FOREST WILDLIFE STEWARDSHIP PLAN

FOR

BIG MILL CREEK
&
LITTLE MILL
WILDLIFE MANAGEMENT AREAS

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

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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 380,000 acres of land as wildlife management areas (WMAs) for a variety of public users. Many of these WMAs are partially or mostly forest covered. These forests, if properly managed, provide a unique opportunity for the DNR to carry out its mission by publicly demonstrating sustainable forest management 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 recognizes the need for forest wildlife stewardship plans (FWSPs) to properly manage public 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. These changes will negatively impact 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 FWSPs. This process will help ensure the wise management of our WMA forests and will aid future managers with decision making.

There is no single type of forest stand that can provide all of the requirements for all forest wildlife species. Different species require different (and sometimes quite specific) forest types and age classes. Some generalist wildlife species use all of the forest age classes, while some specialist species have such specific requirements that only one or two particular forest types are needed to survive. A classic example of this conflicting habitat need is the requirement of an abundance of forest edge for some wildlife species, 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 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, as well as a reduction in the economic value, 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.

The Wildlife Bureau manages state-owned forests for the greatest diversity of forest wildlife, while taking into consideration the landscape around the state-owned property. The FWSP will be the guiding document that prioritizes management activities to meet the needs of forest wildlife species. The DNR's comprehensive Iowa Wildlife Action Plan identifies wildlife "species of greatest conservation need" (SGCN) (Appendix – Tables 3-7). Habitat needs of these wildlife species will be considered when determining forest management decisions. 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 and wildlife unit team are the managers of the WMA and determines the objectives for the WMA. Objectives address the habitat needs of a diverse array of wildlife species and the forest condition of each area. Approximately one third of the total land area managed by the Wildlife Bureau across the state is classified as forest. Forest management is essential to the long term conservation of the native plant communities occurring on these areas. Actively managing the forest is also critical to improving these areas for wildlife and wildlife-related recreation.

Management of forested wildlife areas is a cooperative effort between the wildlife unit and foresters. All of the forest 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 WMA. Forester recommendations are designed to manage the stand to reach the goals and objectives determined by the biologist, while utilizing strategic and sound forest management practices.

WILDLIFE MANAGEMENT AREA INFORMATION

MANAGER:

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

LOCATION:

Big Mill Creek WMA: Section 8, 17, 18, Bellevue Township, Jackson County, Iowa
Little Mill WMA: Section 22 Bellevue Township, Jackson County, Iowa

TOTAL FOREST ACRES:

490.3 Big Mill Creek WMA
40.6 Little Mill WMA

DESCRIPTION OF AREA

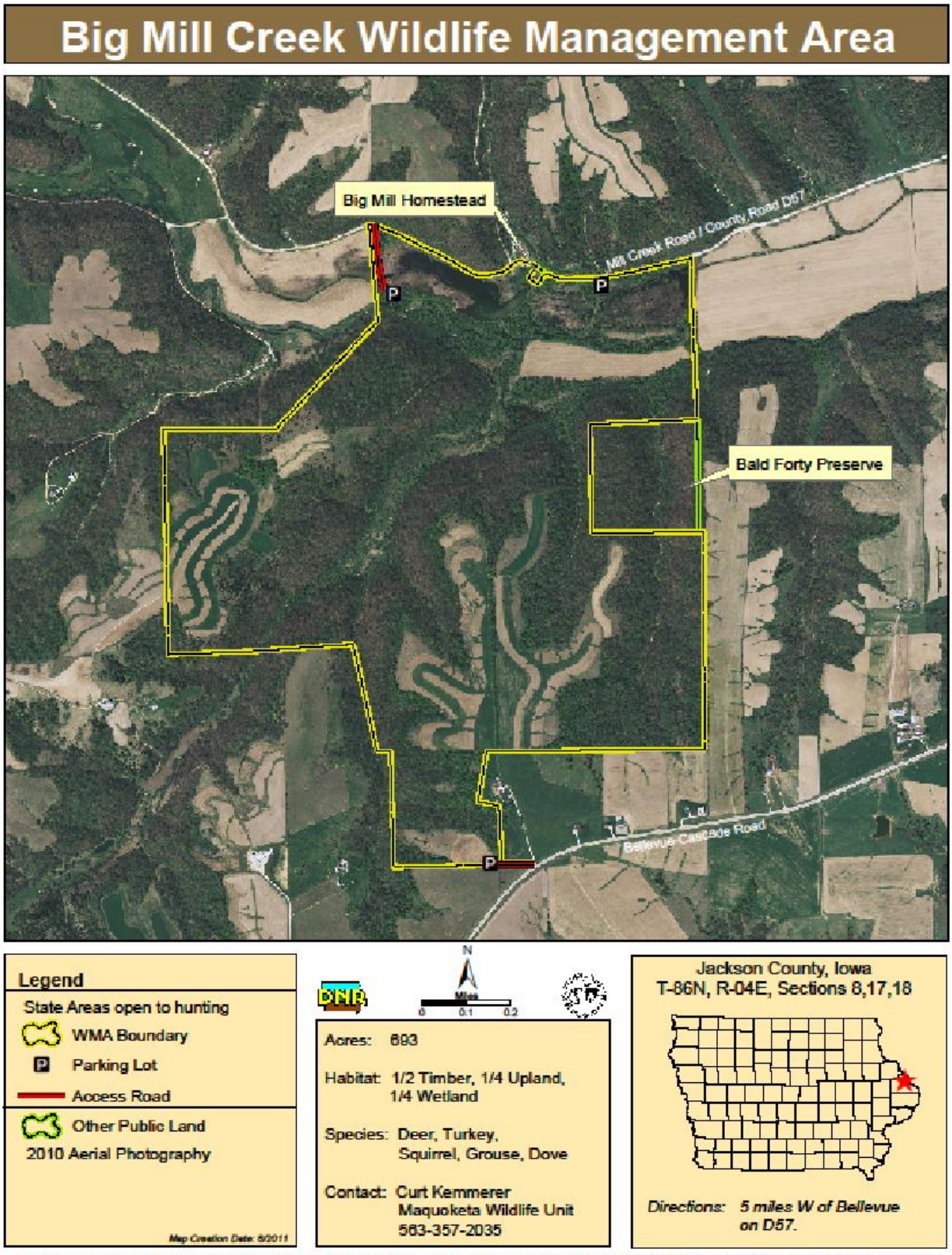
Big Mill Creek WMA is 693 acres in total. With 490.3 acres of forest, the area is 71% forested. The 490.3 forested acres addressed in this plan are outlined on the attached aerial photos. The area is divided into 71 different areas or stands, labeled 1-70 & F on the maps. Stands 1-70 are described in this plan and recommendations are outlined for forest management. Stand F is designated as "Fisheries Management" and will be managed for the benefit of the stream and fishery. The cold-water stream, Mill Creek, runs through the north end of its namesake area, establishing the corridor that this public complex is based upon. This large stream is flood prone during extreme rain events and much of the forest lands along the creek experience sporadic flash flooding. Some of the forests have a history of being grazed prior to DNR ownership. The area in general has steep hills with rocky outcrops, and some large, relatively flat ridgetops not in forest cover.

Little Mill WMA is 42 acres in total. The area is 100% forested, with exception for the namesake cold-water stream flowing through the area and the access road. The 40.6 forested acres addressed in this plan are outlined on the attached aerial photos. The area is divided into 5 different areas or stands, labeled 1-4 & F on the maps. Stands 1-4 are described in this plan and recommendations are outlined for forest management. Stand F is designated as "Fisheries Management" and will be managed for the benefit of the stream and fishery. The area in general has steep hills and rocky outcrops rising up from the stream bench.

Both wildlife areas are used extensively by hunters, anglers and other outdoor recreationalists. The wildlife areas as a whole consists of a wide variety of habitat types common throughout Iowa. Most of the non-wooded areas on Big Mill Creek WMA consist of leased agricultural land or restored grassland. There are a few natural wetlands on the area as well. Agricultural areas provide openings, edge, access, and food plots which are managed for wildlife and hunters.

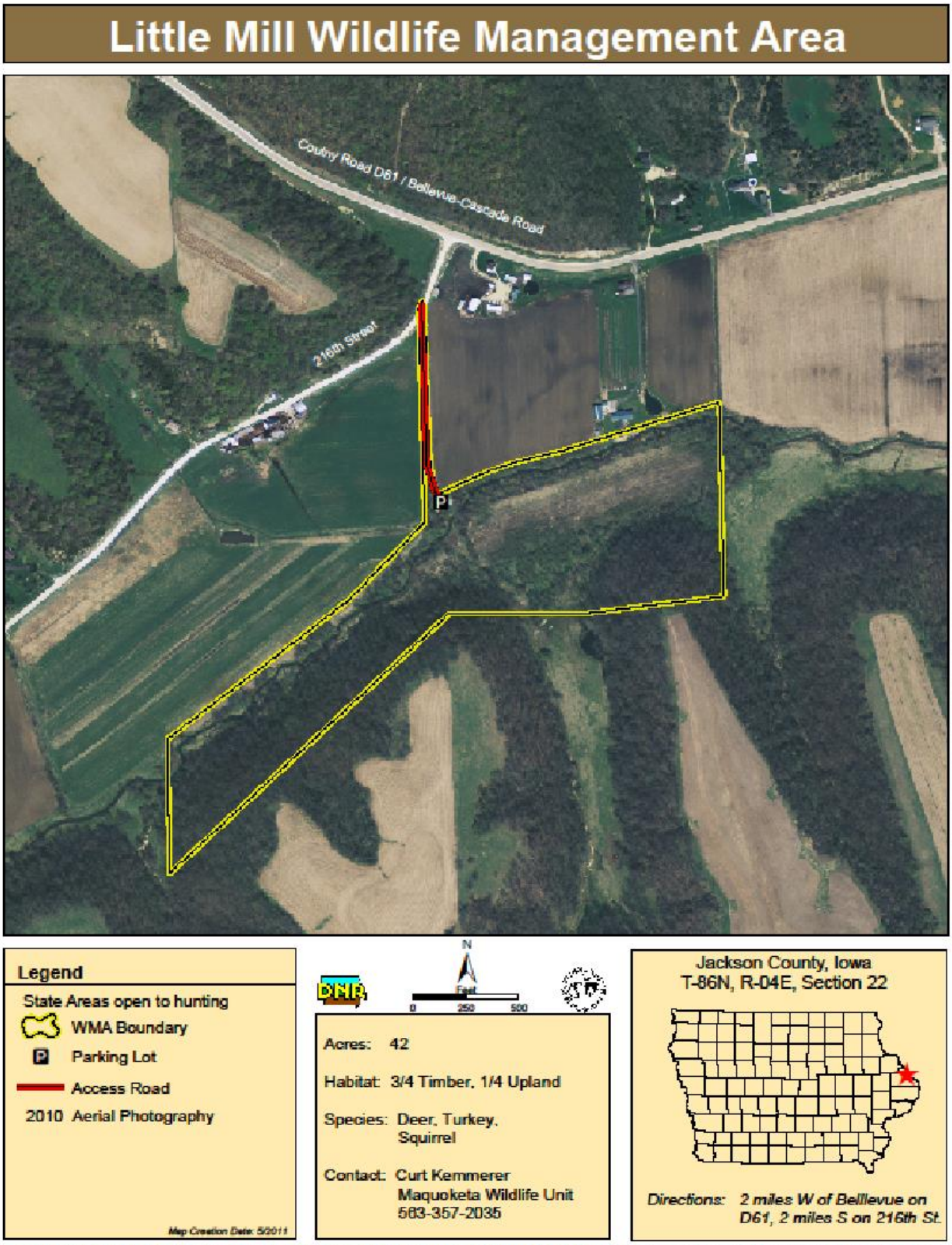
The forest has a good diversity of species typical of upland forest habitat. The major overstory species are oaks, hickories, maple, walnut, basswood, ash, hackberry and cherry. Common understory species include ironwood, elm, bitternut hickory, ash, and hackberry. Several of the stands were logged prior 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. Some 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 some stands.

BIG MILL CREEK OVERVIEW MAP



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.

LITTLE MILL OVERVIEW MAP



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.

OBJECTIVES

The primary objectives for the WMAs are:

- Create and maintain quality habitat for a wide variety of wildlife species
    - Emphasize oak management
    - Increase early successional forest habitat
    - Promote and enhance SGCN habitats
- Practice sustainable forest management
    - Create a diversity of tree sizes
    - Promote tree species diversity
    - Improve forest health
- Promote quality wildlife-dependent recreation
- Promote water quality in all of the associated aquatic ecosystems

Funding for the ongoing management, as well as a portion of the land acquisition costs, of both Big Mill Creek and Little Mill WMAs 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 deer, turkey, rabbit and squirrel. On the other hand, the DNR is committed to considering the effects of management actions on nongame 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 nongame species will benefit from good habitat management practices.

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 WMA to complete the recommended projects within the plan. Those projects include: tree planting, thinning young stands, removing invasive species, converting areas to more desirable species based on the stand objectives, and completing early successional cuts. Harvesting is a very important tool in successfully implementing this plan.

CURRENT DISTRIBUTION OF TREE SIZES ON THE WMAs

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

Big Mill Creek

Tree Size	Forested Acres	% of Total Area
Sapling (<4" dbh)	6.9	2%
Pole size (5-12" dbh)	101.8	24%
Medium Size (14-18" dbh)	147.1	35%
Large (>20" dbh)	162.3	39%
*Total	418.1	100%

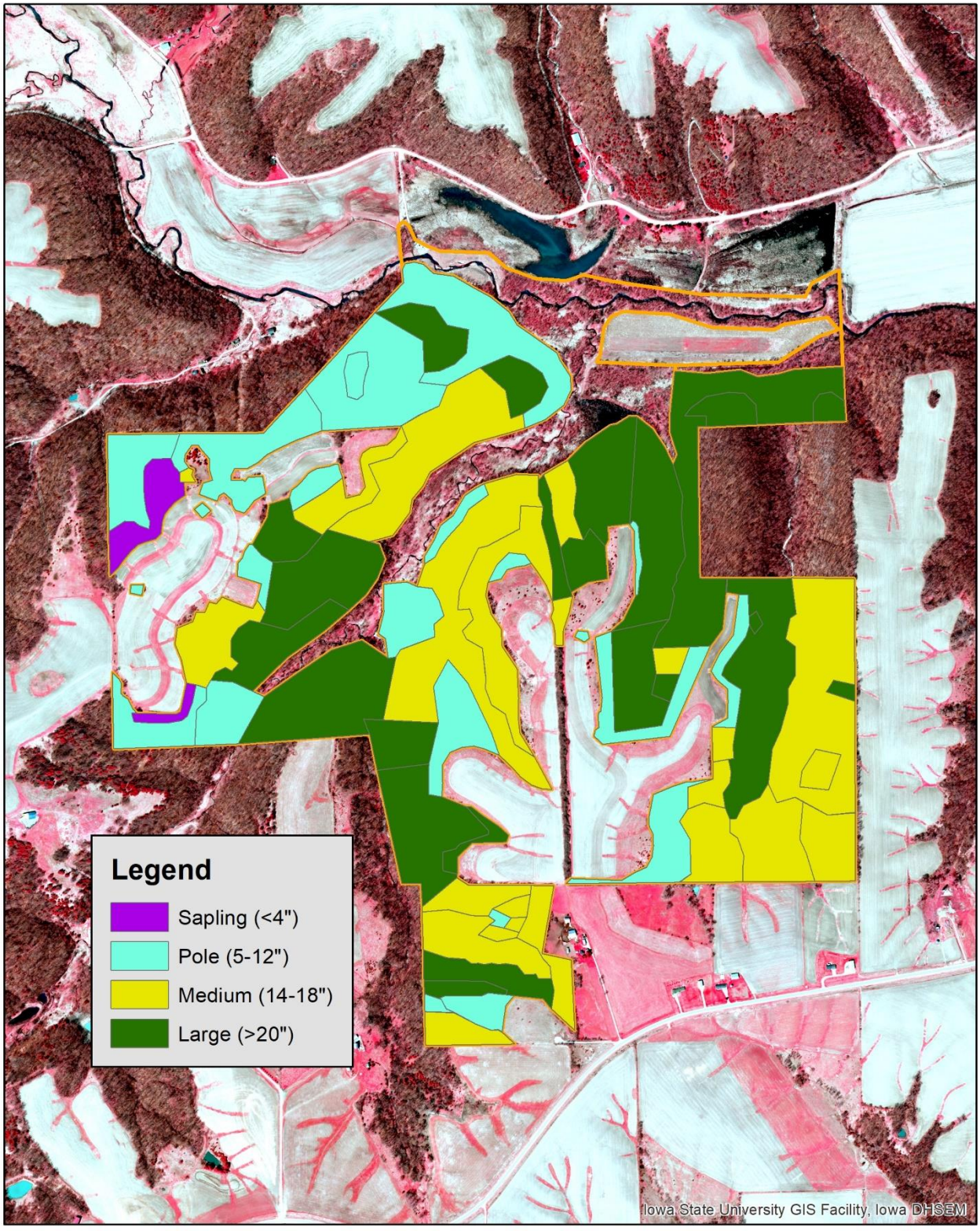
*Does not include Stand F (72.2 acres)

Little Mill

Tree Size	Forested Acres	% of Total Area
Sapling (<4" dbh)	0	0%
Pole size (5-12" dbh)	7.4	26%
Medium Size (14-18" dbh)	10.8	37%
Large (>20" dbh)	10.8	37%
*Total	29	100%

*Does not include Stand F (11.6 acres)

Big Mill Creek WMA
Size Class Distribution



Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 875 1,750 3,500 Feet

N

Little Mill WMA
Size Class Distribution

Sec 22 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 330 660 1,320 Feet

N

PROPOSED MANAGEMENT SYSTEMS FOR THE WMAs

Recommendations for each stand were based on whether the area will be managed to create and/or maintain: early successional growth, an even-aged system, an uneven-aged system, viewshed or to benefit the riparian corridor for fisheries management. 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 forest landscape, protect fragile sites, and increase the acres of early successional growth.

Based on forester recommendations for Big Mill Creek and Little Mill WMAs, the acres under each management system are as follows:

Big Mill Creek

Management System	Acres	% of Total Area
Even-aged	299.9	72%
Early Successional	53.2	13%
Uneven-aged	28.1	7%
Viewshed	36.9	8%
*Total	418.1	100%

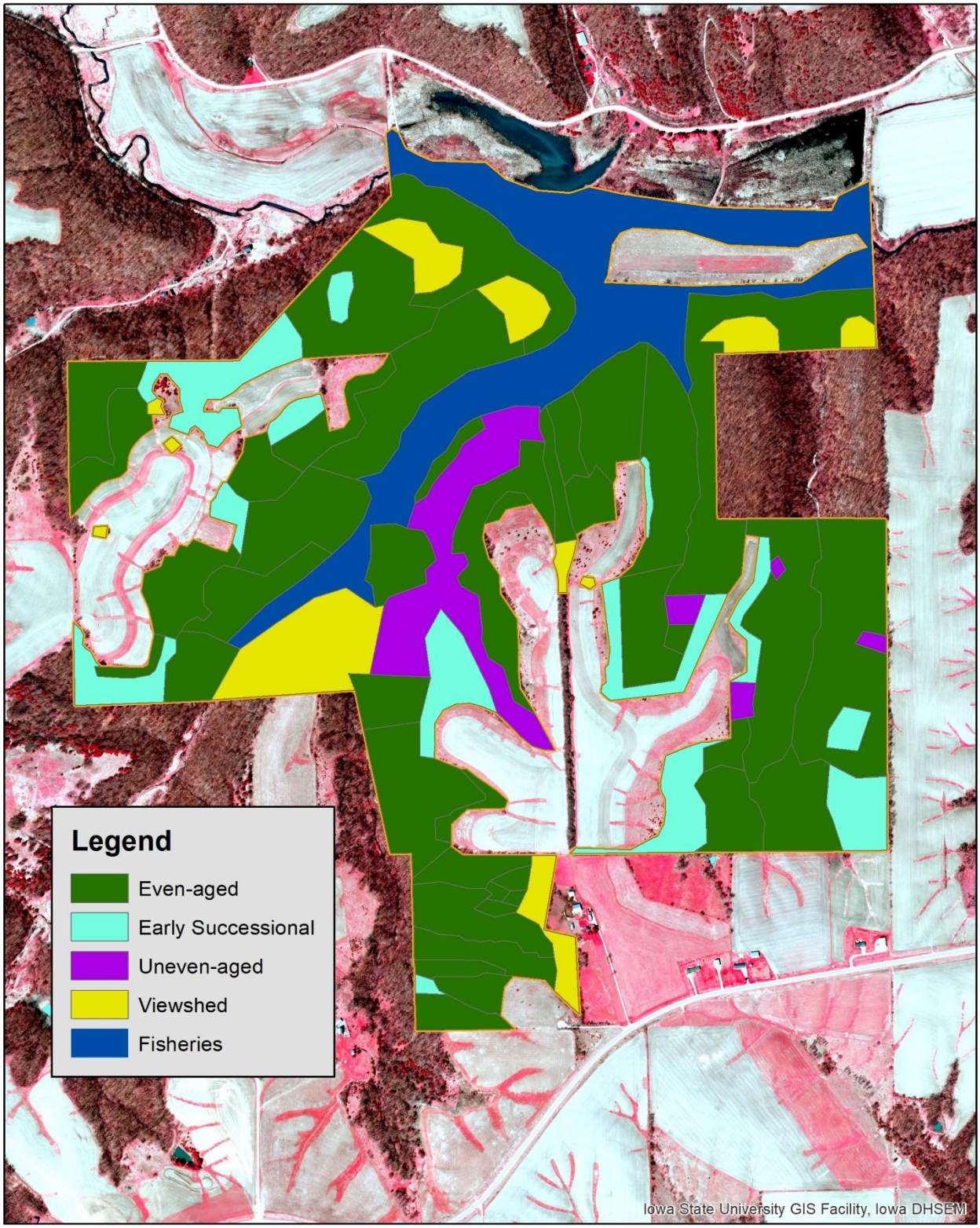
*Does not include Stand F (72.2 acres)

Little Mill

Management System	Acres	% of Total Area
Even-aged	13.2	46%
Early Succesional	0	0%
Uneven-aged	0	0%
Viewshed	15.8	54%
*Total	29	100%

*Does not include Stand F (11.6 acres)

Big Mill Creek WMA
Management Systems

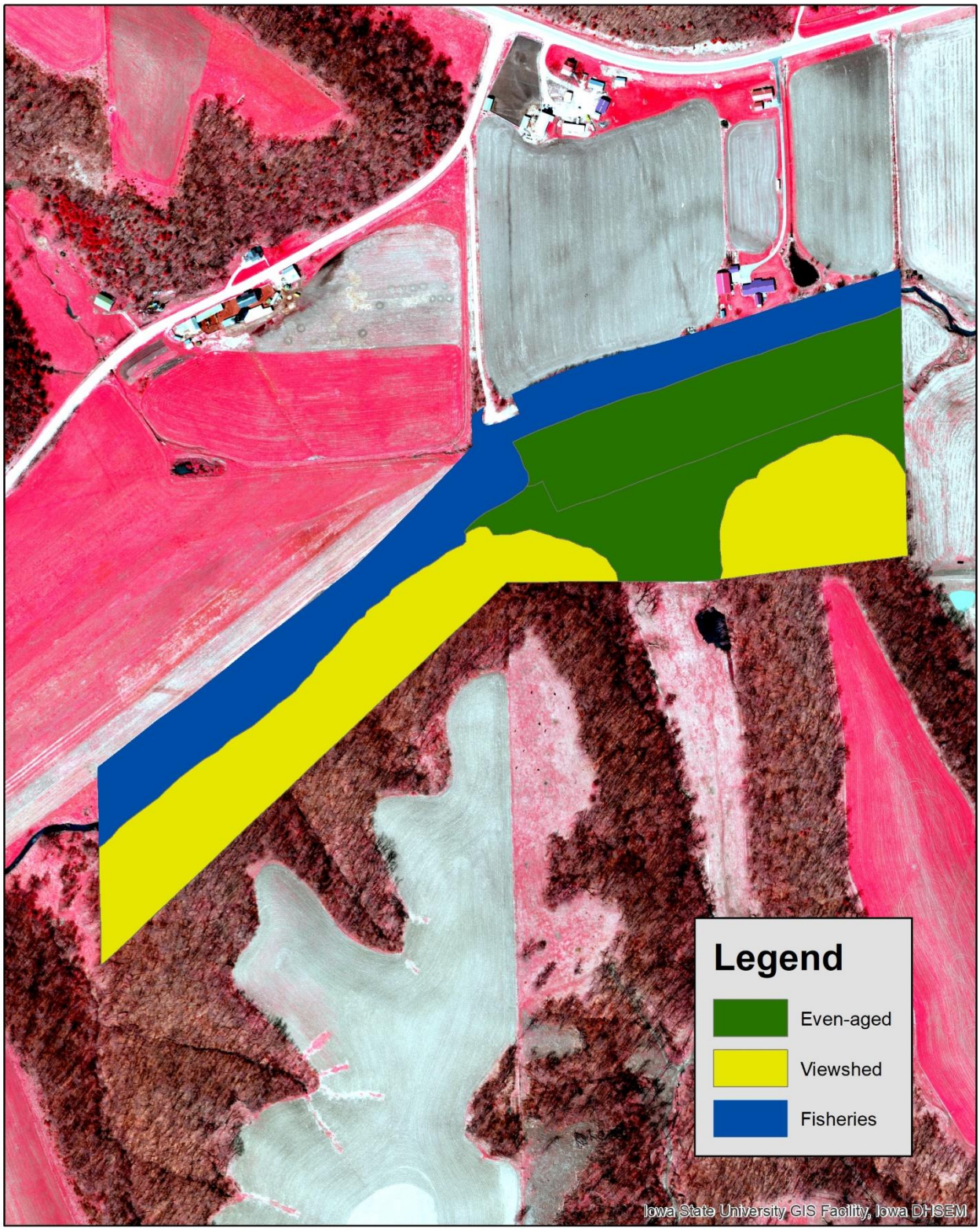


Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 800 1,600 3,200
Feet

N

Little Mill WMA
Management Systems



Sec 22 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 325 650 1,300
Feet

N

EVEN-AGED MANAGEMENT

Even-aged 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-aged stand provides habitat for wildlife. For example, regenerating stands (1-10 years old) benefit the same species of birds as does early successional stands, such as the blue-winged warbler, black-billed cuckoo, yellow-billed cuckoo, Eastern towhee and American woodcock.

Sapling to small pole sized stands between 10 and 20 years old, may be used by species such as the Kentucky warbler. From age 20-60 years, pole to medium 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. All size classes are important for many game species such as bobcat, deer, squirrels and wild turkey.

As forest stands age, they constantly lose trees to shading, insects, disease and other factors. The dead and dying trees provide habitat for cavity nesters such as wood ducks, woodpeckers, nuthatches, titmice and great-crested flycatchers. Over 30 species of Iowa nesting birds nest in the cavities of trees. Iowa's seven species of woodpeckers (including two SGCN) are the primary cavity builders and nesters, and these woodpeckers are the keystone species that provide the cavities for so many other secondary nesting birds, as well as providing homes for flying squirrels, gray and fox squirrels, bats and a host of other species. It is recommended that 6-10 snag trees (6" diameter and larger) per acre be left standing to provide habitat for a substantial number of species. In northeast Iowa, the federally threatened northern long-eared bat uses loose-barked live trees such as hickory as well as the sloughing bark from dying trees for their maternity colonies. In other areas of the state (e.g., southern Iowa), this habitat is also important for maternity colonies of the federally endangered Indiana bat. Retaining live loose bark tree species (e.g., shagbark hickory) whenever possible and 6-10 snags per acre benefits bats and other wildlife.

Even-aged 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-aged structure. Even-aged management creates excellent habitat for deer and turkey, and is essential to the regeneration of oak which require full sunlight. The only way that oak can be maintained as a component of the forest is by practicing some form of even-aged management.

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

A shelterwood system is a form of even-aged management. The final cut is a clearcut, but several thinnings are done prior to the final cut. The large, healthy trees are

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

Clearcutting to create full sunlight is essential at some point in the stand's life to successfully regenerate oak. If stands are not clearcut, the oak component of the forest will be lost to shade tolerant species. 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 forest will kill thin barked species such as sugar 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.

Big Mill Creek has 299.9 acres (72% of all forest acres) that will be managed as even-aged forest to regenerate oak (125 year rotation). Applying sustainable forestry guidelines, approximately 12 acres could be clearcut every 5 years.

Little Mill has 13.2 acres (46% of all forest acres) that will be managed as even-aged forest to regenerate oak (125 year rotation). Applying sustainable forestry guidelines, approximately 0.5 acres could be clearcut every 5 years. However, a clearcut that small is not practical or desirable to achieve long term habitat goals, so the guideline will be extrapolated to allow for appropriately sized cuts to take place over a much longer occurrence interval.

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.

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

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

Big Mill Creek has 53.2 acres (13% of all forest acres) scheduled for early successional management. Applying sustainable forestry guidelines 18 acres could be cut every 5 years, or 3.5 acres could be cut each year.

Little Mill does not have any stands that will be managed as early successional.

UNEVEN-AGED MANAGEMENT

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

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

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

Big Mill Creek has 28.1 acres (7% of all forest acres) that will be managed as uneven-aged forest. Applying sustainable forestry guidelines, approximately 7 acres can be selectively harvested (single tree or group selection) 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.

Little Mill does not have any stands that will be managed as uneven-aged.

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. For example, algific slopes and moderate slopes under viewshed management protect several of Iowa's rarest species and SGCN. Like uneven-aged forest management, viewshed areas provide an important core area of relatively stable natural habitat. While algific slopes are not known to occur in areas managed under this plan, many neotropical birds and other species will benefit greatly from the areas designated as viewshed.

Big Mill Creek has 36.9 acres (8% of all forest acres) that will be managed as viewshed forest.

Little Mill has 15.8 acres (54% of all forest acres) that will be managed as viewshed forest.

FISHERIES MANAGEMENT

Both Big Mill Creek and Little Mill have cold-water trout streams that are focal points for management and public recreation. Management of the riparian corridor along each stream can have direct implications to overall stream and fisheries ecology and management. As such, the forest stands along the streams will be designated as "Fisheries Management" and the objective of future management of these stands will be to the benefit of the stream, the fishery and angler recreation. A variety of management activities can take place in these stands, where desirable. Specific management actions for these stands will be determined as needed in the future. Cooperation between fisheries, forestry and wildlife staff will ensure the best practices and outcomes for the stream resource and its users.

Big Mill Creek has 72.2 acres that are designated for fisheries management purposes.

Little Mill has 11.6 acres that are designated for fisheries management purposes.

SOILS

The vast majority of the forested areas located within Big Mill Creek and Little Mill WMAs are upland timber where flooding and the water table are not an issue. The upper end of the slopes are typically rocky soils such as Nordness rock outcrop, Donatus-Rollingstone, and Dorerton-Lacrescent complex. Portions of this area have exposed bedrock, but there is loose rock in the topsoil throughout. The bottom half of the slope has mostly Fayette and Nordness silt loam. These are excellent soils for growing trees and found regularly in northeast Iowa. These upland soils can grow any native trees the manager chooses with only a few exceptions. Bur oak and other drought tolerant trees out-perform other trees in very rocky soils or those areas with south to west facing slopes. Generally, oaks and hickories regenerate well in tougher conditions and aspect will be an important factor management decisions.

The bottomlands along both creeks experience flooding which is typically short lived, but can be significant events. The soils here primarily include Caneek and Chaseburg complex. These are deep, fertile soils with the ability to grow excellent trees if they can take occasional flooding. The incised creeks may help the soil's ability to drain, but trees with some flood tolerance are recommended for this site.

WORK PLAN

FOR

BIG MILL CREEK

&

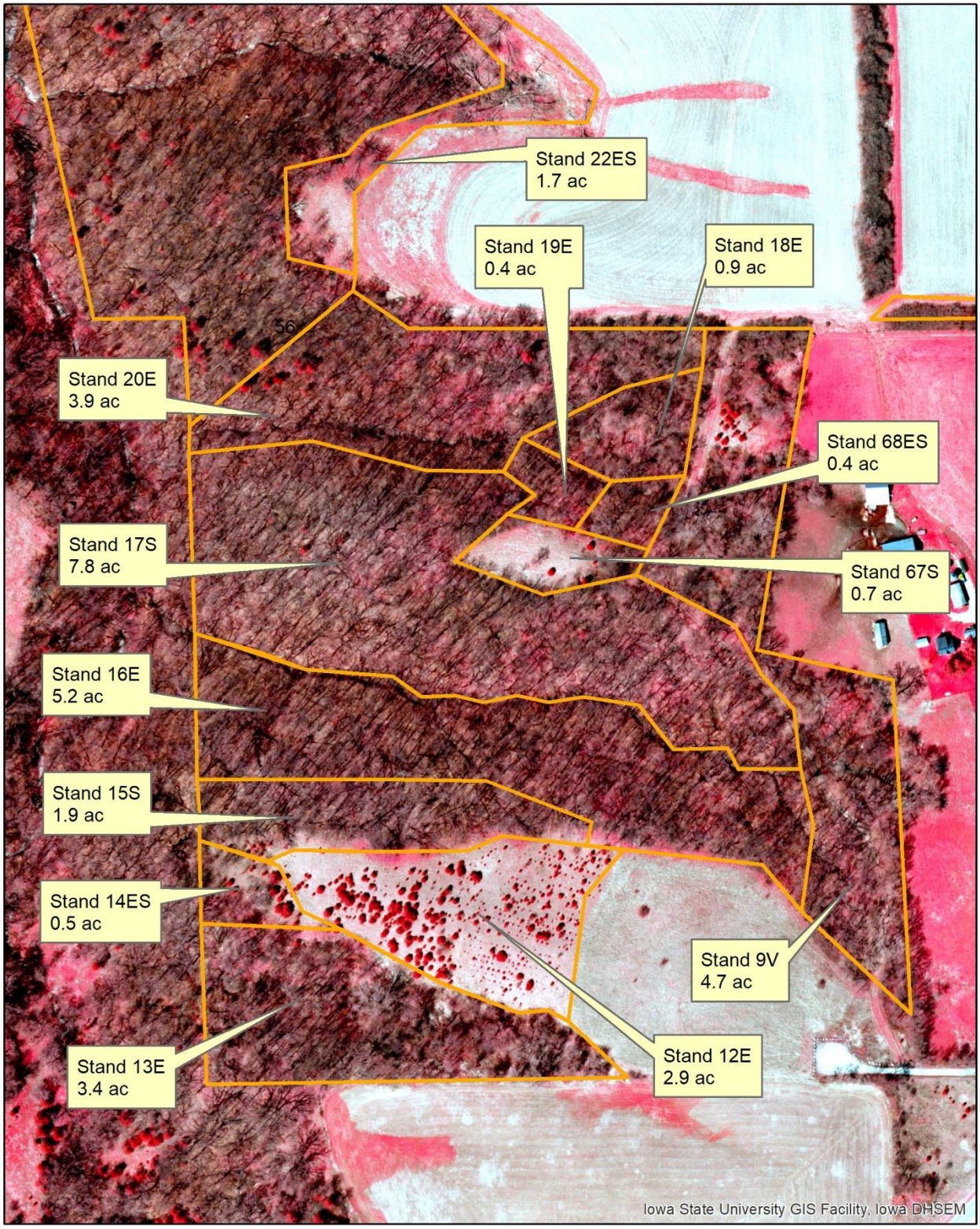
LITTLE MILL WMAs

This is the "working plan" for Big Mill Creek and Little Mill WMAs 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.

***Note: Letter(s) following stand number indicates Management System prescribed for the stand.**
ES=Early Successional E=Even-aged U=Uneven-aged V=Viewshed S=Savanna F=Fisheries

Big Mill Creek WMA
Stand Map

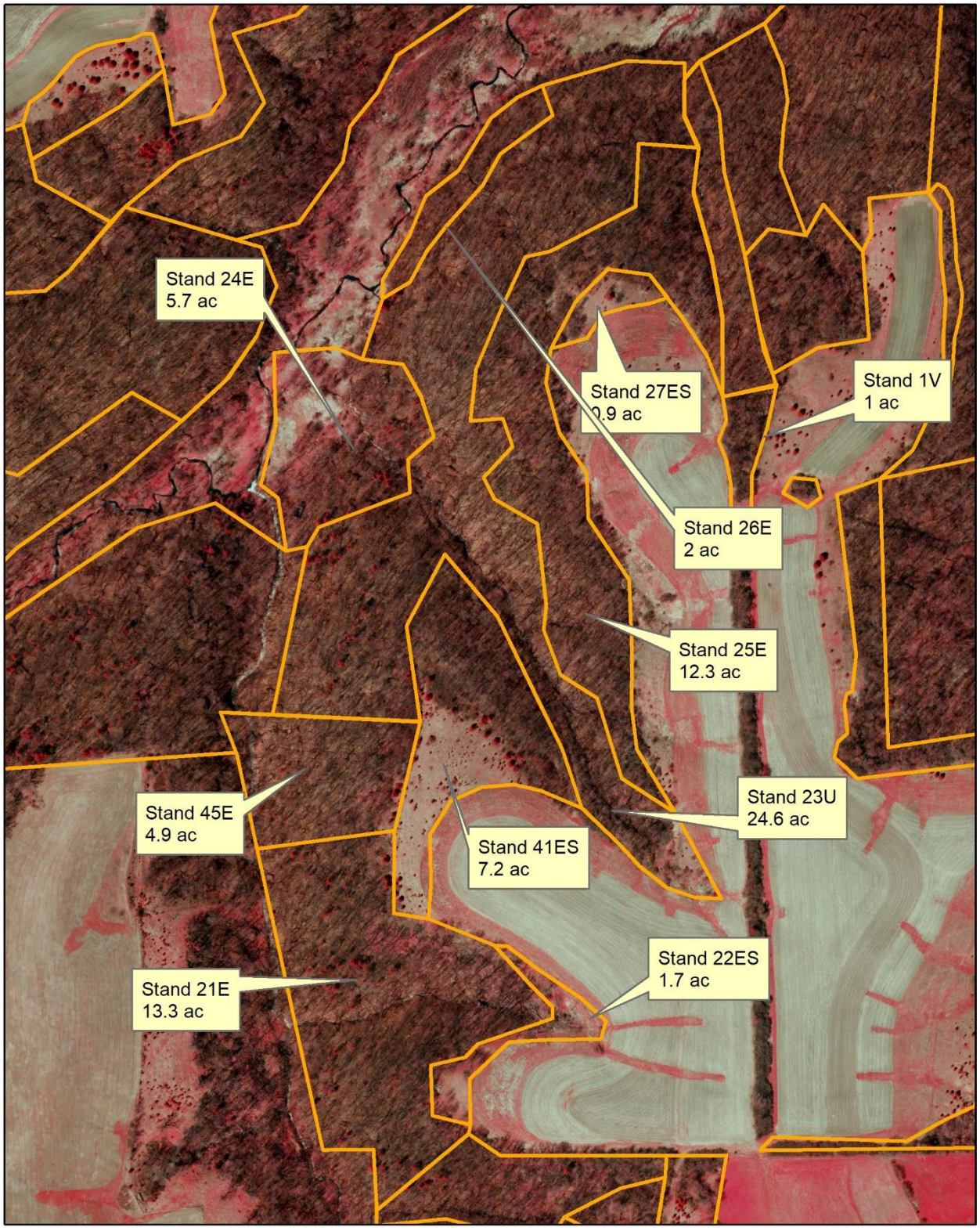


Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 185 370 740 Feet

N

Big Mill Creek WMA
Stand Map

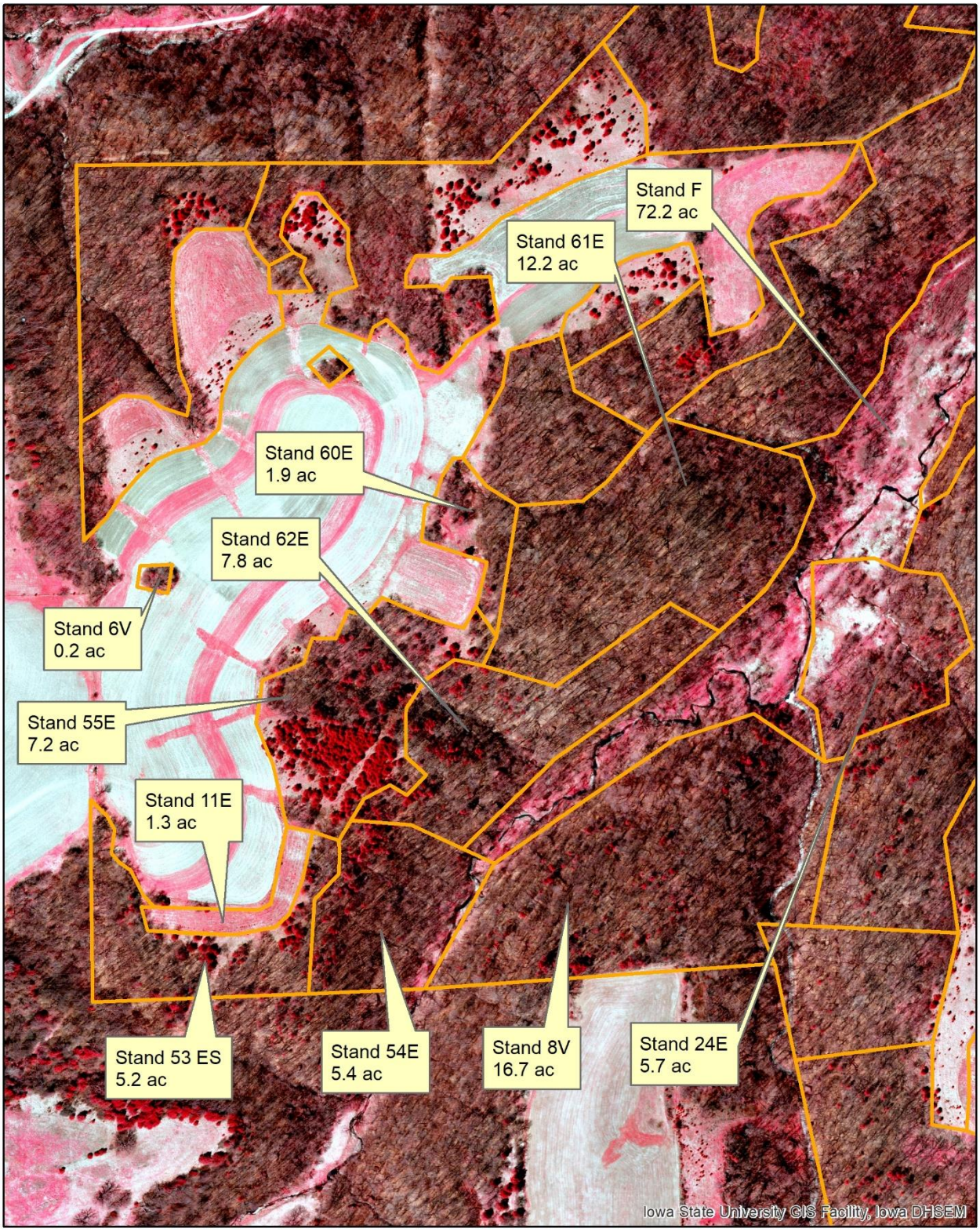


Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 325 650 1,300 Feet

N

Big Mill Creek WMA
Stand Map

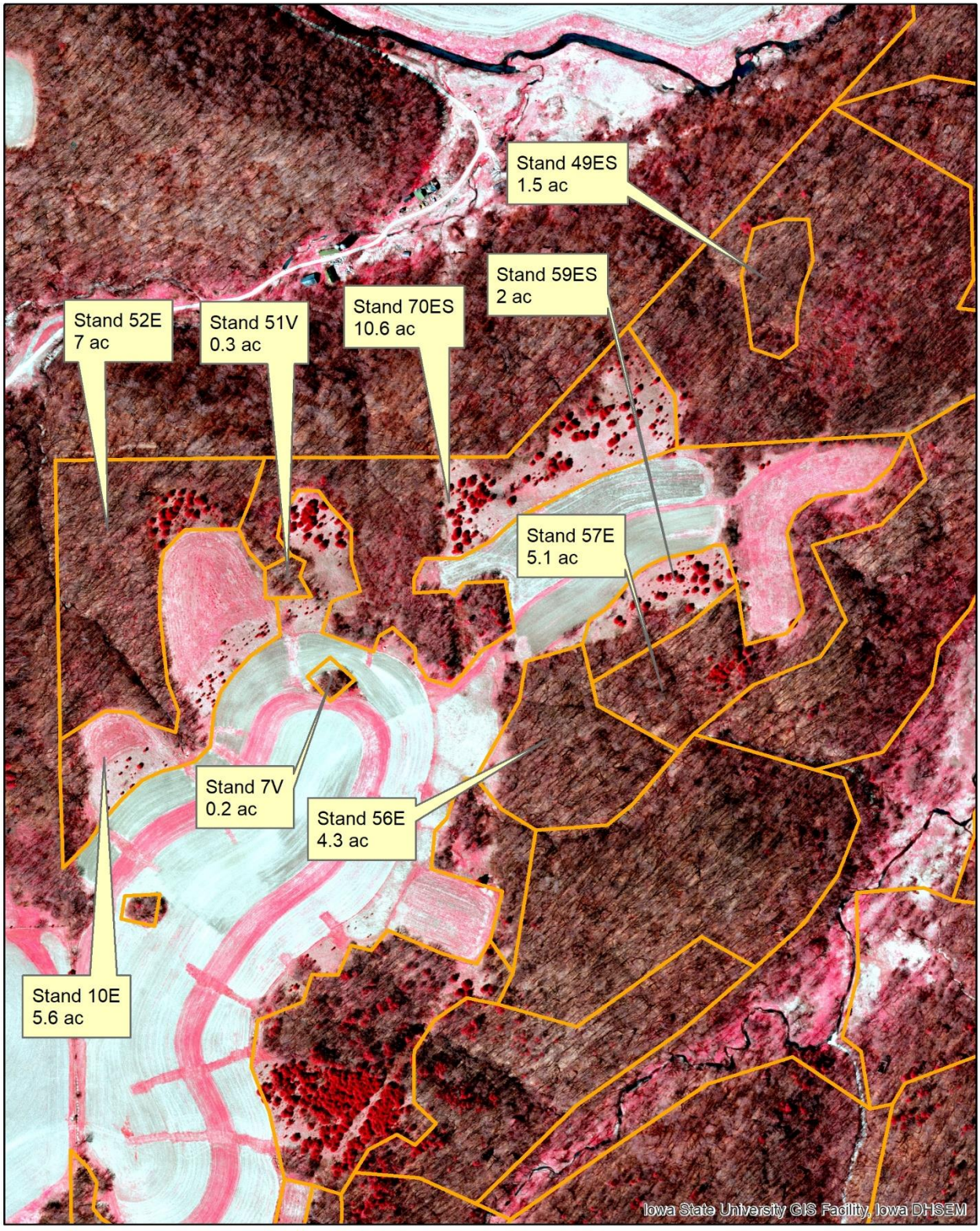


Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 325 650 1,300 Feet

N

Big Mill Creek WMA
Stand Map

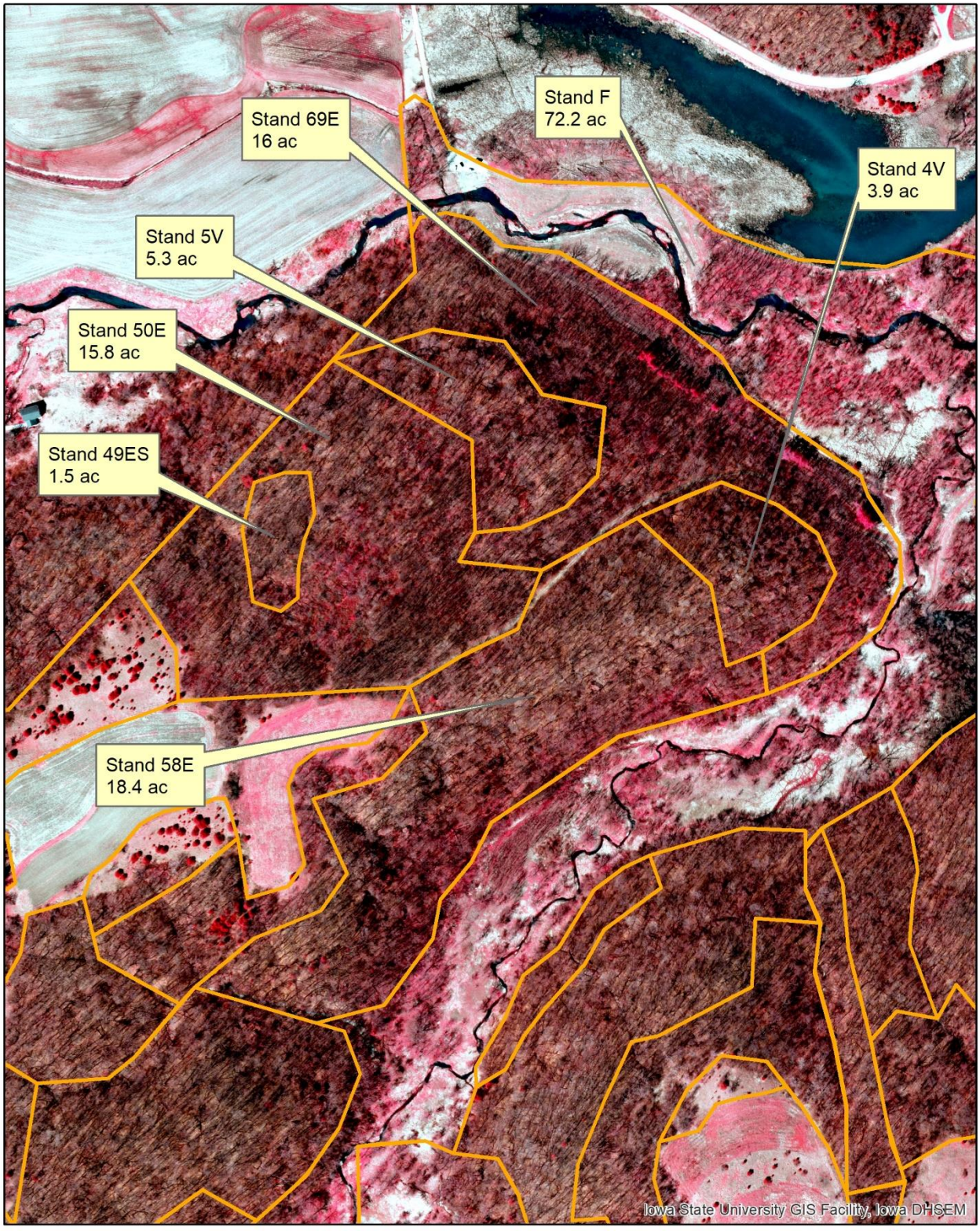


Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 300 600 1,200 Feet

N

Big Mill Creek WMA
Stand Map

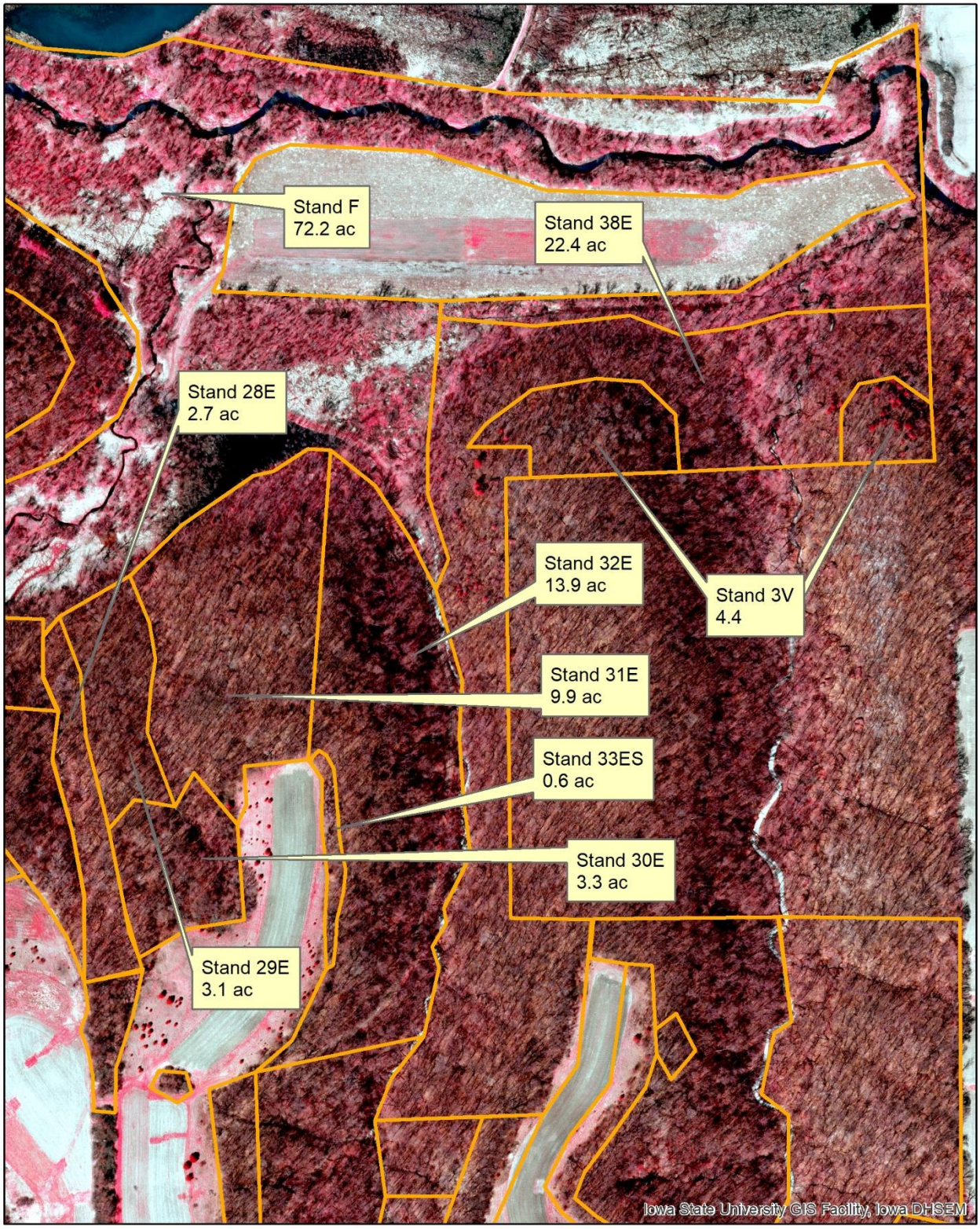


Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 300 600 1,200 Feet

N

Big Mill Creek WMA
Stand Map

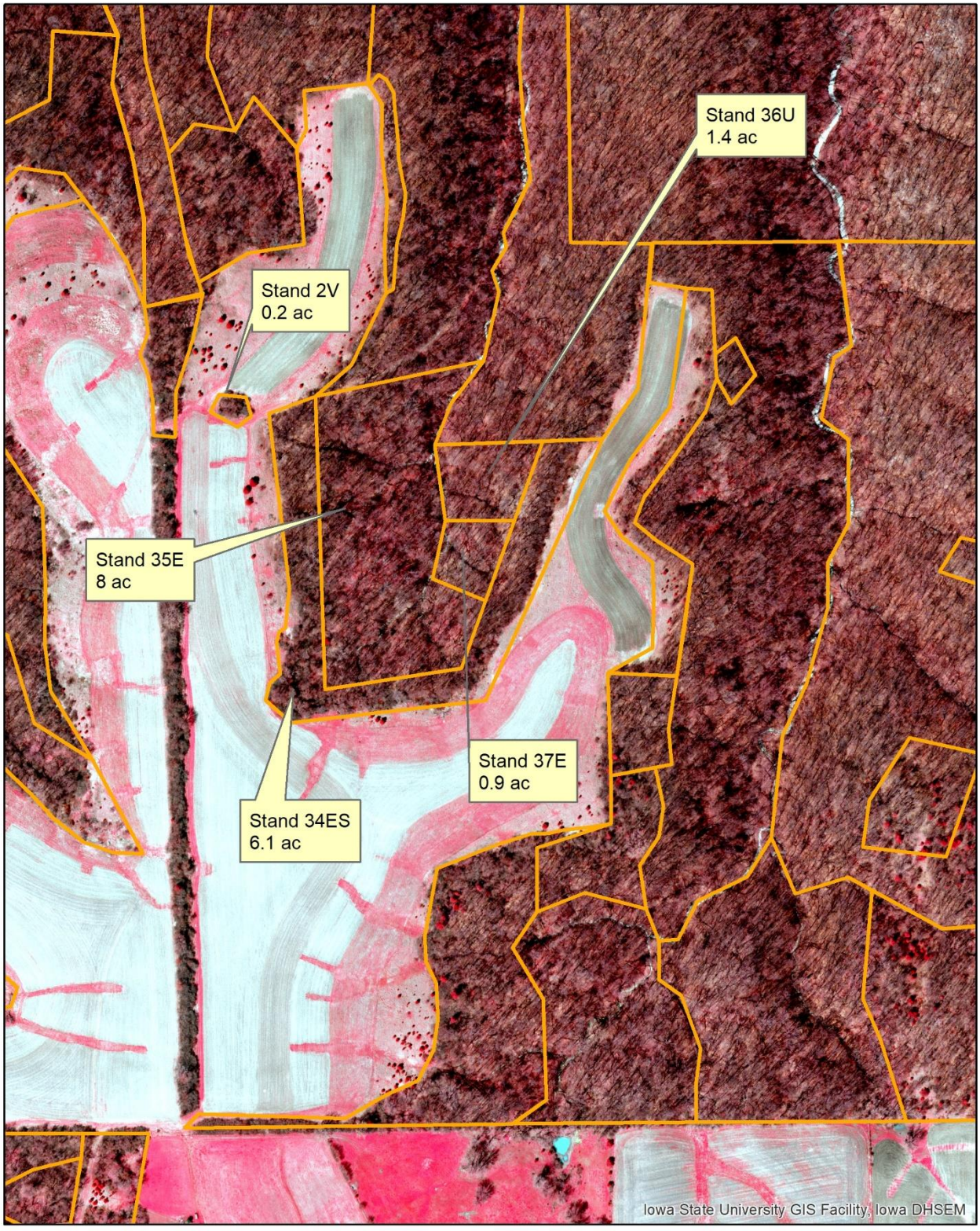


Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 300 600 1,200 Feet

N

Big Mill Creek WMA
Stand Map

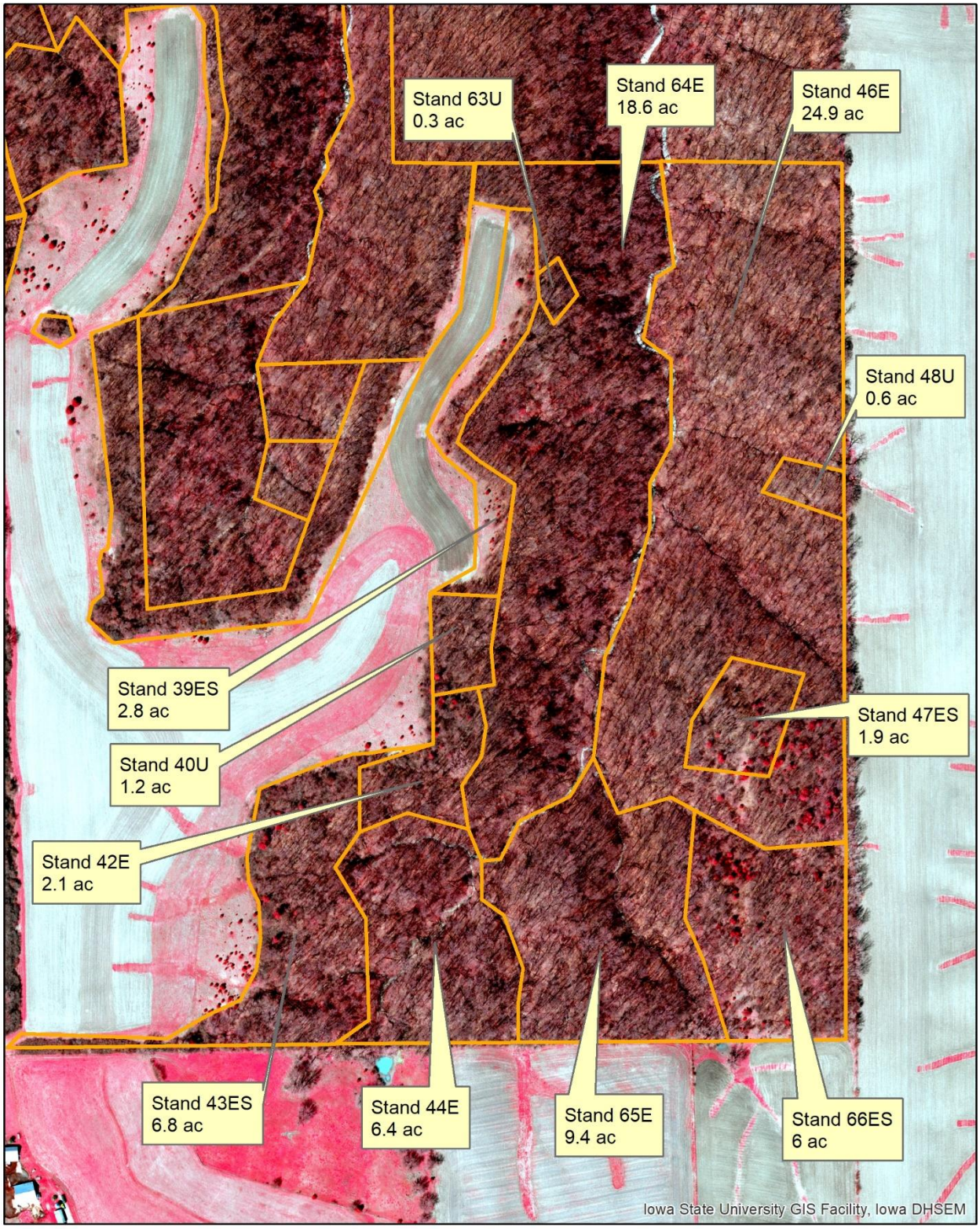


Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 300 600 1,200 Feet

N

Big Mill Creek WMA
Stand Map



Sec 8, 17, 18 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 300 600 1,200 Feet

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DESCRIPTION AND RECOMMENDATIONS FOR INDIVIDUAL STANDS

BIG MILL CREEK STANDS

Stand 1V: 1.0 acres

Forest Description
This is a relatively narrow stand of lower quality large and pole-sized trees extending out from a larger block of timber. Trees in this stand are a mix of oaks, hickory and cherry with primarily honeysuckle in the understory. The most significant feature is a very large sink hole in the middle of the stand.

Management Recommendations
Protect the area containing the large sink hole. Edge feathering could be done on this stand due to the fact that it is adjacent to the crop field, but this would be low priority. Any work performed must be done along the edge, not in the interior of the stand.

Stand 2V: 0.2 acres

Forest Description
This stand includes a sink hole and small circle of trees and shrubs around it. The area is surrounded by row crop land. Boxelder is the most common tree in the area.

Management Recommendations
Protect the area containing the sink hole. Edge feathering could be done on this stand due to the fact that it is adjacent to the crop field, but this would be low priority. Any work performed must be done along the edge, not in the interior of the stand.

Stand 3V: 4.4 acres

Forest Description
This area is the north end of two ridges overlooking Big Mill Creek. To the south is the Bald Forty, which is owned by Jackson County Conservation Board. This stand contains large sized oaks and hickories typical of an upland site with an ironwood midstory.

Management Recommendations
Allow this stand to progress successionally. This stand is to be managed with minimal invasion and activity. Any harvesting to be done is prompted by storm damage, insect or disease and should be considered a salvage. This stand allows a user a fantastic view overlooking the trout stream and this is best done under minimal disturbance and forest management activities.

Stand 4V: 3.9 acres

Forest Description
This area is the north end of two ridges overlooking Big Mill Creek. To the south is the Bald Forty, which is owned by Jackson County Conservation Board. This stand contains large sized oaks and hickories typical of an upland site with an ironwood midstory.

Management Recommendations
Allow this stand to progress successionally. This stand is to be managed with minimal invasion and activity. Any harvesting to be done is prompted by storm damage, insect or disease and should be considered a salvage. This stand allows a user a fantastic view overlooking the trout stream and this is best done under minimal disturbance and forest management activities.

Stand 5V: 5.3 acres

Forest Description
This area is the big hill straight south of the northwest parking lot. This stand contain large sized oaks and hickories typical of an upland site with an ironwood midstory.

Management Recommendations
Allow this stand to progress successionally. This stand is to be managed with minimal invasion and activity. Any harvesting to be done is prompted by storm damage, insect or disease and should be considered a salvage. This stand allows a user a fantastic view overlooking the trout stream and this is best done under minimal disturbance and forest management activities.

Stand 6V: 0.2 acres

Forest Description
This stand includes a sink hole and small circle of trees and shrubs around it. The area is surrounded by row crop land. Elm, mulberry and boxelder are the most common trees in the area.

Management Recommendations
Protect the area containing the sink hole. Edge feathering could be done on this stand due to the fact that it is adjacent to the crop field, but this would be low priority.

Stand 7V: 0.2 acres

Forest Description
This stand includes a sink hole and small circle of trees and shrubs around it. The area is surrounded by row crop land. Elm, mulberry and boxelder are the most common trees in the area.

Management Recommendations
Protect the area containing the sink hole. Edge feathering could be done on this stand due to the fact that it is adjacent to the crop field, but this would be low priority.

Stand 8V: 16.7 acres

Forest Description
This stand contains large sized sugar maple, red oak, white oak, basswood, walnut and ash. It has seedling, sapling and pole-sized sugar maple. There are several large, exposed rock formations that add to the scenic beauty of this off- the beaten-path stand.

Management Recommendations
Allow this stand to progress successionally. This stand is to be managed with minimal invasion and activity. Any harvesting to be done is prompted by storm damage, insect or disease and should be considered a salvage. This stand allows a user a fantastic view overlooking the trout stream and this is best done under minimal disturbance and forest management activities.

Stand 9V: 4.7 acres

Forest Description
This stand is the main entrance from the south access. Although the slopes aren't long or steep, it is very undulating near the main trail. The main trees in the canopy are walnut, elm, boxelder, cottonwood and cherry. There is a considerable amount of honeysuckle and garlic mustard. This stand is adjacent to a neighboring farm.

Management Recommendations
This area is unique in that it is so close to the neighbors. Allow this stand to progress naturally and maintain a visual barrier between the two properties. Any harvesting to be done is prompted by storm damage, insect or disease and should be considered a salvage. The invasive species in this stand should be managed in order to eliminate the seed source.

Stand 10E: 5.6 acres

Forest Description
Stand 10 is a mixed hardwood plantation on the western edge of the property. The planting was originally completed in the mid 2000's and has been supplemented with seedlings since due to deer damage. These seedlings are competing heavily with weeds and their growth is decreased because of it. Black walnut and black cherry are likely to establish naturally because they are present in the stand immediately west.

Management Recommendations
Reduce weed pressure by applying herbicides to rows of trees. This will increase seedling growth. Allow walnut, cherry, hickory and others to regenerate naturally. Monitor the site

for deer and other damage to the tree seedlings and take appropriate action. Trees may need to be added or thinned at some point.

Stand 11E: 1.3 acres

Forest Description
Stand 11 is a mixed hardwood plantation on the western edge of the property. The planting was completed in the mid 2000's. These seedlings are competing heavily with pmj

Management Recommendations
Reduce weed pressure by applying herbicides to rows of trees. This will increase seedling growth. Monitor the site for deer and other damage to the tree seedlings and take appropriate action. Trees may need to be added or thinned at some point.

Stand 12E: 2.9 acres

Forest Description
This stand is a small conifer plantation approximately 10 years old. Species include eastern red cedar, Norway spruce and red pine. Survival is average with the trees fairly dense in places and a little thin in others. The appearance of rows is less noticeable with less than perfect survival and gives a more natural feel.

Management Recommendations
Allow this stand to grow as it is. No thinning, pruning, or herbicide application is needed. Monitor for excessive deer or rodent damage and take appropriate action. If hardwood trees such as cottonwood become established, remove them to allow the conifers to dominate the stand. The exception to this is the aspen would be allowed to sprout/expand into the open areas on the west end.

Stand 13E: 3.4 acres

Forest Description
This stand contains walnut, bur oak and hackberry primarily. The sizes range from pole to large, with average quality. The canopy is somewhat broken which has contributed to lower quality form. The younger walnut are the best formed trees in this stand. The understory is dominated by honeysuckle.

Management Recommendations
This stand would benefit from a light thinning where hackberry are growing into the canopy of bur oak and walnut while competing for sunlight.

Stand 14ES: 0.5 acres

Forest Description
This stand is dominated by pole-sized aspen. This is a set of trees with the ability to expand into other areas with adequate sunlight.

Management Recommendations
Cut or otherwise disturb this area at least once every 15 years. Allow cut stems to remain on site to improve early successional habitat. Allow sprouting to occur (do not treat cut stumps with herbicides). If desired, allow the stand to expand into adjacent areas.

Stand 15S: 1.9 acres

Forest Description
Bur oak, walnut, hackberry, shagbark hickory and red oak are the predominant trees here. Most trees are large or medium size. The understory is a mix of honeysuckle and prickly ash. The midstory is lightly populated. The stand is roughly from the edge of the timber to halfway down the slope.

Management Recommendations
This stand has the ability to carry fire in dry conditions and should be burned in a rotation to reduce the presence of invasive honeysuckle and native prickly ash. The burn rotation is anticipated to be approximately every 5 years, but should be adaptive based on results and desired conditions for stand maintenance. Hackberry should be removed to reduce the seed source and future regeneration of hackberry and to give more open conditions. Reduce tree density to maintain grass and forb growth at ground level. This may mean no more than approximately 20 trees per acre.

Stand 16E: 5.2 acres

Forest Description
Stand 16 is similar to 15 in main canopy species composition, but has more trees with higher quality stems. This is likely due to deeper soils, with more moisture, making better growing conditions. This area is much less likely to carry a fire, so burning as a management tool is unlikely. The honeysuckle and prickly ash that were in Stand 15 aren’t a consideration here.

Management Recommendations
Perform crop tree release (CTR) on the most desired species with the most desirable form.

Stand 17S: 7.8 acres

Forest Description
This stand has a mix of bur oak, black walnut, elm, hackberry and sugar maple. The sizes range from pole to large. Adjacent to the stand is a 0.7 acre area of open grassland which is surrounded by timber. There is economic value to the walnut and bur oak.

Management Recommendations
Remove elm, hackberry and sugar maple greater than 1" diameter at breast height (DBH). Also remove walnut over 22"DBH and those with poor form. Merchantable trees should be harvested by a bonded timber buyer through a timber sale. Cull trees not harvested should be felled or girdled after the sale. This should create a savannah where bur oak is the predominant tree. Use prescribed fire on an approximate 5 year rotation to reduce unwanted regeneration of hackberry, elm and sugar maple.

Stand 18E: 0.9 acres

Forest Description
Stand 18 is a mix of boxelder and elm. This stand has had some tree mortality and has about 75% canopy. These trees provide very little in terms of wildlife habitat.

Management Recommendations
Convert this area to trees with a higher wildlife value. There is very little young oak, particularly white oak on the property. Kill the existing elm, boxelder, hackberry and other trees with comparatively lower wildlife value. Leave several standing snags and all felled trees for wildlife. Plant and cage white oak or swamp white oak every 30' or 50 trees/cages per acre. Maintain the area as an even-aged oak stand.

Stand 19E: 0.4 acres

Forest Description
The stand consists of pole-sized red oak, black cherry, black oak and walnut.

Management Recommendations
Perform crop tree release (CTR) on the most desired species with the most desirable form.

Stand 20E: 3.9 acres

Forest Description
Stand 20 has a mix of shagbark hickory and black cherry trees. They are medium and pole size. The main canopy is only about 70% stocked with trees. These trees will likely have a broader crown and a more open grown structure when they are older. This is good in terms of fruit/mast production if the species are satisfactory.

Management Recommendations
For the most part this stand can be left alone. The trees should have enough room to expand their crowns without needing a thinning. If bur oak were to naturally establish itself from adjacent stands, this area would be a candidate for savannah management.

Stand 21E: 13.3 acres

Forest Description
This stand has a complete canopy made up primarily of shagbark hickory, and bur oak. The southern portion has a lot of ironwood in the midstory where the northern portion has elm and ironwood. There are some elm approaching co-dominance, but this is the exception and not the rule.

Management Recommendations
In the short-term this area does not need anything. However, in the future this stand will be able to be regenerated naturally on the south and west-facing slopes by managing the midstory and reducing some species in the canopy. This should allow enough sunlight to reach the forest floor where seedlings can become established. This can be done about 8 years before a planned harvest of the overstory.

Stand 22E: 1.7 acres

Forest Description
Stand 22 is very similar to 21 except that 22 has sugar maple. These are primarily saplings, with some pole-sized trees.

Management Recommendations
The sugar maple should be able to be nearly eradicated and allow this stand to be managed as an even-aged stand. Hickories, walnuts, and oaks will be the trees allowed to grow and regenerate. Prior to harvest, thin unwanted seed trees and eliminate the midstory to allow enough sunlight for trees to regenerate naturally.

Stand 23U: 24.6 acres

Forest Description
Stand 23 continues the progression from 21 and 22 of continuing to get more sugar maple. The stand contains trees similar to Stands 21 and 22 with slightly more black oak and much more maple representing all size categories. This stand is likely to persist as a maple stand no matter what silvicultural practices are applied.

Management Recommendations
Maintain the oaks and hickories in the stand by releasing them from adjacent, competing trees. This will allow them to be a part of the stand as long as possible. Allow sugar maple in all size categories. Weeding the poorly formed maple will reduce the competition between them and improve the health and vigor of the stand. Maple should

be harvested periodically to keep recruiting trees to the stand. It is unlikely that oaks and shagbark hickory will be part of this stand long-term.

Stand 24E: 5.7 acres

Forest Description
The stand consists of pole-sized red oak, black cherry, bur oak, hackberry, black ash, and walnut. This area is fairly unique in that it contains black ash. It also is near the deteriorated foundation. These pole-sized trees have very good form.

Management Recommendations
Perform crop tree release (CTR) on the most desired species with the most desirable form. Care should be taken not to disturb the old building site. This area is a high priority in terms of thinning. Some consideration may be given to allowing the black ash to die back naturally.

Stand 25E: 12.3 acres

Forest Description
This area is a mix of black oak, bur oak, walnut, cherry, elm and white ash. These trees have good form and are a mix of large and medium sizes. There is very little sugar maple. Downhill, a new stand starts and it has lots of sugar maple. The maple almost follows an elevation contour line.

Management Recommendations
Weed tree removal WTR should be done to remove approximately 20-25% of the basal area. This will increase growth, health, vigor and mast production on the residual trees. It will also move the stand to a more desired species composition and possibly improve the genetics of trees in the stand.

Stand 26E: 1.8 acres

Forest Description
Stand 26 is located at the toe of the slope, below an undulating hillside managed as an uneven-aged stand. This long, narrow stand is bordered on the other side by willow, boxelder and walnut in the long drainage leading to the trout stream. Dominant trees include red oak and shagbark hickory poles with excellent quality stems.

Management Recommendations
Manage this stand as an even-aged stand to promote the growth, health and vigor of trees that thrive in an even-aged system. Perform CTR on the red oak and shagbark hickory.

Stand 27ES: 0.9 acres

Forest Description
This stand is a narrow arc between an even-aged stand and the large crop field in the middle of the property. It is comprised of elm and hickory with a few oaks on the east end. These are sapling and pole-sized trees which are gradually invading the open area to the south.

Management Recommendations
Manage this area as permanently in the early successional stage of tree growth. Cut trees every 10 years. Allow them to sprout to create thousands of small stems. Oak trees could be left alone to create an open tree, with available crown space. These trees tend to be the heaviest mast produces and mast production should be encouraged throughout this property.

Stand 28E: 2.7 acres

Forest Description
Stand 28 is a linear band of trees primarily made up of large white oak. These trees are mature and over mature. Trees regenerating naturally in the stand include hackberry, bitternut hickory and other undesirable trees in an even-aged stand.

Management Recommendations
Manage for an even-aged stand made of a mix of oaks, hickory, walnut and cherry. Harvest all merchantable trees in the stand. Kill or coppice any tree over 1"DBH. Allow as much surface soil disturbance as possible in the harvesting process without encouraging soil erosion, compaction, or rutting. Replant oaks and walnut with seedlings. Provide tree shelters to oaks while planting walnut in tree tops or other large woody debris. Supplement tree seedling planting by seed if available and desired.

Stand 29E: 3.1 acres

Forest Description
This stand has an overstory of medium size basswood, ash and sugar maple. The midstory is similar. The regeneration of seedlings is lacking, but the few that exist are the same species as the overstory trees.

Management Recommendations
Harvest any trees that are of merchantable size. These trees are not very valuable, so the bidding numbers and stumpage value will reflect that. As always, the management objective, and not income, is the main goal. Manage for an even-aged stand made of a mix of oaks, hickory, walnut and cherry. Harvest all merchantable trees in the stand. Kill or coppice any tree over 1"DBH. Allow as much soil disturbance as possible in the harvesting process without encouraging soil erosion. Replant oaks and walnut with seedlings. Provide tree shelters to oaks while planting walnut in tree tops or other large woody debris. Supplement tree seedling planting by seed if available and desired.

Stand 30E: 3.3 acres

Forest Description
Stand 30 is similar to 29 in species (less maple), but the tree diameters are larger. This makes them easier to sell due to having more volume, but they are somewhat undesirable to log buyers. Combining the harvest, site preparation and plantings of Stand 29 and 30 will be more cost effective for all involved.

Management Recommendations
Harvest all merchantable trees in the area. Kill all undesirable species for even-aged management. Coppice desirable species with the intent that they will be a part of the next stand. Allow as much soil disturbance as possible in the harvesting process without encouraging soil erosion. Replant oaks and walnut with seedlings. Provide tree shelters to oaks while planting walnut in tree tops or other large woody debris. Supplement tree seedling planting by seed if available and desired.

Stand 31E: 9.9 acres

Forest Description
This stand is dominated by relatively open grown, large white oak. Additionally, there are sugar maple, ash and walnut in every size category down to seedlings. The oaks are average quality. There is potential to grow very high quality walnut as a second age class stretches to become part of the co-dominant class of trees.

Management Recommendations
Manage for an even-aged stand. Promote the regeneration and growth of trees intolerant to shade. Harvest complete areas to allow full sunlight to reach the forest floor. Continually discourage the growth of trees tolerant to shade. Not all of this stand should be harvested at one time.

Stand 32E: 13.9 acres

Forest Description
This stand of trees lies on a gradual, east-facing slope. There is a mix of trees with oaks and hickory being the most common. These trees are large and medium size. There is a significant amount of recent tree mortality in both red oak and white oak. This has led to a broken tree canopy and the opportunity for scattered midstory trees to become more vigorous.

Management Recommendations
Conduct a timber sale to remove over-mature and poorly formed trees in pockets large enough to establish an even-aged stand of oak, hickory and associated plants. Typically these are 2-5 acres. Considerations will be made to leave several cavity trees and snags. Given the mortality taking place, the harvest could be the entire stand.

Harvest all merchantable trees in the area. Kill all undesirable species for even-aged management. Coppice desirable species with the intent that they will be a part of the next stand. Allow as much soil disturbance as possible in the harvesting process without encouraging soil erosion. Replant oaks and walnut with seedlings. Provide tree shelters to oaks while planting walnut in tree tops or other large woody debris. Supplement tree seedling planting by seed if available and desired.

Stand 33ES: 0.6 acres

Forest Description
Stand 33 is the transition area between Stand 32 and the field being used as a food plot. There are seedling, sapling and pole-sized trees invading into a narrow band of grass. This is a long, narrow stand.

Management Recommendations
Manage this area as permanently in the early successional stage of tree growth. Cut trees every 10 years. Allow them to sprout to create thousands of small stems. If any become established, oak trees could be left alone to create an open tree, with available crown space. These trees tend to be the heaviest mast produces and mast production should be encouraged throughout this property.

Stand 34ES: 6.1 acres

Forest Description
This stand is a narrow "U"-shaped piece around a large lobe of timber. The main canopy trees are a mix of hackberry, ash, elm, boxelder, hickory and mulberry with a fairly developed shrub layer.

Management Recommendations
Manage this area as permanently in the early successional stage of tree growth. Cut trees every 10 years. Allow them to sprout to create thousands of small stems. If any become established, oak trees could be left alone to create an open tree, with available crown space. These trees tend to be the heaviest mast produces and mast production should be encouraged throughout this property.

Stand 35E: 8.0 acres

Forest Description
Stand 35 is an area where several small ravines come together to form the upper end of a large drainage. This is a lobe of timber extending into the cropland. Main canopy trees include large white oak and shagbark hickory.

Management Recommendations
Manage this stand for even-aged trees. Remove the midstory to allow sunlight to reach the forest floor. Monitor to see if any desirable trees begin regenerating. Harvest could begin after oaks and hickories become established in the understory. Fire could be

introduced to discourage the unwanted woody growth and spawn the regeneration of oaks and hickory.

Stand 36U: 1.4 acres

Forest Description
Stand 36 is a small pocket of shade tolerant trees surrounded by shade intolerants. Basswood, shagbark hickory and sugar maple are the dominant overstory trees with 2-4" maple being the most common regenerating tree in the midstory. There is also a population of 4-8" musclewood which is declining. There is also standing, dead red oak which is likely the result of oak wilt. This stand is likely to persist as a maple-basswood stand no matter what silvicultural practices are applied.

Management Recommendations
Maintain the oaks and hickories in the stand by releasing them from adjacent, competing trees. This will allow them to be a part of the stand as long as possible. Allow sugar maple in all size categories. Weeding the poorly formed basswood and maple will reduce the competition between them and improve the health and vigor of the stand. Maple and basswood should be harvested periodically (approximately every 20 years) to keep recruiting trees to the stand. It is unlikely that oaks and shagbark hickory will be part of this stand long-term, but they should be encouraged with practices that improve growing conditions for them to remain in the stand for as long as possible.

Stand 37E: 0.9 acres

Forest Description
Stand 37 is a small hill with large white oak. These trees are mature and over mature. Adjacent to this stand is the dead red oak. There is no oak regeneration. Ironwood and musclewood make up most of the midstory.

Management Recommendations
Conduct a timber sale to remove over mature and poorly formed trees in pockets large enough to establish an even-aged stand of oak, hickory and associated plants. Typically these are 2-5 acres. Consideration will be made to maintain several cavity trees and snags. Given the nearby mortality of the red oak taking place recently, the harvest could be the entire stand.

Harvest all merchantable trees in the area. Kill all undesirable species for even-aged management. Coppice desirable species with the intent that they will be a part of the next stand. Allow as much soil disturbance as possible in the harvesting process without encouraging soil erosion. Replant oaks and walnut with seedlings. Provide tree shelters to oaks while planting walnut in tree tops or other large woody debris. Supplement tree seedling planting by seed if available and desired.

Stand 38E: 22.4 acres

Forest Description
This stand is a west-facing slope that borders the Bald Forty. White oak, red oak, white ash and shagbark hickory are the predominant overstory trees. These trees are large, with many around 22" DBH. There are no oak wilt pockets or other decline seen during the stand mapping process. Tree form is good as is the general condition of the stand. Musclewood makes up most of the midstory.

Management Recommendations
Manage this stand as an even-aged stand. Allow the area to grow with no immediate action needed. Prior to an eventual harvest, the midstory and ash could be managed to allow additional sunlight to the forest floor. Regeneration of overstory trees should occur. If not, artificial regeneration will be needed at the time of harvest.

Stand 39ES: 2.8 acres

Forest Description
Stand 39 is the transition area between Stand 64 and the open agriculture field. There are seedling, sapling and pole-sized trees invading into a narrow band of grass. This is a long, narrow stand.

Management Recommendations
Manage this area as permanently in the early successional stage of tree growth. Cut trees every 10 years. Allow them to sprout to create thousands of small stems. If any become established, oak trees could be left alone to create an open tree, with available crown space. These trees tend to be the heaviest mast produces and mast production should be encouraged throughout this property.

Stand 40U: 1.2 acres

Forest Description
Stand 40 is much like the surrounding stands of mixed oak and hickory, but with a midstory of sugar maple. The maple are sapling and pole-sized. It would take great effort and expense to eliminate them from the stand to prevent them from becoming the next set of overstory trees.

Management Recommendations
Maintain the oaks and hickories in the stand by releasing them from adjacent, competing trees. This will allow them to be a part of the stand as long as possible. Allow sugar maple in all size categories. Weeding the poorly formed maple will reduce the competition between them and improve the health and vigor of the stand. Maple should be harvested periodically to keep recruiting trees to the stand. It is unlikely that oaks and shagbark hickory will be part of this stand long-term.

Stand 41ES: 7.2 acres

Forest Description
This stand is another transitional area adjacent to a crop field. The trees here are elm and cherry in the pole and medium size class. There are occasional oaks found in the north and eastern edge of the stand.

Management Recommendations
Manage this area as permanently in the early successional stage of tree growth. Cut trees every 10 years. Allow them to sprout to create thousands of small stems. If any become established, oak trees could be left alone to create an open tree, with available crown space. These trees tend to be the heaviest mast produces and mast production should be encouraged throughout this property.

Stand 42E: 2.1 acres

Forest Description
Black oak, red oak, shagbark hickory, bitternut, cherry, ash and aspen comprise this diverse stand. The size class ranges from medium to large, with most of the oaks in the medium size class. Elm and hackberry make up the understory. This stand looks like it had just undergone a natural thinning process and the canopy is not yet closed.

Management Recommendations
The aspen on the edge can be cut during the next early succession cutting in surrounding stands. This will promote root suckering of aspen to create habitat for early successional dependent wildlife species. The rest of the stand should be clearcut and planted with oaks. This harvest will not be a high priority until 2035.

Stand 43ES: 6.8 acres

Forest Description
This stand is another transitional area adjacent to a crop field. The trees here are elm and cherry in the pole and medium size class. There are occasional oaks found in the north and eastern edge of the stand.

Management Recommendations
Manage this area as permanently in the early successional stage of tree growth. Cut trees every 10 years. Allow them to sprout to create thousands of small stems. If any become established, oak trees could be left alone to create an open tree, with available crown space. These trees tend to be the heaviest mast producers and mast production should be encouraged throughout this property.

Stand 44E: 6.4 acres

Forest Description
Stand 44 is surrounded by timberlands owned by the state in 3 directions and a privately owned ag field to the south. Large ash dominate the overstory with elm, hackberry, shagbark hickory, white oak, bur oak and boxelder occurring as medium and pole-sized trees. There are occasional, very large cottonwoods spread out along the drainages. There is a significant amount of invasive honeysuckle in this area.

Management Recommendations
Perform Weed Tree Removal (WTR) to reduce the amount of undesirable growing stock. This will allow the favored trees the opportunity to expand their crowns, making healthier, more vigorous trees. The largest honeysuckle bushes could be cut and treated. Follow this with prescribed fire to eliminate honeysuckle seedlings and prevent a reintroduction of the invasive. Several prescribed fires may need to be performed to get the desired result, and should be used for regular maintenance of the site.

Stand 45E: 4.9 acres

Forest Description
This stand has a mix of shagbark hickory, sugar maple, walnut and red oak in the main canopy. These trees are average quality or better, and mostly large and medium sizes. The understory is ironwood.

Management Recommendations
Despite the presence of sugar maple in the overstory, manage this stand as an even-aged system. There are relatively few pole and seedling sugar maple, so this stand can be managed for oaks, hickory and walnut.

Manage the maple, ironwood and poorly formed trees of other species to create a more open canopy and limit the regeneration of these species. This can be done in a commercial thinning in combination with a WTR thinning. Harvest the remaining overstory trees when the desired regeneration becomes established. Fire could be used to set back unwanted regeneration in the event the thinning/harvest process is delayed.

Stand 46E: 24.9 acres

Forest Description
Stand 46 is south of the Bald Forty and borders a private land ag field to the east. It has a mixed oak overstory and a complete ironwood midstory in many locations and some prickly ash in others. Typically the bur oak overstory with a prickly ash understory indicate shallow soils close to rock. Travelling north/south, this stand covers several small hills which all drain to the west to a large ravine, which is the other stand boundary.

Management Recommendations
Manage this stand as an even-aged system with the primary goal to maintain a healthy oak stand with hickory and other trees that flourish in sunlit conditions. Manage ironwood and poorly formed trees of other species to create a more open canopy and limit the regeneration of these species. This can be done in a commercial thinning in combination with a WTR thinning. Harvest the remaining overstory trees when the desired regeneration becomes established. Fire could be used to set back unwanted regeneration in the event the thinning/harvest/regeneration process is delayed. Tree seedlings and shelters could also be used to supplement the natural regeneration and to add additional species not found in the stand.

Stand 47ES: 1.9 acres

Forest Description
This stand is an early succession area surrounded by timber. The area was disturbed approximately 10 years ago or there was a significant event (disease, wind, mortality) to create an opening in the canopy. The additional gooseberry, multiflora rose, blackberry and raspberry bushes have started to decline in vigor indicating less available light. The trees here are elm and cherry in the pole and medium size class. There are occasional oaks around the perimeter and could be used as the stand boundaries.

Management Recommendations
Manage this area as permanently in the early successional stage of tree growth. Cut trees every 10 years. Allow them to sprout to create thousands of small stems. If any become established, oak trees could be left alone to create an open tree, with available crown space. These trees tend to be the heaviest mast produces and mast production should be encouraged throughout this property.

Stand 48U: 0.6 acres

Forest Description
Stand 48 is another stand with oak dominating the overstory. This stand has predominantly large white oak. However, this stand has a high number of sapling and pole-sized sugar maple in the midstory. This stand is likely to persist as a maple stand no matter what silvicultural practices are applied.

Management Recommendations
Maintain the oaks and hickories in the stand by releasing them from adjacent, competing trees. This will allow them to be a part of the stand as long as possible. Allow sugar maple in all size categories to grow. In 20 years, weed the poorly formed maple which will reduce the competition between them and improve the health and vigor of the stand. Maple should be harvested periodically to recruit new trees to the stand. It is unlikely that oaks and shagbark hickory will be part of this stand long-term, so the stand should be managed in an uneven-aged system.

Stand 49ES: 1.5 acres

Forest Description
This stand is an early successional area surrounded by timber. The area was disturbed approximately 10 years ago or there was a significant event (disease, wind, mortality) to create an opening in the canopy. The additional gooseberry, multiflora rose, blackberry and raspberry bushes have started to decline in vigor indicating less available light. The trees here are elm and cherry in the pole and medium size class. There are occasional oaks around the perimeter and could be used as the stand boundaries.

Management Recommendations
Manage this area as permanently in the early successional stage of tree growth. Cut trees every 10 years. Allow them to sprout to create thousands of small stems. If any become established, oak trees could be left alone to create an open tree, with available crown space. These trees tend to be the heaviest mast produces and mast production should be encouraged throughout this property.

Stand 50E: 15.8 acres

Forest Description
This is the stand located along the diagonal boundary in the northwest portion of the property. It is the broad ridges and shallow undulations at the top of the hills. There are a few larger trees scattered, but the bulk of the trees are pole-sized bitternut hickory, ash, cherry, walnut, black oak, shagbark hickory and elm. No single species is very dominant. There is a fair amount of multiflora rose and gooseberry which indicates the stand has only recently had a closed canopy.

Management Recommendations
Maintain this stand in even-aged management to improve wildlife habitat to hard mast trees. Perform WTR, taking out bitternut hickory, ash and elm to reduce basal area by 20-25%. Release the best quality red oak and walnut if possible in the WTR thinning.

Stand 51V: 0.3 acres

Forest Description
This stand includes the sink hole and small circle of trees and shrubs around it. The area is positioned at the end of a wooded peninsula bordered by open grassland on three sides. Elm, mulberry and boxelder are the most common trees in the area.

Management Recommendations
Protect this area containing the large sink hole. Edge feathering could be done on this stand due to the fact that it is adjacent to the crop field, but this would be low priority.

Stand 52E: 7.0 acres

Forest Description
The species composition is diverse with red oak, black oak, white oak, black cherry, hackberry and sugar maple making up the dominant canopy class. The size class is pole size timber. The density varies as pockets of maple create denser stand structure in parts of the stand. There are scattered oak trees throughout most of the stand.

Management Recommendations
Thin this stand using a crop tree release method. This will give growing spaces to desirable trees to promote the growth, health, and vigor of selected crop trees. Crop trees should be selected based on species and growth form. Select crop trees every 30 feet on average.

Stand 53ES: 5.2 acres

Forest Description
This stand is a narrow arc between an even-aged stand and the large crop field in the middle of the property. It is comprised of elm and hickory with a few oaks on the east end. These are sapling and pole-sized trees which are gradually invading the open area to the south.

Management Recommendations
Manage this area as permanently in the early successional stage of tree growth. Cut trees every 10 years. Allow them to sprout to create thousands of small stems. Oak trees could be left alone to create an open tree, with available crown space. These trees tend to be the heaviest mast produces and mast production should be encouraged throughout this property.

Stand 54E: 5.4 acres

Forest Description
This stand is comprised of pole-sized black oak, walnut, cherry, red oak and eastern red cedar. The site has shallower, less productive soils than those on the rest of the property. The site is about 80% stocked. Tree form is average due to the available light in a canopy that is not yet closed. There is more multiflora rose, blackberry and gooseberry for the same reason.

Management Recommendations
Allow this stand to remain as it is. Monitor for insect and disease and take appropriate action. Weed trees should be removed if they become established. Multiflora rose can be managed to make room for more blackberry and gooseberry, if desired.

Stand 55E: 7.2 acres

Forest Description
The southern half of this stand is a dense cedar thicket. This provides great thermal cover for wildlife. The northern half is comprised of medium sized walnut and black oak. Maple and elm are a codominant tree but not throughout the stand. Honeysuckle is present in the understory.

Management Recommendations
Perform a crop tree release in the northern portion of the stand to release walnut and black oak. Utilize the average diameter of the stand to dictate how much basal area to remove and to decide how many crop trees per acre.

Stand 56E: 4.3 acres

Forest Description
The main canopy in this stand is large white oak, red oak and sugar maple. These trees are mature and over mature. There are all sizes of maples down to seedlings, but there isn't an overabundance in any size category. The large trees with little midstory and understory give an open feel to the stand, but it is fully stocked with a closed canopy.

Management Recommendations
Manage this stand in an even-aged system. Remove maple in all size categories. Harvest trees in a clearcut or seed tree cut to allow oak regeneration. Encourage all shade intolerant trees to be part of the new stand. Thin to promote growth on oaks, hickories, walnut and cherry over time.

Stand 57E: 5.1 acres

Forest Description
The species composition consists of ash, and elm with some black cherry and red oak. Most of these trees are medium size. The stands is not heavily stocked with a basal area of 80-100 square feet per acre. There are some elm and maple in the understory but they are spare and not readily present.

Management Recommendations
The species composition of the stand mainly consists of comparatively less desirable trees. The mortality of ash will likely transition this stand to an uneven-aged structure; promoting less desirable species such as maple. Cut all the trees in the stand, except for a few ash left as future snags, and plant black walnut and a diversity of oak species. Cut oaks at ground level to promote stump sprouting.

Stand 58E: 18.4 acres

Forest Description
Stand 58 includes several hillsides connected to a main ridge and extends all the way to the toe of the slope. Generally it is a southeast facing stand. There are small areas of exposed rock and soils are fairly shallow. The main canopy is typical of a central hardwood stand with both shade tolerant species as well as those intolerant of shade. Any tree found on this property can be found in this stand.

The toe of the slope has had a recent decline in elm due to Dutch elm disease. The result is the herbaceous and understory layers have had additional sunlight the last few years and have flourished. There is a lot of white mulberry found here, with multiflora rose 8-10 feet tall.

Management Recommendations
Management of this stand is going to be minimal. Manage for even-aged system with a preference for oaks and walnuts. Plant swamp white oak and pin oak seedlings with cages and spread walnut seed in open areas at the toe of the slope in locations of elm mortality.

Stand 59ES: 2.0 acres

Forest Description
This stand is located adjacent to an ag field. It contains a mix of sapling and pole-sized hardwoods, red cedar and aspen. The cedars are the most significant tree found here.

Management Recommendations
Keep this area as early successional habitat to serve as an important transitional area between a large section of forest and open ag land. Cut the trees on a 15 year rotation and allow them to re-sprout.

Stand 60ES: 1.9 acres

Forest Description
Very few trees per acre. Pole size walnut and boxelder are heavily spaced. These walnuts are of poor quality with many large branches throughout the bole. This is due to their open growing conditions. Thick grasses and scattered shrubs make up the understory.

Management Recommendations
This should be managed for early successional habitat. Remove all trees in the stand to allow for sunlight to the ground level. Plant the area with native shrubs including hazelnut, gray dogwood, redosier dogwood, and wild plum. The grass will compete with the shrub planting and will need to be sprayed. This planting should be done at the same time as stand 70.

Stand 61E: 12.2 acres

Forest Description
Large red oak, white oak, and ash make up the dominant canopy. With maple, bitternut hickory, and elm in the understory. Some of the maples are reaching a codominant class. There are forest health concerns throughout most of the stand, with scattered dead red oak and ash.

Management Recommendations
Manage as an even-aged system using a clearcutting method. Harvest all merchantable trees in a commercial sale. Remove any weed trees after the harvest. Cut any oak in the understory to promote stump sprouting. Apply chemical to bare stump of all undesirable species. Plant a diverse mix of oak species following the harvest. Use cages or tree tubes to discourage the browsing of deer on the seedlings.

Stand 62E: 7.8 acres

Forest Description
Large white oak, red oak, and shagbark hickory make up the majority of the stand. The aspect is south facing with a ridge top on the north end of the stand. Along the ridge is medium size walnut, black oak, and maple. The ridge top has a codominant strata of maple with honeysuckle in the understory.

Management Recommendations
Perform a weed tree removal to eliminate maple and honeysuckle. Hand planting will not be an option in this stand because of the rockiness of the site. A heavy thinning will help to promote natural regeneration of oak and hickory.

Stand 63U: 0.3 acres

Forest Description
Mature maples are competing with desirable oak and hickory. This stand has gradually transitioned into and uneven-aged stand. Maple is present in the understory throughout the stand.

Management Recommendations
Maintain the oaks and hickories in the stand by releasing them from adjacent, competing trees. This will allow them to be a part of the stand as long as possible. Allow sugar maple in all size categories. Weeding the poorly formed maple will reduce the competition between them and improve the health and vigor of the stand. Maple should be harvested periodically to keep recruiting trees to the stand. It is unlikely that oaks and shagbark hickory will be part of this stand long-term.

Stand 64E: 18.6 acres

Forest Description
White oak, red oak, black oak, elm, ash and hackberry are the main species present. The oak is large size with other species in the medium size class. Honeysuckle is present in spots in the understory. Dutch elm disease and emerald ash borer are present in the stand. This has been very beneficial to the oak in the stand. The mortality of elm and ash has created great stocking at 80-100 ft^2 per acre.

Management Recommendations
With the current proper spacing of a long lived species such as white oak dominating the site, there is no need for any urgent management. The next management technique will be a clearcut harvest with and under planting of oak seedlings.

Stand 65E: 9.4 acres

Forest Description
Red oak, white oak, black oak, ash, shagbark hickory, and basswood are the primary overstory species in this stand. Most trees are medium size. There is a co-dominant strata of hackberry and shagbark hickory. Elm comprises most of the understory. The oaks exhibit low hanging branches which indicates more sunlight was reaching the bole of these trees at one point.

Management Recommendations
Co-dominant trees are reaching the crowns of desirable oaks and shagbark hickories. Perform a weed tree removal to improve the health and vigor of desirable species. Target weed trees in the understory and trees competing with desirable species. This will ensure that the basal area is not reduced drastically. The removal of weed trees will benefit residual trees and also promote desirable regeneration.

Stand 66ES: 6.0 acres

Forest Description
Scattered aspen pockets, red oak, black oak, white oak, bur oak, bitternut hickory, and cherry make up the species composition in the stand. This stand is a single age class that has recently reached canopy closure in areas. Honeysuckle and hazelnut make up the understory in areas that are less shaded.

Management Recommendations
Because of the aspen component within the stand, it should be managed for early successional habitat. The size class of oaks is ideal for stump sprouting. Cut all standing trees within the stand. Undesirable species and honeysuckle should be treated at the stump. Do not treat any oak or aspen to allow them to stump sprout or root sucker and comprise the next stand of trees.

Stand 67S: 0.7 acres

Forest Description
This small stand consists of pole size bur oak, white oak, shagbark hickory with some large black oak and walnut. Hackberry, elm and honeysuckle are present in the understory. Fuel loads are light due to honeysuckle shading the understory.

Management Recommendations
This stand will be managed as a savanna. Remove non-oak species in the understory. This will help to increase the fuel load in the understory. Consider harvesting some of the merchantable walnuts with stands 15 and 17. Burn as needed (approximately every 5 years) to reduce unwanted vegetation and create desired spacing to resemble a savanna.

Stand 68ES: 0.4 acres

Forest Description
Elm is the dominant species with some large white oak, shagbark hickory and cherry. The spacing of trees is far apart. Honeysuckle and chokecherry make up the understory.

Management Recommendations
Much of the overstory can be removed by felling or girdling. Merchantable trees can be harvested when a harvest takes place in adjacent stands. Remove invasive honeysuckle. This will enhance desirable understory species and create early successional habitat. Due to its small size and landscape position this stand is a low priority.

Stand 69E: 16.0 acres

Forest Description
Sits on a north facing slope facing the parking lot. The stand is composed of pole size ash, walnut, black oak, red oak, and cherry. There is a codominant canopy of maple and elm. There is light vegetation growth in the understory. Emerald ash borer is present in the stand, resulting in some ash mortality. The walnuts are generally spaced well. Some regeneration of red oak is apparent throughout the stand.

Management Recommendations
This stand is over stocked with many undesirable species. Perform a weed tree removal to eliminate all maple from the stand. This will allow for more desirable species to seed in as well as reduce the basal area.

Stand 70ES: 10.6 acres

Forest Description
Most of the stand mainly consists of pole size boxelder with black willow growing in some of the wetter areas. Species composition transitions moving north to more pole size maple, elm, red oak, black oak and aspen. There is a small pocket of aspen in the northernmost section of the stand.

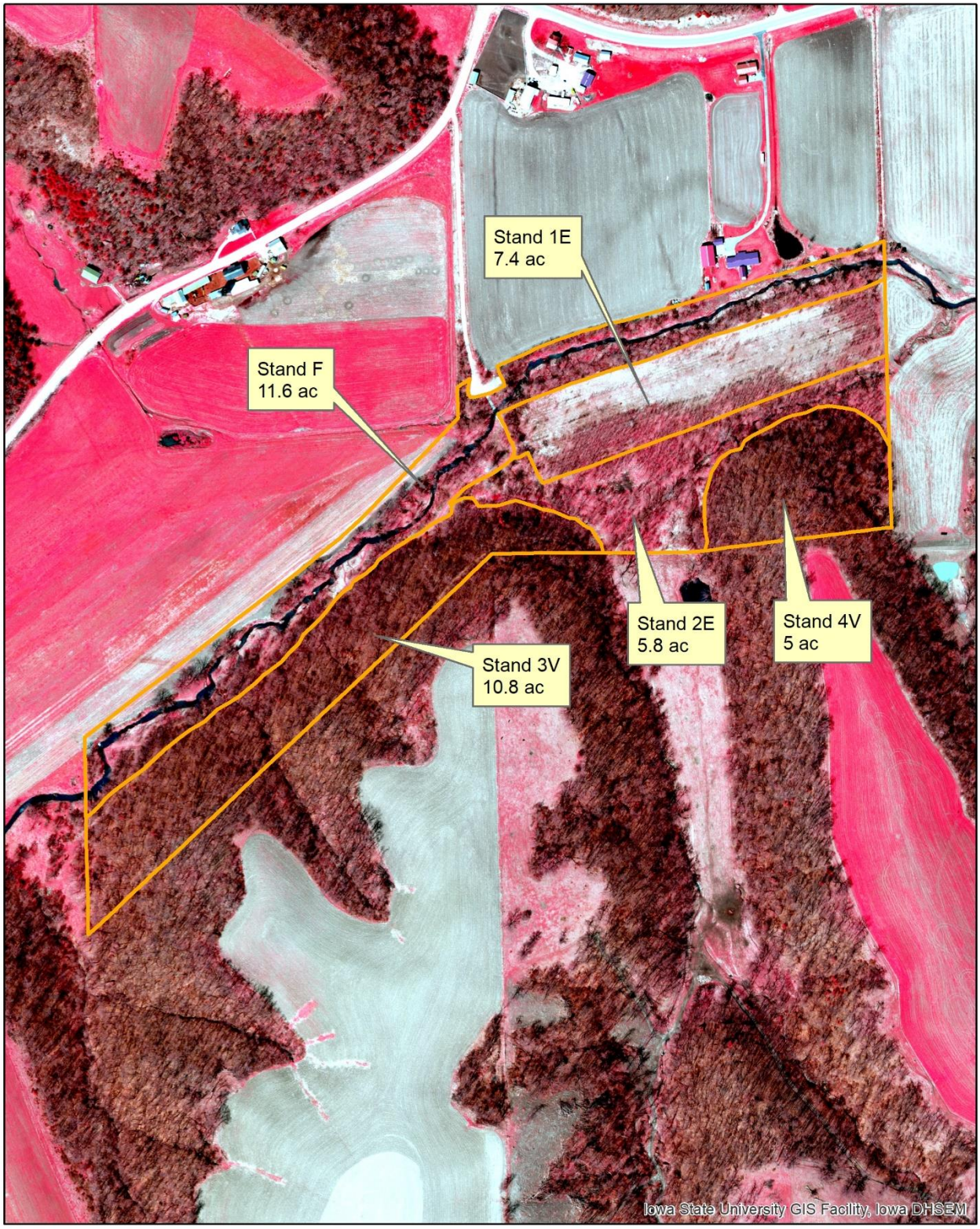
Management Recommendations
This stand should be managed as early successional habitat. Undesirable species can be cut and treated. Oaks should be cut at ground level to promote stump sprouting. Consider leaving 3-5 large oaks per acre. Plant the area with native shrubs including hazelnut, gray dogwood, redoiser dogwood, and wild plum. Do not include planting inside of the aspen cut to allow vigorous root sprouting of aspen.

Stand F: 72.2 acres

Forest Description
This stand includes all trees within the immediate trout stream corridor. A majority of these trees are boxelder, with scattered black walnut, ash, cottonwood and willow. Most of these trees fall within the pole to medium size classes and are of poor form.

Management Recommendations
This stand should be managed to meet the needs of the stream and fishery resource. Trees in this stand can be manipulated as deemed necessary by fish and wildlife area managers.

Little Mill WMA
Stand Map



Sec 22 Bellevue Twsp.,
T-86N R-4E
Jackson County

0 330 660 1,320 Feet

N

DESCRIPTION AND RECOMMENDATIONS FOR INDIVIDUAL STANDS

LITTLE MILL STANDS

Stand 1E: 7.4 acres

Forest Description
This area was planted in the early 2000s. Currently the southern half of the stand has a greater density of trees due to stump sprouts of boxelder from the site prep of the planting. Mixed in with the box elder on the southern half is scattered red oak, bur oak, and swamp white oak. The northern half of the stand is mainly grass and goldenrod with scattered red oak, bur oak, swamp white oak, and walnut.

Management Recommendations
Overall this planting needs time to grow. The boxelders in the southern half of the stand will eventually need to be addressed. Thinning the box elder will promote the health, vigor, and growth of any oaks or walnuts.

Stand 2E: 5.8 acres

Forest Description
This stand is located along a top slope where flooding is the main disturbance regime. There is micro topography throughout the stand caused by flooding but overall the stand is relatively flat. A low density of pole size boxelder, walnut, and cottonwood make up the stand species composition.

Management Recommendations
Plant this area to a mix of northern pecan, swamp white oak, and bur oak. Plant 200 trees per acre of large root stock at a 15 foot spacing. Fell all standing trees the fall after planting to provide enough sunlight to seedlings. Leave several snag trees.

Control the competition around each tree by spot spraying a combination of Roundup and Princep 4L herbicides. In the spring, after the vegetation is actively growing, spray a 4 ft. diameter circle around each tree with 2 quarts of Roundup plus 4 quarts of Princep 4L per acre treated. You must protect the seedling from the Roundup while spraying with a shield.

Stand 3V: 10.8 acres

Forest Description
A steep north-facing hillside with rocky outcroppings. The overstory consists of large size walnut, bur oak, red oak, shagbark hickory, and bitternut hickory. The understory consists of elm, hackberry, and ironwood. There are over mature red oaks that are starting to succumb to wind throw. Some naturally established oak seedlings are present.

Management Recommendations
Because of the rocky and steep topography as well as the landscape position, this stand should be managed as viewshed.

Stand 4V: 5 acres

Forest Description
A steep north and west-facing hillside with rocky outcroppings. The stand is very diverse with medium size basswood and elm making up the north facing aspect. Bur oak, black oak, and hackberry are more prevalent on the west facing slope. Many of the oaks are old with small diameters due to the poor growing conditions.

Management Recommendations
Because of the rocky and steep topography as well as the landscape position, this stand should be managed as viewshed.

Stand F: 11.6 acres

Forest Description
This stand includes all trees within the immediate trout stream corridor. A majority of these trees are boxelder, black walnut, cottonwood and willow. Most of these trees are in the medium size class and of poor form.

Management Recommendations
This stand should be managed to meet the needs of the stream and fishery resource. Trees in this stand can be manipulated as deemed necessary by fish and wildlife area managers.

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-aged system of management, the total acres of even-aged management divided by the rotation age is considered the allowable cut per year. The target rotation age for Big Mill Creek and Little Mill WMAs is 125 years. This ensures that large oaks as well as young forests 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 53.2 acres designated for early successional management on Big Mill Creek WMA. The allowable cut is about 3.5 acres per year. With a working cycle of 5 years, approximately 18 acres could be cut every 5 years.

Even-aged Management

There are 299.9 acres under even-aged management on Big Mill Creek WMA. Dividing 299.9 acres by 125 years yields an allowable cut of 2.4 acres per year, or 12 acres every 5 years.

There are 13.2 acres under even-aged management on Little Mill WMA. Dividing 13.2 acres by 125 years yields an allowable cut of 0.106 acres per year, or 0.53 acres every 5 years. However, a clearcut that small is not practical or desirable to achieve long term habitat goals, so the guideline will be extrapolated to allow for appropriately sized cuts to take place over a much longer occurrence interval.

Uneven-aged Management

Stand can be selectively harvested every 20 years to promote a tree species that thrive under an uneven-aged system. There are 28.1 acres under uneven-aged management on Big Mill Creek WMA. Dividing 28.1 acres by 20 years yields an allowable cut of 1.4 acres per year, or 7 acres of selective harvest every 5 years.

HIGH PRIORITY PROJECTS: First 5 Year Work Cycle

*Little Mill stands indicated by "LM" before the stand number

Open Tree Planting -

Stand #	**Acres**	**Prescription**
LM 2E	5.8	Plant oak and pecan, fell overstory
Total	5.8	

Timber Stand Improvement – Crop Tree Release

Stand #	**Acres**	**Prescription**
16E	5.2	Crop Tree Release
24E	5.7	Crop Tree Release
13E	3.4	Crop Tree Release
Total	14.3	

Timber Stand Improvement – Weed Tree Removal

Stand #	**Acres**	**Prescription**
15S	1.9	Weed Tree Removal
21E	13.3	Weed Tree Removal
25E	12.3	Weed Tree Removal
50E	15.8	Weed Tree Removal
65E	9.4	Weed Tree Removal
Total	52.7	

Early Successional Clearcuts – 10 - 15 yr. rotation

Stand #	**Acres**	**Prescription**
14ES	0.5	Early Successional Management
34ES	6.1	Early Successional Management
39ES	2.8	Early Successional Management
53ES	5.2	Early Successional Management
66ES	6.0	Early Successional Management
Total	20.6	

Even-aged Clearcuts – 60 - 125 yr. rotation

Stand #	**Acres**	**Prescription**
32E	13.9	Clearcut, plant oak
Total	13.9	

Uneven-aged (Selective) Harvests –

Stand #	**Acres**	**Prescription**
17S	7.8	Removal all species but oak, hickory
Total	7.8	

Prescribed Burning to Encourage Oak Regeneration -

Stand	**Acres**	**Prescription**
15S	1.9	WTR, burn
17S	7.8	Selective harvest, WTR, burn
Total	9.7	

APPENDIX

SUMMARY OF FOREST STANDS

Table 1. Big Mill Creek Stands

Stand #	Acres	Timber Type	Tree Size	Mgmt. System	Prescription	Priority	Year Complete	Comments
1V	1.0	Oak, hickory, cherry	Medium	Viewshed				
2V	0.2	Sinkhole	Pole	Viewshed				
3V	4.4	Oak, hickory	Large	Viewshed				
4V	3.9	Oak, hickory	Large	Viewshed				
5V	5.3	Oak, hickory	Large	Viewshed				
6V	0.2	Sinkhole	Pole	Viewshed				
7V	0.2	Sinkhole	Pole	Viewshed				
8V	16.7	Maple, basswood, oak walnut	Large	Viewshed				
9V	4.7	Walnut, elm, boxelder, cherry	Medium	Viewshed				
10E	5.6	Oak planting	Sapling	Even-aged	Weed control	High	2021	
11E	1.3	Oak planting	Sapling	Even-aged	Weed control	High	2021	
12E	2.9	Spruce, pine, cedar planting	Pole	Even-aged	Allow to Grow	Low	On-going	Re-evaluate in 2024
13E	3.4	Walnut, bur oak, hackberry	Medium	Even-aged	CTR	Medium	2023	
14ES	0.5	Aspen	Pole	Early Successional	Clearcut	High	2023	
15S	1.9	Bur oak, walnut, hackberry, shagbark hickory, red oak	Large	Even-aged	Weed Tree Removal	High	2021	Savanna
16E	5.2	Bur oak, walnut, hackberry, shagbark hickory, red oak	Large	Even-aged	Crop Tree Release	High	2022	

Stand #	Acres	Timber Type	Tree Size	Mgmt. System	Prescription	Priority	Year Complete	Comments
17S	7.8	Bur oak, walnut, elm, maple	Medium	Even-aged	Harvest walnut, and Weed Tree Removal	High	2022	Prescribed fire
18E	0.9	Boxelder elm	Medium	Even-aged	Clearcut and plant oak	Medium	2025	
19E	0.4	Red oak, cherry, black oak, walnut	Pole	Even-aged	Crop Tree Release	High	2025	
20E	3.9	Shagbark hickory, cherry	Medium	Even-aged	Allow to Grow	Medium		
21E	13.3	Shagbark hickory, bur oak, elm, ironwood	Large	Even-aged	Weed Tree Removal	Medium	2025	
22E	1.7	Shagbark hickory, bur oak, maple	Large	Even-aged	Weed Tree Removal then harvest	Medium	2025	
23U	24.6	Maple, black oak	Medium	Uneven-aged	Crop Tree Release	Medium	2030	
24E	5.7	Red oak, bur oak, walnut, cherry, hackberry, ash	Pole	Even-aged	Crop Tree Release	High	2020	
25E	12.3	Black oak, bur oak, walnut, cherry, elm, ash	Medium	Even-aged	Weed Tree Removal	High	2025	
26E	1.8	Red oak, shagbark hickory	Pole	Even-aged	Crop Tree Release	Medium	2023	
27ES	0.9	Elm, hickory	Pole	Early Successional	Clearcut	High	2030	
28E	2.7	White oak	Large	Even-aged	Clearcut and plant oak	High	2026	
29E	3.1	Basswood, ash, maple	Medium	Even-aged	Clearcut and plant oak	High	2026	
30E	3.3	Basswood, ash	Large	Even-aged	Clearcut and plant oak	High	2026	

Stand #	Acres	Timber Type	Tree Size	Mgmt. System	Prescription	Priority	Year Complete	Comments
31E	9.9	White oak, maple, ash, walnut	Large	Even-aged	Clearcut and plant oak	Medium	2030	
32E	13.9	Oak, hickory	Large	Even-aged	Clearcut and plant oak	High	2020	
33ES	0.6	Oak	Pole	Early Successional	Clearcut	Medium	2030	
34ES	6.1	Hackberry, ash, elm boxelder, hickory, mulberry	Pole	Early Successional	Clearcut	High	2023	
35E	8.0	White oak, shagbark hickory	Large	Even-aged	Weed Tree Removal then harvest	Medium	2035	
36U	1.4	Basswood, maple, shagbark hickory	Medium	Uneven-aged	Crop Tree Release	Medium	2035	
37E	0.9	White oak	Large	Even-aged	Clearcut and plant oak	High	2025	
38E	22.4	White oak, red oak, ash, shagbark hickory	Large	Even-aged	Clearcut and plant oak	High	2030	
39ES	2.8	Oak, aspen, elm	Pole	Early Successional	Clearcut	High	2023	
40U	1.2	Mixed oak, shagbark hickory, maple	Medium	Uneven-aged	Crop Tree Release	Medium	2030	
41ES	7.2	Elm, cherry	Pole	Early Successional	Clearcut	High	2023	
42E	2.1	Oak, hickory, aspen	Medium	Even-aged	Clearcut	Medium	2035	
43ES	6.8	Elm, Cherry	Pole	Early Successional	Clearcut	Medium	2030	
44E	6.4	Ash, oak, elm, hackberry, shagbark hickory	Medium	Even-aged	Weed Tree Removal	High	2026	Prescribed fire

Stand #	Acres	Timber Type	Tree Size	Mgmt. System	Prescription	Priority	Year Complete	Comments
45E	4.9	Shagbark hickory, sugar maple, walnut, red oak	Large	Even-aged	Commercial thinning/ Weed Tree Removal	High	2025	
46E	24.9	Mixed oak, ironwood	Medium	Even-aged	Commercial thinning	High	2025	
47ES	1.9	Elm, Cherry	Medium	Early Successional	Clearcut	Medium	2030	
48U	0.6	Oak, maple	Large	Uneven-aged	Crop Tree Release	Medium	2035	
49ES	1.5	Elm, Cherry	Pole	Early Successional	Clearcut	Medium	2030	
50E	15.8	Bitternut hickory, ash, cherry, walnut, black oak, shagbark hickory, elm	Pole	Even-aged	Weed Tree Removal	High	2025	
51V	0.3	Sink hole	Medium	Viewshed				
52E	7.0	Red oak, black oak, white oak, cherry, hackberry, maple	Pole	Even-aged	Crop Tree Release	High	2025	
53ES	5.2	Elm, hickory	Pole	Early Successional	Clearcut	High	2023	
54E	5.4	Black oak, walnut, cherry, red oak, cedar	Pole	Even-aged	Allow to Grow	Low	On-going	Re-evaluate in 2030
55E	7.2	Walnut, cedar, oak	Medium	Even-aged	Crop Tree Release	Medium	2026	
56E	4.3	White oak, red oak, maple	Large	Even-aged	Clearcut and plant oak	High	2025	
57E	5.1	Ash, elm	Medium	Even-aged	Clearcut and plant oak	High	2025	
58E	18.4	Oak, ash, elm, maple, hickory	Medium	Even-aged	Plant oak where Dutch Elm Disease is present	Low	2030	

Stand #	Acres	Timber Type	Tree Size	Mgmt. System	Prescription	Priority	Year Complete	Comments
59ES	2.0	Hardwoods, cedars	Pole	Early Successional	Clearcut	Medium	2030	
60ES	1.9	Walnut, boxelder	Pole	Early Successional	Clearcut	Medium	2030	
61E	12.2	Red oak, white oak, ash	Large	Even-aged	Clearcut and plant oaks, and shrubs	High	2022	
62E	7.8	White oak, red oak, shagbark hickory	Large	Even-aged	Weed tree removal	Medium	2026	
63U	0.3	Maple, oak	Large	Uneven-aged	Selective harvest	Medium	2026	
64E	18.6	Oak, elm, ash	Large	Even-aged	Clearcut	Medium	2040	
65E	9.4	Oak, hickory, basswood	Medium	Even-aged	Weed Tree Removal	High	2025	
66ES	6.0	Oak, Aspen	Medium	Early Successional	Clearcut	High	2023	
67S	0.7	Oak, walnut, hackberry	Medium	Even-aged	Weed tree removal	High	2023	
68ES	0.4	Elm, oak, hickory	Medium	Early Successional	Clearcut	Low	2030	
69E	16.0	Ash, walnut, black oak, red oak	Pole	Even-aged	Weed Tree Removal	High	2026	
70ES	10.6	Box elder, black willow	Pole	Early Successional	Clearcut and plant shrubs	High	2030	

SUMMARY OF FOREST STANDS

Table 2. Little Mill Stands

Stand #	Acres	Timber Type	Tree Size	Mgmt. System	Prescription	Priority	Year Complete	Comments
1E	7.4	Oak, Boxelder	Pole	Even-aged	Crop Tree Release	High	2029	
2E	5.8	Boxelder, walnut	Medium	Even-aged	Planting	High	2023	
3V	10.8	Oak, hickory, walnut	Large	Viewshed				
4V	5	Oak, hackberry, elm, ironwood	Medium	Viewshed				

Wildlife Species of Greatest Conservation Need For NE Iowa Forest Lands

*The species lists do not necessarily indicate presence on Big Mill Creek or Little Mill WMAs

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

Table 3. 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	--
Eastern Whip-poor-will	*Caprimulgus vociferus*	--	--
Eastern wood-pewee	*Contopus virens*	--	--
Red-headed woodpecker	*Melanerpes erythrocephalus*	--	--
Acadian flycatcher	*Empidonax virescens*	--	--
Brown creeper	*Certhia americana*	--	--
Veery	*Catharus fuscescens*	--	--
Wood thrush	*Hylocichla mustelina*	--	--
Blue-winged warbler	*Vermivora pinus*	--	--

Cerulean warbler	*Dendroica cerulea*	--	--
Prothonotary warbler	*Protonotaria citrea*	--	--
Worm-eating warbler	*Helmitheros vermivorus*	--	--
Kentucky warbler	*Oporornis formosus*	--	--
Eastern towhee	*Pipilo erythrophthalmus*	--	--
American kestrel	*Falco sparverius*	--	--
Common nighthawk	*Chordeiles minor*	--	--
Bewick's wren	*Thryomanes bewickii*	--	--
Belted kingfisher	*Megaceryle alcyon*	--	--
Northern flicker	*Colaptes auratus*	--	--
Eastern kingbird	*Tyrannus*	--	--
Bell's vireo	*Vireo bellii*	--	--
Brown thrasher	*Toxostoma rufum*	--	--
Common yellowthroat	*Geothlypis trichas*	--	--
Field sparrow	*Spizella pusilla*	--	--
Baltimore oriole	*Icterus galbula*	--	--

Table 4. 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*	--	--
Olive-sided flycatcher	*Contopus cooperi*	--	--
Bay-breasted warbler	*Setophaga castanea*	--	--
Harris's sparrow	*Zonotrichia querula*	--	--
American tree sparrow	*Spizelloides arborea*	--	--

Table 5. Forest Mammals of Greatest Conservation Need in NE Iowa

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

Table 6. Forest Reptiles & 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 7. 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 forests 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://www.thousandcankers.com/

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. If an aggressive/consistent effort is not started 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

Emerald 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 defoliation 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.

Forest 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 – Forest 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 forests.

Viewshed – A physiographic area composed of land, water, biotic, and cultural elements which may be viewed from one or more viewpoints and which has inherent scenic qualities and/or aesthetic values as determined by those who view it. Viewsheds are a habitat factor that will primarily be 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, faunal, 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 FOREST 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 re-sprouting. 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 re-sprout 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.

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:

A shelterwood system 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 less desirable species such as ironwood, elm, bitternut hickory, and boxelder. This removes the seed source for these 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: 7/8/20

Revision Dates (by who):