Forest Wildlife Stewardship Plan
for the
Heritage Hills Wildlife Management Area
Coulson Tract

Actively managing the forestlands owned by the Iowa DNR Wildlife Bureau is critical to improving habitat for a variety of wildlife species and improving the forest ecosystem structure and function. Stand maps and work summary tables are provided to direct the forest management across 342.8 acres of forestland at Heritage Hills Wildlife Management Area in Madison County, Iowa.

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Plan Date: October 31, 2024

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INTRODUCTION

The Iowa Department of Natural Resources (DNR) Wildlife Bureau has recognized and acted on the need for a forest wildlife stewardship plan to properly manage the forest resources at Heritage Hills Wildlife Management Area (WMA). The manager determines the objectives to address the habitat needs for Species of Greatest Conservation Need (SGCN) as determined by Iowa's Wildlife Action Plan and the condition of the forest in each area. Heritage Hills WMA includes ~1,024 acres and more than 35% is forest. The forest acreage is 358 acres, which includes 62% upland forest and 37% bottomland forest. Actively managing forests is essential to improve the areas for wildlife and recreation.

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This project is a cooperative effort among DNR staff including the Rathbun Wildlife Unit and the District Forester. The Wildlife Biologist and technicians are responsible for the day to day operations of the WMA. The forester will implement the forestry plan in coordination with the wildlife biologist.

This plan is the result of stand mapping by the District Forester. Twenty-four unique stands are identified by tree species, tree size, relative stand density, 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. The forester's prescriptions are designed to manage each stand to reach the established goals and objectives for the WMA and to implement the goals and strategies of the 2020 Iowa Forest Action Plan as well as the 2015 Iowa Wildlife Action Plan.

FOREST/WILDLIFE HABITAT GOALS

The Heritage Hills WMA forest wildlife stewardship plan is an ecologically based forest management plan. Goals are focused toward improving forest health and maintaining the forest ecosystem structure and function, with all other forest uses being considered, but not being the primary management goal. "Species of greatest conservation need" will be important for consideration as well as common species, other game and/or nongame wildlife.

Funding for the acquisition and management of Heritage Hills WMA has been almost exclusively hunter generated monies, i.e. license fees and excise taxes on sporting equipment. A primary objective for management of the area is to improve habitat for game species such as white-tailed deer, wild turkey, squirrels, bobwhite quail, and waterfowl. On the other hand, the DNR recognizes the effects of its management actions on nongame species as well, particularly those that are threatened, endangered or species of greatest conservation need.

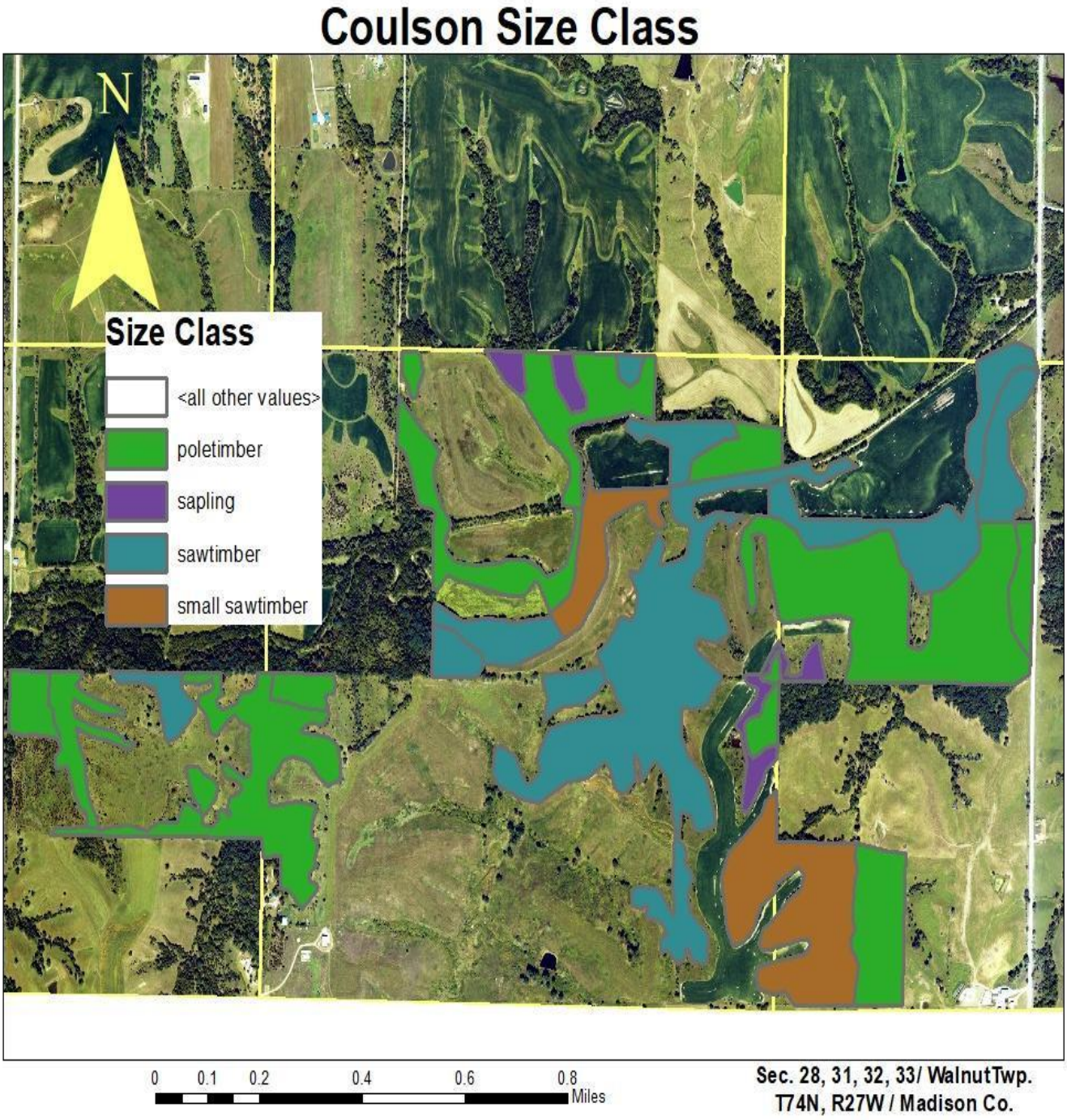
Other stewardship considerations that are incorporated into forest management decisions are the relevant goals and strategies of the 2020 Iowa Forest Action Plan, protection of identified threatened and endangered plant and wildlife species, best management practices (BMP's) to protect soil and water quality, forest health considerations and the protection of any identified "special sites".

The Heritage Hills WMA forest wildlife stewardship plan is a guideline for recommended wildlife management work. Detailed prescriptions will be developed prior to scheduled or recommended management practices in order to take into account the unique stand conditions and more specific targeted wildlife habitat needs. These specific prescriptions will be in the form of detailed practice project plans, developed with collaboration between the District Forester and Wildlife Biologist. A record of the completed management activities will be kept on file at both the Wildlife Biologist's and District Forester's office so that evaluations can be made and compared to determine if management objectives are being met by this work.

CURRENT DISTRIBUTION OF FOREST SIZE CLASSES ON HERITAGE HILLS WMA COULSON TRACT

The forest stands were assessed and mapped according to average tree size classes. Refer to the map on the following pages.

Size Classes	No. of Stands	Acres	% of Total Area
Seedlings (<1" DBH)	0	0	0%
Saplings (1-3" DBH)	3	12.1	3%
Pole size (4-11" DBH)	11	163.8	48%
Small sawlog size (12-17" DBH)	2	43.9	13%
Sawlog size (≥18" DBH)	8	123	36%



CURRENT OVERSTORY FOREST TYPES ON HERITAGE HILLS WMA

Refer to the map on the following pages

Overstory	No. Stands	Acres	% of Total Area
Oak-hickory	17	275.4	80%
Central hardwoods	1	7.8	2%
Bottomland hardwoods, second bench	2	28.8	8%
Bottomland hardwoods, first bench	1	15.4	5%
Red cedar	2	9.2	3%
Others	1	6.2	2%

Oak-Hickory: The density of the overstory canopy can vary from closed canopy (forest) to open canopy (woodland) and anywhere in between. The understory and herbaceous layers are also highly variable due to different levels of sunlight penetration. Oak-hickory forests are dependent on regular disturbances of prescribed fire. Species like oak are specially adapted to fire because of their ability to repeatedly stump sprout after being top killed and because their heavy bark, as they get older, is fire tolerant. With frequent fires (4-6 years), this early successional community can be maintained indefinitely. All the common species are intolerant of shade and include: white oak, red oak, bur oak, black oak, shingle oak, shagbark hickory, and black walnut. Associated species include just about anything in the Central Hardwoods and Maple-Basswood forest types.

Central Hardwoods: This forest cover type is also called mixed hardwoods. No species dominates in this cover type. Most of these upland stands have experienced disturbances such as livestock grazing, harvesting and storm damage. These stands frequently develop on retired pasturelands and retired crop fields. Common species include: shingle oak, northern red oak, white oak, shagbark hickory, bitternut hickory, black cherry, black walnut, basswood, ash, American elm, red elm and ironwood. Associated species include: boxelder, hackberry, cottonwood, eastern red cedar, black oak, and honey locust.

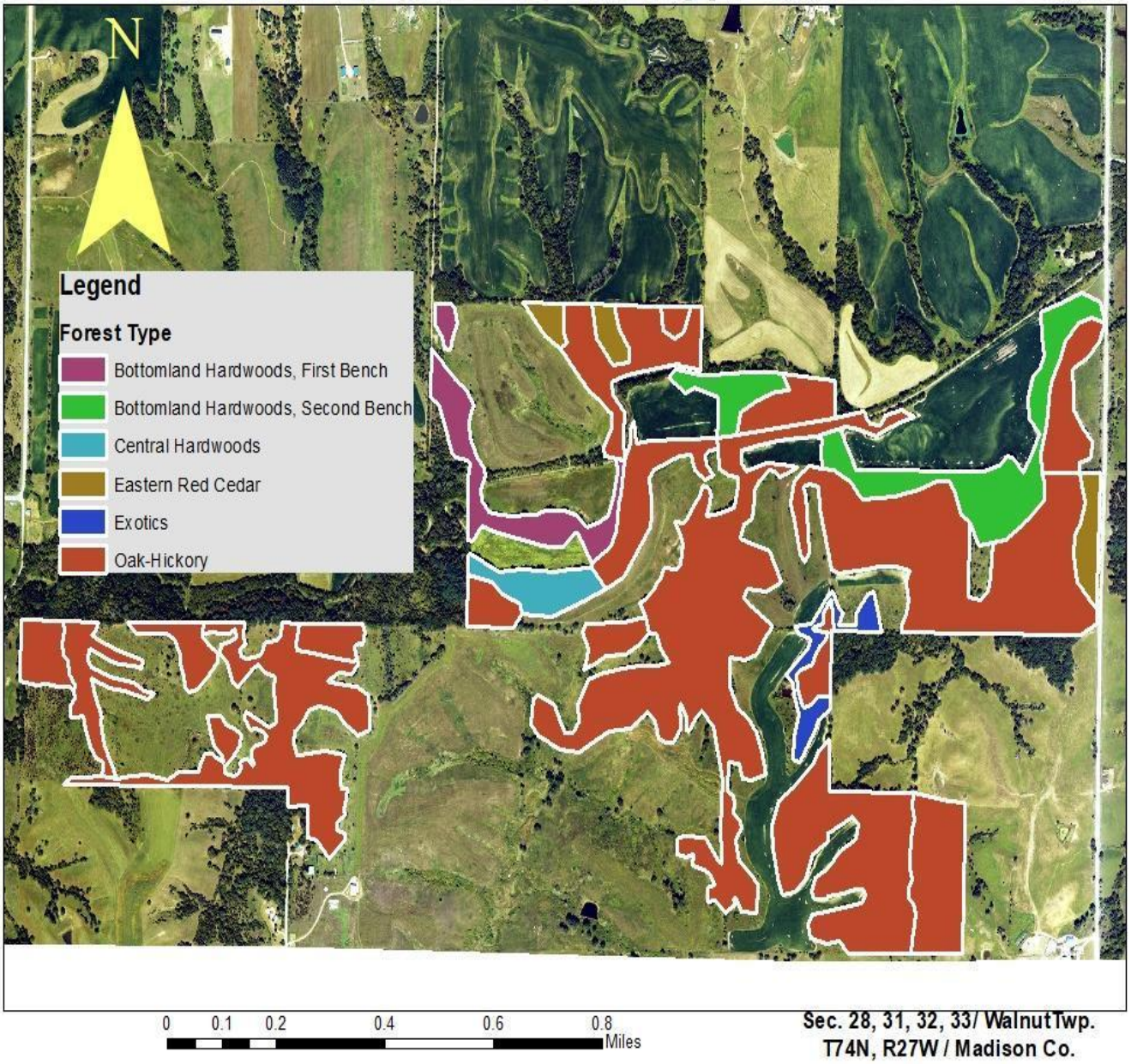
Bottomland Hardwoods, First Bench: The major species for this cover type are adapted to life in wet and poorly drained bottomlands. These areas experience frequent flooding from long to short durations. Flood waters can cause heavy scouring or heavy alluvial depositions. Common species include: cottonwood, silver maple, willows, green ash, boxelder and river birch. Associated species include: sycamore, American elm, and rock elm.

Bottomland Hardwoods, Second Bench: These stands occur on somewhat poorly drained to moderately well-drained soils that are occasionally flooded with light scouring and alluvial depositions. Common species include: cottonwood, silver maple, black walnut, green ash, hackberry, white elm, pin oak, swamp white oak and sycamore. Associated species include: bur oak, river birch, willows, basswood, shellbark hickory, and boxelder. (Black walnut can grow on second bench sites, but sometimes suffers from damage caused by fusarium root rot which is probably caused by waterlogged soils. Walnut is also sometimes prone to frost damage in narrow river valleys where cold air can settle.)

Eastern Red Cedar: Eastern red cedar makes up greater than 50% of the overstory. These sites are often poorly maintained open pasturelands with south to west aspects. Eastern red cedar can be problematic on open pasturelands and native prairie remnants. Common associated species include: black walnut, shagbark hickory, bitternut hickory, hackberry, white elm, red elm, black cherry, aspen, white birch, shingle oak, bur oak, black oak, red oak, ironwood, white ash, boxelder, hard maple and basswood.

Other forest associations include stands of conifers or exotic/invasive trees.

Coulson Forest Type



FOREST MANAGEMENT SYSTEMS FOR HERITAGE HILLS WMA COULSON TRACT

One of four management systems is specified for each of the 24 unique forest stands. This identifies the overall management system for that stand and designates the "road map" for what work will take place on the site in the future.

Recommendations for each stand were based on whether the area will be managed to create early successional growth, even age system, uneven age system or as viewshed. The decision on what system will be used was based on the objectives for the area to maintain a healthy oak-hickory component, develop a diverse woodland landscape, protect fragile sites, improve water quality and increase the acres of early successional growth.

Based on recommendations for the areas, the acres under each management system are as follows. Refer to the map on the following pages.

Management System	No. Stands	Acres	% of Total Area
Early Successional	3	10.8	3%
Even Age	19	318.1	93%
Uneven Age	2	13.9	4%
Viewshed	0	0	0

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 clearcut which results in the even age structure. This type of management creates excellent habitat for deer, turkey, squirrels and other game and nongame 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 that are seedling size (1-10 years old) benefit the same species as do early succession stands, i.e. 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 and ground nesters such as ovenbirds and black and white warblers.

Mature stands 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 competition, insects, disease, etc. The dead and dying trees provide habitat for cavity nesters such as woodpeckers, nuthatches, titmice, and brown creepers. The federally endangered Indiana bat and Northern Long-eared bat use loose barked live trees such as shagbark hickory as well as the sloughing bark from dying trees for their maternity colonies.

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, clearcutting and shelterwood harvesting are the most common. Clearcutting is a practice that opens the stand all at once. Clearcutting also provides highly desired early successional plants for the first 15-20 years until the tree canopy closes. Regeneration via clearcutting requires there be sufficient oak seedlings or advanced regeneration present. Minus these seedlings, bare root planting may be necessary following clearcutting.

Shelterwood harvests are one way of recruiting seedling production prior to a clearcut. Shelterwood harvests include several thinnings done prior to the final clearcut. If the shelterwood 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 10-20 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 be clearcut to successfully regenerate the oak stand.

Crop tree release is discussed in this plan as a type of timber stand improvement. This practice is done most frequently when the trees are pole sized. The goal of the practice is to choose up to 50 trees per acre that are considered to have the best genetics. 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 crop tree to reach maximum growth potential, increase mast production, and improve forest health.

Thinning the understory or weed tree removal is a practice also used in even age management. This practice involves removing trees that are below the main canopy to allow more sunlight to get to the forest floor. Ironwood, bitternut hickory, buckeye, elm, hackberry, and other shade tolerant species warrant this practice when species like oak are wanted in the future.

Prescribed fire is an effective and relatively 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 top-kill thin barked species that are less than two inches in diameter such as hackberry, hard maple, buckeye, cherry, elm, bitternut hickory and ironwood. Fire will expose mineral soil and open up the ground to sunlight. These conditions favor the natural regeneration of oak. 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. Oak has a superior competitive advantage thanks to their strong root collar and ability to sprout. Most shade tolerant trees, such as elm, bitternut, ironwood, and hackberry do not possess strong re-sprout capabilities.

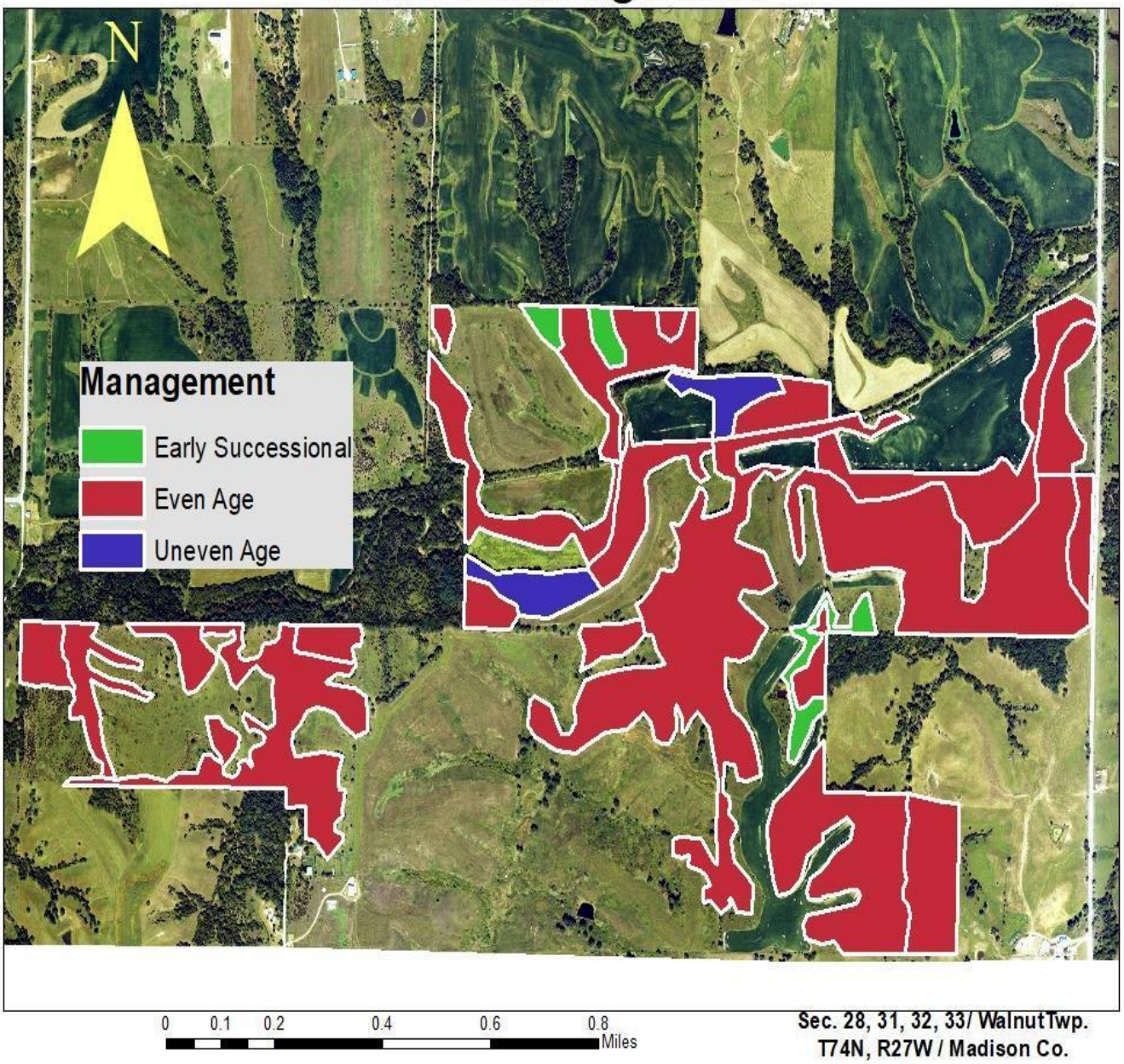
Uneven age management develops a stand of trees with all DBH size classes. The stand structure is developed by selectively harvesting mature and defective trees, and removing unwanted small trees that are damaged or defective. Because uneven age stands always have large trees present, this system favors species that will grow in shade such as hackberry, bitternut hickory, hard maple and basswood. Sustainable harvest guidelines dictate the ability to selectively harvest mature and defective trees every 20 to 25 years in these stands.

Uneven age management areas will provide continuous tracts of woodland with infrequent disturbance. Large tracts of uneven age management will provide necessary habitat for Neotropical 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 woodpeckers, bats, and squirrels. Large oaks that are healthy will be left to provide acorns for many wildlife species. Timber stand improvement and selective harvesting will create woody debris on the forest floor for reptiles and amphibians.

Early successional management provides high density tree and shrub thickets with highly diverse forbs, sedges, and grasses. Many bird species such as turkey, 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 successional management prescribed in this plan is on the woodland edges during timber stand improvements. 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 successional management areas will be managed on a 10-20-year rotation. In other words, every 10-20 years the stands will be cut to create areas with high stem density. Shelterwood and clearcut harvesting will also increase the early successional acreage over time.

Viewshed management areas are typically areas with poor access, steep fragile slopes and areas along streams that are best left to naturally progress through succession. Viewshed may also be used to protect areas for endangered species or be used to protect certain public use facilities. Management can take place in these areas where desirable, but the major objective is to have minimal disturbance. Certain Neotropical migrants will benefit from the areas designated as viewshed.

Coulson Management



INCOME FROM TIMBER HARVESTS

Income generated from timber harvesting operations must be reinvested into the area for reforestation and timber stand improvement, and other silvicultural practices to promote oak regeneration, and otherwise manage forests for habitat. Without this reinvestment, there is little chance that the WMA annual budget will allow the recommendations in this plan to be implemented. Harvesting is a significant portion of this plan to regenerate stands of trees and increase the acreage of early successional communities. The majority of work recommended is directed at thinning young stands so the oak is not shaded by other trees and at removing undesirable species to encourage regeneration of desirable trees.

WORK PLAN FOR HERITAGE HILLS WMA

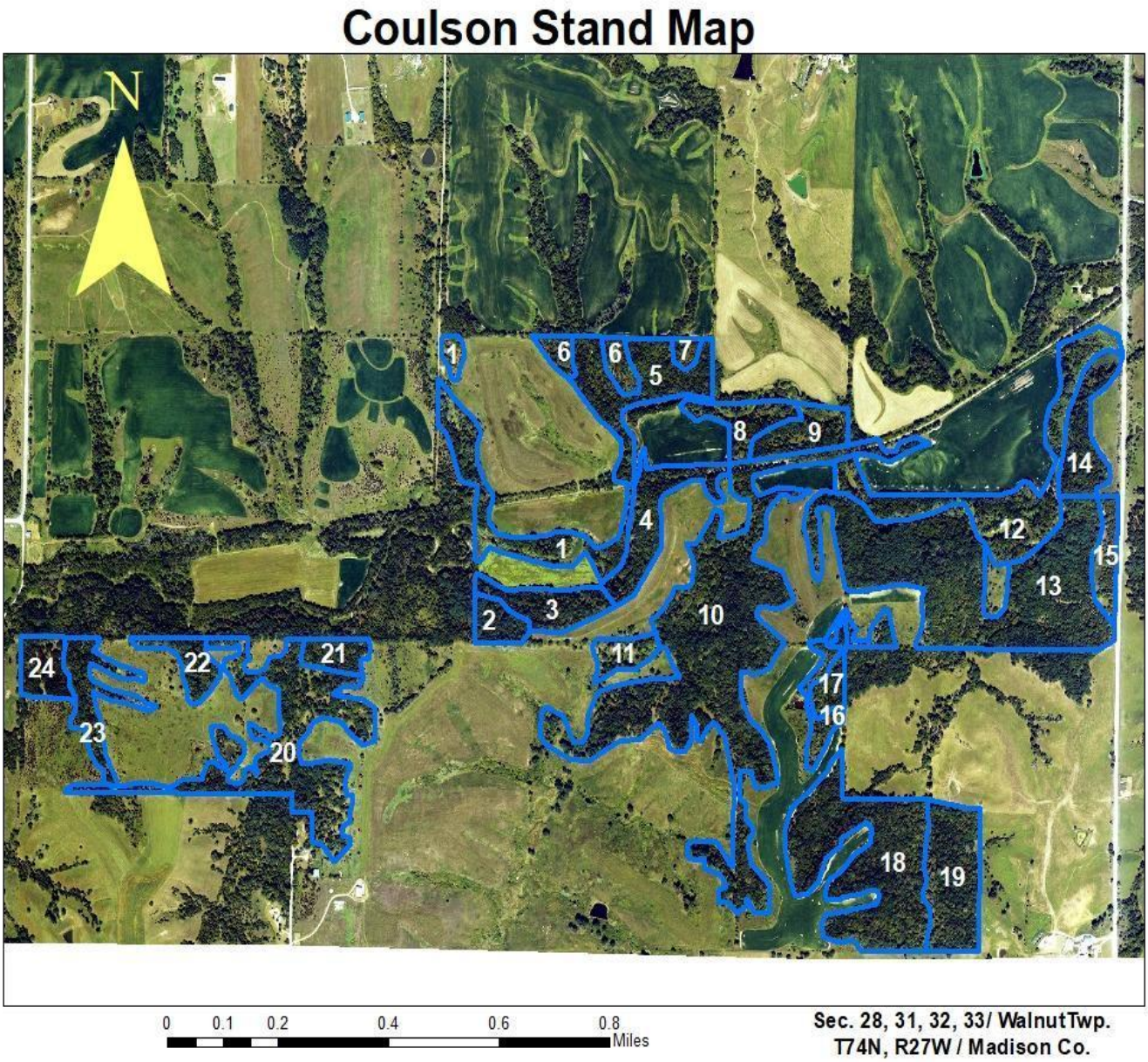
The work plan for Heritage Hills WMA is designed to aid the District Forester and Wildlife Biologist in the implementation of forest management practices. It is written with the presumption that these professionals have a basic understanding of forest management principles and techniques. Every detail or narrative for individual stands have not been outlined in the plan because the document would become too long to be of practical use. This plan is intended to get work accomplished on the ground. Individual project plans/specifications will be developed for practices as they are

implemented. Prior to implementation, the forest management activities described here will be reviewed internally to determine potential impacts to both state and federal threatened or endangered species.

BEST MANAGEMENT PRACTICES

Best Management guidelines are designed to help land managers be good stewards by protecting water quality during forest management activities. These guidelines help determine how to handle streamside management areas and wetlands, where and how to locate and design forest roads, what is required for landings, skid trails, and stream crossings during timber harvest operations, how to handle fuel, lubricant, and other spills, and best practices for chemical application. Iowa DNR Forestry Best Management Practices can be found on the DNR's website.

COULSON FOREST STAND MAP



Stand 1: 15.4 acres

Forest Description

There are a variety of species of trees that make up this stand. In the north part of the stand are black walnut in the pole timber to small sawtimber size classes. Through the rest of the stand there are bottomland species such as willow, silver maple, cottonwood and elm. These bottomland areas are adjacent to a creek and contain dense populations of reeds canary grass. There are a couple of areas where upland species such as pole timber size bur oak, red oak, and black cherry are present. The oak areas are small, but they could benefit from an overstory thinning.

Stand Recommendations - Even age

This is a lower priority area. Conduct an overstory thinning releasing nice oak, walnut, and cherry trees.

Stand 2: 3.8 acres

Forest Description

The overstory of this stand contains mostly sawtimber size white oaks, but also sawtimber size red oak and pole timber size shagbark hickory. The average basal area is 140 square feet per acre. Many of the oaks are multi-stemmed indicating it was probably cut over in the past. The mid-story and understory contains shade tolerant seedling and sapling size ironwood, hackberry, buckeye, and elm.

Stand Recommendations - Even age

Conduct a weed tree removal by removing all shade tolerant mid-story trees. An overstory thinning can also be conducted as a part of the first cut of a shelterwood. Periodically burn to keep shade tolerant stems in check until oak regeneration is adequate.

Stand 3: 7.8 acres

Forest Description

This stand is on a north facing slope and has an overstory of sawtimber size red oak, white oak, bur oak, hackberry, bitternut hickory, black walnut and basswood. The average basal area is around 90 square feet per acre. The mid-story contains buckeye and ironwood.

Stand Recommendations - Uneven age

Conduct a basal area thinning every 15 years or so. This stand can be maintained as an uneven age stand so trees that are removed as part of the thinning could possibly be part of a commercial harvest.

Stand 4: 10.6 acres

Forest Description

This stand is on a west to northwest facing slope with an overstory of pole timber to sawtimber size bur oak and black oak with shagbark hickory and black walnut also present. The average basal area is around 150 square feet per acre. Many trees are multi-stemmed indicating a harvest in the past. The mid-story and regeneration consist of ironwood, hackberry, and buckeye.

Stand Recommendations - Even age

Conduct a weed tree removal by removing all shade tolerant mid-story trees. An overstory thinning can also be conducted as a part of the first cut of a shelterwood. Periodically burn to keep shade tolerant stems in check until oak regeneration is adequate.

Stand 5: 15.3 acres

Forest Description

This is a poletimber size, fully stocked stand with bur oak, black oak, black walnut, shagbark hickory, black cherry, and hackberry in the overstory. The average basal area is 110 square feet per acre. There are scattered old bur oak trees throughout. Multiflora rose bushes are found periodically.

Stand Recommendations - Even age
An overstory thinning could be conducted at any time to favor all oak, walnut, and hickory trees. Rose bushes could be foliar sprayed. Fire can also be utilized to keep roses in check.

Stand 6: 4.6 acres
This stand is in two separate pockets within stand 5. They were once open areas that were probably pastured. Currently there are scattered red cedar trees and areas that are very brushy. The brushy areas contain dogwood, sumac, autumn olive, and multiflora rose. There are younger oak and walnut trees that can be found periodically.

Stand Recommendations - Early successional
Target eradication of autumn olive and multiflora rose where practical with mechanical and herbicide use. These areas could be left alone to develop naturally or they could be mowed down every 15 years or so to maintain early successional habitat.

Stand 7: 1.3 acres
This is a small stand located within the boundaries of stand 5. This stand is very brushy with dogwood and multiflora rose like stand 6, but the difference is there are many more oak saplings and pole timber size trees.

Stand Recommendations - Even age
Spot spray the rose bushes but otherwise let this stand develop naturally for now.

Stand 8: 6.1 acres
This stand has a variety of tree species that are represented in the overstory including sawtimber size hackberry, buckeye, basswood and random bottomland species. The average basal area is 130 square feet per acre. There is a moderate amount of natural regeneration including hackberry and buckeye saplings.

Stand Recommendations - Uneven age
Conduct a basal area thinning every 15 years or so. This stand can be maintained as an uneven age stand so trees that are removed as part of the thinning could possibly be part of a commercial harvest.

Stand 9: 6.8 acres
This stand is composed of mostly poletimber size trees in the overstory including bur oak, black oak, and black walnut. There are also random sawtimber size oaks and walnuts throughout. The average basal area is around 110 square feet per acre. A moderate amount of natural regeneration is present including hackberry and oak. There is an opening in the middle of the stand that is mostly grass but has cedar trees encroaching. There are also some hazelnut shrubs found in the opening.

Stand Recommendations - Even age
Conduct an overstory thinning in the form of crop tree release focusing on oaks and walnuts. Cut the cedar trees to stop encroachment. Burn this area periodically to maintain it as an oak woodland.

Stand 10: 65.6 acres
This is a larger stand and it appears that a large portion of it was pastured in the past. The overstory has many large, mature bur and black oaks that were once open. The overstory also contains black walnut, elm, shagbark hickory, and bitternut hickory in poletimber to sawtimber size classes. The average basal area is 130 square feet per acre. Much of the understory is open but contains ironwood and elm in the mid-story.

Stand Recommendations - Even age
Conduct a weed tree removal of all elm and ironwood. Along with the weed tree removal conduct an overstory thinning to bring the stand to more savanna like conditions. This could possibly involve removing trees as part of a commercial harvest. Periodically burn to maintain savanna conditions.

Stand 11: 3.7 acres

This stand has had significant tree cutting in the recent past to restore to oak savanna conditions. Tree species that are left are sawtimber size black oak, bur oak, and black walnut. The average basal area is around 50 square feet per acre. The understory is very brushy but there is also significant oak regeneration.

Stand Recommendations - Even age

Much of the work has already been done to convert this to savanna conditions. Burn periodically to maintain and improve these conditions.

Stand 12: 22.7 acres

This is a bottomland stand in the sawtimber size class adjacent to the creek. Overstory species include cottonwood, willow, boxelder, hackberry, bitternut hickory, and some black walnut. The average basal area is around 160 square feet per acre.

Stand Recommendations - Even age

This stand is not a high priority. It could be separated in different areas that could have patch clearcuts at different stages.

Stand 13: 53.6 acres

This is an overstocked oak hickory stand. Trees are mostly in the poletimber to small sawtimber size classes but there are some large sawtimber size oaks scattered throughout. Species in the overstory include bur oak, black oak, shagbark hickory, white oak, chinquapin oak, black walnut, bitternut hickory, and red cedar. The average basal area is around 130 square feet per acre. There are numerous multi-stemmed oak trees indicating there was a harvest in the past. Invasive species found in the understory are multiflora rose and honeysuckle. Ironwood is in the mid-story and natural regeneration includes elm, hackberry, buckeye, and some hickory.

Stand Recommendations - Even age

This is a high priority area. An overstory thinning is needed along with a weed tree removal of red cedar and ironwood. Mature trees could be harvested when a harvest is conducted in other stands. Burn periodically to keep invasive species in check. Parts of this stand can be transitioned to savanna conditions if desired.

Stand 14: 8.9 acres

This stand is separated from stand 13 by an old barbed wire fence. It's obvious stand 14 had more disturbance than stand 13, probably due to grazing. There are scattered mature red oak, bur oak, and white oak. Most of the overstory is poletimber size elm, shagbark hickory, white oak, bur oak, red cedar, bitternut hickory, basswood, hackberry, and black walnut. The average basal area is around 80 square feet per acre. Ironwood is common in the mid-story and some multiflora rose bushes can be found in the understory.

Stand Recommendations - Even age

A weed tree removal of all ironwood and undesirable trees should be done for the first step in a shelterwood. Burn the area periodically to reduce competition of small shade tolerant trees and to control multiflora rose. Once adequate oak regeneration is present then cease burning.

Stand 15: 4.6 acres

This is a thick stand of red cedar. There is also a large open grass area.

Stand Recommendations - Even age

Remove all red cedar. Burn area periodically. Oak regeneration could slowly encroach into this area over time.

Stand 16: 6.2 acres

This stand is a mix of open grass areas interspersed with brushy areas. Brushy vegetation includes pockets of dogwood and plum. There are also invasive species such as honeysuckle and multiflora rose.

Stand Recommendations - Early successional
Target honeysuckle and multiflora rose with herbicide treatment. Mow off brushy areas every 15 years or so to keep it early successional habitat.

Stand 17: 3.3 acres

This small stand is made up of poletimber size trees. The overstory trees are bur oak, black oak, red cedar, Osage orange, elm, and hackberry. The average basal area is around 180 square feet per acre. The understory has a population of multiflora rose.

Stand Recommendations - Even age
Conduct an overstory thinning in the form of a crop tree release. Focus on releasing oaks. Target Osage orange for eradication at the same time. Multiflora rose can be killed with a foliar application of herbicide. Periodic burning can also be used to control multiflora rose.

Stand 18: 33.3 acres

This is an overstocked oak stand mostly in the poletimber to small sawtimber size class. Overstory trees include black oak, bur oak, elm, hackberry, black cherry, chinquapin oak, and a few black walnuts. There are a couple pockets of mature black oak. The average basal area is around 150 square feet per acre.

Stand Recommendations - Even age
This stand should be a high priority. Conduct an overstory thinning to favor oak species. Large black oaks could be a part of a harvest in conjunction with other stands.

Stand 19: 14.7 acres

This stand shows evidence it was pastured in the past. The overstory trees are red cedar, chinquapin oak, bur oak, black oak, elm, Osage orange and white mulberry, all in the poletimber size class. The average basal area is around 120 square feet per acre. There is a large area that is thick with red cedar. Under these cedar trees are numerous chinquapin oak saplings that need to be released to survive.

Stand Recommendations - Even age
Conduct an overstory thinning favoring oak species. Remove all red cedars to release chinquapin oak saplings and also kill all Osage orange and white mulberry. Incorporate a burning regime once oak saplings are big enough to tolerate fire.

Stand 20: 32.9 acres

This stand has been pastured up until a few years ago. There are varying densities of trees throughout this stand. Many areas are less dense with scattered mature bur oak trees along with poletimber size black and bur oak. These more open areas have a high population of sapling to poletimber size red cedar. Other areas that have a higher density of trees of the same species of oaks but are more commonly in the poletimber and small sawtimber size classes. The basal area ranges from 40 to 160 square feet per acre. Throughout the whole stand is a large population of multiflora rose. Bur and Black oaks are the main species but other species include shagbark hickory, black walnut, elm, some white oak, white mulberry, and Osage orange.

Stand Recommendations - Even age
Address multiflora rose with herbicide treatment. Remove cedar, elms, Osage orange and white mulberry. Areas with higher density of trees need an overstory thinning. Burn these areas on a regular basis to keep multiflora rose in check and to restore back to oak savanna/woodland conditions. Larger degraded oaks and walnuts can be included in a timber sale in conjunction with other stands.

Stand 21: 3.7 acres

This stand has an upland component and a smaller bottomland area. The upland portion is a thick stand of mostly shagbark hickory poletimber trees with some bur oak, black walnut, black oak, and hackberry. The average basal area is around 220 square feet per acre. The smaller area along the creek is mostly nice poletimber and small sawtimber size black walnut. These areas seem to be less affected by grazing.

Stand Recommendations - Even age
An overstory thinning would benefit this stand. Favor black walnut and oaks first then thin the rest of the stand down to proper stocking levels. An occasional fire in the upland part could be implemented.

Stand 22: 4.4 acres
This is a nice stand of white oak, red oak, and black walnut along with basswood and shagbark hickory. Trees are predominantly in the sawtimber size class. Trees are in good shape and it appears this stand has escaped heavy pasturing. The average basal area is around 150 square feet per acre. The mid-story contains a population of ironwood.

Stand Recommendations - Even age
This stand is ready for the first steps in a shelterwood cut. Remove all ironwood and any other shade tolerant tree found in the mid-story and overstory. To open up the canopy a little some trees that are removed could be a part of a harvest.

Stand 23: 8.2 acres
This is a stand of mostly poletimber size trees with species including black walnut, bur oak, black oak, red oak, shagbark hickory, and elm. It is overstocked with an average basal area of 140 square feet per acre. The mid-story contains ironwood and there is a population of multiflora rose bushes in the understory.

Stand Recommendations - Even age
An overstory thinning would benefit this stand. Favor black walnut and oaks first then thin the rest of the stand down to proper stocking levels. An occasional fire would help control multiflora rose populations.

Stand 24: 5.3 acres
This is an almost pure stand of shagbark hickory. They are all in the small poletimber size class and the average basal area is around 110 square feet per acre. The understory is relatively open but does contain some multiflora rose.

Stand Recommendations - Even age
This is a low priority stand. No thinning is needed at this time. Fire could be utilized occasionally to control the multiflora rose population.

SUMMARY OF STANDS

Stand #	Overstory	Prescription	Completed	Acres	Management System
1	Bottomland Hardwoods, First Bench	Crop Tree Release		15.4	Even age
2	Oak-Hickory	WTR, Shelterwood		3.8	Even age
3	Central Hardwoods	BA thinning		7.8	Uneven age
4	Oak-Hickory	WTR, Shelterwood		10.6	Even age
5	Oak-Hickory	BA thinning		15.3	Even age
6	Red Cedar	Invasive control, mowing		4.6	Early successional
7	Oak-Hickory	Invasive control		1.3	Even age
8	Bottomland Hardwoods, Second Bench	BA thinning		6.1	Uneven age
9	Oak-Hickory	Crop Tree Release		6.8	Even age
10	Oak-Hickory	WTR, Shelterwood		65.6	Even age
11	Oak-Hickory	Burn		3.7	Even age
12	Bottomland Hardwoods, Second Bench	nothing		22.7	Even age
13	Oak-Hickory	WTR, Harvest		53.6	Even age
14	Oak-Hickory	WTR		8.9	Even age

Stand #	Overstory	Prescription	Completed	Acres	Management System
15	Red Cedar	WTR, burn		4.6	Even age
16	Exotics	invasive control, mowing		6.2	Early successional
17	Oak-Hickory	Crop Tree Release, Invasive Control		3.3	Even age
18	Oak-Hickory	BA Thinning, Harvest		33.3	Even age
19	Oak-Hickory	WTR, burn		14.7	Even age
20	Oak-Hickory	Invasive control, WTR, burn		32.9	Even age
21	Oak-Hickory	BA Thinning		3.7	Even age
22	Oak-Hickory	WTR, Shelterwood		4.4	Even age
23	Oak-Hickory	Crop Tree Release		8.2	Even age
24	Oak-Hickory	Invasive Control		5.3	Even age

SPECIES OF GREATEST CONSERVATION NEED

County	Common Name	Scientific Name	Class	State Status	Fed. Status	Link to Species Profile
Madison	Bald Eagle	*Haliaeetus leucocephalus*	Birds	S		Bald Eagle
Madison	Barn Owl	*Tyto alba*	Birds	E		Barn Owl
Madison	Henslow's Sparrow	*Ammodramus henslowii*	Birds	T		
Madison	Creeper	*Strophitus undulatus*	Freshwater Mussels	T		
Madison	Byssus Skipper	*Problema byssus*	Insects	T		
Madison	Edwards' Skipper	*Satyrium edwardsii*	Insects	S		
Madison	Hickory Hairstreak	*Satyrium caryaevorum*	Insects	S		
Madison	Regal Fritillary	*Specyeria idalia*	Insects	S	PTF	
Madison	Wild Indigo Dusky Wing	*Erynnis baptisiae*	Insects	S		
Madison	Zabulon Skipper	*Poanes zabulon*	Insects	S		
Madison	Indiana Bat	*Myotis sodalis*	Mammals	E	E	Indiana Bat
Madison	Tri-colored Bat	*Perimytis subflavus*	Mammals		PE	
Madison	Northern Long-eared Bat	*Myotis septentrionalis*	Mammals		E	Northern Long-Eared Bat
Madison	Earleaf Foxglove	*Tomanthera auriculata*	Plants	S		
Madison	Hill's Thistle	*Cirsium hillii*	Plants	S		
Madison	Nodding Thistle	*Cirsium undulatum*	Plants	S		
Madison	Broom Sedge	*Andropogon virginicus*	Plants	S		
Madison	Glomerate Sedge	*Carex aggregata*	Plants	S		
Madison	Oval Ladies-tresses	*Spiranthes ovalis*	Plants	T		
Madison	Slender Ladies-tresses	*Spiranthes lacera*	Plants	T		
Madison	Blandins's Turtle	*Emydoidea blandingii*	Reptiles	T		
Madison	Bullsnake	*Pituophis catenifersayi*	Reptiles	S		
Madison	Eastern Massasauga	*Sistrurus catenatus*	Reptiles	E	T	
Madison	Smooth Green Snake	*Liochlorophis vernalis*	Reptiles	E		Smooth Green Snake
Madison	Speckled Kingsnake	*Lampropeltis getulus*	Reptiles	T		
Madison	Western Worm Snake	*Carophophis amoenus*	Reptiles	T		

E = Endangered; T= Threatened; S = Special Concern

GUIDELINES FOR PROTECTING INDIANA BAT SUMMER HABITAT

Indiana bats have been documented at Heritage Hills WMA. These guidelines were prepared to provide information about the Indiana bat and its summer habitat requirements in Iowa and to prevent inadvertent harm to the species through various human activities. This update of the guidelines is in response to changes in the US Fish and Wildlife Service requirements for protecting this endangered species. The changes include:

- No cut dates changed to April 1 through September 30
- Updated US Fish and Wildlife Service guidelines for mist net surveys

The Indiana bat is a federal (50CFR Part 17) and state (Code of Iowa, Chapter 481B) endangered species that occurs in southern Iowa from April through September.

Female Indiana bats *(Myotis sodalis)* have their young beneath loose or peeling tree bark. Most nursery colonies have been found on the trunk or large branches beneath the bark of standing dead trees. The nursery colonies are located along streams and rivers or in upland forest areas.

Trees that retain sheets or plates of bark that provide space beneath the bark when dead, such as red oak, post oak, and cottonwood, are potential roost trees. Live trees such as shagbark and shellbark hickory are also occasionally used as roosts.

Indiana bats have also been captured on the edge of urban areas. It is likely that the bats would use the edge of urban areas only if there is suitable habitat such as a greenbelt or a large park with a natural forest component. This would exclude city parks that are maintained as mowed areas.

In Iowa, records for the Indiana bat have occurred in areas of 10% or greater forest cover and near permanent water. Trees with slabs or plates of loose bark are considered suitable as summer roosts.
Suitable summer habitat in Iowa is considered to have the following within a one-half or one mile radius of a location:

- Forest cover of 10% or greater within one-half mile.
- Permanent water within one-half mile.
- The potential roost trees ranked as moderate or high for peeling or loose bark within one mile.

Do not cut down potential roost trees between April 1 and September 30. Such trees can be left standing, live or dead, during that time period.

SPECIAL NOTE ON NORTHERN LONG-EARED BAT

The Northern Long-eared Bat (NLEB) is a federally threatened species that can occur in any county of Iowa.