# Forest Stewardship Plan

Prepared for:
Smith Wildlife Refuge

Garner Township, Sections 9 and 16, Pottawattamie County, Iowa


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## Introduction

The 228 acre Smith Wildlife Refuge has been owned by the Iowa DNR since it was donated in 1958, and has been managed by the Nishnabotna Wildlife Unit since that time. The area is comprised of a fairly even mix of Loess Hills forest and agricultural fields with a few small prairie restorations. The area sees a fairly high amount of visitation by the public, mostly due to its close proximity to Council Bluffs.

## Objectives

To document the forest plant community and develop a plan that will optimize the forest and wildlife resources on the area.

## Management Considerations

### SOIL AND WATER CONSIDERATIONS

Smith WR is situated in the southern half of Iowa's Loess Hills landform. The silt loam soils of the Loess Hills are extremely fragile. 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. For timber management, machinery 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.

Water quality can be protected by adhering to the aforementioned soil conservation measures. In addition, herbicides should be used in accordance with Iowa Forestry BMP practices. Improper use of these chemicals can lead to surface and ground water contamination, as well as collateral damage to desirable plants and wildlife.

### HISTORICAL AND CULTURAL CONSIDERATIONS

While there are no known cultural or historical features on the property, no archaeological surveys have been conducted. Any practices that will cause ground disturbance will have a cultural resources evaluation completed to determine if an archaeological survey is warranted.

### BIOLOGICAL DIVERSITY CONSIDERATIONS

Native tree, shrub, and plant species will be retained wherever feasible. New planting projects should only incorporate native tree and shrub species, suited to the soil and microclimate of the stand. Throughout this refuge, 6 to 10 snags per acre should be reserved to provide habitat for cavity nesting birds, bats, and den dependent mammals in areas where timber stand improvement work is implemented. In addition, timber stand improvement activities involving tree felling or shrub removal should be minimized during the main bird nesting (and bat roosting) season, which is May through July for Birds and April 1$^{st}$ through October 1$^{st}$ for bats. Conveniently, limiting timber stand improvement (felling trees/shrubs) during this time span also helps limit injury to adjacent trees (such as oak trees and elm trees, which are susceptible to vascular wilt diseases when injured during the growing season). One caveat however, is the timing of invasive species control. Invasive species control work is best performed from July through early September for basal bark, hack and squirt, and girdling techniques. Fortunately, these practices do not involve the removal or felling of trees or shrubs.

### AESTHETIC QUALITY AND RECREATION

Thinning work recommended in this plan may affect the aesthetics and recreational use of Smith WR. Negative impacts on aesthetics and recreational use can be lessened by using timber stand improvement practices that leave killed trees standing (trees smaller than 12" in diameter). Undesirable trees larger than 12" in diameter should be considered for commercial harvest. Exotic brush species should be obliterated to chips using forestry mowers whenever practical.

### ENDANGERED SPECIES CONSIDERATIONS

Threatened and endangered plant and wildlife species and their habitats should be protected when conducting woodland management activities. The Indiana Bat is a Federal and State listed endangered species that has not yet been found in Pottawattamie County. The northern long-eared bat is a federally threatened species that is found throughout the state of Iowa. Smith WR contains mature timber areas that could benefit these bats, 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 located along streams and rivers and in adjacent upland forest areas. The guidelines recommend that there be no felling of trees that may provide Indiana Bat habitat from April 1 – October 1. Suitable habitat trees are shagbark 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. In addition, 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 1st through July 31st).*

Before implementation, the forest management activities described in this plan 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.

**FOREST HEALTH AND INVASIVE SPECIES CONSIDERATIONS**

Numerous insects, diseases, and invasive plants impact the forest lands of Iowa's Loess Hills. Smith WR should be monitored yearly for new or unusual impacts to forest health. The following forest health concerns were identified at Smith WR, and will be addressed and prioritized throughout this plan:

- Amur Honeysuckle – invasive shrub
- Multiflora rose – invasive shrub
- Black Locust – invasive tree
- Tree of heaven – invasive tree
- Siberian elm – invasive tree
- White mulberry – naturalized weedy tree
- Oak wilt – disease of oak family
- Bur oak blight – disease of bur oaks

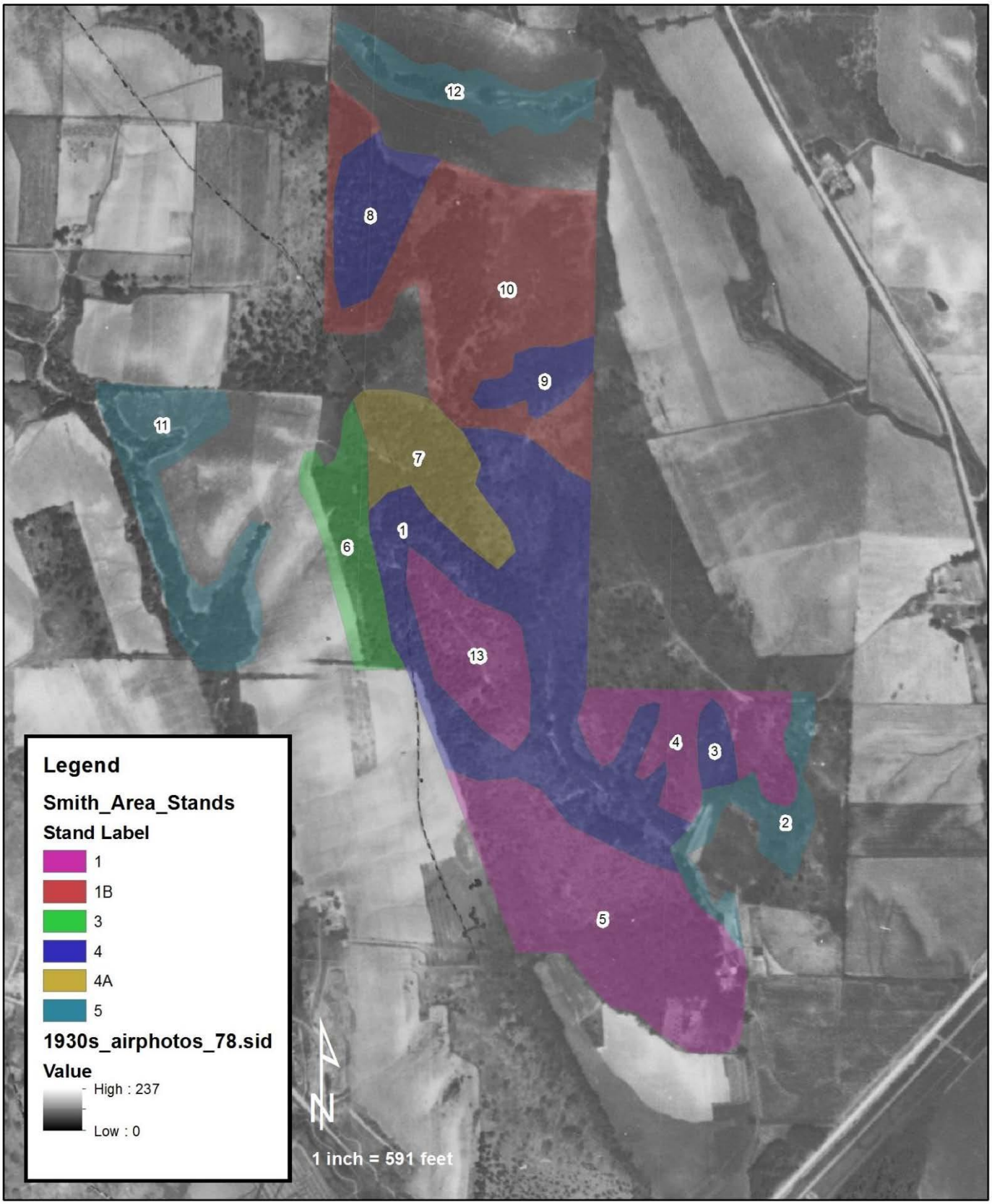
## Management Systems

Income from timber harvest: Any income generated from timber harvesting operations should be reinvested into the area to thin young stands, convert areas to more desirable species and otherwise manage the forest for wildlife, and invest in surveys and/or research to evaluate success of management decisions and help direct future management. Without this reinvestment, there is little chance that the WR annual budget will allow the recommendations in this plan to be implemented. The majority of the work prescribed in this plan focuses on invasive species control, weed tree removal, and other treatments (such as prescribed fire) that will encourage the perpetuation of oak species.

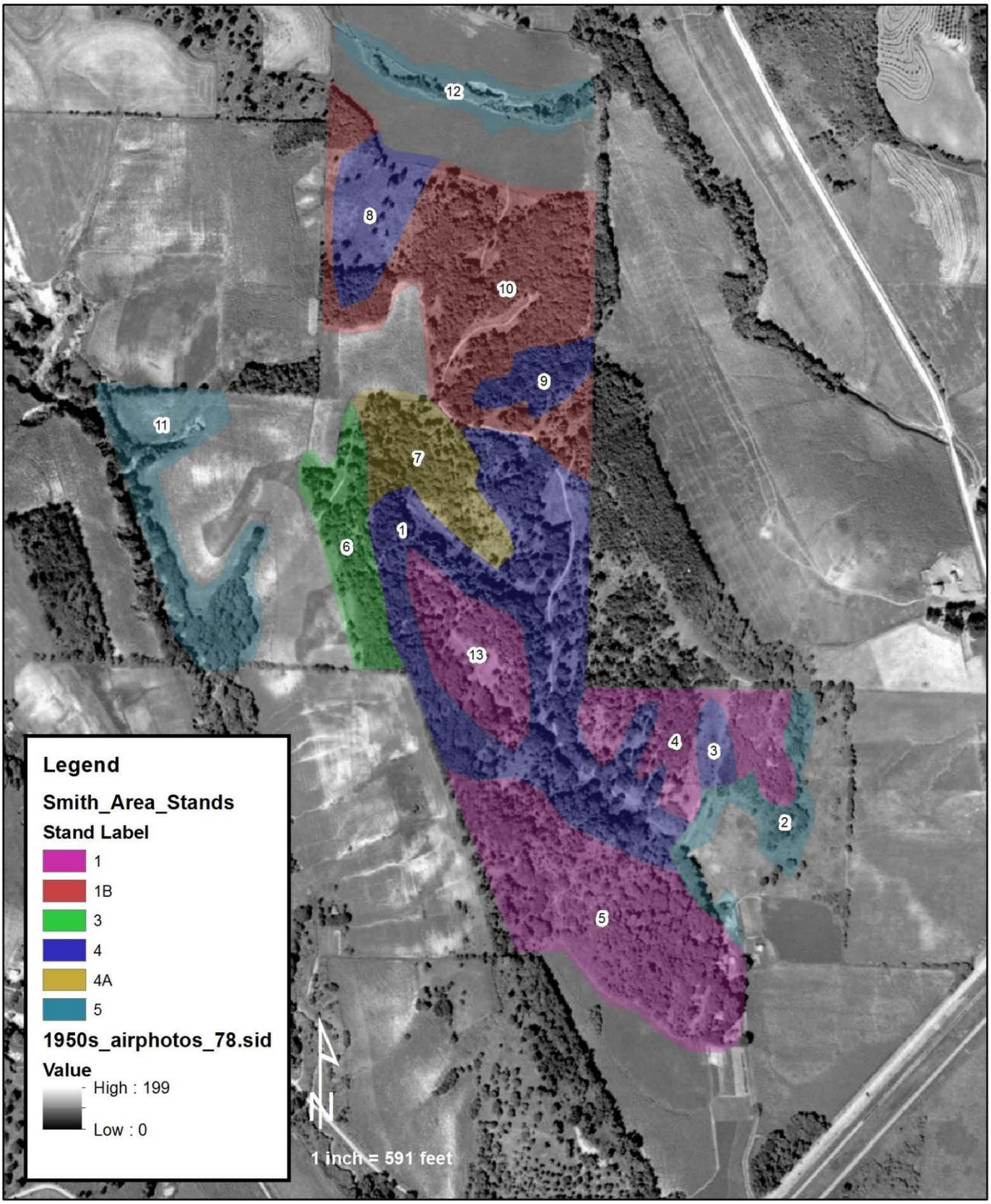
## Description of Smith Wildlife Refuge

Smith Wildlife Refuge is located 1.7 miles north of Highway 6 (Kanesville Boulevard) in Council Bluffs on Highway 191/Railroad Highway. LEGAL DESCRIPTION: T75N, R43W, Sections 9 and 16 Pottawattamie County, Iowa consisting of 228 total acres (173 of which is considered forested).

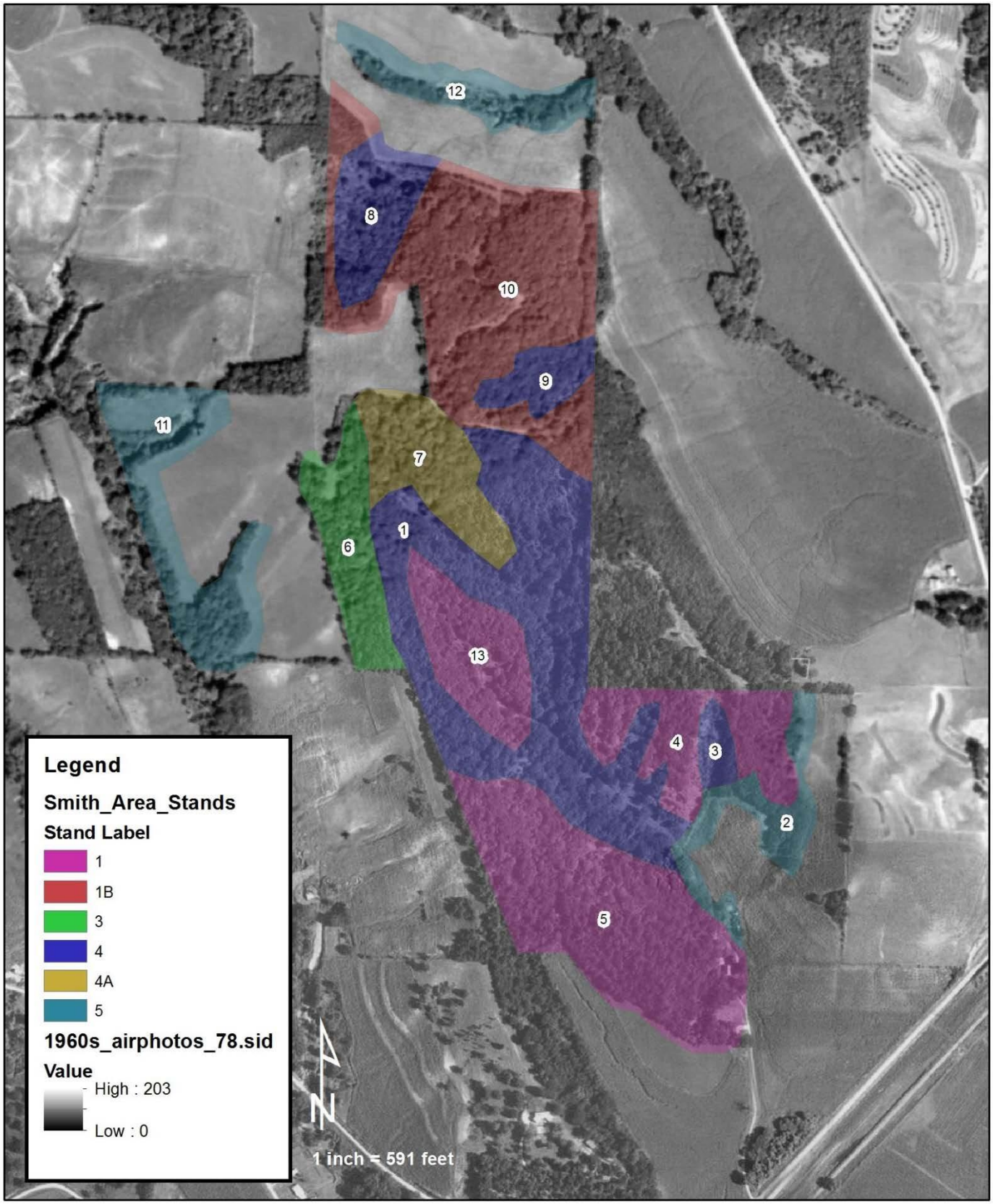
The 228 acre Smith Wildlife Refuge was donated to the Iowa DNR by Hazel R. Smith in September of 1958, making it the 3rd oldest property in the Nishnabotna Wildlife Unit behind only Forney Lake and Riverton. The following maps show the vegetative changes that have occurred at Smith Wildlife Refuge since the first available aerial photos (1938 aerials).



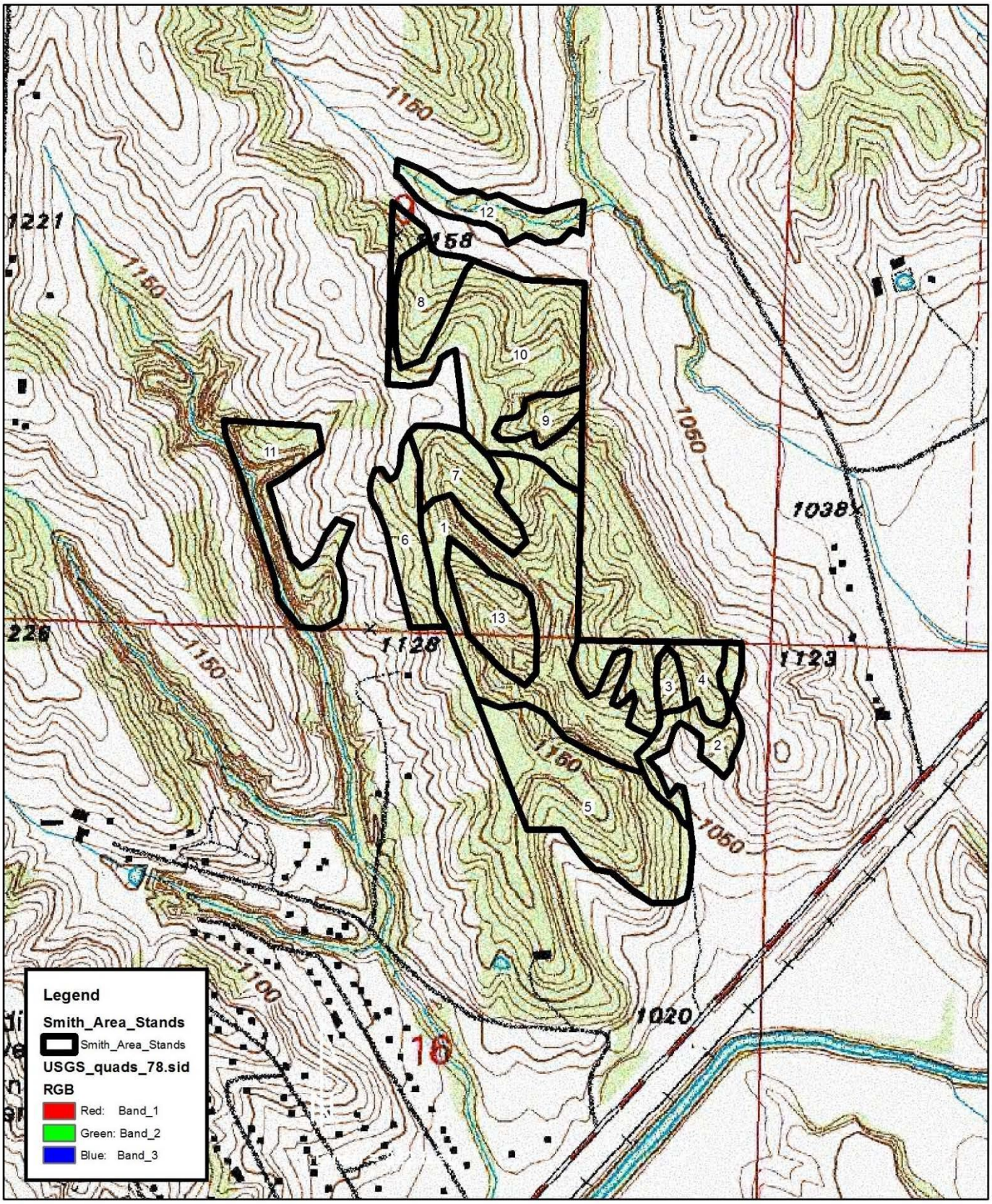

Smith Wildlife Refuge 1930's Aerial



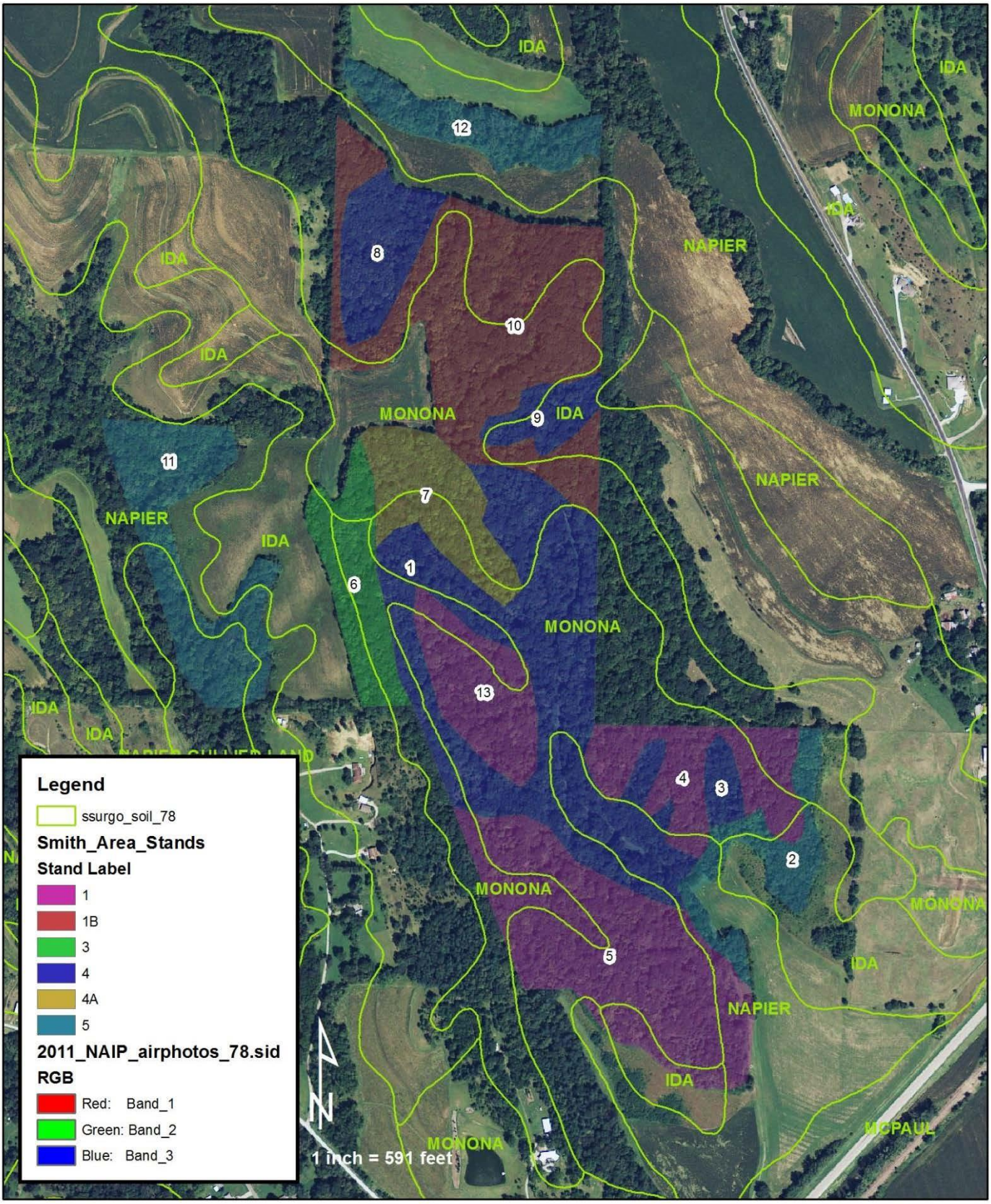

Smith Wildlife Refuge 1950's Aerial




Smith Wildlife Refuge 1960's Aerial




Smith Wildlife Refuge USGS Topo/Watershed

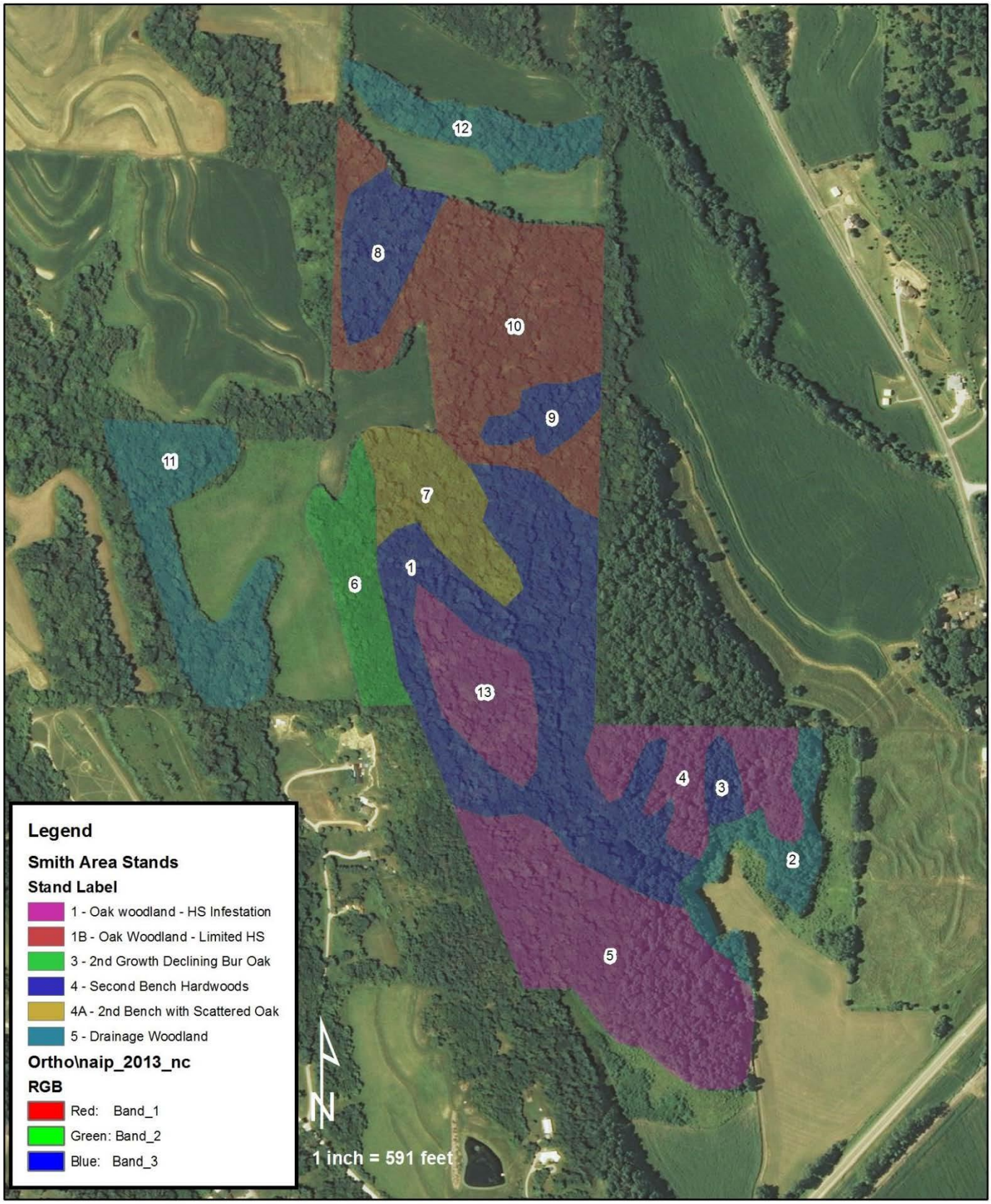



Smith Wildlife Refuge Forest Stands and Soils

The previous USGS map outlines the topographic features and drainage patterns of Smith Wildlife Refuge. Most of the Wildlife Refuge drains south towards Mosquito Creek (which enters the Missouri River at the southern end of Council Bluffs). Smith WR is gently to moderately rolling, with very few steep side slopes (found in occasional draws and gullies).

Soils at Smith Wildlife Refuge are loess derived (windblown) silt loams. Ida, Monona, and Napier soils fall on predictable landscape positions throughout the WR. Each soil has different properties and slope positions that create dramatic differences in forest productivity and composition. Ida soils have the lowest forest productivity, which is evidenced by short statured trees in the most extreme slope positions. Typically Ida silt loams are found on ridge tops. The productivity of this soil is reduced due to a sometimes excessive drainage pattern and droughty aspect. Monona soils are typically found on gradual side slopes, and Napier soils are found in the immediate draw bottoms. Both are well drained soils with good available moisture capabilities. Napier soils are exceptionally desirable for timber production due to their superior fertility. Napier soils are created by topsoil accumulations - washed downhill from the uplands. Unfortunately, these excellent soils are usually severely gullied (due to their position in the landscape). All of these soils are highly erodible, and any practice that encourages infiltration and understory development will help curb erosion problems.

For the purposes of this plan, Smith WR has been divided into 6 forest types based on average overstory diameter, forest species composition, and forest health priorities. Each forest type has been divided into numbered units to make referencing particular areas more straightforward. The following map outlines Smith WR's forest types as they were mapped in 2013.




Smith Wildlife Refuge Forest Stand Types and Units

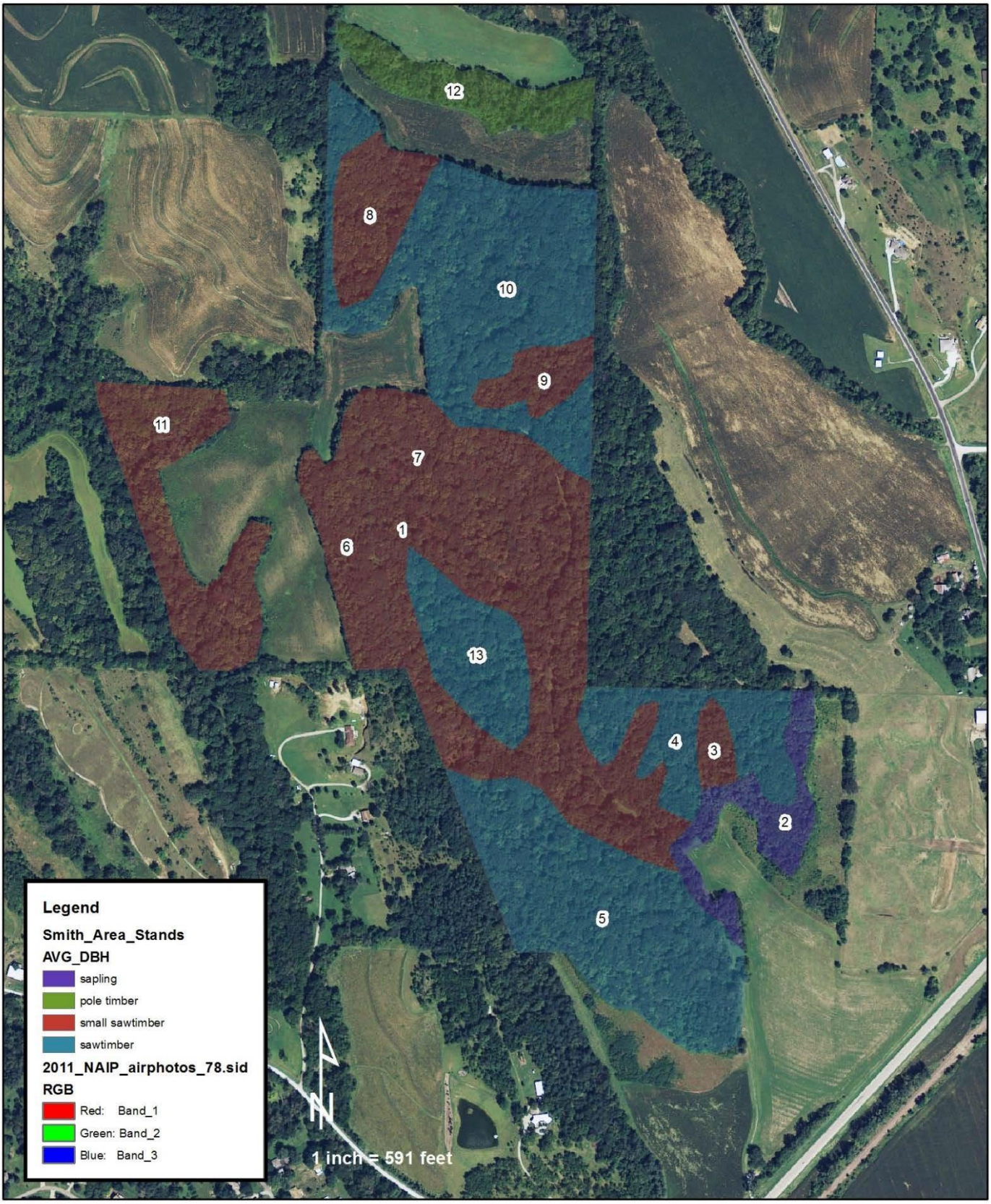
Smith WR's Forest Types were mapped by average overstory tree diameter. The percentages of each size class within the 261 acres of forest cover are as follows:

| TREE SIZE | ACRES | % of AREA |
|---|---|---|
| Sapling (1-5" diameter) | 5.47 | 3 |
| Pole (5-12" diameter) | 5.89 | 3 |
| Small Sawlog (12-18" diameter) | 71.46 | 41 |
| Sawlog (>18" diameter) | 91.15 | 53 |
| TOTALS | 173.00 | 100% |

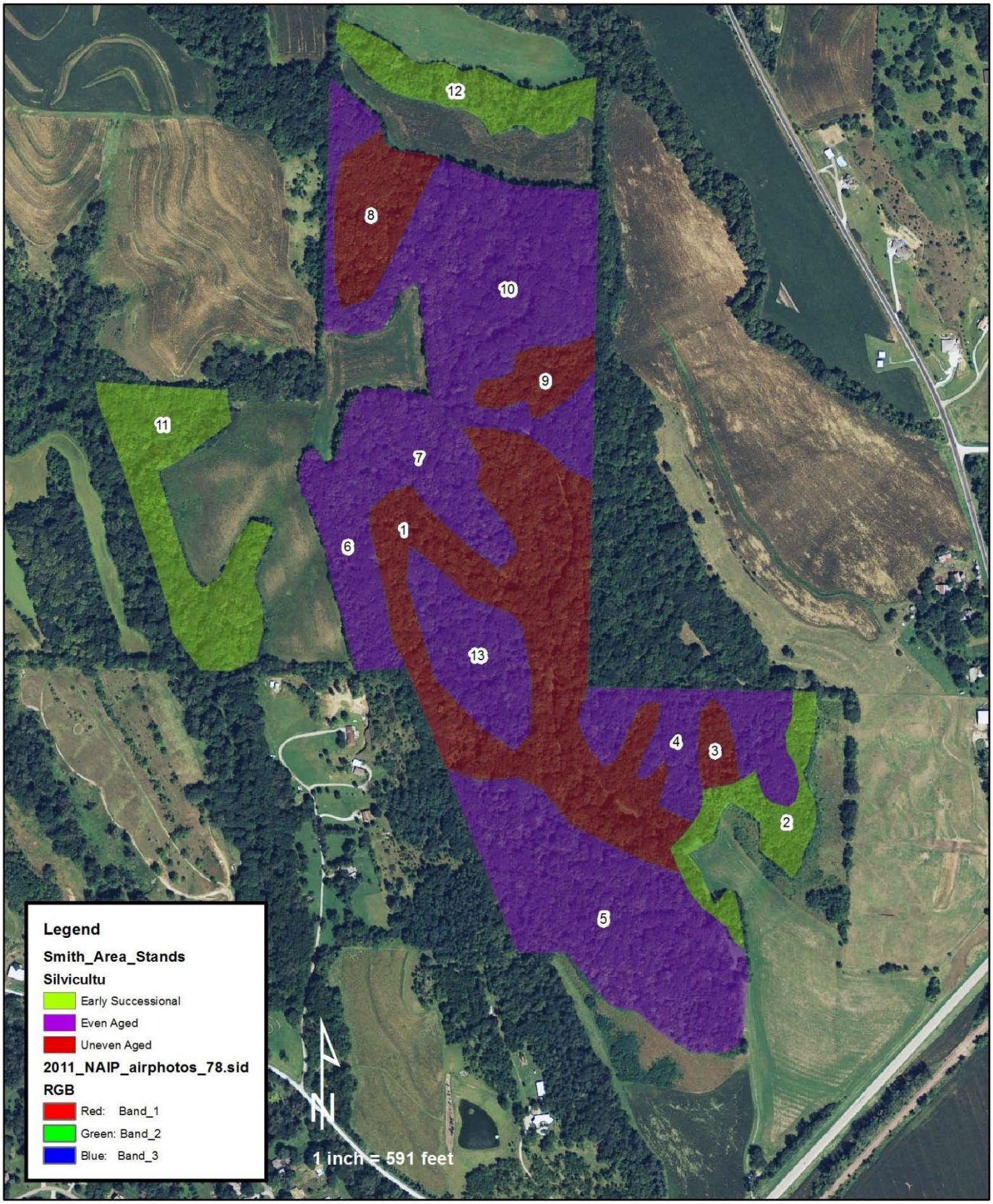
All forest units at Smith Wildlife Refuge require even aged management in order to reproduce. However, some stands (units) may be difficult to manage by this system based on slope steepness and associated inoperability. These inoperable areas, though even aged by nature, are placed into uneven aged management because of their inoperability. Units with primarily shade tolerant tree species compositions were also placed into the even aged management regime. In addition, some stands are currently in an early successional stage – but may be ready for even aged management techniques like pre-commercial thinning in 10-20 years. The following silvicultural systems are proposed for Smith Wildlife Refuge based on stand composition, structure, and current stand health priorities as of 2013:

| SILVICULTURAL SYSTEM | ACRES | % of AREA |
|---|---|---|
| Early Successional | 22.98 | 13.3 |
| Even Aged | 104.28 | 60.3 |
| Uneven Aged | 45.71 | 26.4 |
| TOTALS | 173.00 | 100% |

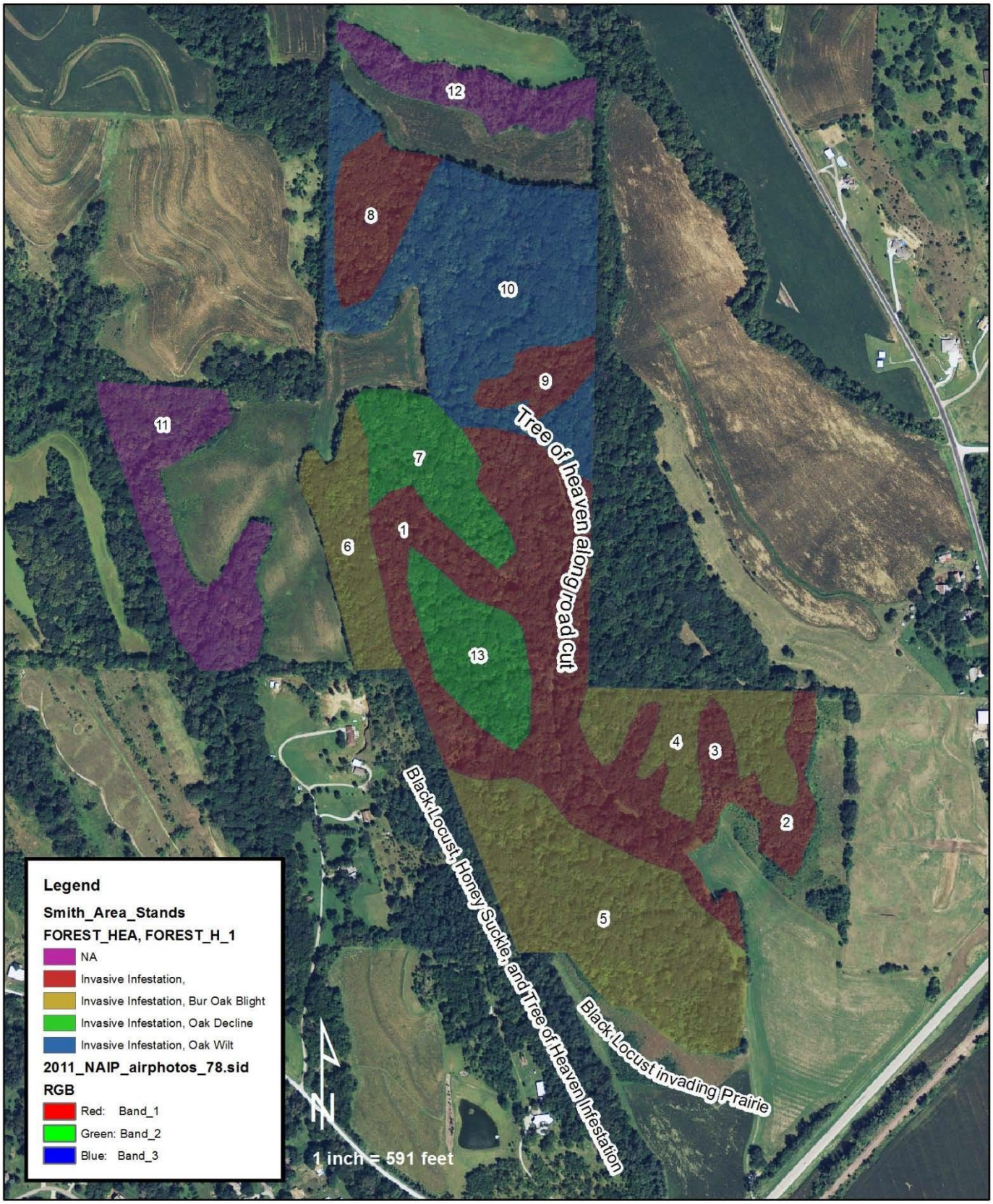
Forest health concerns play a big role in every stand at Smith Wildlife Refuge. Invasive species presence is the most wide-spread and most detrimental forest health concern affecting the sustainability of these upland oak forests. Invasive species control measures must be identified and carried out prior to further timber stand improvement activities are implemented. Many invasive species present on site (bush honeysuckles, tree of heaven, black locust) have great potential for colonization – especially if even-aged silvicultural treatments to promote understory light levels are used. The following map outlines the top two forest health priorities in each unit. Specific invasive species issues will be identified in each unit's description and work plan.




Smith Wildlife Refuge Average Stand Diameter




Smith Wildlife Refuge Silvicultural System




Smith Wildlife Refuge Forest Health Concerns

**Work Plan for Smith Wildlife Refuge**

This work plan summarizes forest health conditions in each stand type as of 2013, and also outlines generalized forest management recommendations. 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. 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.

***Forest Type: Overgrown Mature Oak Woodland – with Honeysuckle Infestation (1)***


*Units:* 4, 5, and 13
*Acreage:* 64.9 total acres

*Site Description:* This forest type is found in the uplands at the southern end of the Wildlife Refuge.

*Forest Description:* This forest type consists of an overstory of sawtimber sized bur and red oak (old growth), pole to small-timber sized green ash, hackberry, Kentucky coffee tree, basswood, black walnut, and American and red elm. The midstory is thick with pole-sized hackberry, ironwood (on north slopes), Ohio buckeye (in patches), red mulberry (occasional), and widespread invasive bush honeysuckle shrubs. The understory is mostly bare of vegetation – except for invasive garlic mustard. Understory oak leaf litter is continuous however, and should carry prescribed fire if ever used. The site index of these units is high – as evidenced by the tree form, stem height, and overall health. Bur oak blight and oak wilt are active in pockets throughout the WR. Overstory disease, in combination with the absence of oak regeneration, makes managing this forest type a high priority. These stands are currently sitting in the understory re-initiation phase of the forest growth cycle.

*Management Recommendations:* Invasive woody plant species are the largest threat to the sustainability and regeneration of this stand type. Tree of heaven exists on the fringes of the stands (mostly along the two track that runs north through the refuge). Black locust threatens the interior and edges of stands 5 and 13. That said, these two species must be targeted first prior to any additional TSI projects (because of their ability to seed, sucker, and the relative expense of their control). Efforts should be made to tie in with neighboring land for invasive species eradication – as many of the dense populations of these two tree species exist on private land.

Tree of Heaven (TOH) and Black locust less than 5-6” in diameter should be killed using a basal bark treatment of oil carried triclopyr ester herbicides. This is best done in mid to late summer – but can be done any time of year except spring. Target trees larger than 6” should be girdled, injected, or cut off at ground level and treated with either of the two already mentioned herbicides. Resprouting should be expected and follow-up treatment should be planned for. Once the TOH and black locust has been adequately controlled throughout the wildlife refuge (WR), the next step for the management of this stand will be hand or mechanical honeysuckle removal. Mechanical removal will make quick work of the project site – but soil disturbance from machinery will be undesirable. Hand work will be slow going and possibly more expensive (unless done by volunteer groups), but should disturb the area less and may damage less desirable understory components.

Honeysuckle should be cut off at ground level and treated with a glyphosate product labeled for woody plant eradication (Roundup, Accord II, etc). All Ohio buckeye and white mulberry saplings and poles should be killed as well. Native red mulberry exists within these units – so proper species identification will be necessary prior to starting this project. All American elm of good form and health should be retained in these units – for diversity. An appropriate dye should be used to allow contractors or volunteers the ability to see what has been treated. Again, this work is best done from mid-summer through fall, but can be done anytime except spring. Mechanical treatments should immediately be

followed up with cut stump application of glyphosate or several rounds of foliar glyphosate application should be planned for after the stumps resprout.

If there are no serious issues on site after the first honeysuckle treatment (i.e. patchy TOH or black locust infestations), fire may be permissible to set back young honeysuckle (so long as the leaf litter will support adequate fire behavior in each unit). Ironwood and hackberry seedlings will also be set back by periodic prescribed burns after the initial honeysuckle removal (which will want to take over the site with the increased light levels). Midstory native trees (hackberry and ironwood) can be removed with the initial honeysuckle removal or can be left in place with the first honeysuckle removal to moderate light levels in the understory. Leaving some midstory shade will help the site from exploding too much with undesirable understory vegetation. If the midstory natives are removed with the honeysuckle removal step, vigorous regrowth should be expected and planned for. Prescribed burning and foliar herbicide treatments would be permissible ways to control adverse flushes in understory vegetation.

After successful honeysuckle eradication, patches of overstory oak decline (BOB and Oak Wilt) should be mapped and planned for salvage harvest and replanting. Snags should be retained for wildlife habitat as part of the salvage process. All other portions of these stands should be evaluated immediately after honeysuckle removal and 3-5 years post honeysuckle removal for adequacy of oak regeneration. At that time – site prep for natural regeneration or artificial replanting may be considered if regeneration is not adequate.

***Forest Type: Mixed Oak Woodland – with limited Honeysuckle Infestations (1B)***

*Unit*: 10
*Acreage:* 25.1 total acres


*Site Description:* This unit is found at the north end of the WR on gently rolling hills on each side of the access road.

*Forest Description:* Structurally this stand is identical to Stand 1 – but with isolated and limited honeysuckle and TOH infestations. The overstory consists of small sawtimber to sawtimber sized bur oak, red oak, American elm, basswood, black walnut (scattered), green ash, and hackberry. Occasional Kentucky coffee trees are present. Midstory layers consist of mostly ironwood and hackberry saplings and poles with occasional white and red mulberry too. Fairly continuous oak leaf litter is found in the understory – making prescribed burning a real possibility in the future.

*Management Recommendations:* The first priority for this stand will be to find and eliminate all pockets of honeysuckle, white mulberry, and tree of heaven (along access road). Follow treatment recommendations from Stand type 1.

There are considerable patches of oak wilt decline and death in mature red oak on the east side of stand 10. These areas need to be delimited, treated, salvaged, and replanted. A fairly new treatment option entails killing healthy, non-infected oak in a defined perimeter around the oak wilt patch. This, in theory, creates a barrier that the oak wilt fungi cannot spread through (because the root grafts are dead ahead of the main disease front. These units would then be put up for salvage logging – if wood quality at that time is not seriously diminished. The openings would then need to be cleared of any overstory, midstory, and understory vegetation that is not desirable (hackberry, ironwood, and ash and elm of poor form). The units would then need to be replanted to a diverse upland hardwood mix and protected from wildlife damages by fencing, cages, or tubes. Suitable species to plant into these gaps include: chinkapin oak, bur oak, black oak, red oak, black walnut, shagbark hickory, white ash, green ash, basswood, Kentucky coffee tree, and black

cherry. Red and black oak can be supplementally planted into these areas after the several years of oak wilt quarantine have passed.

***Forest Type: 2nd Growth Declining Bur Oak Ridge-top– (3)***

*Unit*: 6
*Acreage:* 6.7 total acres


*Site Description:* This forest type is found on the western ridge top – adjacent to a crop field in the central portion of the unit.

*Forest Description:* This stand consists of 2nd growth ridge-top bur oaks and hackberry in pole to small sawtimber sizes. Dense ironwood makes up the midstory layer. The understory mostly consists of garlic mustard and leaf litter, but openings do have pockets of dense coralberry. Black locust infestations on private land threaten this stand from the south. Bur oak blight may be present in this stand and should be sampled for in the growing season of 2014.

*Management Recommendations:* There are two critical concerns in dealing with this stand: 1. the presence of a nearby black locust infestation and 2. the potential presence of bur oak blight and the degraded condition of this stand. This stand should be sampled for bur oak blight as soon as feasible. If bur oak blight is present –management of this stand will transition into site preparations for artificial regeneration of a diverse mix of upland trees. This may entail a clear-cut and salvage harvest operation. Non-merchantable timber would be removed before or after the clear-cut to facilitate seedling plantings. After site preparations have been completed, the stand could be planted back to a diverse upland mix, tolerant of droughty, Ida soils. Protection from wildlife damage will be critical – and may include: tubes, cages, or fencing. Suitable species include: red oak, chinkapin oak, black oak, shagbark hickory, and white ash. If BOB is not present, the midstory layer can be thinned back (taking into account nearby black locust infestations) and a periodic regime of prescribed fire can be started. Prescribed fire will set back young shade tolerant trees and may improve seedbed conditions for natural regeneration.

***Forest Type: 2nd Bench Hardwoods– (4)***

*Unit*s: 1, 3, 8, and 9
*Acreage:* 45.7 total acres


*Site Description:* These stands are found in draws and basins throughout the WR. The soils are likely fertile, from upland topsoil colluvium, and are generally shaded because of their draw bottom locations. This stand type is at highest risk for invasive species colonization due to proximity the disturbed and well-used two track road (which dissects unit 1). This soil type is also very favorable for colonization by species like Tree of Heaven and Black Locust (which thrive in moist, fertile soil).

*Management Recommendations:* The overstory of this stand is made of pole to small-sawlog sized hackberry, American elm, red elm, bitternut hickory, Kentucky coffee tree, green ash, honey locust, and black walnut. The midstory layer is made of sapling and pole-sized hackberry, bitternut hickory, ironwood, and occasional red mulberry and Kentucky coffee tree. The understory is generally leaf litter, nettles, and invasive garlic mustard, which is found in most locations.

Invasive bush honeysuckles may also be found in these units – especially along timber edges and the main two-track. Tree of heaven is found along the main two-track where there are canopy gaps.

*Management Recommendations:* Priority number one for these stands, of course, is invasive species control. The fertile soils and proximity to constant disturbance (two-track road) make these units prime breeding grounds for Tree of Heaven, Black Locust, and Bush Honeysuckles. Unit 1 is the most visible to WR users and is in the worst condition. In unit 1, all TOH should be located (mainly isolated to the two-track corridor) and treated as previously described. The honeysuckle removal work should be done along with stand type 1 – units 4, 5, and 13. Unit 3 should be managed concurrent with unit 4. Units 8 and 9 are less disturbed, but would still benefit from light honeysuckle control. Prescribed fire is not recommended in this stand type. Hackberry, elm, ash, walnut leaf litter will have a hard time carrying fire and will not be intense enough to achieve management objectives (garlic mustard control). In addition, any bare soil on these fertile bottomlands soils (made by prescribed fire) will be fair game for future invasive species colonization.

Once the invasive species have been adequately treated, these units can be considered for midstory removal thinnings (to improve understory vegetation and to stimulate regeneration) and eventual harvest. This stand type has many veneer grade trees that should be allowed to seed the respective sites prior to harvest. Additional plans for site preparations for natural regeneration and harvest will be drafted once the initial steps are completed.

***Forest Type: Old Pasture/Second Bench Hardwoods with Scattered Oak– (4A)***

*Unit*: 7
*Acreage:* 7.4 total acres

*Site Description:* This unit is found in the central part of the WR.

*Forest Description:* This stand shares characteristics with stand types 1B and 4 and was separated out into its own stand. The stand consists of scattered sawtimber sized red and bur oak and basswood with the canopy gaps filled in with the species of Stand type 4. Most trees, especially the oaks, appear to be storm damaged and generally of poor health (rot). Garlic mustard is very much present in this stand, but there are also patches of native understory vegetation (coralberry, gooseberry, Virginia wild rye).

*Management Recommendations:* Again, TOH along the two-track access road and honeysuckle must be completely controlled before initiating additional work on this stand. Once the previous condition has been met, this stand should be considered for salvage cutting and conversion. Cull trees should be retained as habitat trees, so long as they do not pose a disease risk to residual trees. Merchantable trees (unless desirable as seed trees) should be harvested to facilitate site preparation activities. Site preparation after harvest will include: weed tree removal (small diameter trees like ironwood, hackberry, elm, and all non-merchantable, non-desirable trees), invasives species re-treatment (if needed), and possible cover crop seeding. A diverse mix of upland tree species should be seeded or planted into the site. Any of the species recommended for Stand type 3 will be suitable here as well.

***Forest Type: Drainage Woodlands – (5)***

*Units: 2,* 11, and 12
*Acreage:* 22.9 total acres

*Site Description:* Unit 11 is found along a drainage at the west central boundary of the WR. Stand 12 is found along the drainage making up the north boundary of the WR. Unit 2 is found along the timber edge at the SE corner of the WR.

*Forest Description:* This forest type is made up of all size classes and many different species of bottomland trees. The immediate drainage bottom consists of sawtimber sized cottonwood and black willow. Species on the drainage walls and on the fringe of the drainage include: green ash, American elm, hackberry, black walnut, honey locust, box elder, Kentucky coffee tree, and occasional red oak (sapling to pole-sized). Invasive species include multiflora rose, bush

honeysuckle, and Siberian elm. Unit 11 should be further investigated for the presence of TOH and black locust, due to its close proximity to large infestations of these species. Unit 2 should be managed concurrent with units 3, 4, and 5.

*Management Recommendations:* Seek and destroy invasive tree and shrub species. Management on these stands is not critical – as they are currently serving as early successional woody cover. The width of each unit may be expanded into the crop fields by supplemental seedling plants. Tallgrass prairie species would help slow water and increase infiltration, which would help reduce some of the creek bank cutting that is currently happening.

## Summary of Management Units

SSL = Small Sawtimber, ES = Early Successional, EAM = Even Aged Management, UAM = Uneven Aged Management, IC= Invasive Control, RXF = Prescribed Fire, BAT = Basal Area Thinning, WT = Weed tree removal, SHWD = Shelterwood Method, CC = Clearcut, PRIORITY (H = High, M = Medium, L = Low), SPNR = Site Prep for Natural regeneration, GS = Group Selection/Group Opening

| UNIT | STAND TYPE | ACRES | AVE DIA. | MGMT TYPE | PRESCRIPTION | PRIORITY FOR STAND MGMT BEYOND INVASIVE SPP CONTROL: (Proposed treatment start year) | COMMENTS |
|---|---|---|---|---|---|---|---|
| 1 | 4 | 35.3 | SST | UAM | IC, WT | H – 2018 FOR HS, 2021+ for WT | TOH, HS, GM |
| 2 | 5 | 5.4 | Sapling | ES | IC | M-H - 2018 | HS, TOH |
| 3 | 4 | 1.5 | SST | UAM | IC | M - 2018 | HS |
| 4 | 1 | 8.2 | ST | EAM | IC, RXF, WT, SPNR or GS or SHWD | M-H - 2018 FOR HS, 2021+ for WT | HS, BOB |
| 5 | 1 | 21.4 | ST | UAM | IC, RXF, WT, SPNR or GS or SHWD | H - 2018 FOR HS, 2021+ for WT | HS, TOH, BL, BOB, OW |
| 6 | 3 | 6.7 | SST | EAM | IC and Disease Testing, Conversion or SPNR (if clean) | L-M – 2018 for HS, 2021+ for other mgmt | BL, BOB |
| 7 | 4A | 7.4 | SST | EAM | IC, CC, Replant | M-H – 2018, 2021+ for other mgmt | Oak Decline, HS |
| 8 | 4 | 5.9 | SST | UAM | IC, WT | L-M – 2018 for HS, 2020+ for other mgmt | HS |
| 9 | 4 | 3 | SST | UAM | IC, WT | L-M – 2018 for HS, 2020+ for other mgmt | HS, TOH? |
| 10 | 1B | 25.1 | ST | EAM | IC, RXF, WT, GO or SHWD | H - 2018 FOR HS, 2021+ for WT | HS, TOH, Oak wilt |
| 11 | 5 | 11.6 | ALL | ES | IC | L – 2018 for HS | MFR, HS, SE |
| 12 | 5 | 5.9 | ALL | ES | IC | L – 2018 for HS | MFR, HS, SE |
| 13 | 1 | 35.3 | ST | EAM | IC, RXF, WT, GO or SHWD | H - 2018 FOR HS, 2021+ for WT | HS, BL, Oak Wilt |