FOREST HABITAT MANAGEMENT PLAN

Prepared for:

Adair Wildlife Management Area

Jackson Township Sections 23 and 26 Adair County, Iowa

Prepared by: Lindsey Barney
District Forester
May 27th, 2021

INTRODUCTION

Adair WMA is a 338-acre public area 2.5 miles west of the town of Fontanelle, in Adair County Iowa. This tract was purchased in 1968, and has been managed by the Iowa DNR since that time. This Wildlife Management Area (WMA) is found on the forested hill ground east of the West Fork of the Middle Nodaway River. This WMA falls within the Southern Iowa Drift plain landscape area, where windblown loess soils cap rolling glacial till deposits. This WMA offers early successional/brushy habitat, intermediate aged hardwood timber, and also mixed aged timber. Grassland/cropland management on WMA ridges in addition to the forest cover creates a variety of habitats and hunting opportunities all within a relatively small tract.

OBJECTIVES

The main objectives of the forest management practices outlined in this plan are to:

- Maintain forest health and sustainability for Iowa woodland species of greatest conservation need (SGCN's) including: Broad-winged hawk, Red-headed Woodpecker, Northern Flicker, Eastern wood-pewee, Brown Thrasher, Yellow-billed Cuckoo, Black-billed cuckoo, Northern Long-eared bat, and Eastern Gray Treefrog Also, numerous game species including: whitetail deer, eastern wild turkey, ringneck pheasant, bobwhite quail, and cottontail rabbit just to mention a few.
- Rehabilitate woodlands that are declining from invasive plant pressure, disease, or prior intensive land use.
- Manage upland forest areas to promote oak regeneration and understory cover (for both wildlife habitat, and also watershed protection).

MANAGEMENT CONSIDERATIONS

SOIL AND WATER CONSIDERATIONS

The silt loam and silty clay loam soils of the Southern Iowa drift plain are fragile and very prone to erosion. If and when these soils are disturbed, they should be re-vegetated as quickly as possible to reduce the erosion hazard and to reduce invasive species colonization potential. Active erosion is occurring along the south-central boundary of this WMA, likely due to numerous onsite and off-site factors. In order to protect this watershed from further degradation, soil conservationists/engineers/or fisheries experts should be consulted for additional advice.

Forest management actions can have a big impact on soil and water quality. Machinery used for forest management activities should only be operated when soil conditions are frozen or dry. This will avoid the detrimental effects of compaction and erosion. Iowa Forestry Best Management Practices for logging roads, access roads, and associated soil work should be followed at all times. In addition, machinery used on site should follow a cleaning protocol before and after leaving Adair WMA (to prevent the transportation of invasive plant seeds). In addition, herbicides used in the management of Adair WMA should be mixed, handled, and applied according to the specific herbicide's labeled instructions. Improper use of these chemicals can lead to surface and groundwater contamination, as well as collateral damage to desirable plants and wildlife.

HISTORICAL AND CULTURAL CONSIDERATIONS

Efforts must be made before and during forest management work to identify historical or cultural sites that may be present on the landscape. If discovered, these "special sites" will be preserved, with a plan in place to protect the site from disturbance or avoid the area completely during management.

BIOLOGICAL DIVERSITY CONSIDERATIONS

Native tree, shrub, and plant species should be retained wherever feasible. Adair WMA is unique in the fact that many beneficial native shrubs (hazelnut, silky dogwood, chokecherry, coralberry, and gooseberry) are naturally found throughout the forest understories. Future management practices should work to preserve and expand native forest components, while actively managing against non-native plant components.

AESTHETIC QUALITY AND RECREATION

Aesthetic considerations are less of a concern, as treatments recommended in this plan serve to improve the appearance and health of the woodlands. Negative impacts to recreation (especially hunting) can be lessened by treating smaller units, treating portions of the WMA all at one time (and not the entire complex), and/or by varying the

treatment so interference does not occur. In the case of timber rehabilitation, portions of the WMA may need to be temporarily closed for user safety.

ENDANGERED SPECIES CONSIDERATIONS

Grand River Wildlife Unit Biologist Chad Paup provided the following report as to the presence of threatened or endangered species within Adair WMA in June of 2021: "No rare or protected status species of plants or animals are known to be present in the area or in the immediate vicinity. Continued surveillance needs to occur in coordination with management activities to ensure that no species have been overlooked. Management and research activities should consider the strong possibility of remnant prairie in this WMA."

Threatened and endangered plant and wildlife species and their habitats should be protected when conducting woodland management activities. The northern long-eared bat is a federally threatened species that is found throughout the state of Iowa. Adair WMA contains mature timber areas that could benefit this bat species, especially if there are dead or dying trees with flaking bark. Nursery colonies of these bats exist primarily between the months of April and October beneath the loose or peeling bark of certain trees (e.g. shagbark hickory) located along streams and rivers and in adjacent upland forest areas. The following recommendations apply to Northern Long-eared Bats (NLEB): Tree removal should not occur within .25 miles of a known hibernaculum. Occupied maternity roost trees or any other tree within a 150-foot radius of the maternity roost tree should not be disturbed during the pup season (June 1 through July 31st). The Indiana bat is a federal and state listed species that occurs in southern Iowa from April through September. No cut dates are - April 1-September 30. and woodland burns outside of the maternity season. (May 15-Aug 15) Staff should continually monitor the U.S. Fish and Wildlife Service for updated information pertaining to the NLEB.

Many common and endangered/threatened wildlife species rely on dead trees or trees with cavities. These forest components should be retained, where feasible, for wildlife habitat.

Although surveys for threatened and endangered plants and animals have not been completed for the Adair WMA to date, numerous state and federally protected species are known to occur or may occur in Adair County and may be present in the WMA in areas of suitable habitat if present.

FOREST MANAGEMENT OBJECTIVES

The primary management objectives for the Adair WMA are to improve wildlife habitat for a variety of wildlife species, to provide recreational opportunities, to provide clean water, and to protect endangered wildlife species and "species of greatest conservation needs". Keeping and improving the health and vigor of a diverse (tree species diversity) forest ecosystem is the key to optimizing benefits for the widest variety of wildlife species.

Due to the diverse oak resource and primary recreational needs of the Adair WMA, white-tailed deer, squirrels, turkeys, bobwhite quail, and American woodcock are targeted as primary game management species. Non-game birds such as the Black Billed Cuckoo, Yellow-billed Cuckoo, and the Red- headed Woodpecker, are also targeted as primary management species. See zip MSIM folder for a complete list of species found in 2009 (or contact wildlife biologist).

TIMBER HARVEST CONSIDERATIONS

Timber harvesting is not recommended within the current scope of this plan. However, if timber removals are considered in the future, the harvesting/removals must be done in accordance with current state-owned-land harvesting/removal policies. The harvesting/removal work must be done under the supervision of the DNR District Forester and also DNR Wildlife Biologist.

Any income generated from timber harvesting/salvage operations should be reinvested into the area to: control invasive plants, convert areas to more desirable species, and to perform the forest management recommendations put forth in this plan.

FOREST HEALTH AND INVASIVE SPECIES CONSIDERATIONS

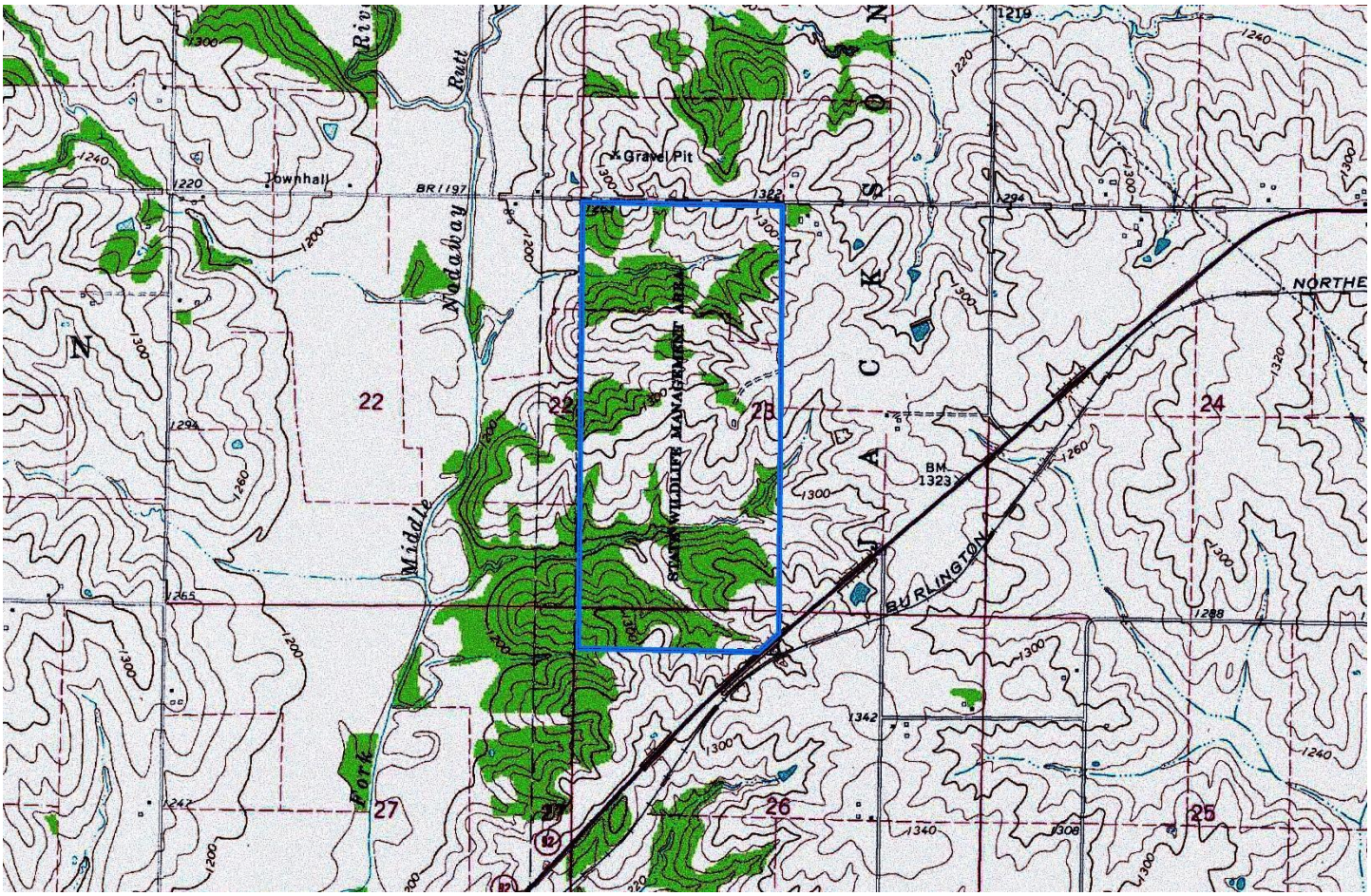
Numerous insects, diseases, and invasive plants impact the forest lands of Southwest Iowa. Adair WMA should be monitored yearly for new or unusual impacts to forest health. The following forest health concerns were identified at Adair WMA:

- *Amur Honeysuckle* - invasive shrub (found throughout the entire WMA)
- *Autumn Olive* - invasive shrub (found in forest openings and along forest edges)
- *Multiflora rose* - invasive briar (found throughout entire WMA)
- *Siberian elm* - invasive tree found in early successional forest, forest edges, right of ways
- *Oak Wilt* - disease of oak species - could be present within oak-hickory stands
- *Bur Oak Blight* -disease of upland bur oaks - could be within oak-hickory stands
- Garlic Mustard - invasive plant (found throughout WMA)

DESCRIPTION OF ADAIR WMA

The following maps display information relating to current forest conditions, and landscape features.

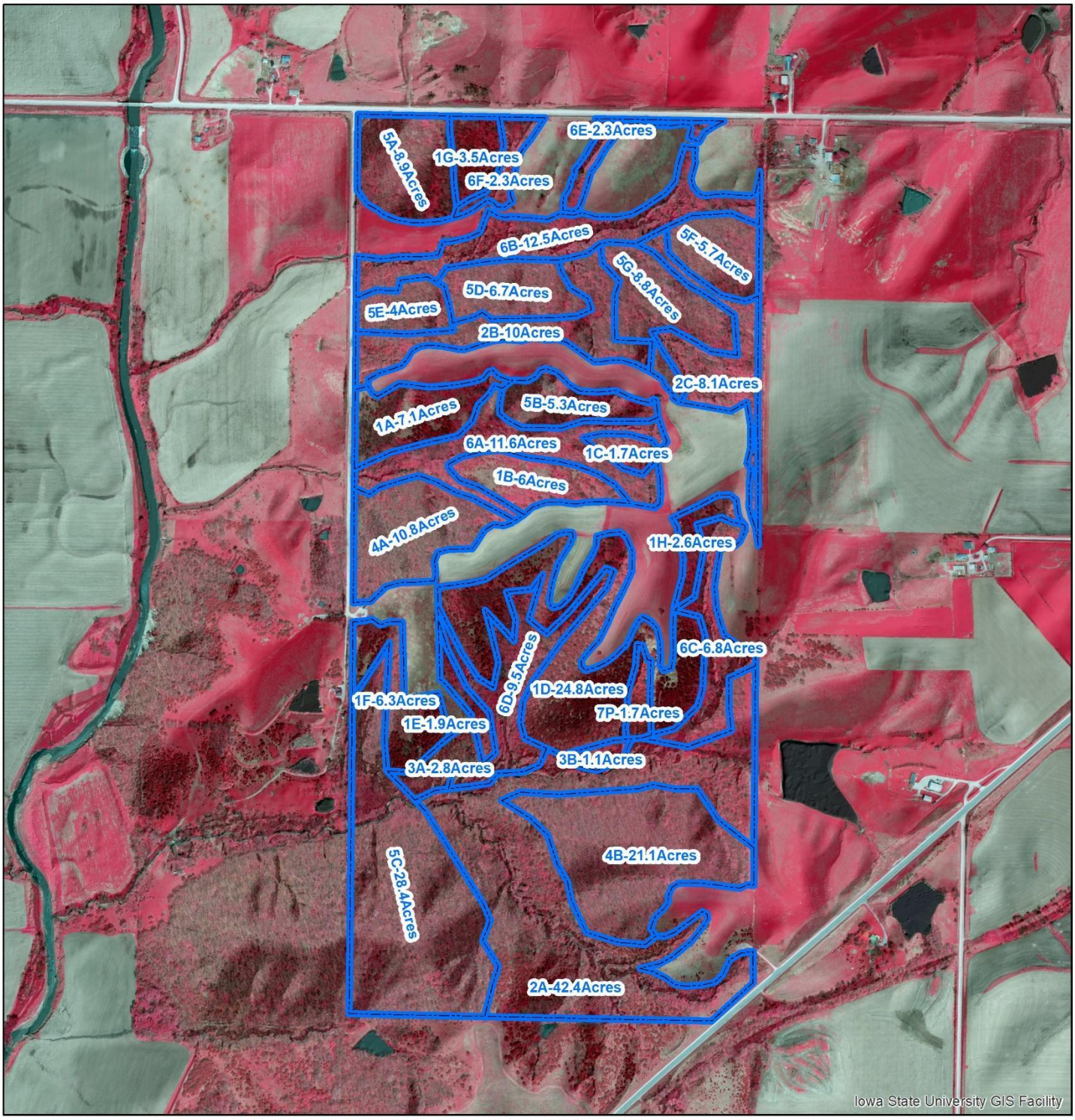
The USGS map below displays the topographic features and drainage patterns of Adair WMA. Two main drainages carry water west and out to the Middle Nodaway River floodplain. Terrain throughout the WMA is gently to moderately rolling. Areas with excessive erosion (south central property line) are very steep and incised.



Soils that formed under forest cover make up most of the forested uplands of this unit. Gara loam (179) and Ladoga silt loam (76) make up most of the forest soils on this WMA. These well drained and fertile soils are well suited to growing productive stands of hardwood timber, and the best productivity is generally found on north and east slopes. Drainage bottoms within Adair WMA fall on Ely (428) and Colo (11B) soils, which are classified as somewhat poorly drained to poorly drained silty-clay loam soils. Bottomland hardwood trees and associated forest understory components are performing well and will continue to perform best in these low areas.

Adair WMA has been divided into 7 main forest types based on average overstory diameter, forest species composition, and prior land usage. Each forest type has been divided into lettered units (or stands) to make referencing particular areas more straightforward. The following map outlines Adair WMA's stands as they were mapped in 2021.

Adair WMA - FHMP - 2016-2018 CIR over LIDAR



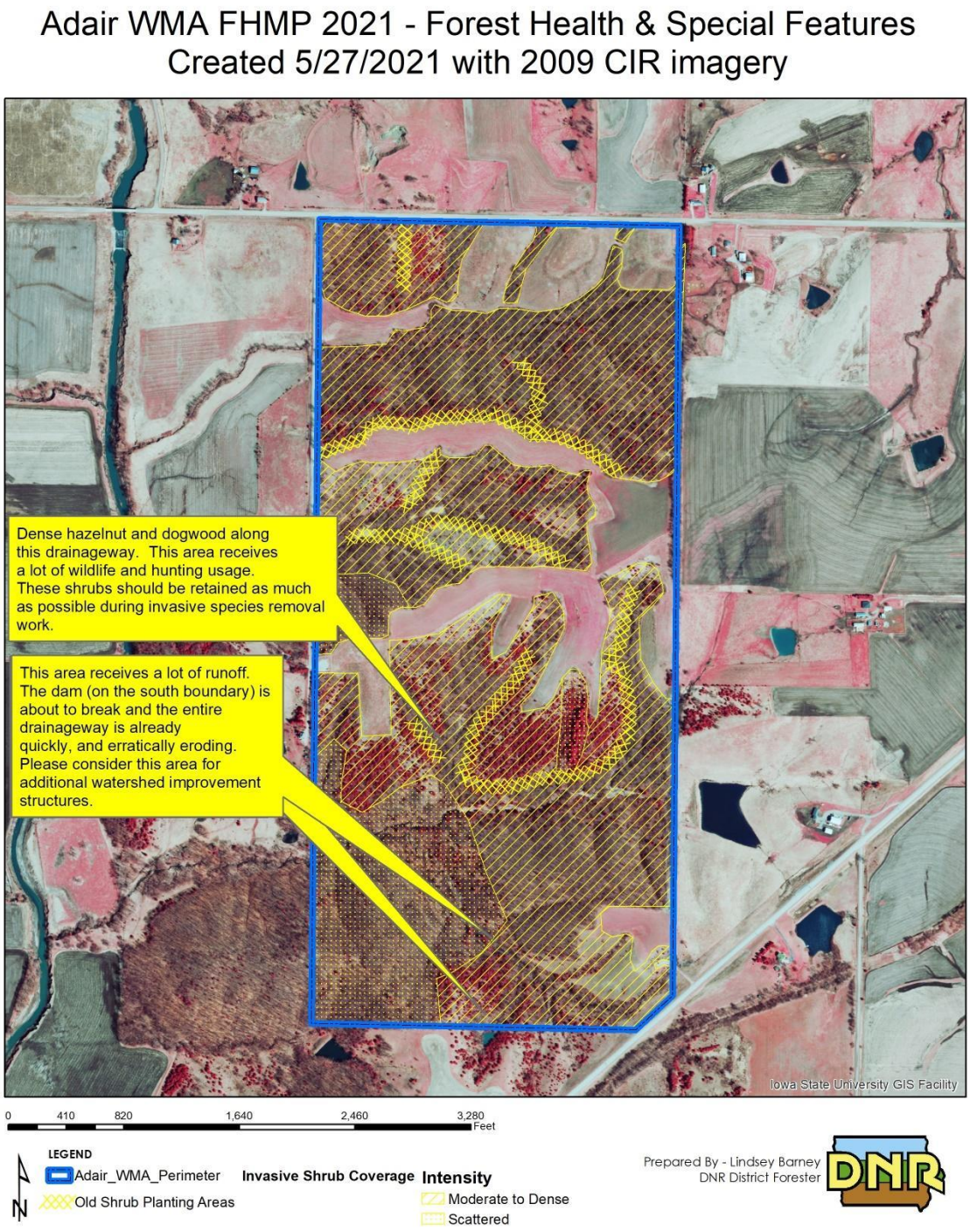
0 405 810 1,620 2,430 3,240 Feet

LEGEND

- District Forestry Stands
- Adair_WMA_Perimeter

Prepared By - Lindsey Barney
DNR District Forester

Forest health concerns play a big role in every stand at Adair WMA. Invasive species presence is the most wide-spread and most detrimental forest health concern affecting the sustainability of these oak-hickory forests and drainage timbers. Invasive species control measures must be identified and carried out prior to further timber stand improvement activities are implemented. Many invasive species present on site (bush honeysuckles, autumn olive, multiflora rose) have great potential for colonization - especially if silvicultural treatments to promote understory light levels are used. The forest stand management matrix at the end of this document summarizes the invasive plants found in each stand, and assigns a priority rating based on the severity of the infestation. In addition, Emerald Ash Borer continues to kill native ash species (white ash and green ash) throughout the WMA. The following map outlines forest health concerns, as they appeared in March of 2021.



MANAGEMENT RECOMMENDATIONS FOR ADAIR WMA

This plan outlines the current forest at Adair WMA, as they were mapped in March 2021. Detailed stand data will be collected as each unit is scheduled for management. Specific management actions will be decided in the future planning processes of each unit/stand with the District Forester and Wildlife Unit Biologist. These specific actions are not outlined in this plan in order to give future on-the-ground treatments more flexibility as logistical and biological conditions change.

While habitat management activities are intended to have an overall conservation benefit through habitat improvement, at times these activities may have unintended consequences for a variety of species. For this reason, prior to implementation, forest management activities described here will be reviewed internally to assess potential impacts to both state and federal species of concern. Site records from the DNR's Natural Areas Inventory Program (NAI) and access to the online database are provided to management biologists for use in project activity planning. When protected species are known to occur in the management area or if suitable habitat for these species is present, management biologists implement conservation measures as described in the Operation & Maintenance Plan for Wildlife Management Areas in the State along with recommendations from NAI staff. Management activities are not initiated until this review has been completed and T/E comments/concerns have been addressed.

FOREST TYPE 1 - EARLY SUCCESSIONAL/YOUNG FOREST

Stands: 1A (7.1 acres), 1B (6 acres), 1C (1.7 acres), 1D (24.8 acres), 1E (1.9 acres), 1F (6.3 acres), 1G (3.5 acres), and 1H (2.6 acres) - **53.9 total acres**

Site Description: This forest type is found between the upland ag fields/grasslands and more mature oak woodlands (which are found along drainage ways and on hill tops).

Forest Description - These units consist of early successional brush, young trees, and many units contain old Amur honeysuckle and Autumn Olive plantings. Most of this woody cover started developing between the 1980s and the early 2000s. The ground cover in the youngest units is made up of smooth brome and associated "oldfield" forbs. Dense sapling and pole stands have understory plants similar to adjacent forests (with native understory plants such as silky wild rye, white snakeroot, and Virginia creeper). Common shrubs in the area include: rough-leafed dogwood, silky dogwood, American hazelnut, smooth sumac, coralberry, gooseberry, raspberry, blackberry, multiflora rose, autumn olive, and Amur honeysuckle. Sapling to small sawlog-sized trees are intermixed with the dense brush, and consist of: eastern red cedar, American elm, red elm, occasional Siberian elm, green ash (dying), white mulberry, bur oak, black oak, shagbark hickory, bitternut hickory, black walnut, black cherry, and cottonwood.

Management Recommendations - This forest type serves as the natural gradation between crop field or grassland, and more mature woodland. This portion of the property when improved will provide cover for cottontail rabbits, bobwhite quail, cuckoos, kingbirds and shrikes as well as small mammals and snakes. Edge effect may have been the original intent of the autumn olive and amur honeysuckle plantings found in many of these stands (as they parallel forest edges from 40 years ago) but today they are considered invasive. Also, the presence of eastern red cedar in these young forests is natural and the cedars have been beneficial in shading the forest floor to suppress invasive brush colonization. But eastern red cedar is problematic where it is encroaching native prairie remnants (such as south or west slopes), or where the trees are so dense that soil erosion is beginning to occur. Invasive shrubs and cedars should also be eliminated by cutting and piling or forestry mowed where possible. Periodic controlled burns are beneficial.

Stands 1A-1F: These units are heavily impacted by invasive shrubs or contain original shrub plantings, are densely populated with eastern red cedar, and are found on slopes that would be conducive to prairie restoration. The cedars should be eliminated. *Forestry mowing, tree shearing, and chainsaw work should occur from October through late February, when soil conditions are firm or frozen. Forestry mowing should not occur past February 28th, as mowing*

during this time will stimulate regrowth of invasive shrubs. Shrubs and trees must be cut flush with the ground, to allow for follow-up treatments. Siberian elm found in these stands (or others) should be girdled and treated with herbicide, or felled and treated with herbicide.

If forestry mowing is used, the sites should be allowed to resprout. Following the product label for specific times of year, these units should be spot or broadcast sprayed (depending on need), with an herbicide containing glyphosate (if no native grasses are present), or triclopyr amine or triclopyr choline, or 2,4-D amine (if desirable grasses are present).

Stands 1G and 1H: These areas fall on soils or slopes that are conducive to forest growth. Invasive shrubs should be: mowed (if desirable hardwoods are not present) or felled by hand. If mowed, the shrub regrowth should be spot or broadcast sprayed the following summer as previously described. If invasive shrubs are cleared by hand, then stumps should be immediately treated with glyphosate herbicide applied directly to the stump. Hand clearing should occur from October through late February to avoid disturbing nesting habitat.

Units 1G and 1H fall on soils and slopes that could easily support oak-hickory forest cover, and/or shrubs. Before considering planting trees/shrubs, these sites should be canvassed to determine if prairie remnant plants are present (which would change the course of management). Prior to planting trees/shrubs, these sites should be spot sprayed for several years (to exhaust invasive plant seed banks), followed by site prep (to remove competing grasses), and eventually mechanically planted to native trees and/or shrubs.

FOREST TYPE 2 - YOUNG HARDWOOD FOREST
Stands: 2A (42.4 acres), 2B (10 acres), and 2C (8.1 acres) - **60.3 total acres**

Site Description: This forest type is found in areas where forest cover developed between the 1970's and 1980's.

Forest Description - These stands consist of sapling and pole sized trees, and are generally dominated by pole-sized trees. Overstory tree species include: bur oak, red oak, black oak, shagbark hickory, black walnut, green ash, black cherry, and eastern red cedar. The understory consists of prickly ash, hazelnut, silky dogwood, Amur honeysuckle, and autumn olive.

Management Recommendations -
Stand 2A: Stand 2A falls in a highly erosive drainage, which consists of many deep gullies and areas that may be inaccessible to machinery. The southern reaches of this stand should be evaluated for erosion concerns, prior to any forest management activities being planned. If access is improved, then forestry mowing, tree shearing, and chainsaw work for invasive brush control may be useful on the SW corner of this stand. Otherwise, most of this stand should be prioritized for hand removal (cut-stump treatment) of invasive shrubs. Cut-stump treatment will allow for better access in rugged ravines, will allow for targeted treatment of herbicides near water courses, will allow for better species identification (sparing beneficial native shrubs like silky dogwood and hazelnut), will minimize soil disturbance in a wet and eroding drainage area, and will minimize damage to existing young hardwood trees (caused by large machinery).

For the scope of this plan, stand 2A should be managed to control understory invasive shrubs. No overstory or midstory thinning is recommended (at this time), as keeping shade on this rugged stand will help suppress invasive regrowth.

Stands 2B and 2C: Stands 2B and 2C contain original honeysuckle and autumn olive plantings. These invasive shrub plantings and eastern red cedar may be able to be mechanically mowed or sheared and treated (as previously described) without harming beneficial pole-sized hardwood trees. This entire area should then be broadcast sprayed with appropriate herbicide in early summer (as described in FT1) to set back invasive brush regrowth. These invasive shrub control areas should then be monitored for several years and spot treated with foliar herbicides (or possibly aerial spraying) to control invasive shrub seedlings and regrowth.

Stand 2B will be fairly open after invasive brush control work, and could be considered for planting to native shrubs. Stand 2C should be considered for interplanting hardwoods among existing hardwoods while the cedars should be eliminated. Shrubs should be planted along the field edge, to limit interference with farm machinery.

FOREST TYPE 3 - COTTONWOOD/YOUNG HARDWOOD FOREST

Units: 3A (2.8 acres), and 3B (1.1 acres) = **3.9 total acres**

Site Description: These small forest stands fall on the north side of the main southern drainage, where forest cover became established between the 1970's and 1980's.

Forest Description - These two small stands are different from others of the same age bracket, due to forest structure and species composition. The overstory consists of scattered sawlog-sized cottonwood, with a mid-story of pole-sized hardwoods and eastern red cedar. Stand 3A has a midstory dominated by pole-sized mixed oak and black walnut, and 3B has a midstory dominated by pole-sized black cherry.

Management Recommendations - The overstory shading created by large cottonwood trees and dense pole-sized hardwoods has done a good job at suppressing honeysuckle invasion. In addition, the midstory eastern red cedar is providing just the right amount of year-round cover, without negatively impacting adjacent hardwood trees. For the time being (5-10 year span of this plan), this stand should remain structurally untouched (not thinned). Original plantings of honeysuckle are found immediately adjacent to both units, making it even more important to keep the existing overstory/midstory shade in place. Invasive shrubs throughout both stands should be treated by cut stump herbicide application in mid to late fall, (or possibly aerial spraying).

FOREST TYPE 4 - SECOND GROWTH BUR OAK FOREST

Units: 4A (10.8 acres), and 4B (21.1 acres) - **31.9 total acres**

Site Description: These larger stands of timber are dominated by trees that have regrown since harvest (which likely happened before or during the 1930's).

Forest Description - These stands are dominated by pole to small sawlog-sized second growth bur oak trees. Other species found in these stands include first and second growth pole to small sawlog-sized: red oak, black oak, shagbark hickory, bitternut hickory, hackberry, black cherry, American elm, and black walnut. The midstory is generally light, and consists of sapling-sized: hackberry, American elm, red elm, black cherry, and eastern red cedar. The understory is also light (due to honeysuckle shading), but still includes: coralberry, gooseberry, prickly ash, and hazelnut. Amur honeysuckle is a serious issue in both stands, and garlic mustard is common in 4B.

Management Recommendations - Amur honeysuckle (and to a far lesser degree multiflora rose) should be controlled by hand applied cut-stump herbicide application of glyphosate in mid to late fall. Aerial application of glyphosate at the recommended rate (if approved in the future by the administration) could be considered after the DNR finalizes its research on such projects.

After successful honeysuckle control is obtained in both units, these stands would benefit from basal area thinning (BAT). BAT will be used to promote the appropriate amount of forest density for the healthiest trees in the woodland. Many sickly and suppressed oaks could be thinned in this process. If invasive shrubs are easily controlled at the time BAT is considered, then a midstory removal thinning (msr) may also be implemented to collect more understory sunlight. Hackberry and elm will be the main targets in the multiflora rose. If honeysuckle is still an issue, then midstory removal should be delayed.

Low intensity fire could be used to suppress multiflora rose and honeysuckle seedlings. Low intensity fire could also be used before and after the previously mentioned thinnings to control flushes of understory seedling growth (from species such as hackberry and elm). Oak regeneration and native understory cover are the end goals for this stand, and fire can help promote oak and set back shade tolerant elm/hackberry seedlings.

FOREST TYPE 5 - MIXED AGED OAK-HICKORY

Units: 5A (8.9 acres), 5B (5.3 acres), 5C (28.4 acres), 5D (6.7 acres), 5E (4 acres), 5F (5.7 acres), 5G (8.8 acres) - **67.8 total acres**

Site Description: These stands fall on a variety of aspects that appeared to be harvested in the 1970's.

Forest Description - These stands consist of pole to sawlog-sized trees, but the overstory is dominated by small sawtimber-sized trees. Overstory species include: black oak, red oak, bur oak, shagbark hickory, hackberry, black walnut, basswood, and black cherry. The midstory, like FT 4, is variable, but generally consists of: eastern red cedar, hackberry, and American elm. The understory is sparse, but includes: coralberry, gooseberry, and chokecherry shrubs. Amur honeysuckle is an issue in most stands, but is most continuous in stands: 5A, 5D, 5E, 5F, and 5G.

Management Recommendations - All stands except 5C are heavily infested with full-sized Amur honeysuckle shrubs. These stands should be prioritized for honeysuckle control for at least 3 consecutive years (to attempt to establish total control) before overstory tree densities are manipulated. When honeysuckle and multiflora rose control has been achieved, each stand should be inventoried to determine stocking, and then assign a specific basal area thinning regimen to each. Some stands may not need overstory thinning, once the honeysuckle layer is controlled. Prescribed fire should be of limited intensity, to protect the already declining second growth stems in many of these stands. Late fall (after leaf drop, but while invasive shrubs are still green), and early spring (when invasive shrubs break bud) will be the best seasons to burn. The following are specific recommendations for each stand:

Stands 5A, 5D, 5E, 5F, and 5G: These stands are fairly operable (gentle slopes) and should be considered for honeysuckle control via forestry mowing in late fall (using immediate cut-stump herbicide treatment techniques if possible). Clusters of desirable shrubs or young hardwoods should be flagged prior to forestry mowing, so these plants are not accidentally cut. Since treating stumps in close proximity to the forestry mower is unsafe, alternative treatment options are needed (possibly aerial spraying). Most water-based herbicides require stump treatment within 5 minutes of cutting, but switching to an oil-based herbicide (where the entire stump and the sides of the stump are treated) can allow for treating on the same day, without being close to machinery. Some experimentation may need to be done to figure out how high stumps can be left so that they are visible for treatment after mowing. Triclopyr ester-based herbicides have been shown to be effective when used as a cut-stump herbicide method, but are not shown to be effective when used for basal bark treatments. Cut stump treatment should also be considered.

These stands should be followed up each October for 2-3 consecutive years to check for new seedlings or sprouts. These small honeysuckle/rose/autumn olive shrubs should be spot treated using 3-7% glyphosate (as labeled for foliar control of woody plants).

If invasive shrub control can be achieved, then the next step for these stands is a stand inventory. The inventory will establish the average diameter, basal area, and derived stocking percentage for each stand. If the stands are nearing an overstocked condition, then the stands will be prescribed for basal area thinning to bring the stocking in between the A and B line on the stocking chart. No more than 1/3 of the stand density should be thinned in any one setting. Basal area thinning will focus on removing sickly and suppressed overstory trees. Preference for retained trees should be given to those with: good health, large canopies, single stems, and trees with limited defects. Dead and dying trees with cavities that do not pose a forest health risk should be retained for den and cavity nesting bird trees.

Stand 5B: The honeysuckle and multiflora rose in this stand should be hand treated (cut stump herbicide application) due to slopes and ravines. The stand should remain unthinned until honeysuckle is controlled within the unit, and also in the adjacent units (1A-1C, and 6A) where original plantings of honeysuckle are found.

Stand 5C: This stand has scattered honeysuckle and multiflora rose infestations. However, pockets of oak wilt, bur oak blight, emerald ash borer, and storm damage have reduced overstory density in many areas. For this stand, the scattered invasive shrubs should be treated by hand using chainsaws or brush cutters. Hand felling and treating of invasive brush will avoid damaging the site and beneficial understory/midstory trees and shrubs, and may also be necessary due to lack of access. Prescribed fire can be useful for setting back invasive seedlings, after the initial control work has been completed. Prescribed fire may need to be minimized (in terms of intensity) in this stand, due to the presence of many desirable pole-sized oak, hickory, walnut, and cherry trees (fall may be preferable).

After invasive brush control work has been completed, this stand should be inventoried (to determine stocking and also presence of oak regeneration), and also mapped to determine the quantity of forest health related openings that are present. Gaps that do not have adequate desirable tree regeneration, should be prepared for replanting. Replanting generally entails: expanding the canopy gap to achieve more sunlight, hand planting native hardwood trees in the spring, protecting hand planted trees with tree shelters, and removing undesirable midstory trees (during summer months) that are creating too much shade.

FOREST TYPE 6 - DRAINAGE BOTTOMS

Units: 6A (11.6), 6B (12.5), 6C (6.8), 6D (9.5), 6E (2.3), 6F (2.3) - **45 total acres**

Site Description: These units are found on clayey soils in drainage bottoms.

Forest Description - These stands consist of scattered sawlog-sized cottonwood and in some stands silver maple (such as 6D). The stands also include pole to sawlog-sized: green ash, black walnut, hackberry, and black cherry. The green ash in most of the stands is dead or dying, due to Emerald Ash Borer. The midstory consists of sapling to pole-sized: American elm, green ash, box elder, and hackberry. The understory (where present) consists of reed canary grass, coralberry, gooseberry, wild grape, dense Amur honeysuckle, multiflora rose, and autumn olive. Most of these drainages started developing forest cover between the 1950s and 1960s.

Management Recommendations - All of these stands should be prioritized for invasive shrub removal. There are portions of these units where forestry mowers will be easy to use (when the ground is frozen or dry). Portions of 6A, 6C, and 6D may be gentle enough to operate machinery safely. All other units and ravine portions of 6A, 6C, and 6D will need to have invasive shrub removal performed by hand (using cut-stump herbicide application). Aquatic safe glyphosate should be used when working in these creekside/high water table environments.

Extreme care should be taken in these stands to avoid damage to beneficial native understory shrubs (such as silky dogwood, hazelnut, and chokecherry).

There are also likely to be portions of each of these stands that will be very open (low overstory density) after honeysuckle/multiflora rose/Autumn olive control. These areas could be prioritized for replanting additional bottomland hardwood species (such as cottonwood, sycamore, silver maple, black willow, red mulberry) to help soak up water and to help control soil erosion. Alternatively, native shrubs may be used in the areas where non-native shrubs were planted several decades ago (species such as: buttonbush, false indigo bush, silky dogwood, nannyberry, elderberry, chokecherry, wild plum, and downy hawthorn).

FOREST TYPE 7P - PINE PLANTATION
Units: 7P (1.7 acres)

Forest Description - It is difficult to determine the age of this plantation from aerial photos, but evergreen trees start to appear on color infrared photos from the 1980's. The planting consists of small sawlog and sawlog-sized white pine, and also pole to small sawlog-sized jack pine.

Management Recommendations - This peninsula of dense evergreen cover is somewhat useful for wildlife, and more importantly the current overstory shading has kept out most invasive shrubs. This stand is of low priority for management. Prescribed fire should be allowed to pass through this area unimpeded. At some point this area could be eliminated and only time will tell if there is a remnant seeded bank in this 1.7 acres. If remnants don't appear to be in the area it is recommended that native grasses and forbs be collected from the Adair WMA in order to sustain local ecotype.

This stand should be spot treated for invasive shrubs using cut-stump herbicide application methods at the same time the work in 6C is completed (or at the same time 1D is mowed and treated).

SUMMARY OF MANAGEMENT UNITS

BAT = Basal Area Thinning, RXF - Prescribed Fire, IUS = Invasive Understory Shrubs, AH = Amur Honeysuckle, AO = Autumn Olive, MFR = Multiflora Rose

Forest Type	Unit #	Acres	Prescription	Invasive Shrubs	Priority
1 Early Successional Young Forest	1A	7.1	**STANDS 1A - 1F**: IUS Forestry Mowing (fall/winter), Summer herbicide control of regrowth, followed by grassland management	AH/AO/MFR	High
	1B	6		AH/AO/MFR	
	1C	1.7		AH/AO/MFR	
	1D	24.8		AH/MFR	
	1E	1.9		AH/MFR	
	1F	6.3	**STANDS 1G and 1H**: IUS Cut-stump application of herbicides by hand, followed by site prep for planting to native shrubs	AH/MFR	
	1G	3.5		AH/AO/MFR	
	1H	2.6		AH/MFR	
2 Young Hardwood Forest	2A	42.4	**STAND 2A:** IUS Cut-stump application of herbicides by hand, Evaluate erosion issues	AH/AO/MFR	High
	2B	10			
	2C	8.1	**STAND 2B & 2C:** IUS Forestry Mowing (fall/winter), Summer herbicide Control of regrowth, followed by replanting with native trees and shrubs		
3 Cottonwood over Young Hardwood Forest	3A	2.8	IUS Cut-stump application of herbicides by hand	AH/MFR	Medium
	3B	1.1			

Forest Type	Unit #	Acres	Prescription	Invasive Shrubs	Priority
4 Second Growth Bur Oak Forest	4A	10.8	IUS Cut-stump application of herbicides by hand - Then BAT - Maintain with RXF	AH/MFR	Medium
	4B	21.1			Medium-High
5 Mixed Aged Oak-Hickory	5A	8.9	**STANDS 5A, 5D, 5E, 5F, 5G:** Forestry mowing in fall with same day oil-based herbicide treatment: Follow up IUS treatments: BAT according to inventory results **STAND 5B:** IUS Cut-stump application of herbicides by hand **STAND 5C:** IUS Cut-stump application of herbicides by hand: Inventory and scout for regen openings	AH/AO/MFR	High
	5B	5.3		AH/AO/MFR	Medium-High
	5C	28.4		AH/MFR	Medium
	5D	6.7		AH/AO/MFR	Medium-High
	5E	4		AH/AO/MFR	
	5F	5.7		AH/AO/MFR	
	5G	8.8		AH/AO/MFR	
6 Drainage Bottom Forests	6A	11.6	IUS Forestry Mowing (where operable), IUS cut-stump herbicide application (in ravines): replant native trees and shrubs in new openings	AH/AO/MFR	High
	6B	12.5		AH/AO/MFR	Medium-High
	6C	6.8		AH/MFR	High
	6D	9.5		AH/MFR	
	6E	2.3		AH/AO/MFR	Medium-High
	6F	2.3		AH/AO/MFR	
7 Pine Plantation	7P	1.7	IUS Cut-stump application of herbicides by hand	AH/MFR	Low