Loess Hills State Forest Management Plan

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Purpose

The purpose for developing a management plan for the State Forests is to ensure that these lands are sustained for future generations and that the mission and core functions for the DNR Conservation and Recreation Division and The Bureau of Forestry are reflected in the management of these lands. Furthermore, this plan serves as a record of public input and desired uses for these lands. This plan reflects the management intentions for the next twenty years based on current knowledge of land capability, inventory data, sound forestry practices, land stewardship, and public demands. This plan will be a working document, and will be revised as needed to address the challenge of managing a forest resource that is constantly changing.

The mission and core functions of the DNR are as follows:

Iowa DNR Mission:

To conserve and enhance our natural resources in cooperation with individuals and organizations. To improve the quality of life in Iowa and ensure a legacy for future generations.

Iowa DNR Vision:

Leading Iowans in caring for our natural resources

Core Functions of the Iowa DNR:

Conservation, Protection, & Stewardship – Protect, manage, and ensure the lands through the effective use of policies and procedures. Provide sustainable, responsible recreational opportunities where possible. Increase awareness and understanding of natural resources values and needs. Provide all vital infrastructure needs necessary to administer and support agency operations to achieve results for Iowans.

Bureau of Forestry Mission:

To help Iowans value, protect, expand and enjoy our trees, forests, savannas and prairies and the amenities they provide.

This plan will achieve forest and prairie management goals on the state forest to help accomplish our mission. In the planning process we have developed goals and objectives that will move the forest resource to a desired future condition. This plan ensures a system of orderly management and development of the state forest which reflects the current science regarding harvesting, forest stand improvement, and reforestation. The following management goals and objectives lay a foundation for the implementation of sound forestry management practices. An area forester is responsible for administration and management of the area.

Management Goals

Sustainability - Manage for healthy, sustainable forests, savannas and prairies. Maintain and improve the diversity of plant species and communities on the state forests.

- Improve forest age diversity through the harvest and regeneration of over-mature forest stands
- Use forest stand improvement to enhance species diversity.
- Manage native prairies and savannahs using fire management to promote plant diversity and control unwanted woody plants and invasive species.
- Increase the quality, quantity, and connectivity of public forestlands in Iowa.

Utilization – Ensure a sustainable flow of wood products for public benefit while promoting forest vigor by applying proper forest management techniques.

- Intensify forest management practices to utilize and regenerate over-mature and declining forest stands.
- Use forest stand improvement to enhance tree growth rates and vigor.
- Reduce non-forest acreage through natural succession and tree planting.

Demonstration and Research - Create and maintain forest management demonstration areas and research areas to increase the public awareness of the value and role of forests in Iowa and provide educational opportunities for students, organizations and others.

- Establish and maintain forest research plots.
- Establish forest demonstration areas, host field days, and provide outdoor classrooms to increase awareness and understanding of forest and prairie management.
- Seek partnerships with supporting private organizations, non-profit groups, and educational institutions to promote forestry education and awareness.

Wildlife - Maintain or improve natural wildlife habitat for game and non-game species. Protect known endangered and threatened species, as well as species of concern and their habitats.

- Use forest stand improvement and other practices to improve mast production for wildlife species.
- Maintain prairie and grassland habitats, increase contiguous forest cover, and create forest edge where appropriate to promote habitat diversity.
- Identify, study, and preserve unique habitats and T & E species.

Recreation – Create and enhance primitive, low-impact recreational opportunities.

- Maintain primitive trail and camping facilities where appropriate.
- Promote hunting, fishing and other game management activities.
- Promote other primitive activities such as backpacking and bird-watching.

Water quality – Enhance water quality by protecting watersheds and preventing soil loss by erosion.

- Prevent soil erosion by employing good conservation practices
- Protect and enhance streams and waterways adjacent to agricultural land by establishing riparian buffers.
- Use “Best Management Practices (BMP’s)” in all forest management operations.

Management Objectives

Conduct over 1000 acres/ of forest stand improvement over twenty years concentrating the efforts on the high quality north facing aspects, and other stands showing high productivity potential.

Work on restoration efforts of 500 acres of savanna management improvement work using prescribed fire and other management control measures and attempts.

Continue to acquire additional acres of land

Prescribed burn 1000 – 3000 acres per year throughout the different land cover types: grass, prairie, savanna, woodland, and forest.

Create demonstration sites to show vegetation improvement work sites (i.e.: tree plantings, silvicultural techniques, prairie and savanna mgmt. and research).

Identify locations for short hiking, nature trails, and overlook areas and work on signing the hiking trails throughout the forest

Harvest 24 of forest stands on good soil sites that are deteriorated, and regenerate with quality oak and walnut species to create new quality stands of forest.

Have a mosaic of the different forest management classes spread throughout each of the units.

Inventory and monitor the progression of land management activities on the state forest areas for contiguous habitats.

Update and improve GIS coverage of the forest and add new acquisitions.

Dredge the Jones Creek Pond to make it a more viable fishery now that the upstream improvements have been completed.

Host a 25th year Anniversary Celebration in Sepetember of 2010, celebrating the beginning of the Loess Hills State Forest.

Create and develop an Adopt a Prairie Program.

Host a Forestry Field Day each year to increase public awareness and forestry education

Continue to partner with other organizations and departments to help educate the public and increase awareness of the value and role of forests, savannas and prairies in Iowa.

Continue to partner and work with DNR Parks and Recreation, Fisheries, Law Enforcement, and Wildlife to help manage recreation facilities and structures.

History and Overview

Historical Account

The area was characterized by a slowing economy with declining school enrollment and loss of services. A hope for the state forest was a revitalization of surrounding communities. Early on, there was indication that this was indeed happening. The area that is encompassed by the state forest has been settled and developed over the years by landowners who farmed small plots of agriculture ground in earlier days to larger fields in most recent, and livestock grazing. The farmers in the area worked hard to scrape together a livelihood. Ownerships ranged from 10 acre woodlots to 1000 acre farms and handed from one generation to another.

Interest in a Loess Hills State Forest had been expressed for some time prior to its being recommended in the Iowa Conservation Commission's 1985 Forest Resources Plan. When the State Lottery became a reality, acquisition of the forest became possible. The first lands were acquired in June 1986 with the purchase of the Bothwell and Hrabik properties.

Prior to the start of acquisition the area was a mixture of private ownerships. Mid America Council of the Boy Scouts of America is one of the largest land holders in the area with 1,834 acres. The sizes of acquisitions have varied ranging from 3 to 1,037 acres.

The first acquisition was purchased in 1986 using Land and Water Conservation Fund (LAWCON) and Lottery funds. Since REAP funds became available in 1987, approximately $400,000 of the annual land acquisition account for IDNR has been earmarked for the forest. Land is acquired only from willing sellers. An average of 1,000 acres has been purchased each year from 1987 through 1994. The largest acquisition was the Rice property in the Preparation Canyon Unit of 1037 acres, purchased May 1993. Refer to the appendix for the record of purchases.

In September 1989, the city of Pisgah donated a 3 acre lot to be used as the site of the forest headquarters. A combination office/equipment storage building was completed in July, 1993, at which time Governor Branstad, other officials and local citizens held an open house to observe completion of the building. In October 1999, a visitor center was completed. Located on the southwest corner of the Pisgah lot, it holds the area manager's office, a meeting room and space for exhibits about the Loess Hills. Governor Vilsack was here to observe the completion of the Visitor Center and planted a couple of Landscape trees in the yard.

The forest is named after the geological formations found in western Iowa and a few other deep deposits around such as in China. The Loess Hills are a very unique formation. The fact of their existence and the fact that they have become vegetated in recent years with pioneer plant species played an important role in decisions to develop a state forest in this area.

Three of the Units were named for the towns in the nearby vicinity; Mondamin, Pisgah and Little Sioux. The Preparation Canyon Unit was named after the small settlement of Mormon travelers that split off of the main Mormon migration. The Gifford Unit, located near Council Bluffs, is a forty acre tract of timber which was given to the state by the late Dr. Gifford. The Gifford unit is managed as a part of L.H.S.F.

Landscape

The loess hills region runs 210 miles from northern Iowa to northern Missouri. It ranges in width from 1 mile to 7 miles wide and contains about 640,000 acres with depths of 50-250 feet deep. To the west of the hills where the state forest is located reside the Missouri river bottoms, a very flat area. To the east of the forest areas are rolling hills with less steepness and deposits of loess.

Changes to the Landscape

Human alterations to the Loess Hills landscape were at first small in scale; horse hooves formed trails "where passage was easiest; through lowlands or along the western edge of the bluffs" (Mutel 1989b). Then more dramatic changes occurred: settlers built dams for water power; carved the bluffs to construct caves for storage, kilns, and stables; quarried limestone, sand, gravel, shale and construction fill; leveled bluffs to make way for cities; constructed roads and railroads; and farmed the prairies. Settlers reshaped the valleys as well, straightening the meandering Missouri river and its tributaries into channels to hasten drainage and constructing dams to control flow and dikes to prevent floods. Some impacts were inadvertent: plowing slopes for cropland accelerated erosion; grazing large herds of cattle degraded the prairies, also exacerbating erosion; and baring soil for construction or recreational purposes. Exposing the soil to water destabilized the loess, often rendering it unable to support its own weight. Farmers cut native woodlands for construction and fuel, and replaced them with exotic species. They simultaneously suppressed wildfires, which allowed woody species to commence massive invasion of the prairie grassland. River channelization and drainage projects destroyed formerly abundant marshlands. Settlers altered native habitats and hunted many large mammals to local extinction. The Loess Hills had been transformed. There are up to 12 landscape areas in the Loess Hills landform region that may meet the criteria for National Natural Landmark designation.

Topography

The Loess Hills are a distinctive topographic region encompassing over 640,000 acres and extending for nearly 210 miles in a narrow band adjacent to the Missouri River valley. Although loess is a widespread geologic deposit, its development in western Iowa is of such magnitude, accumulating to depths of 200 feet in some places, that it dominates the landscape. The terrain is characterized by distinctive shapes: steep, narrow ridge crests, peaks, and saddles; numerous steep side slopes and branching spurs; and precipitous bluffs, some with sheer, nearly vertical faces rising from the adjoining Missouri River floodplain. These deposits form an extensive landscape of unique hill forms that is unparalleled in the United States and rare around the world. The Loess Hills' intricately sculptured loess deposits have been described as "the best example of loess topography not only in the Central Lowlands, but in the United States." (NPS 1985). This striking landform is an outstanding example of a landscape formed by two fundamental geological processes: wind and erosion.

Cultural History

The human story of the Loess Hills western Iowa is integrally related to the tale of the landform region's prehistoric and historic occupants over the last 12,000 to 13,000 years. American Indians have lived in, hunted in, farmed in, and traveled throughout the landform region for thousands of years. In the historic period, the Loess Hills was home to tribes that were indigenous to the region, such as the Ioway (Iowa) and Otos; they were also home to the displaced Pottawatomis. French fur traders and missionaries discovered the Loess Hills in the early 1700s. Several historically important routes crossed through and paralleled the Loess Hills, including the paths taken by Lewis and Clark in 1804 and the Mormons from 1860-1869. A 'track' of the Underground Railroad led slaves from Kansas to freedom by way of the Loess Hills of Fremont County. Determined farmers employed whatever technology was available to raise crops on the steep hillsides. This human story is woven into the fabric of the Loess Hills.

Geology

The Loess Hills State Forest is located in the Loess Hills Landform Region which defines a narrow belt of thick windblown silt (loess) deposits along the western margin of the state. The landscape has a corrugated appearance which is defined by steep narrow ridges, branching side spurs and dense drainages. The primary source of the loess is the Missouri River valley and other major river valleys which served as melt water channels for numerous Pleistocene glaciations. Each winter season, the quantity of melt water was reduced considerably and large areas of flood-deposited sediments were left exposed to the wind. Silt, clay and fine sand were lifted by the wind into great clouds and carried to the east. As the dust clouds encountered the slopes of the east valley wall they slowed and dropped their silt loads.

The Loess Hills are composed of three major geologic units. From oldest to youngest, the layers are known as the Loveland Loess (140,000 to 160,000 years old), the Pisgah Loess (28,000 to 35,000 years old), and the Peoria Loess (12,500 to 30,000 years old). Most of the landform region consists of large continuous tracts of deep silt deposited by the wind 30,000 to 12,000 years ago, and sculpted into distinctive terrain during the last 12,000 years. The loess mantles an eroded Pre-Illinoisan glacial till surface. Early geologists believed there were only two episodes of glaciations in Iowa: the Kansan and Nebraskan. Later regional studies determined that at least seven episodes of glaciations have occurred during the last several million years. The terms Kansan and Nebraskan were abandoned and replaced with the more inclusive term, Pre-Illinoisan. The underlying bedrock of Harrison and Monona Counties is composed primarily of Pennsylvanian limestone.

The Loess Hills are an outstanding example of two basic geologic processes, the strong influence of wind deposition and the erosion action on the landscape. These processes contribute to potential environmental hazards of slope failure and collapse. In addition, the association of the loess, the topography and the vegetation combine for a classic display of the interdependence between geology and ecology. In this high relief area the terrain supports a mosaic of unique ecological niches. These natural features in the area are the Loess Hills themselves. Loess is a common geologic material and is thinly spread over much of the country's agricultural midsection. More significant accumulations of this windblown silt are known especially from eastern Washington state, southeastern Nebraska, the central and southern Mississippi Valley, as well as the Midwest. It is, however, the large contiguous tracts of unusually thick loess sculpted into a distinctive

topography with a significant geologic record that sets the Loess Hills of western Iowa apart from the other areas.

Soils

The soils of the Loess Hills State Forest were formed in loess, alluvium, and glacial till; most soil series formed in a loess parent material. Mighty winds picked up the dust, or loess, left by glaciers and deposited it in great rolling drifts. Then it was water's turn to begin carving. For 12,000 years or more, erosion has shaped the Loess Hills into rare and beautiful landforms. The hills are still changing and reacting to natural and human forces. Loess is yellowish-brown, wind -deposited material consisting largely of silt particles. This specific soil forming factor is what gives Iowa's Western Loess Hills their name as well as their peculiar form. The steep bluffs, comprised solely of loess soil, rise to between 150 and 250 feet above the Missouri River bottom land. The native vegetation of these soils was almost exclusively prairie grasses, with some timber along streams, north facing slopes and drainage ways.

The steep, ridged topography, combined with the special physical properties of loess, create some problems in the Loess Hills. The angles of the slopes often range from 50 to 75 degrees; this is due to the geo-technical or engineering properties of the soil. The loess, composed primarily of coarse silt particles, has very low shear strength when water-saturated, so that often it cannot bear its own weight. Loess particles are uniform in size and smooth-sided, but angular. They stick together when dry and form stable bluffs. When wet, loess particles become slippery and slump away. Cat steps are long narrow ledges that look like wide stairs going up a steep hillside. They can follow the contour of a hill for hundreds of feet. Ridges are the narrow crests along the tops of steep-sided hills connect, ridges can branch into networks. Short ridges in these systems are called side spurs. However, when relatively dry, the loess develops a greater apparent cohesion; this allows the loess to maintain the spectacularly bold bluffs and ridges-forms along the Missouri River valley. These special soil properties impose some serious limitations on any development involving roads and buildings.

Loess is easily eroded by running water and high impact uses. This factor, combined with its collapsibility, contributes to another major problem: soil erosion and resultant gullys. Some of the highest soil erosion rates in the nation, averaging about 40 tons per acre per year, have been documented in this region. The resulting high sediment loads in local streams necessitates continual maintenance of drainage ditches and stream channels and results in detrimental conditions for many aquatic species.

The Loess Hills State Forest is made up of six general soil associations that are located in Harrison County and five general soil associations that are in Monona County. The Nine different soil associations of the two counties are the Sarpy-Albaton-Carr, Albaton-Haynie-Onawa, Luton-Keg, Kennebec-McPaul-Nodaway, Hamburg-Ida-Monona, Monona-Ida-Napier, Luton-Salix-Blencoe-McPual, Kennebec-Zook-Mcpaul, and the Hamburg-Ida-Castana-Napier. Soil appendix C contains information about the soils found on the forest. Soil information is available in farm plans covering the various units of the forest. Each of the farms that have been purchased and are managed by the state forest has conservation plans prepared by the NRCS. They present soil information, best crop or non-crop activities which are allowed or not allowed and can enhance the goals of the forest on a long-term basis.

Climate

The climate in the Loess Hills is of the continental type, characterized by wide variations and rapid changes in temperature. Snow cover of nearly an inch is common for about 47 days per winter. The average depth of snow through the winter months is approximately six inches. Winter conditions are, however, often mild with temperatures ranging from 20 to 25 degrees Fahrenheit, with occasional sub-zero temperatures.

During the spring, annual average temperatures range from 45 to 75 degrees Fahrenheit. The average monthly rainfall during the spring reaches nearly 4.6 inches. The extent of precipitation is enough to cause erosion in the loess as well as damage to facilities. The last spring freeze usually occurs about May 1, and the first fall freeze occurs about September 6. The growing season is about 160 days. Summer temperatures average between 71 and 86 degrees Fahrenheit with some high temperature extremes above 100 degrees Fahrenheit. These high temperatures restrict plant growth to drought resistant species along ridges and south facing slopes. The average total precipitation for the entire year is nearly 31 inches of rain or snow.

The Loess Hills boast some desert-like habitats for two reasons: loess itself doesn't absorb water. Rain runs off the hills or soaks through rapidly, leaving the loess particles high and dry. The already arid hilltops and southwest-facing slopes are directly exposed to the hot midday sun and are constantly swept by summer winds. As a result, unusual mixtures of drought-loving plants and animals have found a home in the hills. Some of these species are typical of arid regions in the West, but are rare in Iowa.

Archeological Sites

There are many Native American artifacts that have been recorded by the state archeologist office over the years. To prevent further vandalism of these sites, the locations are not identified or marked on the forest. The State archeologist office has the records that contains the information about each site and maps showing the location of the sites. Every attempt has and will continue to be made to prevent disturbance of these artifact sites. Therefore recreational opportunities need to be very low- impact to reduce soil disturbance and further protect the archeological resources.

Land Acquisition Priorities

The Loess Hills State Forest contains large acreages of woodlands, savanna and prairies, and provides excellent numbers of wildlife species (deer, turkeys, quail, songbirds,) It lies within an easy drive of Omaha, Nebraska and Sioux City, Iowa, and attracts heavy public use. The existing areas of the state forest property are already heavily hunted for deer, turkeys, quail and pheasants and also used a lot by bird watchers, prairie enthusiasts and hikers.

Land expansion would allow for new lands to join previous purchased lands and create larger contiguous tracts of public ownership for the multiple uses that take place on the state forest. It will also allow us to do more management operations including forest, savanna, and prairies management (i.e.: prescribed burns, TSI, understory plantings, restoration seed plantings of prairies and forbs).

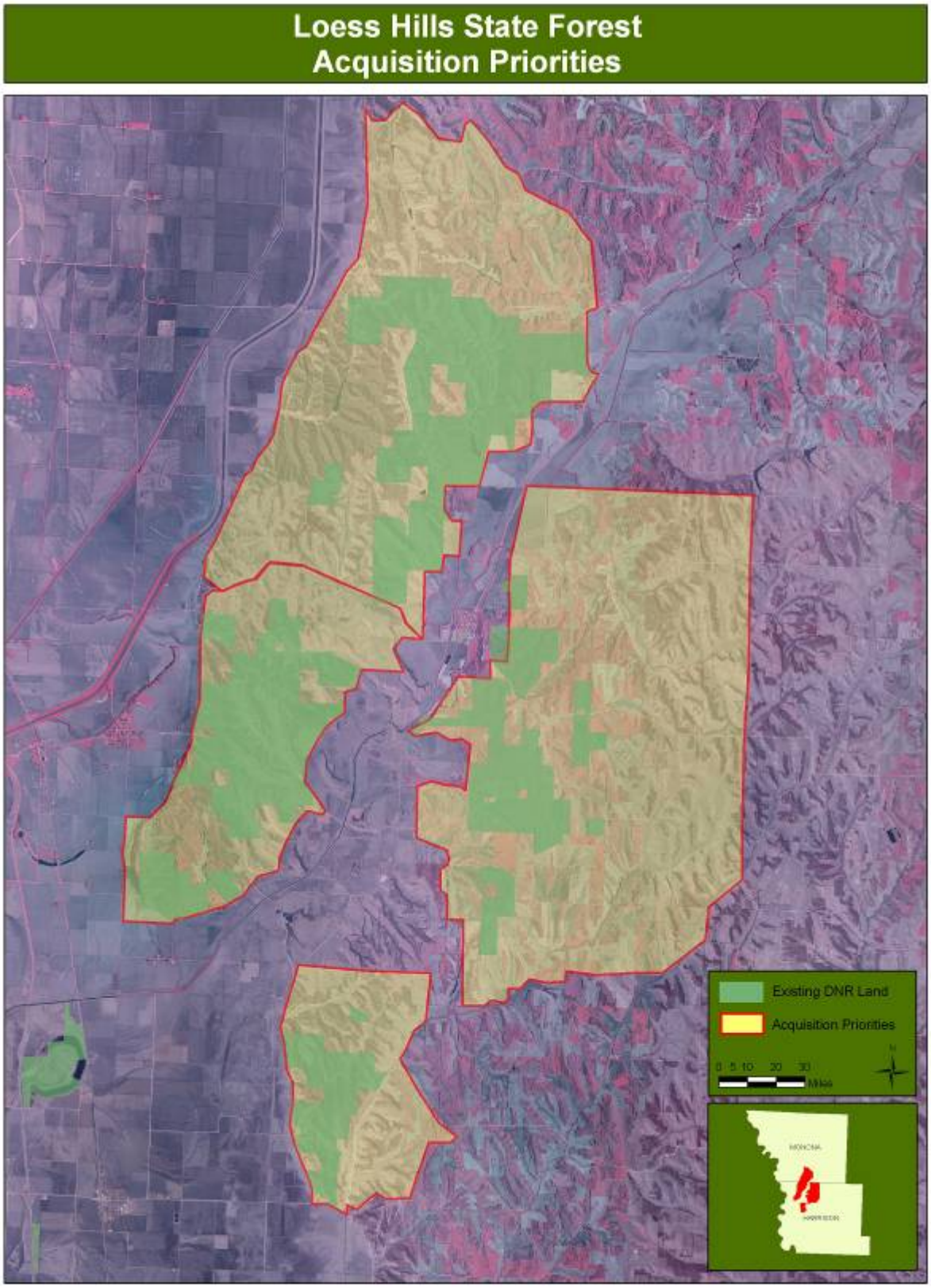
There are many species of state and federal listed threatened and endangered plant, reptile, birds and amphibian animal species found throughout the state forest acquisition properties. There are high populations of game wildlife found throughout the areas of acquisitions and should give the department some good opportunities for special zone hunts.

Land acquisition will help square up boundaries and bring boundaries out to public access roads. These areas will allow us to protect the waterways and will allow us to put permanent vegetation cover on some of the highly erodible agricultural lands, which will in turn produce better non-game and game wildlife habitats. This will allow us to create larger contiguous blocks of prairie, savanna, and oak woodlands and high quality forests for Iowans to enjoy.

Much of the forest is under consideration by the Loess Hills Audubon Society as a Bird conservation Area. We have been doing ongoing bird surveys over the last several years. These areas being considered, are a part of the National Natural Landmarks, and are a part of the Twelve Special Landscape Areas identified by the Iowa Conservation Commission in the 1950's and also re-identified by the National Park Service Study done in 2000.

The Loess Hills State Forests has used REAP open spaces funds, USFS Legacy funds, Turkey Federation monies, Iowa Natural Heritage Foundation, Loess Hills Alliance funds, The Nature Conservancy, Loess Hills Audubon Society, and Scenic Byway funds to help assist in acquiring lands for the state forest properties.

Lands under consideration for acquisition pass the primary criteria of the new Iowa DNR land acquisition policy; and further qualify under the attributes of scenic or unique landscapes, fish and wildlife habitat, threatened or endangered species habitats, water quality enhancements, land cover, and recreational opportunities. In addition, lands must also help the department to achieve its mission to conserve and enhance our natural resources in cooperation with individuals and organizations to improve the quality of life in Iowa and ensure a legacy for future generations.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Recent Changes and Trends in Forest Composition

For over a century, Iowa's Loess Hills have attracted botanists who have studied the unusual assemblage of plants found in this area. Approximately 700 species of vascular plants (over a third of Iowa's flora) have been identified in the Loess Hills. The high diversity of both species and ecological communities is explained by the varied micro-sites created by the dissected terrain. The regional climate, on the whole, is mid-continental with extreme temperature variations exemplified by cold winters and hot summers. However, in this landscape with its diverse exposures, one can climb within a few hundred feet from moist valley woodlands onto sun-scorched, dry ridge tops sparsely vegetated with drought tolerant grasses and forbs.

Until the 1850s, fire-dependent native prairies dominated the Loess Hills, as was true of most of the Western Central Lowlands. Eastern deciduous forest species flourished only in moist sites along creeks and at the base of sheltered slopes. A dynamic border separated the two major types of ecosystems, with frequent wildfires favoring the sweeping expanses of prairie grassland. The post-settlement exclusion of wildfire has allowed woodlands to expand into many areas previously covered by prairie. However, prairies still over broad expanses of the driest, harshest Loess Hills sites: the westernmost bluffs and sun and wind exposed ridge tops with their adjacent south and west facing slopes. Protected from intensive agricultural use by rugged topography, many of these prairies have retained much of their original integrity and diversity and remain relatively large. Indeed, Loess Hills prairies in Iowa in 1980 comprised a minimum of 22,250 acres (three-percent of the landform region), over half of the remaining prairies in the state that was once the heart of the tall-grass prairie (Selby 2000; Appendix G species list of plants).

The expanses of native prairies and forests that today dominate the Loess Hills constitute a highly diverse mixture of eastern and western plant and animal species, many of which reach the edge of their distributional range. At this significant biological crossroad, eastern deciduous forest species at or near the edge of their range interlace with dry prairies that are fostered by the harsh, extremely dry environment (produced by wind, sun, and well drained soils) and include a rich mixture of plants and animals typically found much further to the west. A total of 96 Loess Hill's species are of interest because they are either western species at or near the eastern edge of their range, eastern species at or near the western edge of their range, or are listed by the State of Iowa as endangered, threatened, or special concern species. The 39 state-listed species constitute one of the largest concentrations of rare species in the state. While 11 of the listed species have woodland affinities, 25 are prairie species, a dominance that reflects the relatively large amount of prairie habitat remaining in the Loess Hills (Appendix G). The continued woodland expansion of remaining prairies poses a major treat to many of these regionally rare species. While seven federally listed species occur in one or more of the seven counties that the landform is located in, there are no known occurrences within the upland areas of the Loess hills (Howell, personal communication).

Most scientific interest has been focused on the prairies that house a variety of rare western plants and animals at the eastern terminus of their distributional range. These dry prairies are dominated by little bluestem and side-oats grama, joined on the westernmost bluffs by plains muhly. Great Plains forbs such as skeletonweed, soapweed, and scarlet gaura lend a distinctive element to mid-grass communities. These plant communities, like all prairies, evolved in the presence of wildlife, which stimulates the vigor and health of these fire-adapted ecosystems. The plant communities are matched by western animals such as the Great Plains skink, prairie rattlesnake, and plains pocket

mouse, which join more ubiquitous species such as the badger to form a grassland fauna of small, secretive animals. Western species are most diverse toward the north, where the prairies are the largest. These mid-grass prairies, with their western forbs, are unique in Iowa. They probably resemble the mixed grass prairies 70 miles or more to the west more than the other dry prairies in the region, or the tallgrass prairies that are the norm for this longitude (for a listing of species scientific names, see Appendix B).

Renewed awareness of the landform region's significance shifted attention toward the identification of areas worthy of preservation, and led to the identification of the Loess Hills in 1998 as one of The Nature Conservancy's national priorities. The Conservancy's studies of the central tallgrass ecoregion have revealed that the Loess Hills contain the best examples in the world of three natural community types: Eastern Great Plains Big Bluestem Loess Prairie, Loess Hills Little Bluestem Dry Prairie, and Eastern Great Plains Bur Oak Woodland. Additional recent scientific studies include vegetation analyses primarily by Rosburg and lepidopteral investigations. These have progressed simultaneously with intensified management efforts.

Woody vegetation (primarily forests) covers about 73,500 acres (11 percent) of the landform region (IDNR 1991). The majority of the forests result from woody invasion of prairies, a process that has been aggravated by the exclusion of wildfires that kill most trees and stimulate native grasslands. Bur Oak is the most abundant tree species. Subdominants such as ironwood or red elm may commingle with the bur oak but the understory of bur oak woodlands is often sparse, consisting of a few common species such as Virginia creeper. The low species-richness and diversity emphasize the immaturity of these forests. This is also true of very dense eastern red cedar woodlands that plague pastures. Invasive woodlands of green ash and Siberian elm mix with cottonwood, ironwood, or other trees to cover very disturbed hillside. Although uncommon, older forests occupying historically wooded locations remain western outposts of the eastern deciduous forest.

Woodland animals include common species such as the fox squirrel, eastern cottontail, and woodchuck, as well as a diverse assemblage of birds. Larger animals such as the red fox, white-tailed deer, and coyote wander between woodlands and grasslands. A few rate species such as the hickory hairstreak butterfly and speckled kingsnake also inhabit the forests. Forest animals in general are increasing and expanding their ranges northward as woodlands expand, often at the cost of prairie animals. For example, all increasing Loess Hills reptiles are woodland species, while prairie reptiles are declining in number (Christiansen and Mabry 1985).

Ironwood has been dominating the understory in many stands of trees on the forest, which decreases the diversity in the woodlands and depletes natural regeneration of any other species. Ironwood is very shade tolerant. Elm species continue to die from Dutch elm disease. Eastern Red Cedar and deciduous shrubs and trees such as: sumac, dogwood, honey locusts, green ash, and cottonwoods, continue to invade the native prairie remnants.

Within the last 10 years there has been a tremendous growth of population in and around the Loess Hills region, which has increased the values of the land which in turn makes it much harder to acquire lands for public ownership. There has also been an increase interest in the work we have done with our prescribed fire program of woodlands and prairie for restoration purposes and used for controls of noxious species of plants.

The predominant plant communities on the forest are prairie and mixed hardwood forests. The forests range from pure bur oak to mixtures of oaks, hickories, basswood, elms, ashes, Kentucky coffee tree, cottonwood, ironwood and red cedar. If one species was to be singled out as predominant it would be bur oak due to its ability to grow on dry sites and withstand fire. Black walnut is the most important and valuable commercial species. Bur Oak is the major forest type that is present throughout the Loess Hills State Forest. There is 60% of the forest cover that has Bur Oak present in the stands, and of the 60% there is 35% that is solid Bur Oak, with less than <5% mixture of species in the solid stands. The other 25 % of the Bur Oak stands are a 50/50 mixture of species; consisting of elms, ash, hackberry, walnut, ironwood and mulberry.

The forest contains many acres of natural prairie comprised of big and little bluestem, Indian grass, side oats grama and forbs such as yucca, pasque flower and lead plant. A complete list plants found on the forest is included in the **Appendix G**.

Forest Health

Throughout the Loess Hills State Forest is Dutch elm disease, ash decline, anthracnose of oak, sycamore, maple, and different decays and fungi present in the area. The environmental stresses and age of the forests are causing the most significant loss throughout the forests.

Invasive species

A relatively new threat to Iowa's forests are invasive species. Some of these species were actually planted by land managers in the past because of their wildlife benefits and ease of establishment. The problems that occur are due to the prolific seed production of these species, their lack of natural enemies (disease or insect) and adaptability to a variety of conditions. Once established, these species can crowd out all native species, resulting in an ecological dessert. Species of most concern at this time in the forests include multi-flora rose, common buckthorn, autumn olive and honeysuckle. Forest managers use a variety of control measures for these species including cutting, spraying, pulling, and burning. The hard part of trying to control these invasives is that when people come to visit by any form of transportation, (from wheels to legs) they are capable of spreading it all over.

Garlic mustard has no natural growth controls, spreads rapidly, grows tall, and becomes extremely dense. Within a few years, it dominates the understory. It crowds out understory wildflowers, ferns and tree seedlings. It seriously degrades or destroys high quality woodlands and wildlife habitat. A single plant produces hundreds of seeds, which remain viable 5 years or more. Controls can be done successfully with routine monitoring and early detection. New infestations must be treated immediately and thoroughly by herbicides, prescribed burning, hand pulling and mechanical control. Attacking established invasions with multiple techniques, and careful and continued follow-up will yield favorable results.

Senescence and decline of oak

Many of Iowa's oak stands are in a state of senescence. Midwest foresters generally agree that red oak forests reach this state and start to decline at about 140 to 150 years of age. At this point the trees have surpassed their age of biological maturity and are actually losing more biomass than they are producing through breakage, root rot and disease. Two other contributing factors that affect aging oak trees are the insect called the two-lined chestnut borer and a disease called armillaria root rot. These two factors are not problems for young and vigorously growing trees, but as the trees natural defense mechanisms weaken with age they become the predominant reason for the death of a tree. Much of the management on the state forests is aimed at regenerating these stands to a more diverse mixture of species.

Oak wilt has been and continues to be the biggest forest health problem in Iowa. Oak wilt has been killing all species of oak trees since the earliest days of state forest establishment. The red oak group is more susceptible than the white oak group to this disease and often dies within weeks or months after infection. Since oak wilt is a native disease of oak, it is not epidemic, but does cause a loss of thousands of board feet of oak annually. Forest managers continue to monitor oak wilt activity and attempt to eliminate the inoculum whenever practical to do so. It is a bigger problem in over-mature oak stands where the trees are no longer growing vigorously enough to ward off the disease and insect vectors are more abundant.

Insects

Gypsy moth will defoliate oak trees once populations become established and are able to build up. Once populations become high enough they will be capable of completely defoliating oak trees during the summer, causing these trees to produce a second set of leaves, while draining the nutrient reserves of the tree. Oak trees already stressed from weather events, old age, stocking density or site conditions may die from the defoliation by the gypsy moth. Gypsy moth is established in Wisconsin and Illinois, with it only being a matter of time before it establishes itself in Iowa. The time for managing our mature oak forests for the establishment of gypsy moth is now.

The **emerald ash borer** is a new exotic insect first detected in Detroit, MI in 2002. Since its arrival, millions of healthy ash trees have been killed in Michigan and the insect is now present in Indiana and Ohio. Although not yet found in Iowa, this insect has more potential for future harm to Iowa's forests than any other insect currently being dealt with in the United States.

The **sirex wood wasp** is another exotic insect that can attack and kill living pine trees, unlike the native wood wasps that attack only dead and dying trees. The main concern for landowners will be keeping their pine stands thinned, to reduce their susceptibility to this insect. Mortality has been reported as high as 80% in overstocked pine plantations by this insect. Sirex has only been detected in New York, but efforts are under way to survey surrounding states to monitor the spread of this insect.

Honeysuckle

Buckthorn

Multiflora Rose

Autumn Olive

Garlic Mustard

Prairie Health Issues

Leafy Spurge is a native of Europe and Asia, it emerges early in the spring and gets a head start on other vegetation in a race for space, sunlight, nutrients and water. Prolific seed production and an extensive root system give the plant a huge competitive advantage and makes consistent, long term control difficult. Deep tap roots which can exceed 20 feet in depth, store reserves of nutrients to see the plant through hard times, while lateral roots form a network that enable it to rapidly reproduce and spread. Perhaps worst of all, leafy spurge is highly adaptable and can thrive in a variety of conditions and situations. In short, this exotic invader is extremely competitive and quite capable of completely displacing desirable plants. It invades a variety of land types, reduces range productivity and species diversity, threatens sensitive species, degrades wildlife habitat and reduces land values. We have burned at different times of year to try and set it back, released flea beetles and sprayed. We are now in the monitoring phase of those control treatments.

Demonstration Areas

State Forests provide an environment where management techniques can be tried and documented for success by Area Foresters, the private lands District Foresters, universities, environmental or wildlife organizations, and others. Because of the distribution of the State Forests, the same management techniques can be tested on a variety of forest types, soil types, and landforms. The types of projects suitable for establishment is dependent upon the impact the demonstration will have on the forest and the ability of the local manager to maintain the project.

Non-profit organizations such as National Wild Turkey Federation (NWTF) and Pheasants Forever (PF) have proven to be valuable allies when establishing demonstration plots or areas. For example, NWTF provides $4000 every year for demonstration plots on state forests each year. Additionally, demonstrations of sustainable forest management practices have been established on or near easily accessible areas in order to be used for field days and tours with the public or school classes.

Area Foresters keep records of these demonstration areas and will document the location of each project on their forests.

Water Quality Management

Forests are some of nature's best air and water filters, as long as they are well managed. When managed properly, forests provide different levels of vegetation cover from the tall overstory canopy, to mid-canopy, brush and herbaceous vegetation. Numerous studies have shown that forests reduce the impact of precipitation on the soil, and slow the rate of rainfall thus, allowing more of the rain to absorb into the soil rather than flowing over the soil. This decreases the erosion and soil loss.

Pollutants can enter surface waters from **point sources**, such as single source industrial discharges and waste-water treatment plants; however, most pollutants result from **nonpoint source** pollution activities, including runoff from agricultural lands, urban areas, construction and industrial sites, and failed septic tanks. These activities introduce harmful sediments, nutrients, bacteria, organic wastes, chemicals, and metals into surface waters.

Nonpoint source pollution can be difficult to control, measure, and monitor. In most cases, a combination of practices are required to address the problem. This may include the proper application of fertilizers and pesticides or the introduction of practices to reduce storm water runoff and soil erosion. These practices are commonly known as Best Management Practices (BMP's). One BMP which can be very effective in influencing water quality is the construction of riparian forest buffers along streams, lakes, and other surface waters. Through the interaction of their unique soils, hydrology, and vegetation, riparian forest buffers influence water quality as contaminants are taken up into plant tissues, adsorbed onto soil particles, or modified by soil organisms.

Sediment refers to soil particles that enter streams, lakes, and other bodies of water from eroding land, including plowed fields, construction and logging sites, urban areas, and eroding stream banks. Sedimentation of streams can have a pronounced effect on water quality and stream life. Sediment can clog and abrade fish gills, suffocate fish eggs and aquatic insect larvae, and cause fish to modify their feeding and reproductive behaviors. Sediment also interferes with recreational

activities as it reduces water clarity and fills in ponds and lakes. In addition to mineral soil particles, eroding sediments may transport other substances such as plant and animal wastes, nutrients, pesticides, petroleum products, metals, and other compounds that can cause water quality problems.

Nutrients are essential elements for aquatic ecosystems, but in excess amounts, they can lead to many changes in the aquatic environment and reduce the quality of water for human uses. Some nutrient inputs into surface waters are entirely natural, such as nutrients contained in plant materials or naturally eroding soils. However, most nutrients in surface waters today result from human activities.

Nutrients can enter surface waters in subsurface or surface flows (as a dissolved form or attached to soil particles). For example, nitrogen is most commonly transported as dissolved nitrogen through subsurface flows, with peak nitrate levels occurring during the dormant season after crops have been harvested and soil evaporation rates are reduced. In contrast, phosphorus most often enters the stream adsorbed into soil particles and organic materials in surface runoff after storm events.

Riparian forests have been found to be effective filters for nutrients, including nitrogen, phosphorus, calcium, potassium, sulfur, and magnesium. Because excessive levels of nitrogen and phosphorus are of particular concern in the nation's streams and lakes, the ability of riparian buffers to filter these nutrients has been the focus of much interest and continual research.

Management activities on state forests are designed to protect water quality and prevent erosion. Riparian buffers along streams, creeks and around lakes and ponds are protected from harvesting or have limited harvesting to remove damaged or diseased trees and to allow some new vegetation to become established. Heavy equipment is generally not allowed in these areas. Pesticide and herbicide use are kept to a minimum in these zones. Creek and stream crossings are evaluated and improved when possible.

The Jones Creek Watershed

Located in Monona County, the Jones Creek Watershed is a system of spillways and small impoundments erected by Soil Conservation Service (SCS) between 1937 and 1942. In the mid-1930s, a group of engineers challenged the established practice of building large and hugely expensive dams at key points along major rivers, proposing that the erection of “little dams” along streams feeding those major waterways would be less costly and equally effective. The Jones Creek Watershed was one of a handful of projects selected by the Soil Conservation Service (SCS) to test this hypothesis. The undertaking successfully slowed the flow of water and captured silt, thus protecting farmlands in the Jones Creek drainage area and also downstream. The success of Jones Creek project’s pivotal role in resolving the “big dam vs. little dam” controversy may render it eligible for National Historic Landmark status under Criterion A, properties associated with events that have made a significant contribution to the broad patterns of its history. In 2004, 2 acres of the pond was dredged out to give it some much needed depth for fish survival. In 2006, more vegetation plantings along the waterways of trees and native grasses were planted. In 2007, many repairs were done to the upland concrete structures to further control erosion. Further dredging is recommended in order to make the pond a good fishing area.

Recreation

Recreational opportunities compatible with the other forest uses will be permitted and encouraged.

Low impact recreation is any outdoor activity that treads lightly on the fragile loess hills soils. Because the loess hills soil erodes so easily, up to 40 tons/acre/year, we restrict activities on our trail system that will disturb the soil. To that end, motorized vehicles, ATV's, bicycles or horses are not allowed on the trails of the forest. These restrictions ensure that the miles of trails that are maintained on the forest will be available for generations to come. Some of the low-impact recreation activities on the forest include: fishing, picnicking, driving for pleasure, birding, hiking, nature study, primitive camping, photography, plant and wildlife study, cross-country skiing is allowed on the entire forest during the winter months, snowshoeing, sledding and hunting, snowmobiling with 12" base minimum.

Hunting is allowed on all acres of the forest. Parking areas for access are available throughout the forest areas. Trail construction for hiking access is located around the Jones Creek Pond and from the Loess Hills Forest Overlook. Fishing is available at the Jones Creek Pond, and we are looking into ways to fund some projects to enhance this fishery area. Primitive camping is allowed throughout the forest, and many people especially during the hunting seasons will camp at some of the 40 parking lots spread throughout the forest. The entire forest is open to hiking and backpacking. Outdoor enthusiasts can find opportunities ranging from strolling along well groomed roads and trails, to backpacking into the primitive wilderness and enjoying the solitude of a backcountry experience. Otherwise the forest is open to hiking anywhere the visitors would like to discover. State Forest Boundaries signs are posted on corners of property and approximately every 1/10 of mile along fence lines and roadways.

The DNR and State forest is committed to offering low-impact recreation opportunities that develop awareness, understanding and commitment to our natural world in other words whenever you come to State Forest to relax or play; we strive to help you develop a personal attachment to the Loess Hills.

Wildlife

The Loess Hills of western Iowa have a diversity and abundance of wildlife species, many unique to this area alone. Wildlife management is an important goal on the state forests. The DNR Wildlife Bureau is the authority on wildlife management in the state of Iowa, and we depend heavily on their expertise in this area of management. The Iowa Wildlife Action Plan can be viewed online at http://www.iowadnr.gov/wildlife/diversity/plan.html

The three greatest impacts on wildlife numbers and composition in the loess hills are wildfire suppression, agriculture and human settlement. Historically, Black bear, elk, buffalo, antelope and wolves roamed the rugged Loess Hills in its pristine state of native grassland interspersed with narrow strips of woodland along the edges of narrow gullies formed by erosion of the fragile loess soils. Settlement in the mid 1800's brought about a change in land use as agriculture became more intensive in the loess hills, bringing with it a need to protect homesteads from the natural fires that maintained the vast area of prairie grasslands. Land use changes and fire protection allowed woodland encroachment into vast areas of unbroken prairie sod. Until today, only remnants of prairie remain on steep ridge tops. Changes to the landscape brought about a change in the wildlife species composition inhabiting the Loess Hills. Gone were the nomadic grazers, and the predators that relied on them for survival. The new landscape now supports those species adapted to the grassland/woodland mix interspersed with agricultural fields of corn, soybeans and cool season grasses.

In addition to a change in large game species, other species such as prairie chickens, prairie rattlesnakes and the plains pocket mouse also declined. Species composition now includes species such as whitetail deer, raccoon, quail, pheasant, and wild turkey. These species have been highly successful in surviving and expanding their numbers. The changes in habitat have brought to light a need to protect those few remaining rare or endangered species as they attempt to survive in small remaining areas of pristine prairie that are so critical for their survival.

Through a cooperative effort between wildlife and forestry staff in the Loess Hills, forestry practices and agricultural activities are combined to enhance the forest area for deer, turkeys, quail and pheasants, as well as squirrels, rabbits. An increasing effort is being made to accommodate the needs for other non-game species including insects, herpes and small mammals. Management plans include the use and placement of commodity crops such as corn and beans to provide food plots available as winter food for wildlife. Cool season grasses and forbs such brome and alfalfa are included in agricultural practices to provide nesting cover for ground nesting game birds as well as forage for deer and turkeys.

The combination of good forest practices, fire management and agriculture within the Loess Hills State Forest enhances wildlife populations and creates a hunting surplus for Iowa's hunting public. The same practices enhance the area for non-consumptive users such as bird watchers, hikers and others who are out on the area sampling enjoying the aesthetics. Tree planting will benefit most forest species by continuously increasing the amount of habitat for those species. Forest fragmentation will be addressed by continuing to plant trees in open areas to create large tracts of interior forest habitat. Edge habitat around the perimeter of these large tracts will be enhanced by the planting of various small tree and shrub species to provide habitat for edge dwelling species.

Providing wildlife habitat by the use of forest management practices will result in increased food and cover. The forest and woodland areas will benefit from forest stand improvement, and harvesting techniques will leave den trees for the use of certain species. The timber management will take into account the impacts to species and timing of year, so as not to disturb the species at certain times of the year. Development of a diverse forest will benefit a large number of wildlife species. Oak acorns are an important food source for many species. Forest stand improvement techniques will be used to improve hardwood mast production. Harvesting to regenerate oak will benefit many species as well by sustaining the oak component of the forest. Some species will benefit from more extensive areas of closed-canopy forest, while others will benefit from the edge habitat created through various timber management practices. Loess Hills State Forest will be managed for various wildlife species present using various forestry practices that benefit wildlife. Wildlife species at the forest include, but are not limited to: deer, turkey, bobcat, squirrel, rabbit, red fox, quail, pheasant, and many songbirds.

The open land on the forest will be used for the production of vegetation that benefits wildlife, or to enhance the beauty of the area by offering a change of scenery. Grassland species will benefit from continued fire management in grassland areas.

The state forest will also maintain a base of acres for agricultural ground to enhance wildlife and to show good agricultural practices and follow NRCS farm conservation plans. The agricultural ground of the steep slopes will be planted to trees, native ecotype prairie, and grassland. Agricultural crops left in the field as food plots will serve as a valuable alternative food source for many species during the winter months. These open areas are important for wildlife and the viewing of wildlife.

Several attempts have been made to introduce or re-introduce certain wildlife species at Loess Hills State Forest in the past. Today, the forest boasts a huge turkey population and is one of the most popular turkey hunting areas in the state. The various forestry practices used to manage the timber resource at Loess Hills State Forest will be aimed at improving habitat and natural food sources for all species of wildlife present at the forest. Forest stand improvement practices will benefit many wildlife species by improving forest health and increasing mast production of individual trees which are valuable food sources. Timber harvesting and regeneration will benefit species by providing new and healthy forest stands for sustainable habitat.

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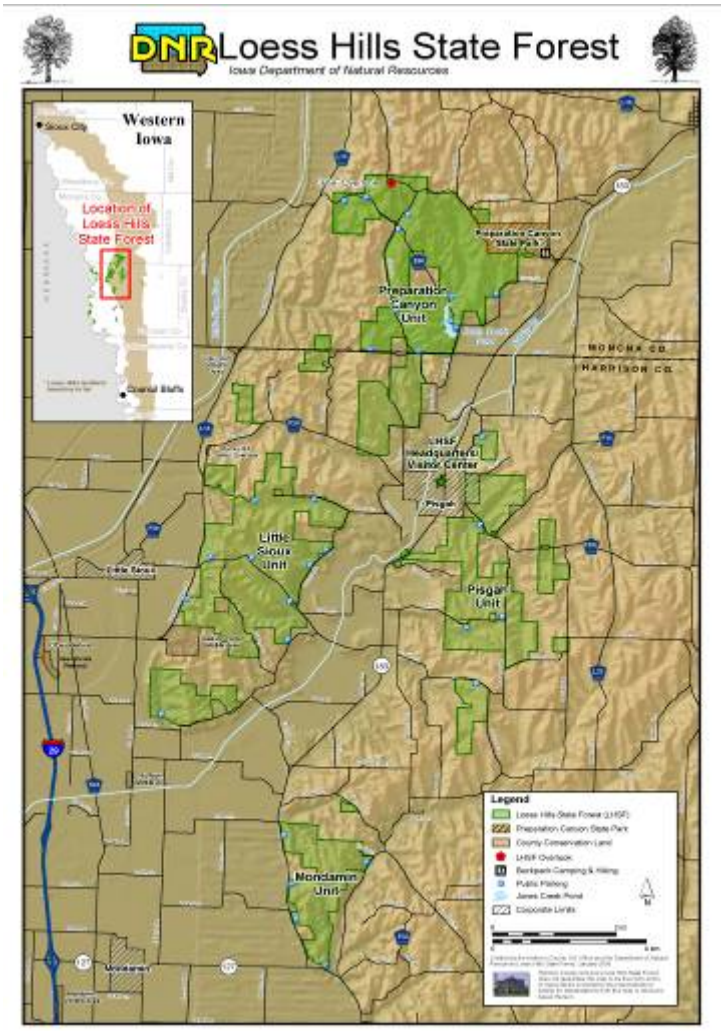
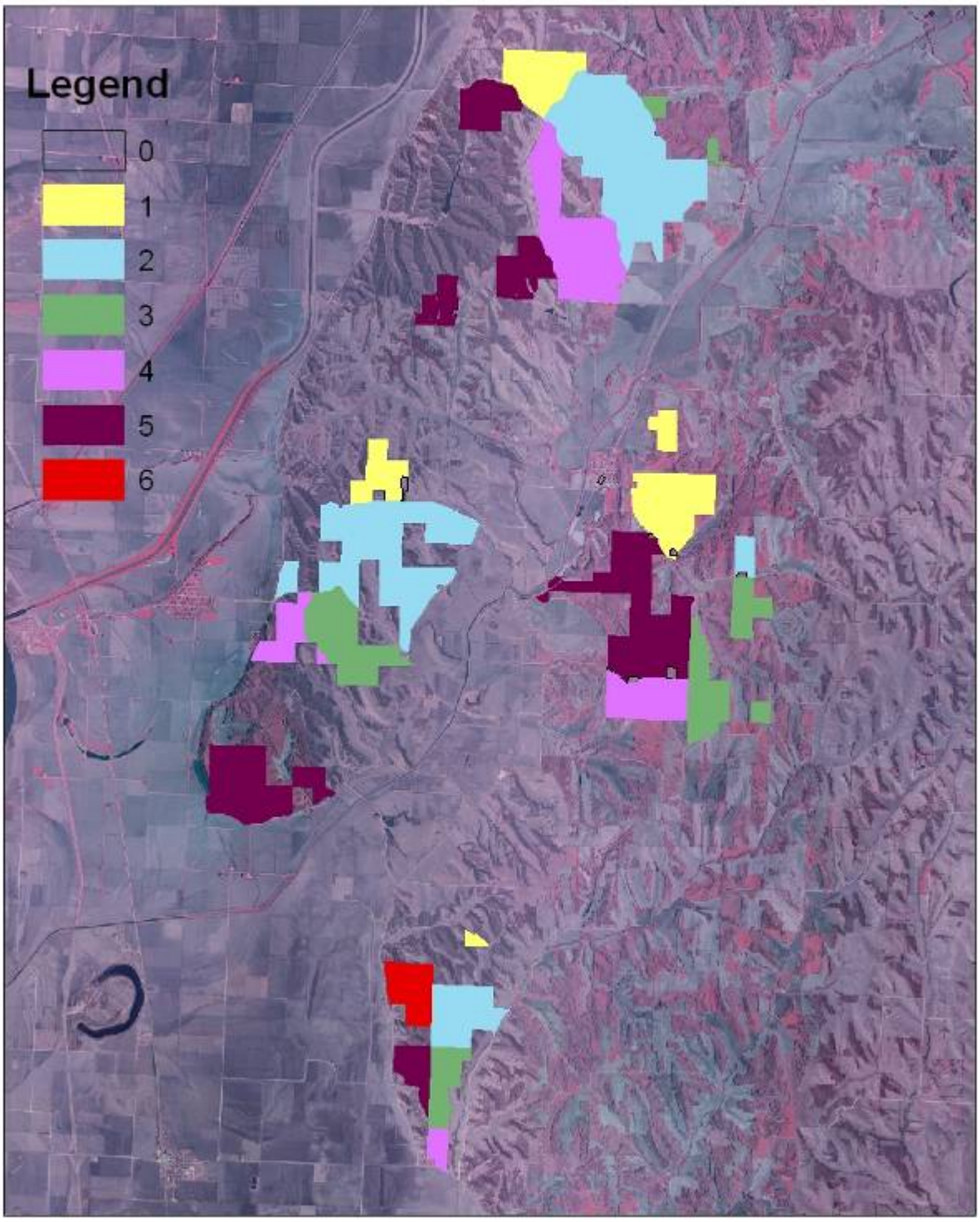
Forest Units

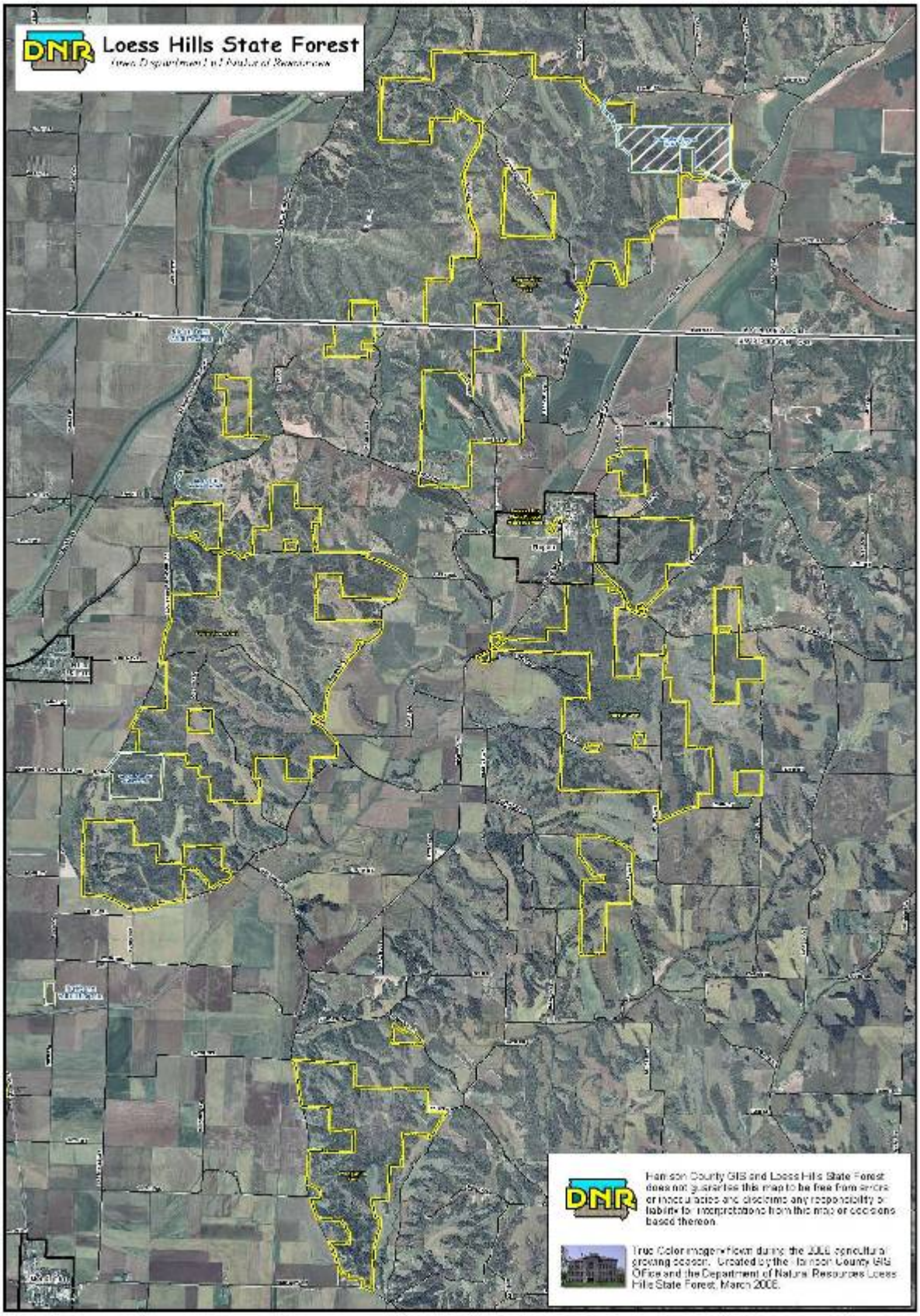
The Loess Hills State Forest is comprised of 4 units. These units are named Pisgah, Preparation Canyon, Little Sioux and Mondamin Units. These units are then divided into manageable sized compartments. There are 5 or 6 compartments in each of the units. The compartments are then broken down into stands by cover type. This allows management to be organized. We have a cultural practice schedule which helps us to rotate the management activities throughout the forest over a 10 year basis.

The cultural practices groups are comprised of a number of compartments. This allows for management work to be spread throughout the forest over the ten year period, so as not to have any areas of the state forest become neglected. There is one cultural practices group for each year of the cultural practices cycle and management activities are rotated from one cultural practices group to another in turn. Compartments are arranged so that each cultural practices group is as equal in acres as possible in area of forest to another. The compartment is a division of the forest on a geographic basis. It is an administrative unit for the purpose of convenience in location, assignment of work and record keeping. As nearly as possible, compartment boundaries should be easily recognized on the ground.



Loess Hills State Forest
Unit Compartments




Loess Hills State Forest
Iowa Department of Natural Resources
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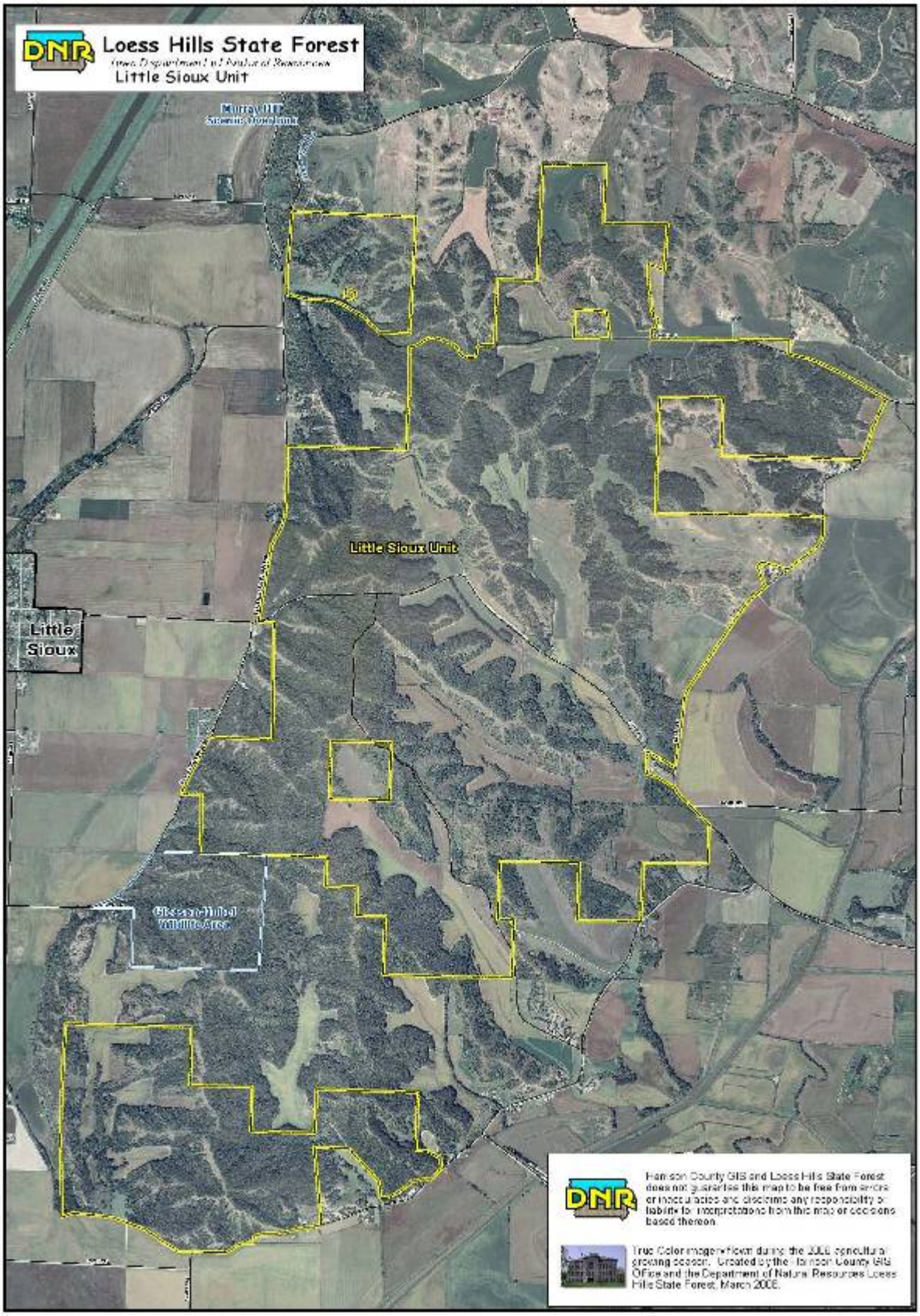
True Color imagery flown during the 2005 agricultural growing season. Created by the Harrison County GIS Office and the Department of Natural Resources Loess Hills State Forest, March 2006.


Loess Hills State Forest
Iowa Department of Natural Resources
Little Sioux Unit
Little Sioux Unit
Little Sioux
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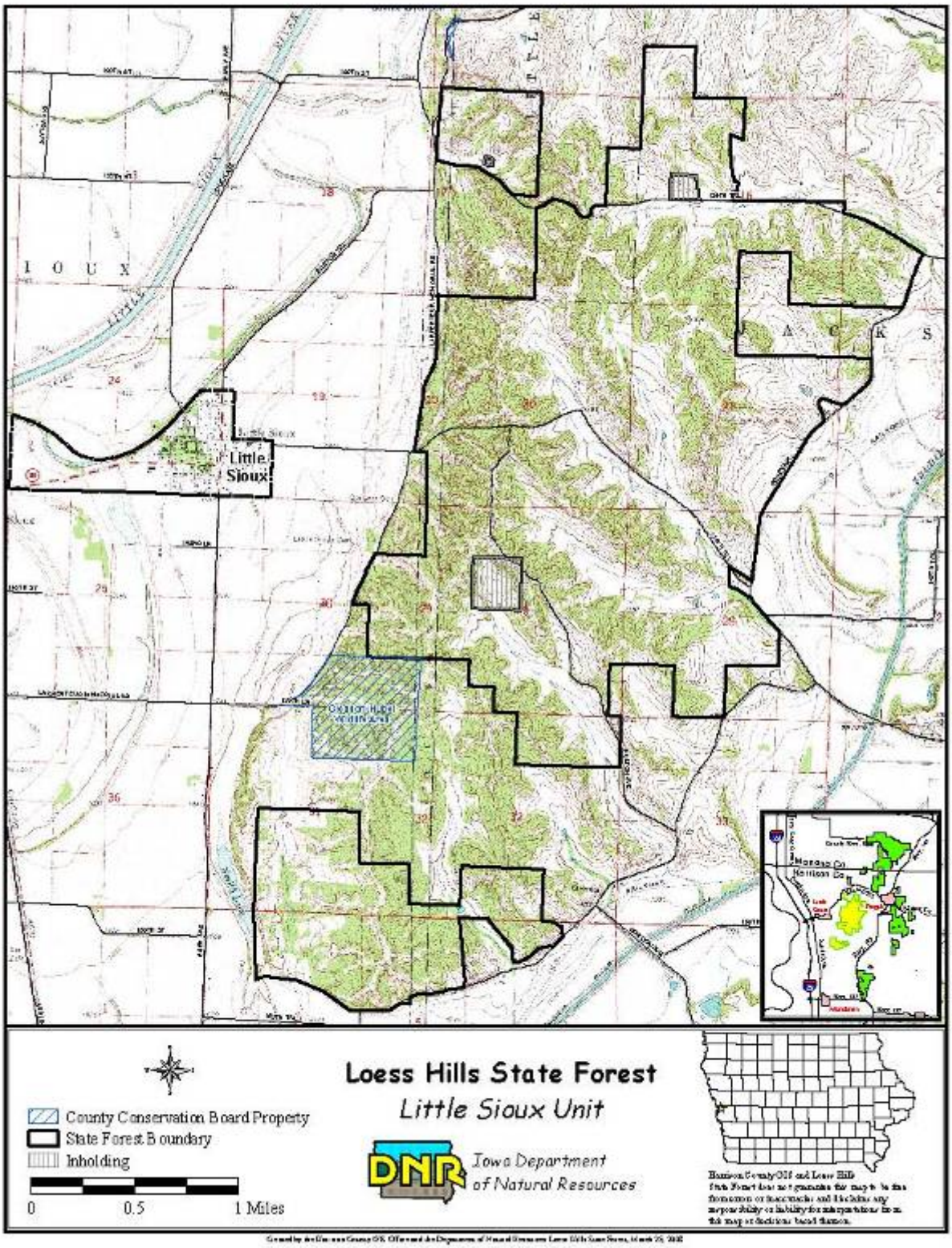
I O U X
J A C K S
Little Sioux
Loess Hills State Forest
Little Sioux Unit
Iowa Department of Natural Resources
County Conservation Board Property
State Forest Boundary
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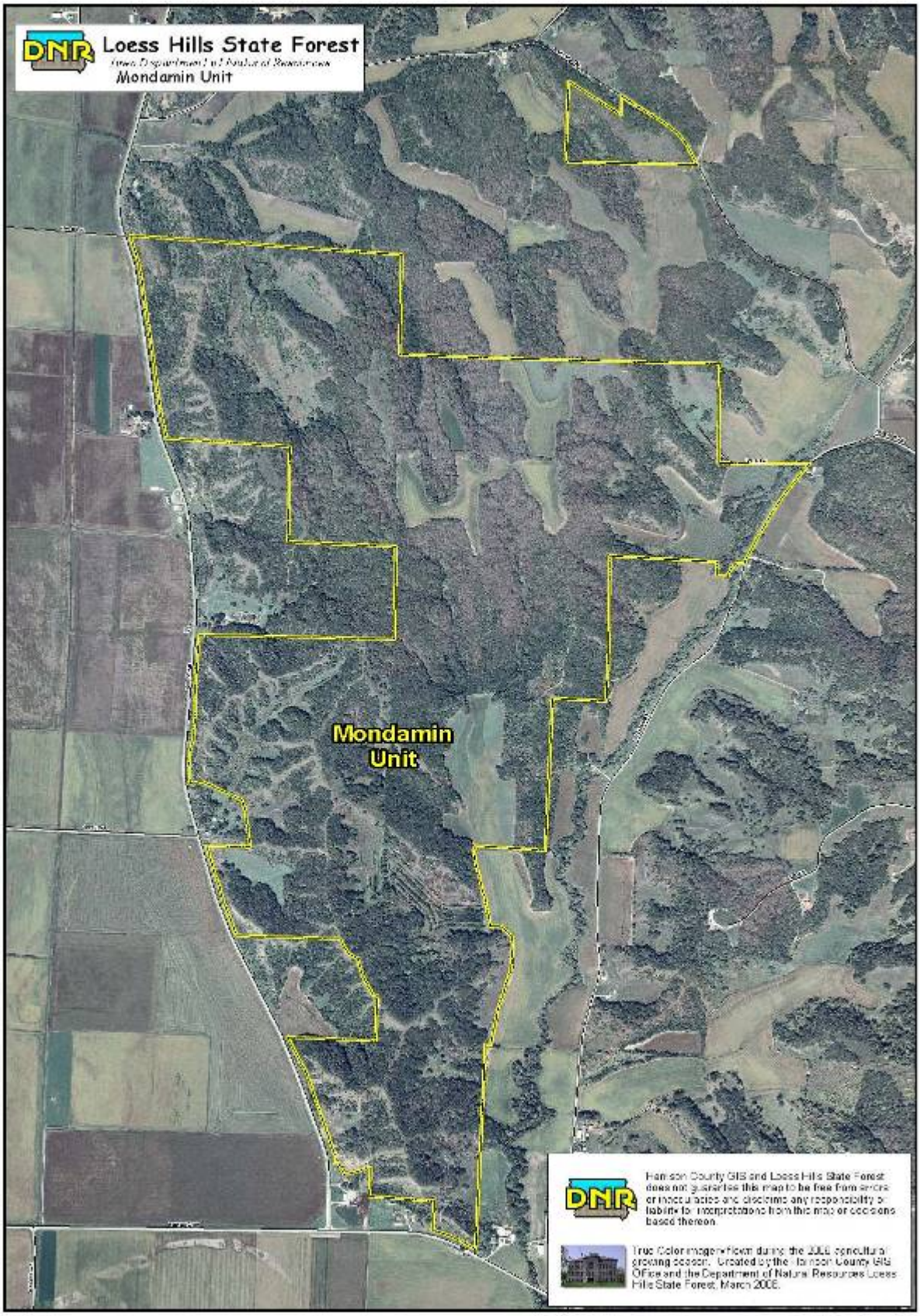
Loess Hills State Forest
Mondamin Unit
Mondamin
Unit
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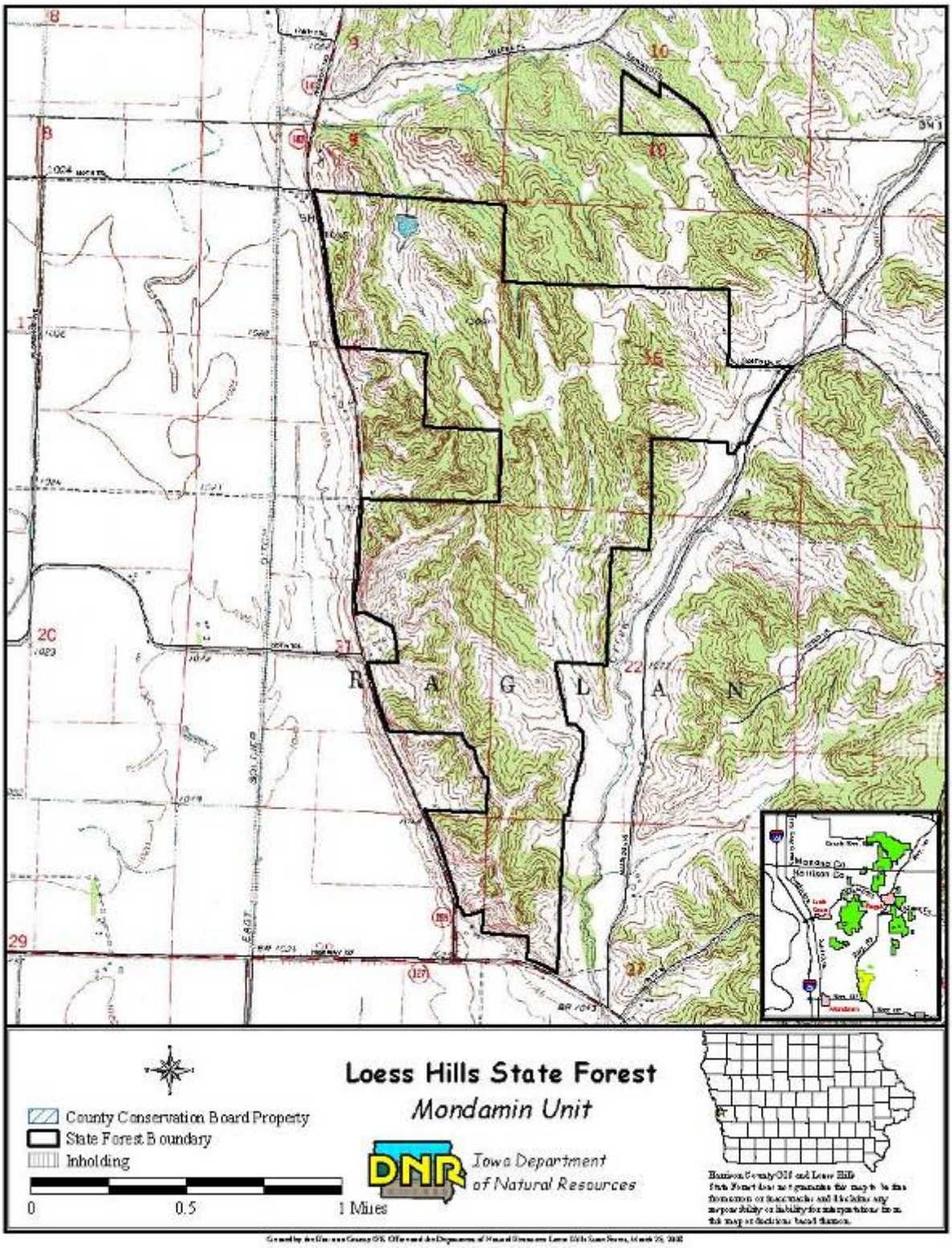
Loess Hills State Forest
Mondamin Unit
County Conservation Board Property
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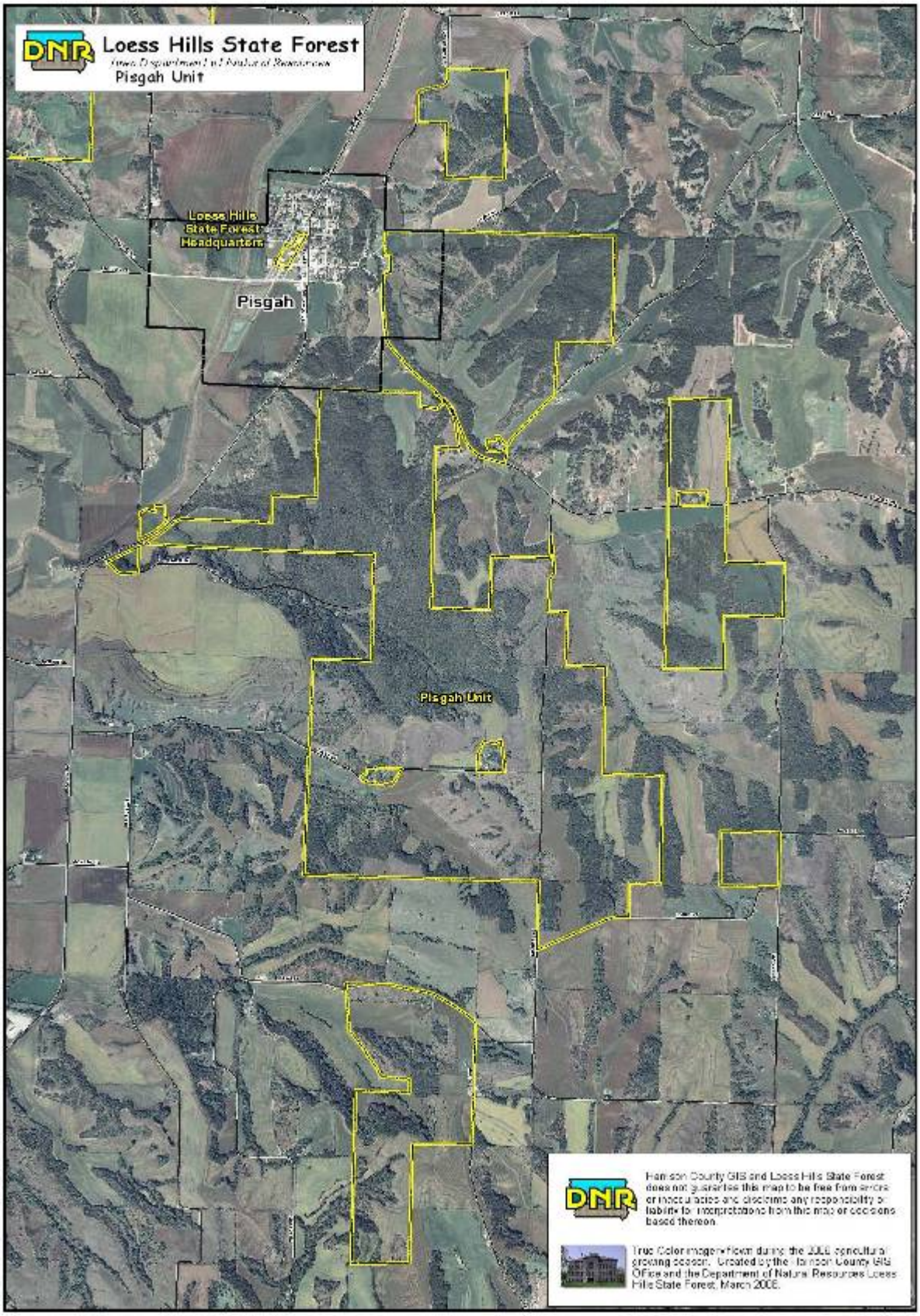
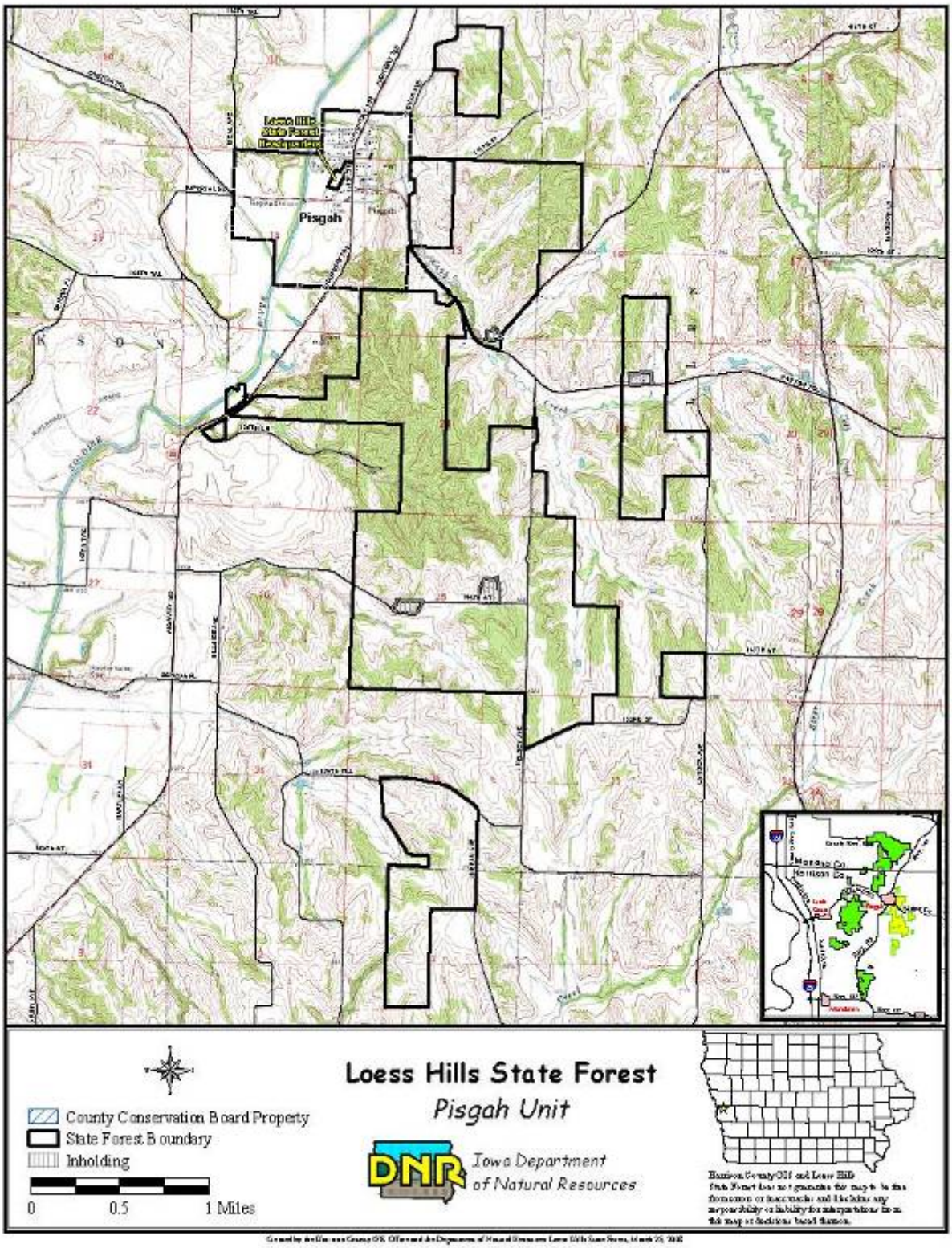

Loess Hills State Forest
Pisgah Unit
Loess Hills State Forest Headquarters
Pisgah
Pisgah Unit
Harrison County GIS and Loess Hills State Forest does not guarantee this map to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations from this map or decisions based thereon.
True Color imagery flown during the 2005 agricultural growing season. Created by the Harrison County GIS Office and the Department of Natural Resources Loess Hills State Forest, March 2006.


Loess Hills State Forest Headquarters
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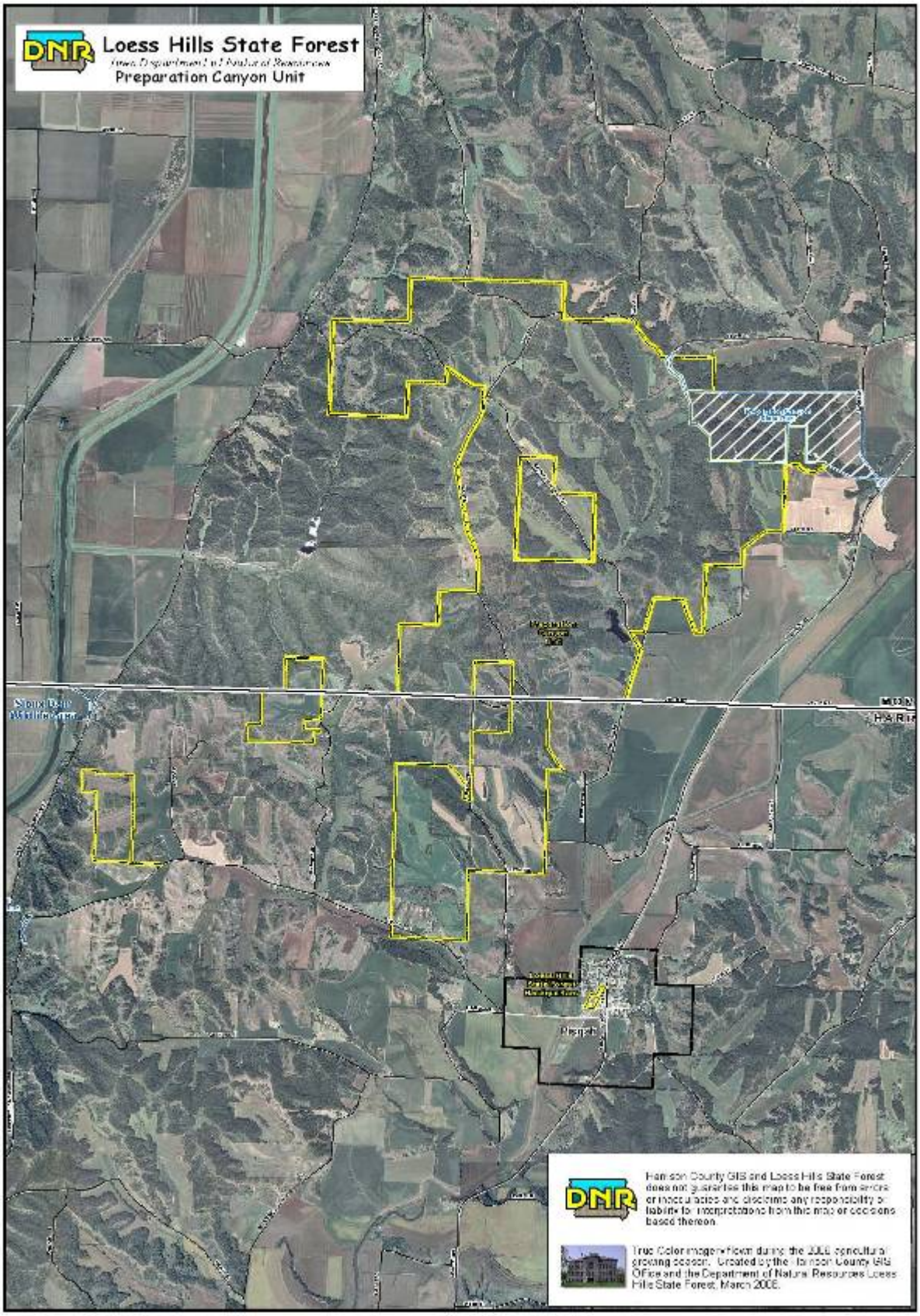
Loess Hills State Forest
Pisgah Unit
DNR
Iowa Department of Natural Resources


Loess Hills State Forest
Preparation Canyon Unit
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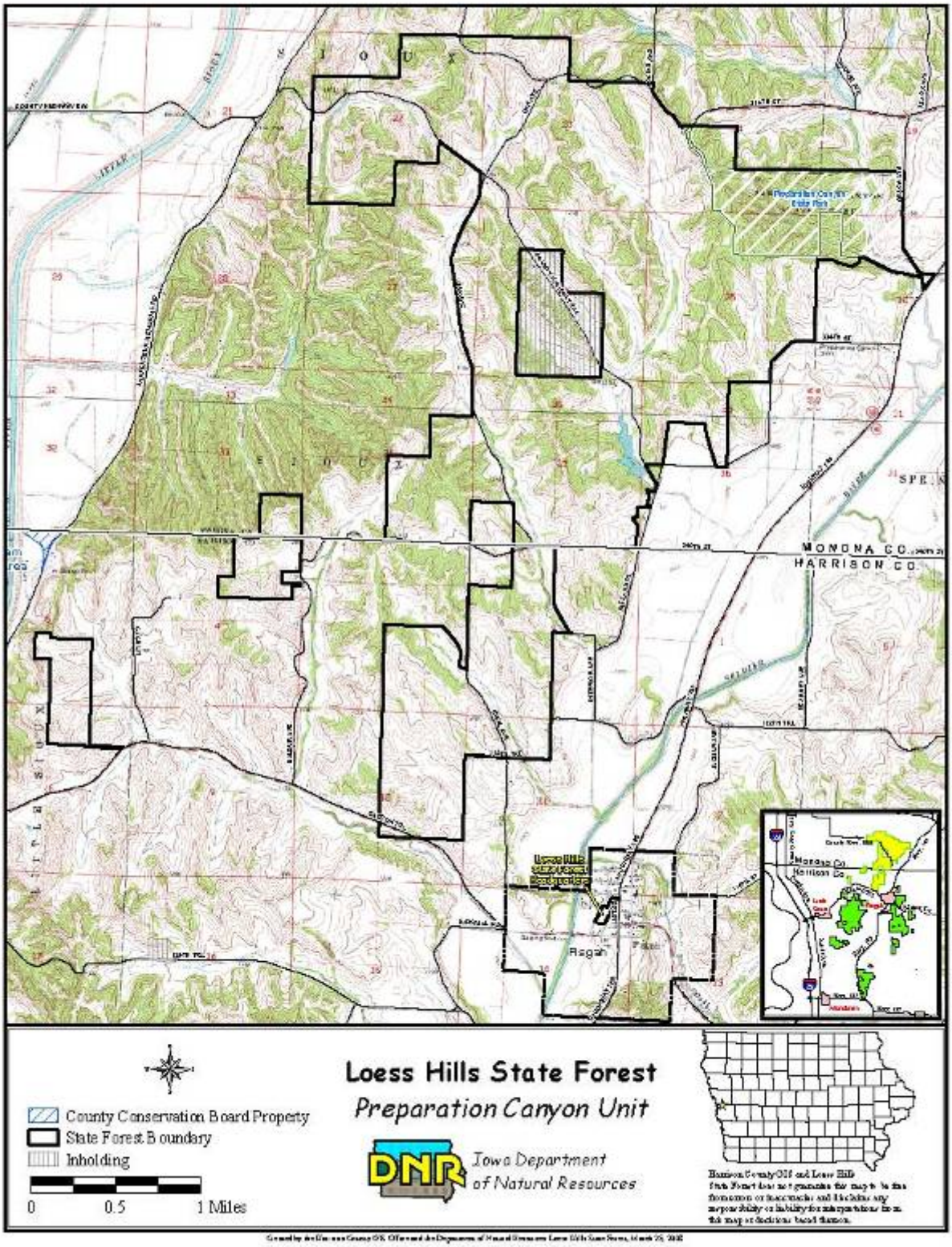

MONONA CO.
HARRISON CO.
Loess Hills State Forest
Preparation Canyon Unit
County Conservation Board Property
State Forest Boundary
Inholding
0
0.5
1 Miles
Iowa Department of Natural Resources

Forest Management Classes

Management Classes	Acres
Active Management	5,100
Limited Management	714
Non-Forest Management	5,800

Active Forest Management

Even- Aged Management

Even-aged management is essential to regenerate shade intolerant species such as oaks, walnut, and Kentucky coffee tree. Even-aged management areas are clear-cut harvested every 125 -200 years. Iowa is losing its oak woodlands. Even-aged management will establish young oak stands to replace the old oak trees that are dying. Even-aged management involves growing a stand of trees which are close to the same age. At some point in the stands life, the area is clear-cut which creates the even-aged structure. This creates excellent habitat for deer, turkey, and quail and is essential for regeneration of oak which require full sunlight. The only way that oak can be maintained as a component of the forest is by practicing some form of even-aged management. Regeneration using even-aged management involves clearcutting and planting, clearcutting with regeneration already established, or a shelterwood system to develop desirable seedlings on the ground.

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

Areas can also be clear-cut harvested and planted to regenerate oak. All merchantable trees would be sold. Following the harvest, all remaining undesirable trees over 1 inch in diameter would be felled. The stumps of ironwood, elm, and bitternut hickory should be treated with Tordon to prevent sprouting. The area should be planted with 30 oak and walnut seedlings per acre. Each seedling should be protected with a 4 ft. tall, tree shelter.

Clearcutting to create full sunlight is essential at some point in the stands life to successfully regenerate oak. If stands are not clear-cut, the oak component of the forest will be lost to shade tolerant species. Clear-cuts also provide additional early successional habitat in the early stages. The area is in the brushy stage for a very short period, normally 10-15 years. After that time, the trees will totally shade the ground, and the area becomes a pole sized (5-10” dia.) stand of trees.

Fire is a tool in managing oak stands that is currently being utilized throughout the forest to promote oak and set back invasives. Frequent burning of the leaf layer in the woods will kill thin-barked species such as hard maple, cherry, elm, bitternut hickory, and ironwood. Fire will expose mineral

soil and open up the ground to sunlight. These conditions favor the natural regeneration of oak. Oak seedlings will tolerate light fires. The top will be killed by the fire, but the deep root systems survive and sprout. Fire will be utilized on a limited scale to encourage oak regeneration in oak stands. Once a good number of oak seedlings are present, these stands will have to be clear-cut or the young oak will die from lack of sunlight.

Uneven- Aged Management

Uneven-aged management involves selective harvesting mature and damaged trees. These stands consist of basswood, elm, ash, hackberry, "wolf" oak, (large, poor formed, spreading crown oak), bitternut hickory and ironwood. The harvest is followed by removing undesirable species and damaged trees in the understory. Because there are always large trees present, only species that can survive in shade are regenerated. Uneven-aged management will result in a basswood-ironwood forest.

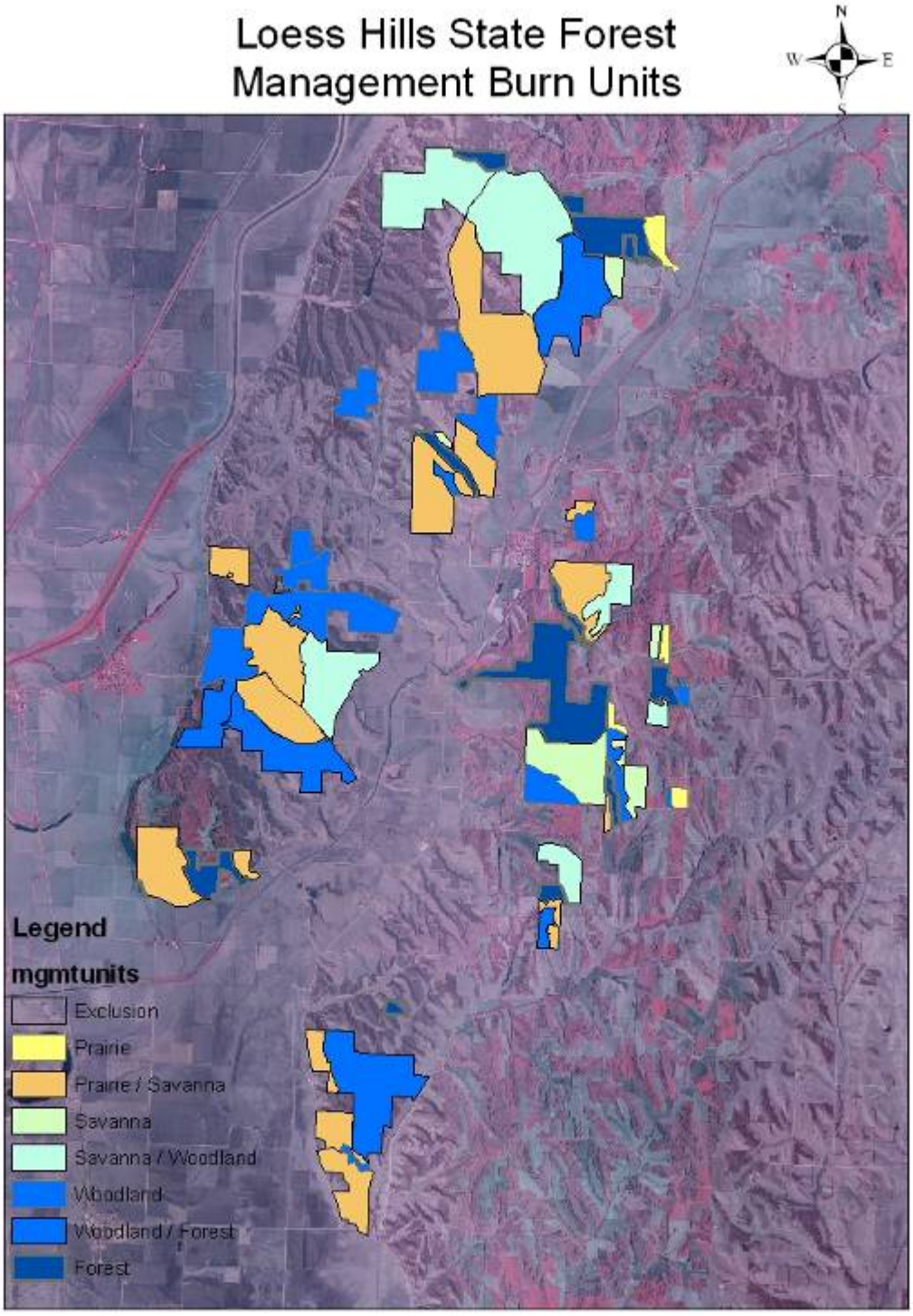
Uneven-aged management develops a stand of trees with all tree sizes represented. The stand structure is developed by selectively harvesting mature and defective trees, and removing unwanted small trees that are damaged or defective. Because uneven-aged stands always have large trees present, this system favors species that will grow in shade such as ironwood, hackberry and basswood. Uneven-aged management areas will provide continuous tracts of woodland with minimal disturbance. Forest stand improvement and selective harvesting will create woody debris on the forest floor for reptiles and amphibians.

Limited Forest Management

These areas are steep slopes, ridge tops, riparian areas, unique areas with historical or archaeological sites, and areas with endangered species. Viewshed areas will be left as is, with no active management Limited management areas are typically steep slopes and areas along streams which are fragile and are best left to naturally progress through succession. Areas where endangered plant or animal species exist, historical sites, and archaeological sites will also be under viewshed management. Management can take place on these areas where desirable, but the major objective is to have very minor disturbance if any. Some steep slopes will be under limited management.

Non-Forest Areas

Prairie Management



The forestry bureau of the DNR feels it is very important to manage and protect the native prairie remnants of the Loess Hills State Forest. It will concentrate its management efforts towards protecting and enhancing large contiguous tracts of native prairie and savanna throughout the state forest. The Loess Hills unusual ecological conditions support many rare plant and animal species. Many of these are considered threatened or endangered in Iowa. Fire is one of the tools that will be used to maintain the essential integrity of the prairie and savanna habitat. Fire keeps undesirable brush and trees form encroaching on prairies and enhances plant diversity through improved seedling generation. Fire will be used to provide numerous benefits, including brush and weed management, forage production, oak seedling regeneration, and improved wildlife habitat. Other tools that may be used to stop the invasive woody vegetation and weed species can be mowing, spaying, tree shearing, and the use of other new technologies as they come along.

In the Loess Hills State Forest, approximately 2500 acres of prairie and savanna are maintained through active management. These acres of prairies and savanna are among some of the most pristine areas left in the state. The habitat provided by these communities is host to many of the special and endangered plants found in the state.

The prairies and savannas of the LHSF provide productive butterfly and bird habitat. We have had two butterfly surveys completed, and an extensive bird survey conducted by the volunteers of the Loess Hills Audubon Society. Volunteers are continuously monitoring throughout the year for the different bird species using the region. This information will eventually be used to make a checklist for forest visitors to use while out and about in the Loess Hills.

One of the most important management tools we have is controlled fire. Without active fire management, woody vegetation and exotic species would eventually claim these important areas. Prairie and savanna management is not an exact science, so the staff at LHSF along with other agencies and volunteer groups have worked together to learn and improve management techniques.

Since 1990, LHSF has been applying prescribed fire to maintain the many acres of prairie. From 1990-1995, our three-person crew burned 400-720 acres a year, primarily on the ridge prairies. Since 1996, we expanded our burn units to encompass more of the native grass ridge prairies and added degraded savanna and woodland sites. During the period from 1996 to 2005 LHSF burned an average of 1520 acres per year, with peak of 2208 acres in 2004. On page 45, the map shows the burn units of the forest. Detailed plans of the units for upcoming years activities are on file in the Area Foresters office.

In addition to prescribed fire, we have planted prairies and cleared cedar on potential prairie sites. Volunteers have participated in cedar clearing days for the past ten years. About 212 acres of grassland prairie was seeded in the first ten years of the state forest. We have expanded our planting efforts in the last 6 years to include local ecotype collecting and seeding. Volunteers have been active in these activities. Forty-seven acres of abandoned farm ground has been seeded with diverse mixtures of 10- 35 species of locally collected seed. In a few more years we will be able to begin harvesting some of these seeded fields for use on sites on the Forest.

We have tried other techniques as well in managing these resources. These techniques include mowing sumacs and dogwoods, and spraying to control woody vegetation and non-native species. There have been successes and failures, but each attempt has increased our knowledge of prairie and savanna management in the region.

We have been continuously striving to restore, create and sustain large contiguous vegetation coverage in the region to give wildlife and people a great chance to observe these unique resources of the region. As the forest has increased in size through the purchase of properties from willing sellers, it has allowed us to enlarge our management schemes to cover more continuous acres of resources. By using REAP monies to make these purchases, the county does not lose tax income because the DNR continues to pay the taxes on these properties.

Many times the properties that we buy have been farmed hard for many years. We have discovered that after we purchase a piece of property, it is best to let the property sit idle for a year or two from use, to allow the vegetation to heal the property and make advances of its own. We then will put fire to the resource and are often amazed at the responses of the vegetation.

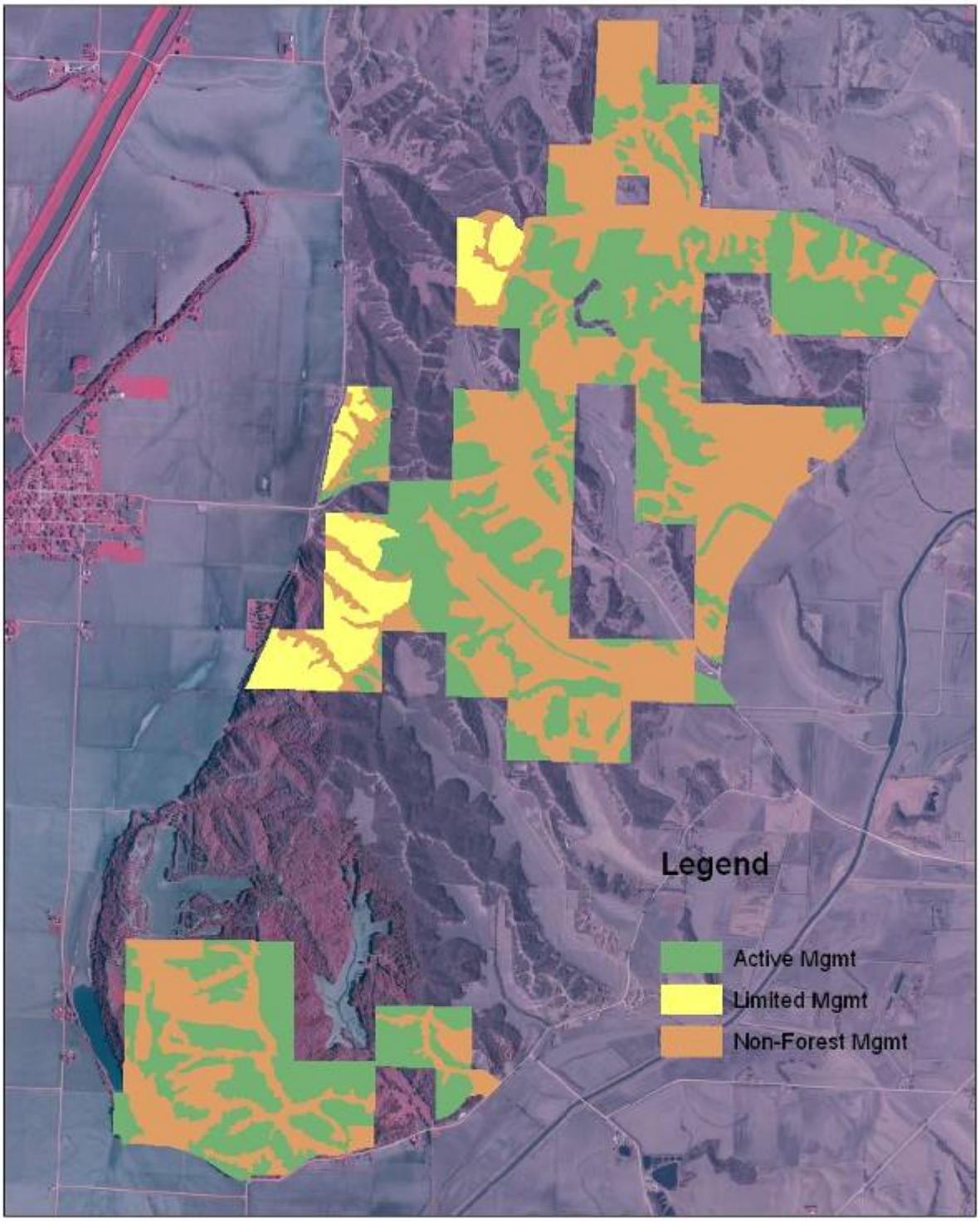
Agricultural Land

The Loess Hills State Forest maintains around 2000 acres of agricultural ground of the some 3700 acres we have purchased from willing sellers. We leave 15-20 % of the crops over winter for food plots for wildlife use. After the purchase of a property, the crop ground is evaluated by the Area Forester and NRCS, and a crop management plan is written for the property. We then decide to take out of production D, E, F, G, H slopes by putting them into permanent vegetation such as tree plantings, native prairie local ecotype seedings, alfalfa or other vegetations depending on the slope and aspect of the field. We cash rent out the crop ground for 5 year leases and usually have 10-15 different farm cooperators. A farm manager is hired to administer the leases of agricultural land.

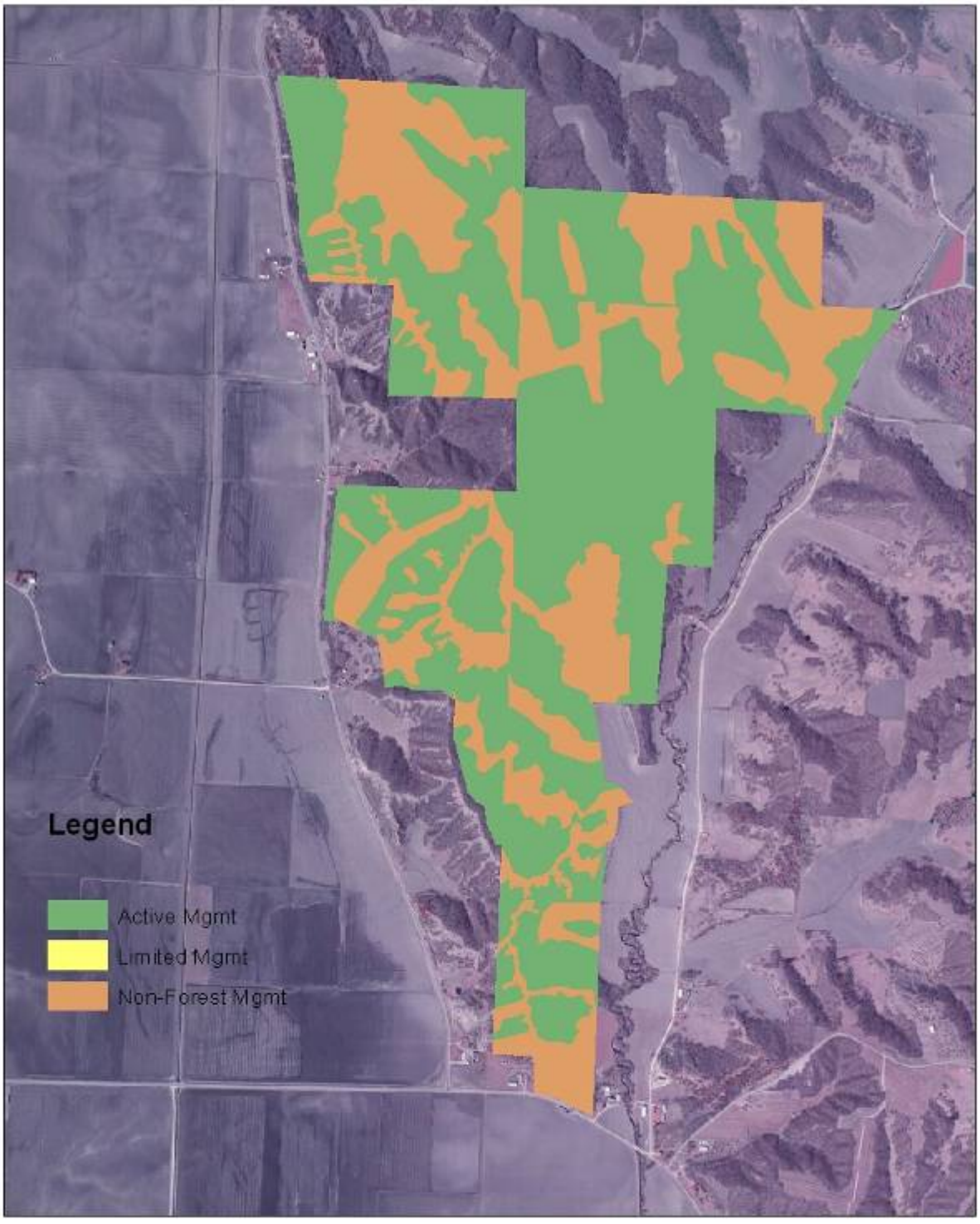
Savanna

We currently have one savanna management area in each of the four units. We have been doing different types of management techniques from mowing, thinning, burning, chemicals, grazing etc. to try and accomplish a sustainable savanna, which will benefit different wildlife species than just woodland and grassland species. These areas are demonstration areas to show the different techniques, what worked and what did not work.

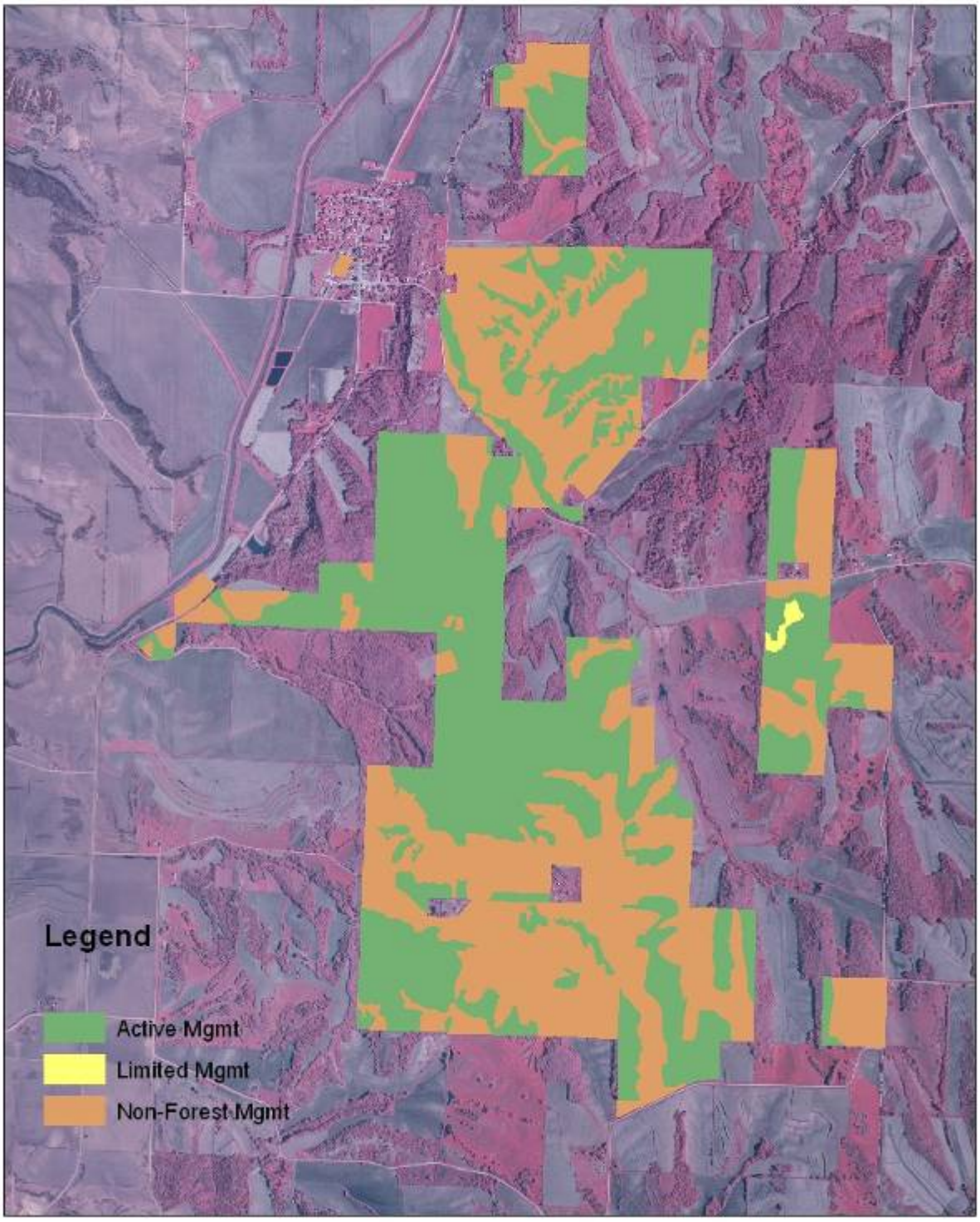
Little Sioux Unit
Management Classes



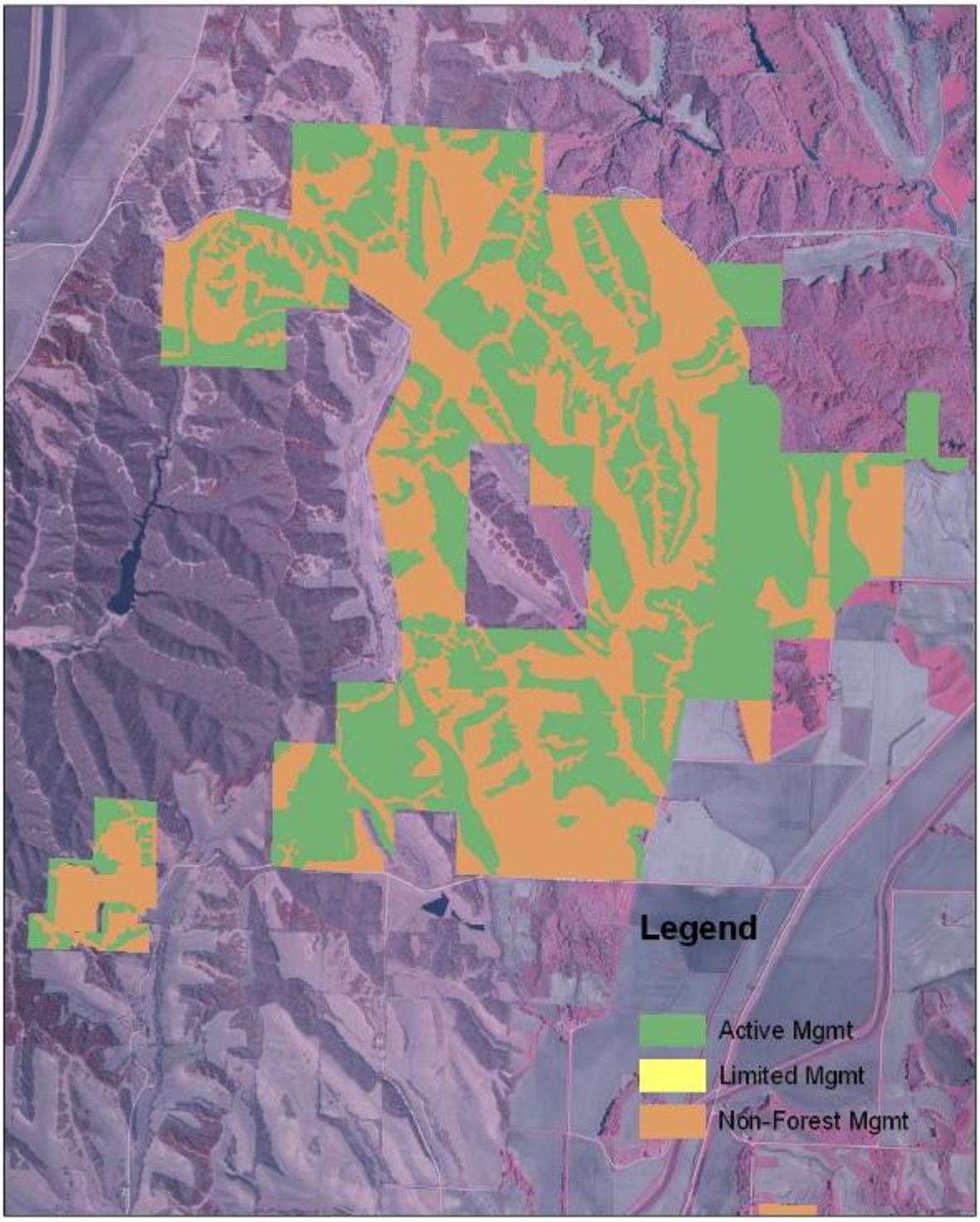
Mondamin Unit
Management Classes



Pisgah Unit
Management Classes



Preparation Canyon Unit
Management Classes



Management Options

The Loess Hills State Forest is managed in accordance with the IDNR Forest Ecosystem Management Guide for several uses including wood products, wildlife, quality water and recreation. Protection of soils, plant and animal communities is an important consideration when planning and carrying out activities on the forest. An active forest management program assures the health, sustenance and diversity of the forest resource.

Timber management practices of planting, harvesting and forest stand improvements are carried out for the purposes of assuring a healthy forest, a diverse forest and sustainable forest resources. One of the most important tools available for meeting these goals is by harvest and regeneration of stands. On state forests, harvests are conducted to intentionally create conditions needed for new oak forests to grow, to provide for a range of tree ages and sizes throughout the entire forest area, evenly distributed.

Harvest methods differ in the percentage of crown cover that is removed and are chosen to produce a future stand of trees that will result in a healthy, diverse and sustained forest. Even-aged harvest methods (clear cutting, shelterwood and seed tree) are used to regenerate species that are intolerant of shade such as oak and walnut. Uneven-aged harvest methods (single tree and small group selection) are used to regenerate shade tolerant species like basswood, hickory or maple. Harvests assure forest health by replacing trees that are declining in health with a young vigorous stand of growing trees. Harvests assure sustainability in the sense that without major disturbances on a regular basis, shade intolerant species would cease to exist in the forest setting on many sites. Forest harvesting can be used to accomplish more than forest health, diversity and sustainability. Forest harvest also contributes to: improved aesthetic qualities, better wildlife habitat, carbon storage, and production of clean water.

Not all forest management activities are aimed at regenerating the forest stand. Some harvest activities may be carried out for the purpose of thinning a stand, removing injured or diseased trees or salvaging high value trees. Forest management is carried out according to the ecosystem management guidelines book.

The sustainable harvest volume for the Loess Hills State Forest will be 5,000 to 20,000 bd.ft. / year. These areas will be harvested to maintain the health of the stands, regenerate good potential growing sites that have been high graded from the past uses, and protect watersheds. The state forest will also do forest stand improvement on 15-100 acres per year.

The prescriptions for the stands can be updated and or changed before implementation. When each prescription is developed, consideration will be given to its impact on the entire forest. The prescriptions for the forest stands can be found in Appendix A. The concept of how one action causes a reaction within the forest system is monitored to sustain the ecological health of the landscape. In order to maximize opportunities for the flora and fauna of the forest, as well as mankind, a goal of the Bureau of Forestry is to enhance and maintain biodiversity, and health of the resources. The goal is also to maintain varying populations distributed throughout a range of conditions.

These prescribed treatments can be grouped into either harvest and regeneration practices or FSI practices. Generally, these treatments can fulfill both purposes. Reproduction treatments are divided into even-aged or uneven-aged. An even-aged stand is one where the difference between the oldest and the youngest trees in the stand is no more than 20% of the length of the rotation. The rotation age of a forest stand is the time from establishment to a specified harvest age (biological or economical). If a condition other that the above exists, the stand is considered uneven-aged.

Demonstrations of forestry in on all areas of the forest which have been given silvicultural treatments serve as tools for educating the general public and others in the practice of forestry. New management techniques and forestry practices are developed and tested as part of the Forestry Bureau's objectives.

In the process of fulfilling management goals, prescriptions have been developed for 12,000 acres. Each prescribed treatment will be the result of an evaluation of the unit in its present condition, the desired future condition, and the practices best suited to attain the desired goals.

Land Cover Management Descriptions

Prairie Prairie is the presence of native remnants or locally planted ecotype seedlings, with a 1-5 year burn rotation. The areas will be remnant ridges and south facing exposures.

Prairie / Savanna This is the presence of some areas which have native remnants or seedlings, with scattering of trees throughout the area and mostly south facing aspects, with a 3 -7 year burn rotation.

Savanna Generally a grassland with a scattering of trees or shrubs, west to southeast aspect exposures, with a 3-7 year burn rotation. Generally more tree areas than open grassland.

Savanna / Woodland Is mainly woodland having an undergrowth mainly of grasses, the trees being of moderate height with a 3-9 year burn rotation.

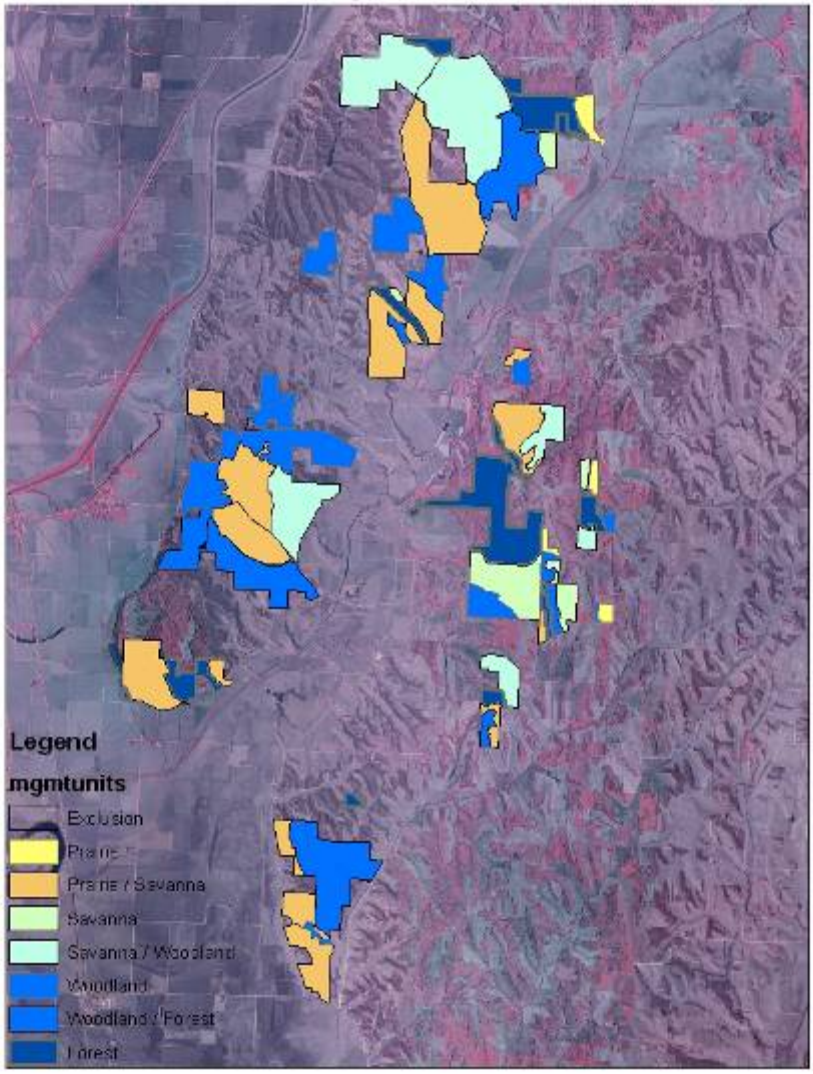
Woodland Is a plant community in which, in contrast to a forest, the trees are often small, characteristically short-boled relative to their crown depth, and forming only an open canopy with intervening area being occupied by lower vegetation, shade tolerant and pioneer species of trees and shrubs. The slope aspects are generally west to north to east, with a burn rotation of 5-9 years.

Woodland / Forest This is generally a plant community that will have periodical burns from 7-15 years to reduce fuel loads and to work on invasives if needed. It will generally sit facing west to north to east facing slopes. It is less dense than a forest and has some openings throughout the area.

Forest Is an ecosystem characterized by a more or less dense and extensive tree cover, often consisting of stands varying in characteristics such as species composition, structure, age class, and associated processes. These areas will generally be located on the northwest to east facing slopes that will be a generally richer soil, with minerals and moisture and will have many shade tolerant species. These areas will be managed to have the least amount of forest fragmentation in them, and may have an occasional fire for fuel load reduction every 10-25 years.

MANAGEMENT	ACRES
Exclusion	14.20
Forest	1533.20
Prairie	174.50
Prairie / Savanna	3238.10
Savanna	608.10
Savanna / Woodland	2204.20
Woodland	1776.50
Woodland / Forest	1762.30

Loess Hills State Forest
Management Units



Coverage Types of the Current Vegetation Cover

14%	Prairie	Native remnants and seedings
14%	Savanna	Oak, walnut, and elm trees with grassland understory
8%	Limited Management	Mature/ old growth, scenic, erosive
2%	Riparian	Protection areas along streams and creeks
14%	Agriculture	Farm rental ground for wildlife
13%	Uneven Aged	Uneven- aged management on woodlands and forests (i.e.: single tree selection, high value)
35%	Even Aged	Even-aged management on Woodlands and Forests (i.e.: group selection, clear-cuts, shelterwood, and fsi)

Total Acres by Type of Cover

Cover Types	ACRES
Agriculture	1939.10
Open Grass Area	791.10
Native Grass Plantings	129.60
Native Prairies	1426.10
Tree Planting	427.70
Water	20.00
Building and Lots	2.60
Eastern Red cedar	134.10
Eastern Red cedar/ Hardwoods	242.40
Black Oak / Hickory	4.90
Bur Oak	1934.90
Black Locust	4.80
Hackberry/ Elm/ Ash	360.60
Oak / Elm / Ash	831.10
Elm / Ash / Cottonwood	328.10
Oak Basswood	278.80
Sycamore/ Pecan/ Elm	50.00
Willow	2.20
Bottomland MH / Walnut	28.50
Basswood/ Ironwood	50.60
Poplar	2.10
Black Walnut	108.50

Allowable Sustainable Harvest

Board Foot Volume by Tree Species

TIMBER	Volume (bd.ft.)	ACRES
Tree Planting		427.70
Eastern Red cedar	51,000	134.10
Eastern Red cedar/ Hardwoods	87,900	242.40
Black Oak / Hickory	1,800	4.90
Bur Oak	501,810	1934.90
Black Locust	2,400	4.80
Hackberry/ Elm/ Ash	176,100	360.60
Oak / Elm / Ash	242,100	831.10
Elm / Ash / Cottonwood	123,300	328.10
Oak Basswood	50,550	278.80
Sycamore/ Pecan/ Elm	21,300	50.00
Willow	2,100	2.20
Bottomland MH / Walnut	8,700	28.50
Basswood/ Ironwood	13,200	50.60
Poplar	2,700	2.10
Black Walnut	58,200	108.50
Totals	**1,343,160.00**	**4789.30**

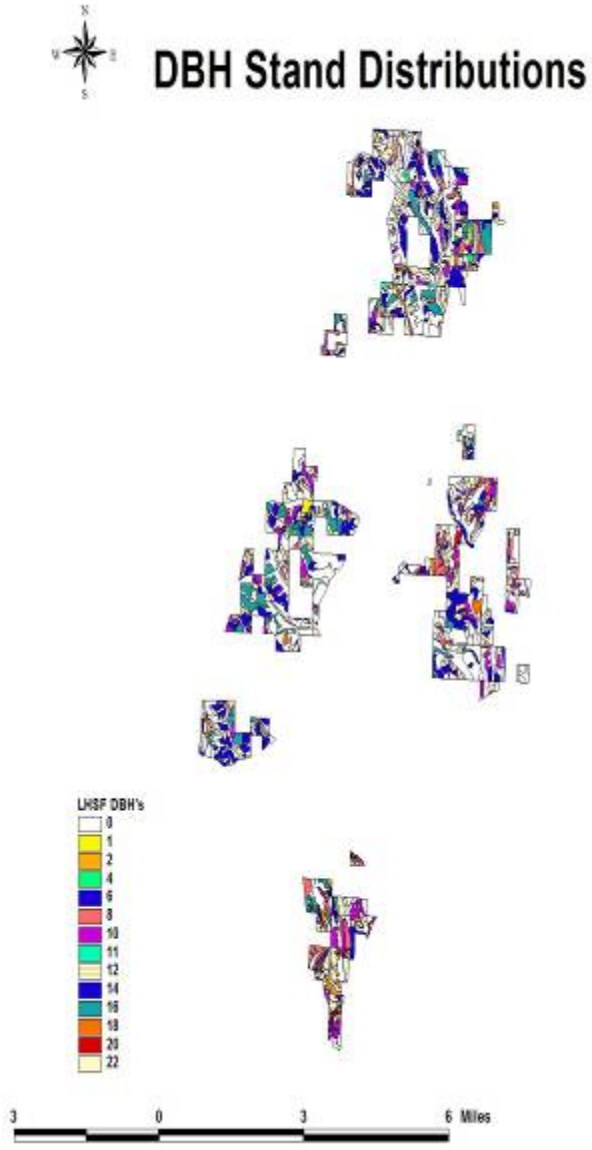
Annual Harvest Goals

By using the above information: The following table shows allowable cut/10 year period

If you take 4,789.3 acres and divide all acres by a 200 year rotation, it would equal 24 acres/year. But not all areas will have a rotation age of 200 so the table below shows the breakdown.

Unit	Management	Rotation Age	Acres/ 10 years
Pisgah	Successional	75	26
	Uneven Age		15
	Even Age	200	15
Little Sioux	Successional	75	34
	Uneven Age		15
	Even Age	200	16
Mondamin	Uneven Age		25
	Even Age	200	15
Preparation Canyon	Successional	75	33
	Uneven Age		25
	Even Age	200	30
Total			249/ 10 years

The Bur Oak species has a annual growth of 1/8" to 1/3". The walnut grows at ¼ to ½ inch, and the majority of the other species have growths of ¼ -3/4" per year.



Diameter Distribution

DBH	Acres
1	43.0
2	52.0
4	46.0
6	166.0
8	437.0
10	636.0
11	700.0
12	1054.0
14	1046.0
16	626.0
18	103.0
20	300.0
22	150.0

Age Class Distribution

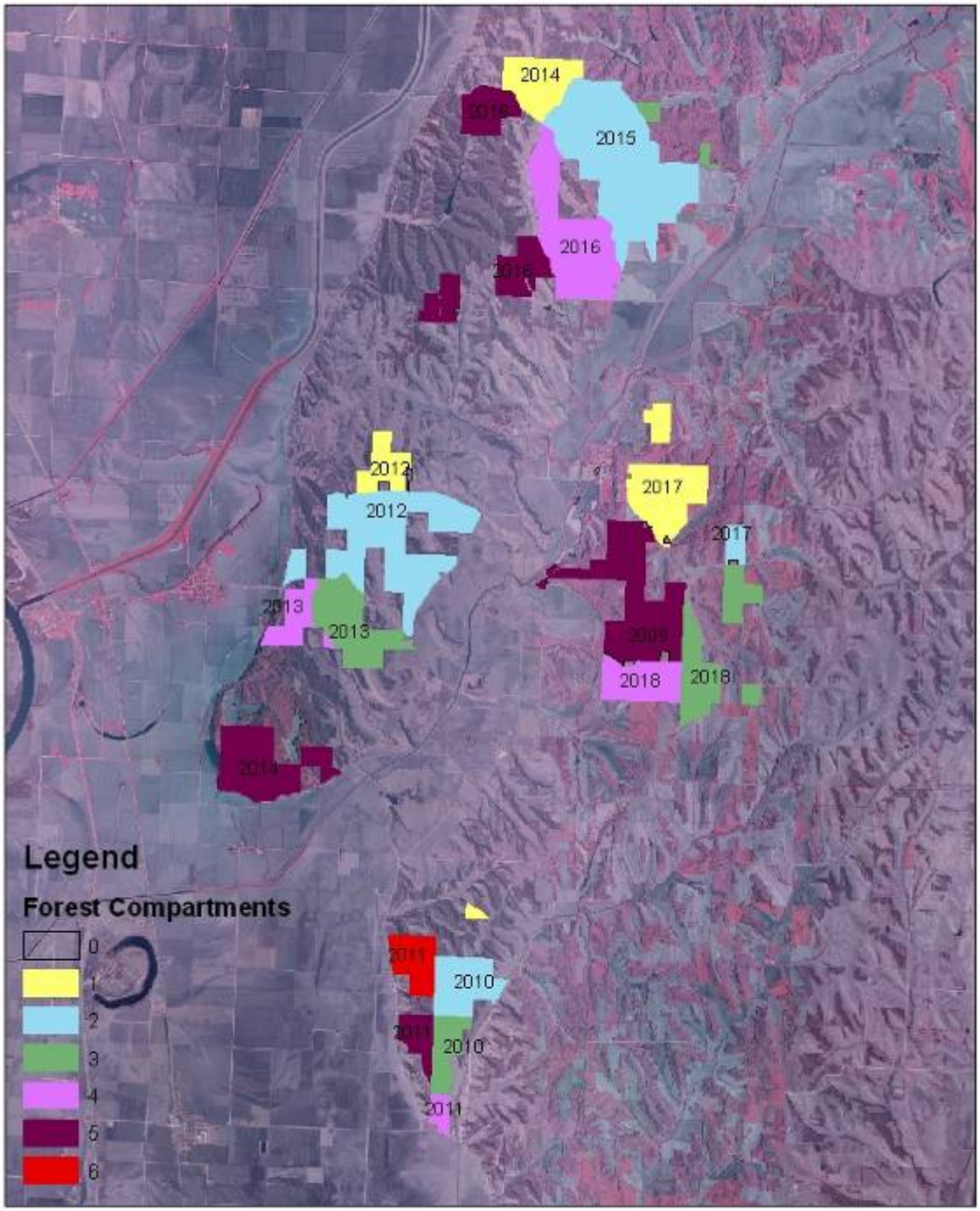
Year of Origin	ACRES
1880	142.6
1890	6.2
1895	2.4
1900	3248.3
1905	28.1
1910	55.7
1920	60.2
1925	5.8
1930	103.5
1940	32.5
1950	1.6
1955	2118.2
1988	19.2
1989	42.9
1990	67.1
1991	19.7
1992	36.6
1993	102.9
1994	56.7
1995	53.5
1996	15.1
1997	53.8

Appendices

Appendix A

Forest Work Plan

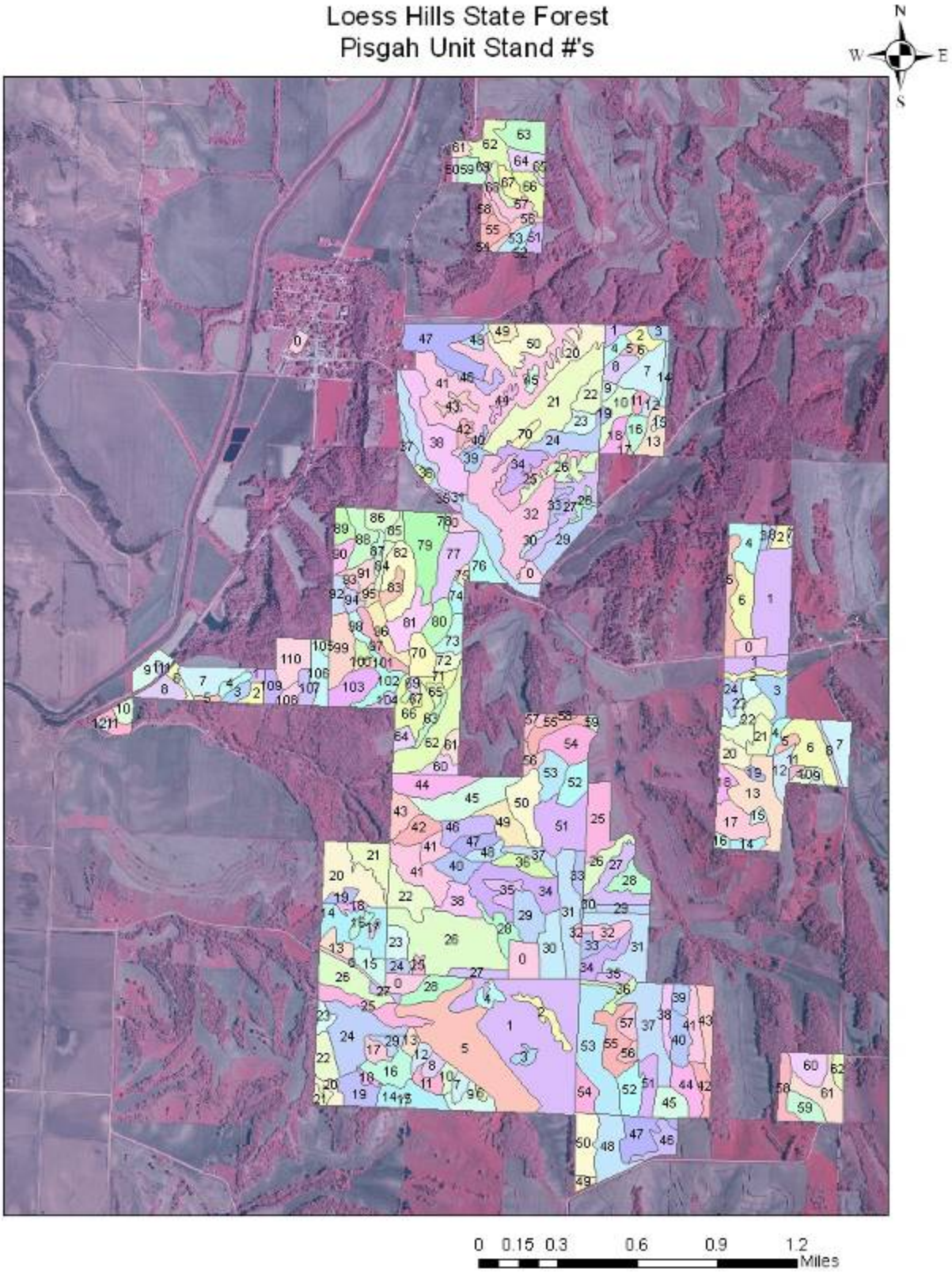
Loess Hills State Forest
Cultural Practices
Compartment Schedule



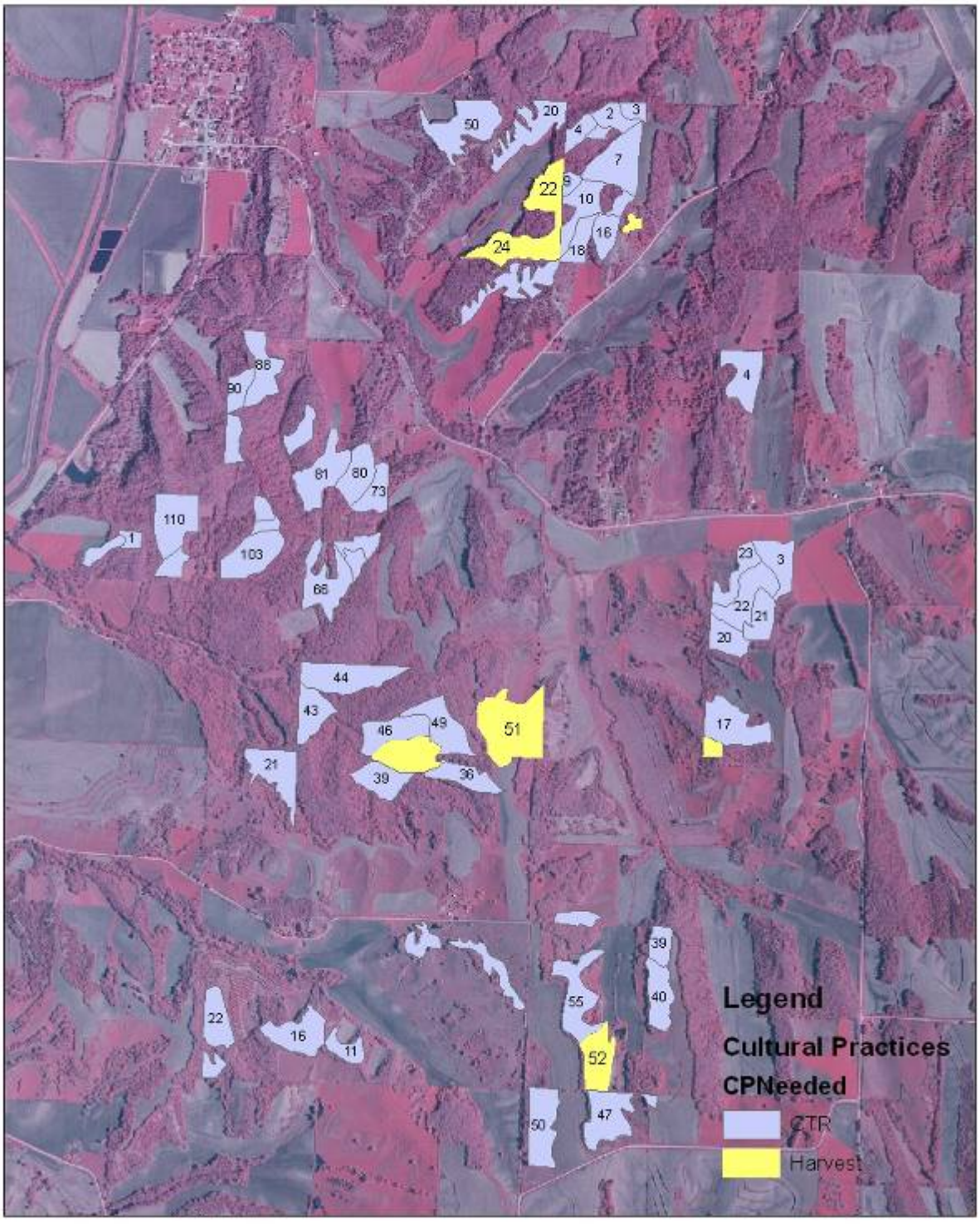
Work Plan Summary for Loess Hills State Forest

Fiscal Year	FOREST ACRES	CULTURAL PRACTICES UNITS AND COMPARTMENTS	Cultural Practices Needed Acres (CTR,FSI)	Stand #'s	Cost of Practices	Harvest Acres	Stand #'s	Est. $
2007	287	P 1, P 2	111	2,3,4,5,7,9,10,12,16,18,20,26,50,68,2-4	$16,650	20	6,11	$4,400
2008	335	P 3, P 4	133	3,17,20,21,22,23,35,39,40,47,50,55,4-2,4,11,16,21,22	$19,950	15	16,52	$8,900
2009	592	P 5, M 1	182	1,4,21,36,39,43,44,46,49,65,66,71,73,80,81,83,88,90,92, 100,101,103,108,110, 1 -2,4	$27,300	24	47,48,51	$6,200
2010	358	M 2, M 3	196	5,9,10,13,14,15,16,17,21,22, 3 -4,6,10,18	$29,400	24	12,17	$5,600
2011	263	M 4, M 5, M 6	123	2,3,4,5,8,5-1,9,10,13,16,18,21,6-13,15	$18,450	24	6,8,9,10	$5,200
2012	604	LS 1, LS2	93	2,13, 2-10,12,24,35,37,43,46,47,64,72,75,110	$13,950	24	62,65,67	$7,100
2013	342	LS 3, LS 4	43	1,18, 4-13,20,22	$6,450	24	6,10	$4,600
2014	446	LS 5, PC 1	91	8,15,17,20,22,32, 1-7,8,26	$13,650	24	9,10	$6,400
2015	845	PC 2, PC 3	179	1,4,6,11,12,13,14,15,16,20,21,61,95,97,99,108,110,139, 3-5,8,10	$26,850	24	17,26	$9,400
2016	668	PC 4, PC 5	99	22,23,24,60, 5-4,8,22,25,3637,42,43,50,52	$14,850	24	7,10,14	$7,600
2017	287	P 1, P 2	111	2,3,4,5,7,9,10,12,16,18,20,26,50,68,2-4	$16,650	24	15,22,24,67	$4,900
2018	335	P 3, P 4	133	3,17,20,21,22,23,35,39,40,47,50,55,4-2,4,11,16,21,22	$19,950	24	40,41	$6,100
2019	592	P 5, M 1	182	1,4,21,36,39,43,44,46,49,65,66,71,73,80,81,83,88,90,92, 100,101,103,108,110, 1 -2,4	$27,300	24	2,3,38	$7,200
2020	358	M 2, M 3	196	5,9,10,13,14,15,16,17,21,22, 3 -4,6,10,18	$29,400	24	1,20	$5,900
2021	263	M 4, M 5, M 6	123	2,3,4,5,8,5-1,9,10,13,16,18,21,6-13,15	$18,450	24	16,18,20	$6,100
2022	604	LS 1, LS2	93	2,13, 2-10,12,24,35,37,43,46,47,64,72,75,110	$13,950	24		$5,800
2023	342	LS 3, LS 4	43	1,18, 4-13,20,22	$6,450	24	3-30,4-9,12	$8,200
2024	446	LS 5, PC 1	91	8,15,17,20,22,32, 1-7,8,26	$13,650	24	5-14,18,24	$6,400
2025	845	PC 2, PC 3	179	1,4,6,11,12,13,14,15,16,20,21,61,95,97,99,108,110,139,3-5,8,10	$26,850	24	77,88	$8,100
2026	668	PC 4, PC 5	99	22,23,24,60, 5-4,8,22,25,3637,42,43,50,52	$14,850	24	16,17,18	$9,400
2027	287	P 1, P 2	111	2,3,4,5,7,9,10,12,16,18,20,26,50,68,2-4	$16,650	24	65,66	$7,600
2028	335	P 3, P 4	133	3,17,20,21,22,23,35,39,40,47,50,55,4-2,4,11,16,21,22	$19,950	24	47,48,51	$7,400
2029	592	P 5, M 1	182	1,4,21,36,39,43,44,46,49,65,66,71,73,80,81,83,88,90,92, 100,101,103,108,110, 1 -2,4	$27,300	24	60,77	$5,400
2030	358	M 2, M 3	196	5,9,10,13,14,15,16,17,21,22, 3 -4,6,10,18	$29,400	24	2-20,17	$6,800
2031	263	M 4, M 5, M 6	123	2,3,4,5,8,5-1,9,10,13,16,18,21,6-13,15	$18,450	24	9,10,12	$7,100

Loess Hills State Forest
Pisgah Unit Stand #'s



Pisgah Unit Cultural Practices for 2007-2009



Pisgah Unit Management Prescriptions

Pisgah Unit Compartment 1, Stand 2,3,4,5,7,9,10,12,16,18,20,26,50, and 68: 100 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2017 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Pisgah Unit, Compartment 1, Stands 6,11,15,22,24,51,65,66,: 76 acres

Site Description -

Northwest to east facing slopes and valleys

Woodland Description –

Medium Sawtimber (14"-20" dia.) bur oak and black walnut species. These stands will be grown out to rotation age and diameters larger than 22". The understory is elm, hackberry, and a few hard maple. The understory is brushy with prickly ash, gooseberry, raspberry, and hazelnut. The east side of the area has pockets of oak wilt.

Management Recommendations – Even Age

This area will be clear-cut to regenerate oak. Following the harvest, all remaining trees 1 inch and larger in diameter should be felled. Treat the stumps of aspen, elm, and ironwood with

Pathfinder II to prevent sprouting. Plant the area with 30 large oak seedlings per acre. Protect each tree with a 4 ft. tall, vented tree shelter.

These two small areas could be planted to reduce fragmentation in this large block of woods. Plant the areas with red oak, bur oak, and white oak. Plant the areas with large oak seedlings. Planting large stock is essential for the trees to compete with the competition and grow above deer browsing height. The trees should be a minimum of 18-24" in height and 3/8" in caliper.

Deer and rabbits will heavily browse oak seedlings. It is nearly impossible to establish oak without protection. You can protect the seedlings with a 4 ft. tall, vented, plastic shelter. Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Pisgah Unit, Compartment 1,Stand 67: 4 acres

Site Description -

Stand 67

Woodland Description –

Large sized (22" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to regenerate oak. Areas can be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter. The stand will be clear-cut harvest in 2017. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species will be treated with Pathfinder II to prevent sprouting. Plant the area with oak and walnut seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Pisgah Unit, Compartment 1, Stand 1.8.23.28,30,31,34,39,40,42,43,44,45,46,48,54,58,64: 86 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species. Benefits such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule.

Pisgah Unit, Compartment 1, Stand 33,53,55,57,61 24 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar if needed. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

Pisgah Unit, Compartment 2, Stand 4 11 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in the next rotation of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

Locate your good quality trees. Do not waste your time and money on poor quality trees. If there are no high quality trees present on an area, go on to an area with good trees. You can not create high quality trees. Either they are present or not. Be selective and work with only your best trees.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Pisgah Unit, Compartment 2, Stand 5 7 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations even-aged

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar if needed. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

Pisgah Unit, Compartment 2, Stand 6 11 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species. Benefits such as stem density, food and den shelters. In 10-20 years, some of these stands will be selectively harvested during the compartment cultural practices schedule.

Pisgah Unit, Compartment 3, Stand 3,17,20,21,22,23,35,39,40,47,50,55 105 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in the next rotation of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Pisgah Unit, Compartment 3, Stand 2,4,12,14,15,19,26,28,30,32,36,43,45 65 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi-open and have a native grass component within and around these areas.

Management Recommendations – successional

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species. Benefits such as stem density, food and den shelters. In 10-20 years, some of these stand will be selectively harvested during the compartment cultural practices schedule

Pisgah Unit, Compartment 3, Stand 5,9,10, 6 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar if needed. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

Pisgah Unit, Compartment 3, Stand 16,52 11 acres

Site Description -

Stand 16,52

Woodland Description –

Large sized (14" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Pisgah Unit, Compartment 4, Stand 2,4,11,16,21,22 28 acres

Site Description -

Stand 16,52

Woodland Description –

Large sized (14" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Pisgah Unit, Compartment 4, Stand 3,10,13,15,17,19,23,25 41 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule.

Pisgah Unit, Compartment 4, Stand 9, 12 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in the next rotation of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Pisgah Unit, Compartment 5, Stands
1,4,21,36,39,43,44,46,49,65,66,71,73,80,81,83,88,90,92,100,101,103,108,110 171 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in the next rotation of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be

selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Pisgah Unit, Compartment 5, Stands 2,3,38,40,41,47,48,51,53,60,77,104,106 86 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Pisgah Unit, Compartment 5,
Stands
5,6,11,15,16,17,18,24,25,33,34,42,45,56,57,58,59,61,62,63,72,82,87,89,91,93,94,95,96,98,99, 102,109 196 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – succesional

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule

Pisgah Unit, Compartment 5, Stands 75 2 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar if needed. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

PISGAH UNIT SUSTAINABLE FORESTRY GUIDELINES

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

Successional Management -

The successional areas will be managed on a 75 year rotation. There are 39 acres designated for successional management. The allowable cut is .52 acres per year (39 acres divided by 75 yrs.). With a working cycle of 10 years, approximately **5.2 acres could be cut every 10 years**.

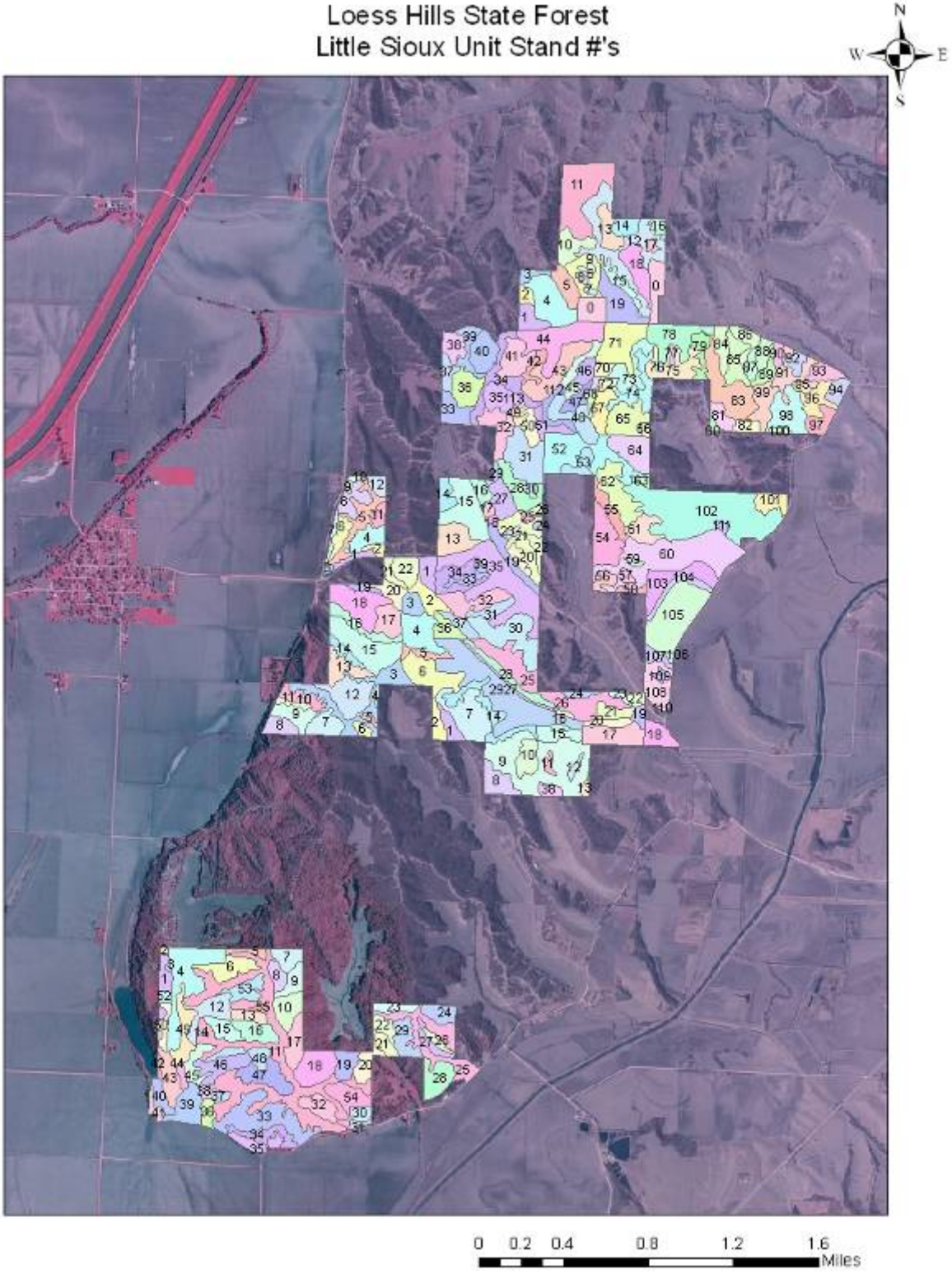
Even Age Management Area –

There are 605 acres under even age management. Dividing 605 acres by 200 years yields an allowable cut of 3.025 acres per year, or **30 acres every 10 years**.

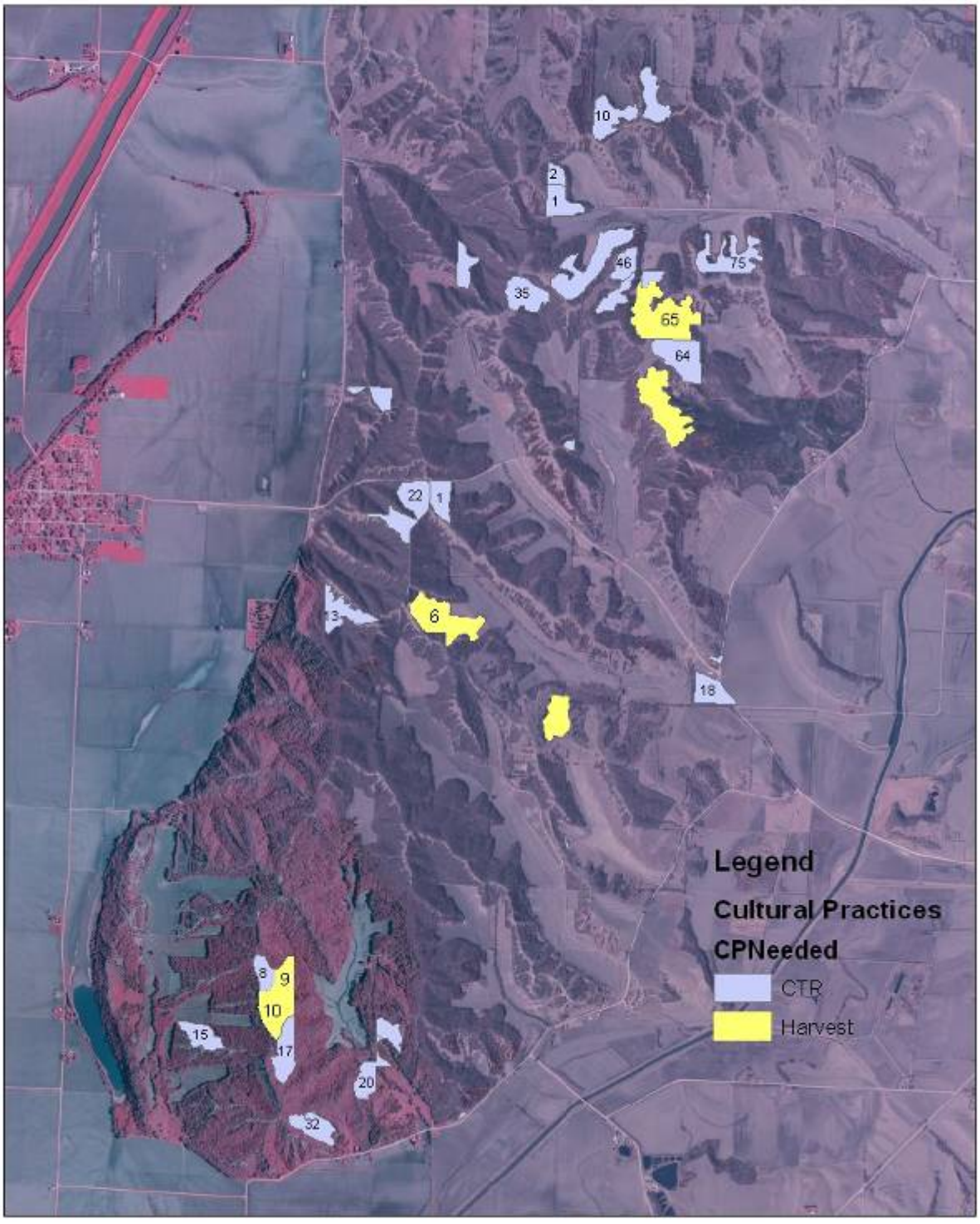
Uneven Age Management Area –

Stands can be selectively harvested every 10 years to remove mature and defective trees. There are 399 acres under uneven age management under 150 year rotation. The allowable harvest is **26 acres of selective harvest every 10 years**.

Loess Hills State Forest
Little Sioux Unit Stand #'s



Little Sioux Unit Cultural Practices for 2012-2014



Little Sioux Unit Management Prescriptions

Little Sioux Unit, Compartment 1, Stands 1,7,8,9,10,15,16,17,18 53 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule

Little Sioux Unit, Compartment 1, Stands 2, 13 13 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Timber Stand Improvement (TSI) in the next rotation of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects. The trees to be removed can be felled or double girdled. No herbicide is necessary.

Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Little Sioux Unit, Compartment 2, Stands 1,3,4,6,7,8,11,13,14,20,22,23,25,28,29,32,36, 38,41,48,49,53,54,56,57,58,59,61,63,73,81,86,87, 90,92,93,95,96,99,101,107,109 247 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule

Little Sioux Unit, Compartment 2, Stands 10,12,24,35,37,43,46,47,64,72,75,110 80 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in the next rotation of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Little Sioux Unit, Compartment 2, Stands 40,62,65,67,83,98 86 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Little Sioux Unit, Compartment 2, Stands 42,45,51 13 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar if needed. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

Little Sioux Unit, Compartment 3, Stands 1,18 16 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in the next rotation of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Little Sioux Unit, Compartment 3, Stands 3,11,12,13,14,23,24,32,34 59 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule

Little Sioux Unit, Compartment 3, Stands 4,6,10,16,30 63 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Little Sioux Unit, Compartment 3, Stands 5,8,31 22 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar if needed. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

Little Sioux Unit, Compartment 4, Stands 13,20,22 30 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (SI) in the next rotation of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Little Sioux Unit, Compartment 4, Stands 1,2,4,6,7,8,10,11,15,17,18,21 111 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stands could be selectively harvested during the compartment cultural practices schedule.

Little Sioux Unit, Compartment 4, Stands 9,12 28 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Little Sioux Unit, Compartment 4, Stands 5, 2 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar if needed. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

Little Sioux Unit, Compartment 5, Stands 8,15,17,20,22,32, 42 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Timber Stand Improvement (TSI) in the next rotation of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Little Sioux Unit, Compartment 5, Stands 1,5,6,7,16,19,23,28,33,35,37,38,41,45,47,48,49 42 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule

Little Sioux Unit, Compartment 5, Stands 9,10,14,18,24,29 51 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Little Sioux Unit, Compartment 5, Stands 27,50,51 11 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

LITTLE SIOUX UNIT SUSTAINABLE FORESTRY GUIDELINES

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

Successional Management -

The successional areas will be managed on a 75 year rotation. There are 48 acres designated for successional management. The allowable cut is .64 acres per year (48 acres divided by 75 yrs.). With a working cycle of 10 years, approximately **6.4 acres could be cut every 10 years**.

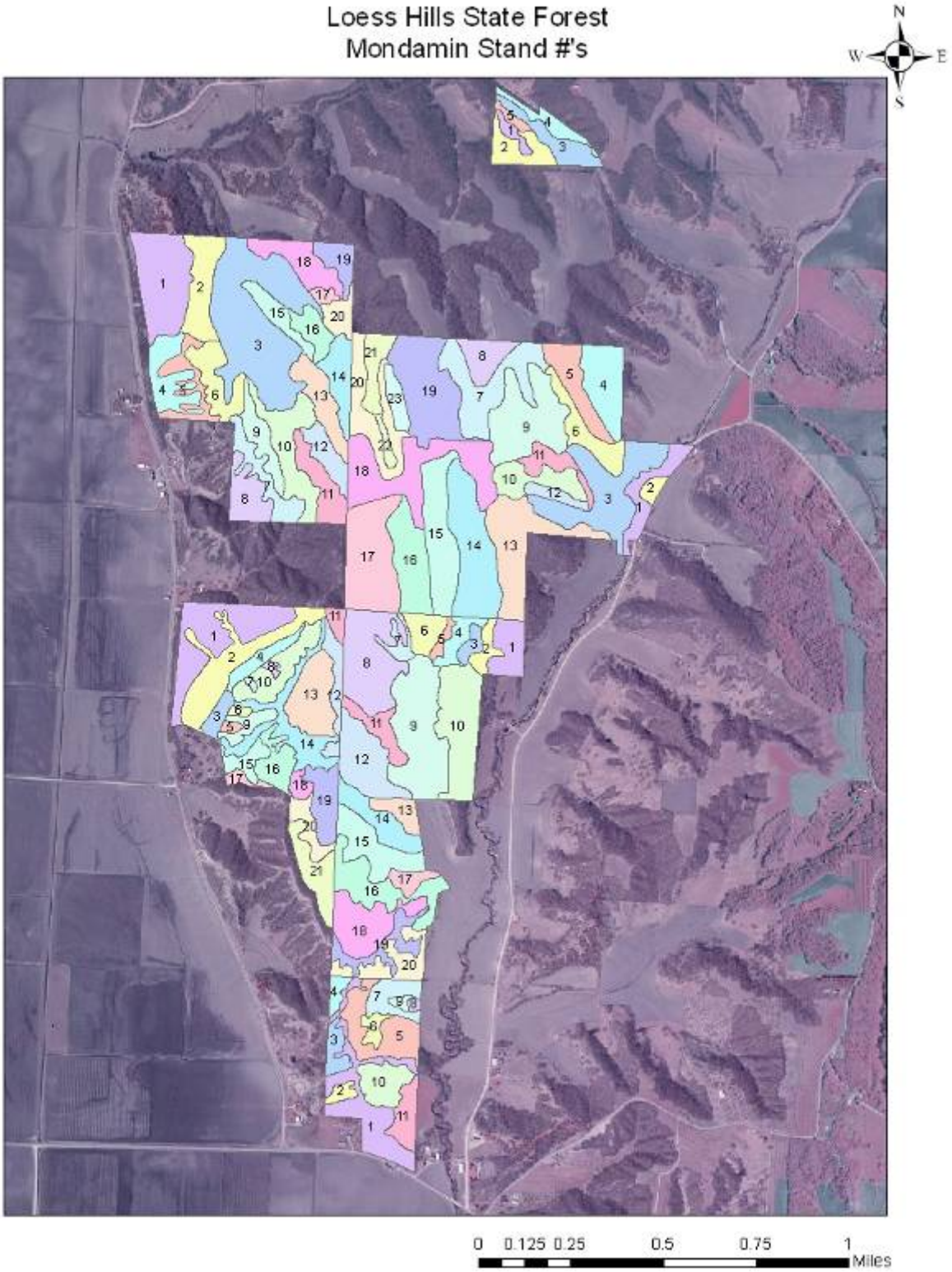
Even-Aged Management Area –

There are 399 acres under even age management. Dividing 399 acres by 200 years, yields an allowable cut of 1.99 acres per year, or **20 acres every 10 years**.

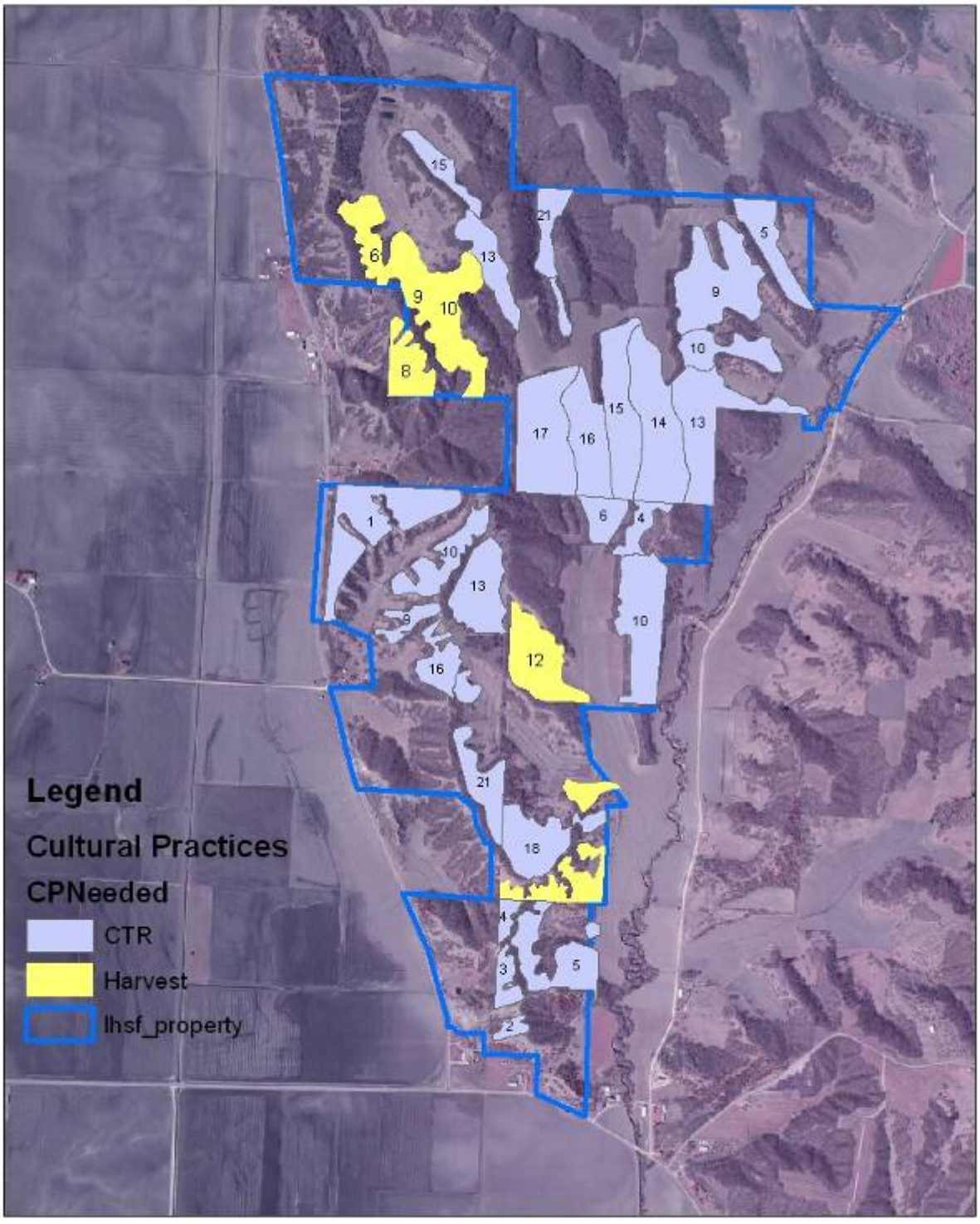
Uneven-Aged Management Area –

Stands can be selectively harvested every 10 years to remove mature and defective trees. There are 512 acres under uneven age management under 150 year rotation. The allowable cut is 3.413 and so the harvest is **34 acres of selective harvest every 10 years**.

Loess Hills State Forest
Mondamin Stand #'s



Mondamin Unit Cultural Practices for 2009-2011



Mondamin Unit Management Prescriptions

Mondamin Unit, Compartment 1, Stands 2,4 11 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even-Aged

These areas are scheduled to have Forest Stand Improvement (FSI) in 2019 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Mondamin Unit, Compartment 2, Stands 5,9,10,13,14,15,16,17,21,22, 148 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2010 and 2020 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Mondamin Unit, Compartment 2, Stands 1,19 35 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. A 2-5 year frequency of fires through these stands will maintain these areas as stunted trees and shrubs surround the area. These areas are semi-open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule.

Mondamin Unit, Compartment 2, Stands 20 28 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Mondamin Unit, Compartment 3, Stands 4,6,10,18, 48 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2020 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Mondamin Unit, Compartment 3, Stands 8,12,13 36 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. With a 2-5 year frequency of fires thru these stands will maintain these area as stunted trees and shrubs around the area. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stands could be selectively harvested during the compartment cultural practices schedule.

Mondamin, Compartment 3, Stands 1,17,20 24 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Mondamin Unit, Compartment 4, Stands 2,3,4,5,8 31 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2011 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Mondamin Unit, Compartment 4, Stands 6,9 5 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, poplar, red cedar, and clumps of dogwood. A 2-5 year frequency of fires through these stands will maintain these areas. These areas are semi-open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stands could be selectively harvested during the compartment cultural practices schedule.

Mondamin Unit, Compartment 5, Stands 1,9,10,13,16,18,21, 75 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2021 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

Locate your good quality trees. Do not waste your time and money on poor quality trees. If there are no high quality trees present on an area, go on to an area with good trees. You can not create high quality trees. Either they are present or not. Be selective and work with only your best trees.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Mondamin Unit, Compartment 5, Stands 11,17, 9 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. A 2-5 year frequency of fire through these stands will maintain the areas. These areas are semi-open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule.

Mondamin Unit, Compartment 6, Stands 13,15 17 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2021 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Mondamin Unit, Compartment 6, Stands 4,6,8,9,10,12,16,18,20 77 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

MONDAMIN UNIT SUSTAINABLE FORESTRY GUIDELINES

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

Successional Management -

There is no substantial amount of acres of successional areas that will be managed on a 75 year rotation.

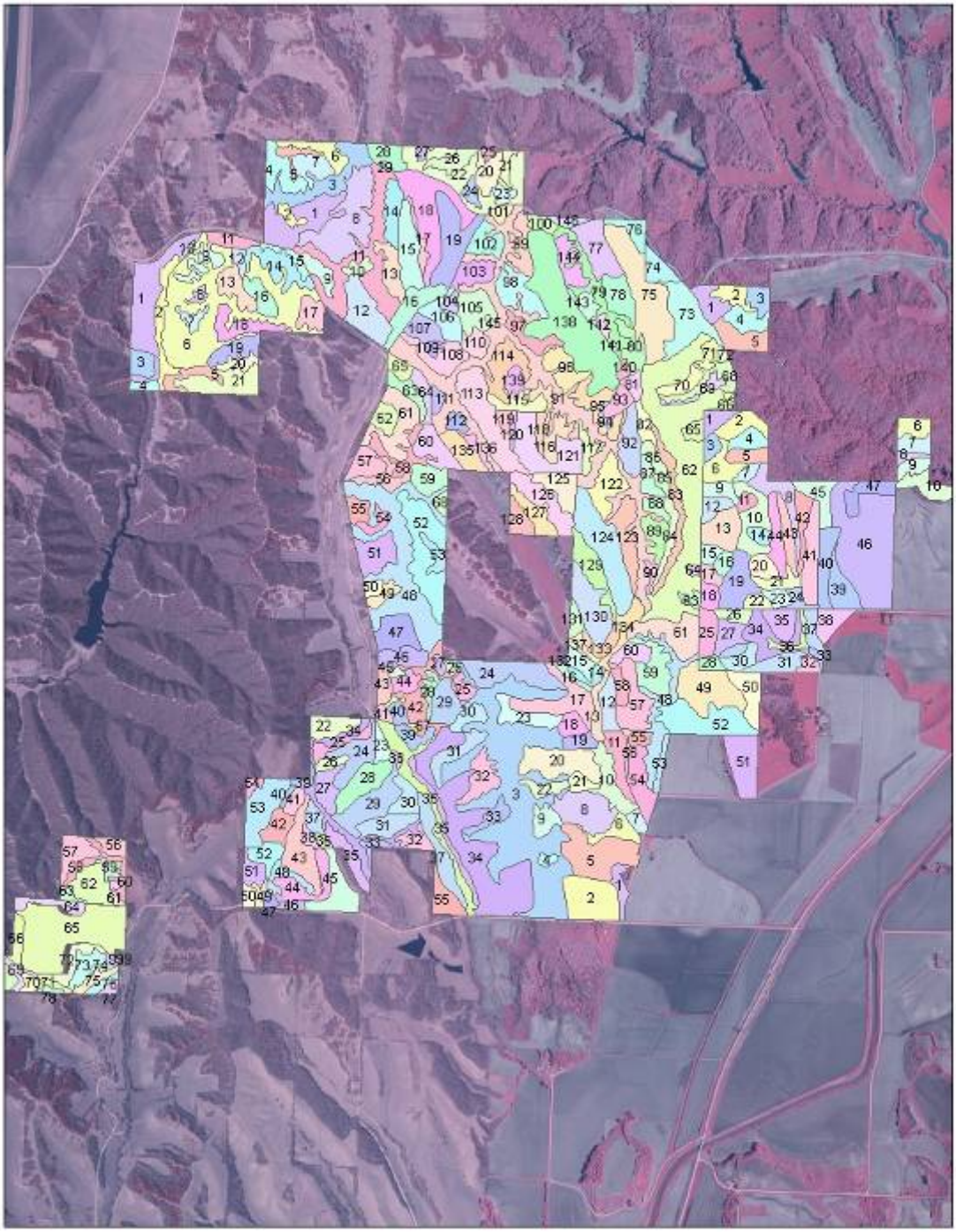
Even Age Management Area –

There are 316 acres under even age management. Dividing 316 acres by 200 years, yields an allowable cut of 1.58 acres per year, or **15 acres every 10 years**.

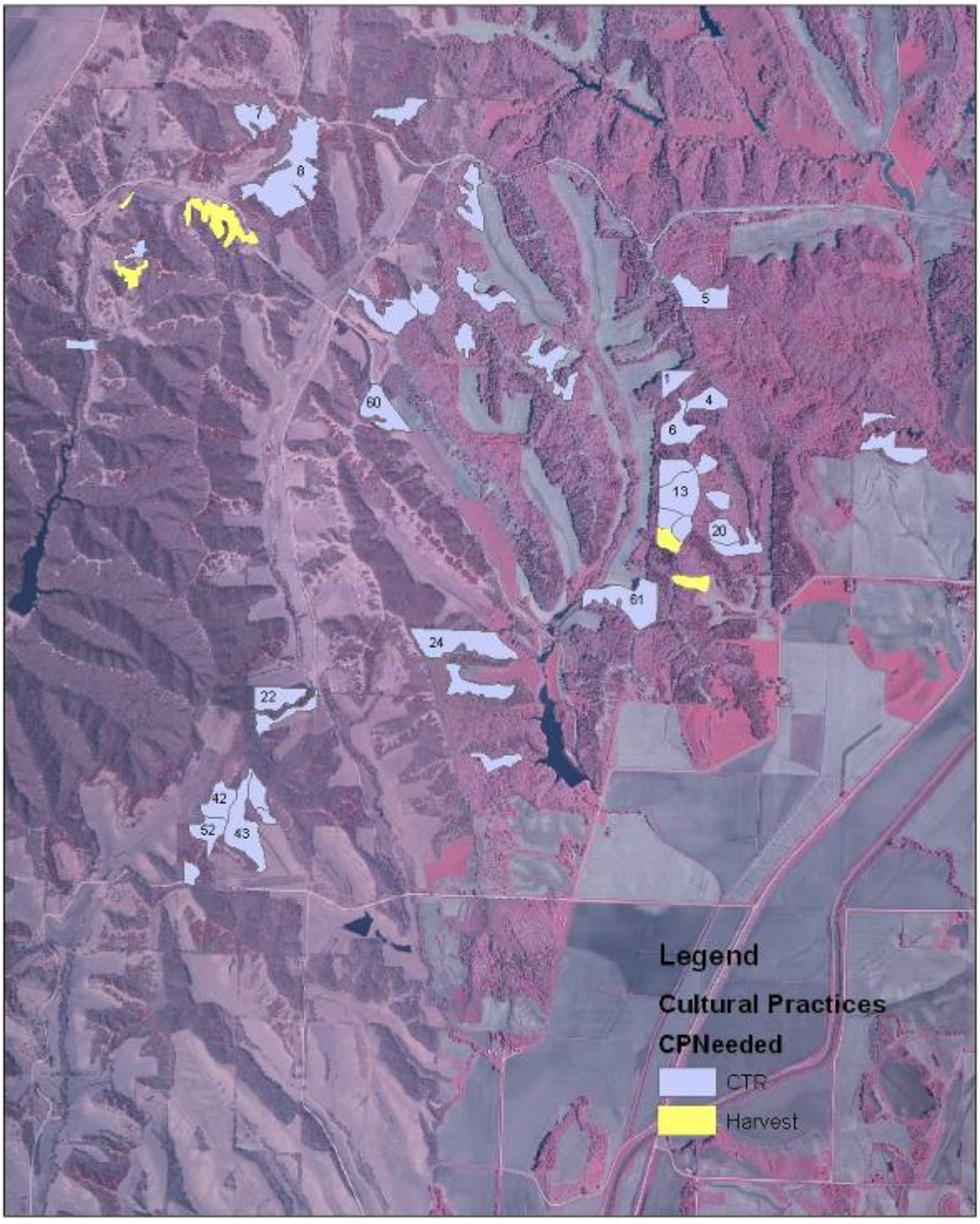
Uneven Age Management Area –

Stands can be selectively harvested every 10 years to remove mature and defective trees. There are 228 acres under uneven age management under 150 year rotation. The allowable cut is 1.52 and so the harvest would be **15 acres of selective harvest every 10 years**.

Loess Hills State Forest
Preparation Canyon Unit Stand #'s



Preparation Canyon Unit
Cultural Practices for 2014-2017



Preparation Canyon Unit Management Prescriptions

Preparation Canyon Unit, Compartment 1, Stands 7,8,26, 49 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2014 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Preparation Canyon Unit, Compartment 1, Stands 2,4,6,9,10,13,14,17,21,23,24,25,27,28 74 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. A 2-5 year frequency of fires thru these stands will maintain the areas. These areas are semi-open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stands could be selectively harvested during the compartment cultural practices schedule.

Preparation Canyon Unit, Compartment 2, Stands 1,4,6,11,12,13,14,15,16,20, 21,61,95,97,99,108,110,139 161 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2015 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Preparation Canyon Unit, Compartment 2, Stands 3,7,8,24,51,52,54,69,70,71,78,80,89,90, 101,103,117,120,136,140,141,142,143 158 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. A 2-5 year frequency of fires though these stands will maintain the areas. These areas are semi open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species such as stem density, food and den shelters. In 10-20 years, some of these stands could be selectively harvested during the compartment cultural practices schedule.

Preparation Canyon Unit, Compartment 2, Stands 2,10,17,26,49,77,87,92,96,98, 102,113,114,126,129,144 190 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Preparation Canyon Unit, Compartment 2, Stands 5,9,18,19,22,23,25,27,28,29,30,31,35, 38,39,40,45,47,50,59,63,64,65,66,106,122,123,130 221 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

Preparation Canyon Unit, Compartment 3, Stands 5,8,10, 18 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2015 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Preparation Canyon Unit, Compartment 3, Stands 1,2,4,6,9, 47 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Preparation Canyon Unit, Compartment 4, Stands 22,23,24,60, 42 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2016 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

Locate your good quality trees. Do not waste your time and money on poor quality trees. If there are no high quality trees present on an area, go on to an area with good trees. You can not create high quality trees. Either they are present or not. Be selective and work with only your best trees.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Preparation Canyon Unit, Compartment 4, Stands 1,4,16,25,26,30,31,33,44,45, 46,49,53,54,56,59,61 102 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. A 2-5 year frequency of fires through these stands will maintain the areas. These areas are semi-open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species. Benefits such as stem density, food and den shelters. In 10-20 years, some of these stand could be selectively harvested during the compartment cultural practices schedule

Preparation Canyon Unit, Compartment 4, Stands 6,8,9,15,20,32,36,52 111 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Preparation Canyon Unit, Compartment 5, Stands 4,8,22,25,36,37,42,43,50,52, 57 acres

Site Description –

Gentle northwest to east facing slopes.

Woodland Description -

Pole sized (8-12 dia.) bur oak, and black walnut. The understory consists of ironwood, elm, and bitternut hickory.

Management Recommendations – Even Age

These areas are scheduled to have Forest Stand Improvement (FSI) in 2016 of the compartments. In pole-sized stands (4-10" dia.), potential crop trees can be selected and released. At maturity, there is room for 30-50 trees per acre. Now you can select the trees you want to comprise your future stand of mature trees and thin around them to give them more growing space. Select a crop tree every 30-35 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of your crop trees. Crop trees can be selected based on criteria that meets your objectives. Normally, the crop trees will be a desirable species, show good form without large side limbs, and be free of major defects.

The trees to be removed can be felled or double girdled. No herbicide is necessary. Thin the stand to release the crop trees. Select 50 crop trees per acre or a crop tree every 30 ft. apart. Remove trees with crowns that are touching or overtopping the crowns of the crop trees. Species to favor are oak and walnut species.

Preparation Canyon Unit, Compartment 5, Stands 9,13,26,35,38,39,40,41,47,56 ,59,60,61,64,66,67,72,78 74 acres

Site Description –

Generally west facing to southeast facing slopes

Woodland Description -

These stands contain poor quality oak, naturally regenerating with sumac, box elder, hackberry, elm, ash, red cedar, and clumps of dogwood. A 2-5 year frequency of fires through these stands will maintain the areas. These areas are semi-open and have a native grass component within and around these areas.

Management Recommendations – Uneven Age

These stands are early successional and poor quality, but provide wildlife benefits to game and non-game species. Benefits such as stem density, food and den shelters. In 10-20 years, some of these stands could be selectively harvested during the compartment cultural practices schedule.

Preparation Canyon Unit, Compartment 5, Stands 2,7,10,14,16,17,18,19,21,27,28, 29,31,57 132 acres

Site Description -

Generally north facing slopes and ridge tops

Woodland Description –

Large sized (14" 20" dia.) bur oak

Management Recommendations – Even Age

This stand will be managed to grow the oak to 22" diameters. Areas will then be clear-cut and planted with oak and walnut seedlings. 30 oak and walnut seedlings would be planted per acre with each tree protected by a 4 ft. tall, tree shelter.

Clear-cut harvest the stand. Following the harvest, all remaining undesirable trees larger than 1 inch in diameter should be felled. The stumps of the undesirable species should be treated with Pathfinder II to prevent sprouting. Plant the area with large oak seedlings.

Control competing vegetation by spot spraying a combination of Roundup and Princep 4L herbicides. Protect the seedling from the spray and spray an area 4 ft in diameter around each tree. Apply 2 quarts of Roundup and 4 quarts of Princep 4L per acre treated. The herbicides must be applied when the vegetation is actively growing.

Preparation Canyon Unit, Compartment 5, Stands 3,32,48,51,54,63,68,70,75 33 acres

Site Description -

Ridge tops and north facing slopes

Woodland Description -

Pole sized Eastern Red Cedar with some oak and black walnut. (4-8" dia.) .

Management Recommendations

The density and size of these cedar stands are too large of areas to eliminate, so we will prune and thin the stands to grow saw log size cedar logs for the increasingly growing markets in the area. Crop Tree Release (CTR) will be done on good quality and formed Oak and Walnut in amongst the cedars. When the stands reach 16-20" diameter they can be clear-cut harvested and either replanted with cedar. They can also be conversion stands to deciduous hardwoods. These sites are very nutrient rich and grow oak and walnut stands well.

PREPARATION CANYON UNIT SUSTAINABLE FORESTRY GUIDELINES

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

Successional Management -

The successional areas will be managed on a 75 year rotation. There are 254 acres designated for successional management. The allowable cut is 3.38 acres per year (254 acres divided by 75 yrs.). With a working cycle of 10 years, approximately **33.86 acres could be cut every 10 years**.

Even Age Management Area –

There are 605 acres under even age management. Dividing 808 acres by 200 years, yields an allowable cut of 4.04 acres per year, or **40 acres every 10 years**.

Uneven Age Management Area –

Stands can be selectively harvested every 10 years to remove mature and defective trees. There are 408 acres under uneven age management under 150 year rotation. The allowable cut is 2.72 and so the harvest is **25 acres of selective harvest every 10 years**.

Appendix B

Wildlife Species List

L.H.S.F. Wildlife Appendix

The following is a list of the wildlife present in the Loess Hills:
Lampe, R.P. and J.B. Bowies, "Annotated checklist of the Mammals of the Loess Hills of Western Iowa" Proceedings of the Iowa Academy of Sciences 92(5) : 176-179, 1985

MAMMALS

SPECIES	HABITAT	CLASSIFICATION
Beaver (g)	riparian, pond	herbivore
Western Harvest Mouse	prairie	grainivore
White-Footed Mouse	woodland	grainivore
Deer Mouse	prairie, savanna, ag land	grainivore
Prairie Vole	prairie, fence rows	herbivore
Meadow Vole	savanna, woodland	herbivore
Woodland Vole	woodland, riparian	herbivore
Muskrat (g)	marsh, pond, lake	herbivore
House Mouse	prairie, ag. land	grainivore
Norway Rat	ag. land, urban	omnivore
Meadow Jumping Mouse	prairie, savanna	grainivore
Coyote	prairie, savanna (ridges)	omnivore
Red Fox (g)	savanna, woodland	carnivore
Gray Fox	woodland	carnivore
Raccoon (g)	woodland, riparian, ag land	omnivore
Long-Tailed Weasel	riparian	carnivore
Mink (g)	riparian	carnivore
Virginia Opossum (g)	woodland, riparian	omnivore
Masked Shrew	woodland riparian	carnivore
Northern short Tailed Shrew	prairie savanna	carnivore
Eastern Mole	woodland, prairie	insectivore
Big Brown Bat	urban	insectivore
Red Bat	urban	insectivore
Evening Bat	woodland	insectivore
Eastern Cottontail (g)	savanna, woodland	herbivore
White-Tailed Jack Rabbit	prairie	herbivore
Eastern Chipmunk	woodland	herbivore, grainivore
Woodchuck	savanna	herbivore
Franklin's Ground Squirrel	prairie (tall grass)	herbivore grainivore
Thirteen-Lined Ground Squirrel	prairie (shot grass) savanna	herbivore grainivore
Gray Squirrel	woodland	herbivore grainivore
Fox Squirrel (g)	woodland	herbivore grainivore
Plains Pocket Gopher	roadsides, hayfield	herbivore grainivore
Badger	prairie, pasture	omivore
Striped Skunk	woodland, riparian	omnivore
White-Tailed Deer (G)	woodland, edge	herbivore
Least Shrew	riparian, prairie	insectivore
Little Brown Myotis	riparian, urban	insectivore

Indian Bat (E)	woodland	insectivore
Silver-Haired Bat	riparian	insectivore
Eastern Pipistrelle	riparian	insectivore
Hoary Bat	woodland urban	insectivore
Richardson’s Ground Squirrel	prairie	herbivore, grainivore
Southern Flying Squirrel	woodland	herbivore, grainivore
Plains Pocket Mouse (R)	prairie	herbivore, grainivore
Northern Grasshopper mouse	prairie	grainivore, insectivore
Southern Bog Lemming (R)	moist bluegrass, fencerows	herbivore
Least Weasel	savanna, fields	carnivore
Spotted Skunk	riparian, prairie	omnivore
Bobcat (E)	woodland, cliffs	carnivore
Mule Deer	woodland, grassland	herbivore

SOURCE: Howe, R. W. et al "Distribution and Abundance of Birds in the Loess Hills of Western Iowa" Proceedings of the Iowa Academy of Sciences 92 (5): 164-175, 1985

BIRDS

SPECIES	HABITAT	CLASSIFICATION
Wood Duck (g)	marsh, riparian, woodland	herbivore, grainivore
Turkey Vulture	woodland	scavenger
Broad-Winged Hawk	woodland, savanna	carnivore
Red-Tailed Hawk	savanna, prairie	carnivore
American Kestrel	savanna	carnivore
Ring-necked Pheasant (g)	edge, ag land	grainivore
Wild Turkey (g)	woodland	grainivore
Northern Bobwhite	edge, prairie, ag land	grainivore
Rock Dove	ag land, urban	grainivore
Morning Dove	savanna, woodland	grainivore
Black-Billed Cuckoo	woodland	insectivore
Yellow-Billed Cuckoo	woodland, edge	insectivore
Eastern Screech-Owl	woodland, ag land	carnivore
Great Horned Owl	woodland	carnivore
Barred Owl	woodland	carnivore
Common Nighthawk	urban	insectivore
Whip-Poor-Will	woodland	insectivore
Belted Kingfisher	marsh, pond	carnivore
Red-Headed Woodpecker	woodland, savanna	insectivore
Red –Bellied Woodpecker	woodland, edge	insectivore
Downy Woodpecker	woodland	insectivore
Northern Flicker	ag land, savanna	insectivore
Eastern Wood-Pewee	woodland	insectivore
Eastern Phoebe	riparian	insectivore
Great Crested Flycatcher	woodland, savanna	insectivore
Eastern Kingbird	woodland	insectivore
Purple Martin	prairie, ag land, urban	insectivore
Northern Rough- winged Swallow	prairie, ag land	insectivore
Bank Swallow	road cut cliffs	insectivore
Barn Swallow	prairie, ag land	insectivore
Blue Jay	woodland savanna, ag land	insectivore grainivore
American Crow	woodland, ag land, urban	scavenger
Black-Capped Chickadee	woodland, savanna	grainivore
White-Breasted Nuthatch	woodland	grainivore
House Wren	woodland, ag land, urban	insectivore
Eastern Bluebird	edge (woodland & prairie)	insectivore
Wood Thrush	woodland	insectivore
American Robin	ag land, urban	insectivore
Gray Catbird	woodland	insectivore
Brown Thrasher	prairie, edge	insectivore
Cedar Waxwing	savanna (cedar)	frugivore
European Starling	ag land, urban	insectivore grainivore
Bell's Vireo	prairie	insectivore

Yellow Warbler	savanna, edge, ponds	insectivore
Ovenbird	edge	insectivore
Northern Cardinal	woodland, savanna	insectivore, grainivore
Rose-Breasted Grosbeak	woodland, edge	insectivore
Green-Backed Heron (R)	riparian, marsh, pond	carnivore
Great Blue Heron	marsh, pond	carnivore
Mallard (g)	marsh, pond	herbivore, grainivore
Blue Winged Teal (g)	mash, pond	herbivore, grainivore
Copper's Hawk	woodland	carnivore
Sharp-Shinned Hawk	woodland, riparian	carnivore
Killdeer	prairie, pasture, pond	insectivore
Upland Sandpiper (R)	prairie, pasture, pond	insectivore
American Woodcock (R)	edge	insectivore
Burrowing Owl (R)	ag land, ditches	carnivore
Chuck-Will's-Widow (R)	woodland	insectivore
Chimney Swift	urban	insectivore
Ruby-Throated Hummingbird	urban, ag land	insectivore
Acadian Flycatcher	riparian, woodland	insectivore
Willow Flycatcher	riparian	insectivore
Western Kingbird (R)	bluff bases	insectivore
Horned Lark (R)	prairie, pasture	insectivore
Tree Swallow	riparian	insectivore
Cliff Swallow (R)	riparian	insectivore
Tufted Titmouse (R)	woodland	insectivore, grainivore
Blue-Gray gnatcatcher (R)	woodland	insectivore
Northern Mockingbird (R)	ag land	insectivore
Loggerhead Shrike (R)	ag land prairie, pasture	carnivore
Warbling Vireo(R)	woodland, savanna	insectivore
Red-Eyed Vireo	woodland	insectivore
Blue Grosbeak (R)	prairie, pasture	insectivore
Scarlet Tanager	woodland	insectivore
Song Sparrow (R)	riparian, prairie (moist)	insectivore
Indigo Bunting	edge	insectivore
Dickcissel	prairie, ag land	insectivore
Common Yellowthroat	riparian	insectivore
Rufous-Side Towhee	edge, woodland	insectivore
Chipping Sparrow	ag land	insectivore
Vesper Sparrow	prairie, savanna, ag land	insectivore
Lark Sparrow	ag land	insectivore
Grasshopper Sparrow	ag land	insectivore
Red-Winged Blackbird	marsh, ag land	insectivore
Eastern Meadowlark	ag land, savanna	insectivore
Western Meadowlark	ag land, prairie	insectivore
Common Grackle	ag land, savanna urban	insectivore, grainivore
Brown-Headed Cowbird	savanna ag land, woodland	insectivore
Orchard Oriole	woodland, orchards, g land	insectivore
American Goldfinch	savanna ag land	grainivore
House Sparrow	ag land	insectivore, grainivore

Franklin, W.L."A Guide to the Mammals of Iowa I.S.U. Press, 1981
(R)=RARE
(T)=THREATENED

AMPHIBIANS & REPTILES (R)=Rare (T) = Threatened

SPECIES	**HABITAT**
Great plains skink (R)	prairie, savanna
Western Spadefoot (R)	prairie
Great Plains Toad (R)	prairie
Ornate Box Turtle (R)	prairie
Prairie Rattlesnake (R)	prairie, savanna
American Toad	woodland
Woodhouse's Toad	prairie
Plains Spadefoot	prairie
Bullfrog (G)	marsh, pond, riparian
Northern Leopard Frog	marsh, pond, riparian
Plains Leopard Frog	prairie
Blanchard's Cricket Frog	prairie, savanna, grassland
Western Chorus Frog	riparian, prairie (moist)
Gray Treefrog	woodland
Small-Mouthed Salamander	woodland
Eastern Tiger Salamander	riparian, prairie (moist), mars
Common Snapping Turtle (G)	riparian, marsh, pond
Western Painted Turtle	riparian, pasture, ag land
False Map Turtle	riparian
Western Spiny Softshell	riparian
Smooth Softshell	riparian
Prairie Racerunner	prairie
Sonoran Skink	prairie
Northern Prairie Skink	prairie
Graham's Water Snake	riparian, marsh, pond, ag land

Appendix C

Soils

SOILS

1. SARPY-ALBATON-CARR association

Excessively drained and poorly drained, nearly level to gently Undulating, stratified sandy, loamy, and clayey soils on bottom lands of the Missouri River.

Besides the indicator soil series, this association is comprised of Onawa, Haynie, Kenmoore, Grable, and Modale soils
.

2. ALBATON- HAYNIE-ONAWA association

Well drained to poorly drained, nearly level silt and clay soils on bottom lands of the Missouri River

Other soil series included are Blake, Grable, Percival, Vore and Modale

3. LUTON-Keg association

Well drained to very poorly drained, nearly level silt and clay soils on bottom lands of the Missouri River.

Less extensive soil series included in this association are Salix, Blencoe, Woodbury, Lakeport, Forney, and Solomon soils.

4. KENNEBEC-McPAUL-NODAWAY association

Moderately well drained and well drained, nearly level silt soils on bottom lands.
Colo, Moville, Monona, and Napier soils are included in this association.

5. HAMBURG-IDA-MOON association

Somewhat excessively drained and well drained, moderately sloping to very steep silt soils on uplands.

The less extensive soil series are mainly Napier and Castana soils.

6. MONONA-IDA-NAPIER association

Well-drained, nearly level to steep silt soils on uplands.
Other soils included in this association are Kennebec, McPaul, and Nodaway

7. LUTON-SALIX-BLENCO-McPAUL association.

Nearly level areas or slight depressions on bottom lands of the Missouri River.
Colo Copper, and Napa soils also occur in this association.

8. KENNEBEC-ZOOK-McPAUL association

Wet soils located on the bottom lands of Missouri River and uplands along Maple, Soldier, and Little Sioux Rivers.

Less extensive soils include Colo, Luton, Napa series.

9. HAMBURG-IDA-CASTANA-NAPIER association

These soils occupy the steep slopes of the area. Monona, Shelby, and Steinauer Soils comprise the lesser abundant soils series.

SOIL SERIES	SLOPE	DRAINAGE	LANDSCAPE	TEXTURE POSITION
Albaton	0-2%	poorly	bottom	silty clay
Blake	0-2%	somewhat poorly	bottom	silty clay loam
Blencoe	0-2%	somewhat poorly	bottom	silty clay
Blend	-0-2%	poorly	bottom	silty clay
Burcham	0-25	moderately well	bottom	silty loam
Carr	0-25	excessively	bottom	very fine sand
Castana	5-20%	well	upland	silt loam
Colo	0-25	poorly	bottom	silty clay loam
Cooper	0-2%	somewhat poorly	bottom	silty clay loam
Dow	9-20%	well	upland	silt loam
Forney	0-2%	poorly	bottom	silty clay
Grable	0-2%	well-excessive	bottom	silt loam
Hamburg	40-75%	somewhat excessively	upland	silt loam
Haynie	0-2%	moderately well	bottom	silt loam
Ida	5-40%	well	ridgeside	silt loam
Keg	0-2%	well moderately	bottom	silt loam
Kenmoor	0-2%	moderately well	bottom	fine sand
Kennebec	0-2%	moderately well	bottom	silt loam
Lakeport	0-2%	somewhat poorly	bottom	silty clay
Luton	0-2%	very poorly	bottom	silty clay
McPaul	0-2%	well moderately well	bottom	silty loam
Modale	0-2%	moderately well somewhat poor	bottom	silt loam
Monona	0-4%	well	ridgeside	silt loam
Moville	0-2%	moderately well somewhat poor	bottom	silt loam
Napa	0-1%	poorly	bottom	silty clay
Napier	2-14%	well	foot	silt loam
Nodaway	0-2%	moderately well	bottom	silt loam
Onawa	0-2%	somewhat poor poorly	bottom	silty clay
Percival	0-2%	poorly	bottom	silty clay
Salix	0-2%	well	bottom	silty clay
Sarpy	0-7%	excessively	channel	fine sand
Shelby	8-35%	well	side	loam
Solomon	0-2%	poorly/ very poorly	bottom	silty clay
Steinauer	9-18%	well	upland	clay loam
Vore	0-2%	moderately well	bottom	silty clay loam
Woodbury	0-2%	poorly	bottom	silty clay
Zook	0-1%	poorly	bottom	silty clay

Appendix D

Employee History

INDR Employees on LHSF

State Foresters

H. Gene Hertel	1969-1987
William Farris	1987-1999
Mike Brandrup	1999- 2005
Paul Tauke	2005- Present

Section Chief State Forests & Management

James Bulman	1986-2000
Jerry Kemperman	2000-2004
Linda Howard	2004-2007
Jeff Goerndt	2008-Present

Area Foresters

Allan Pratt	1986-1989
Randy Cook	1989-1990
Brent S. Olson	1990-1991 Laid Off
Roger Jacob	1991-1992
Brent S. Olson	1992-Present

Permanent Full Time Employees

Dennis Stoner	1988-Present

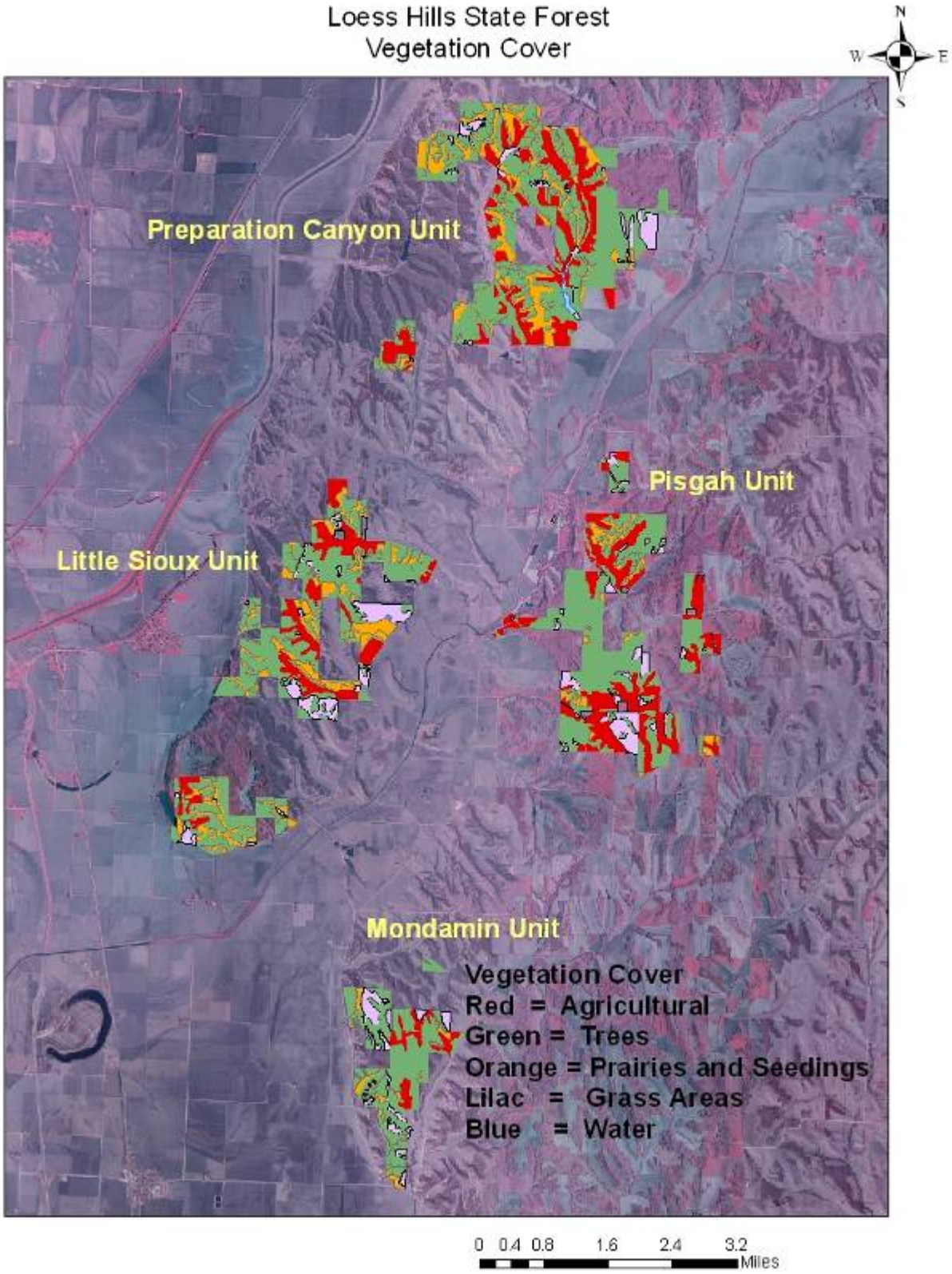
Seasonal Employees

Dee Arion Mann	1986-1998
Tom Clark	1992-1993
Bryan Taylor	1993-Present
Larry Pape	1998- 2002
Chase Durfee	2001 - Present
Joy Carson	2000- Present
Joanna Nuzum	2006 – Present

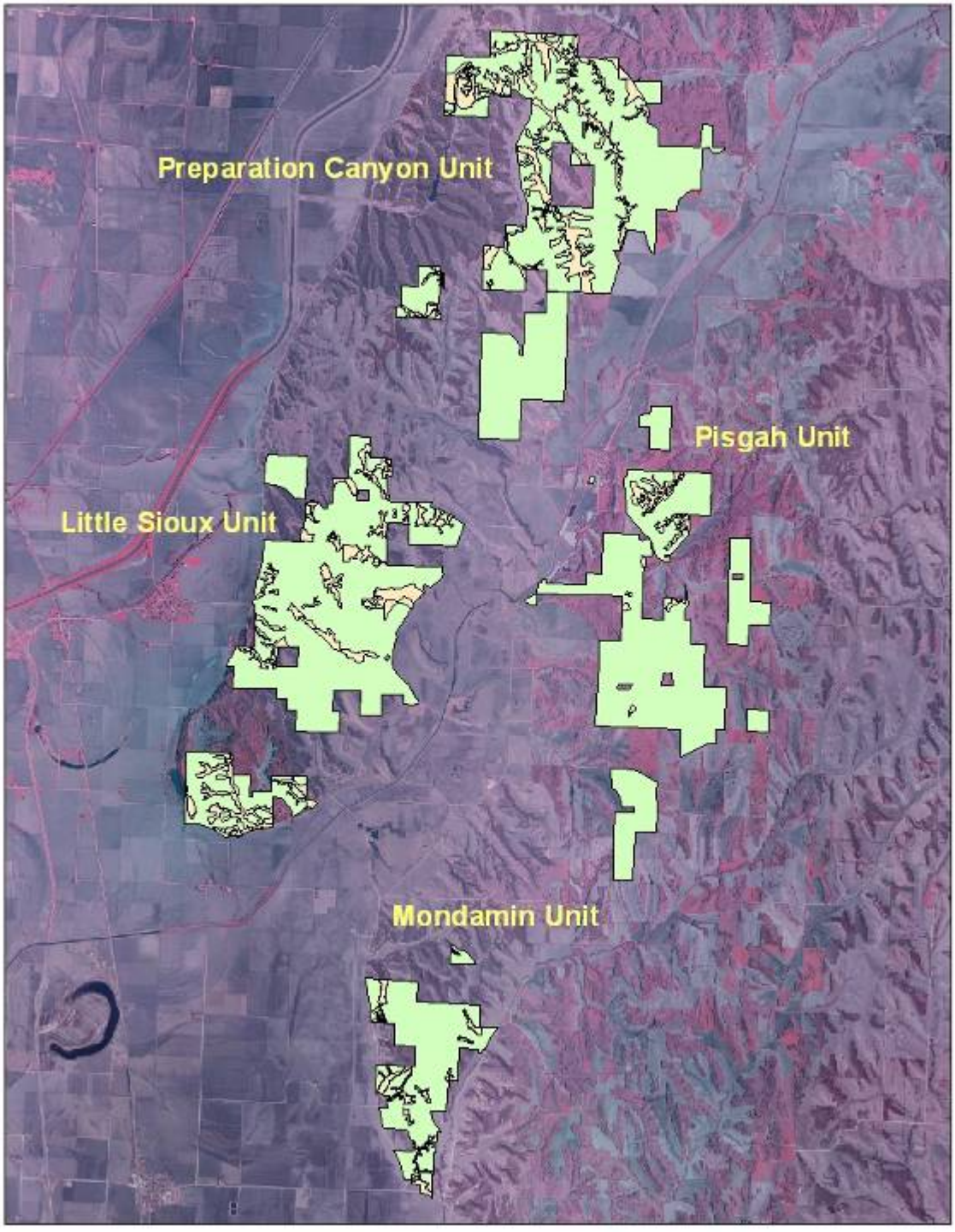
Appendix E

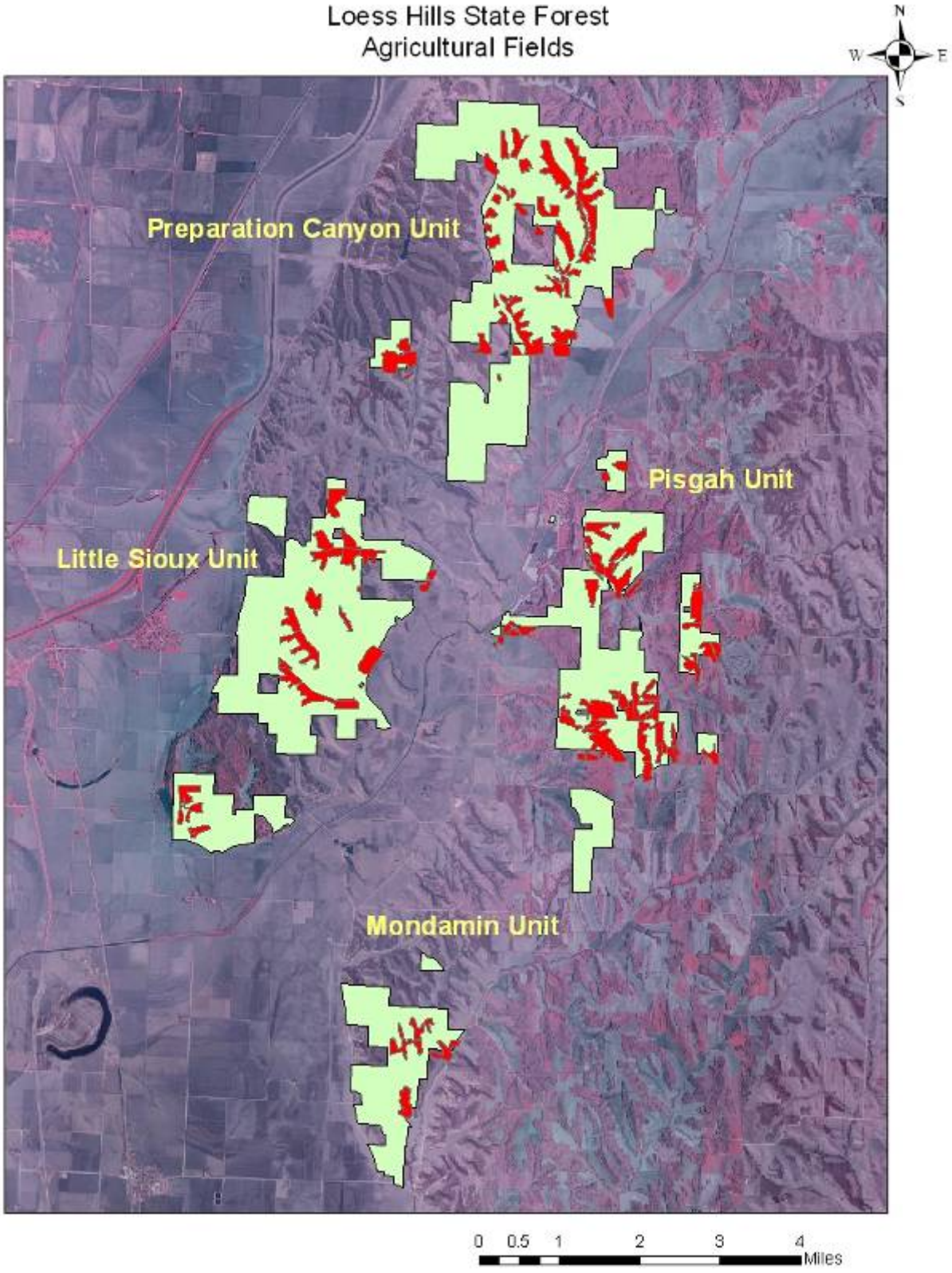
Additional Maps

Legacy Planting

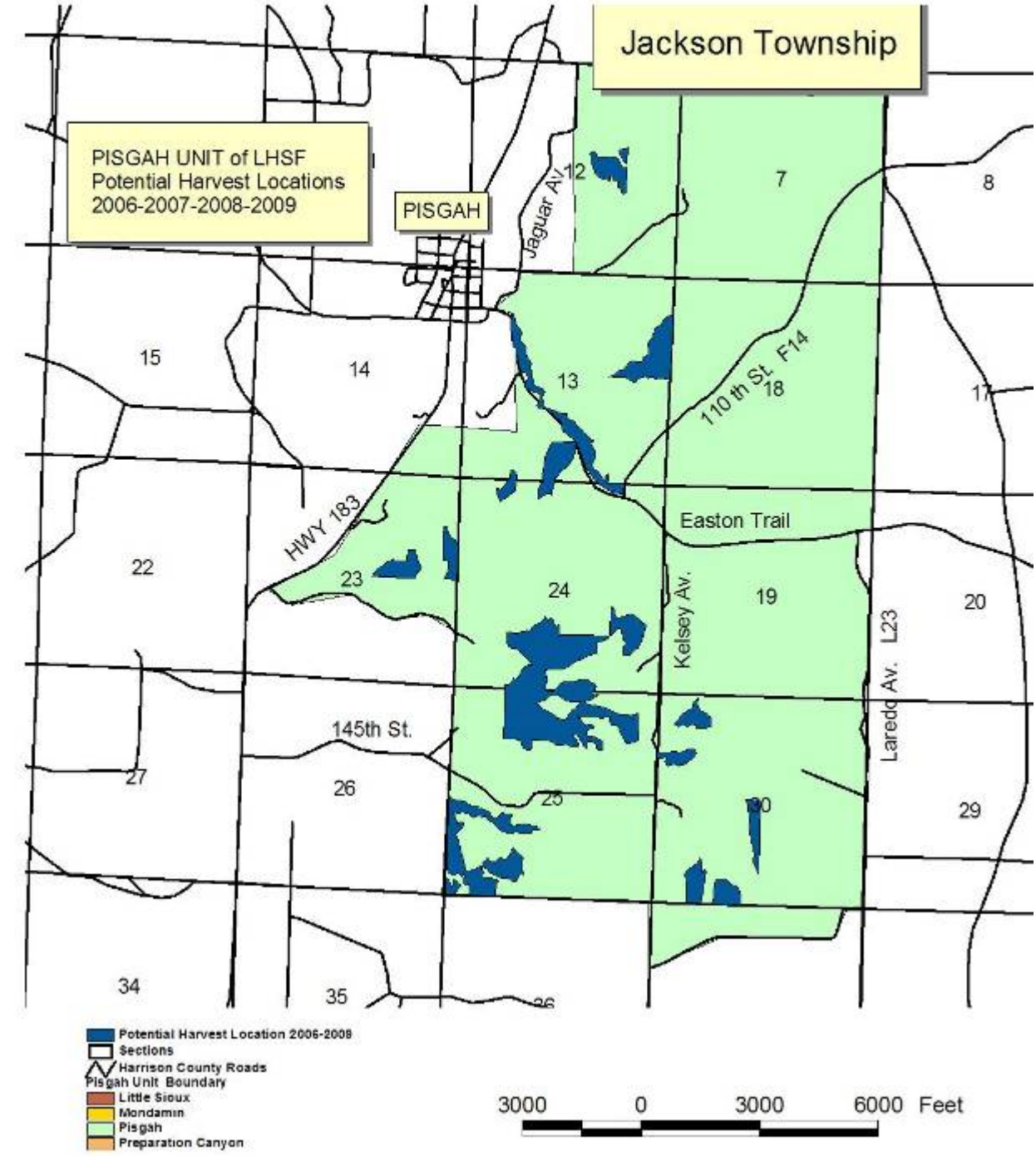

Loess Hills State Forest
Vegetation Cover
N
W
E
S
Preparation Canyon Unit
Pisgah Unit
Little Sioux Unit
Mondamin Unit
Vegetation Cover
Red = Agricultural
Green = Trees
Orange = Prairies and Seedings
Lilac = Grass Areas
Blue = Water
0 0.4 0.8 1.6 2.4 3.2
Miles

Loess Hills State Forest
Prairies and Native Grass Plantings

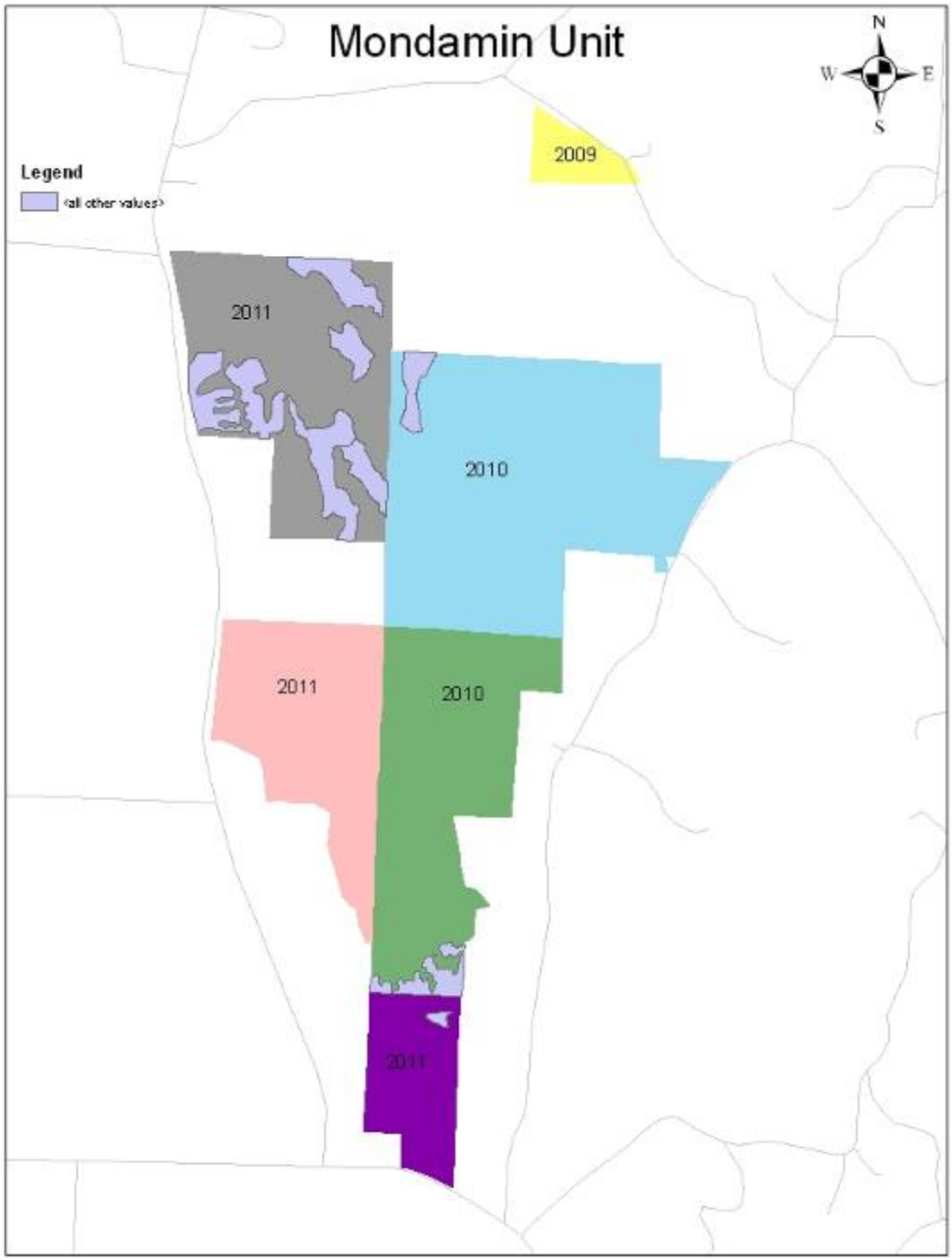



Loess Hills State Forest
Agricultural Fields
N
W
E
S
Preparation Canyon Unit
Pisgah Unit
Little Sioux Unit
Mondamin Unit
0 0.5 1 2 3 4
Miles

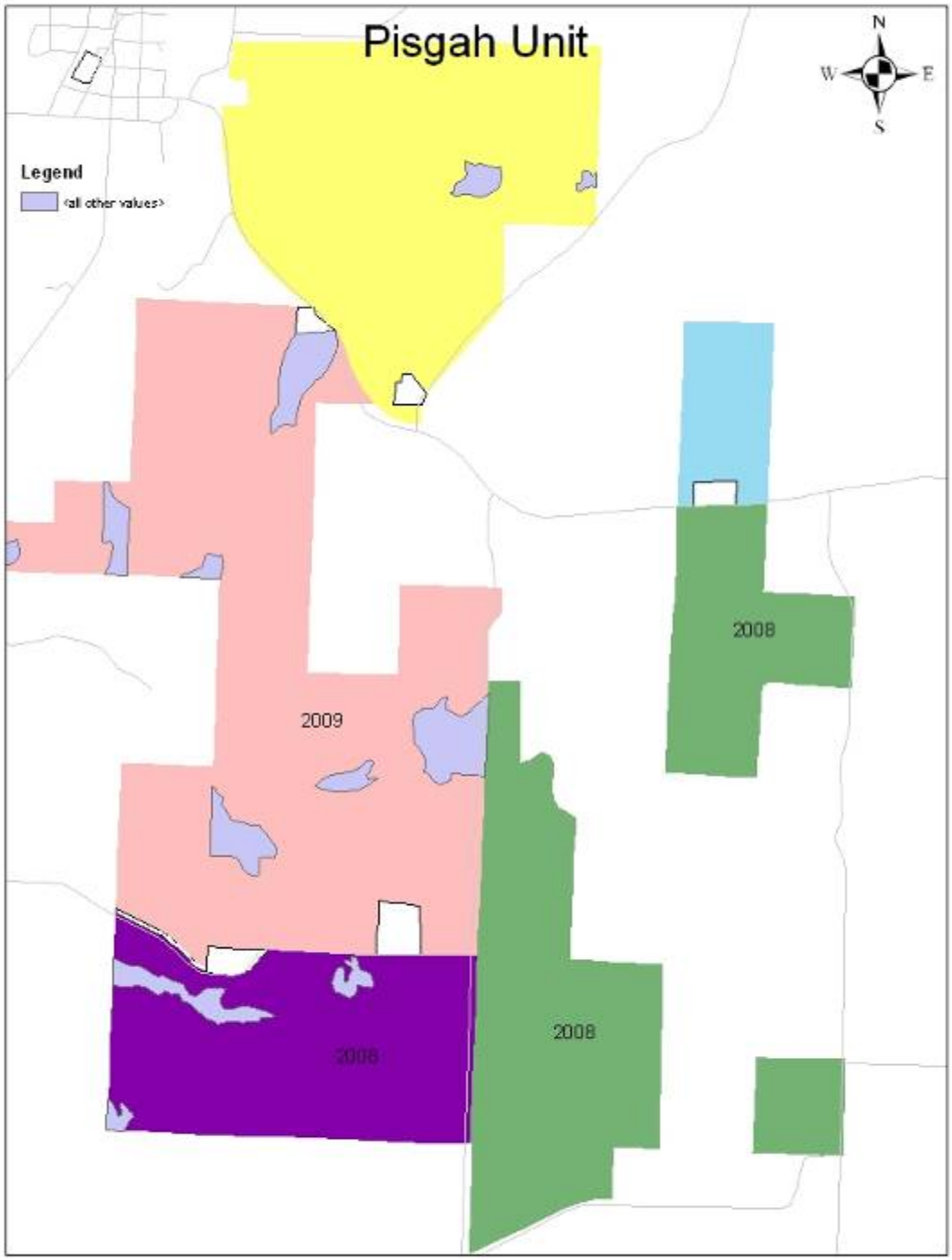
2006-2009 Potential Harvest Location in LHSF



State Forest Potential Harvest Sites in FY 2008-2011



State Forest Potential Harvest Sites in FY 2008-2011



Appendix F

Acquisition History

Acquisition History

Loess Hills State Forest				
UPDATE DATE: October 20, 2007				
Little Sioux Unit (4,700 acres)				
	ACRES	COST	DATE ACQUIRED	
Joe Bothwell	322	$128,000	* 6/1/1986	
Doug Collison	74	20,000	Nov-87	
Karol King	130	28,000	May-87	
Larry Eickhoff	96	23,000	Aug-87	
Ray and Wes Spencer	320	200,000	Nov-88	
Nina Hildreth	80	39,000	Jul-89	
William Roden	96	73,700	Jul-89	
Don and Lillian Wheeler	10	4,500	Sep-90	
Donald Bothwell	125	53,250	Oct-90	
Thomas & Dorothy Erwin	70	23,000	Apr-92	
Dwight & Anita Nuzum	390	186,000	May-92	
Herbert Clark	32	12,600	Oct-92	
Bill Bothwell	80	40,000	Dec-92	
FMHA Peasley	74	22,806	Jun-93	
Patricia Alton	88	38,000	Oct-95	
Shriners Hospital	360	225,060	Nov-95	
Don Powell	200	146,000	May-96	
Jim Rains	40	18,800	Mar-97	
Wayne & Norma Jensen	119	112,800	Aug-98	
Raymond Dixon	140	167,650	Dec-98	
Dave Thomas	36	46,800	Feb-01	
Murray Hill INHF	135	210,000	Jul-01	
64.19%	3,017	$1,818,966		

Preparation Canyon Unit (5,889)				
Dorothy Jepson	205	51,890	*9/1/1986	
Grace Hundahl	876	245,600	Dec-86	
Maude Conyers	119	29,000	Nov-87	
Robert Conyers	160	44,379	May-88	
Blencoe State Bank	216	64,000	Aug-88	
Darrell Vanness	38	24,250	Jan-89	
Addison Hebb	205	96,969	Feb-89	
Darrell & Virginia Vanness	25	9,000	Jul-89	
G.D.P. Farms	85	39,845	Feb-90	
Rogene Sherer	115	88,000	Jan-91	
I Harry Rice	1037	650,000	Apr-93	
Rolling Hills	135	101,813	Sep-96	
Jerry Maguire	308	338,250	Sep-99	
Bill Hebb	120	123,600	May-00	
Harvey Swensen	30	45,000	Sep-00	
62%	3,674	1,951,596		
Pisgah Unit (5,045 acres)				
William Hrabik	248	98,270	*6/1/1986	
Ida Cox	80	21,000	Aug-87	
Larry Pape	196	82,000	Jul-88	
Colleen Alton	12	3,700	Nov-88	
Sylvia Rains	40	24,000	Apr-89	
Illa Mae Storm	35	75,000	Jun-89	
Marvin & Norma Holsapple	129	81,075	Sep-89	
City of Pisgah	3	Donation	Sep-89	
Addison Hansen	40	26,000	Jan-90	
Bryan Remington	8	6,400	Jan-90	
Bessie Bell	35	15,000	May-90	
Paul Gochenour	112	85,000	Jun-90	
Don and Lillian Wheeler	10	2,500	Sep-90	
Francis Haggerman	93	64,000	Sep-90	
Dorothy Rains	54	41,500	Sep-90	
Larry Bryceson	354	255,000	Feb-91	

Mondamin Co-op	1	435	Sep-91	
Tom & Clara Heimforth	365	182,800	Oct-91	
Maynard and Mabel Christensen	258	186,905	May-95	
Don Powell	120	99,600	May-96	
Petrus & Griffith	56	33,100	May-97	
Harlan Gahm	279	334,800	May-01	
John Kress	160	352,285	Dec-01	
John Kress	160	262,075	Jul-02	
56%	2,848	$ 2,332,445		
Mondamin Unit (1,992 acres)				
Virgil Alton	156	49,611	*10/1/1986	
Council Bluffs Savings	225	58,000	*9/1/1986	
Gary Flemming	64	29,000	Nov-87	
Donald Maule	73	30,731	Mar-89	
Ed and Francine Camenzind	25	18,000	Oct-89	
Bryan Remington	120	66,000	Feb-90	
Gene Sorick	100	45,000	Sep-90	
Delores Kay	190	88,000	May-91	
Eugene and LaVera Sorick	75	32,700	Dec-92	
Alton Family Trust	37	60,720	Mar-98	
53%	1,065	477,762		
TOTALS	10,604	385,771	* "LAWCON	
60%		$6,172,192		
		$6,557,963	TOTAL	
PROPOSED TOTAL ACRES	17,626			
Average $ / Acre	$			

	618.44			
Year Purchased	**Acres**	**Cost**	**$/ acre**	**Count**
1986	2032	631,371	$ 310.71	6
1987	563	150,000	$ 266.43	6
1988	904	394,079	$ 435.93	5
1989	749	471,725	$ 629.81	11
1990	792	448,995	$ 566.91	12
1991	1025	614,235	$ 599.25	5
1992	647	294,300	$ 454.87	5
1993	1111	672,806	$ 605.59	2
1994	0	0	$ -	0
1995	706	449,965	$ 637.34	3
1996	455	347,413	$ 763.55	3
1997	96	51,900	$ 540.63	2
1998	296	341,170	$ 1,152.60	3
1999	308	338,250	$ 1,098.21	1
2000	150	168,600	$ 1,124.00	2
2001	610	943,885	$ 1,547.35	4
2002	160	262,075	$ 1,637.97	1
	10,604	$ 6,580,769.00	$ 727.71	71

Priority Units of the Loess Hills State Forest

January 23, 2007

Little Sioux Unit
Preparation Canyon Unit
Pisgah Unit
Mondamin Unit

Little Sioux Unit

Name	Acres
Gordon Glennie	40
Mary Mills	30
Patricia Fell	10
Mary Grimes	40
Kathryn Johnson	153
Scott Pape	500
Bob Harris	191
Otis Edmonds	130
Craig Lightwine	77
Mary Grimes	159
Ricky Shearer	40
Nicolas Bean	79
Bill Harl	78
Thomas Armstrong	159
David Thomas	281
Loveta Bothwell	200
Totals	2,167

Preparation Canyon Unit

Name	Acres
Rolling Hills Harper	180
Chuck Wallis	200
Hutchinson Trust	135
Maxine McIntosh	152
Thomas Martin	800
Herman Bremer	420
GDP Farms	240
Virginia Vanness	250
Bernice Johnson	223
Meridith Foster	150
LSSR Boy Scouts	1,500
Thayer Brown	515
John Pohlman	53
James Wilshire	40
Catherine Webb	40
Totals	4,898

Pisgah Unit

Name	Acres
Bryan Remmington	55
James Johnston	74
Maynard Christensen	10
David Leonard	40
Royl Roden	189
Noel Mumm	189
Lyle Wallis	234
Larry Bryceson	45
George Barry	378
Kenneth Olsen	150
Maxine Perrin	183
Ida Cox	160
Bryan Remmington	150
Marvin Holsapple	116
Larry and Donna Pape	473
Dennis Perkins	80
Bill Tedford	32
Ed Seabury	390
Eugene Christensen	242
Totals	3,190

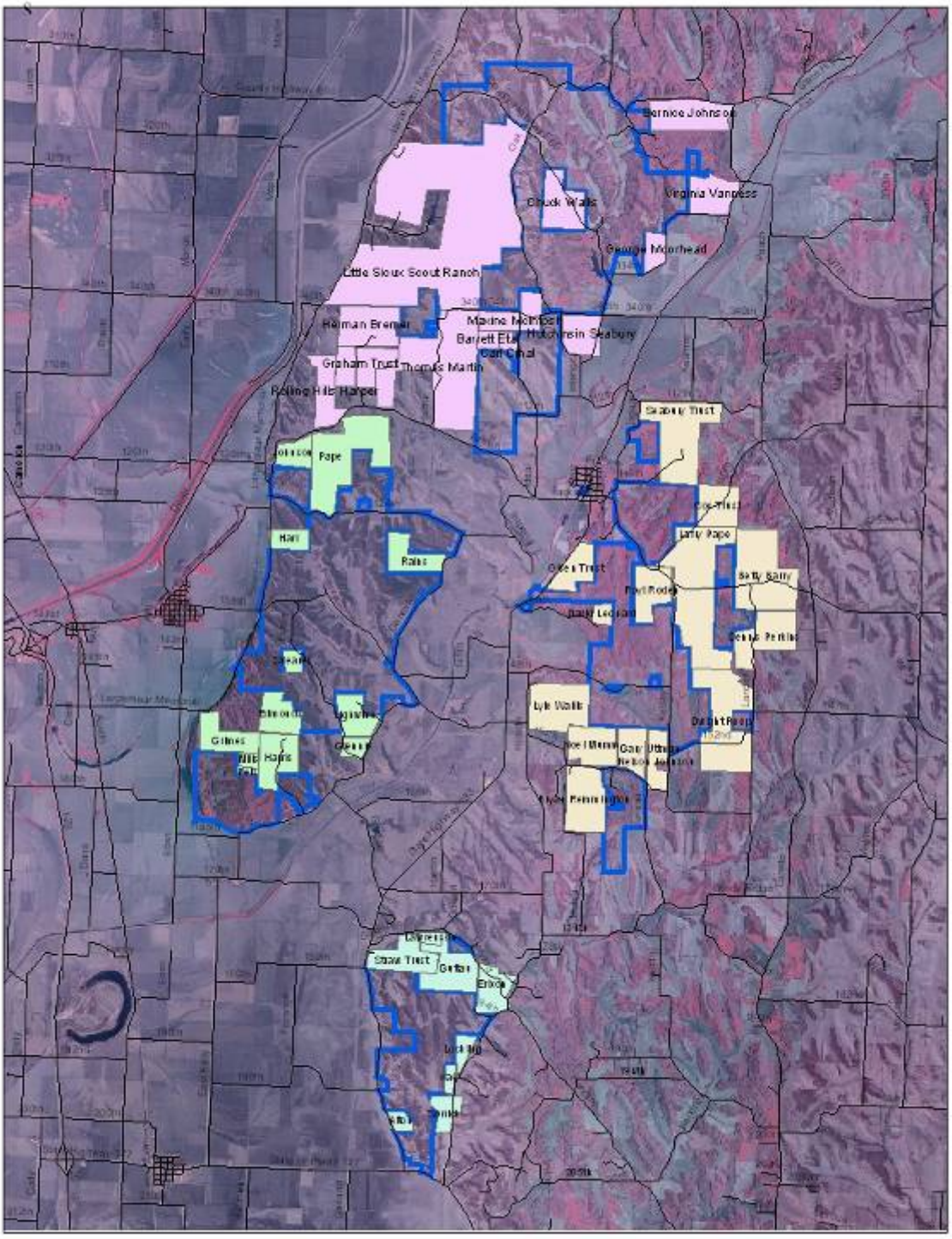
Mondamin Unit

Name	Acres
Jess Alton	40
Don Guttau	156
Delores Kay	30
Rob Lockling	40
Straw Trust	172
Royce Erixon	100
Danneberg	71
Eugene Sorrick	114
Totals	723

Totals Four Units **10,978.00** **Current Rates @ 2,100 / acre =** **$ 23,053,800.00**

These properties all depend on the availability of willing sellers within the acquisition boundaries

Loess HIlls State Forest
Acquisition Priorities



Appendix G

Prairie and Savanna Species Lists

Plant List

Common Name	Scientific Name
Common horesetail	Equisetum arvense L.
Prairie scouring-rush	Equisetum laveigatum A.Br.
Water Hemlock	Cicuta maculata L
Rattlesnake Master	Eryngium yuccifolium Michx.
Golden Alexanders	Zizia aurea (L) W. Koch
Indian Hemp	Apocynum sibiricum Jacq.
Hemp Dogbane	Apocynum cannabinum L.
Common Milkweed	Asclepias syriaca L
Prairie Milkweed	Asclepias sullivantii Engelm.ex Gray
Swamp Milkweed	Asclepias incarnata L
Whorled Milkweed	Asclepias verticillata L
Butterfly Weed	Asclepias tuberosa L.
Green Milkweed	Asclepias viridiflora Raf.
Western Yarrow	Achillea millefolium L
Western Ragweed	Ambrosia psilostachya DC
Pussytoes	Antennaria neglecta Greene
White Sage	Artemisia ludovicianna Nutt.
Tall Wormwood	Artemisia campestris L
Panicled Aster	Aster lanceolatus Willd.
Heath Aster	Aster ericoides L
White Aster	Aster umbellatus Miller
Smooth Blue Aster	Aster laevis L
Sky Blue Aster	Aster azureus Lindley
Silky Aster	Aster sericeus Vent.
Aromatic Aster	Aster oblongifolius Nutt.
New England Aster	Aster novae-angliae L
False Boneset	Brickellia eupatorioides (L) Shinners
Prairie Indian plantain	C tuberosa Nutt.
Field Thistle	Crisium discolor (muhl ex Wild)
Tall thistle	Crisium altissimum (L) Sprengel
Flodmans Thistle	Cirasium flodmanii (Rydb) Arthur
Tickseed	Coreopsis palmata Nutt.
Pale Coneflower	Echinacea pallida Nutt.
Purple coneflower	Echinacea angustifolia
Fleabane	Erigeron strigosus Muhl ed Wild
Sneezweed	Helenium autumnale L
Saw-tooth Sunflower	Helianthus grosseserratus Martens
Prairie sunflower	Helianthus rigidus (Cass.) Desf.
Jerusalem Artichoke	Helianthus tuberosus L
Maximillians Sunflower	Helianthus maximiliani Schrader
Ox-eye	Heliopsis helianthoides (L) Sweet
Golden aster	Chrysopsis villosa Nutt.ex DC
False Dandelion	Krigia biflora (Wlter) Blake
Wild Lettuce	Lactuca canadensis L

Prairie Lettuce	Lactuca ludoviciana (Nutt.) Riddell
Blue Lettuce	L pulchella (Pursh) DC
Prairie Blazing Star	Liatris pycnostachya Michx
Rough Blazing Star	Liatris aspera Michx
Dotted Blazing Star	Liaris puncatata Hooker
Scaly Blazing Star	Liatris squarrosa (L) Michx
Skeleton Weed	Lygodesmia juncea (Pursh) D Don.
Cut-leaved goldenrod	Haplopsppud spinulosus (Pursh) DC
Prairie Dandelion	Agoseris cuspidata (Pursh) Raf.
Rough White Lettuce	Prenanthes aspera Michx
Gray-heaadrd coneflower	Ratibida pinnata (Vent) Barnh.
Thimble weed	Ratibida columnifera (Nutt) Wooton and Standley
Black-Eyed Susan	Rudbeckia hirta L
Sweet coneflower	Rudbeckia subtomentosa Push
Prairie ragwort	Senecio plattensis Nutt
Rosinweed	Silphium integrifolium Michx
Compass Plant	Silphium laciniatum L
Missouri Goldenrod	Solidago missouriensis Nut
Tall Goldenrod	Solidago canadensis L
Showy Goldenrod	Solidago speciosa Nutt
Smooth Goldenrod	Solidago gigantea
Gray Goldenrod	Solidago nemoralis Aiton
Stiff Goldenrod	Solidago rigida L
Ironweed	Vernonia fasciculata Michx
Baldwind Ironweed	Vernonia baldwinii Torrey
Hoary Puccoon	Lithospemum canescens (Michx)
Finged puccoon	Lithospermum incisum Lehm
Hairy puccoon	Lithospermum caroliniense (walter) MacM
False Gromwell	Onosmodium molle Michx
Spring cress	cardamine bulbosa (Schreber) BSP
Little prickly pear	Opuntia humifusa (Raf)
Little Prickley Pear	Opuntia fragilis (Nutt) Haw
Spiked Lobelia	Lobelia spicata Lam
Giant lobelia	Lobelia siphilitica L
Sleepy Catchfly	Silene antirrhina L
Frost Weed	Helianthemum bicknellii Fern
Flowering Spurge	euphorbia corollata L
Toothed sputge	Euphorbia dentata Michx
Spurge	Euphorbia glyptosperma Engelm
Snow-On-The Mountain	Euphorbia marginata Pursh
Fragrant false indigo	Amorpha nana
Lead Plant	Amorpha canescens Pursh
Milk Vetch	Astragalus canadensis L
Ground Plum	Astragalus crassicarpus Nutt.
Milk Vetch	Astragalus lotiflorus Hooker
False indigo	Baptisia bracteata Muhl ex Ell
White wild indigo	Baptissia lactea (Raf) Thieret
Partridge Pea	Chamaecrista fassciculata (Michx)

RattleBox	Crotalaria sagittalis L
Nine Anther Dalea	Dalea enneandra Nutt
Foxtail Dalea	D. alopecuroides Willd
White Prairie Clover	Petalostemon candidum (Wild) Michx
Purple Prairie Clover	Petalostemon purpureum (Vent) Rydb
Prairie mimosa	Desmanthus illinoensis (Michx) MacM
Show tick trefoil	Desmodium canadense (L) DC
Illinois Tick Trefoil	Desmodium illinoense Gray
Wild licorice	Glycyrrhiza lepidota Pursh
March Vetchling	Lathyrus palustris L
Wild Pea	lathyrus venosus Muhl ex Willd
Round-Headed Bush Clover	Lespedeza capitata Michx
Locoweed	Oxytropis lambertii Pursh
Prairie Turnip	Psoralea esculenta Pursh
Silverleaf Scurf-Pea	Pediomelum argophyllum (Pursh)
Trailing Wild Bean	Strophostyles helvula (L) Ell
Wild Bean	Strophostyles leiosperma (T & G) piper
Purple Vetch	Vicia americana Muhl ex Wild
Downy gentian	G puberula Michx
Cranesbill	Geranium carolinianum L
Round-Fruited St. Johns Wort	Hypericum sphaerocarpum Michx
Water Horehound	Lycopus americanus Muhl ex Barton
Horsemint	Monarda fistulosa L
Shelf heal	Prunella vulgaris L
Narrow-Leaved Mt. Mint	Pycnanthemum tenuifolium Schrader
Skullcap	Scutellaria parvula Michx
Wood Sage	Teucrium canadnse L
Wild Flax	Linum sulcatum Riddll
Stiff Flax	Linum rigidum Pursh
Winged Loosestrife	Lythrum alatum Pursh
Wild Four-O-Clock	Mirabilis nyctaginea (Michx) MacM
Hairy Four-O-Clock	Mirabilis hirsuta (Pursh) MacM
Toothed Evening Primerose	Calylophus serrulatus (Nutt) Raaven
Prairie sunrops	oneothera pilosella Raf
Ragged Evening Priemerose	oenothera laciniata Hill
Purple-Leaved-Willow Herb	Epilobium coloratum Biehler
Biennial Gaura	Gaura biennis L
Scarlet Gaura	Gaura coccinea Pursh
Gray Evening Primerose	Oenothera villosa Thunb
Sand Primerose	Oneohera rhombipetala Nutt
Violet wood sorrel	Oxalis violacea L
Plantain	Plantago patagonica Jacq
Prairie Phlox	Phloz pilosa L
Whorled Milkwort	Polygala verticillata L
Pennsylvaina Smartweed	Polygonum pensylvanicum
Fringed Loosestrife	Lysimachia ciliata L
Canada Anemone	Anemone canadensis L
Thimbleweed	Anemone cylindrica Gray

Prairie Larkspur	Delphinium virescens Nutt
Pasque Flower	Pulsatilla patens (L) P Miller
Bristly crowfoot	Ranunculus pensylvanicus L F
Purle Meadow-Rue	Thalictrum dasycapum Fischer & Ave-Lall
Redroot	Ceanothus herbaceus af
New Jersey Tea	Ceanothus americanus L
Wild Strawberry	Fragaria virginiana Duchesne
Tall Cinquefoil	Potentilla arguta Pursh
Prairie Rose	Rosa arkansana Porter
Smooth rose	Rosa blanda Aiton
Pasture rose	Rosa carolina L
Northern bedstraw	Galium poreale L
Wild Madder	Galium obtusum Bigelow
Prairie willow	Salix humilis Marsh
Pussy Willow	Salix discolor Muhl
Basterd Toadflax	Comandra umgellata (L) Nutt
Alumroot	Heuchera richardsonii R Br.
Downy painted cup	Castilleha sessiliflora Pursh
Lousewort	Pedicularis canadensis L
Swamp Lousewort	Pedicularis lanceolata Michx
Large-flowered beardtongue	Penstemon grandiflorus Nutt
Foxglove penstemon	Penstemon digitalis Nutt
Figwort	Scrophularia lanceolata Pursh
Culver Root	Veronicastrum virginicum (L) Farw
Virginia Ground Cherry	Physalis virginiana P Miller
Ground Cherry	Physalis heterophylla Ness
Blue Vervain	Verbena hastata L
Hoary Vervain	Verben stricta Vent
Narrow-Leaved Vervain	Verbena simplex Lehm
White Vervain	Verbena urticifolia L
Prairie Violet	Viola pedatifida G Don
Commom blue violet	V papilionacea Pursh
Yucca	Yucca glauca Nutt ex Fraser
Spiderwort	Tradescantia bracteata Small
Ohio Spiderwort	Tradescantia ohiensis Raf
Slender sedge	Carex lasiocarpa Ehrh
Sedge	Carex gravida Bailey
Sedge	Carex brevior (Dewey) Mack ex Lunell
Sedge	Carex bicknellii Britton
Blue Flag	Viraginica var shrevie (Small)
Blue Eyed Grass	Sisyrinchium campestre Bickn
Wild Onion	Allium canadense L
Wild Prarie Onion	Allium stellatum Nutt ex Ker- Gawl
Yellow Stargrass	Hypoxis hirsuta (L) Cov
Michigan Lily	Lilium michiganense Farw
Bunch-Flower	Veratrum virginicum (L) Ait f
Western prairie finged orchid	Platanthera praeclara Sheviak & Bowles
Nodding ladies-tresses	Spiranthes cernua (L) L C Rich

Western wheatgrass	Agropyron smithii Rydb
Slender Wheatgrass	Agropyron trachycaulum (Link) Malte
Big Bluestem	Andropogon gerardii Vitman
Side-oats grama	Bouteloua Curtipendula (Michx)
Hairy Grama	Bouteloua hirsuta Lag
Blue Grama	Boteloua gracilis (Wild ex HBK)
Bluejoint	Calamagrosits canadensis (Michx)
Sand-Reed-Grass	Calamoavilfa longifolia (Hooker)
Rosette panic grass	Dichanthelium acuminatum (Sw)
Scribners panic grass	Panicum scribnerianum Nash
Wilcox Panic Grass	Panicum wilcoxianum Vasey
Leiberg Panic Grass	Panicum leibergii (Vasey) Scribner
Rosette Panic Grass	Panicum linearifolium Scribner
Canada Wild Rye	Elymus canadensis L
Fescue Grass	Festuca paradoxa Desv.
June Grass	Koeleria macrantha (Ledeb) Schultes
Marsh Muhly	Muhlenbergia raccemosa (Michx) BSP
Plains Muhly	Muhlenergia cuspidata (Torrey) Rydb
Switchgrass	Panicum virgatum L
Reed Canary Grass	Phalaris arundinacea L
Fowl Meadow Grass	Poa palustris L
Little bluestem	Schizachyrium scoparium (Michx)
Indian Grass	Sorghastrum nutans (L) Nash
Cord grass	Spartina pectinata Link
Tall dropseed,rough dropseed	Sporobolus asper (Mihx) Kunth
Prairie Dropseed	Sporobolus heterolepis (Gray) Gray
Porcupine Grass	Stipa spartea Trin
Green Needlegrass	Stipa viridula Trin

Appendix H

Glossary of Forestry Terms

Acre: An area of land containing 43,560 square feet, roughly the size of a football field, or a square that is 208 feet on a side. A “forty” of land contains 40 acres and a “section” of land contains 640 acres.

All-aged: An uneven-aged stand that represents all ages or age classes from seedlings to mature trees.

Annual ring: Trees in climates where growths stops or slows during portion of the year will form annual rings which can be read to determine tree age and growth. The science of dendrochronology studies tree rings to infer knowledge about past climatic conditions, based on the fact that trees will form wider annual rings during seasons when growing conditions are favorable and narrow rings when not. Annual rings are highly visible in species that form less dense wood during favorable growing conditions early in the season and denser wood less favorable conditions later in the year. In some tree species this differentiation does not occur and annual rings are difficult to see. In tropical species, growth never, or seldom, ceases and annual rings may not be apparent.

Bark: The outer layer of the stems, limbs and twigs of woody plants. Often bark is characteristic of the species and can be used for identification.

Basal area: The cross sectional area of the base of any object. In forestry it means the cross sectional area of a tree at a point 4.5 feet above the ground line expressed in square feet. The sum of all the trees on an acre is a measure of the density of the population of trees growing on the acre and is useful for making forest management decisions. A helpful way to think of basal area is to imagine all the trees on an acre cut off with 4.5 foot stumps. Basal area on the acre could be measured by measuring and totaling the cross sectional area of all stumps. Fortunately, it is not necessary to cut trees to measure basal area. It can be calculated from tree diameter or can be easily measured with an angle gauge when certain relationships are known. Basal area will commonly range from 20 to 70 square feet per acre for poorly stocked stands to more than 200 square feet per acre for dense stands of conifers.

Biodiversity (biological diversity): The variety and abundance of species, their genetic composition, and the communities and landscapes in which they occur, including the ecological structures, functions, and processes occurring at all of these levels.

Board foot: A unit of measure wood 1” thick and 1 foot on each side equaling 1/12 cubic foot of wood. In practice, a board foot seldom contains 1/12 of a cubic foot due to loss from surfacing such as planning and sanding .For example, an 8 foot 2x4 would be said to have 5 and 1/3 board feet, but would actually be more like 4.08 board feet after losses from surfacing.

Bole: The stem or trunk of a tree; usually thought of as being that part without limbs, the merchantable part of the stem, the bottom part of the stem

Canker: An imperfection on the trunk, limb or twig of a tree caused by an organism that kills a part of the tree’s tissue. Canker causing organisms sometimes exist in some sort of a balance with the host, never killing enough tissue to cause death. Cankers tend to weaken trees to eventually break.

Clearcut: A method of regenerating a forest in which all trees on a given area are cut. Clearcutting results in conditions which allow the greatest amount of sunlight to reach the forest floor, a desirable condition for the re-growth of certain valuable tree species which need a lot of sunlight to grow, such as oaks and walnut. Clearcutting also confers certain benefits for many wildlife species.

Competition: The struggle between trees to obtain sunlight, nutrients, water, and growing space. Every part of the tree, from the roots to the crown, competes for space and food.

Conversion: A change though forest management from one tree species to another within a forest stand or site.

Coppice: All trees in the previous stand are cut and the majority of regeneration is from sprouts or roots suckers. Coppice selection-only selected stems of merchantable size are cut at each felling, giving uneven-aged stands. Coppice with reserves- reserve trees are retained to attain goals other than regeneration.

Cord: A unit of measure of wood that is equivalent to a pile of round wood 4 feet wide, 8 feet long and 4 feet high. A cord contains 128 cubic feet of wood and space.

Cover type: Expressed as the tree species having the greatest in a forest stand. A stand where the major species is oak would be called an oak cover type.

Crop: The vegetation growing on a forest area, more particularly the major woody growth having commercial value.

Crop tree release: Natural stands of trees start out with thousands of trees per acre. Planted stands may contain 500 to 1500 trees per acre. At maturity, due to constraints of space, nutrient availability and the increased size of individual trees, there can be only 50 to 70 trees per acre. Crop tree release is the practice of selecting the individual trees that are to remain in the stand until maturity and then removing the trees competing with them. Crop trees could be selected on the basis of any of the values associated with trees such as aesthetics or wildlife values, but are almost always selected on an economic basis. In Iowa selected trees would mostly likely consist of walnut and red and white oak. Selected trees would be straight with long, clear boles and would be the trees bringing the best dollar return upon maturity.

Crown: Refers to that part of the tree consisting of limbs, branches, twigs and leaves; in other words, the top of the tree.

Cruise: A survey of forest land to locate timber and estimate its quantity by species, products, size, quality, or other characteristics.

Cubic foot: A wood wolume measurement. A cubic foot of wood contains approxim ately six to 10 usable board feet of wood. A cord of wood equals 128 cubic feet.

Cull: Refers to a tree having no commercial value, usually from having rot, holes, large knots or being crooked rather than from being too small or of a non-merchantable species. It is important to note that a cull, though having no commercial value may have wildlife, aesthetic or other value.

Cultural practice: The manipulation of vegetation to meet objectives of controlling stand composition or structure, such as site improvement, forest tree improvement, increased regeneration, increased growth, or measures to control insects or disease.

D.B.H.: Stands for diameter at breast high. Always taken as 4.5 feet above the ground, that being a convenient height at which to measure a tree's diameter. For trees on a slope, dbh is taken at 4.5 feet from the ground on one of the two sides of the tree that is at right angles to the direction of slope.

Defect: An imperfection in a tree making it less desirable for some purpose. The term is commonly used to refer to some imperfection that will reduce the value of a tree or log for a product, resulting in reduced monetary value.

Den tree: A tree that has a hole in its stem that can be used as shelter by wildlife such as birds and mammals.

Disturbance: Any event, either natural or human induced, that alters the structure, composition, or functions of an ecosystem. Examples include forest fires, insect infestation, windstorms, and timber harvesting

Dominant (trees): individuals or species of the upper layer of the forest canopy.

Early successional forest: The forest community that develops immediately following the removal or destruction of vegetation in an area. Plant succession is the progression of plants from bare ground (e.g., after a forest fire or imber harvest) to mature forest consisting primarily of long-lived species such as sugar maple and white pine. Succession consists of a gradual change of plant and animal communities ove time. Early ssuccession forests commonly depend on and develop first following disturbance eevents (e.g. fire, windstorm, or timber havest). Examples of early successional forest tree species are asspen, paper birch,and jack pine. Each stage of succession provides different benefits benefits for a variety of species.

Endangered species: A plant or animal species that is threatened with extinction throughout all or a significant portion of its native range.

Even-aged stand: A stand of trees composed of a single age class.

Floodplain Forest: Characterized by species such as silver maple, cottonwood, walnut, green ash, elm, hackberry and willows. This habitat factor will benefit wildlife such as songbirds and woodpeckers, furbearers, raptors, reptiles and amphibians on relatively level areas inundated by water periodically.

Forest: A forest is an ecosystem, an association of plants and animals. Trees are its dominant feature. They provide many of the benefits of forests like habitat, quality water, recreation, climatic amelioration and wood products. The plants and animals that make up a forest are inter-dependent and often essential to its integrity.

Forester: A professional engaged in the science and profession of forestry- note foresters are commonly credentialed by states or other certifying bodies, e.g., the Society of American Foresters, and may be licensed, certified, or registered indicating specific education and abilities; the requirements for credentialing differ and usually include earning a baccalaureate degree in forestry, sometimes equivalent experience, and usually passing a comprehensive examination.

Forest cover: All trees and other plants occupying the ground in a forest, including any ground cover.

Forest fire: An uncontrolled fire on lands covered wholly or in part by timber, brush, grass, grain, or other flammable vegetation.

Forest floor: The accumulated organic matter at the soil surface, including litter and unincorporated humus.

Forest inventory: A set of objective sampling methods designed to quantify the spatial distribution, composition, and rates of change of forest parameters within specified levels of precision for the purposes of management. The listing (enumeration) of data from such a survey- synonym cruise, forest survey- note inventories may be made of all forest resources including trees and other vegetation, fish, insects, and wildlife, as well as street trees and urban forest trees- see dynamic sampling, point sampling

Forest management: The practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization, and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest. Forest management includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, and other forest resource values.

Forest stand – A stand may loosely be defined as a contiguous group of trees sufficiently uniform in species composition, arrangement of age classes and general condition to be a homogeneous and distinguishable unit. A stand is usually treated as a basic silvicultural unit, but it seldom represents a natural ecological unit. Its composition and structure are most strongly affected by management, other disturbances and chance factors affecting seed distribution, germination and seedling survival.

Forest Stand Improvement: A practice in which the quality of a residual forest stand is improved by removing less desirable trees and large shrubs to achieve the desired stocking of the best quality trees or o improve the reproduction, composition, structure, condition, and volume growth of a stand.

Fully-stocked stand: A forest stand in which all growing space is effectively occupied but having ample space for development of the crop trees.

Game species: In this plan, game species include those terrestrial species that are hunted and trapped.

Gap: The space occurring in forest stands due to individual tree or groups of trees mortality or blown down. Gap management uses timber harvest methods to emulate his type of forest spatial pattern.

Geographic information system (GIS): Computer software used to manipulate, analyze, and visually display inventory and other data and prepare maps of the same data.

Group selection: A process of harvesting patches of selected trees to create openings in the forest canopy and to encourage reproduction of uneven-aged stands.

Hardwood: Hardwood as opposed to softwood is a relative term. Hardwoods are generally defined as the woods of deciduous trees, i.e., trees which shed their leaves in the winter.

Harvesting vs. silvicultural treatment: The meanings of these two terms are often confused by lay people and sometimes by professionals. Many silvicultural treatments involve harvesting, but not all harvesting is silvicultural treatment. Harvesting is a silvicultural treatment. Harvesting is a silvicultural treatment when its purpose is to shape the residual stand or to affect regeneration. Often the two purposes are accomplished simultaneously. Of course, harvesting can be done simply to remove an existing crop, but this is not management and therefore the operation cannot be called a silvicultural treatment.

Landform: Any physical, recognizable form or feature of the earth's surface having a characteristic shape and produced by natural causes. Examples of major landforms are plains, plateaus, and mountains. Examples of minor landforms are ills, valleys, slopes, eskers, and dunes. Together, landforms make up the surface configuration of the earth.

Landscape: A general term referring to geographic areas that are usually based on some sort of natural feature or combination of natural features. They can range in scale from very large to very small.

Leave trees: Live trees selected to remain on a site to provide present and future benefits, such as shelter, resting sites, cavities, perches, nest sites, foraging sites, mast, and coarse woody debris.

Management goals: Overall purpose for controlling (managing) the composition and structure of forest land. For example, to protect land from erosion, to maintain wildlife habitat, to grow wood for profit, etc.

Management objectives: Defined conditions for the property, or segments of property(e.g. stands or management units), that will achieve management goals. For example, maintenance of continuous forest cover may be the only objective if watershed protection is the primary goal. Another objective may be to grow tree species with highest yields in order to maximize returns from wood production.

Management plan: A plan outlining the objectives for individual management units and describing steps for achieving them. Silvicultural procedures are identified in broad terms, but detailed prescriptions are developed in the field.

Mast: Nuts, seeds, catkins, flower buds, and fruits of woody plants that provide food for wildlife.

Mature tree: A tree that has reached the desired size or age for its intended use. Size or age will vary considerably depending on the species and the intended use.

Merchantable timber: Trees or stands having the size, quality, and condition suitable for marketing under a given economic condition, even if not immediately accessible for logging.

Mesic: Moderately moist.

Multiple use: Using and managing a forested area to provide more than one benefit simultaneously. Common uses may include wildlife, timber, recreation, and water.

Native plant community: A group of native plants that interact with each other and with its environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of native plants form recognizable units, such as an oak forest, prairie, or marsh that tend to reoccur over space and time. Native plants communities are classified and described by physiognomy, hydrology, landforms, soils, and natural disturbance regimes (e.g., wild fires, wind storms, normal flood cycles).

Natural disturbances: Disruption of existing conditions by natural events such as wildfires, windstorms, droughts, flooding, insects, and disease.

Natural regeneration: The growth of new trees from one of the following ways: (a) seeds naturally dropped from trees or carried by wind or animals, (b) seeds stored on the forest floor, or(c) stumps that sprout or roots that sucker.

Non-forest land: Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses such as crops, improved pasture, residential areas, city parks, improved roads, and power line clearings.

Non-game species: In this plan, nongame species include amphibians, reptiles, and those mammal and bird species that are not hunted or trapped.

Old-growth forests: Forests defined by age, structural characteristics**,** and relative lack of human disturbance. These forests are essentially free from catastrophic disturbances, contain old trees (generally over 120 years old), large snags, and downed trees.

Overstory: The canopy in a stand of trees.

Plantation: A stand composed primarily of trees established by planting or artificial seeding.

Pole or pole timber: A young tree or stand of young trees between 3.5 inches and 12.9 inches in diameter at a point 4.5 feet above the ground. In referring to a stand of trees the upper limit holds, however, when referring to processed round wood, pieces larger than 12.9 inches in diameter could be correctly referred to as poles.

Prairie: An extensive tract of level or rolling land that was originally treeless and grass covered. A prairie is generally characterized by deep fertile soil.

Prescribed burn: To deliberately burn wild lands in either their natural or their modified state under specified environmental conditions, which allows the fire to be confined to a predetermine

area and produces the fire line intensity and spread required to attain planned resource management objectives.

Pruning: The practice of removing tree limbs so that a straight, bole, free of limbs, will develop. Several years after pruning the resulting wound will have grown over and the wood that grows over the site of the former branch will be clear, that is knot free. Pruning is a component of FSI.

Recreation: Leisure activities involving the enjoyment and use of natural resources. This habitat factor will favor hunting activities while taking into consideration secondary activities such as wildlife watching, mushroom picking, photography, and hiking.

Recreation facility: The improvements within a developed recreation site offered for visitor's enjoyment.

Regeneration: The act of renewing tree cover by establishing generation usually maintaining the same forest type forest was removed. Regeneration may be artificial(direct seeding or planting) or natural (natural seeding, or planting).

Release (release operation): A treatment designed to free young trees from undesirable, usually over topping, competing vegetation.

Restoration: A new planting of seedlings, direct seeding, or regeneration of roots. This habitat factor will create new habitat that will be of higher quality for wildlife.

Riparian: Related to, living, or located in conjunction with a wetland, on the bank of a river or stream but also at the edge of a lake.

Riparian Buffer- Woodland next to streams, lakes and wetlands that is managed to enhance and protect aquatic resources from adjacent fields. This habitat factor will provide a woody cover buffer to enhance soil and water conservation while providing wildlife habitat.

Rotation age: The period of years between when a forest stand (i.e., primarily even-aged) is established (i.e., regeneration) and when it receives its final harvest. This time period is an administrative decision based on economics, site conditions, growth rates, and other factors.

Round wood. Wood products that are used in their original form, only being cut to length. Includes firewood, posts, and pulpwood and similar products.

Salvage cut: A harvest made to remove trees killed or damaged by fire, wind, insects, disease, or other agents. The purpose of salvage cuts is to use available wood fiber before further deterioration occurs to recover value that otherwise would be lost.

Sanitation cut: A cutting made to remove trees killed or injured by fire, insects, disease, or other injurious agents (and sometimes trees susceptible to such injuries).

Sapling: A young tree larger than a seeding but smaller than a pole. When a tree has grown to a diameter of a 3.5 inches in diameter at a point 4.5 feet above the ground it is no longer a sapling, having become a pole.

Sapwood. That wood found closest to the bark or outside of the bole and usually distinguished from heart wood by being lighter in color.

Savanna: Natural grassland, generally with a scattering of trees or shrubs.

Saw log: A log large enough to produce lumber or other products that can be sawed. Its size and quality vary with the utilization practices of the region.

Sawtimber: Trees that yield logs suitable in size and quality for the production of lumber.

Scarify: To break up the forest floor and topsoil preparatory to natural regeneration or direct seeding.

Seedling: A baby plant. In forestry the term usually used to refer to young trees that have grown beyond the stage where they have just emerged from the soil up to the point that they become saplings.

Seed tree: Any tree that bears seed; specifically, a tree left standing to provide the seed for natural regeneration.

Seed tree method: The harvest of all trees except for a small number of widely dispersed trees retained for seed production and to produce a new age class. Seed trees are usually removed after regeneration is established.

Selective harvest: Removal of single scattered trees or small groups of trees at relatively short intervals. The continuous establishment of reproduction is encouraged and an all-aged stand is maintained. A management option used for shade-tolerant species.

Selection harvest: A method of harvesting whereby individual trees are selected for harvest. A characteristic is that the form and appearance of the forest is maintained and the site is not exposed to sunlight and weathering. This scheme favors a tree species which tolerate shading such as maple and basswood. It also benefits certain wildlife species.

Shade tolerance: Relative ability of a tree species to reproduce and grow under shade. The capacity to withstand low-light intensities caused by shading from surrounding vegetation. Tolerant species tolerate shade, while intolerant species require full sunlight.

Shelterwood: A method of regenerating a forest whereby a portion of the stand is harvested and the rest of the stand is evenly distributed over the area to protect the site and provide seed to reseed the area. After the new stand is well established, the residual trees are harvested. This method is used to regenerate species not tolerate of shading.

Shelterwood harvest: A harvest cutting in which trees in the harvest area are removed in a series of two or more cuttings to allow the establishment and early growth of new seedlings under partial shade and protection of older trees. Produces an even-aged forest.

Silvics: The study of the life history and general characteristics of forest trees and stands, with particular reference to environmental factors, as basis for the practice of silviculture.

Silviculture: The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

Silvicultural prescription: Specific steps prescribed to achieve specific management objectives. Examples: If the management objectives is to maintain an oak component in a mixed stand, the silvicultural prescription may include opening up the forest canopy to initiate the establishment of seedlings of shade-intolerant oaks. If undesirable species are dominating the canopy and a desirable species is becoming in the understory, the silvicultural prescription may be to remove over story trees to release the suppressed species. Thinning and planting are other examples

Single tree selection: individual trees of all sizes classes are removed more or less uniformly throughout the stand, to promote growth of remaining trees and to provide space for regeneration-synonym individual tree selection.

Site index: A measure of the productive quality of an area where trees grow. Site index is based on the height of dominant and co-dominate trees at age 50. That is to say, if the average height of dominant and co- dominate trees on a site was 70 feet at age 50, 70 would be the site index. Graphs are developed to enable determination of site index over a range of tree ages.

Site potential: Collective physical resources (e.g., soil moisture, nutrients, light, heat) available for plant growth. Different potentials facilitate growth of some species and limit growth of others. Consequently, site potential has a strong effect on plant community development.

Slash: The non-utilized and generally unmarketable accumulation of woody material in the forest, such as limbs, tops, cull logs, and stumps that remain in the forest as residue after timber harvesting.

Snag. A snag tree is a dead tree; commonly a tall, limbless tree left a logging operation. Though of little or no commercial value, they can be very valuable wildlife resources.

Softwood. Generally considered to be the wood of conifers, although the wood of some conifers is harder than some hardwoods. See the definition of hardwood for a further explanation.

Stand: a contiguous group of trees similar in age, species composition, and structure, and growing on a site of similar quality, to be a distinguished forest unit. One stand will usually have characteristics that will distinguish it from other stands. Difference could be species, average diameter , density and location.

Stumpage: According to Webster, the value of standing timber. Also, the timber itself or the right to cut it.

Succession: The natural replacement, over time, of one plant community with another.

Sucker: A shoot rising from below ground level from a root. Aspen regenerates from suckers.

Suppressed: The condition of a tree characterized by low growth rate and low vigor due to competition from overtopping trees or shrubs.

Sustainability: Protecting and restoring he natural environment while enhancing economic opportunity and community well-being. Sustainability addresses three related elements: the environment, the economy, and the community. The goal is to maintain all three elements in a healthy state indefinitely. Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Thinning: A silvicultural treatment made to reduce the density of trees within a forest stand primarily to improve growth, enhance forest health, or recover potential mortality. Row thinning is where selected rows are harvested, usually the first thinning, which provides equipment operating room for future selective thinning. Selective thinning is where individual trees are marked or specified (e.g., by diameter, spacing, or quality) for harvest. Commercial thinning is thinning after the trees are of merchantable size for timber markets. Pre-commercial thinning is done before the trees reach merchantable size, usually done in overstocked (very high stems per acre) stands to provide more growing space for crop trees that will be harvested in future years.

Threatened species: A plant or animal species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Tolerance (shade tolerance): A plant's ability to tolerate conditions under a forest canopy. Normally thought of as tolerance to low light conditions, but other understory conditions, such as root competition for water and nutrients, are also factors.

Two-aged stand: A stand with trees of two distinct age class separated in age by more than 20 percent of the rotation age.

Under plant: The planting of seedlings under an existing canopy or over story.

Under-stocked: A stand of trees so widely spaced that even with full growth potential realized, crown closure will not occur.

Under-story: The shorter vegetation (shrubs, seedlings, saplings, small trees) within a forest stand that forms a layer between the over-story and the herbaceous plants of the forest floor.
Uneven-aged stand: A stand with trees of three or more distinct age classes, either intimately mixed or in small groups.

Uneven-aged management: A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes. Uneven-aged (selection) methods will maintain a multi-aged structure by removing some trees in all sizes classes either singly, in small groups, or in strips-synonym all-aged methods

Viewshed: A physiographic area composed of land, water biotic and cultural elements which may be viewed from one or more viewpoints and which has inherent scenic qualities and/ or aesthetic values as determined by those who view it. Viewshed's are a habitat factor that will be primarily a "hands-off" area for aesthetics, proper soil and water conservation, along with providing special wildlife habitats.

Volume: Refers to the amount of wood in a tree or log. Expressed as board feet, cords or other measures.

Well-stocked: The situation in which a forest stand contains trees spaced widely enough to prevent competition yet closely enough to utilize the entire site.

Wolf tree: A generally predominant tree with a broad, spreading crown that occupies more growing space than its more desirable neighbors.

Woodland: A plant community in which, in contrast to a typical forest, the trees are often small, characteristically short-boled relative to their crown depth, and forming only an open canopy with intervening area occupied by lower vegetation, commonly grass.

Woodland edge: An area of habitat transition that consists of vegetation (herbaceous and woody) of different heights and densities. This habitat factor will favor early successional vegetation for wildlife benefiting from edge cover.

Appendix I

Threatened and Endangered Species

Threatened and Endangered Species

Forests and prairies are either full-time or part-time homes to many threatened and endangered species and species of concern. The lakes, streams and rivers that are contained or flow through these state lands are home to additional species. Maintaining or enhancing the habitat for protected species is always a concern and management activities are modified to address concerns. For example, while managing for the continuation of prairies may require periodic burning, not all the acres in an area are burned at the same time. Additionally, harvesting is generally conducted during the winter when disturbance to plant and animal species is minimized.

Areas are checked for known occurrences of protected or special species. When warranted, a specialist will conduct a site visit in the spring and summer. This information is then added to the growing database of knowledge.

"Endangered species" means any species of fish, plant life, or wildlife which is in danger of extinction throughout all or a significant part of its range.
"Threatened species" means any species which is likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range.
"Special concern species" means any species about which problems of status or distribution are suspected, but not documented, and for which no special protection is afforded under state rules.

The following is a list of currently known species across the state. Some may be found on the Loess Hills State Forest. All are equally important and are accommodated when known to exist on a Forest, or if the correct habitat is present for them to exist.

The vastness of this list is not indicative of mismanagement. It is important to note that many species on this list are rare because: a) they are at the edge of their range (i.e.: desert species in Western Iowa) or their habitat requirements are so specific that their needs can only be met in a few areas.

Endangered animal species:

COMMON NAME	SCIENTIFIC NAME
Mammals	
Indiana Bat	Myotis sodalis
Plains Pocket Mouse	Perognathus flavescens
Red-backed Vole	Clethrionomys gapperi
Spotted Skunk	Spilogale putorius
Birds	
Red-shouldered Hawk	Buteo lineatus
Northern Harrier	Circus cyaneus
Peregrine Falcon	Falco peregrinus
Piping Plover	Charadrius melodus
Common Barn Owl	Tyto alba
Least Tern	Sterna antillarum
Bald Eagle	Haliaeetus leucocephalus
King Rail	Rallus elegans
Short-eared Owl	Asio flammeus

Fish

Lake Sturgeon	Acipenser fulvescens
Pallid Sturgeon	Scaphirhynchus albus
Pugnose Shiner	Notropis anogenus
Weed Shiner	Notropis texanus
Pearl Dace	Semotilus margarita
Freckled Madtom	Noturus nocturnus
Bluntnose Darter	Etheostoma chlorosomum
Least Darter	Etheostoma microperca

Reptiles

Yellow Mud Turtle	Kinosternon flavescens
Wood Turtle	Clemmys insculpta
Great Plains Skink	Eumeces obsoletus
Copperbelly Water Snake	Nerodia erythrogaster neglecta
Western Hognose Snake	Heterodon nasicus
Copperhead	Agkistrodon contortrix
Prairie Rattlesnake	Crotalus viridis
Massasauga Rattlesnake	Sistrurus catenatus

Amphibians

Blue-spotted Salamander	Ambystoma laterale
Crawfish Frog	Rana areolata

Butterflies

Dakota Skipper	Hesperia dacotae
Ringlet	Coenonympha tullia

Land Snails

Iowa Pleistocene Snail	Discus macclintocki
Minnesota Pleistocene Ambersnail	Novisuccinea new species A
Iowa Pleistocene Ambersnail	Novisuccinea new species B
Frigid Ambersnail	Catinella gelida
Briarton Pleistocene Vertigo	Vertigo briarensis
Bluff Vertigo	Vertigo meramecensis
Iowa Pleistocene Vertigo	Vertigo new species

Fresh Water Mussels

Spectacle Case	Cumberlandia monodonta
Slippershell	Alasmidonta viridis
Buckhorn	Tritogonia verrucosa
Ozark Pigtoe	Fusconaia ozarkensis
Bullhead	Plethobasus cyphyus
Ohio River Pigtoe	Pleurobema sintoxia
Slough Sandshell	Lampsilis teres
Yellow Sandshell	Lampsilis teres anodontoides
Higgin's-eye Pearly Mussel	Lampsilis higginsi

Threatened animal species:

Mammals	
Least Shrew	Cryptotis parva
Southern Bog Lemming	Synaptomys cooperi
Birds	
Long-eared Owl	Asio otus
Henslow's Sparrow	Ammodramus henslowii
Fish	
Chestnut Lamprey	Ichthyomyzon castaneus
American Brook Lamprey	Lampetra appendix
Grass Pickerel	Esox americanus
Blacknose Shiner	Notropis heterolepis
Topeka Shiner	Notropis topeka
Western Sand Darter	Ammocrypta clara
Black Redhorse	Moxostoma duquesnei
Burbot	Lota lota
Orangethroat Darter	Etheostoma spectabile
Reptiles	
Slender Glass Lizard	Ophisaurus attenuatus
Common Musk Turtle	Sternotherus odoratus
Blanding's Turtle	Emydoidea blandingii
Ornate Box Turtle	Terrapene ornata
Diamondback Water Snake	Nerodia rhombifera
Western Worm Snake	Carphophis amoenus vermis
Speckled Kingsnake	Lampropeltis getulus
Amphibians	
Mudpuppy	Necturus maculosus
Central Newt	Notophthalmus viridescens
Butterflies	
Powesheik Skipperling	Oarisma powesheik
Byssus Skipper	Problema byssus
Mulberry Wing	Poanes massasoit
Silvery Blue	Glaucopsyche lygdamus
Baltimore	Euphydryas phaeton
Snails	
Midwest Pleistocene Vertigo	Vertigo hubrichti
Occult Vertigo	Vertigo occulta
Fresh Water Mussels	
Cylinder	Anodontoides ferussacianus
Strange Floater	Strophitus undulatus
Creek Heelsplitter	Lasmigona compressa
Purple Pimpleback	Cyclonaias tuberculata
Butterfly	Ellipsaria lineolata
Ellipse	Venustaconcha ellipsiformis

Special concern animal species:

Mammals

Southern Flying Squirrel	Glaucomys volans

Birds

Forester's Tern	Sterna forsteri
Black Tern	Chlidonias niger

Fish

Pugnose Minnow	Notropis emiliae
Pirate Perch	Aphredoderus sayanus

Reptiles

Smooth Green Snake	Opheodrys vernalis
Bullsnake	Pituophis catenifer sayi

Butterflies

Dreamy Duskywing	Erynnis icelus
Sleepy Duskywing	Erynnis brizo
Columbine Duskywing	Erynnis lucilius
Wild Indigo Duskywing	Erynnis baptisiae
Ottoe Skipper	Hesperia ottoe
Leonardus Skipper	Hesperia l. leonardus
Pawnee Skipper	Hesperia leonardus pawnee
Beardgrass Skipper	Atrytone arogos
Zabulon Skipper	Poanes zabulon
Broad-winged Skipper	Poanes viator
Sedge Skipper	Euphyes dion
Two-spotted Skipper	Euphyes bimacula
Dusted Skipper	Atrytonopsis hianna
Salt-and-pepper Skipper	Amblyscirtes hegon
Pipevine Swallowtail	Battus philenor
Zebra Swallowtail	Eurytides marcellus
Olympia White	Euchloe olympia
Purplish Copper	Lycaena helloides
Acadian Hairstreak	Satyrium acadicum
Edward's Hairstreak	Satyrium edwardsii
Hickory Hairstreak	Satyrium caryaevorum
Striped Hairstreak	Satyrium liparops
Swamp Metalmark	Calephelis mutica
Regal Fritillary	Speyeria idalia
Baltimore	Euphydryas phaeton ozarkae

Endangered, threatened, and special concern plants. The natural resource commission, in consultation with scientists with special knowledge and experience, determined the following plant species to be endangered, threatened, or of special concern in Iowa.

Endangered plant species:

COMMON NAME	SCIENTIFIC NAME
Pale false foxglove	Agalinus skinneriana
Blue giant-hyssop	Agastache foeniculum
Bearberry	Arctostaphylos uva-ursi
Black chokeberry	Aronia melanocarpa
Eared milkweed	Asclepias engelmanniana
Mead's milkweed	Asclepias meadii
Narrow-leaved milkweed	Asclepias stenophylla
Ricebutton aster	Aster dumosus
Large-leaved aster	Aster macrophyllus
Schreber's aster	Aster schreberi
Fern-leaved false foxglove	Aureolaria pedicularia
Matricary grape fern	otrychium matricariifolium
Poppy mallow	Callirhoe triangulata
Cordroot sedge	Carex chordorrhiza
Large-bracted corydalis	Corydalis curvisiliqua
Silky prairie-clover	Dalea villosa
Swamp-loosestrife	Decodon verticillatus
Northern panic-grass	Dichanthelium boreale
Roundleaved sundew	Drosera rotundifolia
False mermaid	Floerkea proserpinacoides
Bog bedstraw	Galium labradoricum
Povertygrass	Hudsonia tomentosa
Northern St. Johnswort	Hypericum boreale
Pineweed	Hypericum gentianoides
Winterberry	Ilex verticillata
Black-based quillwort	Isoetes melanopoda
Water-willow	Justicia americana
Dwarf dandelion	Krigia virginica
Cleft conobea	Leucospora multifida
Whiskbroom parsley	Lomatium foeniculaceum
Running clubmoss	Lycopodium clavatum
Bog clubmoss	Lycopodium inundatum
Annual skeletonweed	Lygodesmia rostrata
Water marigold	Megalodonta beckii
Northern lungwort	Mertensia paniculata
Bigroot pricklypear	Opuntia macrorhiza
Clustered broomrape	Orobanche fasciculata
Ricegrass	Oryzopsis pungens
Cinnamon fern	Osmunda cinnamomea
Purple cliffbrake	Pellaea atropurpurea
Arrow arum	Peltandra virginica

Pale green orchid	Platanthera flava
Eastern prairie fringed orchid	Platanthera leucophaea
Clammyweed	Polansia jamesii
Crossleaf milkwort	Polygala cruciata
Purple milkwort	Polygala polygama
Jointweed	Polygonella articulata
Douglas' knotweed	Polygonum douglasii
Three-toothed cinquefoil	Potentilla tridentata
Canada plum	Prunus nigra
Frenchgrass	Psoralea onobrychis
Pink shinleaf	Pyrola asarifolia
Prickly rose	Rosa acicularis
Meadow spikemoss	Selaginella eclipes
Rough-leaved goldenrod	Solidago patula
Bog goldenrod	Solidago uliginosa
Yellow-lipped ladies-tresses	Spiranthes lucida
Pickering morning-glory	Stylisma pickeringii
Rough-seeded fameflower	Talinum rugospermum
Waxy meadowrue	Thalictrum revolutum
Long beechfern	Thelypteris phegopteris
Large-leaved violet	Viola incognita
Rusty woodsia	Woodsia ilvensis
Yellow-eyed grass	Xyris torta

Threatened plant species:

Northern wild monkshood	Aconitum noveboracense
Round-stemmed false foxglove	Agalinus gattingerii
Nodding wild onion	Allium cernuum
Fragrant false indigo	Amorpha nana
Virginia snakeroot	Aristolochia serpentaria
Woolly milkweed	Asclepias lanuginosa
Showy milkweed	Asclepias speciosa
Forked aster	Aster furcatus
Rush aster	Aster junciformis
Flax-leaved aster	Aster linariifolius
Water parsnip	Berula erecta
Kittentails	Besseya bullii
Bog birch	Betula pumila
Pagoda plant	Blephilia ciliata
Leathery grapefern	Botrychium multifidum
Little grapefern	Botrychium simplex
Sweet Indian-plantain	Cacalia suaveolens
Poppy mallow	Callirhoe alcaeoides
Pipsissewa	Chimaphila umbellata
Golden saxifrage	Chrysosplenium iowense
Dayflower	Commelina erecta

Spotted coralroot	Corallorhiza maculata
Bunchberry	Cornus canadensis
Golden corydalis	Corydalis aurea
Pink corydalis	Corydalis sempervirens
Showy lady's-slipper	Cypripedium reginae
Slim-leaved panic-grass	Dichanthelium linearifolium
Jeweled shooting star	Dodecatheon amethystinum
Glandular wood fern	Dryopteris intermedia
Marginal shield fern	Dryopteris marginalis
Woodland horsetail	Equisetum sylvaticum
Slender cottongrass	Eriophorum gracile
Yellow trout lily	Erythronium americanum
Queen of the prairie	Filipendula rubra
Blue ash	Fraxinus quadrangulata
Black huckleberry	Gaylussacia baccata
Oak fern	Gymnocarpium dryopteris
Green violet	Hybanthus concolor
Twinleaf	Jeffersonia diphylla
Creeping juniper	Juniperus horizontalis
Intermediate pinweed	Lechea intermedia
Hairy pinweed	Lechea villosa
Prairie bush clover	Lespedeza leptostachya
Twinflower	Linnaea borealis
Western parsley	Lomatium orientale
Wild lupine	Lupinus perennis
Tree clubmoss	Lycopodium dendroideum
Rock clubmoss	Lycopodium porophilum
Hairy waterclover	Marsilea vestita
Bog buckbean	Menyanthes trifoliata
Winged monkeyflower	Mimulus alatus
Yellow monkeyflower	Mimulus glabratus
Partridge berry	Mitchella repens
Pinesap	Monotropa hypopithys
Small sundrops	Oenothera perennis
Little pricklypear	Opuntia fragilis
Royal fern	Osmunda regalis
Philadelphia panic-grass	Panicum philadelphicum
Slender beardtongue	Penstemon gracilis
Hooker's orchid	Platanthera hookeri
Northern bog orchid	Platanthera hyperborea
Western prairie fringed orchid	Platanthera praeclara
Purple fringed orchid	Platanthera psycodes
Pink milkwort	Polygala incarnata
Silverweed	Potentilla anserina
Shrubby cinquefoil	Potentilla fruticosa
Pennsylvania cinquefoil	Potentilla pensylvanica
One-sided shinleaf	Pyrola secunda
Meadow beauty	Rhexia virginica

Beaked rush	Rhynchospora capillacea
Northern currant	Ribes hudsonianum
Shining willow	Salix lucida
Bog willow	Salix pedicellaris
Low nutrush	Scleria verticillata
Buffaloberry	Sheperdia argentea
Scarlet globemallow	Sphaeralcea coccinea
Slender ladies-tresses	Spiranthes lacera
Oval ladies-tresses	Spiranthes ovalis
Hooded ladies-tresses	Spiranthes romanzoffiana
Spring ladies-tresses	Spiranthes vernalis
Rosy twisted-stalk	Streptopus roseus
Fameflower	Talinum parviflorum
Large arrowgrass	Triglochin maritimum
Small arrowgrass	Triglochin palustre
Low sweet blueberry	Vaccinium angustifolium
Velvetleaf blueberry	Vaccinium myrtilloides
False hellebore	Veratrum woodii
Kidney-leaved violet	Viola renifolia
Oregon woodsia	Woodsia oregano

Special concern plant species:

Balsam fir	Abies balsamea
Three-seeded mercury	Acalypha gracilens
Three-seeded mercury	Acalypha ostryifolia
Mountain maple	Acer spicatum
Moschatel	Adoxa moschatellina
Water plantain	Alisma gramineum
Wild onion	Allium mutabile
Amaranth	Amaranthus arenicola
Lanceleaf ragweed	Ambrosia bidentata
Saskatoon serviceberry	Amelanchier alnifolia
Low serviceberry	Amelanchier sanguinea
Raccoon grape	Ampelopsis cordata
Pearly everlasting	Anaphalis margaritacea
Sand bluestem	Andropogon hallii
Broomsedge	Andropogon virginicus
Purple angelica	Angelica atropurpurea
Purple rockcress	Arabis divaricarpa
Green rockcress	Arabis missouriensis
Lakecress	Armoracia lacustris
Fringed sagewort	Artemisia frigida
Common mugwort	Artemisia vulgaris
Pawpaw	Asimina triloba
Curved aster	Aster falcatus
Hairy aster	Aster pubentior

Prairie aster	Aster turbinellus
Standing milkvetch	Astragalus adsurgens
Bent milkvetch	Astragalus distortus
Missouri milkvetch	Astragalus missouriensis
Blue wild indigo	Baptisia australis
Yellow wild indigo	Baptisia tinctoria
Prairie moonwort	Botrychium campestre
Watershield	Brasenia schreberi
Buffalograss	Buchloe dactyloides
Poppy mallow	Callirhoe papaver
Water-starwort	Callitriche heterophylla
Grass pink	Calopogon tuberosus
Low bindweed	Calystegia spithamaea
Clustered sedge	Carex aggregata
Back's sedge	Carex backii
Bush's sedge	Carex bushii
Carey's sedge	Carex careyana
Flowerhead sedge	Carex cephalantha
Field sedge	Carex conoidea
Crawe's sedge	Carex crawei
Fringed sedge	Carex crinita
Double sedge	Carex diandra
Douglas' sedge	Carex douglasii
Dry sedge	Carex foena
Thin sedge	Carex gracilescens
Delicate sedge	Carex leptalea
Mud sedge	Carex limosa
Hoplike sedge	Carex lupuliformis
Yellow sedge	Carex lurida
Intermediate sedge	Carex media
Backward sedge	Carex retroflexa
Richardson's sedge	Carex richardsonii
Rocky Mountain sedge	Carex saximontana
Sterile sedge	Carex sterilis
Soft sedge	Carex tenera
Deep green sedge	Carex tonsa
Tuckerman's sedge	Carex tuckermanii
Umbrella sedge	Carex umbellata
Wild oats	Chasmanthium latifolium
Pink turtlehead	Chelone obliqua
Fogg's goosefoot	Chenopodium foggii
Missouri goosefoot	Chenopodium missouriensis
Coast blite	Chenopodium rubrum
Bugbane	Cimicifuga racemosa
Hill's thistle	Cirsium hillii
Swamp thistle	Cirsium muticum
Wavy-leaved thistle	Cirsium undulatum
Western clematis	Clematis occidentalis

Blue-eyed Mary	Collinsia verna
Cancer-root	Conopholis americana
Fireberry hawthorn	Crataegus chrysocarpa
Red hawthorn	Crataegus coccinea
Two-fruited hawthorn	Crataegus disperma
Hawthorn	Crataegus pruinosa
Hawksbeard	Crepis runcinata
Prairie tea	Croton monanthogynus
Crotonopsis	Crotonopsis elliptica
Waxweed	Cuphea viscosissima
Dodder	Cuscuta indecora
Small white lady's-slipper	Cypripedium candidum
Carolina larkspur	Delphinium carolinianum
Sessile-leaved tick trefoil	Desmodium sessilifolium
Fingergrass	Digitaria filiformis
Buttonweed	Diodia teres
Purple coneflower	Echinacea purpurea
Waterwort	Elatine triandra
Purple spikerush	Eleocharis atropurpurea
Green spikerush	Eleocharis olivacea
Oval spikerush	Eleocharis ovata
Dwarf spikerush	Eleocharis parvula
Few-flowered spikerush	Eleocharis pauciflora
Wolf's spikerush	Eleocharis wolfii
Interrupted wildrye	Elymus interruptus
Dwarf scouring rush	Equisetum scirpoides
Ponygrass	Eragrostis reptans
Tall cottongrass	Eriophorum angustifolium
Tawny cottongrass	Eriophorum virginicum
Upland boneset	Eupatorium sessilifolium
Spurge	Euphorbia commutata
Missouri spurge	Euphorbia missurica
Slender fimbristylis	Fimbristylis autumnalis
Umbrella grass	Fuirena simplex
Rough bedstraw	Galium asprellum
Small fringed gentian	Gentianopsis procera
Northern cranesbill	Geranium bicknellii
Spring avens	Geum vernum
Early cudweed	Gnaphalium purpureum
Limestone oak fern	Gymnocarpium robertianum
Bitterweed	Helenium amarum
Mud plantain	Heteranthera limosa
Water stargrass	Heteranthera reniformis
Hairy goldenaster	Heterotheca villosa
Common mare's-tail	Hippuris vulgaris
Canadian St. Johnswort	Hypericum canadense
Drummond St. Johnswort	Hypericum drummondii
White morning glory	Ipomoea lacunosa

Sumpweed	Iva annua
Alpine rush	Juncus alpinus
Toad rush	Juncus bufonius
Soft rush	Juncus effusus
Green rush	Juncus greenii
Edged rush	Juncus marginatus
Vasey's rush	Juncus vaseyi
Potato dandelion	Krigia dandelion
Pinweed	Lechea racemulosa
Duckweed	Lemna perpusilla
Creeping bush clover	Lespedeza repens
Silvery bladder-pod	Lesquerella ludoviciana
Wild flax	Linum medium
Brook lobelia	Lobelia kalmii
False loosestrife	Ludwigia peploides
Crowfoot clubmoss	Lycopodium digitatum
Adder's-mouth orchid	Malaxis unifolia
Globe mallow	Malvastrum hispidum
Two-flowered melic-grass	Melica mutica
Ten-petaled blazingstar	Mentzelia decapetala
Millet grass	Milium effusum
Rock sandwort	Minuartia michauxii
Naked mitrewort	Mitella nuda
Scratchgrass	Muhlenbergia asperifolia
Water milfoil	Myriophyllum heterophyllum
Rough water milfoil	Myriophyllum pinnatum
Water milfoil	Myriophyllum verticillatum
Glade mallow	Napaea dioica
Showy evening primrose	Oenothera speciosa
Northern adders-tongue fern	Ophioglossum vulgatum
Louisiana broomrape	Orobanche ludoviciana
Mountain ricegrass	Oryzopsis asperifolia
Gattinger's panic-grass	Panicum gattingeri
White beardtongue	Penstemon albidus
Cobaea penstemon	Penstemon cobaea
Tube penstemon	Penstemon tubiflorus
Cleft phlox	Phlox bifida
Annual ground cherry	Physalis pubescens
Heart-leaved plantain	Plantago cordata
Wood orchid	Platanthera clavellata
Green fringed orchid	Platanthera lacera
Plains bluegrass	Poa arida
Chapman's bluegrass	Poa chapmaniana
Weak bluegrass	Poa languida
Bog bluegrass	Poa paludigena
Meadow bluegrass	Poa wolfii
Hairy Solomon's-seal	Polygonatum pubescens
Large-leaved pondweed	Potamogeton amplifolius

Ribbonleaf pondweed	Potamogeton epihydrus
White-stemmed pondweed	Potamogeton praelongus
Spiralled pondweed	Potamogeton spirillus
Tussock pondweed	Potamogeton strictifolius
Vasey's pondweed	Potamogeton vaseyi
Bird's-eye primrose	Primula mistassinica
Prionopsis	Prionopsis ciliata
Mermaid weed	Proserpinaca palustris
Dwarf cherry	Prunus besseyi
Hortulan plum	Prunus hortulana
Sand cherry	Prunus pumila
Lemon scurfpea	Psoralea lanceolata
Crowfoot	Ranunculus circinatus
Gmelin's crowfoot	Ranunculus gmelinii
Buckthorn	Rhamnus alnifolia
Dwarf sumac	Rhus copallina
Northern gooseberry	Ribes hirtellum
Yellow cress	Rorippa sinuata
Swamp rose	Rosa palustris
Tooth-cup	Rotala ramosior
Dewberry	Rubus hispidus
Western dock	Rumex occidentalis
Widgeon grass	Ruppia maritima
Prairie rose gentian	Sabatia campestris
Sage willow	Salix candida
Sassafras	Sassafras albidum
Tumblegrass	Schedonnardus paniculatus
Scheuchzeria	Scheuchzeria palustris
Sensitive briar	Schrankia nuttallii
Hall's bulrush	Scirpus hallii
Prairie bulrush	Scirpus maritimus
Pedicelled bulrush	Scirpus pedicellatus
Smith's bulrush	Scirpus smithii
Torrey's bulrush	Scirpus torreyi
Veiny skullcap	Scutellaria nervosa
Wild stonecrop	Sedum ternatum
Rock spikemoss	Selaginella rupestris
Butterweed	Senecio glabellus
False golden ragwort	Senecio pseudaureus
Knotweed bristlegrass	Setaria geniculata
Virginia rockcress	Sibara virginica
Prairie dock	Silphium terebinthinaceum
Burreed	Sparganium androcladum
Great plains ladies-tresses	Spiranthes magnicamporum
Clandestine dropseed	Sporobolus clandestinus
Rough hedge-nettle	Stachys aspera
Needle-and-thread	Stipa comata
White coralberry	Symphoriocarpos albus

Eared false foxglove	Tomanthera auriculata
Spiderwort	Tradescantia virginiana
Humped bladderwort	Utricularia gibba
Flat-leaved bladderwort	Utricularia intermedia
Small bladderwort	Utricularia minor
Valerian	Valeriana edulis
American brookline	Veronica americana
Marsh speedwell	Veronica scutellata
Maple-leaved arrowwood	Viburnum acerifolium
Black arrowwood	Viburnum molle
Black haw	Viburnum prunifolium
Spurred violet	Viola adunca
Lance-leaved violet	Viola lanceolata
Macloskey’s violet	Viola macloskeyi
Pale violet	Viola striata
Summer grape	Vitis aestivalis
Frost grape	Vitis vulpine