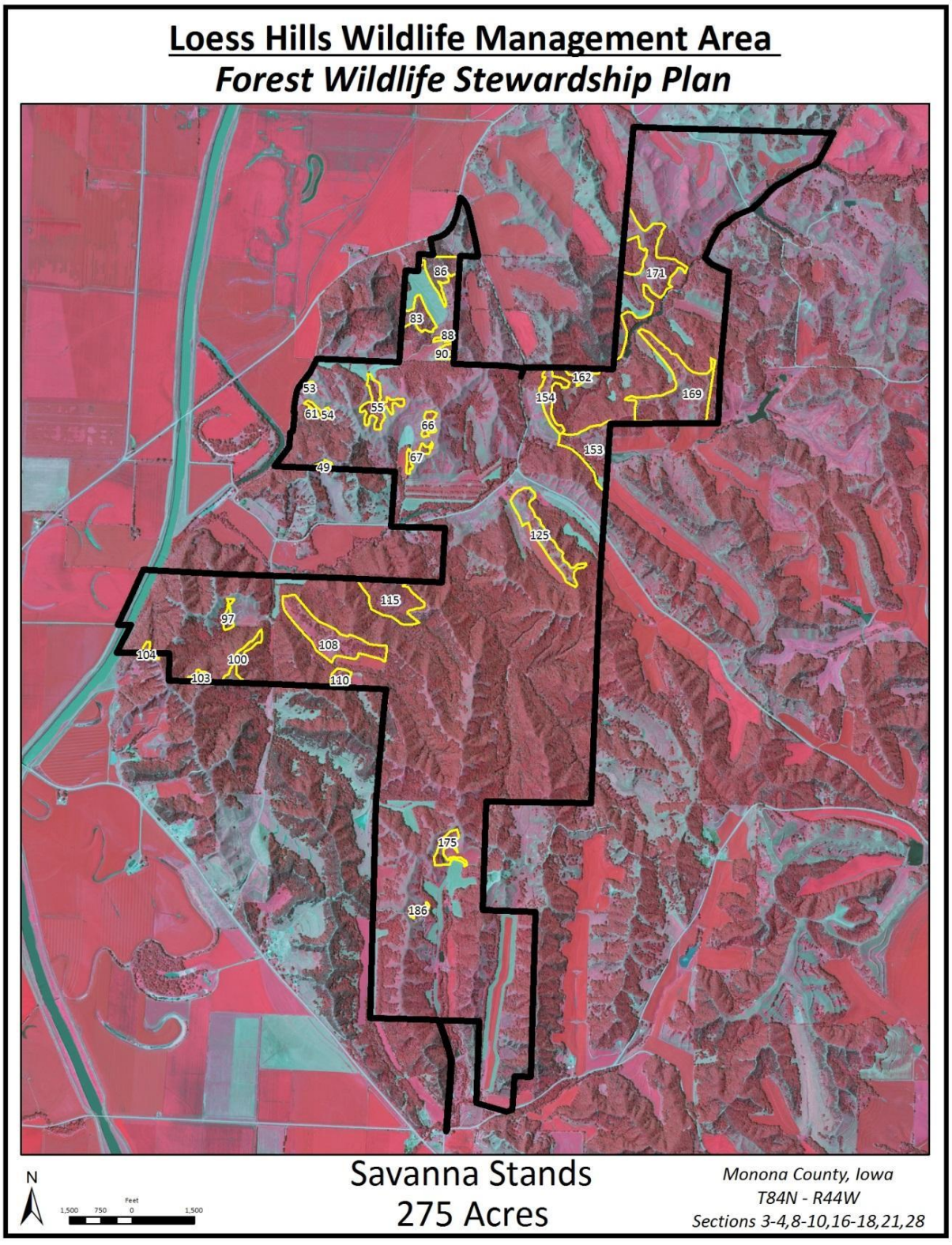


SAVANNA MANAGEMENT

275 acres

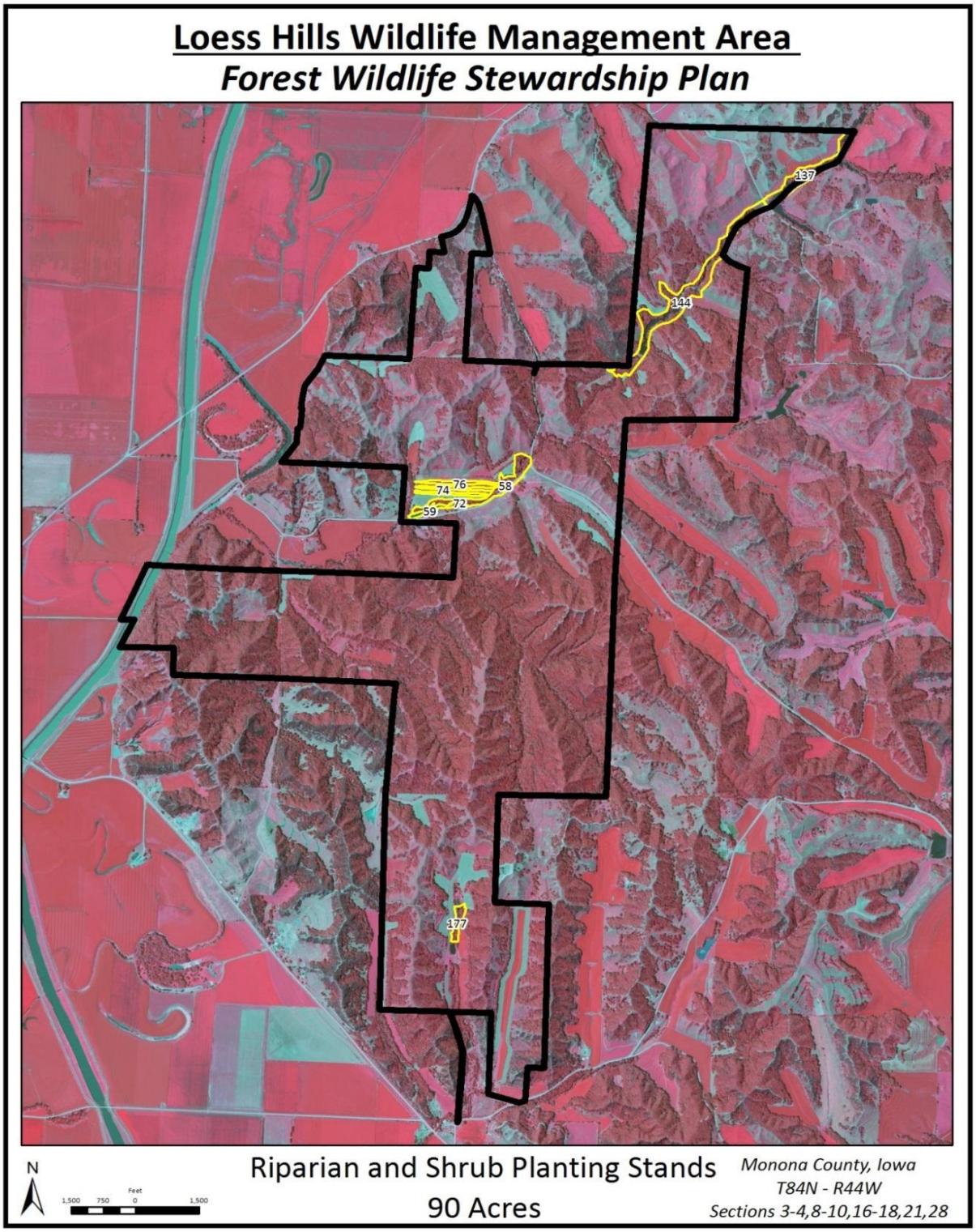
Stands: 49,53,54,55,61,66,67,83,86,88,90,97,100,103,104,108,110,115,125,153,154,162,169,171,175,186

The savanna areas identified will be challenging as the work involves getting rid of the pioneer species that have grown in and around the Oak, Elm and Walnut Trees that make up a central plains savanna. Savanna restoration will require clearing all other species in the area, treating the stumps, and then repeatedly burning the area on a fairly short fire return interval (3-5 years). Savanna management includes diversifying the age and species composition of these areas.



RIPARIAN AND SHRUB PLANTING MANAGEMENT
90 acres
Stands: 58,59,137,144,160,177, Shrub Stands: 72,74,76

These shrub habitat areas will be maintained by intermittently cutting it off every 5-20 years and allowing regrowth. The stands disturbance will be spread out through time so that some portions will be in each age class. This will provide high stem density cover and food for wildlife that use early succession habitat.



APPENDIX 1. SPECIES OF GREATEST CONSERVATION NEED

Table 1. Forest, Savanna, and Shrubland Birds of Greatest Conservation Need

Common Name	Scientific Name
Bald Eagle	*Haliaeetus leucocephalus*
Red-shouldered hawk	*Buteo lineatus*
Broad-winged hawk	*Buteo platypterus*
Swainson's Hawk	*Buteo swainsoni*
American woodcock	*Scolopax minor*
Black-billed cuckoo	*Coccyzus erythropthalmus*
Yellow-billed cuckoo	*Coccyzus americanus*
Long-eared owl	*Asio otus*
Chimney Swift	*Chaetura pelagica*
Eastern Whip-poor-will	*Caprimulgus vociferous*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Northern Flicker	*Colaptes auratus*
American Kestrel	*Falco sparverius*
Peregrine Falcon	*Falco peregrinus*
Eastern Wood-pewee	*Contopus virens*
Acadian flycatcher	*Empidonax virescens*
Eastern Kingbird	*Tyrannus tyrannus*
Loggerhead Shrike	*Lanius ludovicianus*
Bell's Vireo	*Vireo bellii*
Bewick's wren	*Thryomanes bewickii*
Veery	*Catharus fuscescens*
Wood thrush	*Hylocichla mustelina*
Brown Thrasher	*Toxostoma rufum*
Prothonotary warbler	*Protonotaria citrea*
Golden-winged warbler	*Vermivora chrysoptera*
Kentucky warbler	*Oporornis formosus*
Common Yellowthroat	*Geothlypis trichas*
Field Sparrow	*Spizella pusilla*
Baltimore Oriole	*Icterus galbula*
Northern Bobwhite	*Colinus virginianus*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Barn Owl	*Tyto alba*
Eastern Screech-owl	*Otus asio*
Bay-breasted Warbler	*Dendroica castanea*
Canada warbler	*Wilsonia Canadensis*
American Tree Sparrow	*Spizella arborea*

Bald eagle and nest

Eastern whip-poor-will

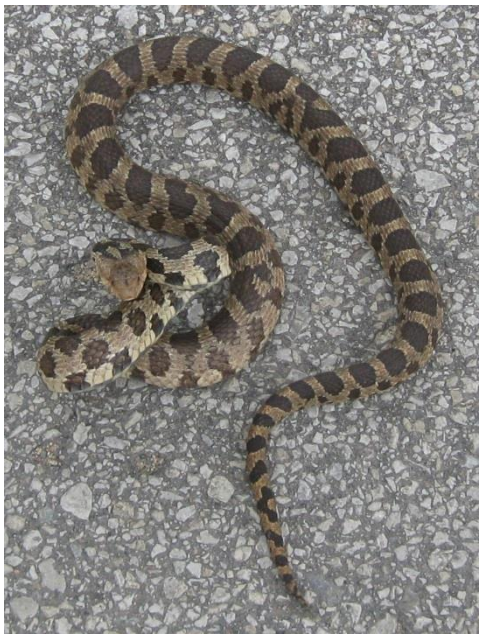
Table 2. Forest, Savanna, and shrubland Mammals of Greatest Conservation Need

Common Name	Scientific Name
Hayden's Shrew	*Sorex haydeni*
Least Shrew	*Cryptotis parva*
Evening Bat	*Nycticeius humeralis*
Northern (Myotis) Long-eared bat	*Myotis septentrionalis*
Little Brown Bat	*Myotis lucifigus*
Silver-haired Bat	*Lasionycteris noctivagans*
Gray Fox	*Urocyon cinereoargenteus*
Long-tailed Weasel	*Mustela frenata*
Least Weasel	*Mustela nivalis*
Ermine	*Mustela ermine*
Southern Bog Lemming	*Synaptomys cooperi*
Spotted Skunk	*Spilogale putorius*

Top: short-tailed weasel
Bottom: least weasel

Table 3. Forest, Savanna, and shrubland Reptiles and Amphibians of Greatest Conservation Need.

Common Name	Scientific Name
Tiger Salamander	*Ambystoma tigrinum*
Blanchard's Cricket Frog	*Acris crepitans*
Great Plains Toad	*Anaxyrus cognatus*
Woodhouse's Toad	*Anaxyrus woodhousii*
Cope's Gray Treefrog	*Hyla chrysoscelis*
Eastern Gray Treefrog	*Hyla versicolor*
Northern Leopard Frog	*Lithobates pipiens*
Snapping Turtle	*Chelydra serpentina*
Ornate Box Turtle	*Terrapene ornata*
Slender Glass Lizard	*Ophisaurus attenuatus*
Prairie Skink	*Plestiodon septentrionalis*
Six-lined Racerunner	*Aspidocelis sexlineatus*
Plains Garter Snake	*Thamnophis radix*
(Prairie) Ringneck Snake	*Diadophis punctatus*
Western Worm Snake	*Carphophis amoenus*
Prairie Kingsnake	*Lampropeltis calligaster*
Gopher (bull) Snake	*Pituophis catenifer*
Western Fox Snake	*Pantherophis ramspotti*



Fox snake

Nesting snapping turtle

Table 4. Potential Forest, Savanna, and shrubland Butterflies of Greatest Conservation Need

Common Name	Scientific Name
Spicebush Swallowtail	*Papilio troilus*
Olympia Marble	*Euchloe olympia*
Harvester	*Feniseca tarquinius*
Northern Broken-dash	*Wallengrenia egeremet*
Acadian Hairstreak	*Satyrium acadica*
Monarch	*Danaus plexippus*
Hayhurst's Scallopwing	*Staphylus hayhurstii*
Little Glassywing	*Pompeius verna*
Hickory Hairstreak	Satyrium caryaevorum
Edward's Hairstreak	Satyrium edwardsii
Striped Hairstreak	Satyrium liparops

Great spangled fritillary

Table 5. Mussels, Fish, Crayfish, Dragonflies & Damselflies of Greatest Conservation Need

Common Name	Scientific Name
Paiute Dancer	*Argia alberta*
Springwater Dancer	*Argia plana*
Taiga Bluet	*Coenagrion resolutum*
Sedge Sprite	*Nehalennia irene*
Variable Darner	*Aeshna interrupta*
Sulphur-tipped Clubtail	*Gomphus militaris*
Plains Emerald	*Somatochlora ensigera*

APPENDIX 2. NATURAL AREAS INVENTORY RECORDS FOR THE LOESS HILLS WMA. 2017

Common Name	Scientific Name	State Status*	Federal Status*
Ottoe Skipper	*Hesperia ottoe*	SC	none
Regal Fritillary	*Speyeria idalia*	SC	none
Roadside Skipper	Amblyscirtes vialis	none	none
Melissa Blue	*Lycaeides melissa*	none	none
Dusted Skipper	*Atrytonopsis hianna*	SC	none
Leonard's Skipper	*Hesperia leonardus*	SC	none
Wild Indigo Dusky Wing	*Erynnis baptisiae*	SC	none
Reakirt's Blue	*Hemiargus isola*	none	none
Least Shrew	*Cryptotis parva*	T	none
Plains Pocket Mouse	*Perognathus flavescens*	E	none
Northern Grasshopper Mouse	*Onychomys leucogaster*	none	none
Bullsnake	*Pituophis catenifer sayi*	SC	none
Glomerate Sedge	*Carex aggregata*	SC	none
Slender Sedge	*Carex tenera*	SC	none
Midland Sedge	*Carex mesochorea*	none	none
Great Plains Ladies'-tresses	*Spiranthes magnicamporum*	SC	none
Nodding Thistle	*Cirsium undulatum*	SC	none
Prairie Moonwort	*Botrychium campestre*	SC	none
Narrow-leaved Milkweed	*Asclepias stenophylla*	E	none
Ragwort	*Senecio pseudaureus*	SC	none
Loess Hills Prairie Community			

*E=endangered, T= threatened, SC= special concern

Bull Snake

Plains Pocket Mouse

APPENDIX 3. FOREST WILDLIFE STEWARDSHIP PLAN DEFINITIONS AND GUIDING FACTORS

Upland Forest Wildlife - Representative tree species include oak, hickory, hard maple, cherry, elm, walnut, ash, and red cedar. This habitat factor will provide habitat for wildlife such as ruffed grouse, woodcock, songbirds and woodpeckers, deer, turkey, raptors, owls, squirrels, and associated furbearing predators.

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

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

Conifer/Wildlife Plantation - A conifer or tree/shrub planting designed for wildlife habitat. This habitat factor will provide nesting sites, food and cover for wildlife. Conifers are also important to wildlife during the winter providing thermal benefits and areas of decreased snow depths.

Restoration - A new planting of seedlings, direct seeding, or regeneration of roots. This habitat factor will create new forest habitat that will be of higher quality for wildlife.

Conversion - An existing shade tolerant forest stand converted to nut and fruit bearing species of trees and shrubs to provide more food and cover. This habitat factor is a timber stand improvement increasing the forest quality. It will begin forest succession from early stages to old growth.

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

Old Growth - Natural forests that have developed over a long period of time, generally at least 120 years, without experiencing severe, stand-replacing disturbance---a fire, windstorm, or logging. This habitat factor will provide necessary wildlife habitat for species requiring mature woodlands.

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

Unique Natural Sites - Sites that contain unusual or rare natural components that should be preserved for their unique characteristics, such as algific slopes. This habitat factor will identify these uncommon sites for management considerations.

Preserve Status - An area of land or water formally dedicated for maintenance as nearly as possible in its natural condition though it need not be completely primeval in character at the time of dedication or an area which has floral, fauna, geological, archeological, scenic, or historic features of scientific or educational value. This habitat factor will recognize the quality of preserve sites and apply proper maintenance to protect its integrity.

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

Special Restrictions - Certain limitations or conditions on the use or enjoyment of a natural resource area. This habitat factor will take into consideration these limitations or conditions to select proper management.

APPENDIX 4. ENDANGERED, THREATENED AND SPECIES OF SPECIAL CONCERN

571—77.2 (481B) Endangered, threatened, and special concern animals. The natural resource commission, in consultation with scientists with specialized knowledge and experience, has determined the following animal species to be endangered, threatened or of special concern in Iowa:

77.2(1) Endangered animal species:

Mammals

Indiana Bat Myotis sodalis
Plains Pocket Mouse Perognathus flavescens
Red-backed Vole Clethrionomys gapperi
Spotted Skunk Spilogale putorius
Northern Long Eared Bat Myotis septentrionalis

Birds

Red-shouldered Hawk Buteo lineatus
Northern Harrier Circus cyaneus
Piping Plover Charadrius melodus
Common Barn Owl Tyto alba
Least Tern Sterna antillarum
King Rail Rallus elegans
Short-eared Owl Asio flammeus

Fish

Lake Sturgeon Acipenser fulvescens
Pallid Sturgeon Scaphirhynchus albus
Pugnose Shiner Notropis anogenus
Weed Shiner Notropis texanus
Pearl Dace Semotilus margarita
Freckled Madtom Noturus nocturnus
Bluntnose Darter Etheostoma chlorosomum
Least Darter Etheostoma microperca

Reptiles

Yellow Mud Turtle Kinosternon flavescens
Wood Turtle Clemmys insculpta
Great Plains Skink Eumeces obsoletus
Copperbelly Water Snake Nerodia erythrogaster neglecta
Western Hognose Snake Heterodon nasicus
Copperhead Agkistrodon contortrix
Prairie Rattlesnake Crotalus viridis
Massasauga Rattlesnake Sistrurus catenatus

Amphibians

Blue-spotted Salamander Ambystoma laterale
Crawfish Frog Rana areolate

Butterflies

Dakota Skipper Hesperia dacotae
Ringlet Coenonympha tullia

Land Snails

Iowa Pleistocene Snail Discus macclintocki
Minnesota Pleistocene Ambersnail Novisuccinea new species A
Iowa Pleistocene Ambersnail Novisuccinea new species B
Frigid Ambersnail Catinella gelida
Briarton Pleistocene Vertigo Vertigo briarensis
Bluff Vertigo Vertigo meramecensis
Iowa Pleistocene Vertigo Vertigo new species

Fresh Water Mussels

Spectacle Case Cumberlandia monodonta
Slippershell Alasmidonta viridis
Buckhorn Tritogonia verrucosa
Ozark Pigtoe Fusconaia ozarkensis
Bullhead Plethobasus cyphyus
Ohio River Pigtoe Pleurobema sintoxia
Slough Sandshell Lampsilis teres teres
Yellow Sandshell Lampsilis teres anodontoides
Higgin's-eye Pearly Mussel Lampsilis higginsi

77.2(2) Threatened animal species:

Mammals

Least Shrew Cryptotis parva
Southern Bog Lemming Synaptomys cooperi

Birds

Long-eared Owl Asio otus
Henslow's Sparrow Ammodramus henslowii

Fish

Chestnut Lamprey Ichthyomyzon castaneus
American Brook Lamprey Lampetra appendix
Grass Pickerel Esox americanus
Blacknose Shiner Notropis heterolepis
Topeka Shiner Notropis topeka
Western Sand Darter Ammocrypta clara
Black Redhorse Moxostoma duquesnei
Burbot Lota lota
Orangethroat Darter Etheostoma spectabile

Reptiles

Slender Glass Lizard Ophisaurus attenuatus
Common Musk Turtle Sternotherus odoratus
Blanding's Turtle Emydoidea blandingii
Ornate Box Turtle Terrapene ornata
Diamondback Water Snake Nerodia rhombifera
Western Worm Snake Carphophis amoenus vermis
Speckled Kingsnake Lampropeltis getulus

Amphibians
Mudpuppy Necturus maculosus
Central Newt Notophthalmus viridescens

Butterflies
Powesheik Skipperling Oarisma powesheik
Byssus Skipper Problema byssus
Mulberry Wing Poanes massasoit
Silvery Blue Glaucopsyche lygdamus
Baltimore Euphydryas phaeton

Snails
Midwest Pleistocene Vertigo Vertigo hubrichti
Occult Vertigo Vertigo occulta
Fresh Water Mussels
Cylinder Anodontoides ferussacianus
Strange Floater Strophitus undulatus
Creek Heelsplitter Lasmigona compressa
Purple Pimpleback Cyclonaias tuberculata
Butterfly Ellipsaria lineolata
Ellipse Venustaconcha ellipsiformis

77.2(3) Special concern animal species:
Mammals
Southern Flying Squirrel Glaucomys Volans

Birds
Forster's Tern Sterna forsteri
Black Tern Chlidonias niger
Peregrine Falcon Falco peregrinus
Bald Eagle Haliaeetus leucocephalus

Fish
Pugnose Minnow Notropis emiliae
Pirate Perch Aphredoderus sayanus

Reptiles
Smooth Green Snake Opheodrys vernalis
Bullsnake Pituophis catenifer sayi

Butterflies
Dreamy Duskywing Erynnis icelus
Sleepy Duskywing Erynnis brizo
Columbine Duskywing Erynnis lucilius
Wild Indigo Duskywing Erynnis baptisiae
Ottoe Skipper Hesperia ottoe
Leonardus Skipper Hesperia l. leonardus
Pawnee Skipper Hesperia leonardus pawnee
Beardgrass Skipper Atrytone arogos
Zabulon Skipper Poanes zabulon
Broad-winged Skipper Poanes viator
Sedge Skipper Euphyes dion
Two-spotted Skipper Euphyes bimacula
Dusted Skipper Atrytonopsis hianna
Salt-and-pepper Skipper Amblyscirtes hegon
Pipevine Swallowtail Battus philenor
Zebra Swallowtail Eurytides marcellus
Olympia White Euchloe olympia
Purplish Copper Lycaena helloides
Acadian Hairstreak Satyrium acadicum
Edward's Hairstreak Satyrium edwardsii
Hickory Hairstreak Satyrium caryaevorum
Striped Hairstreak Satyrium liparops
Swamp Metalmark Calephelis mutica
Regal Fritillary Speyeria idalia
Baltimore Euphydryas phaeton ozarkae

77.3(1) Endangered plant species:
Pale false foxglove Agalinus skinneriana
Blue giant-hyssop Agastache foeniculum
Bearberry Arctostaphylos uva-ursi
Black chokeberry Aronia melanocarpa
Eared milkweed Asclepias engelmanniana
Mead's milkweed Asclepias meadii
Narrow-leaved milkweed Asclepias stenophylla
Ricebutton aster Aster dumosus
Large-leaved aster Aster macrophyllus
Schreber's aster Aster schreberi
Fern-leaved false foxglove Aureolaria pedicularia
Matricary grape fern Botrychium matricariifolium
Poppy mallow Callirhoe triangulata
Cordroot sedge Carex chordorrhiza
Large-bracted corydalis Corydalis curvisiliqua
Silky prairie-clover Dalea villosa
Swamp-loosestrife Decodon verticillatus
Northern panic-grass Dichanthelium boreale
Roundleaved sundew Drosera rotundifolia
False mermaid Floerkea proserpinacoides
Bog bedstraw Galium labradoricum
Povertygrass Hudsonia tomentosa
Northern St. Johnswort Hypericum boreale
Pineweed Hypericum gentianoides
Winterberry Ilex verticillata
Black-based quillwort Isoetes melanopoda
Water-willow Justicia americana
Dwarf dandelion Krigia virginica
Cleft conobea Leucospora multifida
Whiskbroom parsley Lomatium foeniculaceum
Running clubmoss Lycopodium clavatum
Bog clubmoss Lycopodium inundatum
Annual skeletonweed Lygodesmia rostrata
Water marigold Megalodonta beckii
Northern lungwort Mertensia paniculata
Bigroot pricklypear Opuntia macrorhiza

Clustered broomrape Orobanche fasciculata
Ricegrass Oryzopsis pungens
Cinnamon fern Osmunda cinnamomea
Purple cliffbrake Pellaea atropurpurea
Arrow arum Peltandra virginica
Pale green orchid Platanthera flava
Eastern prairie fringed orchid Platanthera leucophaea
Clammyweed Polansia jamesii
Crossleaf milkwort Polygala cruciata
Purple milkwort Polygala polygama
Jointweed Polygonella articulata
Douglas' knotweed Polygonum douglasii
Three-toothed cinquefoil Potentilla tridentata
Canada plum Prunus nigra
Frenchgrass Psoralea onobrychis
Pink shinleaf Pyrola asarifolia
Prickly rose Rosa acicularis
Meadow spikemoss Selaginella eclipes
Rough-leaved goldenrod Solidago patula
Bog goldenrod Solidago uliginosa
Yellow-lipped ladies-tresses Spiranthes lucida
Pickering morning-glory Stylisma pickeringii
Rough-seeded fameflower Talinum rugospermum
Waxy meadowrue Thalictrum revolutum
Long beechfern Thelypteris phegopteris
Large-leaved violet Viola incognita
Rusty woodsia Woodsia ilvensis
Yellow-eyed grass Xyris torta

77.3(2) Threatened plant species:
Northern wild monkshood Aconitum noveboracense
Round-stemmed false foxglove Agalinus gattingerii
Nodding wild onion Allium cernuum
Fragrant false indigo Amorpha nana
Virginia snakeroot Aristolochia serpentaria
Woolly milkweed Asclepias lanuginosa
Showy milkweed Asclepias speciosa
Forked aster Aster furcatus
Rush aster Aster junciformis
Flax-leaved aster Aster linariifolius
Water parsnip Berula erecta
Kittentails Besseya bullii
Bog birch Betula pumila
Pagoda plant Blephilia ciliata
Leathery grapefern Botrychium multifidum
Little grapefern Botrychium simplex
Sweet Indian-plantain Cacalia suaveolens
Poppy mallow Callirhoe alcaeoides
Pipsissewa Chimaphila umbellata
Golden saxifrage Chrysosplenium iowense
Dayflower Commelina erecta
Spotted coralroot Corallorhiza maculata
Bunchberry Cornus canadensis
Golden corydalis Corydalis aurea
Pink corydalis Corydalis sempervirens
Showy lady's-slipper Cypripedium reginae
Slim-leaved panic-grass Dichanthelium linearifolium
Jeweled shooting star Dodecatheon amethystinum
Glandular wood fern Dryopteris intermedia
Marginal shield fern Dryopteris marginalis
Woodland horsetail Equisetum sylvaticum
Slender cottongrass Eriophorum gracile
Yellow trout lily Erythronium americanum
Queen of the prairie Filipendula rubra
Blue ash Fraxinus quadrangulata
Black huckleberry Gaylussacia baccata
Oak fern Gymnocarpium dryopteris
Green violet Hybanthus concolor
Twinleaf Jeffersonia diphylla
Creeping juniper Juniperus horizontalis
Intermediate pinweed Lechea intermedia
Hairy pinweed Lechea villosa
Prairie bush clover Lespedeza leptostachya
Twinflower Linnaea borealis
Western parsley Lomatium orientale
Wild lupine Lupinus perennis
Tree clubmoss Lycopodium dendroideum
Rock clubmoss Lycopodium porophilum
Hairy waterclover Marsilea vestita
Bog buckbean Menyanthes trifoliata
Winged monkeyflower Mimulus alatus
Yellow monkeyflower Mimulus glabratus
Partridge berry Mitchella repens
Pinesap Monotropa hypopithys
Small sundrops Oenothera perennis
Little pricklypear Opuntia fragilis
Royal fern Osmunda regalis
Philadelphia panic-grass Panicum philadelphicum
Slender beardtongue Penstemon gracilis
Hooker's orchid Platanthera hookeri
Northern bog orchid Platanthera hyperborea
Western prairie fringed orchid Platanthera praeclara
Purple fringed orchid Platanthera psycodes
Pink milkwort Polygala incarnata
Silverweed Potentilla anserina
Shrubby cinquefoil Potentilla fruticosa
Pennsylvania cinquefoil Potentilla pensylvanica
One-sided shinleaf Pyrola secunda
Meadow beauty Rhexia virginica
Beaked rush Rhynchospora capillacea
Northern currant Ribes hudsonianum
Shining willow Salix lucida
Bog willow Salix pedicellaris
Low nutrush Scleria verticillata

Buffaloberry Sheperdia argentea
Scarlet globemallow Sphaeralcea coccinea
Slender ladies-tresses Spiranthes lacera
Oval ladies-tresses Spiranthes ovalis
Hooded ladies-tresses Spiranthes romanzoffiana
Spring ladies-tresses Spiranthes vernalis
Rosy twisted-stalk Streptopus roseus
Fameflower Talinum parviflorum
Large arrowgrass Triglochin maritimum
Small arrowgrass Triglochin palustre
Low sweet blueberry Vaccinium angustifolium
Velvetleaf blueberry Vaccinium myrtilloides
False hellebore Veratrum woodii
Kidney-leaved violet Viola renifolia
Oregon woodsia Woodsia oregana

77.3(3) Special concern plant species:
Balsam fir Abies balsamea
Three-seeded mercury Acalypha gracilens
Three-seeded mercury Acalypha ostryifolia
Mountain maple Acer spicatum
Moschatel Adoxa moschatellina
Water plantain Alisma gramineum
Wild onion Allium mutabile
Amaranth Amaranthus arenicola
Lanceleaf ragweed Ambrosia bidentata
Saskatoon serviceberry Amelanchier alnifolia
Low serviceberry Amelanchier sanguinea
Raccoon grape Ampelopsis cordata
Pearly everlasting Anaphalis margaritacea
Sand bluestem Andropogon hallii
Broomsedge Andropogon virginicus
Purple angelica Angelica atropurpurea
Purple rockcress Arabis divaricarpa
Green rockcress Arabis missouriensis
Lakecress Armoracia lacustris
Fringed sagewort Artemisia frigida
Common mugwort Artemisia vulgaris
Pawpaw Asimina triloba
Curved aster Aster falcatus
Hairy aster Aster pubentior
Prairie aster Aster turbinellus
Standing milkvetch Astragalus adsurgens
Bent milkvetch Astragalus distortus
Missouri milkvetch Astragalus missouriensis
Blue wild indigo Baptisia australis
Yellow wild indigo Baptisia tinctoria
Prairie moonwort Botrychium campestre
Watershield Brasenia schreberi
Buffalograss Buchloe dactyloides
Poppy mallow Callirhoe papaver
Water-starwort Callitriche heterophylla
Grass pink Calopogon tuberosus
Low bindweed Calystegia spithamaea
Clustered sedge Carex aggregata
Back's sedge Carex backii
Bush's sedge Carex bushii
Carey's sedge Carex careyana
Flowerhead sedge Carex cephalantha
Field sedge Carex conoidea
Crawe's sedge Carex crawei
Fringed sedge Carex crinita
Double sedge Carex diandra
Douglas' sedge Carex douglasii
Dry sedge Carex foena
Thin sedge Carex gracilescens
Delicate sedge Carex leptalea
Mud sedge Carex limosa
Hoplike sedge Carex lupuliformis
Yellow sedge Carex lurida
Intermediate sedge Carex media
Backward sedge Carex retroflexa
Richardson's sedge Carex richardsonii
Rocky Mountain sedge Carex saximontana
Sterile sedge Carex sterilis
Soft sedge Carex tenera
Deep green sedge Carex tonsa
Tuckerman's sedge Carex tuckermanii
Umbrella sedge Carex umbellata
Wild oats Chasmanthium latifolium
Pink turtlehead Chelone obliqua
Fogg's goosefoot Chenopodium foggii
Missouri goosefoot Chenopodium missouriensis
Coast blite Chenopodium rubrum
Bugbane Cimicifuga racemosa
Hill's thistle Cirsium hillii
Swamp thistle Cirsium muticum
Wavy-leaved thistle Cirsium undulatum
Western clematis Clematis occidentalis
Blue-eyed Mary Collinsia verna
Cancer-root Conopholis americana
Fireberry hawthorn Crataegus chrysocarpa
Red hawthorn Crataegus coccinea
Two-fruited hawthorn Crataegus disperma
Hawthorn Crataegus pruinosa
Hawksbeard Crepis runcinata
Prairie tea Croton monanthogynus
Crotonopsis Crotonopsis elliptica
Waxweed Cuphea viscosissima
Dodder Cuscuta indecora
Small white lady's-slipper Cypripedium candidum
Carolina larkspur Delphinium carolinianum
Sessile-leaved tick trefoil Desmodium sessilifolium
Fingergrass Digitaria filiformis

Buttonweed Diodia teres
Purple coneflower Echinacea purpurea
Waterwort Elatine triandra
Purple spikerush Eleocharis atropurpurea
Green spikerush Eleocharis olivacea
Oval spikerush Eleocharis ovata
Dwarf spikerush Eleocharis parvula
Few-flowered spikerush Eleocharis pauciflora
Wolf's spikerush Eleocharis wolfii
Interrupted wildrye Elymus interruptus
Dwarf scouring rush Equisetum scirpoides
Ponygrass Eragrostis reptans
Tall cottongrass Eriophorum angustifolium
Tawny cottongrass Eriophorum virginicum
Upland boneset Eupatorium sessilifolium
Spurge Euphorbia commutata
Missouri spurge Euphorbia missurica
Slender fimbristylis Fimbristylis autumnalis
Umbrella grass Fuirena simplex
Rough bedstraw Galium asprellum
Small fringed gentian Gentianopsis procera
Northern cranesbill Geranium bicknellii
Spring avens Geum vernum
Early cudweed Gnaphalium purpureum
Limestone oak fern Gymnocarpium robertianum
Bitterweed Helenium amarum
Mud plantain Heteranthera limosa
Water stargrass Heteranthera reniformis
Hairy goldenaster Heterotheca villosa
Common mare's-tail Hippuris vulgaris
Canadian St. Johnswort Hypericum canadense
Drummond St. Johnswort Hypericum drummondii
White morning glory Ipomoea lacunosa
Sumpweed Iva annua
Alpine rush Juncus alpinus
Toad rush Juncus bufonius
Soft rush Juncus effusus
Green rush Juncus greenii
Edged rush Juncus marginatus
Vasey's rush Juncus vaseyi
Potato dandelion Krigia dandelion
Pinweed Lechea racemulosa
Duckweed Lemna perpusilla
Creeping bush clover Lespedeza repens
Silvery bladder-pod Lesquerella ludoviciana
Wild flax Linum medium
Brook lobelia Lobelia kalmii
False loosestrife Ludwigia peploides
Crowfoot clubmoss Lycopodium digitatum
Adder's-mouth orchid Malaxis unifolia
Globe mallow Malvastrum hispidum
Two-flowered melic-grass Melica mutica
Ten-petaled blazingstar Mentzelia decapetala
Millet grass Milium effusum
Rock sandwort Minuartia michauxii
Naked mitrewort Mitella nuda
Scratchgrass Muhlenbergia asperifolia
Water milfoil Myriophyllum heterophyllum
Rough water milfoil Myriophyllum pinnatum
Water milfoil Myriophyllum verticillatum
Glade mallow Napaea dioica
Showy evening primrose Oenothera speciosa
Northern adders-tongue fern Ophioglossum vulgatum
Louisiana broomrape Orobanche ludoviciana
Mountain ricegrass Oryzopsis asperifolia
Gattinger's panic-grass Panicum gattingeri
White beardtongue Penstemon albidus
Cobaea penstemon Penstemon cobaea
Tube penstemon Penstemon tubiflorus
Cleft phlox Phlox bifida
Annual ground cherry Physalis pubescens
Heart-leaved plantain Plantago cordata
Wood orchid Platanthera clavellata
Green fringed orchid Platanthera lacera
Plains bluegrass Poa arida
Chapman's bluegrass Poa chapmaniana
Weak bluegrass Poa languida
Bog bluegrass Poa paludigena
Meadow bluegrass Poa wolfii
Hairy Solomon's-seal Polygonatum pubescens
Large-leaved pondweed Potamogeton amplifolius
Ribbonleaf pondweed Potamogeton epihydrus
White-stemmed pondweed Potamogeton praelongus
Spiralled pondweed Potamogeton spirillus
Tussock pondweed Potamogeton strictifolius
Vasey's pondweed Potamogeton vaseyi
Bird's-eye primrose Primula mistassinica
Prionopsis Prionopsis ciliata
Mermaid weed Proserpinaca palustris
Dwarf cherry Prunus besseyi
Hortulan plum Prunus hortulana
Sand cherry Prunus pumila
Lemon scurfpea Psoralea lanceolata
Crowfoot Ranunculus circinatus
Gmelin's crowfoot Ranunculus gmelinii
Buckthorn Rhamnus alnifolia
Dwarf sumac Rhus copallina
Northern gooseberry Ribes hirtellum
Yellow cress Rorippa sinuata
Swamp rose Rosa palustris
Tooth-cup Rotala ramosior
Dewberry Rubus hispidus
Western dock Rumex occidentalis
Widgeon grass Ruppia maritima

Prairie rose gentian Sabatia campestris
Sage willow Salix candida
Sassafras Sassafras albidum
Tumblegrass Schedonnardus paniculatus
Scheuchzeria Scheuchzeria palustris
Sensitive briar Schrankia nuttallii
Hall's bulrush Scirpus hallii
Prairie bulrush Scirpus maritimus
Pedicelled bulrush Scirpus pedicellatus
Smith's bulrush Scirpus smithii
Torrey's bulrush Scirpus torreyi
Veiny skullcap Scutellaria nervosa
Wild stonecrop Sedum ternatum
Rock spikemoss Selaginella rupestris
Butterweed Senecio glabellus
False golden ragwort Senecio pseudaureus
Knotweed bristlegrass Setaria geniculata
Virginia rockcress Sibara virginica
Prairie dock Silphium terebinthinaceum
Burreed Sparganium androcladum
Great plains ladies-tresses Spiranthes magnicamporum
Clandestine dropseed Sporobolus clandestinus
Rough hedge-nettle Stachys aspera
Needle-and-thread Stipa comata
White coralberry Symphoriocarpos albus
Eared false foxglove Tomanthera auriculata
Spiderwort Tradescantia virginiana
Humped bladderwort Utricularia gibba
Flat-leaved bladderwort Utricularia intermedia
Small bladderwort Utricularia minor
Valerian Valeriana edulis
American brookline Veronica americana
Marsh speedwell Veronica scutellata
Maple-leaved arrowwood Viburnum acerifolium
Black arrowwood Viburnum molle
Black haw Viburnum prunifolium
Spurred violet Viola adunca
Lance-leaved violet Viola lanceolata
Macloskey's violet Viola macloskeyi
Pale violet Viola striata
Summer grape Vitis aestivalis
Frost grape Vitis vulpine

APPENDIX 5: GLOSSARY

Acre: An area of land containing 43,560 square feet. A forty of land contains 40 acres and a section of land contains 640 acres.

Annual ring: Trees in climates where growths stops or slows during portion of the year will form annual rings which can be read to determine tree age and growth rate. Annual rings are highly visible in species that form less dense wood during favorable growing conditions early in the season and denser wood less favorable conditions later in the year. In some tree species this differentiation does not occur and annual rings are difficult to see. In tropical species growth never, or seldom, ceases and annual rings may not be apparent.

Bark: The outer layer of the stems, limbs and twigs of woody plants. Often bark is characteristic of the species and can be used for identification.

Basal area: The cross-sectional area of the base of any object. In forestry, it is the cross-sectional area of a tree at 4.5 feet above the ground, expressed in square feet. The sum of all the trees on an acre is a measure of the density of the trees growing on the acre and is useful for making forest management decisions. Basal area can be calculated from tree diameter or can be easily measured with an angle gauge when certain relationships are known. Basal area will commonly range from 20-70 square feet per acre for poorly stocked stands to more than 200 square feet per acre for dense stands of conifers.

Biodiversity (biological diversity): The variety and abundance of species, their genetic composition and the communities and landscapes in which they occur, including the ecological structures, functions and processes occurring at all of those levels.

Board foot: A unit of measure of wood 1" thick and 1 foot on each side equaling 1/12 cubic foot of wood.

Bole: The stem or trunk of a tree; usually thought of as being that part without limbs- the merchantable part of the stem.

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

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

Conversion: A change though forest management from one tree species or association to another within a forest stand or site.

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

Crop: The vegetation growing on a forest area, more particularly the major woody growth having commercial value.

Crop tree release: Crop tree release is the practice of selecting the individual trees that are to remain in the stand until maturity and then removing the trees competing with them. Crop trees could be selected on the basis of any of the values associated with trees such as aesthetics, wildlife or economic values. Selected trees should be straight with long, clear boles, dominant or co-dominant and should be the trees bringing the best returns upon maturity.

Crown: Refers to that part of the tree consisting of limbs, branches, twigs and leaves.

Cruise: A survey of forest land to identify timber and estimate its species composition, products, size, quality or other characteristics.

Cull: Refers to a tree having no commercial value, usually from having rot, holes, large knots or being crooked. It is important to note that a cull, though having no commercial value, may have wildlife, aesthetic or other values.

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

DBH: Stands for Diameter at Breast Height. Always taken at 4.5 feet above the ground.

Den tree: A tree that has a hole in its stem that can be used as shelter by wildlife.

Disturbance: Any event, either natural or human induced, that alters the structure, composition or functions of an ecosystem. Examples include forest fires, insect infestations, windstorms and timber harvesting.

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

Early successional forest: The forest community that develops immediately following the removal or destruction of vegetation in an area. Plant succession is the progression of plants from bare ground (e.g., after a forest fire or

timber harvest) to mature forest. Succession consists of a gradual change of plant and animal communities over time. Early succession forests commonly depend on and develop first following disturbance events. Each stage of succession provides different benefits for a variety of species.

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

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

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

Forester: A professional engaged in the science and profession of forestry; foresters are commonly accredited by states or other certifying bodies (e.g., the Society of American

Foresters) and may be licensed, certified or registered indicating specific education and abilities.

Forest cover: All trees and other plants occupying the space in a forest, including any ground cover.

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

Forest inventory: A set of objective sampling methods designed to quantify the spatial distribution, composition and rates of change of forest parameters within specified levels of precision for the purposes of management.

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

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

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

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

Game species: Game species include those terrestrial species that are hunted and trapped.

Geographic Information System (GIS): Computer software used to manipulate, analyze and visually display inventory and other data.

Group selection: A process of harvesting patches of selected trees to create openings in the forest canopy and to encourage reproduction of uneven-aged stands.

Hardwood: Hardwoods are generally defined as the woods of deciduous trees (i.e., trees which shed their leaves in the winter).

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

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

Leave trees: Live trees selected to remain on a site to provide present and future benefits, such as shelter, resting sites, cavities, perches, nest sites, foraging sites, mast and coarse woody debris.

Management goals: Overall purpose for managing the composition and structure of forest land. For example: to protect land from erosion, to maintain wildlife habitat, to control insect and disease outbreaks, etc.

Management objectives: Defined conditions for the property, or segments of property (e.g. stands or management units), that will achieve management goals.

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

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

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

Merchantable timber: Trees or stands having the size, quality and condition suitable for marketing under a given economic condition.

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

Native plant community: A group of native plants that interact with each other and with its environment in ways not greatly altered by modern human activity or by introduced organisms. Native plants communities are classified and described by physiognomy, hydrology, landforms, soils and natural disturbance regimes (e.g., wild fires, wind storms, normal flood cycles).

Natural disturbances: Disruption of existing conditions by natural events such as wildfires, windstorms, droughts, flooding, insects and disease.

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

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

Non-game species: Non-game species include amphibians, reptiles, and those mammal and bird species that are not hunted or trapped.

Old-growth forests: Forests defined by age, structural characteristics and relative lack of human disturbance. These forests are essentially free from catastrophic disturbances, contain old trees (generally over 120 years old), large snags and downed trees.

Overstory: The canopy in a stand of trees.

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

Pole or pole timber: A young tree or stand of young trees between 3.5 inches and 12.9 inches dbh.

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

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

Pruning: The practice of removing tree limbs so that a straight bole, free of limbs, will develop. Pruning can be a component of FSI.

Recreation: Leisure activities involving the enjoyment and use of natural resources.

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

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

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

Restoration: A new planting of seedlings, direct seeding or regeneration of roots. This creates new habitat that will be of higher quality for wildlife.

Riparian: Related to, living or located in conjunction with a wetland, river, stream or lake.

Riparian buffer: Woodland next to streams, lakes and wetlands that are managed to enhance and protect aquatic resources. Buffers will enhance soil and water conservation while providing wildlife habitat.

Rotation age: The period of years between when a forest stand is established and when it receives its final harvest. This time period is an administrative decision based on economics, site conditions, growth rates and other factors.

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

Sanitation cut: A cutting made to remove trees killed or injured by fire, insects, disease or other injurious agents (and sometimes trees susceptible to such injuries).

Sapling: A young tree larger than a seeding but smaller than a pole (dbh <3.5 inches).

Sapwood: The wood found closest to the bark or outside of the bole and usually distinguished from heart wood by being lighter in color.

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

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

Scarify: To break up the forest floor and topsoil preparatory to natural regeneration or direct seeding.

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

Seed tree: Any tree that bears seed; specifically, a tree left standing to provide the seed for natural regeneration.

Seed tree method: The harvest of all trees except for a small number of widely dispersed trees retained for seed production and to produce a new age class. Seed trees are usually removed after regeneration is established.

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

Shade tolerance: Relative ability of a tree species to reproduce and grow under shade. The capacity to withstand low-light intensities caused by shading from surrounding vegetation.

Shelterwood: A method of regenerating a forest whereby a portion of the stand is harvested and the rest of the stand is evenly distributed over the area to protect the site and provide seed to regenerate the area. After the new stand is well established, the residual trees are harvested. This method is used to regenerate shade intolerant species.

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

Silvics: The study of the life history and general characteristics of forest trees and stands, with particular reference to environmental factors, as basis for the practice of silviculture.

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

Silvicultural prescription: Specific steps prescribed to achieve specific management objectives.

Single tree selection: Individual trees of all sizes classes are removed more or less uniformly throughout the stand, to promote growth of remaining trees and to provide space for regeneration; synonym: individual tree selection.

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

Site potential: Collective physical resources (e.g., soil moisture, nutrients, light, heat) available for plant growth. Different potentials facilitate growth of some species and limit growth of others. Consequently, site potential has a strong effect on plant community development.

Slash: The non-utilized and generally unmarketable accumulation of woody material in the forest, such as limbs, tops, cull logs and stumps that remain in the forest as residue after timber harvesting.

Snag: A snag tree is a dead tree; commonly a tall, limbless tree. Though of little or no commercial value, they are a very valuable wildlife resource.

Softwood: Generally considered to be the wood of conifers.

Stand: A contiguous group of trees similar in age, species composition, structure and growing on a site of similar quality. One stand will usually have characteristics that will distinguish it from other stands. Differences could include species, average diameter, density and location.

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

Sucker: A shoot rising from below ground level from a root.

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

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

Thinning: A silvicultural treatment made to reduce the density of trees within a forest stand; primarily used to improve growth, enhance forest health or recover potential mortality. Row thinning is where selected rows are harvested, usually the first thinning, which provides equipment operating room for future selective thinning. Selective thinning is where individual trees are marked or specified (e.g., by diameter, spacing, or quality) for harvest. Commercial thinning is thinning after the trees are of merchantable size for timber markets. Pre-commercial thinning is done before the trees reach merchantable size, usually done in overstocked stands to provide more growing space for crop trees.

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

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

Two-aged stand: A stand with trees of two distinct age class separated in age by more than 20 percent of the rotation age.

Under plant: The planting of seedlings under an existing canopy or overstory.

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

Understory: The shorter vegetation (shrubs, seedlings, saplings, small trees) within a forest stand that forms a layer between the overstory and the herbaceous plants of the forest floor.

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

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

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

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

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

Wildfire: An uncontrolled fire on lands cover by timber, brush, grass, grain or other flammable vegetation.

Wolf tree: A dominant tree with a broad, spreading crown that occupies more growing space than its neighbors.

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

Woodland edge: An area of habitat transition that consists of vegetation (herbaceous and woody) of different heights and densities. Edge can favor early successional wildlife species.

APPENDIX 6: COMMENTS

Tom Litchfield (Forest Wildlife Stewardship Coordinator) review:

Is this accurate? Is this synonymous with "species of greatest conservation need"?

prioritize species of greatest concern

edited to "species of greatest conservation need."

Is this accurate? Is it in conflict with the objectives stated later in the plan (Page 10)?

The Forest Wildlife Stewardship Plan (FWSP) will prioritize the "species of greatest conservation need," and the habitat needs of these wildlife species will be guiding factors to forest management decisions.

no change. The goals and objectives reflect priorities: SGCN, forest dependent wildlife, and recreation.

Is this in conflict with stated priorities on page 4?

Consequently, a primary objective for management of the area is to improve habitat for hunted species such as deer, turkey, squirrels, and bobwhite quail.

no change. Multiple objectives can be managed for and successfully met on a wildlife area.

Is this in conflict with stated priorities on page 4?

Even though large blocks of forest are needed on some Wildlife Management Areas for some wildlife species, each stage of an even age stand provides habitat for wildlife. For example, regenerating stands (1-10 years old) benefit the same species of birds as does early successional stands, golden-winged warbler, blue-winged warbler, black-billed cuckoo, yellow-billed cuckoo, Eastern towhee, along with ruffed grouse and American woodcock.

no change. One of the scales of forest mgmt. is temporal. Early successional species benefit when the forest stand is at a young age, then don't use the habitat when it is mature.

Should ruffed grouse be an example here since they do not occur in the Loess Hills?

For example, regenerating stands (1-10 years old) benefit the same species of birds as does early successional stands, golden-winged warbler, blue-winged warbler, black-billed cuckoo, yellow-billed cuckoo, Eastern towhee, along with ruffed grouse and American woodcock.

edited ruffed grouse out.

Wood thrushes will nest up to 50' but nests are typically located 6-12'above ground and not in the canopy.

From age 30-70 years, pole to medium size trees tend to be used by canopy nesters such as scarlet tanagers, wood thrushes, and ground nesters such as ovenbirds and black and white warblers.

no change.

Maybe this paragraph should be at the beginning of the Even Age Management section and perhaps combined with the first paragraph that is already there?

Even-aged management refers to management activities used to create a forest stand that grows for a period of time until it reaches a desirable harvest age or size. At this point the harvesting options become shelterwood or clearcut harvesting, depending on the amount of natural regeneration present. If the stand contains a desired amount of regeneration, a clearcut should be implemented. Lack of regeneration would necessitate a shelterwood harvest, weed tree eradication and/or prescribed woodland burn in order to open up the canopy and increase chances for natural regeneration. Once the regeneration has been established the shelterwood trees can be removed. Even-aged management is used to ensure that shade intolerant species such as oak will remain as a component of the future forest stand.

no change.

Do red squirrels occur in the Loess Hills?

Den trees will be left to provide cavities for wildlife such as woodpeckers, bats, and squirrels, including the Northern myotis and red squirrel, species of greatest conservation need.

edited to remove red squirrel.

I guess I usually think of savanna as having more of an herbaceous understory as opposed to a woody understory & managed with prescribed burning and not cutting… Although later discussed, maybe this might be termed Savanna Restoration Management?

The early successional areas will be managed on a 20-year rotation. There are 290 acres designated for early successional and savanna management. The allowable cut is 14 acres per year. (290 acres divided by 20 yrs.). With a working cycle of 7 years, approximately **98 acres could be cut every 7 years**.

no change. Early successional stands require systematically reset by cutting to keep them young, thick and high stem density. The savanna stands are heavily pressured by shade-tolerant species from fire and grazing suppression as well as seed rain pressure, so there is recurring cutting prescribed for these sites as well.

Very similar to the paragraphs under Even Age Management on pages 11 & 12… Note the year ranges for the various successional stages do not match up.

Edited age classes to be consistent. Early successional 1-10, sapling to small pole 10-20, pole to medium 20-60 yr., and mature 60-125+.

This even age management section seems to be mostly repetitive of the previous section under the same name.

no change.

Acronym not defined until Appendix 5. Would it be better as TSI - timber stand improvement?

edited to spell out acronym.

Should it be DBH? (20 instances)

"…dbh…"

no change.

??

"LSSR"

edited by spelling out the acronym, Little Sioux Scout Ranch (LSSR).

Pete Hildreth (SW District Supervisor) review:

email sent at Nov 30, 2016; 5:17pm

FYI - Clint is going through the FWSP process as well so I thought I would forward on his open house press release for your records. As we will be going down the same road here in the future. See email below

I also attached my meeting notes/chicken scratch from yesterday.

Couple key points:

- Consider moving secondary objective #1 *Restore, enhance, and protect forested habitat for the benefit of forest dependent wildlife* up as primary objective #3
- Under the Management Considerations section consider adding the statement: *Identify locations and establish 1-2-acre areas of diverse oak trees (White, Red, Bur, Swamp and Chinkapin) in an effort promote oak regeneration.*
- Add a sentence or 2 about the establishment of the BCA
- Still need to edit the years to match our updated time frame. IE 2016 to 2017 etc.
- Ask Katy if any SGCN were added to IWAP revision that are associated with the Loess Hills not found in the original IWAP.

email sent at Sep 19, 2017; 2:12pm

I had a chance to review the LH FWSP and I fully support the management type and prescriptions identified in the work

plan and prioritization thereof. I have no additions or edits to make to the document.

Thank you for the opportunity for review.

Pete

Kelly Poole (Endangered Species Coordinator) review:
email sent at Sep 21, 2017; 8:09am

Thank you for the opportunity to review the stewardship plan. I appreciate the level of detail included and have an even greater appreciation for the area and the challenges of managing it over time for having read it.

I have only a few questions/comments. How are management activities like tree removal, burning, mowing etc. timed for minimizing potential impacts to species such as SGCN/TE/breeding birds? The plan describes burn units to provide refuge for butterflies and other insects etc. Is there something similar for mowing (e.g., mower height/timing) or tree removal (e.g., seasonal to avoid nesting season)? Or is this addressed site by site at the time of implementation when staff (e.g., NAI/TE, WDP) are asked for specific comments? I think this is probably the case but am double checking. This also semi-relates to my next comment which is my standard when reviewing long-term plans. Because implementing the plan will occur over time (and possibly involve multiple managers) would it make sense to include a short paragraph that describes the process that is already followed for reviewing potential impacts to T/E? For example, something like:

> Before implementation, the forest management activities described here will be reviewed internally to determine potential impacts to both state and federal threatened or endangered species. Project descriptions accompanied by aerial photos will be provided to the Natural Areas Inventory Program staff for T/E review and comment. Management activities will not be initiated until this review has been completed and all T/E comments/concerns have been addressed.

Or a general statement that references activities are implemented in a manner that addresses current species at risk? Because the plan itself is intended to be implemented over time and species status' can changed maybe a general reference of implementation addresses current listings or current IWAP would work. In the past, I have (for other plans) been specific but in hindsight, I'm not sure it makes sense to be specific (e.g., conservation measures for NLEB) unless it's understood things change. I'm really interested in your thoughts as a management biologist on this.

The only other comment I have is for areas where harvest or thinning work is done, I recommend retaining live loose bark tree species (e.g., shagbark hickory) whenever possible and 6-10 snags per acre to benefit bats (and other wildlife).

Thanks again for the opportunity to review and for your work on this. Give me a call if you want to discuss.

Kelly

> edit made to include the T/E program review "before implementation…" into the management strategies section on page 14. T/E review prior to implementation of projects maintains a key control given the changing nature of species listings and emergent best practices.
>
> snags are a key component for bats as noted in #4 on page 15. Updated to include "loose-barked species".

Brian Hickman (Southwest District Private Lands Biologist) review:
email sent at Aug 29, 2017; 2:29pm

I didn't go through this with a fine-tooth comb to catch everything but I do have some comments.

1. The first paragraph there is an extra space in the word percent.
2. In the Description of the Area you mention an Appendix but haven't appeared to put a number or letter in there for reference.
3. Stand 16. This is minor and it states its located on the West Boundary. When I was referencing a map, it took me awhile to find it because I didn't consider that far north piece west. I realize this is a minor thing and ignore it if you wish.
4. Stand 35. For the management recommendation it states to leave the dogwood. We previously removed a bunch of cedar out of it and did some burning to get it back to prairie where feasible. My only concern is that by leaving the dogwood or stating that you are it conflicts with what I thought our previous management was in this area. I've been gone for nearly 7 years so I realize plans could have changed in that time frame.
5. Stand 148. It's been awhile since I've been on this stand so take that into consideration. I didn't like the only cut the female cedar trees when your objective was to return it to prairie. My experience with cedar stands is it gets hard as tightly as they grow to get them down. Leaving some standing I can see them all getting jumbled up and making it more work than necessary. Also, I just don't like the idea of leaving cedar trees in an area in the Hills you are trying to get back to prairie. Again, I haven't been there in a while and it may make more sense to do it that way written then what I was thinking.
6. Stand 188. the first sentence under Management Recommendations "seed back" you just need a D on the end of see.

Just some general comments. It seems like a bunch of crop tree release. Which is also the method I use the most so it makes sense to me. Just pointing an observation.

Using the Sustainable Forestry Guidelines and doing the math you are essentially committing to 25.8 acres a year of some sort of Forestry project involving cutting. I love it!!! However, with your current staffing restrictions it seems lofty.

Overall, it had to take a ton of time to put this together. Kudos to you and all that worked on it. I look forward to watching the Forestry Management in the years to come. I'll gladly sign off on this plan.

Brian

edits made to incorporate both management and writing suggestions.

Mark Leoschke (Botanist) review: none received.

Matt Dollison (Nishnabotna Wildlife Unit Biologist) review: none received.

Jeff Seago (State Forester, Loess Hills State Forester) review: None received. Would only consider if we start over. email sent at May 19, 2018; 9:01am

I need to inventory and stand map the LHSF work unit for FY19 which is about 2,000 acres (maybe 900 of forest) so I can get a good plan of attack for our fall and winter work. Then I think that it's time to tackle your Loess Hills WMA. I think we should just about start over from scratch with this one due to how long it has been since it was inventoried and stand mapped the first time. That probably puts us into July and August for stand mapping it. The bad part about stand mapping is the amount of information that needs to be trained to do it properly. So, I am wondering what you are thinking about getting some wildlife guys feet wet with timber cruising? The handy thing is that almost all of the tools are the same for stand mapping as they are for marking TSI or timber sales.

Bruce Ehresman (Avian Ecologist) review: no written response. Verbal discussion prior to his retirement. 09/11/17.

Anna Buckardt (Avian Ecologist) review:
email sent at Sep 13, 2019; 4:13pm

I read through the Loess Hills management plan and have made suggestions. I have a list of broader suggestions in a one-page document and then I made comments and track change edits on the plan itself. I have also attached some resources that I think will be helpful. Please let me know if you have any questions and I would be happy to discuss.

Review of Forest Wildlife Stewardship Plan for the Loess Hills Wildlife Area (draft 6)

Recommendations prepared by IA DNR Avian Ecologist Anna Buckardt Thomas, Sept 2019

Although Golden-winged Warbler is listed as a breeding Species of Greatest Conservation Need in the state, their breeding range is contracting and they no longer breed in Iowa. I would hesitate to use them as an example of an Iowa breeding bird that would benefit from early successional forest management in the Loess Hills. They do however migrate through Iowa in good numbers and need forest habitat for stopover, however during migration they are not tied to early successional stages.

There are multiple places throughout the plan that say things like “a good number of oak seedlings” and “a sufficient number of desirable trees” but I was unable to find a definition of what constitutes desirable. I think it would be helpful to determine a target range for stocking and list the actual stems/acre you would be looking for.

The plan briefly mentions post-management monitoring if funding allows. It might be worth proposing a few monitoring priorities or strategies to address specific management-related questions to help inform future management decisions.

Appendix 1, Table 1 seems to be missing some nesting bird species that are possible in your area. I’ve attached a bird list for the Loess Hills Bird Conservation Area that Bruce Ehresman put together that should help with updating the table. It would also help to specify if this list is only breeding species or if it includes migratory SGCN species as well. Possibly consider a separate prairie SGCN table as well.

Additional suggestions were directly added to the draft plan document using track changes and comments.

Here are several references that I think directly apply to this plan and that I would encourage you to review if you have not already. I have also sent copies directly to Doug Chafa via email.

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Gilbert, M. 2012. Under cover: wildlife of shrublands and young forest. Wildlife Management Institute. Cabot VT, 87 pages.

Lanham, JD, PD Keyser, PH Brose, and DH Van Lear. 2002. Management options for songbirds using the oak shelterwood-burn technique in upland forests of the southeastern US. *In* Editors WM Ford, KR Russel, and CE Moorman. The role of fire in Nongame Wildlife Management and Community Restoration: Traditional Uses and New Directions: Proceeding of a Special Workshop, Nashville, TN, September 15, 2000. USDA Forest Service, Northeastern research Station, Newton Square, Pennsylvania.

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