FOREST WILDLIFE STEWARDSHIP PLAN

FOR

BUFFALO CREEK WILDLIFE AREA

A plan that will increase the diversity of forest habitats and wildlife

Developed by:

Jeff Seago
District Forester

and

Curt Kemmerer
Wildlife Biologist

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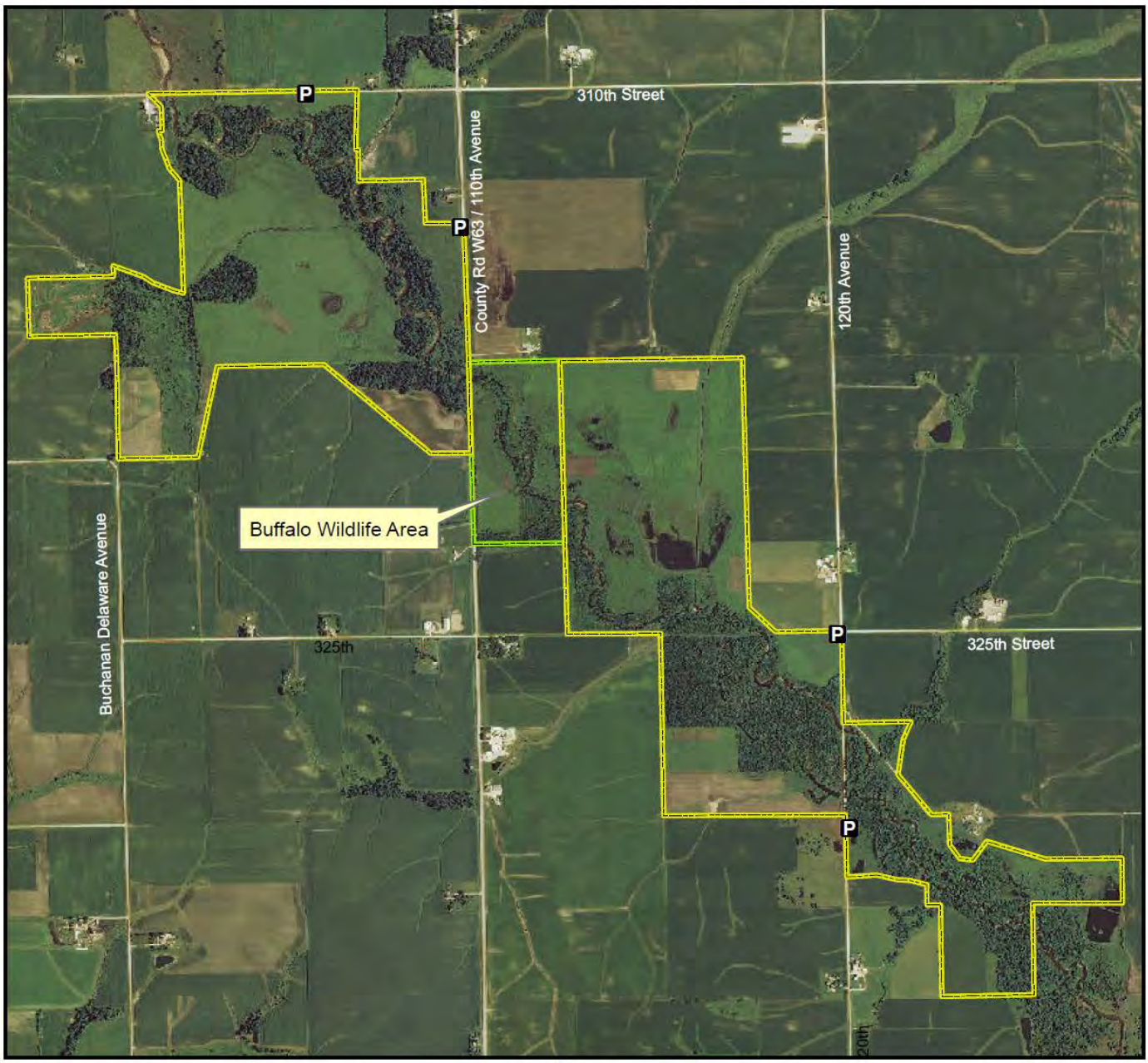
Buffalo Creek Wildlife Management Area



Legend

State Areas open to hunting
WMA Boundary
P Parking Lot
Other Public Land
2013 Aerial Photography

Map Creation Date: 8/2014

N
Miles
0 0.1 0.2

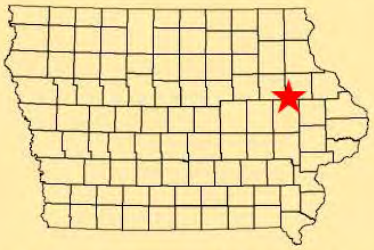
Acres: 1,005

Habitat: 2/5 TImber, 1/2 Grassland, River, Wetland

Species: Deer, Turkey, Squirrel, Pheasant, Waterfowl, Rabbit, Dove

Contact: Curt Kemmerer
Maquoketa Wildlife Unit
563-357-2035

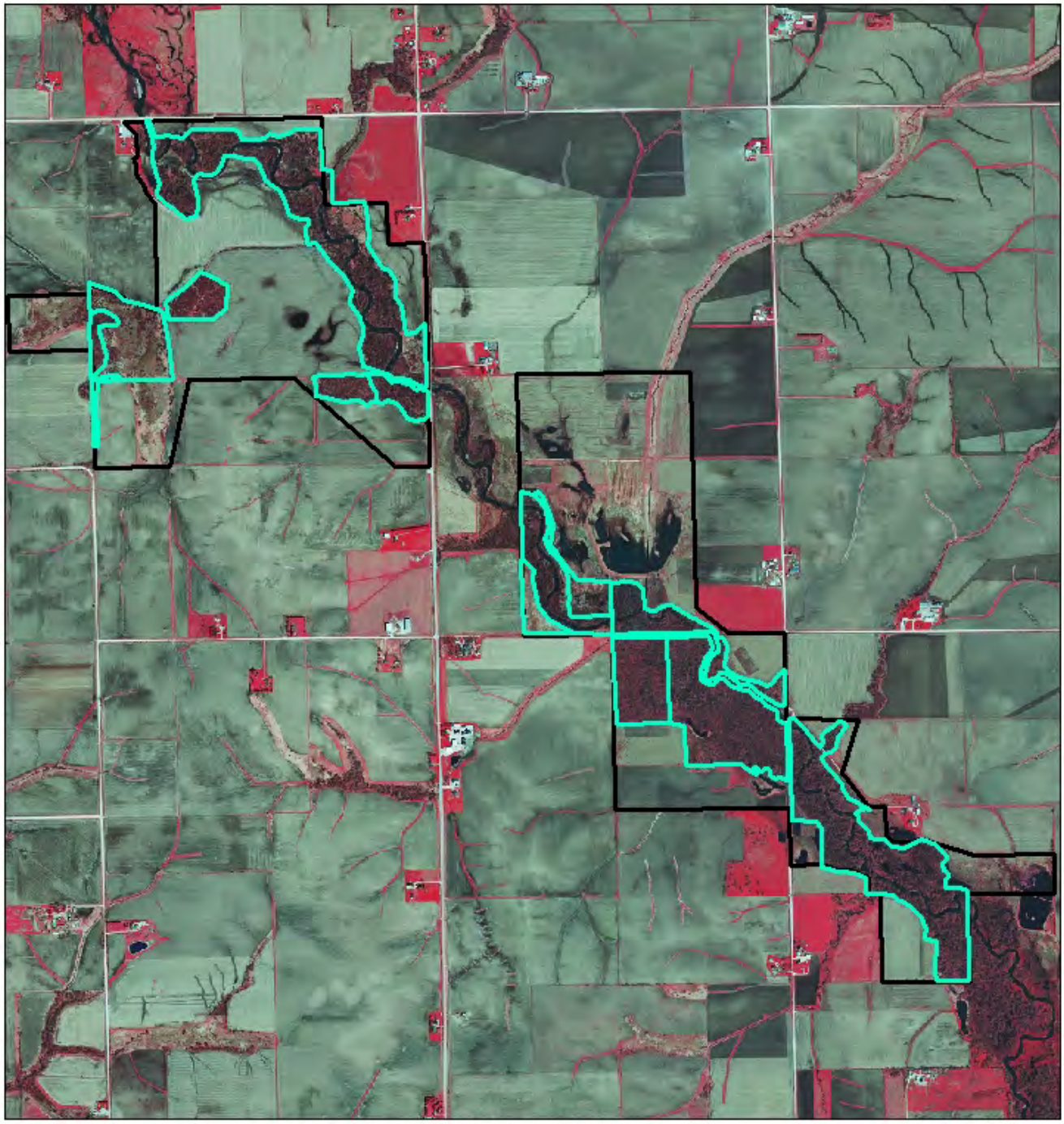
Delaware County, Iowa
T-87N, R-06W, Sections 20,28-29,33



Directions: 2.5 miles S of Ryan on Hwy 13, 4 miles W on 325th St.

Every effort has been made to accurately depict the boundaries on this map. However, users should rely on boundary signs actually located in this area to ensure they do not trespass on private property.

Buffalo Creek Wildlife Area
Forest Wildlife Stewardship Plan
381 acres of woodland



0 1,950 3,900 7,800 Feet

Sec. 24, Newton Twsp.
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Delaware County

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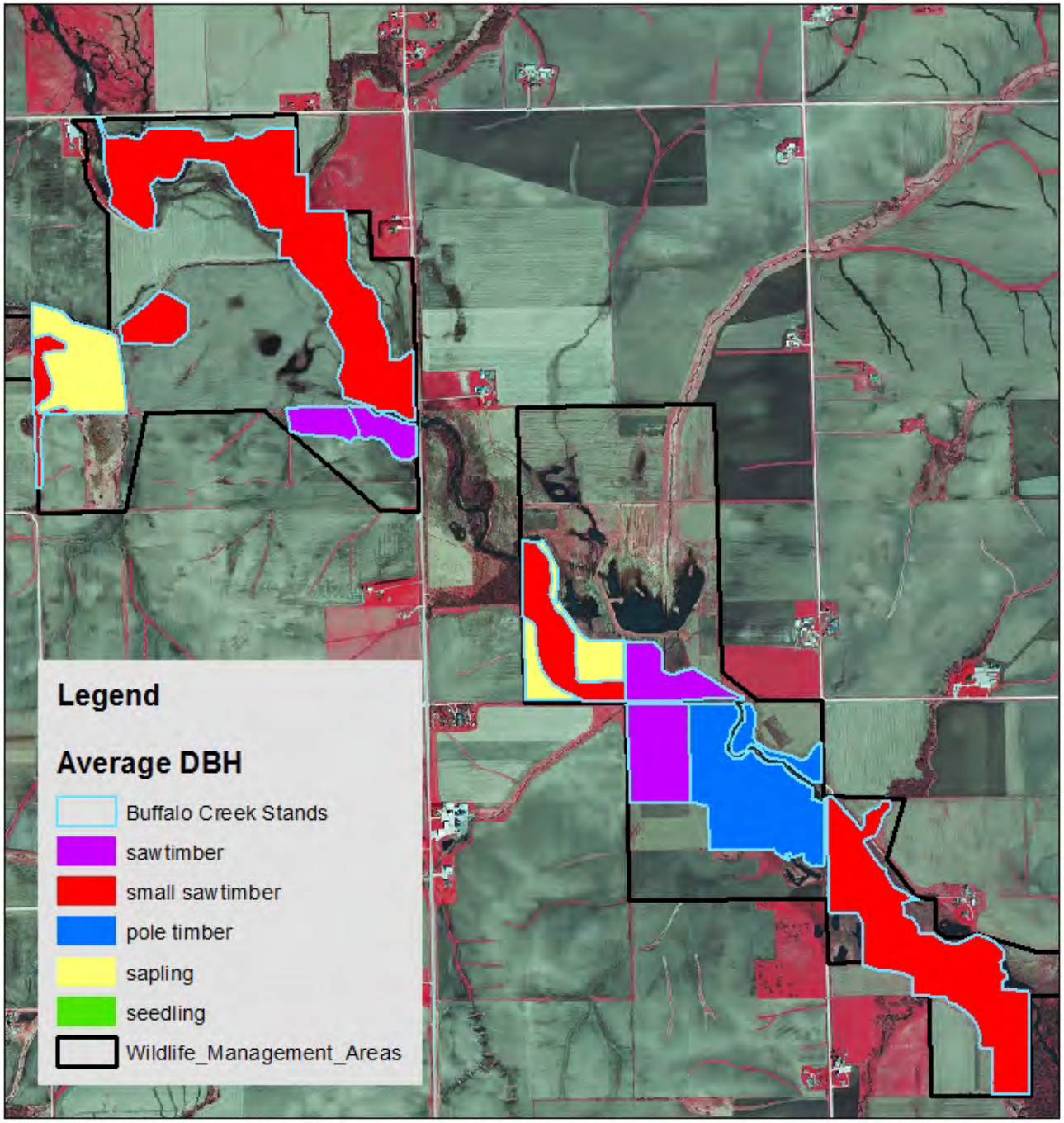
Buffalo Creek Wildlife Area
Forest Size Distribution



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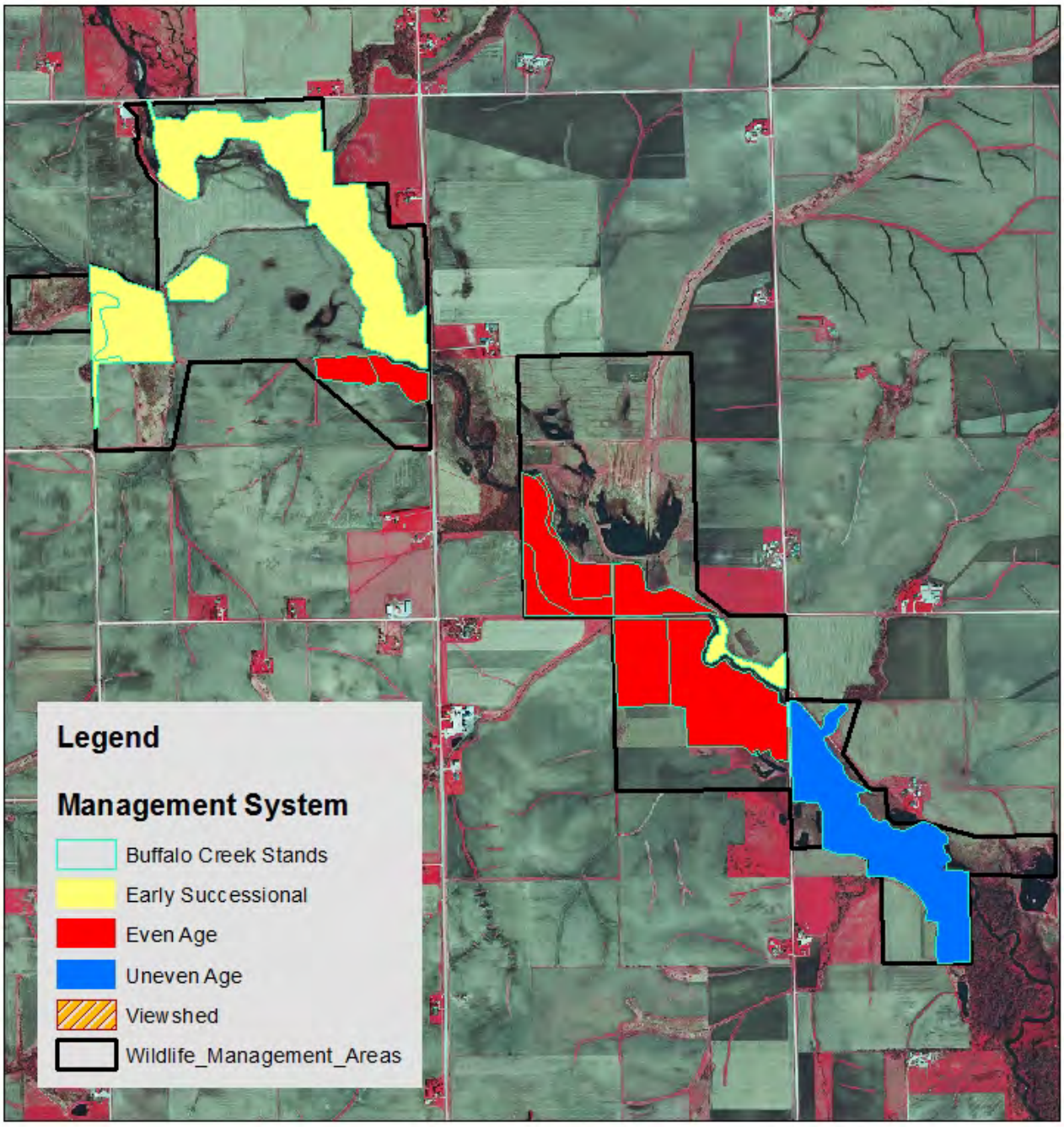
Buffalo Creek Wildlife Area
Forest Management Systems



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Sec. 19, 28, 29, 33, Adams Twsp.
Delaware County

FOREST WILDLIFE STEWARDSHIP PLAN
FOR
BUFFALO CREEK WILDLIFE AREA

MANAGER:
Curt Kemmerer
Wildlife Biologist
Maquoketa Wildlife Unit
18670 63rd St.
Maquoketa, IA 52060
(563) 357-2035

LOCATION:
Section 24, Newton Township, Buchanan County, Iowa
Sections 19, 28, 29 & 33, Adams Township, Delaware County, Iowa

TOTAL ACRES: 381

INTRODUCTION

The Iowa Department of Natural Resources (DNR) is the state government agency whose vision is to lead Iowans in caring for their natural resources. Conservation and enhancement of natural resources to ensure a legacy for future generations is part of the DNR's mission. Within the DNR, the Wildlife Bureau manages more than 350,000 acres of land as wildlife management areas (WMA's) for a variety of public users. Many of these WMA's are partially or mostly forest covered. These forests, if properly managed, provide a unique opportunity for the DNR to carry out its mission by demonstrating to the public the wise use (conservation) and enhancement of these valuable resources for wildlife.

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

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-hickory stage to the shade tolerant stands of maple and basswood.
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.

Unfortunately there is no single type of forest stand that can provide all of the requirements for all forest wildlife species. Different species require different (and sometimes quite specific) forest types and ages classes. Some generalist wildlife species use all of the forest age classes, while some specialist species have such specific requirements that only one or two particular forest types are needed to survive. A classic example of this conflicting habitat need is the requirement of some species for an abundance of forest edge while others need relatively large blocks of un-fragmented forest.

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

Generally, the Wildlife Bureau manages state-owned forests for the greatest diversity of forest wildlife. The FWSP will be the guiding document that prioritizes management activities to meet the needs of the wildlife species identified by the plan. The Wildlife Bureau's State Comprehensive Wildlife Conservation Plan identifies wildlife "species of greatest conservation need" (SGCN). (Appendix – Tables 1-6). Habitat needs of these wildlife species will be included in determining forest management decisions. Evaluations will be conducted to monitor the success of these management decisions. Forest and wildlife inventories conducted on each WMA will be used to assess and refine future forest management decisions on the WMA's. The primary goal will be to maintain quality habitat that will support abundant and diverse wildlife populations.

HOW THE FOREST WILDLIFE STEWARDSHIP PLAN WAS DEVELOPED

The Wildlife Biologist is the manager of the area and determines the objectives for each wildlife management area. Objectives address the habitat needs of a diverse array of wildlife species and the woodland condition of each area. Approximately one third of the total land area managed by the Wildlife Bureau across the state is classified as woodland. Managing the woodland is essential to the long term conservation of the native plant communities occurring on these areas. Actively managing the woodland is also critical to improving these areas for wildlife and wildlife-related recreation.

Management of wildlife areas is a cooperative effort by the Wildlife and Forestry Bureaus to enhance state-owned areas for a diversity of plant and wildlife species. All of the woodland on the WMA 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 wildlife 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 strategic and sound woodland management practices.

DESCRIPTION OF AREA

The 381 forested acres addressed in this plan are outlined on the attached aerial photos. The area is divided into 14 different areas or stands, labeled 1-14 on the maps. Each stand is described in this plan and recommendations outlined for woodland management.

Buffalo Creek Wildlife Management Area is 1,005 total acres in size. With 381 acres of woodland, Buffalo Creek WMA is 38% forested. Buffalo Creek runs through the center of the area, establishing the corridor that this public complex is based upon. This large stream is flood prone and a much of the forest lands along the creek experience periodic “flashy” flooding. Some of the woodlands have a history of being grazed prior to DNR ownership. The area is generally very flat and consisting of floodplain soils such as the Spilleville-Coland complex adjacent to Buffalo Creek and Wapsie loam on the second bench of the creek. Much of the woodland on the area is poorly drained to varying degrees.

The area is used extensively by hunters, trappers and other outdoor recreationalists. The wildlife area as a whole consists of a wide variety of habitat types common throughout Iowa. Most of the non-wooded areas consist of restored tallgrass prairie. There are a few natural wetland areas, as well as several wetland restorations developed on the WMA. Agriculture is almost non-existent on this area, except for several small food plots which are managed for wildlife and hunters.

The woodland has a good diversity of species typical of riverine woodland habitat. The major overstory species are silver maple, cottonwood, green ash, swamp white oak, hackberry and river birch in the bottomlands and pin oak, black oak, red oak, white oak, bur oak, green ash, hackberry, basswood and black cherry in the uplands. Common understory species include ironwood, elm, bitternut hickory, ash, and basswood. Several of the areas were logged prior to the state purchasing them. The large trees were harvested at that time which left mostly lower quality trees that have various health and disease issues. Many of the remaining medium sized trees are actually slow growing, old trees. Because the trees have low vigor, oak wilt and various other diseases are present in many stands.

Objectives –

Funding for the ongoing management, as well as many of the most recent land acquisitions of the Buffalo Creek WMA can be attributed almost exclusively to hunter generated monies via license fees and excise taxes on sporting equipment. Consequently, a primary objective for management of the area is to improve habitat for game species such as pheasant, deer, turkey, rabbit and squirrels. On the other hand, the DNR should be obligated to consider the effects of management actions on non-game species as well, particularly those that are threatened, endangered, or species of special concern. The DNR recognizes that it is difficult, if not impossible, to manage for all species at the same time on any given tract or WMA. However, this plan operates under the assumption that creating and maintaining diverse forest habitats will benefit the most wildlife species possible, regardless of their protective status. In other words, game and non-game species alike will benefit from good habitat management practices. Both classifications are taken into consideration as management strategies are developed and decisions are made.

The primary objectives for the wildlife area are: creating and maintaining quality wildlife habitat for a wide variety of wildlife species (both game and non-game), promoting quality wildlife-dependant recreation, protecting SGCN and improving water quality in all of the associated aquatic ecosystems. This Forest Wildlife Stewardship Plan strives to develop forest stands that have a diversity of tree sizes and species. Developing a diverse

forest will benefit the widest variety of wildlife species. Wildlife species have diverse habitat requirements. Even on a given WMA, what is productive habitat for one species may be unproductive for another. This plan will strive to find balance for all species.

Early successional forest dependent Species of Greatest Conservation Need including American woodcock, yellow-billed cuckoo, black-billed cuckoo, common yellowthroat and field sparrow populations in northeast Iowa are declining, in large part due to a lack of early successional growth. Many other neotropical migratory birds dependent on early successional growth are also declining. Because a majority of the restored habitat on Buffalo Creek WMA is tallgrass prairie, the area is conducive to intensive management for early successional habitat. The woodland stands that, if not managed, serve to fragment the larger blocks of native grassland are of particular interest for early successional management. These stands will be managed to compliment the grassland habitats that surround or abut them.

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, convert areas to more desirable species, and complete the early successional cuts. Harvesting is a very minimal portion of this plan. The majority of work recommended is to complete the early successional work, thin young stands so that the oak is not shaded out by other trees, remove undesirable species to encourage natural regeneration of desirable trees, and tree planting.

Current Distribution of Tree Size on the Area -

The woodland was stand mapped according to the average tree size as follows:

Tree Size	**Acres**	**% of Total Area**
Sapling (<4” dbh)	45.4	12
Pole size (5-12” dbh.)	60	15.7
Medium Size (14-18” dbh.)	219.5	57.6
Large (>20” dbh)	56.1	14.7
Totals	381	100

Proposed Management Systems for the Area

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

Based on Forester recommendations for Buffalo Creek WMA, the acres under each management system are as follows:

Management System	**Acres**	**% of Total Area**
Early Successional	154	40
Even Age	149	39
Uneven Age	78	21
Viewshed	0	0
Total	381	100

Early Successional Management -

Many species of birds such as American woodcock, blue-winged warbler, black-billed cuckoo, yellow-billed cuckoo, and eastern towhee are dependent on the early stages of woody growth for at least some part of their life cycle. The high stem density of both trees and shrubs provides suitable foraging and/or nesting habitat, and protection from predators. This type of habitat is most easily created by cutting a stand and allowing all of the desirable species to re-sprout. Many tree and shrub species stump sprout vigorously after being cut, especially when cut at a younger stand age.

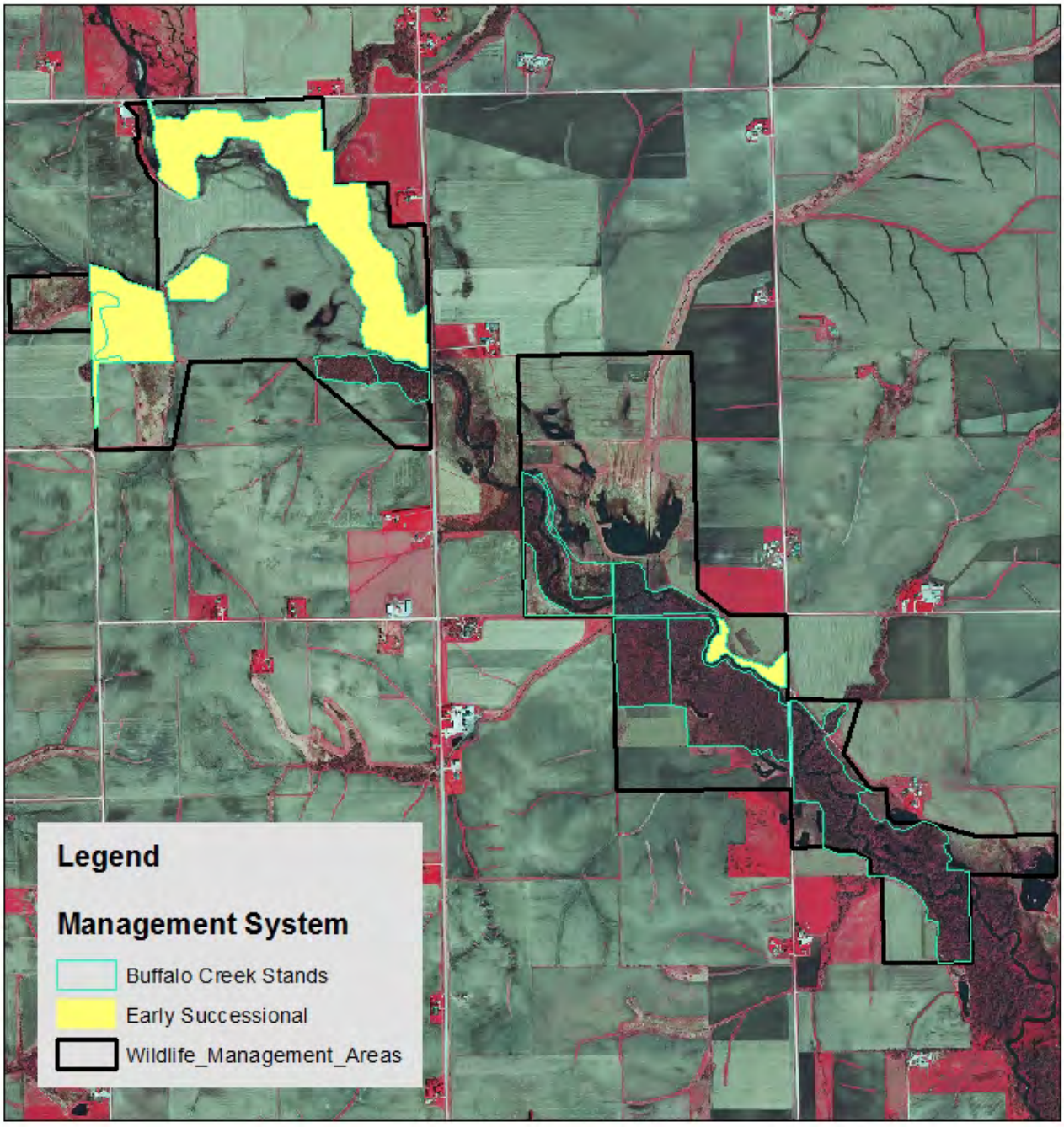
Buffalo Creek WMA has a high percentage of its woodland area that is recommended for early successional management. Managers recognize that this type of management, at this scale, is appropriate to meet the overall objectives of the WMA. Several factors support the decision to create a large proportion of young forest stands, including; the recognition that Buffalo Creek WMA is primarily a grassland complex, the lack of young forest/shrubland in the region, and the historic land cover.

The majority of early successional management is recommended for the creek corridor and for isolated small patches of trees that exist within larger blocks of grassland habitat. Keeping the woody species growth "low and dense" in these areas will limit the fragmentation of the grassland and will create more attractive habitat for grassland/shrubland species. Some of this management will also take place on the woodland edges This work will "feather" the edges and make a gradual transition from the grassland field edges to the larger trees. Feathering or softening the edges creates attractive cover for "edge" species and often results in less nest parasitism of interior forest bird species by brown-headed cowbirds.

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

Buffalo Creek has 154 acres (40% of all woodland acres) scheduled for early successional management. Applying sustainable forestry guidelines, 50 acres could be cut every 5 years, or 10 acres could be cut each year.

Buffalo Creek Wildlife Area
Early Successional Managment - 154 acres



0 1,950 3,900 7,800 Feet

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Delaware County

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 WMA's 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, such as the blue-winged warbler, black-billed cuckoo, yellow-billed cuckoo, Eastern towhee and American woodcock.

Sapling to small pole sized stands between 10 and 20 years old, may be used by species such as the Kentucky warbler. From age 20-60 years, pole to medium size trees tend to be used by canopy nesters such as the scarlet tanager, and ground nesters such as the ovenbird.

Mature stands of 60 to 125 years of age are used by birds such as the wood thrush, Acadian flycatcher, ovenbird and scarlet tanagers. They are also important for game species such as squirrels and wild turkey.

As woodland stands age, they constantly lose trees to shading, insects, disease and other factors. The dead and dying trees provide habitat for cavity nesters such as wood ducks, woodpeckers, nuthatches and titmice. Over 30 species of Iowa nesting birds nest in the cavities of trees. Iowa's seven species of woodpeckers (including two SGCN) are the primary cavity builders and nesters, and these woodpeckers are the keystone species that provide the cavities for so many other secondary nesting birds, as well as providing homes for flying squirrels, bats, and chipmunks and a host of other species. It is recommended that 6-10 snag trees (6" diameter and larger) per acre be left standing to provide habitat for a very substantial number of species. The state and federally endangered Indiana bat and the federally threatened northern long-eared bat use loose barked live trees such as hickory as well as the sloughing bark from dying trees for their maternity colonies.

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 and turkey, and is essential to the regeneration of oak which require full sunlight. The only way that oak can be maintained as a component of the forest is by practicing some form of even age management.

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

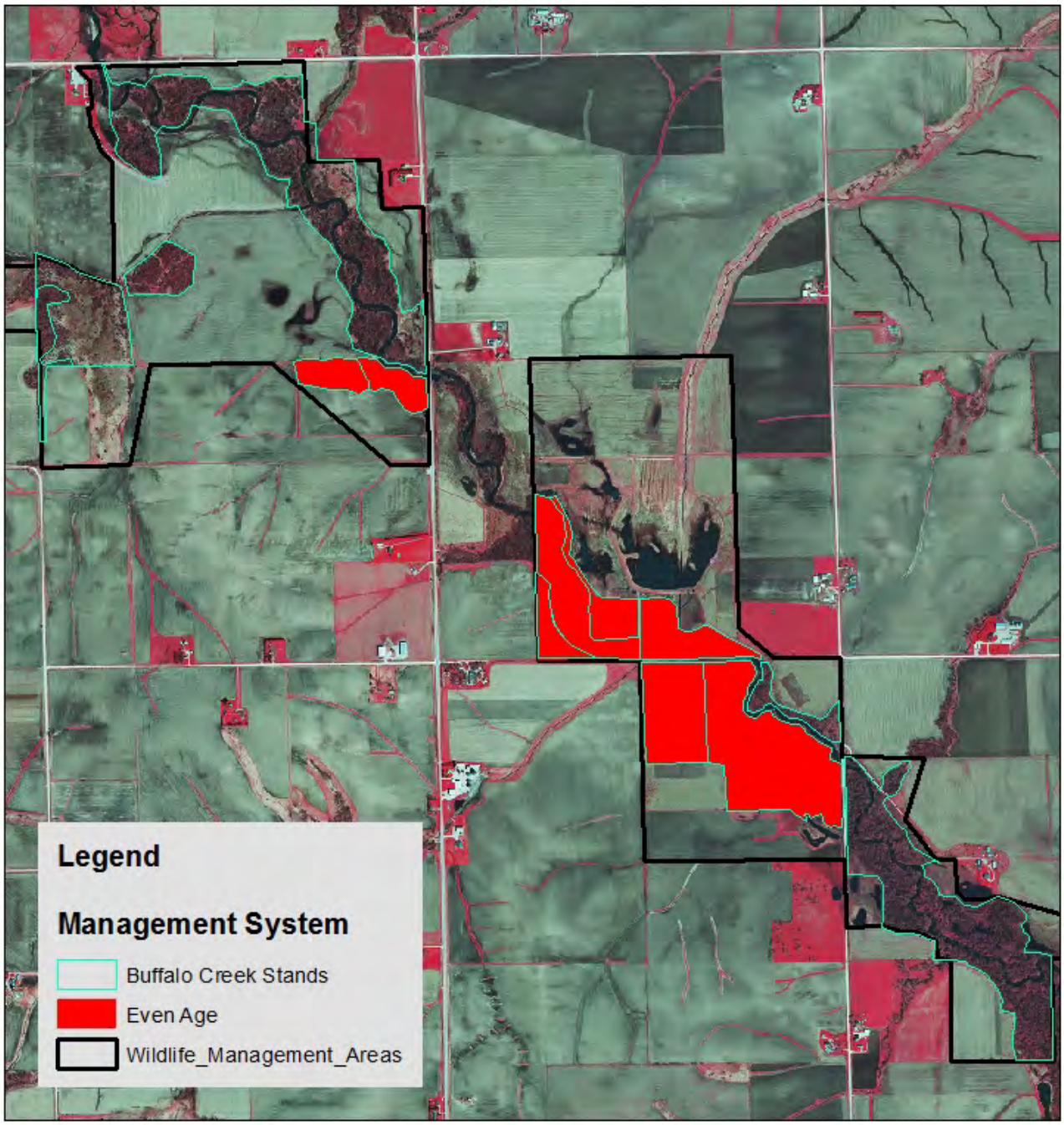
Shelterwood is a form of even-age management. The final cut is a clearcut, but several thinnings are done prior to the final cut. The large, healthy trees are left to provide seed for naturally reseeding the stand, and to create partial shade to inhibit the growth of weeds and brush until the desirable seedlings are well established. The final cut, or clearcut, is normally done when there are a sufficient number of desirable trees that are 3-5 ft. tall. The shelterwood system can take many years to develop a good stocking of desirable young trees. You may have to kill the undesirable species several times to favor the species you want. The final clearcut should not be made until you are satisfied with the stocking of desirable young trees.

Clearcutting to create full sunlight is essential at some point in the stand's life to successfully regenerate oak. If stands are not clearcut, the oak component of the forest will be lost to shade tolerant species. 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 (5-10" dia.) stand of trees.

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

Buffalo Creek has 149 acres (39% of all woodland acres) that will be managed as even aged woodlands to regenerate oak (125 year rotation). Applying sustainable forestry guidelines, approximately 6 acres will be clearcut every 5 years.

Buffalo Creek Wildlife Area
Even Age Managment - 149 acres



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Uneven Age Management -

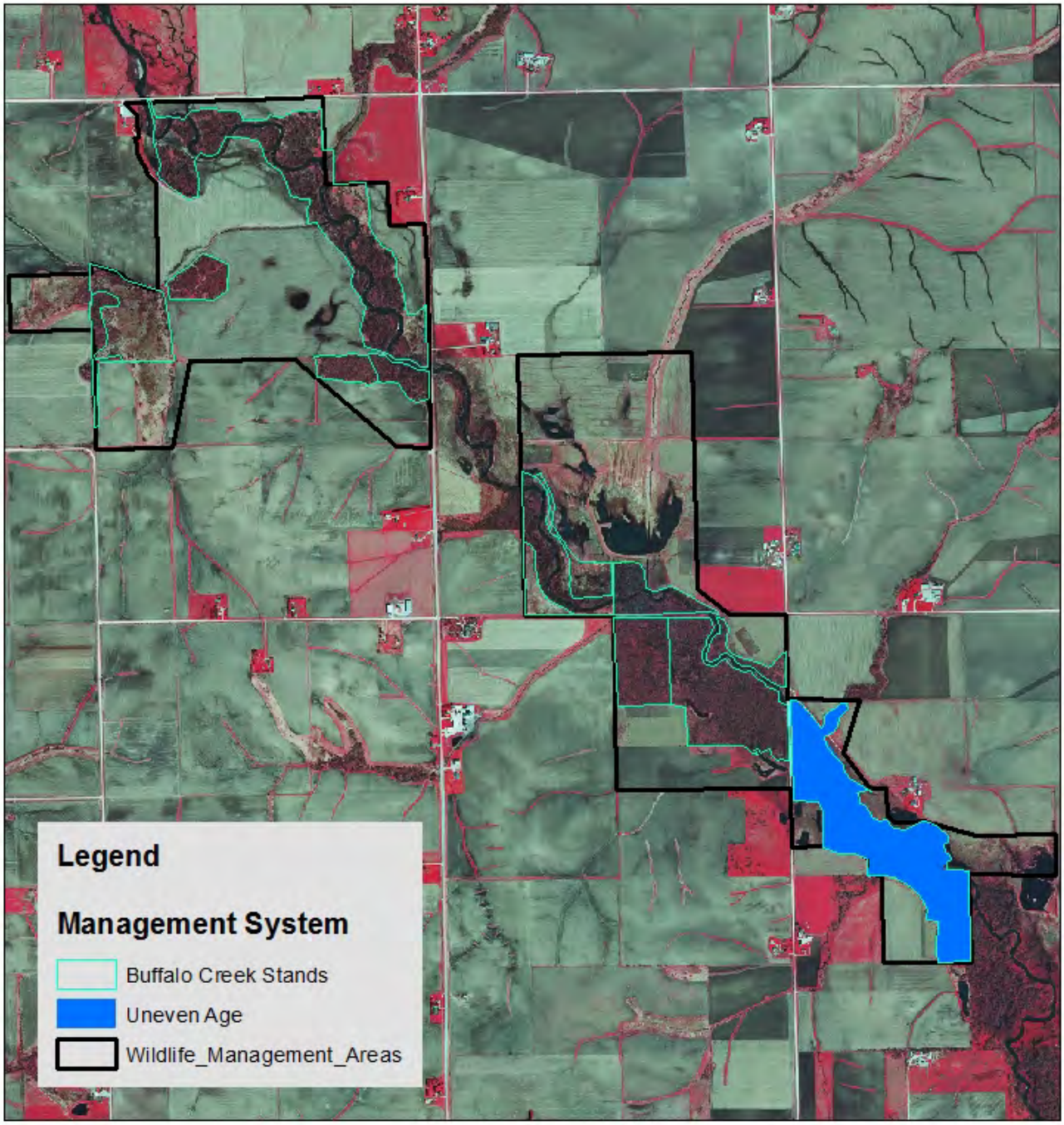
Uneven age management develops a stand of trees with all tree sizes represented. The stand structure is developed by selectively harvesting mature and defective trees, and removing unwanted small trees that are damaged or defective. Because uneven age stands always have large trees present, this system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

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

Uneven age management areas will provide continuous tracts of woodland with minimal disturbance. Large tracts of uneven age management will provide necessary habitat for nesting GCN neotropical migratory bird species such as Eastern wood-pewee, Acadian Flycatcher, wood thrush, cerulean warbler, worm-eating warbler, Kentucky warbler, and for migrant GCN neotropical migratory species such as golden-winged warbler, bay-breasted warbler, and Canada warbler. Selective harvesting will create small openings in the canopy, which will increase ground cover, and enhance stand structure. Den trees will be left to provide cavities for wildlife such as woodpeckers, bats, raccoons and squirrels. Timber stand improvement and selective harvesting, along with allowing some natural tree mortality, will create woody debris on the forest floor that will serve as important habitat for reptiles and amphibians along the riparian corridor.

Buffalo Creek has 78 acres (21% of all woodland acres) that will be managed as uneven aged forests. Applying sustainable forestry guidelines, approximately 4 acres can be selectively harvested every 5 years. Selective harvests may be used on this area (in conjunction with other management practices) as an important step in the process of creating more species diversity in the forest stand.

Buffalo Creek Wildlife Area
Uneven Age Managment - 78 acres



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Viewshed Management -

Viewshed areas are typically steep slopes, areas along streams which are fragile and are best left to naturally progress through succession, or other particularly sensitive sites (ecologically or socially). Areas where endangered plant or animal species exist may also be under the viewshed system of management. Management can take place on these areas where desirable, but the primary objective is to have very minor disturbance if any.

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

Buffalo Creek does not have any forest stands that will be managed as viewshed.

SOILS

The vast majority of the forested areas located within Buffalo Creek WMA consist of bottomland floodplains that experience very frequent, although typically short lived and minor, flooding events. These bottomland floodplain areas can be classified by viewing the area as a series of benches that begin at the creek's edge. These are also commonly referred to as stream terraces.

The first bench is defined as the area from the creek's banks to the toe slope where the floodplain rises and appears to form a bench. This area tends to be very flat and typically floods on an annual basis. These floods tend to not be very powerful or long-lasting. Nearly all of this area is mapped as Spillville-Coland soil. This particular soil type has a wide range of characteristics from well drained and fertile all the way to very poorly drained and saturated to the soil surface. Most of this area consists of somewhat well drained soils that are highly suitable for growing bottomland oaks such as bur oak, swamp white oak and pin oak. The poorly drained areas are better suited for silver maple, cottonwood and sycamore.

The second bench begins at the top of the first slope that forms the appearance of a terrace. Sometimes this transition from first to second bench is very gradual but the contrast in forest vegetation is clear when walking through these areas. The second bench area just tends to mold into the adjacent higher ground due to the gently sloping topography. These second bench areas account for only a small portion of the total forested area but are significant due to the fact that they are very well suited for growing upland oaks including red oak, white oak and bur oak. These areas contain a wider variety of soils that almost all share a very sandy parent material that causes them to be somewhat droughty. This also favors upland oaks.

A brief description of the soils can be found within each stands narrative.

WORK PLAN

FOR

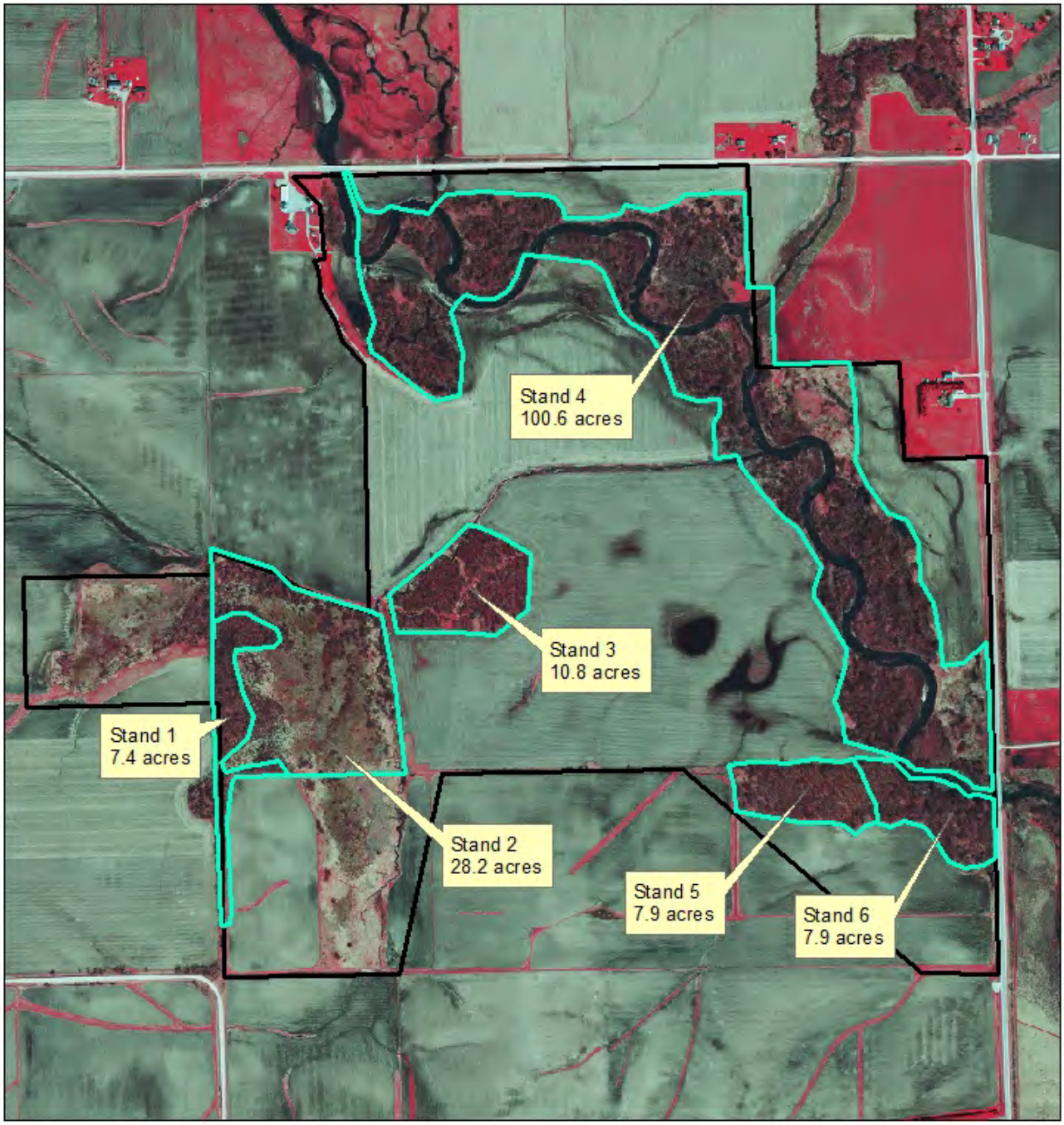
BUFFALO CREEK WMA

This is the "working plan" for Buffalo Creek WMA 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.

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.

Buffalo Creek Wildlife Area

Stands 1-6



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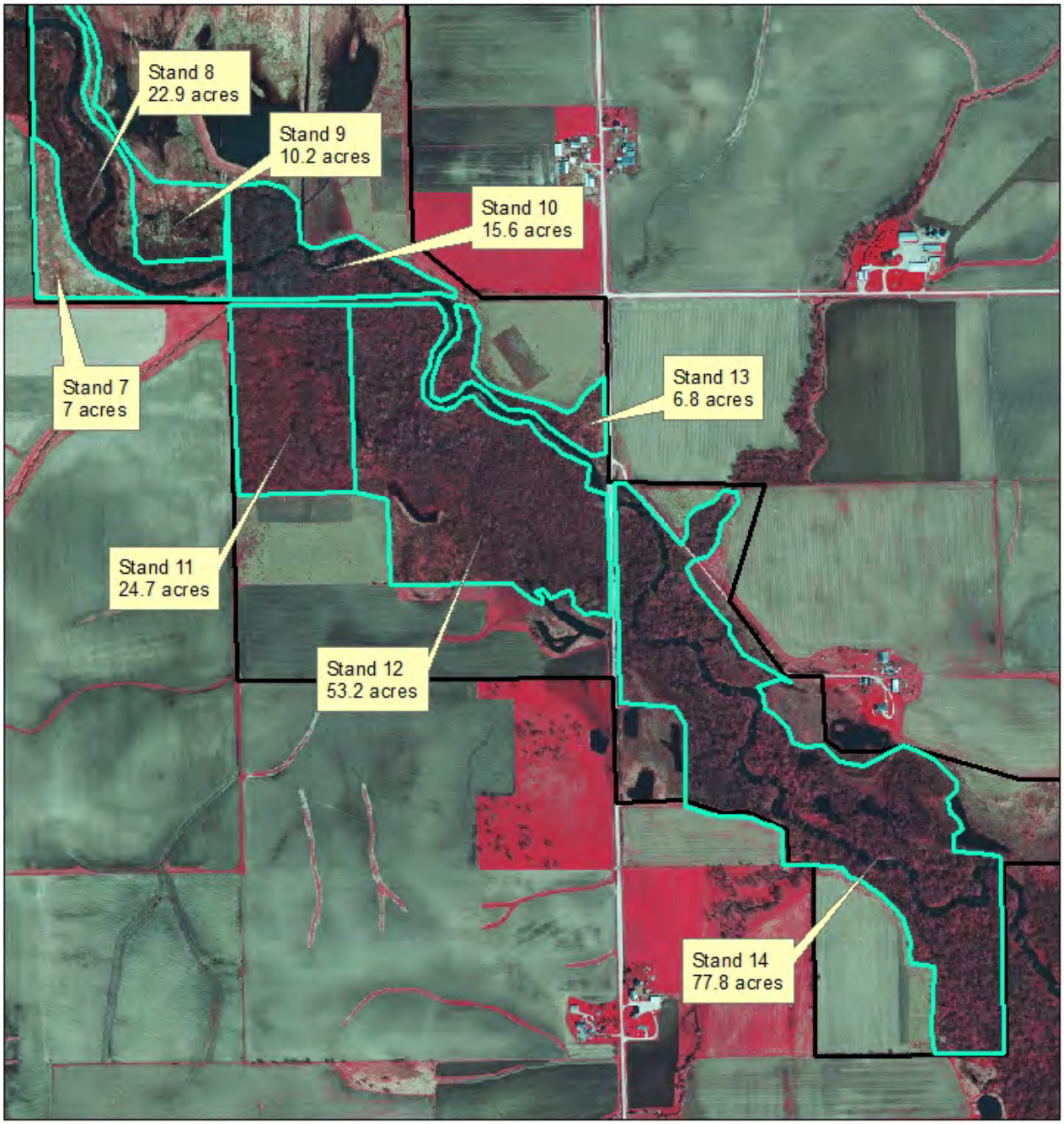
Buffalo Creek Wildlife Area

Stands 7-14



Sec. 28, 29, 33, Adams Twsp.
Delaware County

DESCRIPTION AND RECOMMENDATIONS FOR INDIVIDUAL STANDS

Stand 1: 7.4 acres

Site Description -

This stand is relatively flat and slopes slightly to the east. The predominant soil type on this site is a Clyde-Floyd complex with Clyde being poorly to very poorly drained and located closer to the bottom of the slope and Floyd being somewhat poorly drained, deep and located on the upslope from the Clyde soil.

Woodland Description-

The overstory of this stand is very diverse with species including silver maple, black walnut, black cherry, hackberry, elm, white mulberry (non-native), bitternut hickory, bur oak (wolf trees) and a handful of aspen that range in size from 2-18" DBH. The understory consists of a nice shrub layer with plum, chokecherry, hawthorn and brambles.

Management Recommendations – Early Successional

The main objective for this stand is to provide early successional habitat in order to provide the best transition to the grassland fen. This can be accomplished by felling all overstory trees and shrubs and allowing them to resprout. Any desirable mast producing species such as oak, black walnut or black cherry should be left standing, as well as some of the hawthorn. All non-native species such as honeysuckle, buckthorn and mulberry should be cut and have the fresh wound treated with an herbicide such as Rodeo® or Garlon® 3A that are labeled for use in areas with a high water table.

After completing these recommendations, this stand should be a very dense stand of saplings, shrubs and a few large overstory trees that provide excellent early successional habitat for a diverse mix of species. This early successional habitat can be maintained by completing this management every 10-15 years. Please see the attached list for species that are likely to benefit from this type of management.

Stand 2: 28.2 acres

Site Description -

This stand is flat with the predominant soil type being Palms muck. Palms muck is a peat soil that remains saturated throughout the growing season. This saturated condition and the peat soil combine to create what is known as a fen. Fens are very unique features and are host to a wide range of rare and declining flora and fauna.

Woodland Description -

The woody component of this fen contains mostly smaller trees and shrubs including plum, chokecherry, gray and silky dogwood, willow, boxelder and elm. These plants are stunted due to the extremely wet conditions of this site.

Management Recommendations – Early Successional

This stand contains some unique soil types and hydrology and management activities will be cautiously evaluated as conducted. Management activities should avoid detrimental disturbances to unique plant species which do exist on the site. The objective for this area is to keep it in a state of early succession, even restoring it to more native grasses, sedges, forbs and rushes if possible. Woody vegetation in this stand should be limited to the native shrubs which have adapted to the site. In general, maintain the wetland plant community will require removing most of the woody vegetation.

Once the area is thoroughly assessed and inventoried, the woody competition can be controlled by felling or girdling the undesirable woody material and treating the fresh cut wounds with an herbicide such as Rodeo® or Garlon® 3A that are labeled for use in areas with a high water table.

Once the woody vegetation is removed from this site it can be considered part of the overall grassland habitat and its management can be combined with surrounding grassland tracts rather than managing it a woodland stand.

The end result of this work will be a fen that is relatively void of undesirable woody competition which will free up light for grassland species and wetland grasses, sedges and forbs to thrive.

Stand 3: 10.8 acres

Site Description –

This stand is relatively flat with the predominant soil type being Sparta loamy fine sand which is excessively well drained due to its high sand content and very prone to drought. There is a small area of Spillville-Coland complex along the edge of the creek which is somewhat poorly drained and has a high moisture holding capacity.

Woodland Description -

The overstory of this stand consists of 2-18" black oak, black walnut, silver maple, hackberry, elm, white mulberry and scattered bitternut hickory. The understory consists of a nice shrub layer which contains hawthorn, brambles, multiflora rose, gooseberry, elderberry and chokecherry.

Management Recommendations –Early Successional

The objective is to promote early successional habitat in this stand. This is a bit tricky due to the sandy soil and its droughty nature. A modified approach to the normal cut everything and let it sprout practice would be best for this site and should result in a

very brushy savanna-like stand. Black oak, nicely formed black walnut and many of the better hawthorn should be left standing. All other trees and shrubs should be felled and allowed to sprout. Non-native species such as white mulberry, buckthorn, honeysuckle and multiflora rose should be cut and have the fresh wound treated with an herbicide such as Rodeo® or Garlon® 3A that are labeled for use in areas with a high water table.

After completing these recommendations, this stand should be a very dense stand of saplings, shrubs and a few large overstory trees that provide excellent early successional habitat for a diverse mix of species. This early successional habitat can be maintained by completing this management every 10-15 years. Please see the attached list for species that are likely to benefit from this type of management.

Stand 4: 100.6 acres

Site Description –

This stand is very flat, adjacent to the creek and prone to flooding. This stand is almost entirely comprised of Spilleville-Coland complex soils and the drainage ranges from moderately well drained in areas to poorly drained for most of the stand.

Woodland Description -

This stand is very diverse with an overstory consisting 2-18" DBH of black cherry hackberry, green ash, American elm, river birch, black oak, black walnut, black willow, white mulberry, boxelder and scattered large bur oak. Approximately half of this stand contains trees. The other half of this stand consists of shrubs including: prickly ash, chokecherry, elderberry, buckthorn, wild plum, multiflora rose, hawthorn, honeysuckle, small boxelder and small river birch.

Management Recommendations – Early Successional

The objective is to promote early successional habitat in this stand and this is an excellent area for that purpose. This can be accomplished by felling nearly all overstory trees and all shrubs and allowing them to resprout. This should be done in sections to spread out the early successional benefits by creating several age groups. Any desirable mast producing species such as oak, black walnut, black cherry and hawthorn should be left standing. All non-native species such as honeysuckle, buckthorn, multiflora rose and white mulberry should be cut and have the fresh wound treated with an herbicide such as Rodeo® or Garlon® 3A that are labeled for use in areas with a high water table.

After completing these recommendations, this stand should be a very dense stand of saplings, shrubs and a few large overstory trees that provide excellent early successional habitat for a diverse mix of wildlife species. This early successional habitat

can be maintained by completing this management every 10-15 years. Please see the attached list for species that are likely to benefit from this type of management.

Stand 5: 7.9 acres

Site Description -

This stand slopes slightly upward as you move from east to west. The stand consists of primarily Schley soils with Clyde-Floyd soils at the west end. These loamy soils are somewhat poorly drained.

Woodland Description -

This site appears to have been high-grade logged prior to the DNR purchasing the property, which has left primarily low quality and or diseased trees. This stand contains primarily large (>20" dbh) tees. This stand is diverse, with an overstory containing pin oak, bur oak, bitternut hickory, black cherry, elm, basswood, silver maple, green ash, river birch, and hackberry. The understory contains primarily shrubs including prickly ash, chokecherry, elderberry, multiflora rose, hawthorn, honeysuckle, small boxelder and small river birch.

The overstory of this stand is showing signs of serious disease pressure which is evident by the large-scale mortality of the pin oak. This stand should be a priority of management within the first two years of the approved FWSP.

Management Recommendations – Even Age

Based on the overall objectives for managing this property, this area should be restored to desirable species such as bur oak, white oak, and black walnut.

It appears as though the pin oak, which makes up a majority of this stand, is infected with oak wilt fungus. Oak wilt is a vascular disease that is spread to one or more oaks by an oak wilt infected bug that lands on a tree wound in May or June. The fungus rapidly colonizes the black oaks and cuts off the flow of water and nutrients. This leads to tree mortality in one growing season with the trees typically turning brown in July or August. The fungus can then travel through root grafts to other black oaks that are within one tree height of the epicenter. The fungus typically does not stop until it runs out of root grafted black oaks.

This site should clear-cut harvested as a sanitation procedure to remove the oak wilt from this stand. Due to the lack of desirable species in the understory and the size of this stand, it is appropriate to reforest the area with oak seedlings.

Planting (ideally this will occur prior to harvesting): procure approximately 1,600 bare root seedlings (200 seedlings per acre) for this stand. The planting should include 200 black walnut, 800 bur oak and 600 white oak seedlings for the higher elevation portions of the stand. A contractor should be hired to complete this work.

Stand 6: 7.9 acres

Site Description -

This stand slopes slightly from the creek up to its borders with the prairie fields. This stand consists of both Spillville-Coland soils and Chelsea Loamy Fine Sand. These soils range from very poorly drained to excessively well drained.

Woodland Description -

This site appears to have been high-grade logged prior to the DNR purchasing the property, which has left primarily low quality and or diseased trees. This stand contains primarily large (>20" dbh) tees. This stand consists of an overstory containing silver maple, green ash, river birch, pin oak, hackberry, elm, and basswood. The understory contains primarily shrubs including prickly ash, chokecherry, elderberry, multiflora rose, hawthorn, honeysuckle, small boxelder and small river birch.

The overstory of this stand has reached biological maturity and is showing signs of decline in the silver maple, as well as the diseased pin oak component as described in the previous adjacent stand. This stand should also be a priority of management within the first several years of the approved FWSP.

Management Recommendations – Even Age

Based on the overall objectives for managing this property, this area should be restored to desirable species that are well adapted to the site, such as sycamore, river birch, silver maple, and cottonwood.

Many of the non-oak desirable species in the stand are reaching biological maturity and are showing signs of severe decline. As mentioned above, most of these trees are lower quality due to what appears to be recent high-grade logging.

This site should clear-cut harvested as a sanitation procedure to remove the oak wilt and declining maple from this stand. Due to the lack of desirable species in the understory and the size of this stand it is appropriate to reforest the area with oak seedlings.

Planting (ideally this will occur prior to harvesting): procure approximately 1,600 bare root seedlings (200 seedlings per acre) for this stand. The planting should include 200 swamp white oak and 200 bur oak seedlings for the higher elevation portions of the stand and 400 sycamore, 400 river birch, 200 cottonwood, and 200 silver maple for the lower elevation areas. A contractor should be hired to complete this work.

Stand 7: 7 acres

Site Description -

This stand is very flat and on a second bench of Buffalo Creek. The predominant soil type in this stand is Wapsie loam which is well drained and relatively shallow to a gravely substrate causing it to be somewhat prone to drought.

Woodland Description –

This stand was direct seeded with acorns in the fall of 2003. The species that were seeded included red oak, bur oak, white oak, swamp white oak and black cherry. This seeding did very well and all of these species are now present in the overstory of this stand along with elm, ash, hackberry, mulberry and cottonwood to lesser extents than the species that were seeded. This stand is currently overstocked with hardwood trees and their growth has slowed down due to this competition. There is also an area of shrubs and conifers on the west and south borders of this stand that are doing very well and do not require management at this time.

Management Recommendations – Even Age

The primary objective for this stand is restoring this site to a mature upland oak forest which will provide habitat for interior forest birds and ample amounts of mast for wildlife. Due to the fact that this stand is currently overstocked with desirable mast producing trees it would benefit from a Timber Stand Improvement (TSI) practice known as a crop tree release. Crop trees are selected based on species and growth form and then are released from surrounding competition on all four sides if possible. This gives the crop trees more space to spread out their canopies and improves their health and vigor.

This stand should have 50-100 crop trees per acre released from direct completion. Some acres are a bit denser than others and should have more trees released than the areas that still have heavy grass in the understory. Trees that are competing with the crop tree should be felled or double girdled to top-kill them. Any undesirable species such as elm, bitternut hickory and hackberry should be treated with an herbicide to prevent them from sprouting as they are shade tolerant and will resprout and continue to grow in the understory and eventually reach the overstory.

Selecting crop trees is very technical in nature and should either be completed by a professional forestry contractor or marked by a professional forester. A DNR forester will be available to mark crop trees if Wildlife Bureau staff would prefer to complete the crop tree release.

After completing a crop tree release on these acres, the selected mast producing crop trees should be free on all four sides, meaning they should have at least 6’ of space

to grow on all sides. The crop tree release should be completed as soon as possible as the competition these trees are experiencing has the potential to cause insect and disease problems when combined with the dry nature of this site.

Stand 8: 22.9 acres

Site Description -

This stand is very flat, adjacent to the creek and prone to flooding. This stand is almost entirely comprised of Spilleville-Coland complex soils and the drainage ranges from moderately well drained in areas to poorly drained for most of the stand.

Woodland Description –

The overstory of this stand is somewhat open in places and fully canopied in others. The overstory of this stand is also very diverse and contains swamp white oak, pin oak, bur oak, cottonwood, American elm, red elm, hackberry, black cherry, green ash, river birch, silver maple and black willow with a wide range of sizes and age classes. The understory consists of a nice shrub component including with plum, chokecherry, hawthorn and brambles.

Management Recommendations – Even Age

The main objective for the north half of this stand is to maintain the area in early successional habitat and the south half would be maintained as an even-aged bottomland oak forest. Combining the two management systems will probably produce the best results. Areas that have an oak overstory would be managed to promote and maintain them and areas that have more of a shrub component should be managed for early successional habitat.

The areas that have a significant oak component would benefit from a TSI practice known as a weed tree removal. In order to complete a thorough weed tree removal all weed species (in the oaks portions only) including elm, ash, hackberry, bitternut hickory, silver maple, willow and cottonwood should be felled or girdled and have the fresh cut stump treated with an herbicide such as Rodeo® or Garlon® 3A that are labeled for use in areas with a high water table to prevent them from sprouting. Any viable oak species that is 2" or greater DBH should be released from direct competition as well. Vines that are growing on desirable tree species such as oak should also be cut and treated with and herbicide also. This work should occur between the end of August and beginning of March in order for the herbicide to be effective.

Areas that have a heavier shrub component and very few oaks should be managed for early successional habitat. This can be accomplished by felling all overstory trees and shrubs and allowing them to resprout. Any desirable mast producing species such as oak, black walnut or black cherry should be left standing. All non-native species such as honeysuckle, buckthorn and mulberry should be cut and have the fresh wound treated with an herbicide such as Rodeo® or Garlon® 3A that are labeled for use in areas with a high water table.

After completing these management recommendations, the stand will be transformed into a mosaic of pockets of desirable mast producing species and dense shrublands containing a few scattered desirable mast producing trees. The early successional areas can be maintained by repeating the cutting on a 10-15 year cycle. The areas that are being managed for oaks have no specific time frame for further management other than as needed (likely 10-20 years from the first TSI).

Stand 9: 10.2 acres

Site Description -

This stand is very flat, adjacent to the creek and prone to flooding. This stand is almost entirely comprised of Spilleville-Coland complex soils and the drainage ranges from moderately well drained in areas to poorly drained for most of the stand.

Woodland Description –

This area was planted with 5' tall nursery stock in the spring of 2007. There has been little tree mortality and as such most of the saplings that were planted are still alive. The species that were originally planted were red oak, swamp white oak, bur oak and sycamore. The trees are now approximately 10' tall. The understory of this stand contains mainly native prairie grasses and reed canary grass.

Management Recommendations – Even Age

The primary objective for this stand is to restore the area to a bottomland oak forest. The stand is well on its way to that goal with the saplings that were planted. There is no need for management at this time as all of the trees have plenty of room to grow. Prescribed fire in any grassland stands adjacent to this site should be conducted with great care so as not to burn this area. Burning this area will top-kill the desirable trees and they will be set back 8 years or more of growth.

The desired result of this stand is a mature bottomland oak forest that will provide habitat and hard mast for a variety of wildlife. It will take many decades for these trees to reach maturity, so in the mean time the most important factor is to ensure that they have ample room to spread their canopies. This stand should be reassessed every 10 years or so to determine if any management is needed to improve the growth of the oaks.

Stand 10: 15.6 acres

Site Description –

This stand is very flat, adjacent to the creek and prone to flooding. This stand is comprised entirely of Spilleville-Coland complex soil and this particular site is extremely wet with pockets of standing water throughout this stand.

Woodland Description -

The overstory of this stand consists of mature to over-mature 24-30+" silver maple and a few swamp white oak. Silver maple and swamp white oak are perfectly suited for this site and likely two of only a handful of tree species that can grow to their fullest potential on a harsh site like this. If left unmanaged the silver maple will begin to decline rapidly and break apart over time. They require full sunlight to regenerate a new crop of seedlings and this can only occur if nearly all of them would die at one time. If they die slowly over time they will be replaced by elm, ash and hackberry which will have very short lives on a site like this. The few swamp white oak are huge and very valuable to wildlife.

Management Recommendations – Even Age

The main objective for this stand is to maintain the swamp white oak component. As a result of their value to wildlife and the fact that they are very well suited for life on a site like this, it would be ideal to regenerate them (which can only be completed by first conducting a harvest as both species are intolerant of shade and will not regenerate under their own canopies). Having a component of silver maple in this stand will add to the diversity and is encouraged. All of the trees in this stand are nearly to their biological maturity and as stated will begin to decline at an accelerated rate. The only viable option to maintain silver maple and swamp white oak on this site is to conduct a harvest and remove the overstory either in stages with a shelterwood harvest or all at once with a clear-cut harvest.

A shelterwood harvest is essentially a multi-staged clear cut where a portion of the trees are removed at one time and the best of the best remain to provide a seed source for the next crop of trees. Once the site has adequate regeneration in place (300+ saplings per acre) the project can be considered a success and the remainder of the overstory trees can be removed, with the exception of the swamp white oak which should not be harvested. The remaining (non-oak) overstory trees must be removed at some point in order to provide full sunlight to the new saplings or they will eventually die due to shading.

Clear-cutting would remove the entire overstory (except for the swamp white oak) at one time and open the stand up to full sunlight immediately. This method is effective if there are seedlings in place already and there were very few that were counted due to the intense shade in the understory. It is very likely that tree seedlings would need to be planted after a harvest to help ensure that silver maple and swamp white oak are maintained on this site. It is also possible to have to plant in a shelterwood harvest also.

The results of regenerating this stand back to silver maple and swamp white oak will be a thick stand of swamp white oak and silver maple saplings that will mature into the next bottomland forest.

Stand 11: 24.7 acres

Site Description –

This stand is very flat and on a second bench of Buffalo Creek. The predominant soil type in this stand is Wapsie loam which is well drained and relatively shallow to a gravely substrate causing it to be somewhat prone to drought.

Woodland Description -

The overstory of this stand is predominantly upland oak and shagbark hickory that includes: white oak, black/red oak, bur oak and shagbark hickory that range from 14-24+" DBH. These are very desirable species that produce vast amounts of hard mast. There is a significant amount of species present that do not produce hard mast and that are not rare or declining including: elm, ash, hackberry and bitternut hickory. These species are competing with your overstory oaks and shagbark hickories which results in reduced acorn production and an increase in insect and disease problems related to them being stressed. It needs to be noted that the upland oak/hickory forest type is a rare and declining habitat and the management prescriptions are aimed solely at maintaining this forest type.

Management Recommendations – Even Age

The primary objective for this stand is to maintain the oak/hickory forest cover in perpetuity. The current overstory is approaching biological maturity and will begin to decline over the next several decades (oaks and hickories will die). Due to oaks and shagbark hickory being intolerant of shade (cannot regenerate themselves under their own canopies) they will eventually be replaced by shade tolerant species such as elm, ash, hackberry and bitternut hickory. The following list of recommended management activities is designed to naturally regenerate the oak/hickory forest cover through a series of harvests known as a shelterwood. This can be controversial due to eventually removing all of the overstory except designated wildlife trees but is absolutely necessary to maintain this forest cover.

1. Timber Stand Improvement (TSI) – All of the shade tolerant tree species that are present in this stand are considered weed trees with respect to the goal of maintaining an oak/hickory forest type. Completing a TSI weed tree removal will eliminate these species and increase the amount of sunlight that reaches the understory and improve the odds of obtaining desirable regeneration. All shade tolerant species that are 1" DBH or greater such as elm, ash, hackberry, bitternut hickory and ironwood should be felled or girdled and treated with an herbicide such as Roundup® or Garlon® 4 to prevent them from resprouting. This will free up growing space and improve mast production.

2. Commercial Thinning – At least five years after completing TSI on this stand, certain trees should be selected for removal by harvesting. The goal is to reduce the canopy cover to approximately 50%. This will greatly increase the amount of light that reaches the understory and allow oak and shagbark hickory seeds to germinate and thrive. The trees that are selected for removal will be culls and

unacceptable growing stock that are either suppressed or have defects that result in a high likelihood of them not making it to the final stage. The trees that remain on this site to provide seed and shelter for desirable regeneration will be the best of the best.

3. Final Harvest – This final stage may take 10 or more years to implement and is entirely dependent on obtaining adequate regeneration. Prior to completing the final harvest you must have adequate regeneration of oaks and shagbark hickories which includes 300+ advanced seedlings and saplings per acre. Once a forester has determined that there is adequate regeneration of desirable species on this site the remaining overstory must be removed to provide full sunlight to the new crop of oaks and shagbark hickories. It is absolutely critical to provide the young oaks and shagbark hickories full sunlight or they will remain suppressed and die resulting in the plan moving back to step 1.

It may also be desirable to feather the south edge of this field by felling all tree and shrub species to provide "soft edge", which is a gradual vertical gradient from the crop field to the forest stand. Herbicides should not be used on felled species, with the exception of exotic invasive species such as honeysuckle and buckthorn which should be stump treated with Rodeo® or Garlon® 3A to prevent them from resprouting. This will promote a bushy early successional edge and eliminate the hard edge that is undesirable to many wildlife species.

After these management activities have been completed the site should exhibit a healthy stand of young oak and shagbark hickory trees that will grow into the next mature forest. Patience is necessary when trying to regenerate oaks and adjustments may need to be made to the prescription to help ensure that the future forest stand is dominated by oak and shagbark hickory.

Stand 12: 53.2 acres

Site Description –

This stand is very flat, adjacent to the creek and prone to flooding. This stand is almost entirely comprised of Spilleville-Coland complex soils and the drainage ranges from moderately well drained in areas to poorly drained for most of the stand.

Woodland Description -

This area was planted to trees approximately 30 years ago (mid 1980's) and is now a pole-sized (6-12" DBH) stand that contains bur oak, black walnut, pin oak, red oak, swamp white oak, ash, river birch, cottonwood, silver maple, willow and white oak.

Management Recommendations – Even Age

The primary goal of this stand is to maintain and promote the hard mast producing floodplain species such as oak and black walnut. This area had a TSI crop tree release completed within the last decade and is currently doing very well. The oaks and black walnuts currently have plenty of room for their canopies to grow but it is highly likely that they will become crowded again in the next 10 years. This stand should be visited again in five years to determine if another crop tree release will improve the production of hard mast. If it is deemed necessary and beneficial to complete another TSI the process will be as follows:

> Up to 50 crop trees will be selected per acre and released from canopy competition on at least two sides. The priority for species to release is in descending order as follows: swamp white oak, bur oak, red oak, white oak, pin oak, black walnut, river birch and silver maple. Crop trees should be released by double girdling the trees that are competing with them for canopy space. Double girdling will result in standing dead trees that will provide habitat for insects, fungi and woodpeckers. No herbicides should be used on the trees that are girdled.

It may also be desirable to feather the south edge of this field by felling all tree and shrub species to provide "soft edge", which is a gradual vertical gradient from the crop field to the forest stand. Herbicides should not be used on felled species with the exception of exotic invasive species such as honeysuckle and buckthorn which should be stump treated with Rodeo® or Garlon® 3A to prevent them from resprouting. This will promote a bushy early successional edge and eliminate the hard edge that is undesirable to many wildlife species.

A bottomland hardwood stand comprised primarily of hard mast producing species that have adequate room to expand their canopies in order to increase mast production and improve tree health and vigor.

Stand 13: 6.8 acres

Site Description -

This stand is very flat, adjacent to the creek and prone to flooding. This stand is almost entirely comprised of Spilleville-Coland complex soils and the drainage ranges from moderately well drained in areas to poorly drained for most of the stand.

Woodland Description –

This stand consists almost entirely of boxelder and willow trees with a few shrubs scattered throughout and a few cottonwoods near the creek. The willows and boxelders are relatively thick with an understory of reed canary grass.

Management Recommendations – Early Successional

The primary goal is to manage this stand for early successional habitat due to its narrow width and it being adjacent to a restored prairie. Boxelder and willow are excellent for this purpose. Managing this area for early successional habitat should be complete by felling all boxelder and willow. Herbicides should not be used on felled species with the exception of exotic invasive species such as honeysuckle and buckthorn which should be stump treated with Rodeo® or Garlon® 3A to prevent them from resprouting.

Boxelder and willow will respond to being cut by vigorously resprouting from the cut stumps. These species grow incredibly fast and will become a thick stand of saplings very quickly which will provide the early successional habitat that is desired for this stand. This treatment may be repeated as necessary every 10-15 years to maintain this habitat.

Stand 14: 77.8 acres

Site Description -

This stand is very flat, adjacent to the creek and prone to flooding. This stand is comprised entirely of Spilleville-Coland complex soil and this particular site is extremely wet with pockets of standing water throughout this stand.

Woodland Description -

This stand appears to have been subject to high grade logging prior to the easement being purchased by the DNR and as such is just about all poorly formed and undesirable bottomland species with a carpet of reed canary grass in the understory. The current overstory trees consist of poorly formed, damaged and at one time suppressed ash, elm, hackberry, boxelder, willow, river birch and cottonwood that range in DBH from 6-18".

Management Recommendations – Uneven Age

The primary goal for this stand is restoring portions of the area to more desirable species such as silver maple, sycamore, pin oak and swamp white oak. It is also desired to maintain a component of mature forest in this stand at all times.

Tree planting on this area will likely be completed on a small scale (1-5 acres) due to the high cost and guaranteed long term management to suppress the reed canary grass. Left to its own devices, this stand will likely become a bottomland savanna with a few scattered trees and an understory of reed canary grass. This makes planting a fantastic alternative but very challenging due to the reed canary grass and high water table of this site.

Species suitable for planting on this site include: swamp white oak, pin oak, bur oak, cottonwood, silver maple, river birch and sycamore. Planting steps may not occur in the following order, but all of the following steps will be implemented.

1. Overstory Removal – Current overstory trees are less desirable to wildlife than the species that have been indicated as suitable for planting. Current overstory trees must be removed to provide sunlight for desirable species to grow as they are all intolerant of shade. Current overstory trees should be felled or girdled and treated with an herbicide such as with Rodeo® or Garlon® 3A to prevent them from resprouting.

2. Tree Planting – Trees will have to be hand planted and will consist of 50 trees per acre with species quantities being based on site conditions (wetness). All of the listed species should be used to provide diversity. Bareroot or container stock may be used and all trees should be protected with a 5' vented tree shelter with a fiberglass stake installed for support.

3. Maintenance – Herbicide will be required to control weeds around the trees including reed canary grass. Rodeo® may be applied around the newly planted seedlings prior to them leafing out in the spring. It may be very carefully applied around the trees during the growing season with careful consideration given to weather conditions to prevent herbicide volatilization which can cause plant injury. It will likely be necessary to treat weeds around the seedling for 5 years or more by spraying at least a 2' band around them.

The desired result for this stand will be to obtain a component of more diverse, desirable species to replace those that were removed during logging.

SUSTAINABLE FORESTRY GUIDELINES

Sustainable forestry is managing a forest to maximize the distribution of age classes on the property, and ensure there is a balanced distribution of tree sizes. With the even age system of management, the total acres of even age management divided by the rotation age is considered the allowable cut per year. The target rotation age for Buffalo Creek is 125 years. This ensures that large oaks will always be present on the area.

Early Successional Management -

The early successional areas will be managed on a 10-15 year rotation. There are 154 acres designated for early successional management. The allowable cut is 10 acres per year (154 acres divided by 15 yrs.). With a working cycle of 5 years, approximately **50 acres could be cut every 5 years**.

Even Age Management –

There are 149 acres under even age management. Dividing 149 acres by 125 years yields an allowable cut of 1.2 acres per year, or **6 acres every 5 years**.

Uneven Age Management –

Stand can be selectively harvested every 20 years to remove mature and defective trees. There are 78 acres under uneven age management. The allowable harvest is **4 acres of selective harvest every 5 years**.

HIGH PRIORITY PROJECTS
First 5 Year Work Cycle

Open Tree Planting -

Stand #	Acres	Prescription
Total		

Timber Stand Improvement – Crop Tree Release

Stand #	Acres	Prescription
6	7	Oak release by contractor
Total	7	

Timber Stand Improvement – Weed Tree Removal

Stand #	Acres	Prescription
10	24.7	Remove all shade tolerant species from understory
Total	24.7	

Early Successional Clearcuts – 10 - 15 yr. rotation

Stand #	Acres	Prescription
1	7.4	Non commercial
2	28.2	Non commercial
3	10.8	Non commercial
4*	100.6	Non commercial
12	6.8	Non commercial
Total	153.8	

*Stand #4 cutting will begin in the first 5 year cycle but will not be completed for at least 10 years due to its size.

Even Age Clearcuts – 60 - 125 yr. rotation

Stand #	**Acres**	**Prescription**
5	7.9	Commercial timber sale
6	7.9	Commercial timber sale
9	15.6	Commercial timber sale
Total	31.4	

Uneven Age (Selective) Harvests –

Stand #	**Acres**	**Prescription**
Total		

Prescribed Burning to Encourage Oak Regeneration -

Stand	**Acres**	**Prescription**
10	24.7	
Total	24.7	

APPENDIX

BUFFALO CREEK WILDLIFE AREA

SUMMARY OF WOODLAND STANDS

No.	Acres	Timber Type	TreeSize	Mgmt. System	Prescription	Priority	Year Complete	Comments
1	7.4	Bottomland Hardwoods	Medium	Early Successional	Clearcut	Medium	2020	Leave select mast species
2	28.2	Willow	Sapling	Early Successional	Clearcut	High	2019	Leave select mast species
3	10.8	Bottomland Hardwoods	Medium	Early Successional	Clearcut	Medium	2021	Leave select mast species
4	100.6	Bottomland Hardwoods	Medium	Early Successional	Clearcut in stages to regenerate	Medium	2028	Leave select mast species
5	7.9	Upland Hardwoods	Large	Even Age	Clearcut/Sanitation	High	2018	Oak wilt removal. Cut and re-plant
6	7.9	Bottomland Hardwoods	Large	Even Age	Clearcut	High	2019	Cut and re-plant
7	7	Upland Hardwoods	Sapling	Even Age	TSI – Crop Tree Release	High	2018	Oak Release
8	22.9	Bottomland Hardwoods	Medium	Even Age	TSI – Weed Tree Removal	Medium	2025	Some early successional work within stand
9	10.2	Bottomland Hardwoods	Sapling	Even Age	Allow to Grow	Low	Long-term	Be careful not to top kill oaks with fire
10	15.6	Bottomland Hardwoods	Large	Even Age	Harvest	High	2020	Leave swamp white oaks
11	24.7	Upland Hardwoods	Large	Even Age	TSI – Weed Tree Removal	High	2021	Shelterwood system of oak regeneration
12	53.2	Bottomland Hardwoods	Pole	Even Age	Allow to Grow	Low	On-going	Re-evaluate in 10 years
13	6.8	Bottomland Hardwoods	Pole	Early Successional	Clearcut	Medium	2023	Can use hinge cutting
14	77.8	Bottomland Hardwoods	Medium	Uneven Age	Restoration	Low	On-going & Long-term	Restore as time and funding allow. Maintenance will be an issue.

Wildlife Species of Greatest Conservation Need For NE Iowa Forest Lands

(E=Endangered, T=Threatened, SC=Special Concern)

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

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

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

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

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

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

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

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

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

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

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

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

FOREST HEALTH THREATS AND CONCERNS

Iowa's woodlands today face unprecedented levels of forest health threats in the forms of non-native invasive species, climate extremes, insect pests (some exotic), pathogens, urbanization, and more.

DISEASES

Oak Wilt

Oak wilt is caused by the fungus *Ceratocystis fagacearum*. Oak wilt is a major player in the decline of oaks, especially red oaks, as it can kill large overstory trees rapidly and can spread via root systems from tree to tree. The trees in Iowa most commonly impacted by oak wilt are species such as red and black oak, but it can infect white and bur oak as well. If red, northern pin, or black oak are infected by the fungus that causes this disease they usually die within the summer they are infected. White oak and bur oak can often take a number of years before they succumb to this disease after infection. One way to avoid the potential transfer of the fungus that causes oak wilt problems is to not prune, remove, or wound oaks between March 1 and November 1 each year. When planning any type of forest stand improvement activities that might wound residual oaks be sure to target those activities during the dormant season.

Browning and Wilting Symptoms (Oak Wilt)

Thousand Cankers Disease

There is an emerging disease called Thousand Cankers Disease that is being found on black walnut trees in the Eastern U.S. Currently this disease has been very destructive to eastern black walnut in the Western U.S. This disease has not been found in Iowa at this point, but it is a critical one to watch for. Managers should attempt to monitor the overall health of walnut trees over time. See the following site for specific information. http://na.fs.fed.us/pubs/palerts/cankers_disease/thousand_cankers_disease_screen_res.pdf

INVASIVE PLANT SPECIES

Exotic (non-native) plant species that are introduced to an ecosystem without the benefits of co-evolution can become invasive and disruptive to the balance of the natural ecosystem. Such is the case with a suite of non- native invasive species common to Iowa. Species such as honeysuckle, Oriental bittersweet, common buckthorn, autumn olive, multi-flora rose, garlic mustard, barberry, white mulberry, black locust, and tree-of- heaven are some notable examples. These different non-native species have the ability to out-compete native species and subsequently cause a decline in biodiversity and ecosystem health. Invasive species typically provide little in the way of benefits to wildlife. Currently, honeysuckle is the most prevalent plant throughout the property. Oriental bittersweet, a very aggressive vine, was observed in at least 4 of the 11 stands and it can overwhelm native trees, shrubs, and entire habit areas. Over the last year there have been some efforts to minimize non-native invasive species such as autumn olive in some locations, but if an aggressive/consistent effort is not started soon many of these non-native plants will continue to reduce the bio-diversity, increase the potential of site erosion, and reduce the recreational accessibility on the property in the near future.

INSECT PESTS

Emeral Ash Borer

The Emerald Ash Borer continues to rapidly spread across Iowa, so this pest will most likely start to impact ash trees on this property in the next 5 to 10 years. Emerald Ash Borer attacks and kills any and all species of ash. The result of this pest will likely lead to the absence of ash in the forest community.

Gypsy Moth

The Gypsy Moth has been a pest in the Eastern U.S. for over a century and is finally making its way into Iowa (northeast). It causes heavy defoliation of oak, maple, and other hardwoods during the early summer months and degrades recreational and aesthetic uses of the forest. Repeated defoliations can cause decline and death of mature trees.

Walnut Twig Beetle

The Walnut Twig Beetle is not yet known to exist in Iowa, but has the potential to cause very serious harm to the state's black walnut population. It vectors the recently discovered "Thousand Cankers Disease" which has caused walnut mortality in 9 western and 5 eastern states.

FWSP 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 woody cover buffer 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. Viewshed's are a habitat factor that will be primarily a "hands-off" area for aesthetics, proper soil and water conservation, along with providing special wildlife habitats.

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 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.

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 Tordon RTU or Pathway 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 resprouting. Wet the outer rim of freshly cut stumps. The work can be done anytime except spring during heavy sap flow.

Desirable trees that are poor formed or damaged should also be removed. These trees should not be treated with herbicide. The stumps will resprout and produce another tree. Cut the stumps close to the ground so that the sprout will originate near the ground.

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. Now you can select the trees you want to comprise 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. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets 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 black walnut, red oak, white oak, white ash, basswood, cherry, and hard maple.

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 1/2 to 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.

Harvest:

Uneven-Age Management:

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. Hard maple 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, poor formed trees, and low value species. The thinning following the harvest insures that you have high quality trees ready to replace the older trees as they are harvested.

Even-Age Management:

Even-age management involves a clearcut at some point in the stands rotation. Clearcutting creates full sunlight to the ground. All trees 2" and larger in diameter are felled. Oak, ash, hickory, and walnut require full sunlight to grow. Even-age management must be applied to successively manage these species. Clearcutting creates stands of trees all the same age. The trees compete equally for sunlight and are forced to grow straight and tall, resulting in high quality timber. Clearcutting also provides excellent browse and cover for wildlife.

Shelterwood:

Shelterwood is a form of even-age management. The final cut is a clearcut, but several thinnings are done prior to the final cut. The large, healthy trees are left to provide seed for naturally reseeding the stand, and to create partial shade to inhibit the growth of weeds and brush until the desirable seedlings are well established. The final cut or clearcut is normally done when there are a sufficient number of desirable trees that are 3-5 ft. tall.

The first thinning can be a killing of the undesirable species such as ironwood, elm, bitternut hickory, and boxelder. 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 light, 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. 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.

Plan Completion Date **9/15/17**