



FOREST STEWARDSHIP PLAN

WAUBONSIE STATE PARK

DATE: January 8th, 2015

LOCATION: Fremont County, Iowa
Sidney TWP Sections 20, 21, 29, 30, 31, 32, & 33
Washington TWP Sections 5 & 6

FOREST ACRES: 1748 forested

PREPARED BY:

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Introduction: Waubonsie State Park is a 2000 acre manifestation of the best ecological features that the Southern Loess Hills of Iowa has to offer. The prairies, savannas, and woodlands are diverse and ecologically important to many wildlife species, both endangered and common. Unfortunately, many negative aspects of human settlement over the past 150 years have begun to severely impact the function of the ecological systems of the Loess Hills. The woodlands of Waubonsie State Park (WSP) are a microcosm of the bountiful forest resources that the Loess Hills Landform (LHL) has to offer. Regrettably, Waubonsie State Park also shares many of the forest health issues that plague the rest of the LHL.

Waubonsie State Park is widely used for camping, hiking, horse-back riding, nature viewing, and numerous other uses. The forest and prairie resources at WSP set the stage for these recreational uses, in addition to providing outdoor classrooms for many types of students, ranging from: elementary children, to graduate-level researchers, to regional landowners attending field days in ecological topics. Maintaining the health of WSP's forest resources is important to its recreational and educational users alike.

The purpose of this Forest Stewardship Plan is to provide base-line data on the current forest stand conditions while also identifying all known forest health issues that will shape or limit future management options. The ultimate objective of timber management at WSP is to make strategic, forest health-based decisions in order to preserve the forest resource for its human and wildlife users.

In October, November, and December of 2014 and January of 2015, the park was thoroughly scouted to collect stand data, identify forest health issue locations, and to map stand and unit boundaries. The data and observations this plan is based on are relative to conditions observed in 2014. This plan should be updated in 5-10 year increments, or as forest conditions notably change.

Forestry History: Much of the cultural history of the park is covered in the WSP Ecological Plan – and will not be reiterated in this plan. What should be discussed in this plan are the known forestry-based activities that can have impacts on the timber resource as it occurs today. As far as records show, the following forestry activities have occurred at WSP since its founding in 1926.

- Several walnut timber sales occurred throughout the original portions of WSP in the 1970's and 1980's. Records show these sales occurred in the Equestrian area and also near the park office. Several walnut sales also occurred during the same time frame on the Washawtee Girl Scout Camp unit.
- Black walnut and autumn olive were planted in the Washawtee Girl Scout Camp in 1991.

- Much of the Washawtee unit was logged of large diameter black walnut prior to its purchase by the State of Iowa.
- Timber stand improvement work was completed near the upper camping area – removing Eastern Red Cedar (ERC) in 2009.
- There was a black walnut salvage sale for the lower picnic area road extension into the Washawtee unit in 2008.
- Prescribed fire has been used throughout the park – sporadically through its history, and regularly from 2006-2013. Fire was used in conjunction with ERC removal in prairie restoration efforts according to WHIP grant stipulations during these later years.
- A 19 acre timber stand improvement project was completed by contractor along the Sunset Ridge trail in November of 2013 to promote oak regeneration.

Forest Management Goals

Again, the main goal of forest management at WSP is to make strategic, forest-health based management decisions in order to sustain the timber resource for its numerous dependents. Specifically, the following steps will help us achieve this one main goal:

1. Control invasive plant species throughout the park, and encourage invasive plant control measures on neighboring lands.
2. Create conditions necessary for oak and hickory recruitment throughout the maturing upland timber stands.
3. Maintain productive timber stands and improve declining or damaged timber stands.
4. Encourage native biotic diversity throughout the park.
5. Continue to judiciously use prescribed fire as a natural disturbance throughout the oak/hickory woodlands and prairie areas of the park.

Landscape Features

SOILS: The represented soil types are listed below (see the Soils map in the appendix):

Soil Type	Productivity	Location	Total Acreage	Percent of Total
<i>Castana Silt Loam</i>	Low – aspect and slope	Found SW of Lodge	15	<1%
<i>Hamburg Silt Loam</i>	Low – aspect and slope	Most of front-range	311	16%
<i>Ida Silt Loam</i>	Low – slope position	Most of park on side slopes	996	51%
<i>McPaul</i>	Low-moderate	Flood plain	0.6	<1%
<i>Monona Silt Loam</i>	Moderate-High	Ridge-tops in park	261	13%

<i>Napier Silt Loam</i>	High	Drainage bottoms	77	4%
<i>Napier Silt Loam</i> <i>Gullied Land</i>	High	Canyon bottoms – prone to invasive spp. colonization	286	15%
<i>Water</i>	NA		5	<1%
TOTAL			1952	100%

TOPOGRAHY AND WATERSHED INFORMATION: Waubonsie State Park forest lands are positioned on some of the most ruggedly steep and canyon dissected land in the whole LHL. Many small drainages interact throughout the park to conduct water from the steep uplands toward the Missouri River Floodplain. Only two main arterial drainages are named in the park, and they include: Militia Hollow (the main draw at the southern 1/3 of the park) and Horse Thief Hollow (at the Northern 1/3 of the park). In addition, springs feed an un-named drainage that flows north and west, nearly parallel to highway 2 on the south side of the highway.

Militia hollow is dammed northeast of the park lodge. The ability for this pond to hold water has been observably decreasing over the past 15 or more years. The increasing presence of invasive species (namely autumn olive and bush honeysuckle in that portion of the park) may have a direct impact on the water production of that part of the watershed. Practices to restore native forest stem density in the southern 1/3 of the park may help achieve the desired water production.

Special Sites

SPECIAL SITES: Cultural history is covered in depth in the Waubonsie State Park Ecological Management Plan. However, it should be noted that there are many pioneer homesteads spread throughout the various draws of WSP. Artifacts from these homesteaders are also found throughout the woodlands of the park. These sites should be identified and planned around when implementing management in a unit. Iowa Forest Management BMPs will be followed whenever implementing projects in any management unit.

ADJACENT PRIVATE LAND CONCERNS: Invasive species are the main concern on neighboring lands. Under this plan, we must work to encourage the control of all known adjacent invasive species infestations before we begin to implement restoration and forest management activities. Likewise, we must work to ensure the infestations at WSP are controlled so that private lands forest management activities are not impacted.

RECREATION – WSP is used for many different forms of recreation, including: hiking, horseback riding, mountain biking, wildlife observation, and camping. Forest management activities should be implemented in a way to limit potential risks to park visitors, while enhancing the recreational experience. In addition, forest management activities should be implemented in locations where they can be observed and used to teach about the importance of maintaining the fragile ecosystems of the LHL.

Biodiversity

WILDLIFE GOALS: Forest management at WSP will be focused on improving or enhancing habitat for all wildlife species. Forest restoration efforts will help improve wildlife habitat by increasing native plant diversity, helping to ensure future generations of beneficial trees (especially oaks), preventing stand conversion to less beneficial forest types, and by maintaining a diverse matrix of forest types, forest structures, and forest ages.

ENDANGERED SPECIES CONSIDERATIONS: Threatened and endangered plant and wildlife species and their habitats should be protected when conducting woodland management activities. Some of the special wildlife species listed in the 2007 Waubonsie State Park Ecological Management Plan known or predicted to use Waubonsie State Park include: the Sleepy Duskywing, the Zebra Swallowtail, the Hickory Hairstreak, the American Toad, the Western Worm Snake, the Speckled King Snake, Bald Eagle, Kentucky Warbler, Summer Tanager, Louisiana Waterthrush, Southern flying squirrel, Bobcat, Woodland Vole, and the Eastern Chipmunk. Many additional sensitive plants are found within Waubonsie State Park woodlands as well.

Timber management activities can impact Indiana bat habitat, if not planned or implemented correctly. The Indiana Bat is a Federal and state listed endangered species that has not yet been found in Fremont County. Indiana bats (and the proposed for endangered listing Northern Long-eared bat) may still exist in Western Iowa. Timber management activities should be conducted in order to preserve their habitat. Nursery colonies of the bat exist primarily between the months of April and October beneath the loose or peeling bark of certain trees located along streams and rivers and in adjacent upland forest areas. WSP's forest stands may be suitable summer Indiana and/or Northern Long-eared bat habitat.

Timber stand improvement, timber harvests, and other forest management activities are not yet restricted in bat summer habitat areas on private property. However, the Iowa Department of Natural Resources Forestry Bureau recognizes the importance of the Indiana bat as a vital forest ecosystem component and encourages forest management in accordance with guidelines that will enhance and protect the bat habitat.

Basically, the guidelines determine that there be no felling of trees that may provide Indiana Bat habitat from April 1 – October 1. Suitable habitat trees are shagbark and shellbark hickory, live or dead, or dead deciduous trees with slabs or plates of loose or peeling bark on the trunks or limbs, or dead snags with deep cracks or splits.

Snags (dead trees) should always be maintained for wildlife use – unless they will impact human-used target (trail, campground, etc.).

Prior to completing any timber harvest activities, John Pearson, Mark Loeschke, or Kelly Poole will be contacted for a site review.

FOREST HEALTH PRIORITIES AND CONSIDERATIONS

The forestlands of WSP are threatened by many forest health concerns. Black locust, tree of heaven, Amur cork tree, Siberian elm, white mulberry, autumn olive, bush honeysuckles, Japanese barberry, and multiflora rose are the woody plants directly impacting the forest resource at WSP. Bur oak blight, oak wilt, and Dutch elm disease are dramatically impacting portions of WSP as fungal tree infections. Finally, Japanese beetle infestations have radically impacted the basswood trees over the past 4+ years, and emerald ash borer may be impacting the ash trees now and in the future.

Priority throughout the park should be placed on invasive species control. Heavy consideration should also be placed in the selection of ornamental trees for the public use areas, as these selections will ultimately encroach into the native woodlands (as seen with Amur cork tree and bush honeysuckle). Only native species were used when replanting the campgrounds with the Trees for Kids Grant in spring of 2014.

Finally, the most important part of managing woodlands for forest health is: monitoring and retreating. Financial and time resources are always limited, but as projects are set up, a designated portion of that time should be focused on long-term monitoring and retreatment needs.

FOREST TYPE DESCRIPTIONS AND MANAGEMENT RECOMMENDATIONS

This property has been classified into 11 main forest stand types and 259 individual units for management (best seen on the following map). The Forest Stand Types are designated with 11 different colors, and the individual units are designated with corresponding white-outlined numbers (see Stand Map in the appendix).

Stands were described in the field based on several features, including: species composition, age/diameter distribution, site productivity, prior logging or pasture history, presence of invasive plants, and successional status. Succession refers to where the woodland is in terms of its age and progression towards a climax vegetation type (is it a shrubby field or a stand of poles or old growth timber, etc.). Each forest stand type will be described based on the average size of the timber. Trees in each unit will be placed into five possible size categories: seedling-sized (less than 1 inch in diameter), sapling-sized (1-4 inches in diameter measured at breast height or 4.5 feet off the ground -called DBH), pole-sized trees (5 to 12 inches DBH), small sawtimber-sized (13-18 inches DBH), and large sawtimber-sized trees (greater than 18

inches DBH). Shrub and non-woody vegetation will also be listed when found in significant populations.

STAND A – CEDAR & EARLY SUCCESSIONAL TIMBER

Units: 21

Total Acres: 139

General Description: This stand type is dominated by sapling and pole-sized trees with occasional trees in the small sawtimber sizes. Most native hardwoods are represented in these units, many have dense eastern red cedar cover, and many units are impacted by invasive shrub cover. Most of these stands fall on areas previously used as pasture, crop, or were once grasslands.



Overstory Species: Eastern red cedar, red, black, chinquapin, and bur oaks, ironwood, American elm, honey locust, black cherry, red mulberry, white mulberry, shagbark and bitternut hickories, black walnut, and sometimes occasional scattered cottonwoods.

Midstory Species: ironwood, redbud, gray dogwood, and autumn olive and/or honeysuckle (depending on unit).

Understory Species: Light woodland understory components (Virginia wild rye, coralberry, gooseberry, snakeroot), leaf litter, and Autumn olive and ironwood seedlings.

Forest Health Concerns: Autumn olive and bush honeysuckle infestations

Estimated Stand Statistics: 120-130 sqft/ac at 5" average diameter. Many units may be approaching an overstocked condition (but the shade may be keeping out invasive shrub cover).

Desired Future Condition: Future stands should be clear of invasive shrubs so that their densities can be maintained at healthy levels - to promote seed production and diameter growth.

Recommended Management: Control Autumn Olive and Honeysuckle through cut-stump or basal bark methods using triclopyr or Imazapyr based herbicides. Once invasive shrubs

are under control, evaluate each unit for stocking rate, and determine if pre-commercial thinning is needed to maintain forest health.

STAND B – UPLAND MIXED AGE HARDWOODS

of Units: 71

Total Acres: 532

General Description: This stand type consists of predominantly pole-sized and second growth small-sawtimber-sized upland hardwoods. Sawtimber-sized trees are also present- but are not dominant in the stand. It is likely these stands were harvested, pastured, or both at some point. This stand type was further divided into HP (high productivity) stands. To the right, the top photo shows a HP site – where no logging was evident. The bottom photo shows a low quality site with oak wilt and other forest health issues.

Overstory Species: Red oak, bur oak, chinquapin oak, black oak, shagbark hickory, red elm, green and white ash, black walnut, hackberry, and occasional honey locust and black cherry.

Midstory Species: ironwood, mixed oak, red mulberry, hackberry. Many stands also have patches of pawpaw trees.

Understory Species: Dense ash and ironwood regen, occasional honey locust regen, leaf litter, and varying densities of normal woodland understory (NWU) or coralberry/gooseberry/Virginia wild rye/snakeroot.

Forest Health Concerns: Oak wilt and bur oak blight impact many of the low quality stands. In addition, canopy openings or lower density units are heavily impacted with autumn olive



and bush honeysuckle. Many stands have scattered Japanese barberry or multiflora rose bushes, or scattered patches of tree of heaven (TOH) or black locust. Lack of desirable oak and hickory regeneration is also a concern in these stands.

Estimated Stand Statistics: Average estimated conditions of 110 square feet/acre at 12" dbh – within range of fully stocked, but some units may be getting close to being overstocked. The range of measured conditions is: 80-140 sqft/acre and 6-16" average dbh.

Desired Future Condition: Stands should be free of invasives and should be actively regenerating themselves so there are replacements for the maturing overstory trees.

Recommended Management: The first priority is to treat all known patches of invasives first. This means treating isolated invasive shrubs using cut-stump or basal bark methods, and treating patches of TOH and black locust by basal bark or injection methods. Degraded stands should be prioritized for conversion – meaning: complete harvest of merchantable trees and replanting the site to improve stand quality. These stands could also be underplanted, leaving the degraded trees in place if harvest is not desired. Lower productivity stands on steep slopes or in the front range may be considered at some point for restoration work (similar to stand H). High productivity stands should be assessed for their respective stocking levels and pre-commercially and/or commercially thinned as needed to maintain forest density and regenerative ability. Prescribed fire should be used to set-back undesirable flushes of ironwood, hackberry, A. olive, and honeysuckle seedlings before or after thinning. Fire should not be used in artificially regenerating stands or where fire conditions will be hot enough to cause damage to sensitive trees (i.e. near oak wilt patches or in red oak dominated stands).

STAND C – OLD GROWTH MIXED UPLAND HARDWOODS

of Units: 53

Total Acres: 361

General Description: This stand type encompasses units made up of old-growth, sawtimber-sized upland hardwood trees. All diameters are represented in these stands however. This stand type falls on steep drainage walls and other areas



not exposed to logging or major disturbance.

Overstory Species: Red oak, bur oak, chinquapin oak, black walnut, hackberry, basswood, shagbark hickory, white ash, green ash, Kentucky coffee tree, and honeylocust.

Midstory Species: Dense midstory layers of sapling to pole-sized ironwood in most stands, some are dense with hackberry, shagbark and/or bitternut hickories. Pawpaw patches are common as well.

Understory Species: Light NWU in most units, shady units are dominated by leaf litter and nettles.

Forest Health Concerns: Tree of heaven, autumn olive, and bush honeysuckle are main concerns – though pawpaw expansion may be keeping out further invasive colonies. Patches of bur oak blight and oak wilt are also of concern. Japanese beetles also heavily impact the basswood in these units. Lack of oak regeneration is also concerning in many units. Generally, however, the units under this stand type are pretty healthy.

Estimated Stand Statistics: Average estimated stand conditions are: 120 sqft/acre at 17" average diameter. Range of conditions: 90-150 sqft/acre and 12-24" dbh. Average stocking = very near overstocked condition.

Desired Future Condition: Again, having stands free of invasive species so oak regenerative efforts can begin. Many of these stands are mature or becoming overmature – so promoting understory reinitiation is of utmost importance.

Recommended Management: Many of these stands are highly productive: containing valuable seed bearing trees for wildlife, and valuable mature trees for timber harvest. The main goal in these stands, after invasive species control, is to encourage natural regeneration. This would slowly be done by first using midstory removal thinnings and possibly prescribed fire, and secondly by commercial overstory thinnings to remove declining, poor formed, or less desirable trees. Through time, the overstory stocking should be reduced to 60-70% - which, as long as woody competition in the understory is managed, should be enough sunlight to support oak regeneration. If after several years in this high light condition there are no signs of adequate natural oak regeneration, the respective units should be considered for artificial regeneration (or hand planting scattered trees).

STAND D- CANYON BOTTOM TIMBER

of Units: 8

Total Acres: 40

General Description: Units of the stand type encompass main arterial draws and canyons and consist of relatively new and/or open woodland conditions (due to the eroded nature

of these drainages). All size classes of trees are found in these units – cottonwoods are generally small sawtimber to sawtimber-sized.

Overstory Species: Cottonwood, sycamore, black willow, hackberry, white mulberry, American elm, green ash, and occasional red oak (higher on banks).

Midstory Species: Ironwood, boxelder, elderberry, and witch hazel.

Understory Species: Scouring rush, nettles, maidenhair fern, sedges, hyssop.

Forest Health Concerns: Current and potential autumn olive and honeysuckle infestations in the Militia Hollow area are of concern. Tree of heaven is a great risk to the Horse Thief hollow vicinity.

Desired Future Condition: The desired condition for this stand type is free of invasive plant threats, maintaining current plant diversity (including the rare witch hazel), and promoting soil stabilization to limit further infestations.

Recommended Management: These canyons are rugged and difficult to access. Regardless, infestations of honeysuckle and autumn olive are still of the density and size class to be controlled. Tree of heaven infestations to the north are small and easy to control on the WSP side. Control efforts with equestrian area neighbors should be encouraged for seed bearing TOHs at the very least.



STAND E- WALNUT PLANTATION

of Units: 1

Total Acres: 10

General Description: This stand lies only in the Washawtee unit – and consists of a plantation of small sawtimber-sized black walnut. Autumn olive was planted to be the trainer vegetation for the black walnut – but has since spread aggressively throughout most of the park.

Overstory Species: Black walnut, honey locust, American elm.

Midstory Species: Dense full-sized autumn olive shrubs and scattered eastern red cedar.

Understory Species: Snakeroot, nettles, and sedges.

Forest Health Concerns: This entire stand is a concern, but the damage done by these original olive stems has already been done. Deer heavily use this site for bedding, but seed bearing autumn olive in this area should be controlled as soon as feasible.



Estimated Stand Statistics: 70 sqft/acre at 12". This understocked condition is perpetuating the olive infestation. The quality of the growing walnuts appears to be diminished by unproductive soils – and possibly due to the competition for water and resources with the A. Olive.

Desired Future Condition: The desired condition would be to remove all autumn olive to prevent further colonization in other parts of the vicinity.

Recommended Management: Autumn olive control on this scale may need to be done mechanically (i.e. forestry mower or tree shear). If for cost-effective control, the existing trees need to be removed, I would not hesitate to clear the entire area at once. Any merchantable trees could be utilized (including honey locust). The site could be converted back to prairie – and then, at least repeated fire could be used to help control suckering or seedlings until the site heals. Fire would not be compatible with honey locust or black walnut trees.

STAND F– POLE-SIZED MIXED UPLAND HARDWOODS

of Units: 36

Total Acres: 192

General Description: This stand type is dominated primarily by pole-sized upland hardwoods, but certain units may also contain small-sawtimber-sized trees too. This stand differs from B in that this stand type is an original, young/intermediate stand (not second or third growth with varying age classes like stand B).

Overstory Species: Chinquapin oak, bur oak, red oak, black oak, black walnut, shagbark and bitternut hickories, black cherry, hackberry, honey locust, green ash, white ash, American elm, red elm, basswood, and Kentucky coffee tree. Scattered large cottonwoods are sometimes present as well.

Midstory Species: Dense autumn olive (some Washawtee stands) or dense eastern red cedar, or ironwood in all other units. Hackberry, American elm, and red oak saplings are also present.

Understory Species: Nettles, leaf litter, and occasional autumn olive or bush honeysuckle seedlings. Dense ironwood seedling cover is nearly universal.

Forest Health Concerns: Autumn olive and honeysuckle seedlings and parent shrubs are of concern.



Estimated Stand Statistics: 110 sqft/acre at 8" dbh equates to 100% stocking. Range of observed stand conditions is: 80-150 sqft/acre at 5-10" dbh.

Desired Future Condition: Remove invasive species in order to limit their impact on the growth and longevity of the existing hardwoods stand.

Recommended Management: I would recommend hand treating A. olive and honeysuckle as much as possible in these stands – using basal bark herbicide application or cut-stump herbicide application. Thinning should not be attempted until the invasive shrubs are controlled, or the problem will get worse. After acceptable invasive control is achieved, these stands should be scheduled for routine basal area thinnings in order to maximize the growth potential of these mixed species units. The black cherry and red oak of these stands are of excellent quality and should be promoted for their commercial and ecological values.

STAND G– UPLAND DRAW BOTTOM TIMBER

Units: 32

Total Acres: 289

General Description: This stand type is found in upland draw bottoms and also sometimes in canyon bottoms where no running water is present. These sites lie on very fertile soil, and many of these woodlands are relatively new – many draw bottoms were open in nature as far back as the 1930's.

Overstory Species: Most species are predominantly pole to small sawtimber in size, but there are more mature areas with sawtimber-sized trees as well. Overstory species consist of: black walnut, Kentucky coffee tree, hackberry, green ash, bitternut hickory, American elm, and honey locust. Occasionally, red oak, basswood, red mulberry, and cottonwood are present.

Midstory Species: The midstory is primarily made up of sapling and pole-sized hackberry, American elm, honey locust, and white mulberry. Some areas may have thick patches of pawpaw as well (i.e. north of park office and south of Hwy 2.)

Understory Species: Nettles, leaf litter, and garlic mustard.

Forest Health Concerns: The units of this stand type are at high risk for invasive species colonization – due to the bare, fertile soil that exists in many stands. TOH and black locust are already present in some units, and honeysuckle and autumn olive are well established in southern and eastern units. Basswood decline (from Japanese beetle or otherwise) is also of concern in these units.

Estimated Stand Statistics: 95 sqft/acre at 14 inches average DBH. The conditions range from 70-120 sqft/acre at 10-20" dbh. Units in this condition are right in the middle range of being fully stocked.

Desired Future Condition: The desired future condition is again, that these stands will be free of invasive colonization or colonization threat. The greatest potential for high productivity timber production exists on these sites. Sustainable timber removals from accessible sites would be the ultimate outcome.



Recommended Management: Control invasive plant infestations. TOH through basal bark or injection, and black locust through basal bark, injection, or cut-stump application. The sites will need to be consistently monitored until the invasive plant populations are under

control. Autumn olive and honeysuckle shrubs can be treated by cut-stump or basal bark, or possibly by foliar spraying (for late fall application).

Individual units should be formally inventoried to establish detailed stand statistics. Units of small sawtimber-sized trees nearing overstocked conditions should be considered for commercial thinning. Group selection harvest may be considered on areas with mature trees, less desirable trees, or areas of heavy tree decline. Harvested units should be immediately followed up with timber stand improvement work to remove remaining non-merchantable trees. Finally, the sites should be replanted using diverse mixtures of LH specific native hardwoods (i.e. black walnut, black cherry, Kentucky coffee tree, red oak, green ash, white ash, red elm, American elm, honey locust, etc).

STAND H- OVERGROWN OAK BARRENS

of Units: 28

Total Acres: 201

General Description: These units consist of short-statured, low site index scattered oaks in areas previously more open in density (south and west facing slopes or ridge-tops). With fire suppression, these areas have filled in with a variety of native hardwood trees and shrubs and are now fairly dense.



Overstory Species: Bur oak or chinquapin oak make up the core of most old “oak barren” areas. Red oak, black walnut, honey locust, basswood, green ash, bitternut hickory, shagbark hickory, and coffee tree are found mixed in these units. Most trees average small-sawtimber in size, but the overstory diameters generally range from pole to sawtimber size.

Midstory Species: Eastern red cedar, ironwood, red mulberry, redbud, sapling and pole-sized young oak & hickory (west stands). Autumn olive is a fairly heavy player the midstories of southern stands.

Understory Species: Snakeroot, coralberry, gooseberry, Virginia wild rye, muhly grass, and light to dense cover in honey locust, cedar, ironwood, and/or dogwood seedlings.

Forest Health Concerns: The current concern is invasive species colonization. TOH is present in many of the front-range units. Autumn olive and honeysuckle also threaten western and southern units. More degraded units are likely to have bur oak blight as well - which will threaten the longevity of the overstory oak trees.

Estimated Stand Statistics: 85 sqft/acre at 14" ave DBH. The units of this stand type range from 70-100 sqft/acre and 8-20" in diameter.

Desired Future Condition: It is desirable to return these areas back to their historic densities, mainly in order to regenerate oaks to replace the overstory trees (which are at risk of decline and death due to age, stand stagnation, and disease).

Recommended Management: Again, after the invasive species threats are subdued, a series of pre-commercial and commercial thinnings should be used to gradually bring the stem densities down to a level that at least will support natural oak regeneration (60% stocking). This low density condition will encourage flushes of woody vegetation, so fire should be used in conjunction with the thinning process to set these flushes back. Fire will also be helpful at encouraging natural understory vegetation to come back, and to discourage draw bottom species from recolonizing the site.

STAND I- BLACK LOCUST & INVASIVES

of Units: 4

Total Acres: 7

General Description: This stand type covers units that are predominantly dense in non-native, invasive woody plants. These areas are likely situated on old pasture areas.

Overstory Species: Black locust, green ash, black walnut – occasional stands (near park office) have hackberry, shagbark hickory, and bitternut hickory as well.

Midstory Species: Gray dogwood, ironwood, eastern red cedar, occasional paw paw. Tree of heaven seedlings and saplings are found scattered in the NW EQ. area unit.



Understory Species: In more open areas, dense NWU exists.

Forest Health Concerns: The entire stand is a woodland health concern – as TOH and black locust that reach maturity in these units serve as seed trees to surrounding high value timber areas.

Estimated Stand Statistics: This stand type is relatively open (as black locust casts diffuse shade) – which makes these units at risk for further invasive spp. colonization.

Desired Future Condition: Remove all invasives and convert stands to upland hardwoods.

Recommended Management: In assessable areas, stand conversion may be best attained mechanically. Black locust residues may be merchantable – and should be marketed if possible. After removal of both Black locust, and any other invasives (TOH, barberry), the site should be monitored for several years before creating a replanting plan.

If mechanical removal is not feasible or would pose too much of a site disturbance risk, black locust larger than 5" should be felled, and smaller than 5" should be treated by basal bark application or injection. Again, the site should be monitored until the threat of invasive colonization and resprouting has subsided. Prescribed fire should be discouraged, as both TOH and black locust are stimulated by fire.

In stands where fungal infections are controlling black locust, underplanting the site to suitable native hardwoods may be another option to reclaim the site.

STAND J– INTERMEDIATE RED OAK DOMINANT TIMBER

of Units: 2

Total Acres: 8

General Description: This stand type consists of small units of red-oak dominated pole to small sawtimber trees.

Overstory Species: Primarily small sawtimber red oak with basswood, green ash, bitternut hickory, and other woodland cohorts.

Midstory Species: Dense ironwood saplings and poles



Understory Species: The understory is fairly bare –consisting of leaf litter and heavy ironwood regeneration.

Forest Health Concerns: An outbreak of oak wilt would take these units out entirely by shared root grafts.

Estimated Stand Statistics: 120 sqft/acre at 14" dbh. Range of conditions was 8-20" at 120 sqft/acre. These units are nearing an overstocked condition.

Desired Future Condition: While it may be difficult to encourage diversity in a stand of this condition, it is possible to keep the existing stand healthy to discourage forest health issues through regular thinnings.

Recommended Management: These units should be inventoried to acquire site specific statistics. Units nearing overstocked should be thinned back to 70-80% stocking in order to improve their growth rates (using basal area thinning). Other species in these units should be favored for retention, in order to increase stand diversity.

Ironwood removal may encourage a healthier woodland understory – but at an intermediate stage in the forest cycle – midstory cover is really not a concern yet.

Prescribed fire should be discouraged, as fire will likely cause damage to the intermediate-sized red oak trees.

STAND P- PINE PLANTATIONS

of Units: 3

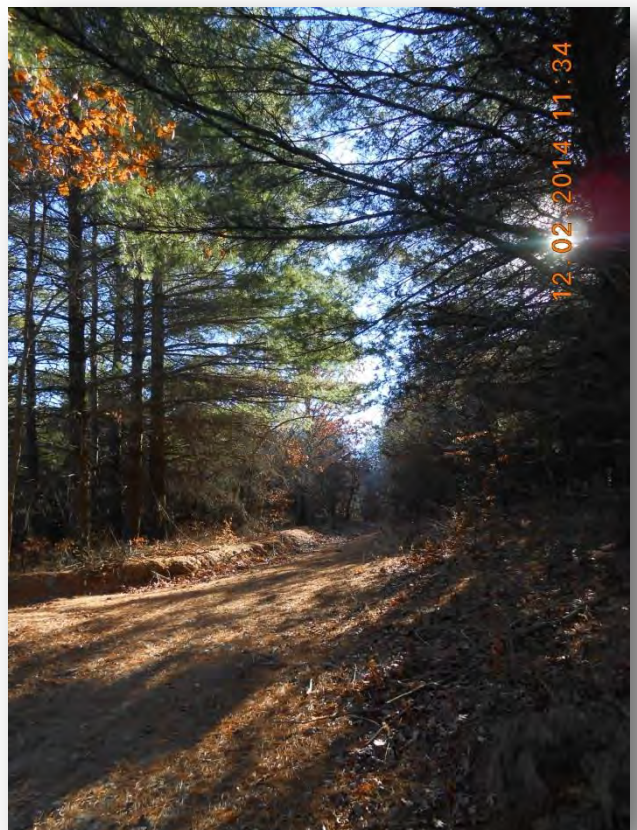
Total Acres: 9

General Description: This stand type consists of old farm field units on ridge-tops where pines were likely planted as windbreaks or as a remediation cover for old crop fields.

Overstory Species: Pole to small sawtimber-sized white pine dominate these units. Eastern red cedar is present in the Equestrian Area units. EQ. Area units are also integrated with pole-sized mixed upland hardwoods (similar to stand F).

Midstory Species: Gray dogwood, ironwood, autumn olive

Understory Species: Seedlings of ironwood, ash, honeysuckle, and autumn olive are dominant, in



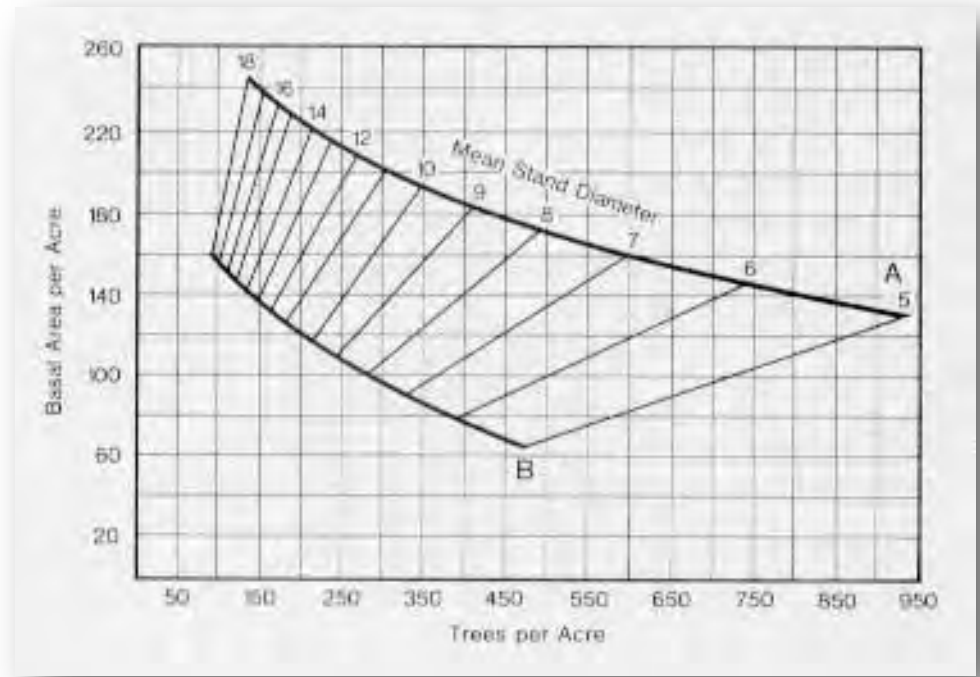
addition to NWU components. The south stand has an understory of smooth brome and A. Olive seedlings.

Forest Health Concerns: Stand stagnation and the spread of invasive shrubs (honeysuckle and A. Olive) are the main threats to these stands.

Desired Future Condition: Maintain stem density in these plantations so the pines do not decline or succumb to forest health issues.

Recommended Management: Control invasive species using cut stump or basal bark methods first.

Secondly consider removing suppressed and/or poor-formed pine first from the plantations. The plantations should be commercially thinned of these lesser trees, down to a level somewhere between the A and B line on the adjacent graph (dependent on the particular unit's stem density and average diameter). Merchantable trees should be marketed as much as possible.



SUGGESTED PRIORITY FOREST MANAGEMENT PROJECTS – IN ORDER OF PRIORITY:

1. Remove and replace Amur Cork Tree in Equestrian Area.
 2. Work with adjacent landowners to control tree of heaven in the North-Central Equestrian Area and also the Western front-range slopes of the park along Bluff (see Forest Health Concerns Map for more information). Control known Amur cork tree and tree of heaven outliers outside of these two main populations ASAP.
 3. Control black locust in the West Central portions of the park, near the park office, north and west of the overlook, and also in the north central portion of the Equestrian Area. Seed bearing trees may be prioritized first.
 4. Control Autumn Olive. Start by removing all original shrubs in Stand E, followed by intensive removal in all prairie/woodland interface areas. Limit woodland management in the southern portions of the park until hand-control of autumn olive and honeysuckle can be planned.
 5. Control the bush honeysuckle invasion in the basin east of the upper camping area.
 6. Move forward with proposed treatments for oak decline/oak wilt areas.
-

APPENDIX

Page 20 – 1875 Andreas Map

Page 21 – 1930's Aerial Photo

Page 22 – 1950's Aerial Photo

Page 23 – 1960's Aerial Photo

Page 24 – 1980's Color Infrared Photo

Page 25 – 2009 Color Infrared Photo

Page 26 – 2014 Natural Color Aerial Photo

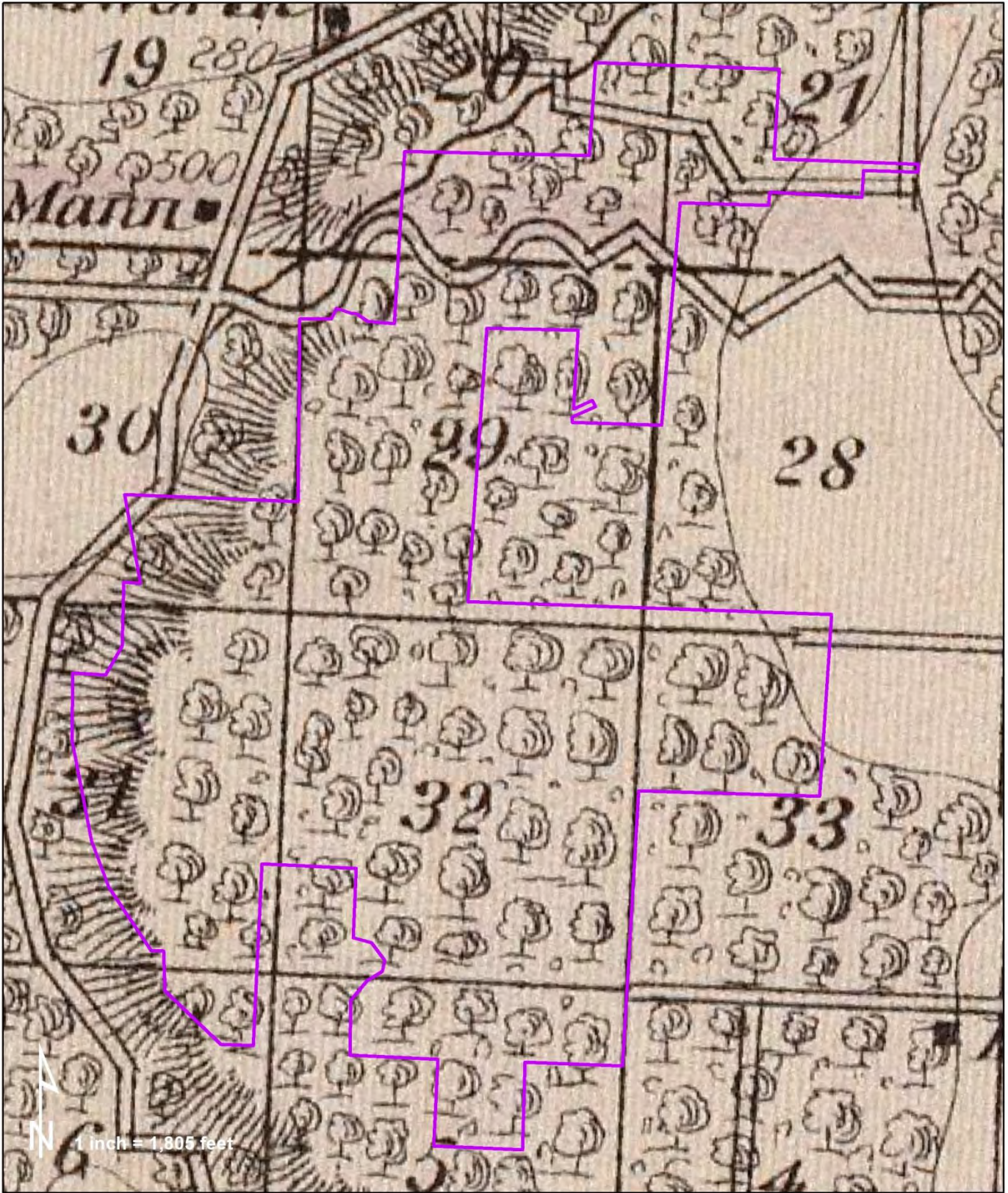
Page 27 – USGS Topographic Map

Page 28 – 2014 Aerial Photo with Soils

Page 29 – Forest Health Concerns on 2009 Color Infrared

Page 30 – 2014 Waubonsie State Park Stand Map

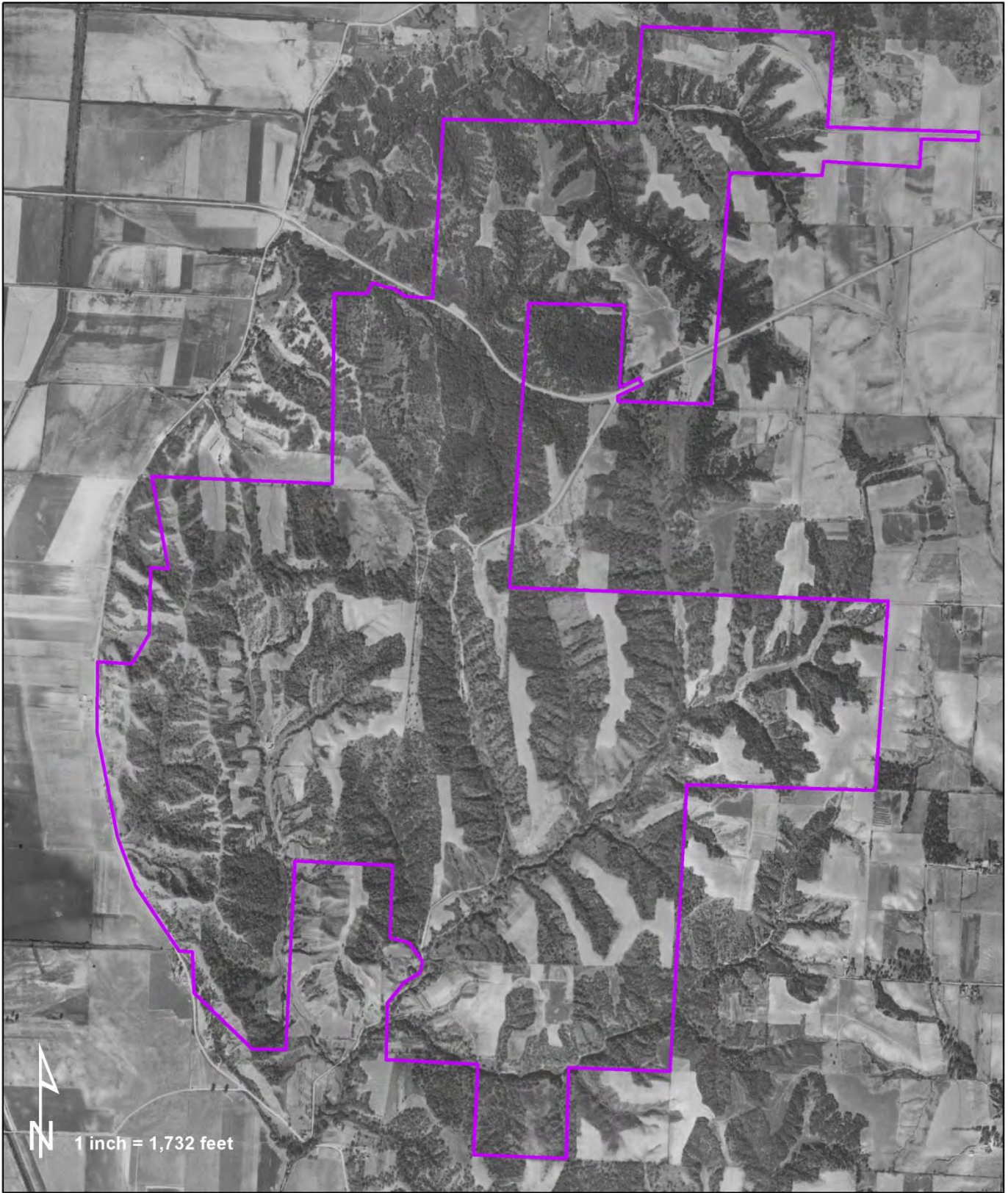
Page 31 – 2014 Waubonsie State Park Stand Map with Unit labels.



LANDOWNER: DNR - WAUBONSIE SP
IMAGERY: 1875 Andreas Map
DATE: 1.14.2015



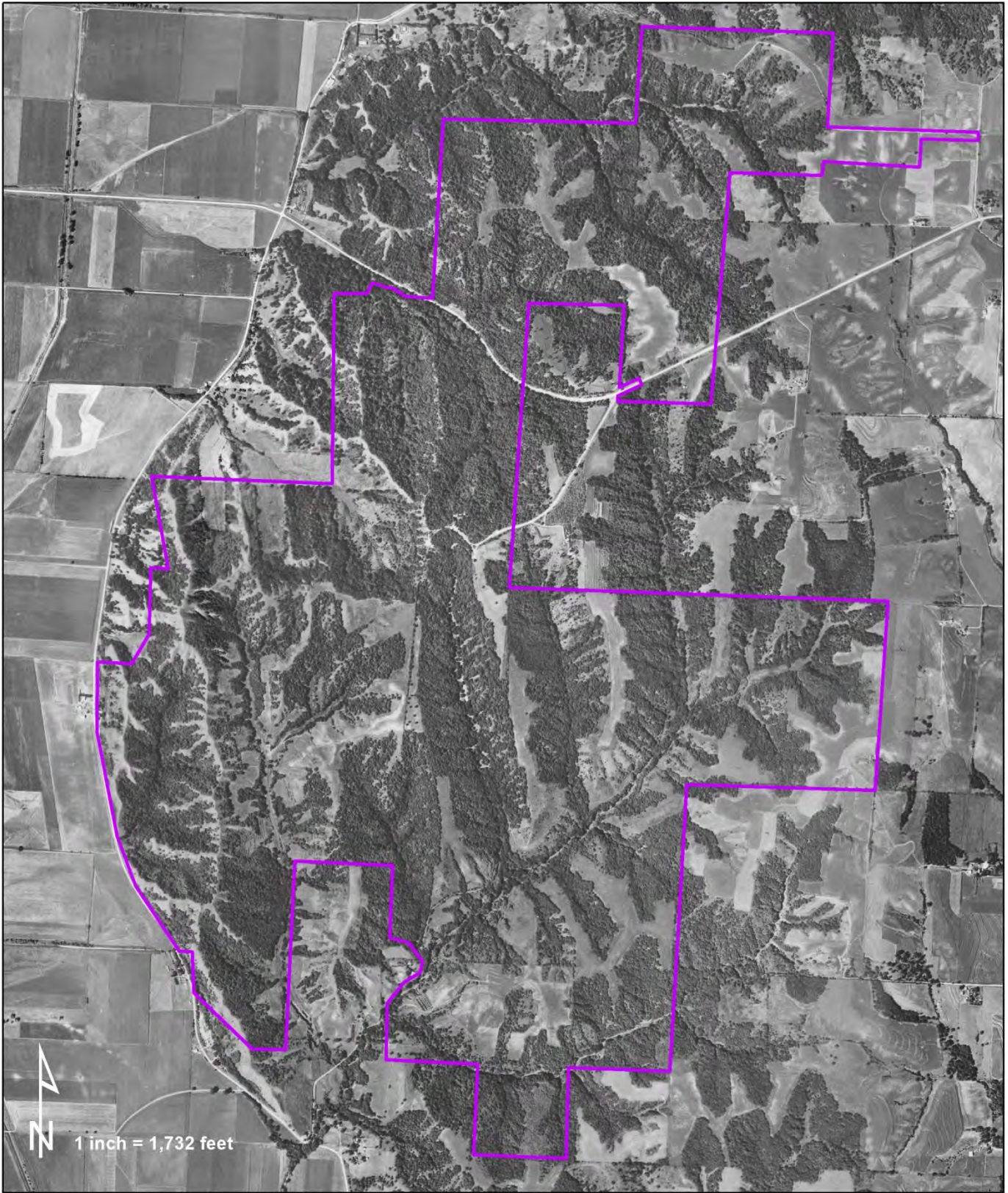
PREPARED BY: LINDSEY BARNEY
IDNR DISTRICT FORESTER
PO BOX 189
OAKLAND, IA 51560



LANDOWNER: DNR - WAUBONSIE SP
IMAGERY: 1930'S
DATE: 1.14.2015



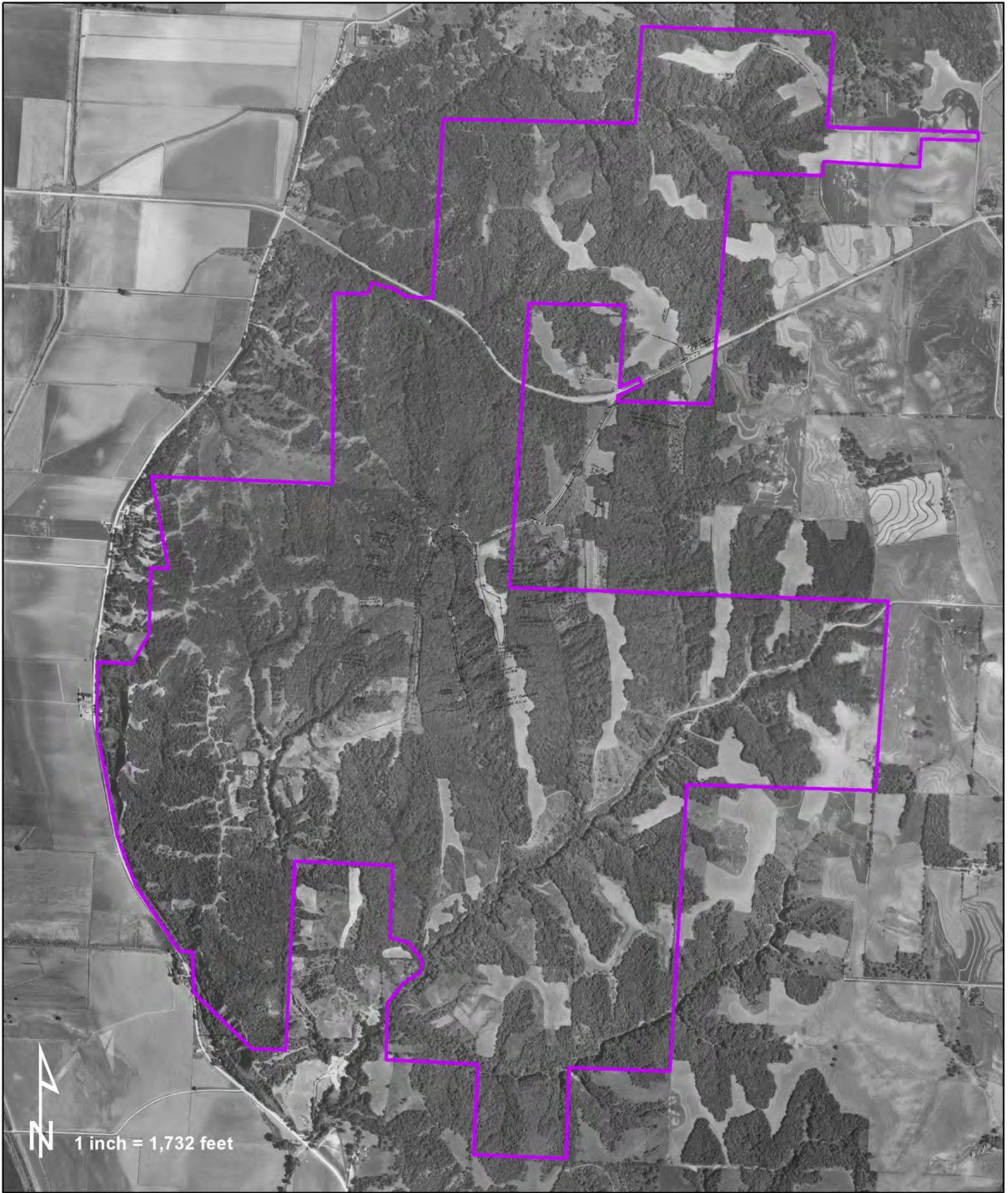
PREPARED BY: LINDSEY BARNEY
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PO BOX 189
OAKLAND, IA 51560



LANDOWNER: DNR - WAUBONSIE SP
IMAGERY: 1950'S
DATE: 1.14.2015



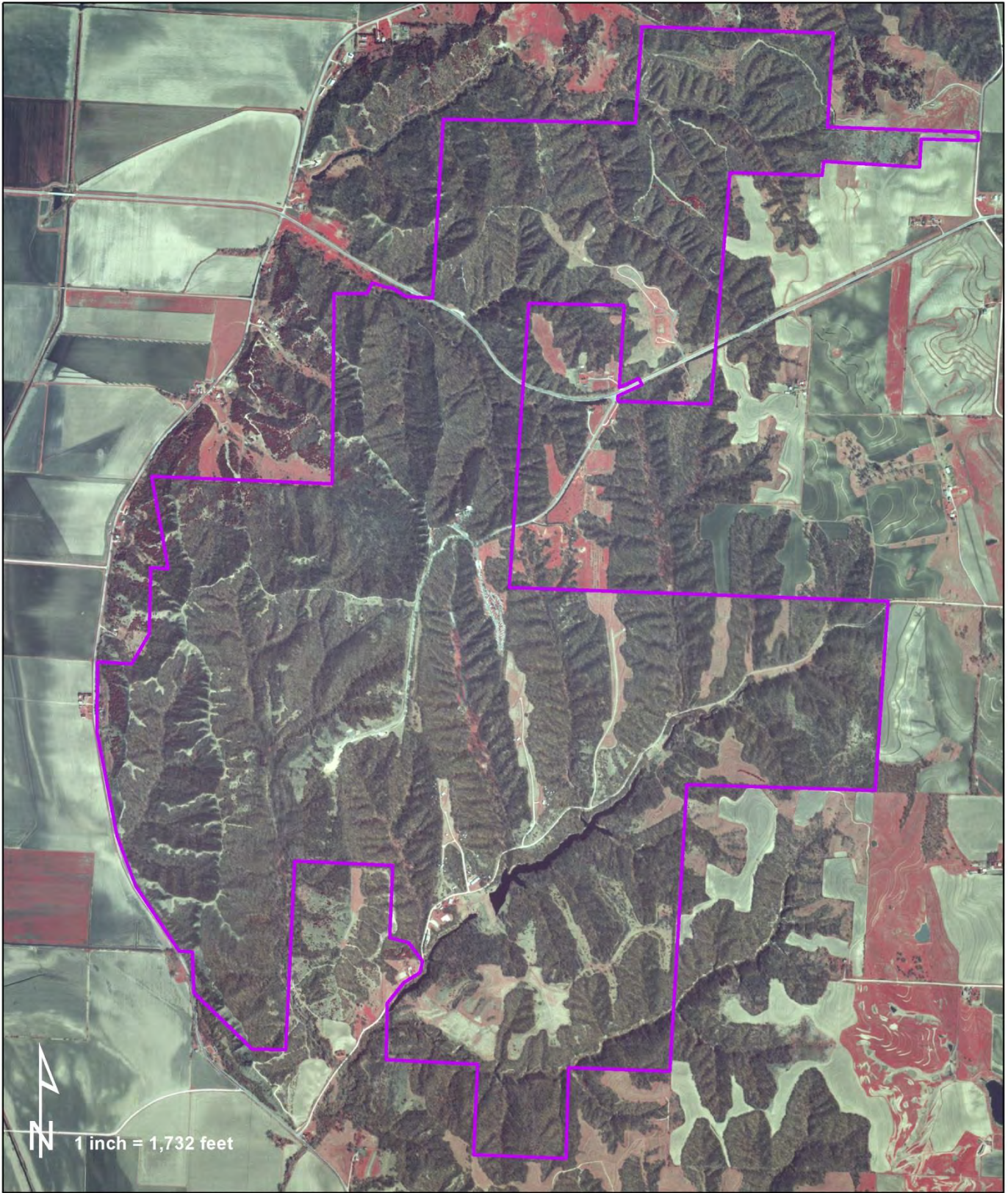
PREPARED BY: LINDSEY BARNEY
IDNR DISTRICT FORESTER
PO BOX 189
OAKLAND, IA 51560



LANDOWNER: DNR - WAUBONSIE SP
IMAGERY: 1960'S
DATE: 1.14.2015



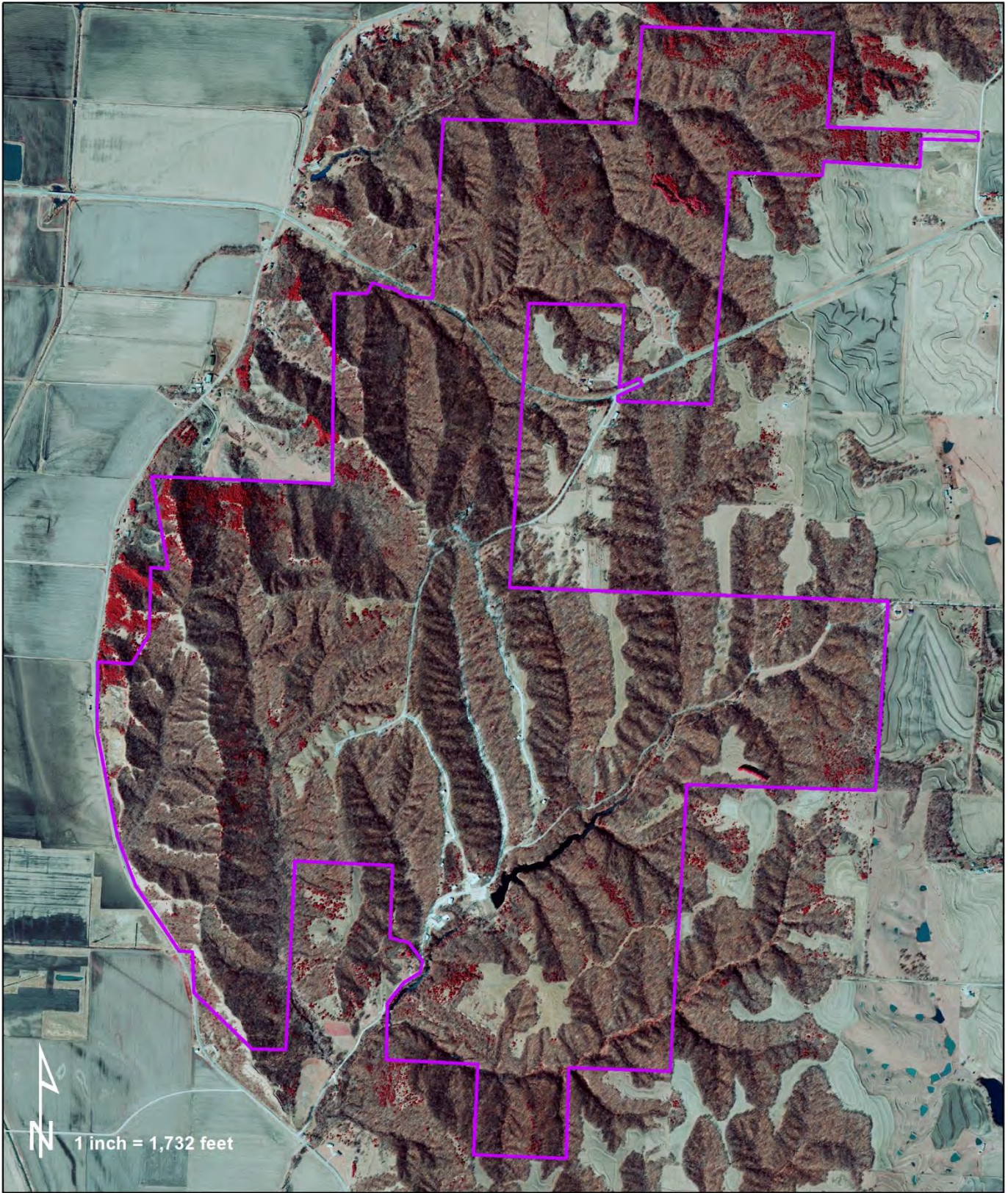
PREPARED BY: LINDSEY BARNEY
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OAKLAND, IA 51560



LANDOWNER: DNR - WAUBONSIE SP
IMAGERY: 1980'S
DATE: 1.14.2015



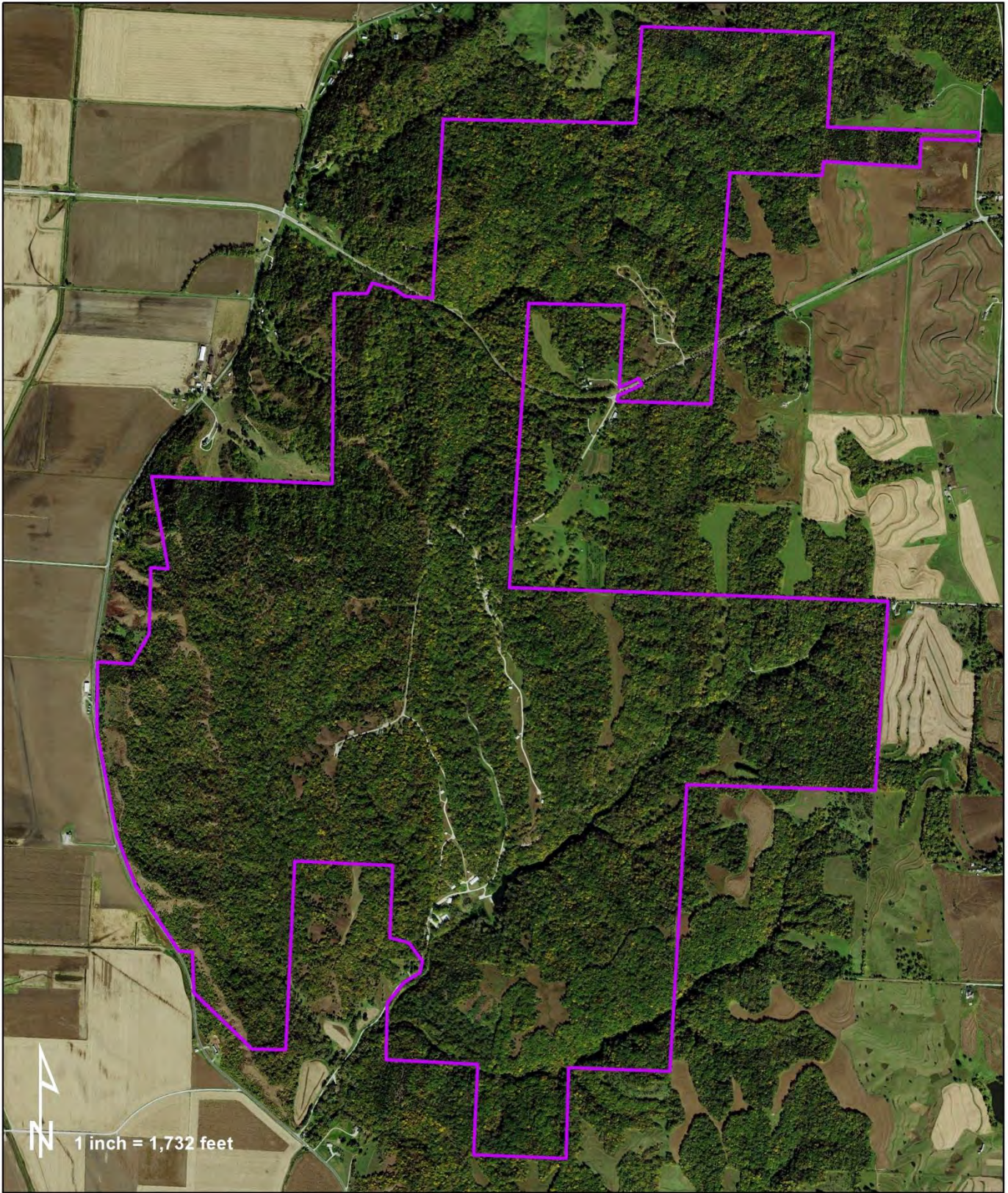
PREPARED BY: LINDSEY BARNEY
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PO BOX 189
OAKLAND, IA 51560



LANDOWNER: DNR - WAUBONSIE SP
IMAGERY: 2009 CIR
DATE: 1.14.2015



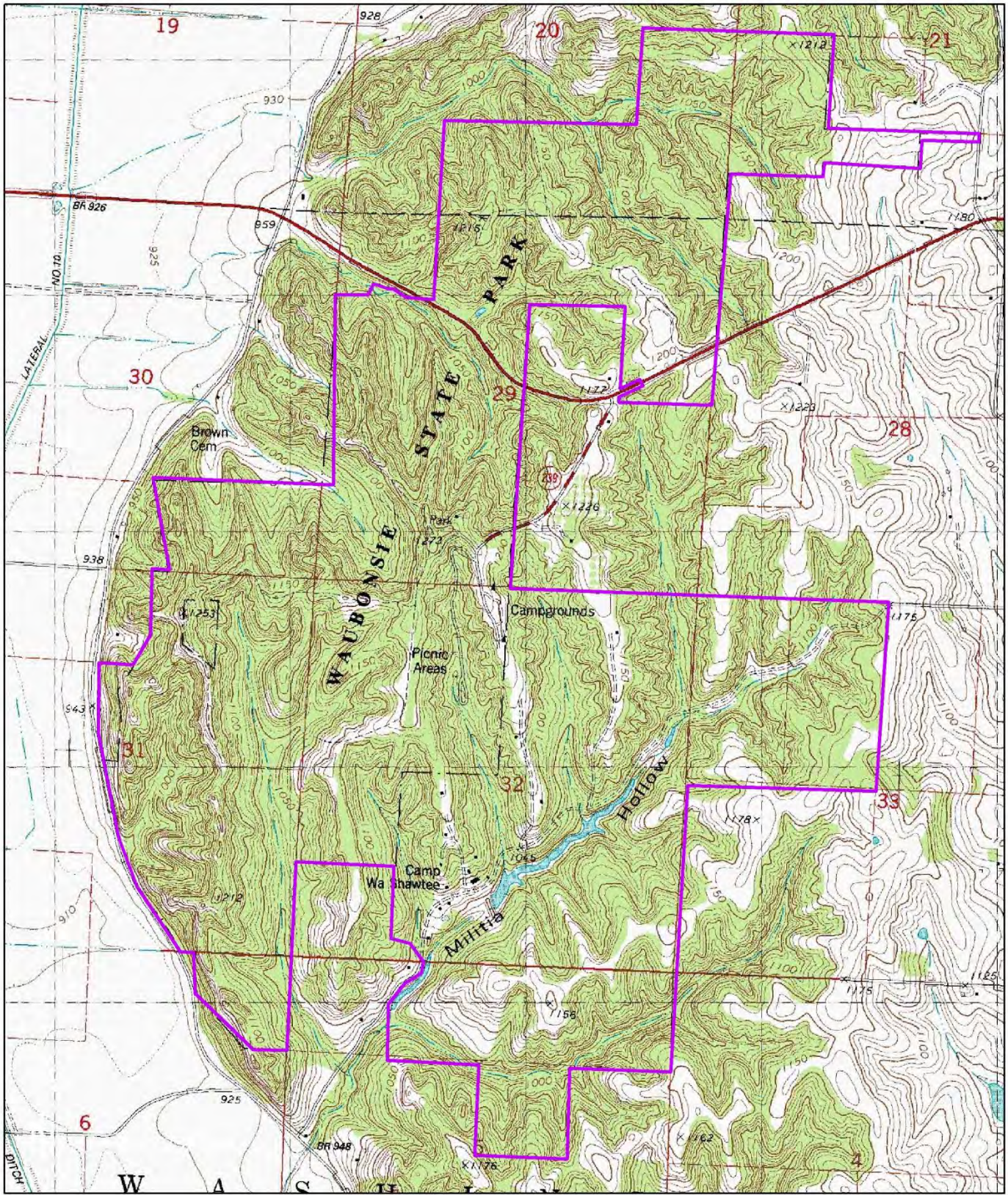
PREPARED BY: LINDSEY BARNEY
IDNR DISTRICT FORESTER
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OAKLAND, IA 51560



LANDOWNER: DNR - WAUBONSIE SP
IMAGERY: 2014 NAIP
DATE: 1.14.2015



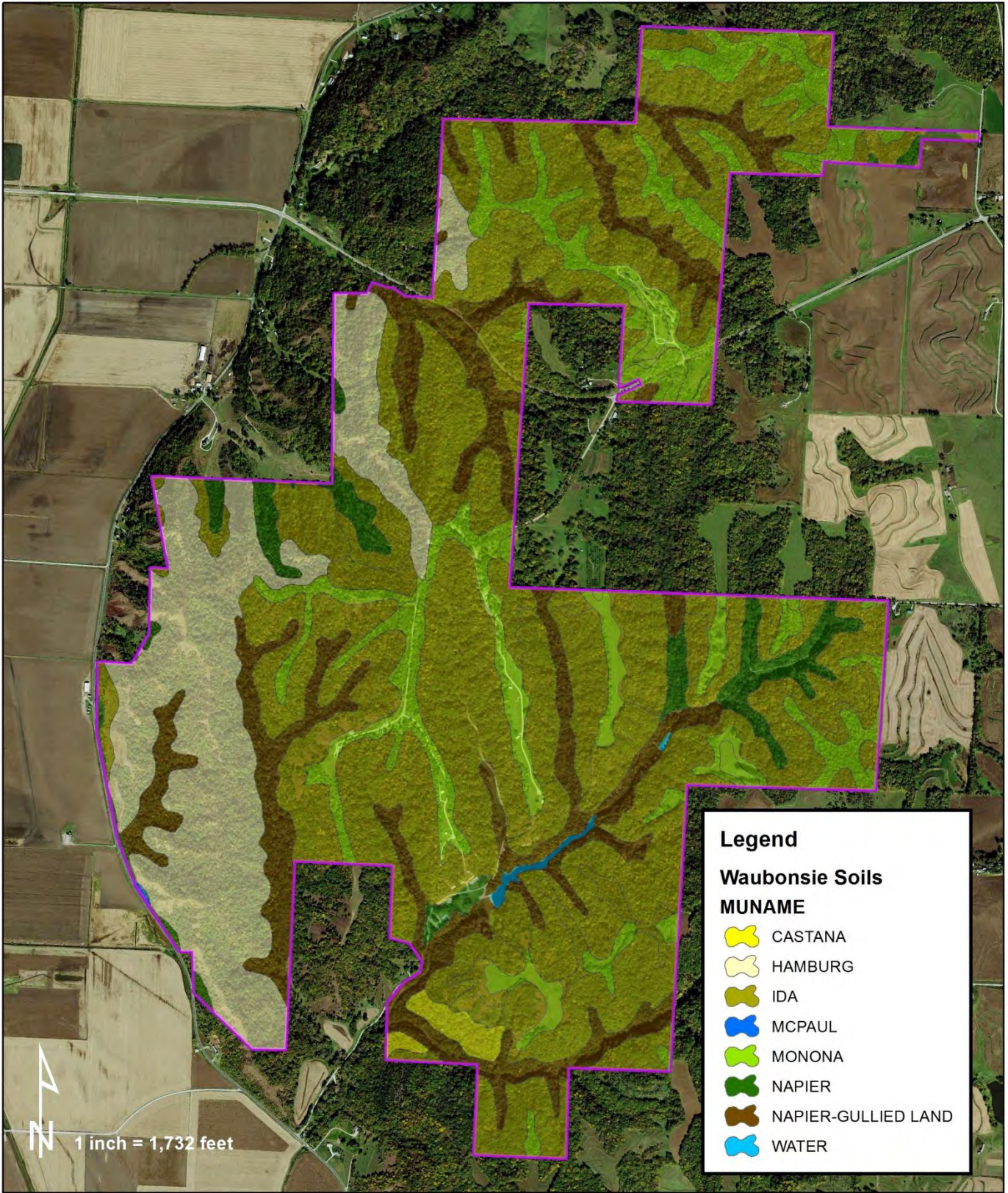
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 IMAGERY: USGS
 DATE: 1.14.2015











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Legend

Waubonsie Soils

MUNAME

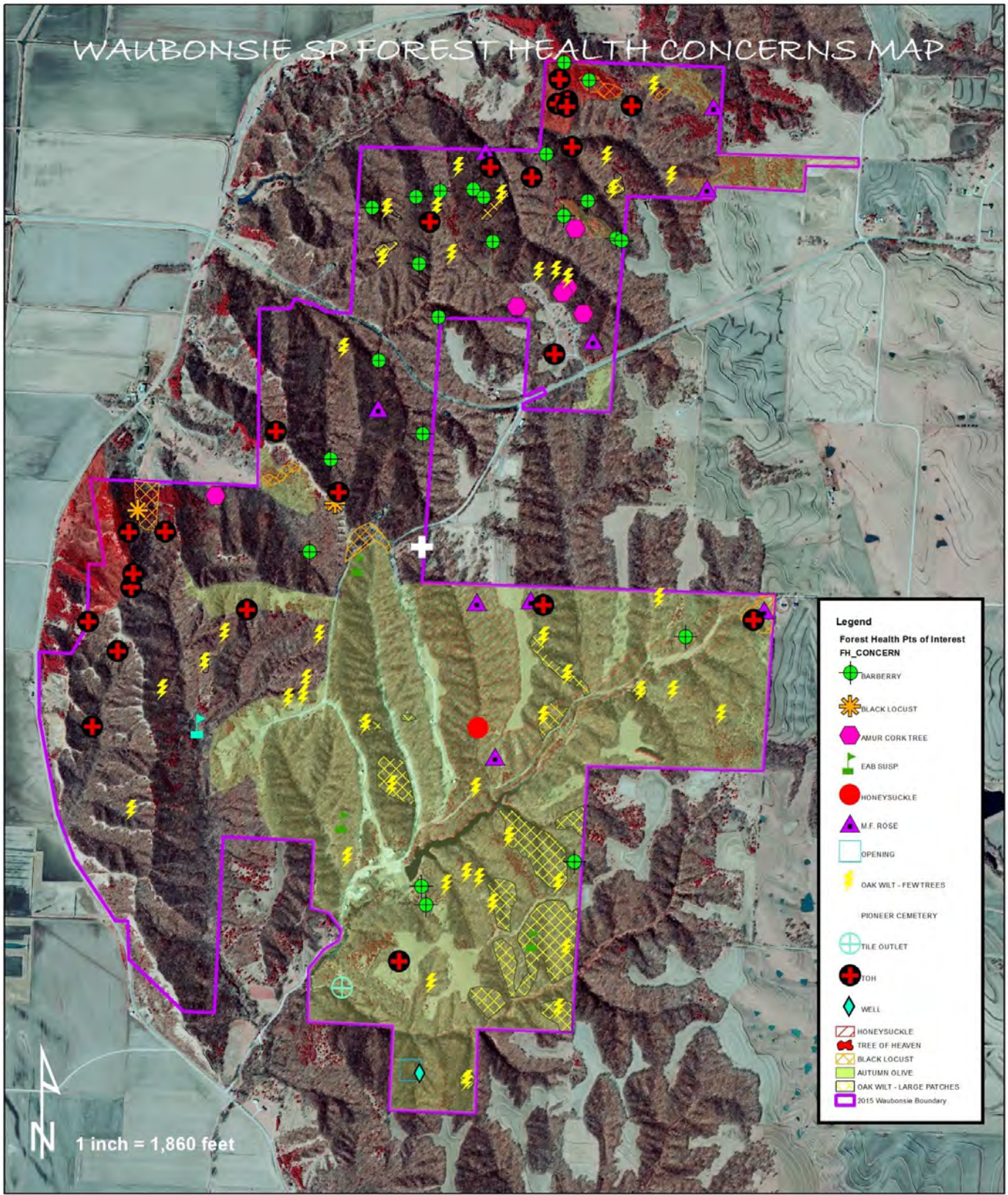
-  CASTANA
-  HAMBURG
-  IDA
-  MCPAUL
-  MONONA
-  NAPIER
-  NAPIER-GULLIED LAND
-  WATER

LANDOWNER: DNR - WAUBONSIE SP
 IMAGERY: 2014 NAIP WITH SOIL LAYER
 DATE: 1.14.2015



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WAUBONSIE SP FOREST HEALTH CONCERNS MAP

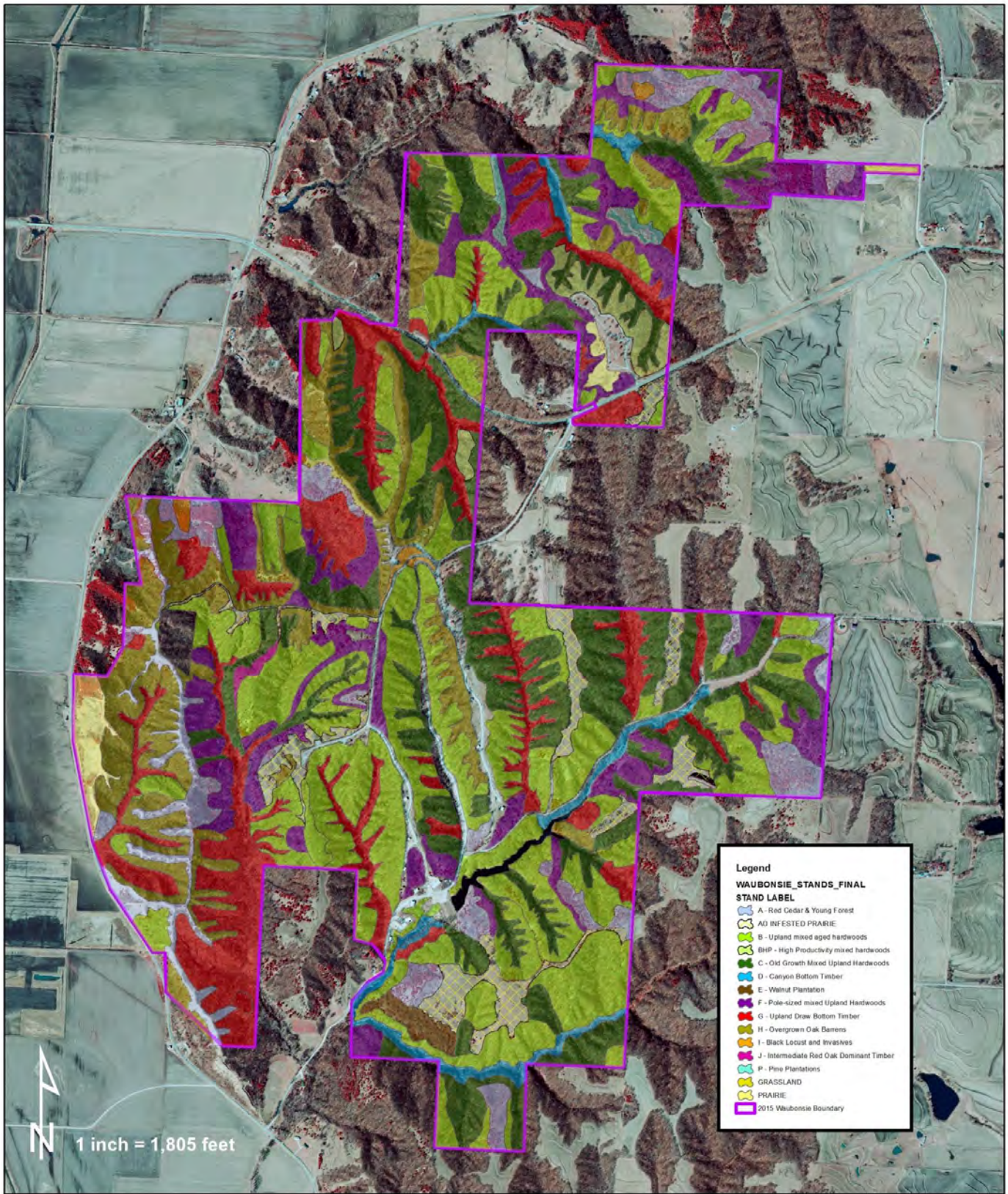


Legend	
Forest Health Pts of Interest	
FH_CONCERN	
	BARBERRY
	BLACK LOCUST
	AMUR CORK TREE
	EAB SUSP
	HONEYSUCKLE
	M.F. ROSE
	OPENING
	OAK WILT - FEWTREES
	PIONEER CEMETERY
	TILE OUTLET
	TOH
	WELL
	HONEYSUCKLE
	TREE OF HEAVEN
	BLACK LOCUST
	AUTUMN OLIVE
	OAK WILT - LARGE PATCHES
	2015 Waubonsie Boundary

LANDOWNER: DNR - WAUBONSIE SP
 IMAGERY: 2009 CIR
 DATE: 5.14.2015



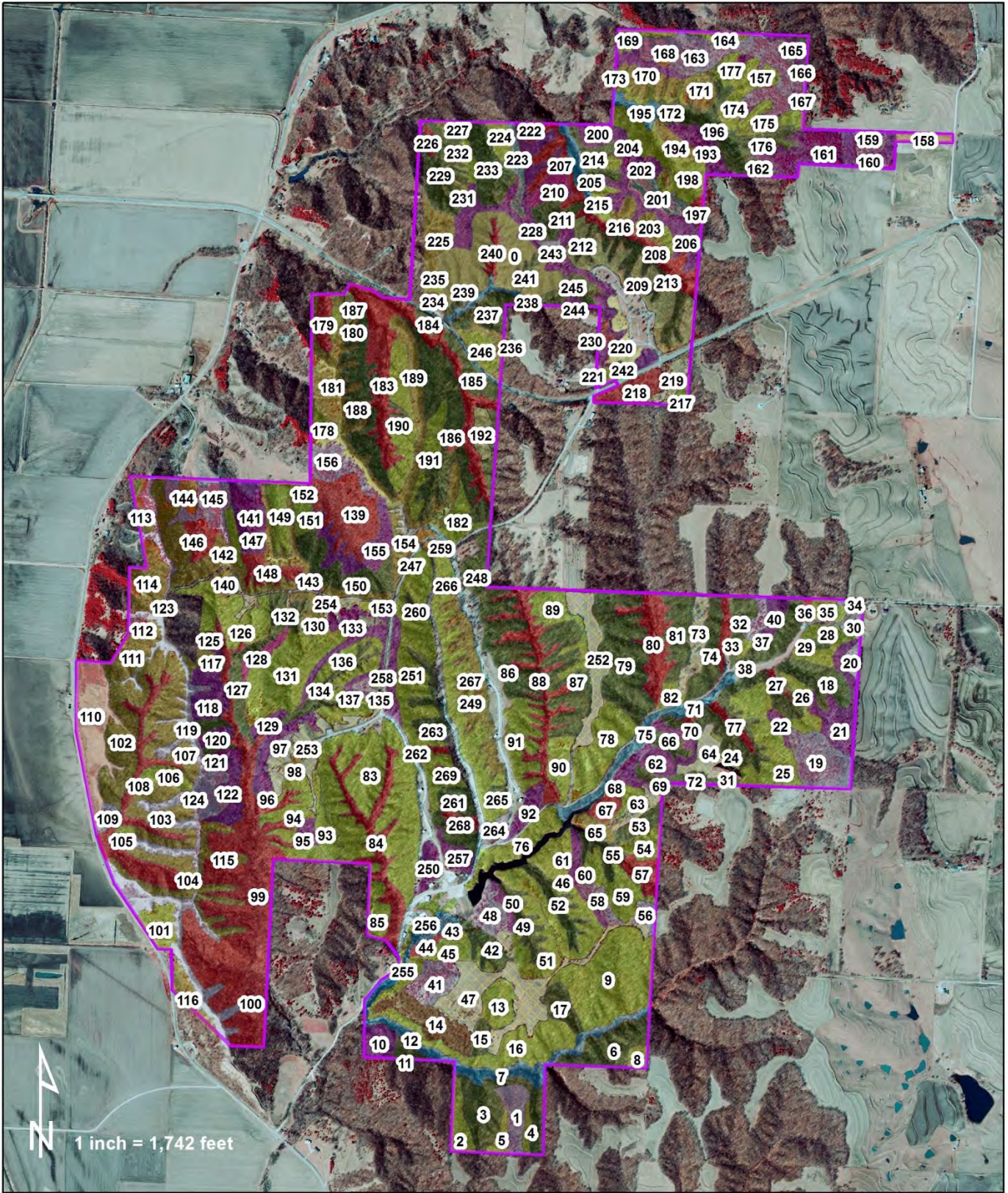
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LANDOWNER: DNR - WAUBONSIE SP
 IMAGERY: 2009 CIR
 DATE: 1.14.2015



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LANDOWNER: DNR - WAUBONSIE SP
 IMAGERY: 2014 NAIP
 DATE: 1.14.2015



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