



The National Park Service

PRAIRIE MANAGEMENT PLAN

HERBERT HOOVER NATIONAL HISTORIC SITE

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Recommended by:

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I. Introduction

A. History of reconstructed prairie

The National Park Service reconstructed a 76-acre prairie in 1971 to represent the vast tallgrass prairie that once covered 85 percent of Iowa. This reconstruction began in accordance with the Master Plan (1970, amended, 1977) for Herbert Hoover National Historic Site (NHS). In June of 1971, the NHS planted land that had been agricultural, primarily row-crop for more than a century, to five native species of grasses. The NHS used available seed stock that included non-local genotypes (ecotypes). The area was mowed in midsummer of 1971 to control weeds and then burned in May of 1972.

The NHS did little to affect the development of the prairie over the next five years. The first management plan to specifically address needs of the reconstructed prairie was the Vegetation Management Plan approved in March, 1977. The NHS initiated rotational mowing in October, 1977 to simulate the effects of fire in the prairie. One quarter of the prairie was mowed each year and hay was removed until 1982. During the same period, the NHS initiated manual cutting of invasive species and the additional planting of forbs. Chemical treatment of weedy vegetation targeted Canada thistle (*Cirsium arvense*) and ragweed (*Ambrosia trifida*) which was sprayed with 2,4D until 1981. Biological control of thistle using a target specific fly, *Urophora cardui*, and beetle, *Rhinocyllus conicus*, both of which eat the seed heads of the species, was investigated, but not initiated. The NPS tightened restrictions on chemical use during this time and the NHS turned to mowing and plant competition as primary weed control methods.

In the spring of 1982, seventeen forb species were sowed in several locations. The NHS sowed a spring blooming prairie mix and 26 additional species of forbs in the spring of 1983. Seed distributors provided local ecotype seed whenever possible. Germination rates appeared to be low for many of the forbs.

The Resource Management Plan of 1982 called for prescribed fire to become the primary tool for prairie management. Dr. Paul Christiansen began annual surveys of the prairie flora in August of the same year. Christiansen's findings led to steps that initiated spring prescribed fire and to the discontinuance of fall mowing.

Spring burning began in 1984, after approval of the Fire Management Plan in 1983. The plan emphasized the use of prescribed fire as the primary management technique. A natural resources project plan approved in August 1983, called for an integrated pest management program that used chemical spraying, hand cutting, mowing, USDA approved biological controls for Canada thistle, and a program of prescribed fire coupled with reseeding. Dr. Christiansen recommended reseeding the floodplain and swales on the west side of the prairie, as well as one weedy patch south of the Gravesite. These areas, approximating 40 acres, were prepared for reseeding by burning, plowing, and disc harrowing. Dr. Peter Schramm, Knox College, used a Nisbet drill to plant the mix of grasses and forbs. A dramatic difference was observed in the quality of prairie in burned areas within six months of treatment. The prescribed fire appeared to substantially reduce Canada thistle while improving vigor in the native grasses (Robinson 1985).

Prescribed fire became the primary management technique in subsequent years with some manual cutting and chemical spot treatment. Prescribed fires successfully burned half or more of the prairie in each of the following years: 1984, 1985, 1990, 1991, 1992, and 1993. Only 16 acres were burned in 1994 and fires were not accomplished in subsequent years. Thirty acres were burned in 1999 and fire has been used as the primary treatment since then. The current Fire Management Plan provides a five-year prescription schedule. Prescriptions are written annually to address the management needs for each unit.

B. Reasons for Developing This Plan

A functioning prairie is a complex system of interdependent flora, fauna, and microbial species. Small, reconstructed prairies are incomplete facsimiles of the native prairie that once dominated the plains. Iowa once had a 28-million acre expanse of prairie that determined the wildlife species, soils, meso-climate, and water quality and quantity. Understanding of this landscape's influence on flood abatement, weather, and diversity of life upholds the need to preserve and restore this landscape.

The reconstructed tallgrass prairie has a 30-year history in which the best management techniques of the day were sometimes employed and periods when prevailing forces shaped the prairie without intrusion of active management. Planners originally intended to develop a landscape that would complement the solitude of the Gravesite while providing a picture of the landscape that contributed to Hoover's heritage and experience in Iowa.

The NHS prairie is small relative to the space needed to secure a fully functioning ecosystem. It is too small to successfully provide habitat for some obligate grassland species and the largest of the plains herbivores. However, it can provide a small island of habitat for many prairie flora and fauna. This island stands in the midst of developed land with few corridors for wildlife accession.

The NHS accepts the concept that a healthy plant community will attract prairie wildlife occurring in its vicinity. This structure-based approach to ecosystem management relies on persistence or re-colonization by native species that are not formally reintroduced to the system (Noss 1991). Although obvious connectivity does not exist between this native habitat and others in eastern Iowa, many species, particularly birds and flying insects, have successfully re-colonized the NHS prairie.

Any plant community is a dynamic entity. Therefore, it is important that the restoration of the prairie continue so that it achieves its fullest potential as

- a repository for genetic diversity within the prairie community
- an example of genetic integrity within the prairie community
- a mosaic of well distributed grasses and forbs with species reflecting the characteristics of their location (e.g., moisture level, soil type)
- a landscape that protects soil and water quality
- a habitat for wildlife

- a site for contemplation and commemoration of Herbert Hoover and our heritage

C. Compliance

This Prairie Management Plan (PMP) complies with the National Environmental Protection Act (NEPA) and requirements of the Iowa State Historic Preservation Office (SHPO). A *Memo To The Files* serves as the NEPA documentation for this plan and is included as Appendix D. This memo includes the Environmental Screening Form that indicated no formal Environmental Assessment was necessary for this plan which combines and schedules the use of already approved treatments and techniques. The SHPO compliance is documented and meets National Historical Preservation Act (NHPA) requirements.

The NHS has a current Fire Management Plan (FMP), which describes actions relevant to wildland fires. Prescribed fire use has been approved by the SHPO and each Prescribed Fire Plan (burn plan) falls under the compliance of the original FMP. The FMP is reviewed annually to ensure that it is still consistent with the goals, objectives, and current circumstances of the NHS. This includes consideration of biological assessments and cultural/historical site surveys as appropriate.

Management strategies outlined in this document comply with NPS regulations and policies, including those pertaining to Integrated Pest Management. In turn, NPS policies meet EPA regulations for Restricted Use Products (40CFR Subpart I, 152.60).

D. Authorities for Implementing this Plan

There are three laws that constitute the primary authorities for administration of the National Park System. Under the 1916 NPS Organic Act, the NPS is charged with management of the parks to "... conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The General Authorities Act of 1976 defined the National Park System as including all the areas administered by the NPS "...for park, monument, historic, parkway, recreational, or other purposes," and declared that all units in the System will be managed in accordance with their respective individual statutory directives, in addition to the Congressional direction found in the Organic Act and other relevant legislation, providing the general legislation does not conflict with specific provisions.

In 1978, in an act expanding Redwood National Park, NPS general authorities were further amended to specifically mandate that all park units be managed and protected "in light of the high public value and integrity of the National Park System" and that no activities should be undertaken "in derogation of the values and purposes for which these various areas have been established," except where specifically authorized by law.

II. Compliance with NPS Policy and Relation to Other Plans

A. NPS Management Policies

Natural resource management is the function by which the NPS strives to understand natural processes and human induced effects; mitigate the potential and realized effects; monitor for ongoing or future trends; protect existing natural organisms, species, populations, communities, systems, and processes; and interpret these organisms, systems, and processes to the park visitor.

Director's Order #2: 3.1.1. The National Park Service will take a comprehensive approach to planning for how resources, visitors, and facilities will be managed to carry out the mission of the NPS and each individual park. Park planning will help define what types of resource conditions, visitor uses, and management actions will best achieve the mandate to preserve resources unimpaired for the enjoyment of future generations.

The PMP meets the criteria established in the Natural Resource Management Policy which states that the NPS will seek to perpetuate native plant and animal life as part of natural ecosystems. Landscapes and plants may be manipulated only when necessary to achieve appropriate management objectives. These objectives will vary according to management zones. To the maximum extent possible, plantings in all management zones will consist of species that are native to the area or that are historically appropriate for the period or event commemorated. Only native species will be allowed in natural zones. Natural processes will be relied on to control populations of native animals to the greatest extent possible. NPS will seek to understand and preserve the soil resources of parks and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil.

The PMP also seeks to adhere to the NPS guidelines for Inventory and Monitoring. This plan includes steps taken to create baseline inventory data and to update data through monitoring. In 1998 the United States Congress passed the National Parks Omnibus Management Act, calling for "a broad program of the highest quality science and information" to enhance management of the National Park System." Congress charged all NPS facilities with applying good science to resource management as the best hope to restore and retain the rich heritage found in our National Park System.

The PMP integrates vegetation, wildlife, soil, and water resource management. It is consistent with the enabling legislation, mission, goals, and site plans for the NHS. The PMP considers the needs of the Interpretative Division and other divisions while setting forth the methods for attaining resource management goals. The PMP meets the goals of the Strategic Plan, as part of the Government Performance and Results Act of 1993 (GPRA), specifically goals in category I – preserve park resources.

B. Enabling Legislation and Purpose of Herbert Hoover NHS

The NHS enabling legislation (79 Stat. 510; 16 U.S.C. 1 et seq.; 16 U.S.C. 461-467), authorized August 12, 1965, provides for the preservation in public ownership of historically significant properties associated with the life of Herbert Hoover. That

included necessary acres of land in or near West Branch. Omnibus act, P.L. 92-272 (86 Stat. 120; April 11, 1972) authorized an increase in the development and land acquisition ceilings of the site.

Values to be protected include those attributes that memorialize Herbert Hoover, encompassing his Birthplace Cottage, Gravesite, Presidential Library-Museum, Friends Meeting House, and Blacksmith Shop. Additional values to be protected include the Schoolhouse, statue of Isis, Isaac Miles Farm, Thompson Farm, approximately 81 acres of natural land including over 76 acres of prairie and a tributary to the west branch of Wapsinonoc Creek, and the dignified setting in a representation of the Hoover family's neighborhood within the town of West Branch, Iowa. Both the enabling legislation and Organic Act mandate that these values be maintained unimpaired for future generations.

C. General Management Plan

The 1970 Master Plan, as amended in 1977, identifies the strategies and actions necessary to manage visitation and provide the best visitor experience. The Master Plan guides further planning and management pending the result of the current General Management Plan development process. The Master Plan maintains that the NPS will manage resources to provide a setting to support the commemorative emphasis of the site. The prairie is promoted as an asset particularly valuable in interpreting rural Iowa as it was during Hoover's childhood to urban visitors.

D. Resource Management Relationship

The Resource Management Plan (RMP) expresses a primary goal which is the appropriate stewardship of the NHS natural resources, so as to support the commemorative nature of the site. The natural resources component of the RMP addresses the issue of prairie management in a general manner. The PMP is a specific action plan that implements management actions from the RMP.

The RMP nests within the authority of the Master Plan and relates directly to resource management of the site. The RMP states, "The natural resources of the site, in addition to those included within the cultural landscapes and identified by the Congress ... include the west branch of the Wapsinonoc and a 76-acre reconstructed tallgrass prairie." Other properties endorsed by Congress for acquisition, which include the Isaac Miles Farm and the Thompson Farm, offer natural resource values as well.

The Isaac Miles farm fields were planted as tallgrass prairie for educational and interpretive purposes, to provide a serene surrounding landscape for the Gravesite, and to mitigate soil erosion and drainage problems that threatened the Gravesite, the Library-Museum, and historic-core. With the reintroduction of this historic landscape, NPS takes on the responsibility to manage this habitat in a manner

- compatible with the commemorative nature of the site
- that provides educational and interpretive opportunities
- that does no harm to species of concern using the habitat

- that does not adversely impact neighboring land
- that promotes best management practices for soil, water, and native species conservation, including control of invasive and exotic species

E. How the PMP will Help Meet GMP and RMP Goals

Implementation of the PMP will support the NHS by

- establishing the management actions that will further enhance the restoration process in the prairie
- protecting and conserving the natural and historic resources associated with the life of Herbert Hoover
- demonstrating NPS leadership in natural resource stewardship while commemorating the life of Herbert Hoover

Implementation of the PMP will also contribute to meeting goals specified in the Strategic Plan, as part of the requirements of GPRA. The Strategic Plan specifically addresses the condition of the prairie within Goal Category I concerning preservation of park resources.

III. PMP Description and Goals

A. Description

The principle action of the PMP is to guide the natural process of restoration in the reconstructed prairie. After thirty years, the prairie continues to develop and change. Although it does not fully represent the dynamic ecosystem that once occurred on the site, it is a good representation of a successful prairie reconstruction. The vision is to create a system that pragmatically functions as a prairie and that, in time, requires little human input to sustain it.

The reconstructed prairie should contain plant diversity that reflects the diversity in the site's physical characteristics. The plant community assemblage should consist of the greatest amount of genetic diversity practicable within and between species while using native genotypes. This diversity stabilizes plant communities for the long run and diversifies the habitat available for fauna.

The emphasis on vegetation management recognizes that re-assembling plant communities is not sufficient to reestablish the bacteria, fungi, soil invertebrates, insects, arachnids, and wildlife. The plant community provides the basic structural environment on which all the other living components depend and therefore it is seen as the most important manageable level of the prairie environment.

B. Goals and Associated Objectives

1. Preserve and enhance genetic diversity

Genetic diversity includes the full range of genotypes present within the area of consideration.

- Objective: Increase genetic diversity of vegetation

A healthy plant community contains a diversity of plants that provides the community with resiliency to recover from changes in physical factors within the system.

- Objective: Increase diversity of invertebrates

By providing diversity of vegetation, the plant community will provide a diversity of niches to be filled by invertebrates. Colonization of the prairie should occur if habitat is adequate to support species. Only species that still occur in the area and that do not require special corridors of accession to the prairie would be able to naturally colonize.

2. Preserve genetic integrity of vegetation

Genetic integrity goes beyond genetic diversity by presenting the natural proportions of and natural interactions between genotypes. Plants need to be distributed in natural spatial patterns and utilize natural pollination and dispersal mechanisms. The NHS will attempt to achieve the proportional mix of plants that occurred prior to disturbance.

- Objective: Improve dominance/diversity ratio of native plants

Some areas within the reconstructed prairie appear to be dominated by small plant assemblages. The prairie contains few spring blooming perennial forbs, but has abundant autumn flowers. Big bluestem (*Andropogon gerardii*) tends to dominate the three principle prairie grasses located here as it did in the pre-settlement prairie of eastern Iowa. Increasing grass diversity, particularly under trees, would ensure perpetuation of good cover once the tree groves mature.

- Objective: Reduce woody plant succession within prairie

The climate of eastern Iowa would allow the succession of landscape to forest cover without the effects of wildland fire. Such is the case in this reconstructed prairie, where woody plants, including non-native species, became established during periods when the NHS did not consistently use prescribed fire.

3. Minimize genetic contamination by exotic species and non-local ecotypes

Genetic contamination is the introduction of genotypes not native to the locality into a natural zone. This includes introduction of a native species in a variety that comes from a different ecological niche (differing ecotype).

- Objective: Avoid genetic contamination from non-local ecotypes

The key to successful restoration of prairie landscape is promoting genetic diversity of native stock and limiting contamination by genotypes not found in the area. Local ecotypes are usually more successful than those from other locations. Restoring and preserving local ecotypes ensures the preservation of the local genetic pool.

- Objective: Reduce exotic and invasive woody plants

Exotic ornamental trees and shrubs can be introduced from surrounding land. These plants cannot be tolerated within the prairie.

- Objective: Reduce exotic and invasive herbaceous plant intrusion

Exotic and invasive plants threaten the reconstructed prairie. Much of the threat originates in the surrounding land use. Exotic and invasive plants have gained control in localized spots within the prairie, particularly in areas affected by agricultural runoff.

4. Preserve natural soils and the processes of soil genesis

- Objective: Protect soils from erosion

Good vegetation cover, deep root penetration, and suitable water infiltration results in stabilization of soils. The deep and expansive root complexes associated with prairie improve soil tilth. Prairie plants provide the best natural and most cost-effective means of preventing soil erosion and promoting soil genesis on the Tama-Downs soils of the uplands and Colo-Ely alluvium complex of the drainage-ways.

- Objective: Manage native cover in a manner that promotes soil genesis

Native prairie supports a host of soil-building organisms. Natural decomposition and fire help to cycle sub-soil minerals captured by plants back into topsoil. Fire does not adversely affect soil building organisms of the prairie, but excessive use of chemicals and fire suppression can slow soil genesis by interrupting the life cycle of microorganisms in the soil.

5. Preserve water quality and preserve natural flow regimes

- Objective: Protect infiltration pathways in the prairie

Prior to conversion to agriculture, the countryside of eastern Iowa consisted of uplands and strings of connected wetlands that eventually drained to large streams. Clearing the prairie increased the rate of runoff that carved a latticework of small streams that replaced the wetlands. Prairie cover promotes water infiltration and retention in soils. Prairie plants capture humidity and funnel it to their roots. Therefore, the hydrologic cycle within a prairie tends to be one of evapotranspiration and soil infiltration that results in a net reduction in runoff to streams.

- Objective: Provide back water areas for flood mitigation in the floodplain

The moist prairie on the northwest corner of the NHS, where the creek enters, provides a safe backwater area where floodwater can collect without damaging resources in the NHS or on neighboring property. Prairie plants in this location can improve water infiltration and mitigate flooding. A backwater area would reduce water-current and protect soils and banks from erosion.

- Objective: Stabilize stream bank within prairie

Prairie plants are deep rooted and tenaciously hold soil in place. The fragile soils of the stream bank are subject to sheeting and undercutting. Prairie plants help to stabilize the stream banks. Improved stability of the stream bank can be achieved through actions recommended in the PMP.

6. Provide wildlife habitat that supports biological diversity

- Objective: Provide diversity within plant communities that includes host/food species for native wildlife

Good biological diversity in the plant community supports good diversity of animal species, both invertebrate and vertebrate.

- Objective: Use management treatments in a manner that limits adverse impacts on wildlife

Management treatments, such as prescribed fire, mowing, and chemical application, can adversely impact wildlife at the population level when improperly used. The NHS will assess and minimize long-term impacts of treatment on wildlife.

7. Preserve the historic and cultural importance of the prairie

- Objective: Protect solitude, space, sense of history, and sounds of nature associated with the prairie

The prairie is a location for the commemoration of Herbert Hoover. The sights and sounds of nature were part of his life. The prairie is part of our American heritage as well and can be shared through interpretation if its values are kept intact.

- Objective: Provide interpretation of natural resources

Prairie once covered 83% of Iowa. Nearly all of it has been lost to development. The prairie provides an opportunity to interpret both the natural and cultural aspects of this important landscape and ecosystem.

8. Use natural processes whenever practicable to maintain and restore the prairie

- Objective: Use fire management as the primary treatment and select secondary treatments that best simulate natural processes.

Prairie in Iowa was probably maintained by natural and anthropogenic occurrence of fire prior to Euro-American settlement. Aboriginal people intentionally and unintentionally burned the prairie and were an important part of this ecosystem. Prescribed fire mimics these fire events.

Large herbivores grazed the grasses and forbs. Mowing and selective cutting can simulate grazing. Not all natural processes can be reestablished, but they can in some cases be mimicked through management techniques.

C. Strategies Available

1. Prescribed fire alone

Prescribed fires are intentionally ignited under predetermined weather and fuel-moisture conditions allowing the NHS to exert substantial influence over the spread and intensity of the fire. Trained personnel ignite these fires to accomplish resource management objectives and subsequently reduce hazard fuel as well. All prescription parameters, acceptable ranges, and objectives are clearly stated in a Prescribed Fire Plan (burn plan) for each prescribed fire conducted.

Fire once played an important role in the functioning of the tallgrass prairie ecosystem in Iowa. Far from being a negative and destructive force, fires maintained prairie in a climate conducive to woody plant succession. In fact, of all grassland ecosystems in North America the tallgrass prairie seems to benefit most from fire (Higgins et al. 1989). Although evidence of Indian use of fire is fragmentary, researchers now believe that the “wilderness,” including mid-western prairie, was a product of human manipulation in which fire served as the principle tool (Williams 2000). Fire is the one element that suppressed woody plant intrusion in the prairie.

Fire helped to maintain savannas where fire-dependent woody plants coexisted with a prairie grass and forb understory. Fire prevented the succession of oak-hickory savanna to maple (*Acer spp.*) forest during the last 3000 years, when weather favored eastern deciduous forest succession. It also prevented the development of a shrubby mid-story typical of such forests. Tallgrass prairie and savanna predominated where fire occurred cyclically until settlement by Euro-Americans in the mid-1800s.

Savannas provided an important transition from grassland to forest habitat in eastern Iowa. Savannas occurred in the floodplain, on ancient banks and alluvium, and at the interface between the riparian and the upland. Because of their dependence on fire, savannas tend to succeed to closed forest if fire is suppressed. Fire suppression, cultivation, and other processes have greatly reduced the amount of savanna remaining in North America (Noss 1991).

It is the policy of the NPS to allow natural processes to occur to the extent practical while meeting park unit management objectives. The goal of fire management in the NPS system is to restore fire to park ecosystems where appropriate and possible. The RMP recommends prescribed fire as the principle management tool in the NHS prairie. Fire has the potential of maintaining adequate conditions in the prairie, when used as a consistent, cyclical treatment as described in the current FMP.

2. Integrated Pest Management (IPM) with prescribed fire

Integrated Pest Management is the selection, integration, and implementation of pest management methods based on predicted economic, ecological, and sociological consequences. The term also refers to the process by which the NHS decides if treatment is necessary and appropriate, and when, where, what, and how treatment should be administered. The term, IPM, has become a euphemism for chemical control of pests among some managers, but this is not the intended use in this document. This plan will use a much broader definition of IPM.

Integrated Pest Management is an umbrella which incorporates combined strategies, including mechanical, physical, chemical, cultural, or biological controls in the suppression of unwanted organisms. The NHS could use indirect or direct suppression methods. In the case of vegetation, indirect suppression could take the form of competition with more desirable species. Direct suppression is focused on suppression of specific pest populations. These methods include physical removal, biological control, and chemical treatment. These techniques and prescribed fire are all methods that the NHS will consider as part of its IPM program.

Mechanical treatment, principally mowing, attempts to simulate the effects of grazing. It is an effective direct suppression technique for the control of some annuals and biennials that rely solely on seed formation for propagation. Mowing effectively controls woody plants when repeated several times during the season for one or more growing seasons. Occasional mowing or cutting does not control woody shrubs that are prone to suckering unless coupled with stump-treatment.

The NHS could use hand cutting and pulling to surgically remove invasive species, when other methods would cause damage to preferred species. This is labor intensive, but very effective when used on some annual and biennial weeds, some perennials when the root is removed, and woody plants when repeated during the season or followed with chemical stump-treatment.

The NHS could use EPA-registered pesticides within NPS facilities provided certain criteria are met. Certified commercial applicators must apply or supervise application of restricted use pesticides. The NPS recommends that a certified pesticide applicator be present during application of all general pesticides.

Biological controls rely on the use of naturally occurring predators or parasites to maintain pest populations below injury levels. When naturally occurring predators and parasites are not effective, the NHS could import a US Department of Agriculture approved biological agent, which attacks a targeted species with no collateral damage. The Servicewide IPM Coordinator must approve the use of biological control agents within NPS facilities.

D. Ecosystem Management Preferred Technique

Integrated Pest Management with an emphasis on prescribed fire will be used to maintain and restore prairie plant communities, improve plant diversity, cycle nutrients, and reduce or remove exotic and invasive plants. Literature suggests that prescribed fire is not

effective alone in removal of some exotic or invasive species, such as Canada thistle and bullthistle (*Cirsium vulgare*), although results of prescribed fire to control those species in the NHS prairie have been fair to good (Christiansen 1984). The NHS must time prescribed fire carefully when the intention is to reduce populations of cool season grasses, such as smooth brome (*Bromus inermis*) and reed canary grass (*Phalaris arundinacea*). If seasonal timing is correct, fire suppresses annuals and biennials, such as smartweed (*Polygonum pensylvanicum*), giant ragweed (*Ambrosia trifida*), sweet clover (*Melilotus spp.*) and wild parsnip (*Pastinaca sativa*). Similarly, the NHS must consider the needs of wildlife, such as herpetofauna, birds, and butterflies that could be affected by prescribed fire. The NHS has considered the management objectives and impacts to resources in determining the best time for use of fire in the FMP.

The NHS will control woody plants in the prairie and tree grove understory using prescribed fire coupled with mechanical removal and chemical application to stumps. This combined approach has proved effective in the past. Mechanical cutting with a brush hog at least three times in a season has also proved effective in restored prairies in the NPS Midwest Region (Lisa Thomas, Prairie Cluster Long Term Ecological Monitoring, personal contact). The NHS would rely less on costly mechanical removal and chemical application if it utilized prescribed fire as a management tool for invasive plant control, since fire suppresses the encroachment of trees and shrubs and the vigor of exotic species. Fire followed by hand cutting and chemical application to the stump is probably the most effective control of woody plants.

Hand cutting or removal of annual and biennial weeds is labor intensive, but effective in the removal of giant ragweed, sweet clover, and wild parsnip. Volunteers have removed these species from small patches where concentrations were high. Reportedly, Canada thistle can be suppressed by cutting the seed heads from the plant before maturity. This procedure reduces seed production, but also weakens the plant, which “bleeds” sap through the severed tops (Paul Christiansen, personal communication).

IV. Prairie Management Units

The 76-acre reconstructed prairie and its associated tree groves, plus the riparian, constitute the approximately 81-acre Natural Zone referred to in this plan.

A. Physical Description

1. General

Interstate freeway borders the southern edge of the prairie. Farm fields of the Thompson Farm border the western edge. Parkside Drive, a freeway entrance ramp, the Miles Farm, and the Herbert Hoover Library Association offices border the east edge. Mowed landscape occurs on the northern border with road right-of-way, a business, and residences lying adjacent to the northern border in the west. Mowed parkland borders the east edge of the northern portion and north edge of the eastern portion of the prairie.

2. Topography and soils

The topography of the prairie is typical of the Southern Iowa Drift Plain. Soils originated from loess deposition on top of pre-Illinoian glacial material. Subsequent water erosion provided relief with a slight north to northeast aspect. The prairie consists of gently rolling terrain which substantially impacts microhabitats within the landscape. Erosion can occur on slopes along the west side of the prairie and also in a draw south of the Gravesite parking area.

The soils consist of five distinct silty-clay-loam types: Tama silty-clay-loam, Coco-Ely-Judson complex, Colo silty-clay-loam, Downs silt loam, and Adair clay loam. These soils have moderate to moderately slow permeability and are susceptible to sheet erosion. No geology is exposed in the area, including the creek bed, or in the region. Southern Iowa Drift Plain is characterized by very deep soils overlying bedrock.

3. Climatic conditions

Temperatures range broadly over the annum with –28°F and 108°F representing the extremes. The average growing season extends over 183 days from April through September. Average precipitation is 36.31 inches with about 60% occurring during the growing season in late spring through summer (recorded by National Weather Service at site #134101, Iowa City).

4. Water quality

A creek runs from west to east near the northern border of the prairie. Development upstream impacts water quality in the tributary to the west branch of Wapsinonoc Creek as it enters the prairie. Land uses within the watershed, upstream of the NHS, include active development for new residential and business zones, agricultural lands, a golf course, and residential housing. Siltation is the greatest cause for concern followed by nitrate loads and coliform levels. The creek floods periodically and shows signs of significant channel erosion.

5. Vegetation

Tallgrass prairie grasses provide most of the cover within the prairie. The remaining cover consists of two tree groves, planted in 1997 on the southeast and in 2000 on the north-central portions of the prairie, and cool season grasses in a small area of floodplain on the north side of the creek. The young groves are treated as values to be protected and are excluded from prescribed fire by mowing and foaming because of their vulnerability to fire damage. The trees should tolerate prescribed fire treatment in 20 to 30 years. The groves would then behave as young savanna areas with fire-dependent, nut-producing trees with grasses and forbs in the understory.

Prairie grasses dominate with 46% relative cover of big bluestem and Indian grass (*Sorghastrum nutans*) as the predominant species. Prairie forbs constitute up to 43% of the cover. No overstory exists in the interior of the prairie. Although the recently planted groves are not mature enough to provide significant habitat, the historic core

and picnic areas of the NHS provide a habitat that is similar to savanna. Birds that frequent savannas occur in these areas outside of the natural zone.

6. Wildlife

Native animals typical for this region are found within the prairie. Mammals include opossum (*Didelphis virginiana*), red fox (*Vulpes vulpes*), white-tailed deer (*Odocoileus virginianus*), and members of the mouse family, including *Peromyscus* spp. and *Microtus* spp., plains pocket gopher (*Geomys bursaritus*), eastern cottontail (*Sylvilagus floridanus*), striped skunk (*Mephitis mephitis*), squirrels (family Sciuridae), raccoon (*Procyon lotor*), and eastern mole (*Scalopus aquaticus*). Big brown bats (*Eptesicus fuscus*) have been observed overhead. Northern brown snake (*Storeria dekayi dekayi*), eastern garter snake (*Thamnophis sirtalis parietalis*), western ribbon snake (*Thamnophis proximus proximus*), fox snake (*Elaphe vulpine*), black rat snake (*Elaphe obsoleta obsoleta*), and bullsnake (*Pituophis melanoleucus savi*) have been observed in the prairie. American toad (*Bufo americanus*) is the only known amphibian.

The reconstructed prairie is considered too small to be an important breeding habitat for grassland birds such as Bobolink (*Dolichonyx oryzivorus*), but numerous song birds use the area as a source of food. Ring-necked Pheasant (*Phasianus colchicus*) nest here. Eastern Meadowlark (*Sturnella magna*), Western Meadowlark (*Sturnella neglecta*), and Dickcissel (*Spiza americana*) establish territories in the prairie. Killdeer (*Charadrius vociferous*) are observed passing through or loitering in the mowed pathways. Indigo Bunting (*Passerina cyanea*), Red-headed Woodpecker (*Melanerpes erthrocephalus*), and Eastern Bluebird (*Sialis sialis*) are observed along the edges. Grasshopper Sparrow (*Ammodramus savannarum*) has been observed in the years subsequent to prescribed burning. A list of common bird species is provided in Appendix C, Table 2.

7. Rare, threatened, and endangered species

No federally listed threatened or endangered species are known to exist in the prairie. Many of the prairie plants are considered locally rare. Iowa classifies about 150 plant species as rare and many of these are prairie species. A comprehensive list of plants in the prairie can be found in Appendix C, Table 1.

8. Cultural resources

Archeologists have not surveyed within the prairie. The land had been agricultural during Herbert Hoover's years in West Branch and until its conversion to prairie in 1971. The constant tilling and soil disturbance makes the existence of surficial artifacts unlikely.

B. Prairie Management Units – PMU

Seven prairie management units (PMU) were established based on physical features (Figure 1), vegetation complexes, and fire management considerations. Each PMU is delineated by a mowed trail or the border of the natural zone. Each PMU will be treated

individually in the following section with a specific prescription for management based on the current conditions and future needs of each PMU.

V. Prairie Management Program

A. Scope of Prairie Management Program and Links to Resource Management

Reconstruction of a tallgrass prairie has dominated natural resource management actions since 1971, but management efforts have been spotty and inconsistent. Invasive and exotic species tend to increase when the prairie is not actively managed. Park plans, including the Resource Management Plan, support active prairie management.

Nonnative grasses and forbs and woody vegetation continue to degrade localized sections of the prairie, particularly where agricultural drainage from outside the park enters the prairie. Surrounding agricultural land use, land use prior to establishment as a prairie, and proximity of ornamental, non-native plantings within the park contribute to exotic invasion. Reed canary grass and shrubs have become more abundant along the creek banks and in draws of the prairie. Dr. Paul Christiansen's (1984-2002) annual reports on prairie inventory indicate a general improvement in health of the prairie with conspicuous changes in plant dominance occurring after each change in management strategy. He continues to recommend use of prescribed fire followed by mechanical and herbicide treatments of woody plants as the principle management strategy. Intrusions of both herbaceous and woody plants dominate in wet-mesic locations and along the prairie edge.

In areas that are diverse and well populated with native grasses and forbs, natural competition coupled with fire management appears to sustain native species. Seed collection and manual redistribution of seed have increased diversity in patches where a single species once dominated. Purchase and distribution of seeds of local ecotypes not represented in the park has also increased diversity.

B. PMP Strategy Overview

The PMP will provide a strategy for vegetation management that promotes further restoration of the prairie matrix. It is recognized that this prairie is isolated, not connected to other sources of wildlife for colonization, and is too small to successfully support some grassland birds and most of the large herbivores. Management of wildlife will be through provision of quality habitat for native species that currently inhabit or could colonize the prairie. That factor will guide NHS decisions about when, where, what, and how treatments would be applied to vegetation and the stream.

Specific objectives for wildlife, soil, water, and other aspects of the prairie ecosystem might not be mentioned for each PMU, but are implicit in the restoration process. If an issue is addressed in the "problem" section of the description, a strategy is proposed to manage it. The PMP will refer to prairie specific aspects of soil management and water quality management where a problem exists, but management strategies specific to the creek are not addressed here.

The PMP will attempt to use natural processes or anthropogenic processes with effects that mirror natural processes wherever possible. Natural processes include fire, grazing, competition, parasitism, and predation. Because fire was withheld from the prairie during the mid-1990s, some exotic and invasive species, particularly woody plants and cool-season grasses, have become established and will require intensive treatment to suppress. These intensive treatments could include chemical, mechanical, and biological controls in localized areas. Once treatments have suppressed invasive plants, competition from well-established, fire-dependent native species would hold exotic populations in check. Fire will be the principle element that allows native plants to compete aggressively with exotic and invasive plants.

C. Prairie Management Objectives and Strategies Listed by PMU

Several techniques or treatments are appropriate to the entire prairie, while some apply to select problem areas within several PMUs. The following two techniques will be applied to the entire prairie:

Prescribed fire

Prescribed fire, as recommended in the current FMP, will be applied to the entire prairie on a cyclic basis. Fire effects and invasive species monitoring caused the NHS to reconsider the five-year prescribed fire schedule presented in the FMP. Fire will be used frequently in the remediation of problem areas. Fire will be used annually for up to three years in some treatment areas. These adaptations to the original schedule will be written into the burn plans and are amended in the annual review of the Fire Management Plan. After the period of intensive treatment with fire, prescribed fire will be scheduled such that each PMU will receive treatment once every three or once every five years. An odd year cycle must be maintained to avoid proliferation of biennial invasive plants. Conditions within any given PMU will determine whether the area is treated on a three year or five year cycle. The intent is to bring all PMUs to a level of quality vegetative cover that will permit maintenance treatments on a five-year cycle. Prescribed fire will only be further mentioned in the individual PMU prescriptions if it will be used for intensive treatment or will be used outside of the three to five year cycle.

Add spring flowering forbs

The prairie has abundant late summer and autumn flowering forbs, but few spring flowering species. Spring flowering forbs will be added to all areas of the prairie. The simplest method of increasing spring forbs is to broadcast seed after prescribed fire as an over seeding technique. New species will be the most successfully introduced when they are planted as plugs or incorporated into seed mixes that are used to re-establish native plants in areas that were intensively treated for invasive species. When opportunity for over seeding or reseeding occurs anywhere on the prairie, spring flowering forbs will be used in the seed mixes.

Treatments or techniques that are repeated within several PMUs will be referenced by name in italics. They include:

Treatment after killing frost

Cool season plants continue to grow after a “killing frost” that causes dormancy in warm season prairie plants. This provides an opportunity for broadcast application or target application of glyphosate or a similar herbicide to control invasive cool season plants. This technique would be used in problem patches less than two acres in size, but may be applied to several such patches in any given year. The treated patches will be over seeded with a mix of local ecotype grasses and forbs that are appropriate to the location and will compete with residual invasive plants.

Treat reed canary grass

Reed canary grass will be suppressed wherever it creates thick stands by burning annually, cutting the culms at flowering (Hutchinson 1992), and using chemicals as necessary, until population levels decline. Monotypic stands can be treated with herbicide such as glyphosate, but areas where desirable forb species persist will be treated with a monocot selective herbicide, such as Dalapon. Treatment will be followed by replanting of the area with a mix of grasses and forbs that is appropriate to the location. Plugs and/or seed obtained from local ecotype sources will be used.

Treat the draw

The draws often have several invasive species in them, because of the destabilization of soil caused erosion. The lower portions of most draws are characterized by dense stands of reed canary grass. Higher elevation areas of the draws often have a mix of annual, perennial, and woody invasive plants. Ragweed does well in the disturbed soils of the draw.

(Year 1) Burn entire draw in late spring; plant plugs of grasses and forbs, and sow a seed mix that is high in grasses in the upper portion of the draw, above reed canary grass; cut culms on reed canary grass and brome before flowering; mow replanted areas to an eight inch height; *treat after killing frost* throughout the draw.

(Year 2) Burn the lower draw in late spring; apply herbicide to sprouts in the lower draw as needed; plant the lower section of the draw where treatments occurred with a grass and forb mix, including slough grass and switch grass, in late spring and discontinue herbicide use; over seed the upper draw if necessary and remove invasive plants by hand as needed; mow at a 14 inch level in areas with second year growth and at eight inches in first year growth.

(Year 3) Mow second year growth at 14 inches height in the summer to suppress persistent weeds; in the fall, sow additional forbs between established grasses to increase interspecies competition. Remain vigilant to control the emergence of invasive species. If re-emergence occurs, rely on fire, early spring mowing (for reed canary grass, but not for brome), hand pulling, and *treatment after killing frost* to reduce competition from undesirable species.

Suppress woody plants

Woody plants have the potential for intruding in every PMU. Although fire prevents some species from competing with prairie plants, fire may not be enough to control the most aggressive species in areas with high soil moisture. Wherever woody invasive plants appear, fire in accordance with the prescribed fire cycle will constitute initial treatment. Secondary treatment will consist of cutting suckers and applying herbicide to the stump.

Intensive woody plant treatment

Additional *intensive woody plant treatment* can be done where woody suckers are abundant. The process consists of mechanically cutting shrubs at least three times during the growing season to weaken stock. Mechanical treatment is best done the year before or after a prescribed fire, since the result would be two consecutive years of treatment. Only use mechanical treatment for one year so that the mechanical cutting does not have long-term effects on desirable prairie species. Follow up with hand cutting and stump-treatment as needed.

1. PMU 1

Acres: 2.656

Vegetation: The area is predominately tallgrass prairie and cool season grasses with sparse tree cover in flood plain. Many tree species are not native to east-central Iowa floodplains. Reed canary grass and smooth brome are the predominant ground cover. This area north of the creek has not been included in the 76-acres usually defined as the prairie, but clearly resides within the natural zone and has been treated as part of the prairie since 1999.

Physical features: The area consists of floodplain with creek on southern border and city with cool season lawns on the north. Soils are Colo-Ely complex with 2 – 5% slopes, characterized as poorly drained and subject to flooding. These soils are low in phosphorus and potassium, but have potential for prairie restoration or tree growth. They are usually moist because of seepage from higher elevations and can gully if not grass covered. Prairie plants effectively improve drainage through Colo-Ely soils and prevent erosion.

Problem: This area was not included in prairie management until 1999 and has no discernable character as an ecosystem. The PMU is a transitional area between the city-scape and prairie landscape and is very visible to the public.

The general condition of this area is poor with a large assemblage of exotic or inappropriate species. It is a source of invasive species for PMU 2 and natural zone areas downstream. It contains non-native, cool-season grasses with some native species. Reed canary grass and smooth brome dominate. The trees are a mix of oaks (*Quercus spp.*), white pine (*Pinus strobes*), maple (*Acer spp.*), ash (*Fraxinus sp.*), and other assorted woody plants. Many of the trees that were planted in the PMU are inappropriate to the natural zone or to this location in Iowa. Dogwood (*Cornus stolonifera*), white mulberry (*Morus alba*), elderberry (*Sambucus canadensis*), and tartarian honeysuckle (*Lonicera tatarica*) grow well here. Although two of these

shrubs are consistent with native species found in a riparian area, they are aggressive and could spread beyond the riparian. Tartarian honeysuckle and white mulberry are exotic species.

The stream banks through this PMU show severe scouring, undercutting of the toe of the bank, slumping, and sheeting. A riparian buffer to protect water quality has not been designated along the creek. No structures exist to retain or detain floodwater or to reduce the energy of flow in the stream channel.

Priorities:

Aggressively manage the riparian buffer for stream bank and water quality protection by using the CP-21 Grass Filter Standard and CP-22 Multispecies Riparian Buffer Standard, as practicable (Natural Resources Conservation Services, riparian filter strip standard designs).

Suppress reed canary grass and smooth brome using *treatment after killing frost* and *treatment of reed canary grass*. Follow treatments by planting prairie grasses and forbs, preferably a mix of big bluestem, bluejoint (*Calamagrostis canadensis*), switchgrass (*Panicum virgatum*), slough grass (*Spartina pectinata*), marsh muly (*Muhlenbergia racemosa*), sedges, rushes, and forbs. Additionally, burn this unit annually for two to three years while intensive treatments are applied. Follow a three-year fire-cycle until brome and reed canary grasses are significantly reduced. Enter into a five-year fire-cycle once invasive plants have declined and the cover has stabilized.

Remove trees or girdle trees that are not part of the cultural landscape and are not appropriate to the eastern Iowa floodplain. Pruned snags may be left for wildlife when they pose no safety hazards. Retain some native floodplain trees, broadly spaced, to create an open riparian wood that supports the CP-22 Multispecies Riparian Buffer. If tree removal reduces the integrity of the riparian woods, add a limited number of floodplain tree species (white oak [*Quercus alba*], swamp white oak [*Quercus bicolor*], etc.) in strategic locations. *Suppress woody plants* that may spread into the prairie, such as shrubs and non-native saplings.

Reduce the width of the riparian path and maintain it at a distance of 20 feet or more from the stream bank. Use the smallest, lightest available lawn tractor to maintain the path.

2. PMU 2

Acres: 18.904

Vegetation: This unit consists of a range of growing conditions, including wet meadow, and mesic to dry tallgrass prairie. The NHS added forbs in a semicircle running from the northwest corner, along the PMU border in southeasterly arc, and continuing to near the southwest edge of the PMU in the early 1990s (Figure 2). The remaining vegetation is the result of the 1971 planting with some active dispersal of forb seed taken from the forb-rich planting. Swales are encroached upon by reed canary grass and shrubs do well in some areas. A small tree grove provides transition between the groomed lawn associated with the cultural landscape and the prairie in the northeast corner. Smooth brome provides most of the ground cover beneath an

assortment of volunteer trees. The trees form a closed canopy and consist of walnut (*Juglans niger*), ash, Siberian elm (*Ulmus pumila*), and other hardwoods.

Physical features: The topography is varied ranging from floodplain to a north-facing aspect that rises about 50 feet in elevation between the creek and a ridge on the southern border of the PMU. One major draw or swale flows in an easterly direction carrying agricultural runoff from outside the functional park boundary. Agricultural tiling has never been removed, broken, or blocked.

Problem: Agricultural drainage has encouraged the growth of cool season grasses along the western border (smooth brome) and in the major draw (reed canary grass). Exotic and native shrubs are established and spreading in the flood plain. Canada thistle occurs in small patches, mostly near the south border. Several ragweed patches appear each summer where vegetation is sparse, particularly in the upper draw and on the edge of the PMU. The lower half of the draw and floodplain consist of impenetrable reed canary grass. Very dense patches of white sweet clover (*Melilotus alba*) appeared in 2001 and increased in coverage during 2003 (Christiansen reports 2001, 2002, and 2003).

A mowed pathway on the north side of this PMU is in contact with the creek bank. Patrol vehicles and mowers frequent this path, destabilizing the soil matrix. Agricultural tile drains water from soils directly into the draw and the creek. This impacts the moisture balance of the soil and stream discharge. Where tiles discharge into a draw or are broken in the floodplain, erosion occurs, creating gullies that extend into the creek. At one time, landscape keepers dumped vegetation debris into the gullies in an attempt to fill eroded areas. Much of this debris originated from the cultural landscape and carried seeds and cuttings from exotic and ornamental plants.

Priorities:

Treat reed canary grass and replant those areas to wet meadow prairie grasses and forbs with an emphasis on species not yet well represented (slough grass, switch grass, and a variety of forbs). Over seed sparse growth areas in subsequent years. *Treat draws* for invasive brome, ragweed, and reed canary grass. Over seed treated areas and areas where erosion has exposed the soil.

Suppress woody plants that volunteer in the unit, but maintain the established tree groves. Thin the established groves to open the canopy and remove the walnut trees to prevent a build up of natural herbicide (phytocide) in the soil. *Treat after a killing frost* under the trees and replant the area to woodland ground cover and shade-tolerant savanna plants. This area may require several treatments to suppress the smooth brome. In spots where no native plants persist, treat the entire spot with glyphosate twice or more to eliminate the cover and then sow seed or plant plugs.

Consider using prescribed fire in early August to suppress dense patches of white sweet clover. These treatment areas could be kept small to facilitate smoke management. Yellow sweet clover (*Melilotus officinalis*) is suppressed by mowing while patches are in flower and before seed is set. Pull persistent sweet clover plants before seed sets and remove and dispose of the debris. Over seed patches that are left sparsely vegetated by the removal of sweet clover.

Remove agricultural tiling or break and plug tiling as is feasible to return soils to a natural moisture regime. This will reduce the erosion in the rills and in the stream channel. Reduce the width of the riparian path and maintain it at a distance of 20 feet or more from the stream bank. Use the smallest, lightest available lawn tractor to maintain the path. Eliminate use of the path by sport utility vehicles or patrol cars.

3. PMU 3

Acres: 18.653

Vegetation: This area is tallgrass prairie of varying condition with some quality forb areas. Sparse tree cover intrudes from the north. In April of 2000, nut trees were planted around the south and west of the Gravesite on the unit's north edge. A mixture of summer and fall blooming forbs rims the northern portion of the PMU.

Physical features: The north facing aspect rises about 50 feet in elevation to a ridge on the southern border of the PMU; one major draw or swale flows due north and smaller rills starting at the western edge carry agricultural runoff from outside the functional park boundary in a northeasterly direction toward the creek.

Problem: Agricultural drainage has encouraged the growth of cool season grasses along the western border (smooth brome and Kentucky bluegrass [*Poa pratensis*]). The major draw contains reed canary grass, and exotic and native shrubs. The nut tree grove is mowed several times each summer, adversely affecting native cover. In 2003, several clones of Canada thistle appeared as a result of this disturbance. Plant diversity exists on northern portions of PMU, but the southern ridge is dominated by three grasses (big bluestem, Indian grass, Canada wildrye [*Elymus canadensis*]) and Canada goldenrod (*Solidago canadensis*). Although Canada goldenrod is a native, it can become weedy and reduce species diversity by competing with other prairie plants. Intrusions of invasive and exotic species occur on the north border. White sweet clover has appeared in dense patches since 2002.

Priorities:

Treat reed canary grass and treat the draw. Replant those areas to a mix of prairie grasses and forbs, including wet to mesic species that compete well with reed canary grass. *Treat after a killing frost* to control Canada thistle and cool season plants, including white sweet clover. *Suppress woody plants* that are volunteering in the unit.

Reduce or eliminate mowing among the nut trees. Treatment of Canada thistle in the nut grove provides an opportunity to sow prairie dropseed (*Sporobolus heterolopsis*), and other mid height grasses, and forbs that would increase diversity and create a transition between the mowed lawn and the prairie.

4. PMU 4

Acres: 9.130

Vegetation: This portion of the tallgrass prairie has well established grasses, but only a few areas rich in forbs. There are some well developed Russian olive (*Elaeagnus angustifolia*), choke cherry (*Prunus virginiana*), dogwood, and exotic honeysuckle shrubs or trees. Canadian thistle is occasionally seen, but does not pose a major threat to the integrity of the prairie.

Physical features: The south facing aspect drops about 20 feet in elevation to the southern border toward the interstate highway.

Problem: The PMU has little plant diversity. Being a south facing slope, its aspect creates a meso-clime that would favor drought resistant species. Canada goldenrod is the principle forb and impacts species diversity. Small clones of Canada thistle occasionally occur. Invasive species that occur in the interstate right-of-way can encroach onto this PMU and so managers must remain vigilant. Sweet clover and wild parsnip are well established in the right-of-way and have moved in along the southern border of this PMU. Crown-vetch (*Coronilla varia*) occurs in the right-of-way, but has not yet entered the PMU. Occasional trees and bushes have become well established.

Priorities:

Treat after killing frost to suppress cool season invasive plants. Prescribed fire can be used on a three to five-year cycle immediately. Fire will occur in fall occasionally to provide a competitive advantage for early season flowering forbs. *Suppress woody plants* by cutting and stump treating.

Dr. Paul Christiansen noticed a reduction in Canada goldenrod in other PMUs where mowing was used to help establish the nut tree grove. Mowing was done twice during the season. The first mowing occurred when Canada goldenrod was taller than surrounding plants in spring. The second occurred in midsummer. This treatment will be further explored to reduce the dominance of Canada goldenrod in this PMU.

5. PMU 5

Acres: 7.238

Vegetation: This area is predominately a good mosaic of tallgrass prairie with an intrusion of trees that were planted in the late 1990s and could eventually become a savanna. This tree grove extends into the prairie from the Miles Farm on the northeast side of the unit.

Physical features: South facing aspect drops about 20 feet in elevation to the southern border toward the interstate highway.

Problem: The PMU has little diversity in prairie plants and Canada goldenrod is dominant among the forb species throughout the PMU. The artificial mound on which the tree grove was planted has not been finished and a portion was not seeded in grasses and forbs. This area was used as a dump site for woodchips and debris through 2003 and has become infested with weedy plants and exotics. It is a potential source of exotic seeds, woody starts, and phytocide (natural herbicides that leach from plant tissue, such as walnut). Many of the trees from the original planting have died and some show evidence of disease or stress. Siberian elm has sprouted in the eastern half of the PMU. Sweet clover and wild parsnip make incursions into the PMU from the highway right-of-way and PMU 7. Crown vetch has potential for spreading into the PMU from the highway right-of-way.

The original intention for the savanna which was to create a visual screen is difficult to achieve with native species that can survive on a dry ridge. The only native

evergreen in this part of Iowa is red cedar (*Juniperus virginiana*). This tree does not reach the height necessary to screen neighboring commercial signs. Deciduous species provide maximum screening in summer, but are less effective in winter months. A deciduous screen must consist of species with a broad crown and many interlacing twigs to provide maximum screen density during winter. To survive along the ridge, the trees must be adapted to dry, windswept conditions.

Priorities:

Prescribed fire can be used on the three- to five-year fire-cycle. Planting forb seed after fires will increase plant diversity. Seed may be collected from forb-rich sites in the prairie or it may be purchased.

The piles of soil and woodchips will be contoured to fit the ridge shape during the autumn of 2003. The disturbed area will be *treated after killing frost* to suppress cool season plants that emerge from the disturbed soil. Treatment with herbicide will occur in 2004 until exotic weeds and cool season perennial populations are controlled. A dry site prairie seed mixture will be planted on the open soil. Once native ground cover has become established, bur oak (*Quercus macrocarpa*) and other oaks suitable to the location will be planted as an extension of the Miles Farm woodlot. Placement of the oaks should maximize overlap of crowns such that the depth of the planting will eventually provide maximum screening between the Gravesite and development at the highway interchange.

Suppress woody plants by cutting and stump treating. Pull incursions of wild parsnip and sweet clover. Treat white sweet clover with fire during flowering or *treat after killing frost*, as needed.

Include this PMU in the investigation of mowing on density and dominance of Canada goldenrod.

6. PMU 5a

Acres: 0.640

Vegetation: This unit is tallgrass prairie that originally served as a forb nursery.

Physical features: This area is split off from PMU 5 by a pathway. It is small and perched on the top of the ridge, next to the Miles Farm.

Problem: This unit has been separated for special treatment. It is similar to PMU 5 in most ways, except that it was initially established as a forb nursery and contains more forbs than PMU 5. It has not been maintained as a nursery and exotics have intruded into the unit.

Priorities:

Restore the forb nursery and create an interpretive area with informal beds and a patchwork of forb and grass species. Add species that are not currently represented in the prairie. These plants would provide seed for projects within the rest of the prairie. Label patches and beds with interpretive signs. Provide guide brochures and encourage visitation to this demonstration plot within the prairie. This unit would

serve as a source of seed, plug nursery, experimental area, and educational project. The NHS could alter dominance/diversity in other parts of the prairie using plugs and seed from this nursery.

No genetic contamination will be tolerated in this area. Only local ecotypes will be used. Encroachment by invasive and exotic plants will be aggressively deterred. Good horticultural techniques would be implemented. An area will be devoted to composting of organic material from landscape projects on the site. Compost could be used to amend the soil and contribute to soil genesis within this PMU or for other purposes in the NHS. The compost area will be included in educational and interpretive programs.

7. PMU 6

Acres: 17.149

Vegetation: This tallgrass prairie has low diversity, except along northern sections. The nut tree grove extends into the northwest edge of this PMU.

Physical features: The north facing aspect rises about 50 feet in elevation to a ridge on the southern edge of the unit; two major draws are oriented due north.

Problem: Acreage that was added to the prairie after the original 1971 reconstruction stretches along the northern portion of the unit. Kentucky bluegrass and brome are well established in this area which is contiguous with mowed lawn. The addition of the nut grove and subsequent mowing has further enhanced the dominance of cool season grasses on this edge. The nut grove also harbors several stands of Canada thistle. Lawn abruptly ending at the tall grasses is a source of exotic species and the mow line shifts from year to year. This causes a very weedy, 10-meter swath of prairie edge.

Canada goldenrod is the predominant forb in the southern half of the unit. Reed canary grass, red-osier dogwood, elderberry, white mulberry, and tartarian honeysuckle are well established in the drainages. Giant ragweed periodically appears on the north edge and in the swales. Siberian elm and tartarian honeysuckle are scattered in the southeast quadrant.

Priorities:

Treat reed canary grass and treat after killing frost for cool season grasses, Canada thistle, and unwanted woody plants. *Suppress woody plants* using the techniques described. Replant treated areas with a mix of prairie grasses and forbs. Eliminate the giant ragweed patches by clipping before they form seed heads, and replant areas to native species. Reduce mowing among the nut trees and sow treated areas within the grove with prairie dropseed. Subject the PMU to prescribed fire on a three to five-year rotation. The nut grove will not be included in prescribed fire until the tree boles reach 10 centimeters diameter. Include this unit in a study of the effects of mowing on Canada goldenrod.

This PMU will show a great deal of variability in plant community between the base of the draw and the top of the ridge. The NHS will take advantage of the relief to establish grasses and forbs with different moisture requirements.

Interpretive products will highlight natural, cultural, and historic values of the prairie along the border of this PMU that is maintained as the “Short Trail.” Products would include a self guided brochure, waysides, ranger led walks, and programs. Cool season lawn between the Gravesite access sidewalk and the prairie will be converted to low and mid-height prairie and savanna plants to provide a transition to the tallgrass prairie. Plant diversity and genetic integrity must be maintained in this PMU and a demonstration plot created in the 1980s at the trailhead will be maintained.

8. PMU 7

Acres: 7.451

Vegetation: This unit is poor quality tallgrass prairie with low diversity and sparse tree placement. Trees were planted along the Downy Street sight-line to increase visibility of the original position of the street. Some trees have been lost and some volunteer trees, many of which are exotic species, have grown in the unit. The land lying between the Miles Farm and the PMU has no established management associated with it and is a combination of various exotic and invasive species under tree canopy.

Physical features: Much of the relatively flat landscape near the road contains sink holes and concrete outcrops that erupted after reclamation of the land. The PMU is between two historic structures. There is one swale that is oriented to the north.

Problem: The area was reclaimed from a concrete covered gas station and other businesses and has poor soil. The highest concentrations of wild parsnip and sweet clover within the NHS occur here. Woody shrubs, including multi-floral rose (*Rosa multiflora*) and Siberian elm are located throughout this PMU. Much of the area near the Miles Farm was incorporated into the prairie after the initial planting in 1971 and was never converted to native grasses. It is dominated by smooth brome and other cool season grasses that have been allowed to grow without mowing. Large clones of Canada thistle harbored within brome are immediately north of the Miles Farm trees. The swale running from the Miles barn to the north is dominated by invasive woody shrubs, Siberian elm, and exotic, cool-season grasses.

This PMU is highly visible from the main north-south road into West Branch. It has a large sign identifying the tallgrass prairie, but this sign is currently surrounded by stands of sweet clover.

Priorities:

Use two or more glyphosate treatments to kill ground cover in the Miles Farm grove of trees where no desirable species persist. Thin tree cover by removing walnut trees to reduce the amount of phytocide in the grove and by removing Siberian elm. Retain silver maple (*Acer saccharinum*), ash, and other good examples of native species. Replant treated areas with woodland and savanna plants. Use premixed savanna and woodland seed preparations from local ecotypes.

Begin control of biennial and annual weeds by burning annually for two or three years. *Treat after killing frost* to suppress cool season plants, including brome, Canada thistle, and white sweet clover in areas that have desirable species. In areas that are completely dominated by exotic species, use glyphosate to eradicate the

ground cover. *Treat the draw* to reduce reed canary grass and brome in this area. Mow the PMU at 14 inches height before yellow sweet clover seed sets, during the first year of treatment. Use a brush hog to apply *intensive woody plant suppression* in areas around the draw.

Pull exotic weeds by hand as needed after the initial treatments with fire and herbicide. Summer burning of white sweet clover may be possible in very small patches on this PMU, although smoke control is difficult at this time of year and roadways border this unit. If prescribed fire cannot be done, resort to hand pulling sweet clover.

Soil nutrient tests will be taken prior to the first spring planting. Determine levels of phosphate, potassium, trace elements, pH, and organic matter. Amend soil if needed through spreading of good quality compost and/or conservative additions of fertilizer. Prairie seed mixes must contain a high percentage of legumes and these seeds will be inoculated prior to planting.

Plant forb and mid-height grass plugs in a broad band at the eastern edge of the unit near the roadway after the first late-spring burn. Over seed the remaining PMU with a quality prairie mix that includes legumes. Plant competitive forbs with grasses in the draw to reduce the probability of reed canary grass recurring. Because soils are poor in this unit, expect to over seed in subsequent years, until good cover is established. Remain vigilant to recurring invasion, since this area is particularly vulnerable to intrusion from its borders and because the soils are extremely disturbed.

D. Five-year Burn Program -- NHS Multiple Year Burn Plan

Following a period of intense treatment with fire, most of the prairie will be subject to a three- to five-year fire cycle. The fire schedule in Table 1 represents the likely timing of fire for each PMU for the first five years of this plan. It is a suggested fire sequence based on spatial distribution and need for exotic plant suppression. The schedule is flexible and must remain responsive to needs within each PMU. Ignition will occur in spring, summer, or autumn, as determined by the natural resource manager. Refer to map Figure 1 for PMU locations.

Table 1: Five-year prescribed fire schedule.

Year	Unit	Acres	Objectives
2004	1, 3, 4, 7	38	Begin intensive treatment of problem areas within these PMUs and begin a three- to five-year prescribed fire cycle for PMU 3 and 4
2005	1, 2, 5, 5a, 7	37	Further intensive treatment of problem areas; burn small trouble spots as needed; maintain a three-year fire cycle, possibly adding PMU 5 to regular cycle
2006	(1), 2, 6, (7 or 5)	< 46	Finish intensive treatments in most PMUs and enter into a three- to five-year; begin treatment of PMU 6
2007	(1), 3, 6	38	Apply adaptive management by monitoring response of PMUs to treatment; burn small patches as needed
2008	No burn planned, but option to burn problem areas remains open		Monitor response to treatment and leave option to burn patches or problem areas open; continue rotation at three years, until overall PMU objectives are met; transition to a five-year rotation, possibly as early as 2010.

() indicates optional PMUs that should be burned if intensive efforts are underway to reduce problem exotics and fire may contribute to the techniques. Intensive efforts should only be started if the treatment can be continued over the full duration of the prescription.

E. General Monthly Activities

January

- Implement activities specified in Fire Management Plan.

February

- Review results of monitoring research from previous year.
- Review and revise PMP, if necessary.

March

- Begin observations of flora and fauna
- Finalize plans for growing season

April through November

- Apply PMP prescriptions to PMUs
- Collect herbarium specimens for new species
- Perform wandering surveys to locate species of concern and invasive species

- Implement IPM program
- Perform annual monitoring program

October

- Use geospatial techniques to record new data on locations of exotic and invasive plants, size of invasion areas, changes in vegetation dominance, and occurrence of species of concern

November and December

- Critique season including all management activities

F. Prairie Monitoring

The NHS has a baseline inventory of plant species and their relative abundance. An annual monitoring of permanent plots and walking transects has successfully assessed changes in plant cover over time (Christiansen 1984 – 2003). This monitoring provides a means to evaluate management outcomes based on stated objectives. Twenty years of data show temporal and spatial trends in species diversity and abundance.

Monitoring is essential for adaptive management where qualitative and quantitative changes to resources are measured and used as a tool to guide modifications for subsequent treatments and reevaluation of objectives. Geospatial techniques will be used to map vegetation types, plot exotic and invasive species incursions, and designate locations of rare species or species of concern, annually.

VI. Prairie Research

A. Previous and Ongoing Restoration Research at Herbert Hoover NHS

Research at the NHS has monitored the reconstruction and maintenance of the prairie. Dr. Paul Christiansen has monitored prairie cover since 1984. His data provide insight to the dynamics of the system response to management. His reports from 1984 and 1985 specifically addressed the effects of prescribed fire. Christiansen's 1999 report made inferences concerning the re-establishment of fire as a management tool. Generally speaking, the prairie flora has shown a steady improvement, since the reintroduction of prescribed fire, and is currently a healthy example of a reconstructed tallgrass prairie (Christiansen, personal communication).

Dr. Paul Christiansen inventoried the prairie plant community which provided a species list and estimates of relative cover. The species list is believed to contain in excess of 90% of the plants on site. The relative cover estimates provide a baseline for investigation into the effects of management techniques on genetic integrity.

B. Research Needs and Opportunities

Implementation of this PMP should not be contingent on completion of research. Its implementation opens the door to investigating the effects of management techniques on

species composition and relative cover. In particular, the effect of mowing Canada goldenrod should be examined. Effects of glyphosate use in autumn and autumn prescribed fire should be monitored. Each evaluation of management technique points the NHS towards the best methods for managing the prairie plant community using natural processes as often as possible.

Inventories of insects have not been made on the prairie. Their diversity and abundance would indicate the overall health of the ecosystem. Herpetofauna were inventoried in 2002. Few species were identified and further monitoring would contribute to determination of management effects. Since prescribed fire is the primary management tool, impacts on herpetofauna will be assessed as part of fire effects monitoring. Birds were inventoried in 2003 with five obligate grassland species identified as using the prairie during the breeding season. Birds are an important indicator of the acceptability of the prairie as grassland habitat. A mammal survey is scheduled for 2004.

The prairie management has emphasized the management of vegetation. The assumption has been made that a healthy plant community will provide the best possible wildlife habitat. Any research designed to assess the condition and trends in wildlife distribution and abundance would improve our current knowledge base.

VII. Public Information and Education

The prairie opens opportunity for quality interpretation in natural resources and the historical importance of the prairie. Programs on awareness and stewardship could be offered at the NHS, in schools, and to the community. Prescribed fire education would continue to be important in the interpretation program. Volunteers could assist with research and management in the prairie on National Public Lands Day and throughout the year. Through an active volunteer program, the NHS could provide in-depth education in the values of natural lands to a broad audience.

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List of Appendices

- A. Bibliography
- B. Acronyms and Glossary
- C. Species Lists
- D. Memo to the Files
- E. Maps

A. Bibliography

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B. Acronyms and Glossary

FMP -- Fire Management Plan

GMP – General Management Plan

GPRA – Government Performance and Results Act of 1993

HHPLA – Herbert Hoover Presidential Library Association

HHPLM – Herbert Hoover Presidential Library-Museum

MWRO – Midwest Regional Office

NEPA – National Environmental Policy Act

NHS – National Historic Site

NPS – National Park Service

PMP – Prairie Management Plan

PMU – Prairie Management Unit

SHPO – State Historic Preservation Office

Birthplace Cottage – historic resource within historic core

Blacksmith Shop – cultural resource within the historic core

Burn plan – common usage for Prescribed Fire Plan which establishes the specific objectives, conditions, and methods that will be employed when using fire as a management tool

Ecoregion – a geographical area defined by the indigenous ecological community

Ecotype – plant genotype that fits a defined niche in the local ecosystem

Friends Meetinghouse – historic resource within historic core

Gravesite – historic resource; grave site for Lou Henry and Herbert Hoover

Historic Core – location of most of the historic buildings, located in the northeast portion of the park

Herbert Hoover Presidential Library Association – a private association, one of three entities located at the NHS, with a mission to commemorate the life of Herbert Hoover

Herbert Hoover Presidential Library-Museum – a facility of the National Archives and Records Administration, located within the NHS

Miles Farm – historic farm structures located on east side of park

Schoolhouse – historic resource located in the historic core

Thompson Farm -- historic farm structures located on west side of park; these structures belong to NPS, but are part of a lifelong lease and are not functionally part of the NHS

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C. Species Lists

Table C1: Plant Species List

Species	Common name	Plant family
<i>Yucca glauca</i>	soapweed	Agavaceae
<i>Amaranthus arenicola</i>	pigweed	Amaranthaceae
<i>Amaranthus hybridum</i>	green amaranth	Amaranthaceae
<i>Rhus glabra</i>	smooth sumac	Anacardiaceae
<i>Toxicodendron radicans</i>	poison ivy	Anacardiaceae
<i>Angelica atropurpurea</i>	angelica	Apiaceae
<i>Daucus carota</i>	Queen Anne's lace	Apiaceae
<i>Eryngium yuccifolium</i>	rattlesnake master	Apiaceae
<i>Pastinaca sativa</i>	wild parsnip	Apiaceae
<i>Zizia aurea</i>	golden alexanders	Apiaceae
<i>Asclepias syriaca</i>	common milkweed	Asclepiadaceae
<i>Asclepias tuberosa</i>	butterfly weed	Asclepiadaceae
<i>Achillea millefolium</i>	western yarrow	Asteraceae
<i>Ambrosia artemisiifolia</i>	common ragweed	Asteraceae
<i>Ambrosia trifida</i>	giant ragweed	Asteraceae
<i>Antennaria neglecta</i>	field pusseytoes	Asteraceae
<i>Arctium minus</i>	common burdock	Asteraceae
<i>Aster azureus</i>	sky-blue aster	Asteraceae
<i>Aster ericoides</i>	heath aster	Asteraceae
<i>Aster laevis</i>	smooth blue aster	Asteraceae
<i>Aster novae-angliae</i>	New England aster	Asteraceae
<i>Aster pilosus</i>	hairy aster	Asteraceae
<i>Aster sp.</i>	aster	Asteraceae
<i>Brickellia eupatorioides</i>	false boneset	Asteraceae
<i>Cirsium arvense</i>	Canada thistle	Asteraceae
<i>Cirsium discolor</i>	field thistle	Asteraceae
<i>Cirsium vulgare</i>	bull thistle	Asteraceae
<i>Conyza canadensis</i>	horseweed	Asteraceae
<i>Coreopsis palmata</i>	tickseed	Asteraceae
<i>Coreopsis tinctoria</i>	golden coreopsis	Asteraceae
<i>Coreopsis tripteris</i>	tall tickseed	Asteraceae
<i>Echinacea pallida</i>	pale coneflower	Asteraceae
<i>Echinacea purpurea</i>	purple coneflower	Asteraceae
<i>Erechtites hieracifolia</i>	fireweed	Asteraceae
<i>Erigeron annuus</i>	annual fleabane	Asteraceae
<i>Erigeron strigosus</i>	Daisy fleabane	Asteraceae
<i>Helenium autumnale</i>	sneezeweed	Asteraceae
<i>Helianthus annuus</i>	common sunflower	Asteraceae
<i>Helianthus tuberosus</i>	Jerusalem artichoke	Asteraceae
<i>Helianthus grosseserratus</i>	saw-tooth sunflower	Asteraceae
<i>Heliopsis helianthoides</i>	ox-eye	Asteraceae
<i>Lactuca canadensis</i>	wild lettuce	Asteraceae
<i>Lactuca serriola</i>	prickly lettuce	Asteraceae

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Species	Common name	Plant family
<i>Liatris aspera</i>	rough blazing star	Asteraceae
<i>Ratibida pinnata</i>	yellow coneflower	Asteraceae
<i>Rudbeckia hirta</i>	black-eyed Susan	Asteraceae
<i>Rudbeckia triloba</i>	brown-eyed Susan	Asteraceae
<i>Senecio plattensis</i>	prairie ragwort	Asteraceae
<i>Silphium integrifolium</i>	rosinweed	Asteraceae
<i>Silphium laciniatum</i>	compass plant	Asteraceae
<i>Silphium perfoliatum</i>	cup plant	Asteraceae
<i>Silphium terebinthinaceum</i>	prairie dock	Asteraceae
<i>Solidago canadensis</i>	Canada goldenrod	Asteraceae
<i>Solidago gigantea</i>	smooth goldenrod	Asteraceae
<i>Solidago rigida</i>	stiff goldenrod	Asteraceae
<i>Sonchus oleraceus</i>	common sow thistle	Asteraceae
<i>Taraxacum officinale</i>	dandelion	Asteraceae
<i>Tragopogon dubius</i>	goat's-beard	Asteraceae
<i>Vernonia fasciculata</i>	ironweed	Asteraceae
<i>Corylus americana</i>	hazlenut	Betulaceae
<i>Lithospermum canescens</i>	hoary puccoon	Boraginaceae
<i>Barbarea vulgaris</i>	yellow rocket	Brassicaceae
<i>Capsella bursa-pastoris</i>	Shepard's purse	Brassicaceae
<i>Lepidium densiflorum</i>	peppergrass	Brassicaceae
<i>Lobelia spicata</i>	spiked lobelia	Campanulaceae
<i>Lonicera tatarica</i>	Tartarian honeysuckle	Caprifoliaceae
<i>Sambucus canadensis</i>	elderberry	Caprifoliaceae
<i>Cerastium sp.</i>	field chickweed	Caryophyllaceae
<i>Saponaria officinalis</i>	bouncing bet	Caryophyllaceae
<i>Chenopodium album</i>	lamb's quarters	Chenopodiaceae
<i>Tradescantia sp.</i>	spiderwort	Commelinaceae
<i>Calystegia sepium</i>	field bindweed	Convolvulaceae
<i>Ipomea sp.</i>	morning glory	Convolvulaceae
<i>Cornus foemina ssp racemosa</i>	gray dogwood	Cornaceae
<i>Cornus stolonifera</i>	red-osier dogwood	Cornaceae
<i>Carex spp.</i>	sedge	Cyperaceae
<i>Equisetum arvense</i>	common horsetail	Equisetaceae
<i>Astragalus canadensis</i>	milk vetch	Fabaceae
<i>Baptisia lactea</i>	white wild indigo	Fabaceae
<i>Dalea candida</i>	white prairie clover	Fabaceae
<i>Dalea purpurea</i>	purple prairie clover	Fabaceae
<i>Desmodium canadense</i>	showy tick-trefoil	Fabaceae
<i>Lespedeza capitata</i>	round-headed bush clover	Fabaceae
<i>Lotus corniculatus</i>	bird's-foot trefoil	Fabaceae
<i>Medicago lupulina</i>	black medic	Fabaceae
<i>Melilotus alba</i>	white sweet clover	Fabaceae
<i>Melilotus officinalis</i>	yellow sweet clover	Fabaceae
<i>Trifolium hybridum</i>	alsike clover	Fabaceae
<i>Trifolium pratense</i>	red clover	Fabaceae
<i>Trifolium repens</i>	white clover	Fabaceae

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Species	Common name	Plant family
<i>Quercus alba</i>	white oak	Fagaceae
<i>Quercus bicolor</i>	swamp white oak	Fagaceae
<i>Quercus borealis</i>	northern red oak	Fagaceae
<i>Quercus macrocarpa</i>	bur oak	Fagaceae
<i>Hypericum sp.</i>	St. John's wort	Hypericaceae
<i>Sisyrinchium campestre</i>	blue-eyed grass	Iridaceae
<i>Carya ovata</i>	shagbark hickory	Juglandaceae
<i>Juglans nigra</i>	black walnut	Juglandaceae
<i>Physostegia parviflora</i>	obedient plant	Lamiaceae
<i>Morus alba</i>	white mulberry	Moraceae
<i>Fraxinus pennsylvanica</i>	green ash	Oleaceae
<i>Pinus strobus</i>	eastern white pine	Pinaceae
<i>Oenothera villosa</i>	gray evening primrose	Onagraceae
<i>Plantago spp.</i>	plantain	Plantaginaceae
<i>Platanus occidentalis</i>	sycamore	Plantanaceae
<i>Agrostis gigantea</i>	redtop	Poaceae
<i>Alopecurus carolinianus</i>	common foxtail	Poaceae
<i>Andropogon gerardii</i>	big bluestem	Poaceae
<i>Bouteloua curtipendula</i>	side-oats grama	Poaceae
<i>Bromus inermis</i>	smooth brome	Poaceae
<i>Dactylis glomerata</i>	orchard grass	Poaceae
<i>Elymus canadensis</i>	Canada wildrye	Poaceae
<i>Panicum virgatum</i>	switchgrass	Poaceae
<i>Phalaris arundinacea</i>	reed canary grass	Poaceae
<i>Poa pratensis</i>	Kentucky bluegrass	Poaceae
<i>Schizachyrium scoparium</i>	little bluestem	Poaceae
<i>Setaria faberi</i>	giant foxtail	Poaceae
<i>Sorghastrum nutans</i>	Indian grass	Poaceae
<i>Polygonum aviculare</i>	knotweed	Polygonaceae
<i>Rumex crispus</i>	curly dock	Polygonaceae
<i>Potentilla arguta</i>	tall cinquefoil	Rosaceae
<i>Rosa multiflora</i>	multiflora rose	Rosaceae
<i>Verbascum thapsus</i>	common mullein	Scrophulariaceae
<i>Veronica sp.</i>	speedwell	Scrophulariaceae
<i>Veronicastrum virginicum</i>	Culver's root	Scrophulariaceae
<i>Physalis heterophylla</i>	ground cherry	Solanaceae
<i>Physalis virginiana</i>	ground cherry	Solanaceae
<i>Solanum americanum</i>	black nightshade	Solanaceae
<i>Solanum carolinense</i>	horse nettle	Solanaceae
<i>Ulmus pumila</i>	Siberian elm	Ulmaceae
<i>Viola pratincola</i>	common blue violet	Violaceae
<i>Viola sp.</i>	violet	Violaceae
<i>Parthenocissus quinquefolia</i>	Virginia creeper	Vitaceae
<i>Vitis riparia</i>	riverbank grape	Vitaceae

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Table C2: Breeding bird listing

Species	Probability of Breeding
American Kestrel	Probable
Ring-necked Pheasant	Confirmed
Northern Bobwhite	Possible
Killdeer	Probable
Mourning Dove	Confirmed
Yellow-billed Cuckoo	Probable
Eastern Screech Owl	Probable
Great Horned Owl	Probable
Common Nighthawk	Probable
Chimney Swift	Probable
Ruby-throated Hummingbird	Probable
Re-headed Woodpecker	Confirmed
Downy Woodpecker	Probable
Northern Flicker	Probable
Eastern Wood Peewee	Possible
Willow Flycatcher	Possible
Horned Lark	Possible
Purple Martin	Probable
Tree swallow	Possible
Northern Rough-winged Swallow	Confirmed
Barn Swallow	Confirmed
Blue Jay	Confirmed
American Crow	Possible
Black-capped Chickadee	Confirmed
Brown Creeper	Possible
House Wren	Confirmed
American Robin	Confirmed

List taken from:
Jackson, L.S., C. A. Thompson
and J.J. Dinsmore. 1996.
The Iowa Breeding Bird
Atlas. Univ. Iowa Press. 484
pp.

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Species	Probability of Breeding
Gray Catbird	Possible
Brown Thrasher	Confirmed
Cedar Waxwing	Probable
European Starling	Confirmed
Warbling Vireo	Possible
Yellow Warbler	Possible
Common Yellowthroat	Probable
Northern Cardinal	Probable
Indigo bunting	Probable
Dickcissel	Confirmed
Chipping Sparrow	Probable
Field Sparrow	Possible
Vesper Sparrow	Probable
Savannah Sparrow	Possible
Grasshopper Sparrow	Probable
Song Sparrow	Possible
Bobolink	Probable
Red-winged Blackbird	Confirmed
Eastern Meadowlark	Probable
Western Meadowlark	Confirmed
Common Grackle	Confirmed
Brown-headed Cowbird	Probable
Orchard Oriole	Probable
Northern Oriole	Confirmed
American Goldfinch	Probable
House Sparrow	Confirmed
House Finch	Possible

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List C3: Mammals – as taken from range maps

(*confirmed sightings)

Marsupial

*Virginia opossum, *Didelphis virginiana*

Canidae

*coyote, *Canis latrans*

gray fox, *Urocyon cinereoargenteus*

*red fox, *Vulpes vulpes*

Cervidae

*white-tailed deer, *Odocoileus virginianus*

Cricetidae

*deer mouse, *Peromyscus maniculatus*

*meadow vole, *Microtus pennsylvanicus*

*muskrat, *Ondatra zibethicus*

*prairie vole, *Microtus ochrogaster*

*western harvest mouse, *Reithrodontomys megalotis*

*white-footed mouse, *Peromyscus leucopus*

woodland vole, *Microtus pinetorum*

Geomyidae

*plains pocket gopher, *Geomys bursarius*

*thirteen-lined ground squirrel, *Spermophilus parryii*

*woodchuck, *Marmota monax*

Leporidae

*eastern cottontail, *Sylvilagus floridanus*

white-tailed jack rabbit, *Lepus townsendii*

Muridae

house mouse, *Mus musculus*

Norway rat, *Rattus norvegicus*

Mustelidae

*badger, *Taxidea taxus*

eastern spotted skunk, *Spilogale putorius*

ermine, *Mustela erminea*

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least weasel, *Mustela nivalis*

long-tailed weasel, *Mustela freyata*

*mink, *Mustela vison*

*striped skunk, *Mephitis mephitis*

Procyonidae

*Raccoon, *Procyon lotor*

Sciuridae

*eastern chipmunk, *Tamias striatus*

*fox squirrel, *Sciurus niger*

*Franklin's ground squirrel, *Spermophilus franklinii*

*gray squirrel, *Sciurus carolinensis*

Soricidae

least shrew, *Cryptotis parva*

masked shrew, *Sorex cinereus*

short-tailed shrew, *Blarina brevica*

Talpidae

*eastern mole, *Scalopus aquaticus*

Vespertilionidae

*big brown bat, *Eptesicus fuscus*

eastern pipistrelle, *Pipistrellus subflavus*

hoary bat, *Lasiurus cinereus*

Keen's myotis, *Myotis keenii*

little brown bat, *Myotis lucifugus*

Red bat, *Lasiurus borealis*

silver-haired bat, *Lasionycteris noctivagans*

Zapodidae

meadow jumping mouse, *Zapus hudsonius*

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D. Memo to the Files



The National Park Service

DATE: NOVEMBER 7, 2006
TO: FILE
FROM: BIOLOGIST
RE: PRAIRIE MANAGEMENT PLAN NEPA COMPLIANCE

The accompanying documentation, an Environmental Screening Form, and this memo fulfill the DO-12 requirements for documenting the decision making process in developing the Prairie Management Plan, 2003. Two alternatives were considered during a scoping session held on January 31, 2001. The first was the use of prescribed fire as the only treatment. The second was the use of fire as the primary treatment with the option to use mowing, hand weeding and cutting, chemical treatment, and other IPM methods to spot treat problem areas of invasive plants. Other treatments were briefly discussed and dropped from consideration as non-viable alternatives.

The Resource Management Plan calls for prescribed fire to become the primary tool for prairie management. Fire management falls under a current Fire Management Plan that was developed through the DO-12/DO-18 processes and meets all requirements of the National Environmental Policy Act with an Environmental Assessment and Finding of No Significant Impacts. The IPM techniques follow the guidelines presented in NPS-77. These treatments would be done on small trouble spots during a short time period and are designed to have no significant negative impacts. The treatments have been done in the past under previous management plans and their impacts are known. The Significant Natural Resources Project, approved in August 1983, called for an Integrated Pest Management program that used chemical spraying, hand cutting, mowing, USDA approved biological controls for Canada thistle, and a program of prescribed fire coupled with reseeding. Analysis of the Environmental Screening Form for the Prairie Management Plan of 2003 shows that there are no significant adverse impacts from the proposed actions. Past use of these techniques supports a finding of no significant impact.

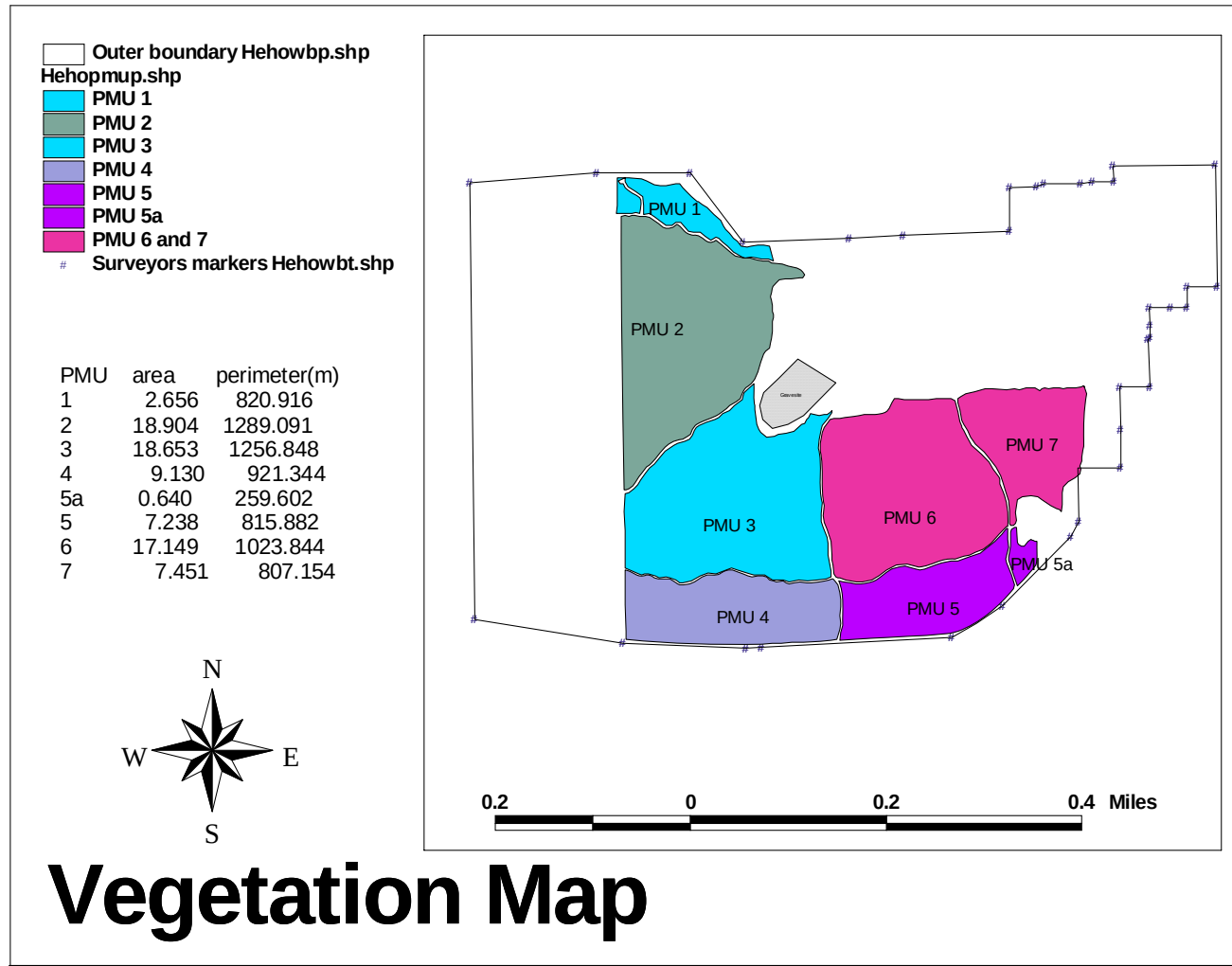
Therefore, it is the opinion of the park biologist that the Prairie Management Plan does not require an Environmental Assessment. This opinion was supported by MWRO planning and compliance personnel, Sue Jennings, based on the information presented to her by the park biologist in a phone conversation on July 10, 2003. The attached documentation serves to support that opinion.

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E. Maps

Figure 1: PMU locations and acreage



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Figure 2: Vegetation types in prairie

