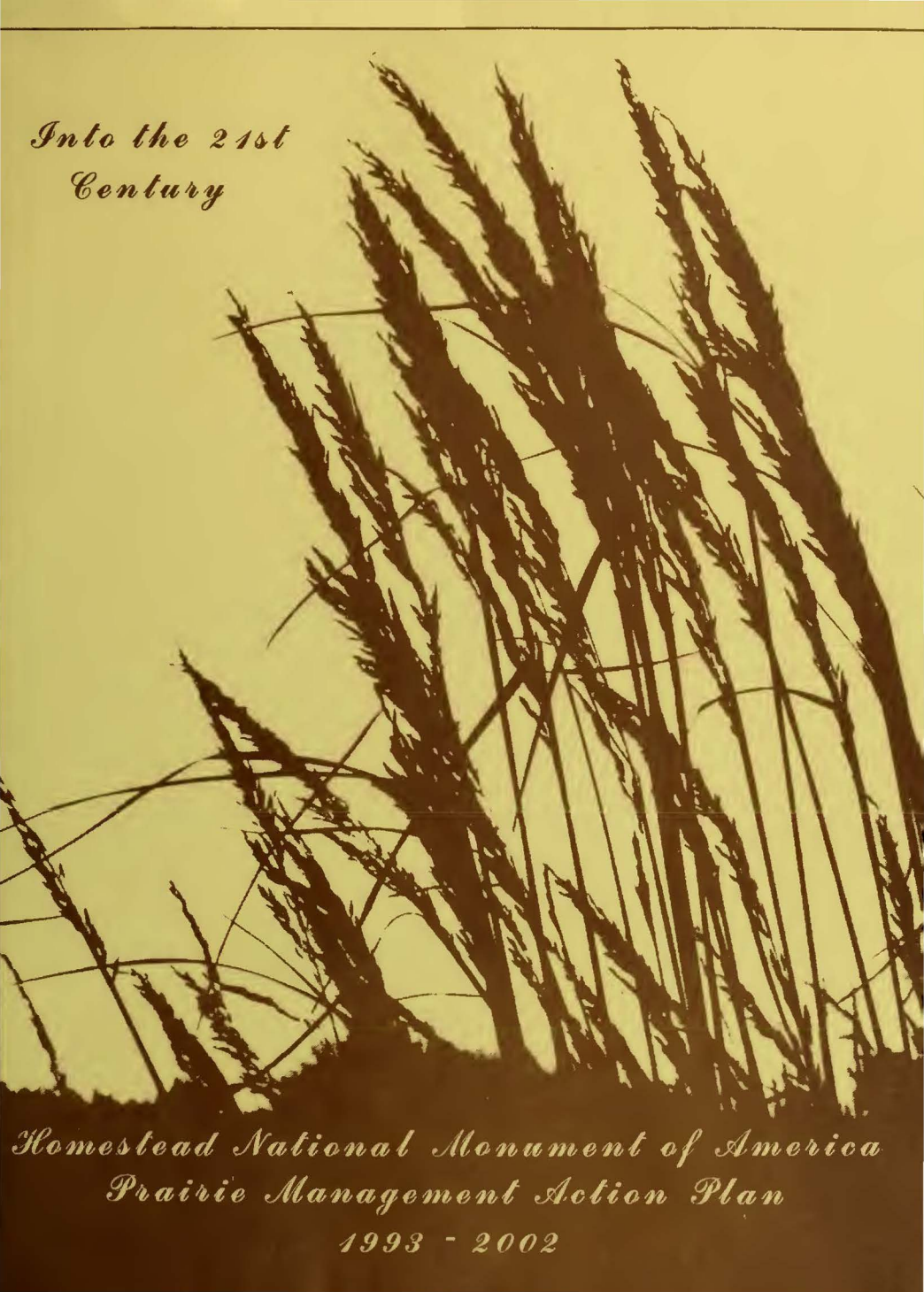

Homestead National Monument of America
Prairie Management Action Plan
1993 - 2002

INTO THE 21ST CENTURY
HOMESTEAD NATIONAL MONUMENT OF AMERICA
PRAIRIE MANAGEMENT ACTION PLAN
1993 - 2002

Prepared by:
John F. Batzer, Chief Ranger
Rebecca Dahle Lacome, Park Ranger
March, 1993

APPROVED BY: Randall K. Baynes 3-13-93
Superintendent Date

This document expands the management actions listed in the Resource Management Plan (1989) for Homestead National Monument. Included with the Resource Management Plan is an environmental assessment with a finding of no significant impact.

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INTO THE 21ST CENTURY
HOMESTEAD NATIONAL MONUMENT
TEN YEAR PRAIRIE MANAGEMENT ACTION PLAN
1993 - 2002

I. PURPOSE

The monument's long range prairie restoration objective is to restore the prairie scene to one typical of that seen by pioneers when the area was first settled in the mid-1860's. This plan will be used by park management to identify, program and schedule prairie restoration and maintenance projects to work toward accomplishing this objective.

In 1986, a five-year Prairie Management Action Plan was produced by monument staff using as a guideline the recommendations of Dr. James Stubbendieck of the University of Nebraska. Management actions during the time period covered by the plan (1986-1991) concentrated on treating identified critical areas to effect an improvement in the overall health, diversity and appearance of the Homestead prairie.

This action plan revises the original Prairie Management Action Plan and amends Homestead's 1989 Resource Management Plan (RMP).

RMP projects associated with this plan include:

N-100.001	Restore Native Prairie - Prescribed Fire Program
N-100.002	Restore Native Prairie - Control Exotic Vegetation
N-100.003	Restore Native Prairie - Sod Transplant
N-100.004	Restore Native Prairie - Remove Non-Historic Trees
N-100.005	Restore Native Prairie - Freeman School Prairie
N-100.006	Restore Native Prairie - Monitoring Program
N-100.007	Restore Native Prairie - Transplant Rare Forbs
N-100.008	Restore Native Prairie - Old Hwy 4 Landscape
N-100.009	Restore Native Prairie - Thicket Control
N-100.010	Restore Native Prairie - Edge Management
N-100.011	Restore Native Prairie - Seeding Native Species
N-200.001	Wildlife Management - Cavity Nesters Census
N-200.004	Wildlife Management - Baseline Inventory
N-400.003	Monitor and Control Erosion - Upland Prairie
N-600.000	Preserve Historic Trees
N-800.002	Rehabilitate/Maintain Trail System - Expand Trail System
N-900.000	Deciduous Forest Baseline Data

The statement of the problem and alternative actions for each of the above projects are contained in the RMP project statements.

A prioritized and chronological series of management actions have been developed to work toward achieving management objectives over a ten year period beginning with FY93. This plan will be reviewed annually to ensure management actions are consistent with the findings of current scientific research and techniques used are appropriate for achieving prairie management objectives.

II. GOALS

The primary goals of prairie management at Homestead are to restore and maintain the tallgrass prairie ecosystem to represent the pre-settlement scene, encourage the propagation of native species and provide for visitor education, enjoyment and safety. The "prairie ecosystem" referred to in this plan, defined using an ecosystem approach, includes all portions of the monument outside of developed areas. The woodlands area is included as a part of the prairie management plan because of the biological interactions that take place along the edge of the prairie and woodlands.

Related goals include:

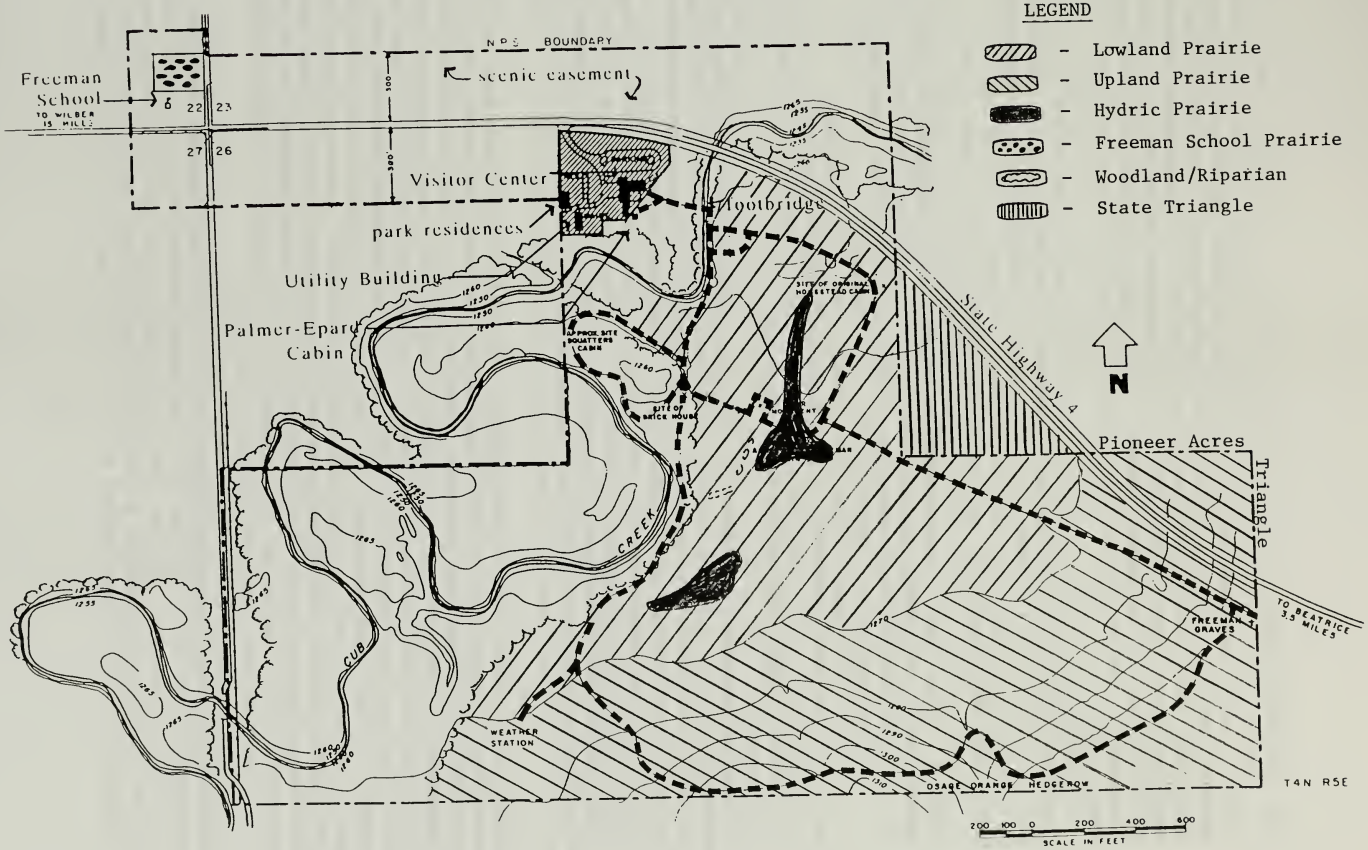
1. Mitigate the natural and exotic influences which have a detrimental effect on the restoration and maintenance of the prairie ecosystem.
2. Use natural processes and minimally intrusive methods to the extent possible for restoration and maintenance activities.
3. Develop and conduct an inventory and monitoring program to determine success of management actions and validity of objectives.
4. Identify scientific research needs, conduct research with existing staff where possible, and solicit outside research assistance for those projects that cannot be completed locally in order to provide needed information for restoration and maintenance of the ecosystem.
5. Perpetuate the wildlife and microorganisms which will provide a practicable, healthy prairie ecosystem.

III. MANAGEMENT UNITS

There are five management units in the Homestead prairie ecosystem (see Map 1):

1. UPLAND PRAIRIE - that portion of the prairie above the 1270 foot contour. 55 acres
2. LOWLAND PRAIRIE - that portion of the prairie below the 1270 foot contour, excluding the woodland, riparian, and hydric areas. 43 acres
3. HYDRIC PRAIRIE AREAS - that portion of the lowland prairie identifiable by hydric vegetation types, soils, and drainage. 2 acres
4. FREEMAN SCHOOL PRAIRIE - the native prairie unit north of the historic Freeman School. 0.75 acres
5. WOODLAND/RIPARIAN AREA - that portion along the prairie edge where the dominant vegetative species are of the woodland/riparian types. 60 acres

PRAIRIE MANAGEMENT UNITS



IV. DOCUMENTATION

A daily work log (see Appendix A) will be used to record management actions and locations of field work performed. Data collected in the field will be entered and stored in DBASE III program formats. A Geographic Information System (GIS) program using EPPL 7 software will be used to arrange, present and analyze data for management planning. Target goal for full GIS operation capability is in FY94-95.

The Photo Station Project begun in 1976 (revised in 1987, Homestead Policy #RM-87-02) documents changes in vegetational and scenic qualities of the prairie and Freeman School. Color slides and black and white photos are taken 3 times a year.

Refer to other park planning documents for detailed information not contained in the PMAP as follows:

- --Resource Management Plan (RMP) for individual project statements and updated priority ranking.
- --Fire Management Plan for prescribed fire regime.
- --Inventory and Monitoring Plan (after development).

V. BACKGROUND INFORMATION

Homestead National Monument of America exhibits one of the oldest recorded tallgrass prairie restoration efforts in the U.S. Begun in 1939, the restoration was to recreate an approximate example of the original landscape encountered by Daniel Freeman, who filed on this property as one of the first homestead claimants under the Homestead Act of 1862. The prospect of such a restoration on 100 acres of former pasture and cropland presented a unique challenge. It was categorized by Dr. J.E. Weaver as containing "the possibilities of an excellent experiment..."

That experiment, now over half a century old, represents the evolving understanding of landscape restoration and resource management techniques within the National Park Service (see Appendix B, article by Stubbendieck and Willson, briefly outlining HOME restoration history to 1986). This evolutionary trend has lead to the increased awareness that the "prairie ecosystem" at Homestead includes not only the original 100 acres of restoration, but all grassland, woodland and transition zones within the monument exclusive of developed areas. There is also the awareness that as a small "island" of prairie, the natural integrity of the monument will always be influenced by the impacts of development and intensive agriculture which surround it.

Management actions to date have been largely successful in the restoration of a tallgrass prairie plant community on the original 100 acres. Since 1986, when the first Prairie Management Action Plan was authored, a variety of techniques have been used to restore the land to tallgrass prairie (see Appendix B for a summary

of actions, 1985-1992). Sod transplants from a donor prairie and seeding of native species appears to have been successful in restoring portions of the lowlands to native prairie. Forb seedlings which were transplanted into the lowlands have successfully established vegetative diversity in the area formerly used by Freeman as a barnyard. However, exotic vegetation continues to be a problem in this area. A combination of fire and manual removal techniques has been used to reduce the number of woody thickets on the upland prairie. Approved herbicide treatments have been used on woody thickets to help control their spread, but the long-term success of these treatments has not been determined.

Some small areas of the lowland prairie are still undergoing initial stages of restoration, while the bulk of the area is beginning to require less intense management. A critical element in the continuing process is the need for information provided by inventory and monitoring, on which future management decisions must be based.

Baseline data for the woodlands and prairie/woodland edge is a need addressed in this and other planning documents for the monument. Baseline data from the original prairie restoration area was collected by Dr. James Stubbendieck of the University of Nebraska, who completed a vegetation survey using the modified step-point method in 1984. The 1270 foot contour line was selected to separate upland and lowland prairie management units because of soil and vegetation changes which occur along that general line. Species lists and percent composition figures were developed for each unit. The resulting document, Vegetation Survey and Management Recommendations by Sutton, Stubbendieck and Traeger, was used as the basis for the first Prairie Management Action Plan in 1986.

Cultural resources are located in each of the prairie management units. The lowland prairie contains the original housesite of the Freemans, the Agnes Suiter Freeman housesite (located partially in a hydric area), the site of the brick house constructed by Freeman, and the Quackenbush housesite. There is no visible evidence of these sites, which have been verified by archeological surveys, and they are intentionally not marked to prevent vandalism. Other cultural resources located in the lowland prairie include a DAR marker and a time capsule, both located adjacent to the Farm Loop Trail. Steps are taken to protect cultural resource sites during natural resource management actions.

The upland prairie contains the Freeman gravesite located adjacent to the east boundary and the osage orange hedgerow which forms the south boundary of the Monument.

The Woodlands Management Unit contains the squatter's cabin site, however, archeological surveys have not verified the exact location of this site.

The Freeman School Management Unit contains four historic buildings, a well pump and a may pole, all of which require protection during natural resource management activities.

VI. INTO THE 21ST CENTURY: ACTION PLAN 1993-2002

This plan, which is designed to direct management objectives and actions into the 21st century, incorporates the need for annual review and adjustment of priorities. Based on the dynamics of research and data collection, the plan guides the continuing evolution of management technique and understanding which has characterized the history of prairie restoration at Homestead.

The plan format addresses management objectives for each prairie management unit, with corresponding action prescriptions and timetable forecast. Some overlapping or similarity of objectives exists between management units, but prescription/treatment may vary according to topography, soil and vegetation types. Appendix C contains a chronological listing of projected management actions by year through 1995, which should be updated and added to as needed.

Accomplishment of management actions is based on the presumption that sufficient annual funding will be available for staffing needs. Seasonal and YCC personnel will be needed to supplement permanent staff if labor intensive prairie restoration and maintenance is to be accomplished each year. Given that prerequisite, the following objectives and prescriptions for the 10 year period beginning FY93 are designed to achieve the goals listed in Section II of this document.

VI. Into the 21st Century: Action Plan 1993-2002

A. UPLAND PRAIRIE MANAGEMENT UNIT

Unit Description

The Upland Prairie Management Unit is that portion of the prairie that lies above the 1270′ contour, where the soils change from the lowland Rokeby series to the Judson series soils. This unit consists of approximately 55 acres. The topography of the site ranges from near level ground at the east end of the unit to steep slope in and adjacent to the drainages, changing to gentle slope in the area of transition from upland to lowland prairie. The slope has a north aspect. Elevation ranges from 1270′ to 1320′. There are five soil types associated with the upland unit (see Appendix F Soils Profile):

1. Crete silty clay loam (CrA) located along the eastern boundary.
2. Geary silty clay loam (GeC2) located along the hedgerow/ south boundary and most of the Pioneer Acres triangle.
3. Morrill soils (ME3) located in a portion of the southeast corner of the unit and on the steepest upland slopes.
4. Judson silt loam (JuB) which comprises the majority of the upland slopes.
5. Judson fine sandy loam (JfB) which makes up a small area in the southwest corner of the unit.

The vegetation of the upland prairie was sampled along a line transect across the management unit in 1992. The results of the sampling are contained in Appendix D. The primary grass species sampled (64% of the samples) were Indiangrass (Sorghastrum nutans), little bluestem (Andropogon scoparius), and big bluestem (Andropogon gerardii). Total species composition for all grasses was 80%. Goldenrod sp.(Solidago sp.) and field pussytoes (Antennaria neglecta) were the most abundant forbs sampled, each comprising 3% of the total sample. A variety of forbs made up the remaining 17% of the samples along the transect.

Occurance observations indicate an increasing number of native shrub thickets throughout the upland and lowland areas. Past management actions utilized a number of techniques in attempting thicket control, but thicket locations and follow-up observations were not documented. A priority of this Action Plan is to identify and map existing thickets, and develop an effective procedural regime for thicket management.

The Homestead trail system winds through the Upland Prairie Unit, primarily along the perimeter of the unit. On the north side of

the upland, the trail is buffalo grass. The remainder of the trail system in the unit is constructed of fine gravel which has been packed to provide an even walking surface. The osage-orange (Maclura pomifera) hedgerow, listed on the List of Classified Structures (LCS), forms the south boundary of the Prairie Upland Unit and the monument. The Daniel and Agnes Freeman grave site is located in the upland unit. This site is also listed on the LCS.

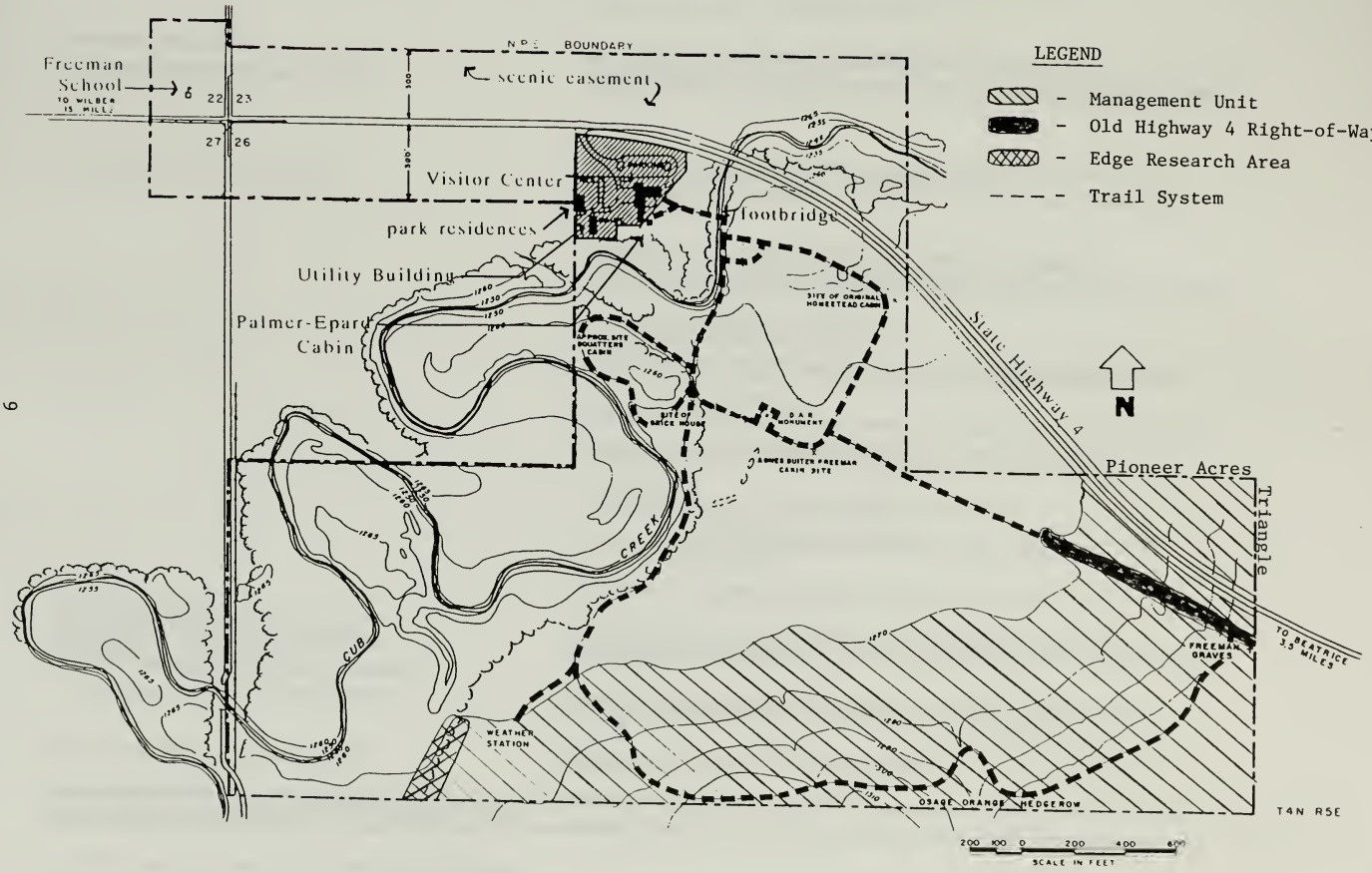
The Old Highway 4 right-of-way crosses the northern section of the upland unit and traverses two soil types, Crete silty clay loam and Geary silty clay loam. Sampling along the right-of-way indicates a higher percentage of switchgrass (Panicum virgatum) than is desired. Forb species were transplanted to aid in the diversification of the area in 1992 and that project will be continued as funding/personnel allow.

Three drainages occur on the unit, which were identified in the 1986 Action Plan as erosion problem areas. Actions taken under that plan seem to have successfully checked erosion in these drainages. The trail crosses all three drainages and culvert pipes have been placed under the trail in these locations to allow for runoff following periods of heavy precipitation. The two drainages on the south portion of the unit originate on land outside the monument.

The upland prairie joins the woodlands unit in the southwest corner of the Upland Prairie Management Unit. This area will become a research area to determine successional patterns of the prairie/woodland edge ecotone.

A small portion of the prairie upland is located adjacent to the Pioneer Acres development at the northeast corner of the unit. This area, henceforth referred to as the Pioneer Acres Triangle, is detached from the remainder of the upland unit and the monument by Nebraska Highway 4. Because private residences are immediately adjacent to the park boundary in this area, management of the prairie here will exclude the use of prescribed fire. Park management has determined that the use of fire is an unacceptable risk, except at those times when hazard fuel reduction is necessary. The area will therefore be monitored as a control area for fire exclusion, with all other prairie management techniques utilized as needed.

UPLAND PRAIRIE MANAGEMENT UNIT



A. UPLAND PRAIRIE MANAGEMENT UNIT

MANAGEMENT OBJECTIVES	PRESCRIPTIONS AND TIMETABLE
1. Eliminate and/or control thickets of native smooth sumac (Rhus glabra), wild plum (Prunus americana) and dogwood (Cornus sp.).	--Identify existing thickets by type and location <1993, 1994> --Map desired perimeters of thickets to be maintained <1993,1994> --Eliminate undesirable thickets and new sprouts by : a. cutting or b. cutting/stump treatment <1993,1994,1995, and as needed for control> --Eradicate shrubs outside perimeters of thickets to be maintained by cutting and/or cutting with stump treatments <1994,1995,1996> --Eradicate new sprouts outside perimeters of maintained thickets <Annually beginning 1994> --Allow prescribed fires to burn through thickets for control of woody vegetation <3-year burn cycle - see annual Burn Plan> --Monitor for maintenance of desired shrub species to grass/forb ratio in the management unit <Bi-annually beginning 1995>
2. Establish a prairie/woods edge ecotone study area.	--Mark and map existing upland edge ecotone between weather station trail junction and south park boundary <1993>

	--Allow prescribed fires to burn through study area <3-year burn cycle - see annual Burn Plan>
	--Monitor area to observe the succession/encroachment of native woody vegetation into the upland prairie. <Bi-annually beginning 1995>
3. Eradicate exotic vegetation.	--Cut/mow smooth brome (Bromus inermis). <Annually>
	--Determine native shade tolerant species which could be introduced to restore brome invasion area along south boundary fenceline. <1996,1997>
	--Acquire seed for south boundary restoration and begin seeding. <1996,1997>
	--Manually remove other exotic plant species as they occur. <Annually>
	--Prescribed fire treatments. <See annual Burn Plan>
4. Continue control of erosion on upland slopes/drainages.	--Monitor erosion prone areas. <Annually and after major precipitation events>
	--Repair/restore newly eroded areas. <As needed>
5. Continue species diversification of Old Hwy. 4 Right-of-way.	--Monitor species composition. <1993,1994,1995 then bi-annually beginning 1997>

	--Prescribed fire treatments. <3-year burn cycle - see annual Burn Plan>
	--Continue species/sod transplanting and/or seeding for diversity. <1993 and as monitoring indicates and funding allows>
6. Preserve historic osage orange (Maclura pomifera) hedgerow.	--Maintain existing trees by removal of invading tree species. Evaluate, mark and cut trees/seedlings for removal. <1994,1997,2000>
	--See Resource Management Plan for Project Statement regarding restoration of hedgerow as a cultural resource.
7. Manage continued restoration of the Pioneer Acres Triangle with the least intrusive management actions, due to proximity of housing development along park boundary.	--Remove trees/seedlings. <1993 and as needed>
	--Use prescribed fire for fuel hazard reduction. <As needed>
	--Monitor for species composition. <Bi-annually beginning 1993>
8. Continue vegetation monitoring.	--See Appendix D.

VI. Into the 21st Century: Action Plan 1993-2002

B. LOWLAND PRAIRIE MANAGEMENT UNIT

Unit Description

The Lowland Prairie Management Unit is that portion of the prairie that lies below the 1270' contour, excluding the Woodland/Riparian and Hydric Management Units, and is 43 acres in size. The topography of the lowland unit is nearly level to gently sloping soils. The unit is bounded on the west by the prairie/woodland edge, on the north by Nebraska Highway 4, and on the south and east by the Upland Prairie Management Unit. The soils of the prairie lowland consist of (see Appendix F):

1. Rokeby silty clay loam (Rt) in the central lowland area onto which most of the upland prairie drains.
2. Muir silt loam (Mu) stretching northeast from the south boundary, including much of the prairie/woodland edge.
3. Hobbs silt loam (Hb) in the lowland area extending from the old cash crop area through the lowland prairie restoration areas to the north boundary.
4. Hobbs silt loam (2Hb) in the lowland area adjacent to the northeast corner of the monument.

In 1992, four areas of the lowland were sampled for species composition: the Old Highway 4 right-of-way, R1 restoration area, the area below the base of the upland slope, and a line transect east of R1 (see Appendix D). Sampling indicated that good diversity exists throughout the lowland. The Old Highway 4 right-of-way contains a higher percentage of switchgrass (Panicum virgatum) than is desired. Forb species being transplanted to diversify that area will continue as personnel/funding allow. The R1 restoration area contains 21% exotic vegetation species, but has a good distribution of native grasses and forbs and is a very diverse unit. The lowland area south of the Old Highway 4 right-of-way appears to be quite diverse with 30% forb species along the transect.

As in the upland unit, the spread of native thickets is a concern in the lowland area. A priority of this Action Plan is to identify and map existing thickets, and develop an effective procedural regime for thicket management.

The Farm Loop Trail, constructed of packed gravel, forms a square in the northern portion of the unit. The Old Highway 4 right-of-way crosses the unit from the southeast, where it enters from the prairie upland, to the northwest, where it enters the woodlands.

There are four sites of historic interest in the management unit:

1. Site of the original Freeman homestead cabin, adjacent to the present day Nebraska Highway 4
2. Agnes Suiter Freeman cabin site, adjacent to the Old Highway 4 right-of-way
3. Site of the Freeman brick house, located at the lowland prairie/woodland edge
4. Quackenbush homesite, located between the Agnes Suiter Freeman cabin site and the Freeman brick house site.

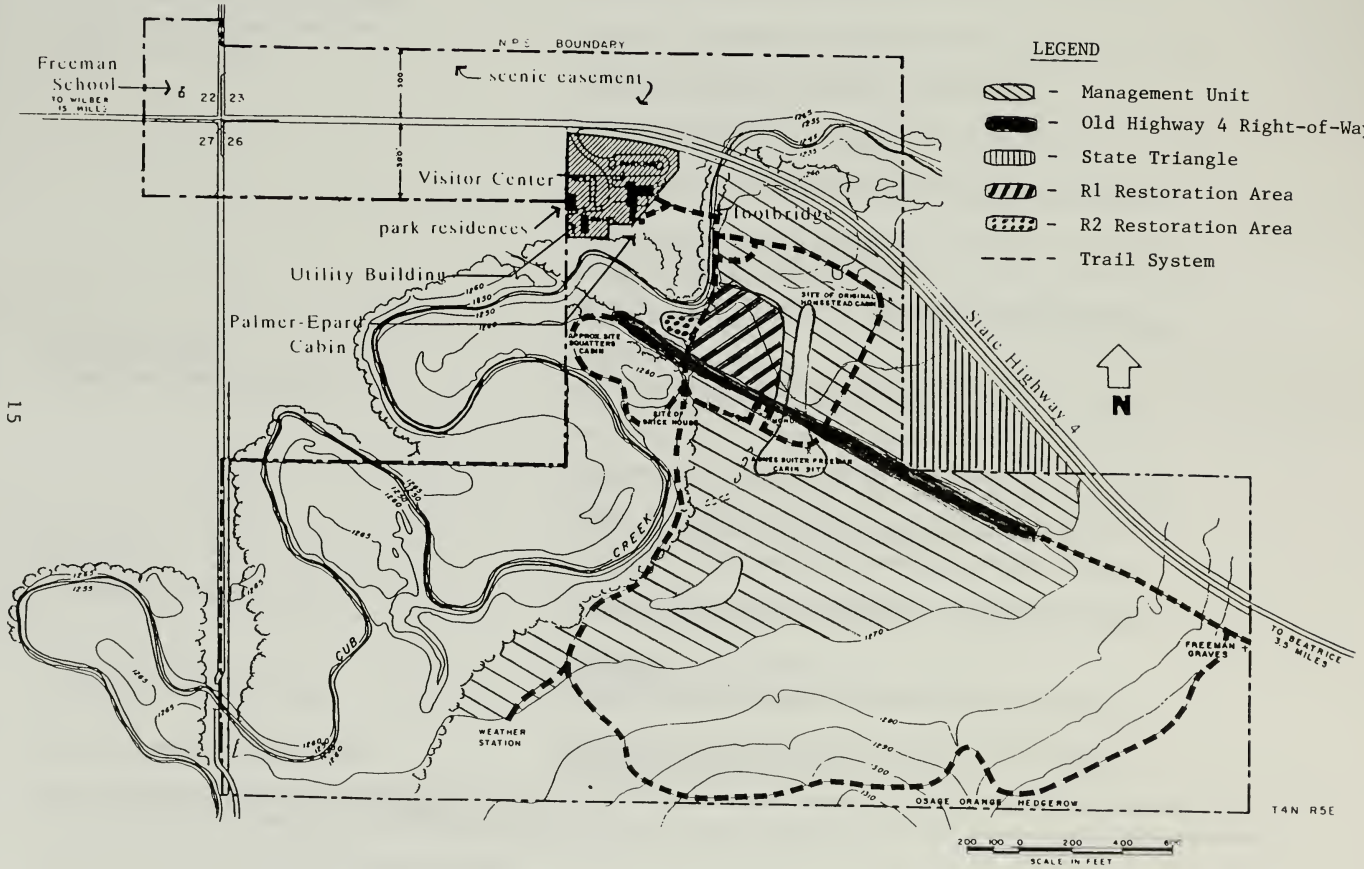
A Daughter's of the American Revolution monument and a time capsule are located on the Farm Loop Trail adjacent to the Old Highway 4 right-of-way. There are numerous historic trees, associated with the various home sites located in the management unit, south of and adjacent to the Old Highway 4 right-of-way. Trees which have no historic value are targeted for removal and the stumps flush cut.

The park's weather station is located adjacent to the Hedgerow Trail at the southwest corner of the management unit. The weather station is accessed by a spur trail which leads from the Hedgerow Trail. One objective listed in the park's goals is to provide an access trail to the woodlands which would extend from the weather station, through the Woodland/Riparian Management Unit, and exit at the southwest corner of the monument. Initial study for this trail is scheduled for 1993 and would affect this management unit.

A state-owned 5.4 acre parcel of land that borders the monument on the north hinders Homestead's prairie restoration efforts. This tract contains many eastern red cedar trees that readily establish themselves in the park's prairie. The NPS currently has an agreement with the Nebraska Department of Roads which allows removal of trees smaller than 3 inches in diameter and periodic burning of the tract to help meet restoration goals. Legislation has been initiated to exchange a 50 foot right-of-way along Nebraska Highway 4 for this 5.4 acre tract of land. If this land swap is completed, efforts to restore the land to an 1860's scene will be undertaken.

A parcel of land that was once a part of the Freeman barnyard needs to be restored to tallgrass prairie species. This tract, the R2 restoration area, is the only remaining parcel of land that has not received restoration efforts. It is located west of the Farm Loop Trail and the R1 restoration area.

LOWLAND PRAIRIE MANAGEMENT UNIT



B. LOWLAND PRAIRIE MANAGEMENT UNIT

MANAGEMENT OBJECTIVES	PRESCRIPTIONS AND TIMETABLE
1. Continue restoration in R1 restoration area.	--Prescribed fire treatments. <3-year burn cycle - see annual Burn Plan> --Cut/mow/hand-pull exotic vegetation. <Annually as needed> --Use R1 as a donor area for species/sod transplants and seed source for R2 area. <1993,1994,1995 and as needed> --Monitor for species composition. <Annually>
2. Begin restoration of R2 area. (see R2 Site Plan)	--Introduce native prairie plant species by seeding. <1993 and as needed> --Introduce native prairie plant species by sod transplant from lowland areas and Mattoon Prairie. <1993,1994,1995 and as needed> --Cut/mow/hand-pull exotic vegetation. <Annually as needed> --Prescribed fire treatments. <See annual Burn Plan> --Monitor for species composition. <Annually>

3. Eliminate and/or control thickets of native smooth sumac (Rhus glabra), wild plum (Prunus americana) and dogwood (Cornus sp.).	--Identify existing thickets by type and location. <1993,1994> --Map desired perimeters of thickets to be maintained. <1993,1994> --Eliminate undesireable thickets and new sprouts by: a.cutting or b.cutting/stump treatment <1993,1994,1995 and as needed for control> --Eradicate shrubs outside perimeters of thickets to be maintained by cutting and/or cutting with stump treatments. <1994,1995,1996> --Eradicate new sprouts outside perimeters of maintained thickets. <Annually> --Allow prescribed fires to burn through thickets for control of woody vegetation. <3-year burn cycle - see annual Burn Plan> --Monitor for maintenance of desired shrub species to grass/forb ratio in the management unit. <Bi-annually beginning 1995>
4. Eradicate exotic vegetation.	--Cut/mow/hand-pull exotic vegetation. <Annually as needed> --Prescribed fire treatments. <3-year burn cycle - see annual Burn Plan> --Seed with native prairie species into larger patches where exotics are being eradicated. <As needed>

5. Remove non-historic trees.	--Identify and map existing historic trees. <1994> --Cut/remove all trees which have not been identified as historic. <1994, 1995> --Monitor for and cut/remove new tree sprouts. <Bi-annually beginning 1996>
6. Continue species diversification of Old Highway 4 right-of-way.	--Monitor species composition. <1993,1994,1995 then bi-annually beginning 1997> --Prescribed fire treatments. <3-year burn cycle - see annual Burn Plan> --Continue species/sod transplanting and/or seeding for diversity. <1993 and as monitoring indicates and funding allows>
7. Study and manage prairie/woods edge ecotone.	--Solicit research assistance for an historical survey of probable pre-settlement edge conditions along Cub Creek (i.e. edge location, width of woodlands along creek, species composition of edge, and possible existence of oak savannah). <1993,1994,1995...> --Develop and implement a long-term edge management plan based on findings of historical survey (above), Freeman School brome control research project, and preliminary findings from upland edge ecotone study area. <2000,2001> --During interim, continue smooth brome control by: a. cutting/mowing <annually> b. prescribed fire treatments <as indicated in annual Burn Plan>

8. Restore State Triangle area (upon completion of land swap with the state).

--Prepare a restoration Site Plan and solicit NRPP prairie parks funding for restoration of this highly visible lowland area. <1993,1994>

--Management actions to be included in the Site Plan:

a. cut/remove trees and shrubs
b. restore ground contour where area was used as a borrow pit
c. transplant sod and/or seed for species diversity
d. eradicate and control exotic vegetation
e. prescribed fire treatments (see annual Burn Plan)
f. monitor for species composition

--Begin restoration (pending funding). <1995 or 1996>

9. Control erosion along Cub Creek.

--Monitor stream bank to determine extent of annual erosion. <Annually>

--Prepare and submit a 10-238 for stabilization. <1993>

10. Continue vegetation monitoring.

--See Appendix D.

VI. Into the 21st Century: Action Plan 1993-2002

C. HYDRIC PRAIRIE AREAS MANAGEMENT UNIT

Unit Description

The Hydric Prairie Areas Management Unit is that portion of the lowland prairie identifiable by hydric vegetation types, soils, and drainage. The combined hydric land area is approximately 2 acres. The topography of the unit is such that the hydric areas are pockets in the lowland below the surrounding lowland prairie. Hydric areas are located in the transition zone between upland and lowland management units and run in a general northerly direction to the present day Nebraska Highway 4. There are three soil types associated with the unit (see Appendix F):

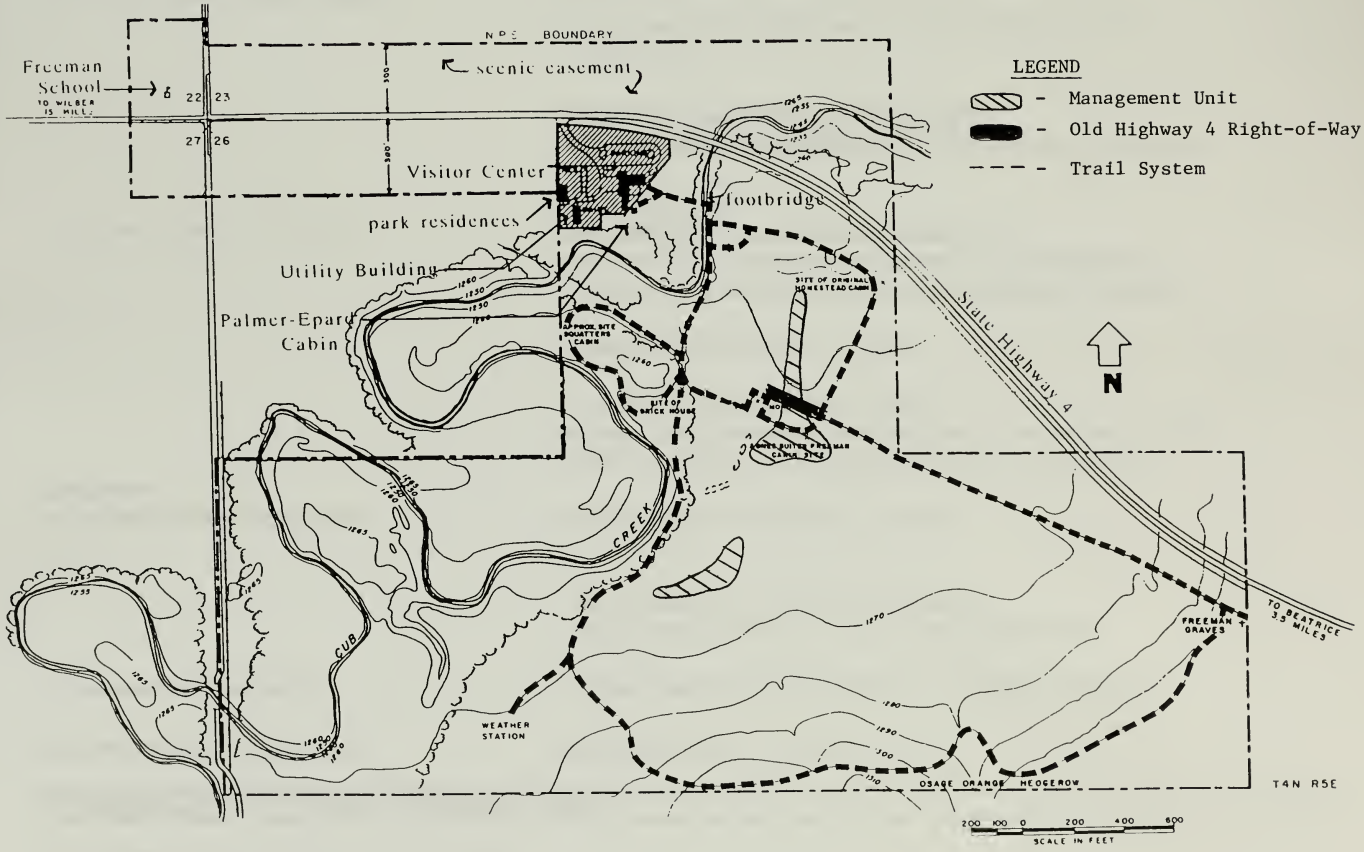
1. Rokeby silty clay loam (Rt) in the central lowland area to which most of the upland drains.
2. Muir silt loam (Mu) in which the major portion of the management unit is located.
3. Hobbs silt loam, occasionally flooded (2Hb) in which a small portion of the hydric areas is contained.

As a separate management unit, the hydric areas will require vegetation surveys to more completely identify native and non-native species already present and determine management objectives to acheive appropriate composition.

A small grove of green ash (Fraxinus pennsylvanica) occupies the most southern hydric area. Research is needed to determine the origin of this stand, whether or not it occupies a stream channel remnant, and to determine the origin of the remainder of the hydric areas in the park.

A portion of the Farm Loop Trail crosses one hydric area. A boardwalk crosses an area of the trail adjacent to a large stand of prairie cordgrass (Spartina pectinata).

HYDRIC PRAIRIE MANAGEMENT UNIT



C. HYDRIC PRAIRIE AREAS MANAGEMENT UNIT

MANAGEMENT OBJECTIVES	PRESCRIPTIONS AND TIMETABLE
1. Eradicate exotic vegetation.	--Cut/mow/hand-pull exotic vegetation. <Annually as needed>
	--Prescribed fire treatments as part of lowland burn units. <3-year burn cycle - see annual Burn Plan>
2. Monitor and study Ash Thicket hydric area.	--Map perimeter of Ash Thicket. <1993>
	--Monitor perimeter to control spread of thicket; eradicate new sprouts of woody species beyond perimeter by cutting/hand-pulling. <Annually as needed beginning 1994>
	--Conduct vegetation survey. <1994>
	--Solicit research assistance to determine natural history of this area (i.e. history of thicket existence, soils history, hydrologic history and possibility of old stream channel remnant) <1993,1994,1995...>
	--Develop and implement a management plan for this area based on findings of research (above). <1997,1998>

3. Remove non-historic trees (exclude Ash Thicket pending research results).	--Identify and map existing historic trees. <1994> --Cut/remove all trees which have not been identified as historic. <1994,1995> --Monitor for and cut/remove new tree sprouts. <Bi-annually beginning 1996>
4. Monitor for species composition.	--See Appendix D.

VI. Into the 21st Century: Action Plan 1993-2002

D. FREEMAN SCHOOL PRAIRIE MANAGEMENT UNIT

Unit Description

The Freeman School Management Unit is the native prairie unit north of the historic Freeman School. This unit is approximately 0.75 acre in size. The topography of the site is nearly level. There is one soil type associated with the unit:

1. Judson silt loam (JuB) which occupies the entire unit.

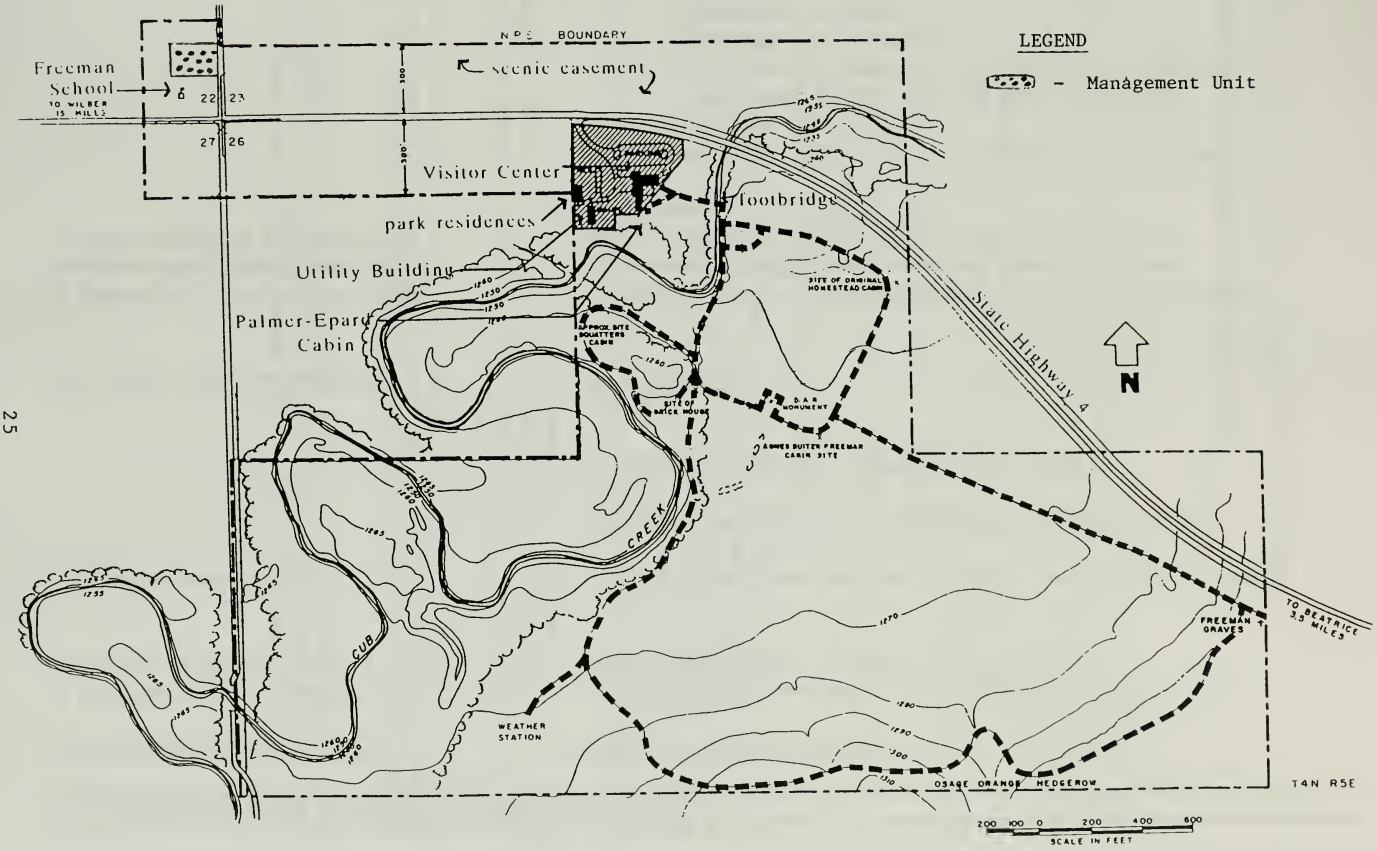
The vegetation of the Freeman School prairie was sampled by Stubbendieck et. al. in 1982, 1983 and 1984 using the modified step-point method, and by park staff in 1986, 1989, 1990 and 1992 using the same method. The results of these samplings are contained in Appendix D. In 1992 the primary grass species sampled (70% of the samples) were big bluestem (33%) and smooth brome (37%). Total species composition for all the grasses was 80%. Goldenrod (Solidago sp) and prairie wild rose (Rosa arkansana) were the most abundant forbs sampled, each comprising 4.7% of the total sample.

The unit abuts private property along the north and west boundaries and vegetative composition is influenced by the invasion of smooth brome (Bromus inermis) from this property.
In 1992 a research project was initiated to determine the most effective techniques for eradication of brome from this area (see Appendix H - Freeman School Research Plots).

The east boundary of the management unit is formed by a paved county road and the south boundary is the landscaped area adjacent to the historic school. The Freeman School building (ca. 1872) is on the List of Classified Structures (LCS) along with its associated structures which include two privies, a Maypole and a shed. These structures must receive protection from management actions to the prairie as well as from the effects of vegetation and vegetative root systems.

Approximately 1.2 acres were added to the unit in 1993 and a site development plan will need to be completed. This plan will need to address management options for visitor access/parking, and prairie restoration of this newly acquired land as a buffer around the unit's native prairie remnant.

FREEMAN SCHOOL PRAIRIE MANAGEMENT UNIT



D. FREEMAN SCHOOL PRAIRIE MANAGEMENT UNIT

MANAGEMENT OBJECTIVES	PRESCRIPTIONS AND TIMETABLE
1. Continue research on control of smooth brome (Bromus inermis).	--Conduct treatments and gather data per project description "Freeman School Research Plots". <1993,1994,1995>
2. Eradicate exotic vegetation.	--Cut/mow smooth brome (areas not included in research plots <Annually> --Manually remove other exotic plant species as needed. <Annually> --Prescribed fire treatments. <See annual Burn Plan>
3. Continue vegetation monitoring.	--See Appendix D.
4. Restore non-visitor use areas of new land acquisition around School prairie (upon completion of deed transfers).	--Prepare a restoration Site Plan and solicit NRPP prairie parks funding for restoration of buffer areas around the Freeman School native prairie remnant. Site Plan will include development of a visitor trail and parking area. <1993,1994> --Management actions for restoration to be included in the Site Plan: a. eradicate smooth brome b. prepare soil for introduction of native plant species c. introduce native plant species by seeding and transplanting d. prescribed fire treatments e. vegetation monitoring --Begin restoration (pending funding). <1995 or 1996>

VI. Into the 21st Century: Action Plan 1993-2002

E. WOODLAND/RIPARIAN MANAGEMENT UNIT

Unit Description

The Woodland/Riparian Management Unit is that portion along the prairie edge where the dominant vegetative species are of the woodland/riparian types. It extends west from the prairie/woodland edge and includes approximately 57 acres of Monument lands now vegetated by eastern deciduous forest species. The topography of this unit ranges from nearly level at the prairie/woodland edge to steep slopes in the riparian area along Cub Creek. The unit is bounded on the west, south and north by the park boundary and on the east by the upland and lowland prairie management units. The soils of the woodland/riparian unit consist of:

1. Alluvial land (Sy) which occupies the major portion of the management unit.
2. Hobbs silt loam (Hb) in the northeast quarter of the southwest quarter of the monument.

The woodland/riparian vegetation consists primarily of oak (Quercus sp.), silver maple (Acer saccharinum), hackberry (Celtis sp.) and cottonwood (Populus sp.). Native shrubs, including plum (Prunus americana), dogwood (Cornus sp.), and coralberry (Symphoricarpos sp.) occur in clusters with American elm (Ulmus americana), green ash, mulberry (Morus alba), box elder (Acer negundo), and honeylocust (Goleditsia triacanthos). The American elm population was largely destroyed by Dutch elm disease.

There is very little data on vegetation composition in this management unit. One research project is in progress to determine vegetative types located in the riparian area along Cub Creek. No baseline data exists for the woodland/riparian management unit.

Where the woodland joins the upland and lowland prairie units in the southeast corner of the management unit will become a research area to determine successional patterns of the prairie/woodland edge.

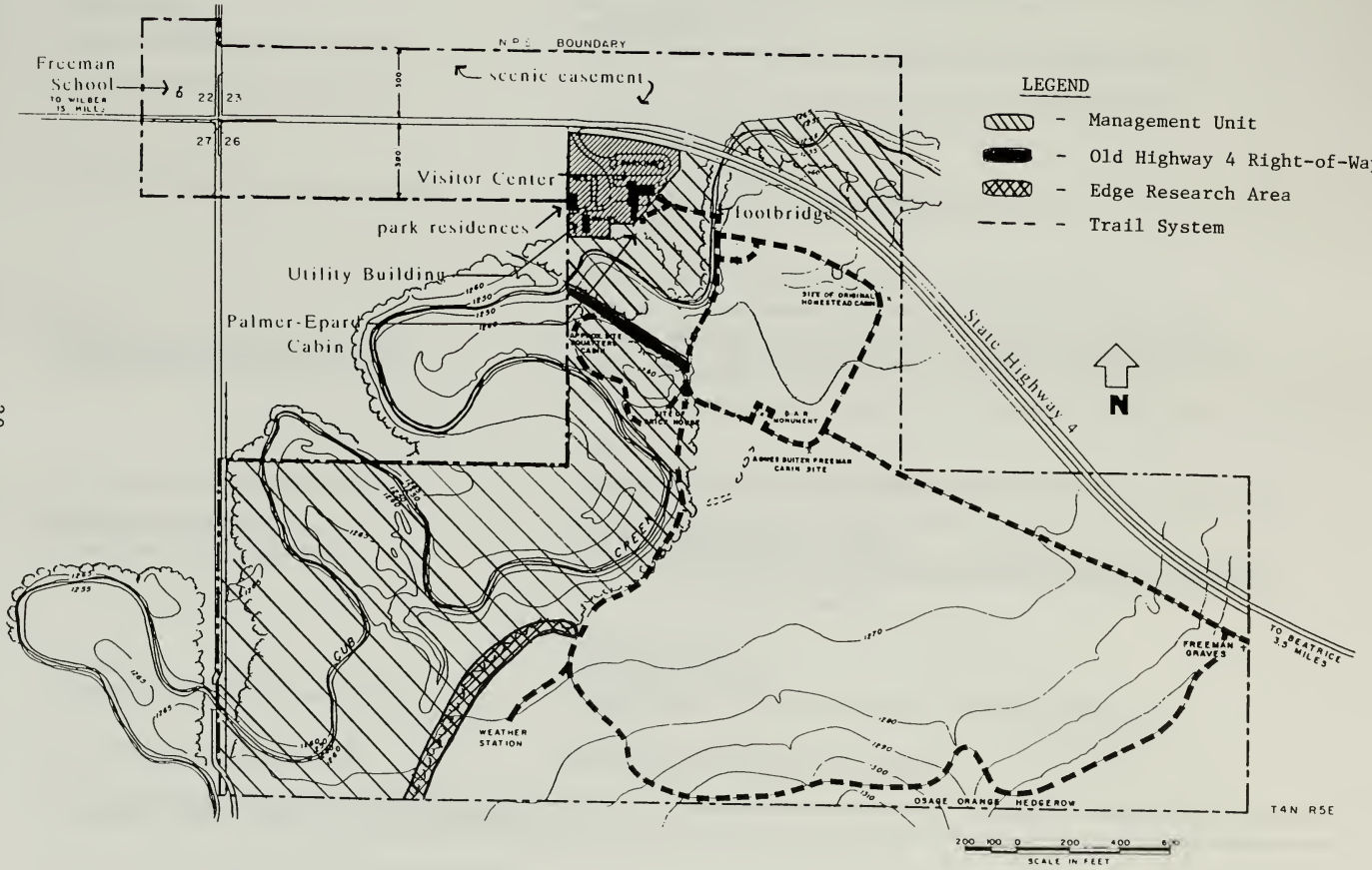
The Woodlands Trail loops through a portion of the management unit and connects with the Farm Loop Trail. The Old Highway 4 right-of-way crosses the unit and forms part of the Woodlands Trail.

There are two sites of historic interest in the management unit:

1. Site of the Freeman brick house, located at the lowland prairie/woodland edge
2. Squatter's cabin site, exact location unknown

One objective listed in the park's goals is to provide an access trail to the woodlands which would extend from the weather station, located in the upland unit, through the Woodland/Riparian Management Unit, and exit at the southwest corner of the monument. Initial study for this trail is scheduled for 1993 and will affect future management of the unit. Future research may indicate the need to devise a separate action plan for the woodland/riparian management unit.

WOODLAND/RIPARIAN MANAGEMENT UNIT



E. WOODLAND/RIPARIAN MANAGEMENT UNIT

MANAGEMENT OBJECTIVES	PRESCRIPTIONS AND TIMETABLE
1. Obtain baseline data on woodlands vegetation.	--Solicit/contract for baseline inventory of woodlands vegetation. (see RMP N-900.000) <1993,1994,1995...>
2. Complete riparian vegetation baseline data collection.	--Determine continued involvement of Wesleyan University and completion date of research project. <1993> --Solicit other sources for completion of study if necessary. <1993,1994>
3. Obtain data on prairie/woods edge ecotone.	--Solicit research assistance for an historical survey of probable pre-settlement edge conditions along Cub Creek (i.e. edge location, width of woodlands along creek, species composition of edge, and possible existence of oak savannah). <1993,1994,1995...>
4. Obtain hydrology data for Cub Creek.	--Solicit/contract for a hydrologic study of Cub Creek. (see RMP N-300.004) <1993,1994,1995...>
5. Obtain baseline data on woodland/ riparian wildlife.	--Solicit research assistance for woodland/riparian wildlife surveys. <1993,1994,1995...>

6. Continue water quality monitoring of Cub Creek.	--Collect water samples from Cub Creek twice annually for chemical and biological composition (see RMP N-300.002) <Annually>
7. Obtain data for snag management.	--Determine number, size and map locations of large tree snags as possible nesting sites for cavitiy nesting birds. <1994,1995> --Solicit/contract a cavity nesters bird census. (see RMP N-200.001) <1993,1994,1995...>
8. Develop and implement a long-term woodland/riparian management plan.	--Write a plan based on findings of research projects and data collection collection projects listed above. <2002 and incorporate into next Prairie Management Action Plan>
9. Conduct interim management actions.	--Pending completion and implementation of woodland/riparian management plan, interim management actions include: a. prescribed fire treatments <as indicated in annual Burn plans> b. cut/mow/hand-pull smooth brome and other exotic vegetation <annually as needed>

VII. Assessment of Alternatives

Introduction

Restoration of tallgrass prairie within Homestead National Monument is based on an interpretation of the Monument's enabling legislation, e.g., to "use the land for such other objects and purposes as in the Secretary's judgement may perpetuate the ***history of the country*** (emphasis added) mainly developed by the homestead law." (49 Statute 1184). Efforts to restore the eroding croplands on the Freeman Homestead, using a variety of techniques, began in 1939 and have continued uninterrupted ever since.

Aesthetic, ecological, and cultural factors were evaluated in assessing the potential environmental impacts of the alternatives for continuing to restore approximately 100 acres of Homestead National Monument to native tallgrass prairie. Alternative E is selected as the most feasible alternative for prairie restoration at Homestead National Monument.

Compliance Needs

Clean Air Act (PL chapter 360, 69 Stat. 322, 42 USC 7401 et seq.)

Congressional Act of March 19, 1936 (49 Stat. 1184) establishing Homestead National Monument of America

Congressional Act of September 25, 1970 (PL 91-411) adding the Freeman School to Homestead National Monument

Endangered Species Act of 1973, as amended (16 USC 1521 et seq.)

Federal Environmental Pesticide Act
(PL 92-516, 86 Stat. 973, 7 USC 136 et seq.)

National Environmental Policy Act of 1969 (PL 91-190, 42 USC 4321 et seq., 83 Stat. 852, 42 USC 4332 as amended)

National Historic Preservation Act of 1966 (PL 89-665, 80 Stat. 915-919, 16 USC 470 et seq.)

National Park Service Organic Act of 1916 (PL Chapter 408, 39 Stat. 535 et seq., 16 USC 1)

Management Alternatives

A review of past management actions and of the scientific literature identifies five (5) alternatives under which the Homestead prairie could continue to be managed. The alternatives identified in this assessment are:

A. No Action
B. Prescribed fire to maintain existing conditions
C. Manual removal of exotic species and undesirable shrub thickets
D. Transplanting sod from donor prairies and seeding of native grass/forb species
E. A combination of techniques as detailed in this plan.

Each alternative briefly describes and assesses a management technique to meet resource management objectives for the prairie.

ALTERNATIVE A: No Action

Description

Under this alternative, the vegetation on the prairie would be allowed to proceed through natural succession and exotic vegetative species would be allowed to remain.

Impacts

* Exotic vegetative species would continue to thrive in those areas of the prairie where they now exist.

* The prairie would proceed through the successional stages from tallgrass prairie to a woodlands.

* Diversity of vegetative species would be lost due to a diminished forb population.

* The more dominant grass species would suppress the forb species and woody species would begin to dominate the prairie.

* One of the largest and the oldest restored tallgrass prairie ecosystems in the NPS would be lost.

ALTERNATIVE B: Prescribed Fire to Maintain Existing Conditions

Description

This alternative would provide management with the means to control woody shrub expansion and increase vegetation diversity if applied at the correct time. Research has shown that the expansion of woody species can be controlled with prescribed fire. The use of fire to increase vegetative diversity is well documented.

Impacts

* Burning to favor diversity also favors cool season exotic vegetation.

* Burning in early spring would allow for some control of woody species but would not decrease the size and numbers of thickets on the prairie.

* The frequent application of fire would negatively impact wildlife, especially ground nesting birds and rodents.

* Smoke generated by fire would result in short term negative impacts on air quality.

* Smoke generated by prescribed fire would produce short term negative impacts on traffic safety and the adjacent housing development.

ALTERNATIVE C: Manual Removal of Exotic Vegetation and Undesirable Shrub Thickets

Description

The size of shrub thickets would be maintained by manually cutting new sprouts outside existing perimeters. Undesirable thickets would be cut and maintained by cutting new sprouts each year. Exotic vegetation would be mowed when the growth point is above ground so new growth must use carbohydrate reserves.

Impacts

* Manual removal of new sprouts outside existing perimeters will help maintain thickets at their present size.

* Manual removal of undesirable thickets and new sprouts is a labor-intensive technique that requires a great number of personnel to be successful.

* Exotic grass species will be harmed by mowing when the growth point is sufficiently above ground to mow below the growth point.

* Increased use of motorized equipment on the prairie would lead to increased soil compaction.

ALTERNATIVE D: Transplanting Sod from Donor Prairies and Seeding Native Grass/Forb Species

Description

Under this alternative, sod will be transplanted from a donor prairie to increase diversity and to restore areas to native prairie. Seeding would occur in those areas not previously restored and in disturbed areas of the prairie.

Impacts

* Sod transplants will increase diversity in those areas dominated by grass species.

* Sod transplants will increase diversity by including soil microorganisms.

* Seeding will help establish native species in areas needing intensive restoration and areas previously occupied by exotic species and thickets.

* Sod and seeding techniques will ensure continuation of the gene pool if local seed sources are used.

* Thickets may expand if fire and mechanical control measures are excluded.

* Newly transplanted/seeded areas are vulnerable to the invasion of exotic vegetative species.

ALTERNATIVE E: A Combination of Techniques as Detailed in This Plan

Description

Under this alternative, a combination of techniques including prescribed fire, manual removal of undesirable woody thickets, manual cutting of new sprouts of woody materials outside desired thickets, mowing of exotic grasses, and sod transplants/seeding of native species will be used to accomplish management objectives for prairie management. When justified, approved cut stump herbicide applications will be used on some woody species to aid in controlling the spread of thickets.

Impacts

* A combination of techniques will provide an effective means to restore this area to a tallgrass prairie ecosystem.

* Combining techniques will help to maintain the area in tallgrass prairie species to meet management objectives.

* This combination of techniques is less labor intensive and can be accomplished with fewer numbers of personnel.

VIII. Research Needs

One of the goals of this plan is the identification and initiation of research to provide needed information for restoration and maintenance of the prairie ecosystem. Future planning documents and management decisions must be based on sound scientific data and analysis of past and present land management actions. Research needs which have been identified to date are included in the project statements of the RMP and are identified as specific objectives under the appropriate management units in this Action Plan.

A catalog of research needs/opportunities at Homestead will be produced and distributed to regional universities and CPSU's (target completion date 12/93). Important projects which need to be initiated are:

--the collection of several types of baseline data

--soil and hydrology studies

--plant list updates

--update of area native prairie remnant inventory including management histories

--a natural history survey of monument property from 1860's to the present, including probable presettlement native vegetation composition, pre-park land use, and 50+ years of prairie restoration history

--potential National Register or Historic Places nomination for the prairie restoration efforts at Homestead, now over 50-years old

APPENDIX A

HOME-42
(Rev. 3/93)

HOMESTEAD NATIONAL MONUMENT
PRAIRIE MANAGEMENT ACTION
DAILY WORK RECORD

DATE:_____

WORK CREW: (LEADER)_____
_____
_____
_____

MGT. UNIT	APPROX. LOCATION	TIME	ACTIONS/WORK ACCOMPLISHED

ANY PROBLEMS, NEEDS OR SAFETY CONCERNS ENCOUNTERED
_____
_____
_____
_____
_____

APPENDIX B

Prairie Restoration/Management At Homestead: A History

By James Stubbendieck and Gary D. Willson

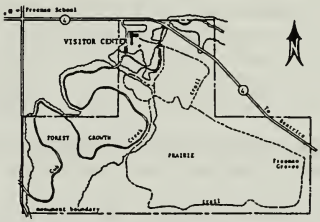
Homestead National Monument of America (HOME) is located 5 miles west of Beatrice, Neb., on 160 acres first homesteaded by Daniel Freeman in 1862. In 1936, Congress set aside the 100 acres of formerly abused pasture and cropland and 60 acres of woodland as a permanent monument to the homesteading era. Physical features of the site are dominated by Cub Creek, a major tributary to the Big Blue River, and its adjacent bottomlands. The balance of the site is made up of moderately steep glacial till with eroded sandy and gravelly side slopes.

Because of the importance of prairie to the settler, the primary objective of HOME has been restoration of the landscape to approximate the original conditions encountered by Daniel Freeman. This goal has been evident from the first management plan written by Wildlife Technician Adoph Murie circa 1938. Murie described two possible restoration methods; one was transplanting sod from a local prairie, and the second was seeding. He realized the advantages of sodding by stating, " . . . not only is prairie grass brought into the area, but also native species of prairie herbs." In preparing this first management plan, Murie contacted the eminent prairie ecologist, Dr. J.E. Weaver of the University of Nebraska, who felt that this project, "contained the possibilities of an excellent experiment . . . "

When the site was acquired by the National Park Service, severe erosion had occurred on the upland slopes, heavy depositions of silt were on the lower slopes, and the woodlands were cutover and heavily grazed. Management during the early years at HOME centered around stabilizing the severely abused soil and protecting newly planted native grasses.

At least 40 acres of the site were under cultivation as late as November 1939. Park records indicate that the first seeding took place in 1939 with seed gathered from a prairie located approximately 5 miles to the west. The approximate seed mixture was 45 percent big bluestem; 50 percent little bluestem; and 1 percent each of Kentucky bluegrass, needleandthread, indiangrass, prairie dropseed, and sideoats grama. The first sodding also was carried out in 1939 to control severe sheet, rill, and gully erosion on the coarse-textured south upland slopes. Source of the sod is unknown.

Park map.



***Cropped upland and** overgrazed woodland at Homestead NM in 1939.*

***Recent view** of restored upland prairie at Homestead NM.*

The following is a selected summary from park records of the management history at HOME between 1942-1986.

1942 – Additional seeding and sodding along with the construction of small check dams to slow erosion.

1943 – Weed control; sunflowers were mowed and bindweed was treated with sodium chlorate.

1947 – Sodding in upland gullies; seeding and local prairie hay mulch used in eroding areas.

1948 – Additional spot seeding; sod added to the uplands; selective grazing suggested as a means of reducing fire hazard.

1949 – First use of a herbicide other than sodium chlorate (2,4-D).

1951 – 40 acres moved.

1952 – Upland hayed.

1953 – Bottomland hayed.

1954 – Seeds harvested.

1955 – Smooth bromegrass infestation noted.

1963 – 2,4-D used for weed control.

1964 – Lowlands heavily infested with weeds. Dalapon used for smooth brome control and 2,4-D for broadleaf weeds.

1965 – Thatch buildup leads to complete mowing.

1968 – Smooth brome mowed.

1969 – 7-11 acres of lowland seeded.

1970 – First prescribed burn; 2,4-D applied.

1976 – Four acres of lowland reseeded.

1979 – Woody plants sprayed with ammonium sulfamate; routine 2,4-D spraying program stopped.

1980 – 17-acre wildfire occurred.

1982 – Quantitative vegetative sampling begun; prescribed burn in April (8 acres); manual removal of musk thistles and common mullein.

1983 – Entire prairie burned; 4 acres of weedy lowland mowed.

1984 – Weedy lowland mowed; fall burn of small overgrown sumac; herbarium assembled.

1986 – Lowland area sodded and planted with approximately 3,000 greenhouse grown seedlings from locally collected prairie seed.

This chronological summary shows clear changes in management emphasis as prairie restoration at HOME evolved. The first priority of soil stabilization gave way to an interest in more natural management of vegetation. For example, prescribed burning replaced mowing and the general use of herbicides. A logical, progressive understanding that management procedures can be integrated and selected to obtain certain results has occurred. Interest has also moved from native grasses in the early stabilizing years of HOME management in the 1930s and 1940s, to an interest in legumes in the 1950s, and on to a more recent and complex understanding of the role of forbs. Quantitative sampling of the vegetation was initiated in 1982 and a herbarium was assembled in 1983 and 1984. A recent concern has emerged over the use of local gene pool sources for future introduction of plants, which indicates a further evolution of the park's understanding of the prairie ecosystem.

HOME is one of the oldest ongoing prairie restorations on a man-altered landscape. The only other nearly contemporaneous example is restoration of the Curtis Prairie in Madison, Wis., in the 1930s. The Curtis Prairie started with a less disturbed site and benefitted from the intensive labor of CCC crews and close association with Dr. John Curtis and University of Wisconsin graduate students.

Stubbendieck is Professor of Range Ecology at University of Nebraska – Lincoln; Willson is Ecologist Operations for the NPS Midwest Region, Omaha, Neb.

PRAIRIE MANAGEMENT ACTIONS SUMMARY
1985-1991

Listed below is a summary of prairie management actions which occurred from 1985 through 1991. These actions were based on the first Prairie Management Action Plan for the Monument. The quadrants (Q's) referenced in the summary are delineated on the attached map.

1985

Prescribed fire of all quadrants except Q2 and Q9-11. Burns were conducted in mid march and early april. On 03-19 the Freeman School prairie was burned, on 04-09 a strip of brome grass on the south boundary and on private land adjacent to the park was burned, the upland prairie was burned on 04-04 as was the lowland prairie south of the trail system, and the weedy area was burned on 04-04 with the objective of reducing the fuel load in the areas with native grasses and to retard the germination of cool season exotics.

Herbicide treatments (3) to prepare trail areas.

Tilling was performed to prepare trail areas for seeding of buffalo grass and to remove weed species in lowland.

Mowing occurred at the school yard, on trails, and at the weather station for maintenance purposes. Mowing was done in the cash crop area to reduce competition of weeds with native grasses.

60 transplant actions occurred, primarily in Q4 and Q16 to introduce a variety of forb species back into the prairie.

Hand weeding was performed in the cash crop area and along the gravesite trail in an effort to reduce sumac and plum sp.

1986

Prescribed fire was used south and west of the hedgerow trail on 03-21 to control brome grass. On 03-24, a burn was conducted north of the gravesite trail and SE of the state triangle to control exotic species between the trail and highway right of way. The lowland weedy area was burned on 03-24 to control weedy cool season species. On 03-26 the lowland and upland prairie enclosed by the hedgerow and gravesite trails was burned

In February, soil samples were taken in the lowland area and tested for ph. From the test results, a lime treatment was applied to the corn crop area to increase ph.

The trail in Q's 1, 4, 13 and the schoolyard were seeded to buffalo grass.

In April, the cash crop area was completely tilled.

In June, the cash crop area was seeded to corn and in July was tilled between rows.

Mowing was used in the weedy area to reduce competition and in the native plant display area to keep the buffalo grass at a low level.

Manual weeding techniques were utilized in the lowland area to remove sunflower, foxtail, marijuana, thistle, mullein, and a variety of invading exotics. Sunflower was removed at the school area.

Broadcast seeding was done in Q's 1, 4, and 5.

Seedlings were planted for erosion control in Q's 2, 8, and 15.

Herbicides were applied to the native plant display and weedy areas as well as the trail area. Herbicide was applied to sod transplant to remove exotics.

A variety of seeds were collected to be planted in 1987.

1987

Prescribed fire was used in the lowland in the area seeded in 1986 and was also used at the school. The lowland was burned to control weedy, cool season species. The School grounds were burned to control brome grass and other exotic species. The burns were conducted on April 9th.

Herbicide was applied to a 5000 sqft area in the lowlands and as a measure to reduce sumac, brome, annual weeds, and to control woody vegetation.

The historic Osage orange hedgerow area was tilled and native plant transplants were made.

The corn crop area was tilled twice and mowed once. Manual weeding took place.

Mowing occurred in the weedy area on two occasions and once in the previously seeded lowland area. Transplants were placed in the lowland and in Q15.

1988

Prescribed fire was used to create blackline on the 1270' contour and approximately 40a of the upland were burned. The school prairie area was burned to retard invasion of brome and weeds.. Temperature tablets were used to record temperatures during the upland burn. Two one-acre plots were established to monitor changes to vegetation. The southeast corner, SE of the hedgerow trail, was burned to control non-native grasses and weeds. The area east of the hedgerow trail (south of the weather station) was burned to maintain the native prairie transition zone between the forested area and the prairie. The upland prairie, north of the hedgerow trail, was burned to reduce thatch and retard exotic species. All prescribed fires occurred on 3-29. Other prescribed burn activities occurred on 04-18 and included a burn in the state triangle area to reduce thatch and retard the growth of brome grass, the lowland prairie south of the gravesite trail to reduce thatch and retard exotic species, and the lowland area contained within the trail system to reduce thatch and control exotic species.

Erosion in Q15 and 16 was monitored and changes recorded.

Herbicide was used to a 900 sqft area of the barnyard and to 2,262 sqft of sumac thickets.
Mowing was conducted in the barnyard area.

The osage orange trees were pruned.

252 sqft of prairie sod was transplanted into the lowland area.

1989

The corn planting program was continued with a reduction in the area planted in accordance with the prairie management plan.

224 cuft of native prairie sod was transplanted to the lowland and 3330 sqft of the lowland weedy area was seeded to grasses and transplanted forb species. For preparation to transplant the sod, holes were dug and the dirt around the holes was compacted. Compaction was accomplished by driving over the area with the tractor. After the sod was transplanted, it was packed in with soil and watered.The area was mowed in July. The restoration seeding was accomplished by pulling the harrow over the area to loosen the packed surface, broadcasting the seed by hand, and packing the soil with a push roller. On 05-19, this area was hand raked to better cover the seeds and then repacked to establish a firm seed bed. Approximately 640 sqft of the 1988 restoration area was scraped with the loader and scraper, remaining weeds were manually removed, seed bed prepared, and seed was broadcast by

hand. The area was raked to cover seed and packed by foot and watered. The 1988 restoration area was mowed three times in an effort to retard growth of weeds.

Cannabis plants were eradicated in the lowland area in July.

Native grass seeds were collected in the lowland area for use in 1990.

The first documented collection of data since the vegetative study of 1984 was performed at the Freeman School prairie. The modified step point method was used. Evaluation of the data showed an increase in native grass species and a decrease in brome species after application of atrazine in 1987. Prior to this, the trend was reversed with brome sp. on a continuous increase.

No prescribed burns were conducted this year.

1990

Herbicides were used in the upland prairie in the erosion control area to control weed species and followed up in June with seeding of over 2800 sqft to native grasses.

Woody thicket areas on the upland prairie were mowed and manually weeded in an effort to check the spread of woody growth.

The 1989 area of restoration in the lowland weedy area was seeded to native grasses in May and manually weeded in June. The 1988 lowland area of restoration also received hand weeding treatment.

The area of lowland restoration for 1990 was mowed in May and seeded to native grasses in an area of 5200 sqft. This area was sprayed with round-up on 04-20, a portion of the area was scraped and tilled and then the area was compacted by driving the tractor over it. Seed was hand broadcast and covered by dragging the harrow over the area with the tractor.

The corn crop was again planted in an effort to reduce soil nitrogen levels.

Cannabis plants were eradicated from the Freeman School prairie.

Garlon was used in an effort to control the spread of a sumac thicket on the upland prairie.

Prescribed fire was utilized east of the hedgerow trail, between the trail and the forested area, to reduce thatch and retard exotic species growth. The southeast corner of the monument, southeast of the trail, was burned to reduce thatch and retard growth of exotic

species. The lowland area south of the trail system was burned to reduce thatch and retard exotic species growth. The lowland area north of the gravesite trail was burned to reduce thatch and retard exotic species. Burns were conducted on 05-08.

1991

The corn crop area was reduced in size and limited to the west side of the trail.

Sod was transplanted from the same donor site, a total of 186 sqft transplanted.

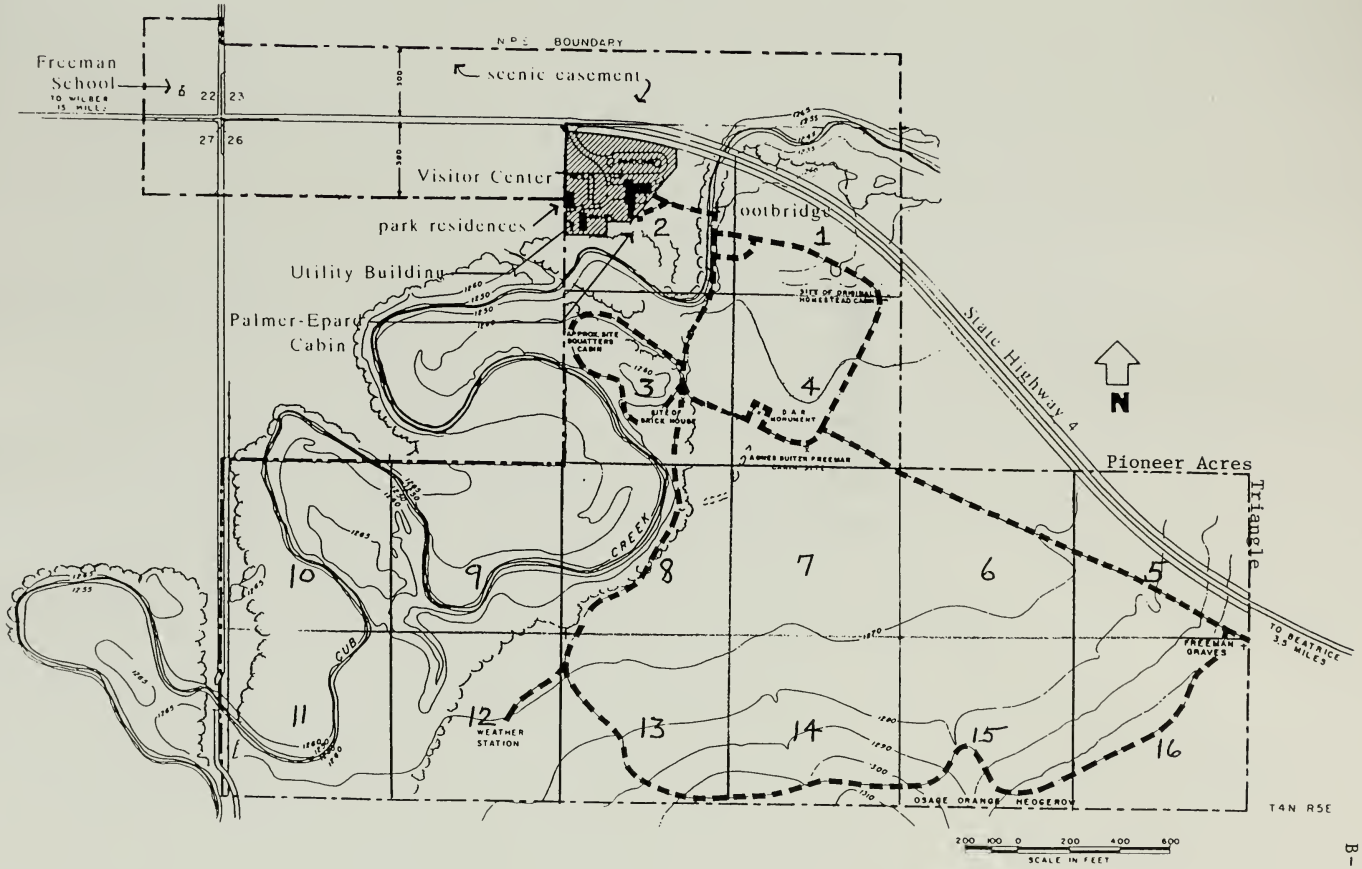
Mowing was used in an effort to control exotic and weedy species in the NE triangle.

Forty osage orange seedlings, one year of age, were transplanted to the historic hedge row. Only 6 survived.

4300 sqft of the weedy area was mowed, tilled, and planted to native grass seed. The area was deep tilled on 03-26, shallow tilled on 05-10, then packed utilizing the tractor. On 05-28 the area was hand weeded then the surface was drug with the harrow. The area was then hand raked to further loosen the surface soil. Seed was hand broadcast then the area was dragged with the harrow and raked to cover the seed. The 1989 restoration area was hand weeded on 05-24 and the erosion control area was hand weeded on 05-30.

On 05-07 prescribed fire was used at the Freeman School to control brome grass and other exotic species. The lowland area and the area north of the gravesite trail was burned on 04-23 to reduce thatch and retard exotic grasses and woody vegetation. The upland prairie was burned on 04-22 to reduce thatch and retard exotic grass and woody vegetation, and the area west of the hedgerow trail and south of the weather station was burned on 04-22 to reduce thatch and retard exotic species and woody vegetation.

QUADRANTS


Freeman School
TO WILBER 15 MILES
N.P.S. BOUNDARY
scenic easement
Visitor Center
park residences
Utility Building
Palmer-Epard Cabin
oothbridge
State Highway 4
N
Pioneer Acres
Triangle
CREEK
CUB
WEATHER STATION
FREEMAN GRAVES
TO BEATRICE 3.5 MILES
OSAGE ORANGE HEDGEROW
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SCALE IN FEET
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APPENDIX C

ANNUAL WORK PLAN -- 1993 -- ANTICIPATED MANAGEMENT ACTIONS

I. UPLAND PRAIRIE MANAGEMENT UNIT
1. Begin identifying thickets by type and location.
2. Begin mapping perimeters for thickets to be maintained.
3. Begin eliminating undesireable thickets.
4. Mark and map upland edge ecotone study area.
5. Monitor erosion prone areas as needed.
6. Continue sod transplanting and/or seeding of Old Highway 4 Right-of-Way.
7. Remove trees/seedlings from Pioneer Acres Triangle.
8. Prescribed fire treatment in U1 burn unit.
9. Vegetation monitoring: --Old Highway 4 ROW
--Pioneer Acres Triangle
--Upland Line Transect

II. LOWLAND PRAIRIE MANAGEMENT UNIT
1. Begin R2 area restoration.
2. Monitor erosion of Cub Creek into prairie.
3. Begin identifying thickets by type and location.
4. Begin mapping perimeters of thickets to be maintained.
5. Begin eliminating undesireable thickets.
6. Continue sod transplanting and/or seeding of Old Highway 4 ROW.
7. Begin preparation of restoration site plan for State Triangle.
8. Prepare and submit 10-238 for erosion control along Cub Creek.
9. Prescribed fire treatment in L1 burn unit.
10. Vegetation monitoring: --R1 area
--R2 area
--Old Highway 4 ROW
--Lowland Line Transect

III. HYDRIC PRAIRIE AREAS MANAGEMENT UNIT
1. Map perimeter of Ash Thicket.
2. Prescribed fire treatment as part of L1 burn unit.

IV. FREEMAN SCHOOL PRAIRIE MANAGEMENT UNIT
1. Continue smooth brome research.
2. Begin preparation of restoration site plan for new land acquisition.
3. Prescribed fire treatment Freeman School burn unit.
4. Continue vegetation monitoring.

V. WOODLAND/RIPARIAN MANAGEMENT UNIT
1. Continue water sampling of Cub Creek.
2. Prescribed fire treatments as burn-through from L1 burn unit.

VI. ALL UNITS
1. Prepare and distribute research needs catalog and begin soliciting research assistance for specific projects.
2. Continue eradication of smooth brome and other exotics.
3. Continue Photo Station project.

ANNUAL WORK PLAN -- 1994 -- ANTICIPATED MANAGEMENT ACTIONS

I. UPLAND PRAIRIE MANAGEMENT UNIT
1. Complete identification of thickets by type and location.
2. Complete mapping of perimeters of thickets to be maintained.
3. Continue elimination of undesireable thickets.
4. Begin eradication of shrubs and new sprouts outside perimeters of thickets to be maintained.
5. Continue to monitor erosion prone areas as needed.
6. Evaluate osage orange hedgerow for maintenance of existing historic trees; mark/remove invading trees/shrubs.
7. Prescribed fire treatment in U3 burn unit.
8. Vegetation monitoring: --Old Highway 4 ROW
--Upland Line Transect

II. LOWLAND PRAIRIE MANAGEMENT UNIT
1. Continue restoration of R2 area.
2. Continue monitoring erosion of Cub Creek into prairie.
3. Complete identification of thickets by type and location.
4. Complete mapping of perimeters of thickets to be maintained.
5. Continue elimination of undesireable thickets.
6. Begin eradication of shrubs and new sprouts outside perimeters of thickets to be maintained.
7. Identify and map existing historic trees.
8. Begin to cut/remove all trees which have not been identified as historic.
9. Complete restoration site plan for State Triangle.
10. Prescribed fire treatments in L2 burn unit.
11. Vegetation monitoring: --R1 area
--R2 area
--Old Highway 4 ROW
--Lowland Line Transect

III. HYDRIC PRAIRIE AREAS MANAGEMENT UNIT
1. Begin monitoring perimeter of Ash Thicket; eradicate new sprouts of woody species beyond perimeter.
2. Conduct vegetation survey of Ash Thicket.
3. Identify and map existing historic trees.
4. Begin to cut/remove all trees which have not been identified as historic.
5. Prescribed fire treatments as part of L2 burn unit.

IV. FREEMAN SCHOOL PRAIRIE MANAGEMENT UNIT
1. Continue smooth brome research.
2. Complete restoration site plan for new land acquisition.
3. Continue vegetation monitoring.

ANNUAL WORK PLAN -- **1994** (CONTINUED)

V. WOODLANDS/RIPARIAN MANAGEMENT UNIT
1. Continue water sampling of Cub Creek.
2. Begin snag management project.
3. Prescribed fire treatments as burn-through from U3 and L2 burn units.

VI. ALL UNITS
1. Continue to solicit research assistance.
2. Continue eradication of smooth brome and other exotics.
3. Continue Photo Station project.

ANNUAL WORK PLAN -- 1995 -- ANTICIPATED MANAGEMENT ACTIONS

I. UPLAND PRAIRIE MANAGEMENT UNIT
1. Continue elimination of undesireable thickets and woody vegetation sprouts outside perimeters of thickets to be maintained.
2. Begin monitoring for maintenance of desired shrub species to grass/forb ratio in the upland unit.
3. Begin monitoring succession of woody vegetation into the upland edge ecotone study area.
4. Continue to monitor erosion prone areas.
5. Prescribed fire treatment in U2 burn unit.
6. Vegetation monitoring: --Old Highway 4 ROW
--Pioneer Acres Triangle
--Upland Line Transect

II. LOWLAND PRAIRIE MANAGEMENT UNIT
1. Continue R2 area restoration.
2. Continue elimination of undesireable thickets and woody vegetation sprouts outside perimeters of thickets to be maintained.
3. Begin monitoring for maintenance of desired shrub species to grass/forb ratio in the lowland unit.
4. Complete cutting/removal of all non-historic trees.
5. Begin restoration of State Triangle (pending funding).
6. Continue to monitor erosion of Cub Creek into prairie.
7. Prescribed fire treatment in L3 burn unit.
8. Vegetation monitoring: --R1 area
--R2 area
--Old Highway 4 ROW
--Lowland Line Transect

III. HYDRIC PRAIRIE AREAS MANAGEMENT UNIT
1. Monitor and control spread of Ash Thicket.
2. Complete cutting/removal of all non-historic trees.

IV. FREEMAN SCHOOL PRAIRIE MANAGEMENT UNIT
1. Continue smooth brome research (final year).
2. Begin restoration of new land acquisition (pending funding).
3. Continue vegetation monitoring.

V. WOODLAND/RIPARIAN MANAGEMENT UNIT
1. Continue water sampling of Cub Creek.
2. Continue snag management project.

VI. ALL UNITS
1. Continue to solicit research assistance.
2. Continue eradication of smooth brome and other exotics.
3. Continue Photo Station project.

APPENDIX D

Inventory and Monitoring

Monitoring vegetation over time is necessary to determine the success or failure of management actions for prairie restoration. Monitoring is also a valuable tool for determining the changes to vegetation caused by climatic factors, soils, and the outside influences of agricultural activities adjacent to the Monument.

The park staff currently uses a variety of techniques for prairie restoration and needs to gather and analyze data to help management determine if restoration objectives are being met.

The objectives of vegetation monitoring are:

(1) Determine the long-term changes in species composition of all prairie management units.

(2) Determine the effectiveness of management actions for control of woody thickets and exotic vegetation, and for increasing the diversity of native vegetation.

(3) Determine the success of prairie restoration methods.

(4) Determine long-term survival and spread of species in prairie sod transplants, seedling transplants, and from seeding.

Sutton et al. (1984) utilized the modified step-point method of data collection during their study at the Monument. Follow-up monitoring activities since that time have been limited to the Freeman School prairie. The data collected at the Freeman School prairie is contained in this appendix. In 1992, park staff initiated an interim monitoring program, using the modified step-point method. The data obtained in 1992 was valuable for determining general trends in vegetative change since 1984 and for evaluation of restoration needs for the future. Locations of transects and monitoring areas established in 1992 are described on the following pages.

The staff will continue to research monitoring methods and techniques to refine the inventory and monitoring program as needed. A complete description of inventory and monitoring activities will be contained in the Monument's Inventory and Monitoring Plan scheduled to be completed by early FY94.

VEGETATION MONITORING AREAS DESCRIPTIONS

Upland Line Transect (U1)
The starting point for the upland line transect is at the east edge of the Hedgerow Trail, 60 feet southwest of trail marker #14. The line transect is on a line running 80 degrees across the upland to the east boundary fence. The transect goes through both drainages that run south to north and crosses the trail between the gravesite and the south boundary. One-hundred points are monitored along the transect at a distance of 7 paces between each point. The first data point of collection is at a random number of paces in from the line transect start point.

Lowland Line Transect (L1)
The reference point for the L1 line transect is the trail post at the junction of the Farm Loop and Gravesite Trails. The line transect begins 30 feet west of the trail sign post at a bearing of 285 degrees. The transect is on a line running 14 degrees and is 500 feet in length. Data is collected every 5 feet for a total of 100 data collection points.

Restoration Area (RA1)
The starting point for the monitoring area is the Visitor Center trail post at the north junction of the Woodlands and Farm Loop trails. The trail marker is the SW corner of the monitoring area. One-hundred twenty five points are monitored using the modified step-point method. The first monitoring point is at a random number of paces in from the starting point, on a line bearing 105 degrees. There are six paces between each data collection point thereafter. At the end of fifteen points on a line, the data collector moves four paces on a line bearing 15 degrees. Then the collector moves the same number of paces as the random start, on a line running 285 degrees, at which point the collector reaches the first data collection point on the return line. This same pattern is repeated until 125 data points have been collected using the modified step point method.

Lowland Line Transect (L2)
The line transect begins at the east edge of the trail where the Hedgerow and Weather Station trails intersect. The L2 line transect is on a line 57 degrees from its starting point. One-hundred points of data are collected, starting at a random number of paces in from the beginning of the transect. One point of data is collected every 5 paces.

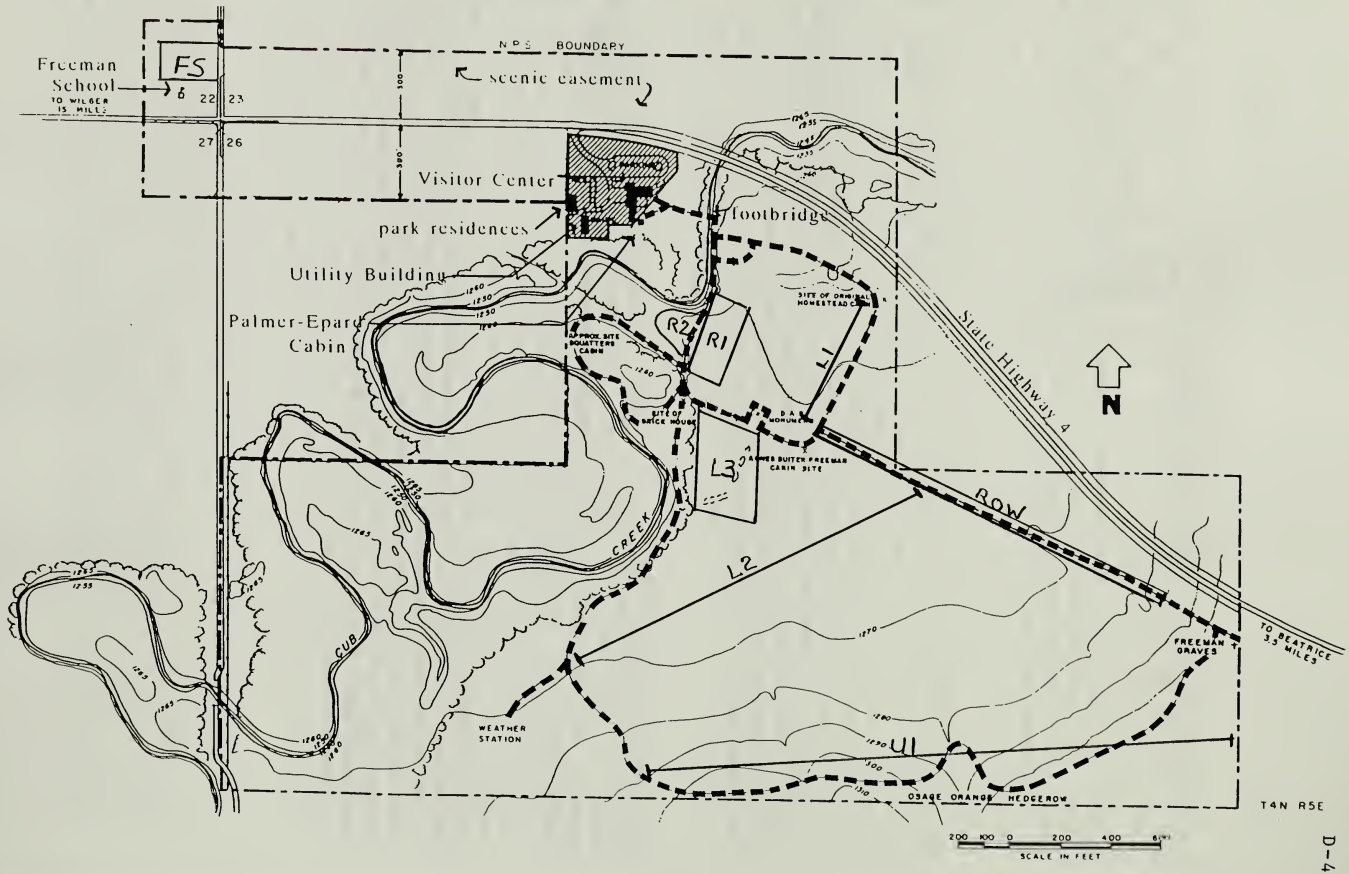
Old Highway 4 Right-of-Way Area (ROW)
The area to be monitored begins 10 feet north of the Grave Spur trail post and runs approximately 1500 feet on a line of 108 degrees. The first monitoring point is randomly selected at a number of paces at 108 degrees from the starting point. Fifty points are monitored, one point of data every 10 paces, then the line is then moved north 10 feet, and a return line at 228 degrees is monitored to achieve 100 points of data.

Old Cash Crop Area (L3)
The starting point is located 25 meters at 146 degrees from map point #3. The first data collection point is a random number of paces at 180 degrees from the starting point. One point of data is collected every 10 paces for a total of 12 collection points on the line. The line is moved 25 feet at 108 degrees and data is collected on a return line, 360 degrees, until opposite the start point. This pattern is repeated until 100-110 points of data have been collected using the modified step point method.
The area monitored is approximately 2 acres.

Restoration Area (RA2)
This area is to be seeded in 1993. Monitoring activities will begin in the fall of 1993 or 1994 depending upon vegetation growth. A description of data collection methods will be added at that time.

Freeman School (FS)
The area monitored is the prairie unit north of the school. The first point is a randomly selected number of paces west of the road edge adjacent to the north end of the culvert at the southeast corner of the prairie unit. A total of 40 to 50 points should be monitored using the modified step point method. The area monitored is approximately .75 acres.

VEGETATION MONITORING AREAS



UPLAND LINE TRANSECT - U1
HOMESTEAD NATIONAL MONUMENT
SEPTEMBER 21, 1992

SPECIES	FREQUENCY	DIRECT HITS	PERCENT COMP.
LITTER	54	---	80.60
BARE GROUND	9	---	13.43
Big Bluestem	7	0	10.45
Little Bluestem	12	2	17.91
Indiangrass	24	2	35.82
Switchgrass	2	0	2.99
Sideoats gramma	3	0	4.48
Canada wild rye	1	0	1.49
Lovegrass	1	0	1.49
Dropseed sp.	1	0	1.49
Eastern gamma	1	0	1.49
Muhlenbergia sp.	1	0	1.49
Unknown grass sp.	1	0	1.49
Goldenrod sp.	2	0	2.99
Leadplant	1	0	1.49
Yellow wood sorrel	1	0	1.49
Field pussytoes	2	0	2.99
Prairie rose	1	0	1.49
Unknown forb	3	0	4.48
Dogwood	1	0	1.49
Elderberry	1	0	1.49
Smooth sumac	1	0	1.49
TOTAL	67	4	100.00

LOWLAND LINE TRANSECT - L1
HOMESTEAD NATIONAL MONUMENT
SEPTEMBER 21, 1992

SPECIES	FREQUENCY	DIRECT HITS	PERCENT COMP.
LITTER	69	---	69
BARE GROUND	26	---	26
Big Bluestem	19	1	19
Little Bluestem	1	0	1
Indiangrass	47	1	47
Unidentified grass sp.	6	2	6
Switchgrass	11	1	11
Green foxtail	1	0	1
Sunflower sp.	1	0	1
Ironweed	1	0	1
Goldenrod sp.	7	0	7
Rhomboic copperleaf	2	0	2
Yellow wood sorrel	2	0	2
White vervain	1	0	1
Western ragweed	1	0	1
TOTAL	100	5	100

LOWLAND LINE TRANSECT - L2
HOMESTEAD NATIONAL MONUMENT
OCTOBER, 1992

SPECIES	FREQUENCY	DIRECT HITS	PERCENT COMP.
LITTER	83	---	83
BARE GROUND	12	---	12
Big Bluestem	39	4	39
Little Bluestem	1	0	1
Indiangrass	17	0	17
Switchgrass	3	0	3
Sideoats Gramma	1	0	1
Purple lovegrass	2	0	2
Muhlenbergia sp.	1	0	1
Dropseed sp.	1	0	1
Unk. grass sp.	1	0	1
Smartweed	1	0	1
Blue prairie violet	10	0	10
Canada goldenrod	1	0	1
Late goldenrod	3	0	3
Goldenrod sp.	2	0	2
Yellow wood sorrel	4	0	4
Prairie rose	2	0	2
Wild licorice	1	0	1
Common ragweed	3	0	3
Unk. forb sp.	3	0	3
American plum	1	0	1
Dogwood	3	0	3
TOTAL	100	4	100

RESTORATION AREA - R1
HOMESTEAD NATIONAL MONUMENT
OCTOBER, 1992

SPECIES	FREQUENCY	DIRECT HITS	PERCENT COMP.
LITTER	93	---	74.4
BARE GROUND	24	---	19.2
Big Bluestem	13	3	10.4
Little Bluestem	10	0	8
Indiangrass	21	0	16.8
Switchgrass	16	3	12.8
Sideoats Gramma	6	1	4.8
Reed canarygrass	1	0	0.8
Cordgrass	2	0	1.6
Dropseed sp.	1	0	0.8
Green foxtail*	1	0	0.8
Giant foxtail*	6	0	4.8
Large crabgrass*	14	1	11.2
Sedge sp.	1	0	0.8
Unk. grass sp.	1	0	0.8
Canada goldenrod	4	0	3.2
Late goldenrod	2	0	1.6
Goldenrod sp.	9	0	7.2
Prairie rose	2	0	1.6
White vervain	2	0	1.6
Blackeyed susan	2	0	1.6
Lambs quarters*	1	0	0.8
Unk. forb sp.	9	0	7.2
Elderberry	1	0	0.8
TOTAL	125	8	100

OLD HIGHWAY FOUR RIGHT-OF-WAY
MODIFIED STEP-POINT MONITORING
OCTOBER 22, 1992

SPECIES	FREQUENCY	DIRECT HITS	PERCENT COMP.
LITTER	84	---	84
BARE GROUND	8	---	8
Big Bluestem	16	2	16
Little Bluestem	5	1	5
Smooth bromegrass	1	0	1
Switchgrass	35	3	35
Fall panicum	4	0	4
Indiangrass	7	0	7
Buffalo grass	6	0	6
Sideoats gramma	1	0	1
Unk. grass sp.	10	2	10
Wood sorrel sp.	5	0	5
Sunflower sp.	2	0	2
Ragweed sp.	3	0	3
Prairie rose	1	0	1
Unk. forbs	4	0	4
TOTAL	100	8	100.00

FREEMAN SCHOOL
MODIFIED STEP-POINT MONITORING
JUNE 17, 1992

SPECIES	FREQUENCY	DIRECT HITS	PERCENT COMP.
LITTER	33	---	80.5
BARE GROUND	8	---	19.5
Big Bluestem	14	1	32.6
Little Bluestem	1	0	2.3
Smooth bromegrass	16	0	37.2
Downy bromegrass	1	0	2.3
Panicum sp.	1	0	2.3
Switchgrass	1	0	2.3
Sunflower sp.	1	0	2.3
Ironweed	1	0	2.3
Reed canarygrass	2	0	4.7
Canada goldenrod	2	0	4.7
Sweet Clover sp.	1	0	2.3
Prairie rose	2	0	4.7
TOTAL	43	1	100.00

Species Composition of the Freeman School Prairie

Fall Sampling

Common name	10-82	10-83	10-84	10-86	9-89	11-90
	%					
Big bluestem	54.7	60.7	51.6	33.8	39.8	51.0
Indiangrass	1.0	5.9	4.3	-0-	0.8	0.7
Little bluestem	1.0	2.0	1.6	-0-	-0-	-0-
Switchgrass	5.9	6.1	6.0	2.0	0.8	5.5
Bluegrass	-0-	-0-	1.2	13.5	2.4	8.3
Bromegrass	35.3	23.4	33.9	46.5	45.5	34.5
Canada wildrye	1.0	1.9	1.4	-0-	-0-	-0-
Other, including:				4.2	10.6	14.5
Carex					(2.4)	(0.7)
Rose				(0.3)	(1.6)	(1.4)
Rough pigweed					(1.6)	
Slender pigweed					(0.8)	
Sideoats grama					(0.8)	(0.7)
Prairie dropseed					(0.8)	(0.7)
Scribner dichanthelium					(0.8)	(0.7)
Barnyard grass						(2.8)
Horseweed						(1.4)
Squirreltail					(0.7)	
Western ironweed						(0.7)
Annual fleabane						(0.7)
Late goldenrod					(0.7)	
Prairie Coneflower	1.0					
Pitcher sage				(0.3)		
Panicum grass				(0.6)		
Wood sorrel				(0.3)		
Lead plant				(0.3)		
Unidentified				(2.4)	(1.6)	(3.4)

Species Composition of the Freeman School Prairie

Spring Sampling

Common name	6-83	6-84	6-92
	%		
Big bluestem	61.0	53.2	32.6
Indiangrass	6.2	4.9	-0-
Little bluestem	2.1	1.3	2.3
Switchgrass	6.6	5.2	2.3
Bluegrass	-0-	2.1	-0-
Bromegrass	21.3	31.4	39.5
Canada wildrye	2.8	1.9	-0-
Panicum sp.	-0-	-0-	2.3
Other, including:	-0-	-0-	21.0
Sunflower sp.			(2.3)
Ironweed			(2.3)
Reed canarygrass			(4.7)
Canada goldenrod			(4.7)
Sweet clover sp.			(2.3)
Prairie rose			(4.7)

APPENDIX E

PRESCRIBED FIRE FOR PRAIRIE MANAGEMENT
HOMESTEAD NATIONAL MONUMENT

The role of fire in the natural environment is well documented. Fire has played a significant role in the development of vegetation communities in North America. The role of fire is especially important in North American grasslands where periodic droughts, high temperatures, and strong winds provide a suitable environment for ignition and maintainance of fire.

Fire, as a disturbance to the environment, promotes patch dynamics which in turn enhances community diversity on a larger spatial scale. When fire is excluded from the environment, species richness declines as the dominant species, that is, those species with a wider range of tolerance, occupy the majority of available space. Without fire, the prairie unit declines in diversity.

Prescribed fire needs to be applied judiciously to meet management objectives and provide for wildlife as well as vegetation. One way to provide for wildlife is to leave unburned areas in both upland and lowland environments. The timing of prescribed fires needs to be well thought out and research results utilized so that the application of fire meets specific management objectives.

The fire management units at Homestead consist of:

1) lowland prairie, and,
2) upland prairie

Each of the management units is sub-divided to provide for areas of burned and unburned prairie during each burn cycle (see attached maps). The fire regime at Homestead is currently on a three year cycle. Each sub-unit will be burned every three years. This system of patch burning will aid in meeting vegetation and wildlife management objectives. Providing areas of tallgrass prairie that are unburned in any one year allows wildlife to continue normal life processes as well as areas of escape from fire. This, in turn, allows for viable populations of wildlife which are adapted to the tallgrass prairie ecosystem.

The lowland prairie fire management unit contains three burn units:

1. L1 - that area bounded by Nebraska Highway 4 on the north, the woodlands on the west, and the Farm Loop Trail on the south and east.
2. L2 - that area bounded by the Farm Loop and Grave Site Trails on the north, the woodlands on the west, and the 1270′ contour on the south and east.
3. L3 - that area bounded by Nebraska Highway 4 on the north, the east side of the Farm Loop Trail on the west, the Grave Site Trail on the south and the 1270′ contour on the east.

The native plants display will be an area of fire exclusion and will be maintained by other means. Hydric areas will be included in the lowland units for purposes of fire application.

The upland prairie fire management unit contains four burn units:

1. U1 - the area bounded on the north by Nebraska Highway 4 and the 1270' contour, on the west by the eastern-most upland drainage, on the south by the south boundary, and on the east by the east boundary line.
2. U2 - the area bounded by the 1270' contour on the north, the western-most upland drainage on the west, the south boundary line on the south, and the eastern-most upland drainage on the east.
3. U3 - the area bounded on the north by the 1270' contour, on the west by the woodlands, on the south by the south park boundary and on the east by the western-most upland drainage.
4. FS - the Freeman School prairie unit.

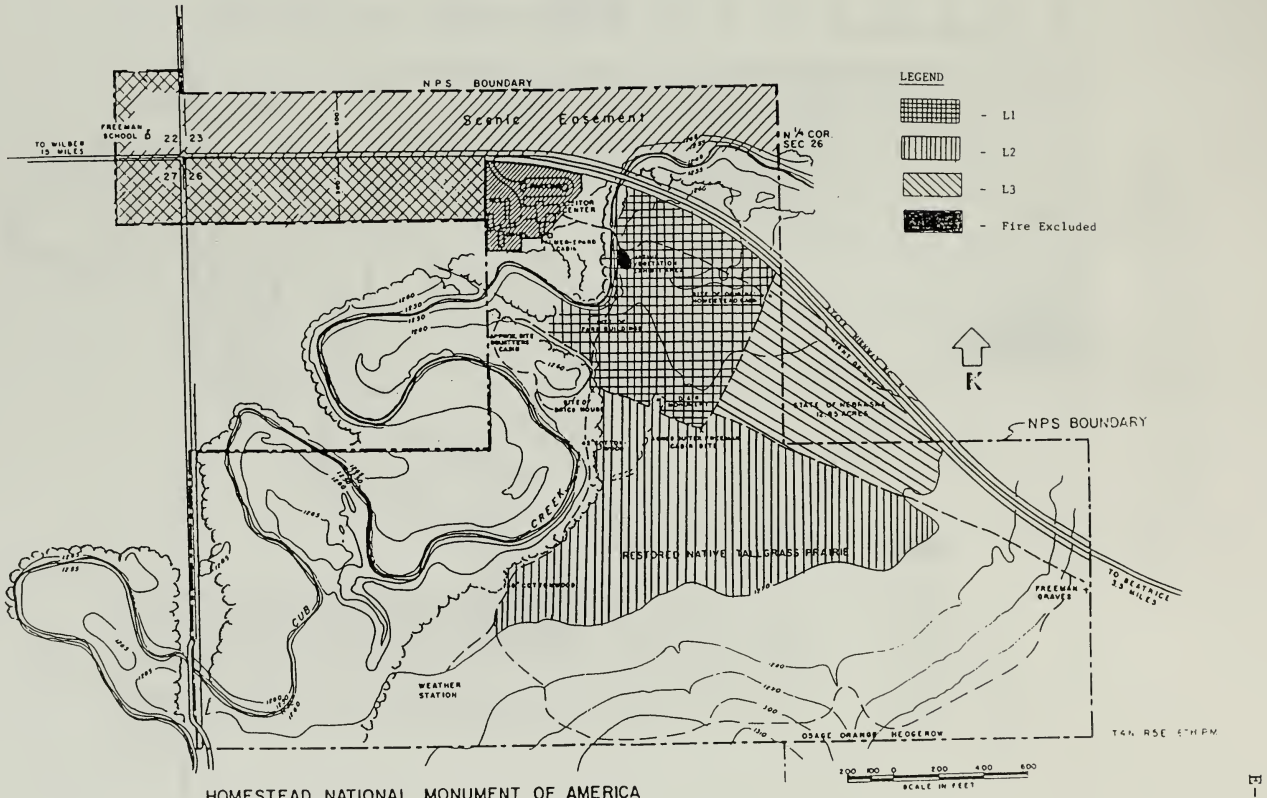
The area north of Nebraska Highway 4 that forms a triangle bounded on its north and east sides by the Pioneer Acres development will be an area of fire exclusion except for times when fire is a necessary tool for fuel hazard reduction. Exotic vegetation and thicket control in this area will be performed using manual techniques as described in the Prairie Management Action Plan.

Prescribed fire will be used at Homestead National Monument as one tool to help meet the objectives stated in the Prairie Management Action Plan. Fire will be applied to prairie units for control of exotic vegetation, to control the spread of woody vegetation, to increase species diversity, to maintain the prairie/woodland edge and as an understory maintenance tool in the woodland/riparian unit.

Prescribed burn plans will be prepared annually. Data from the park's I&M program, current research and specific management unit objectives will be utilized in establishing each prescribed burn plan. Thus, depending upon objectives, one sub-unit may have fire applied to it at different times of the year. As the park's monitoring program indicates a need, objectives in any one fire management unit may change from one burn cycle to the next.

FIRE MANAGEMENT UNITS

LOWLAND PRAIRIE

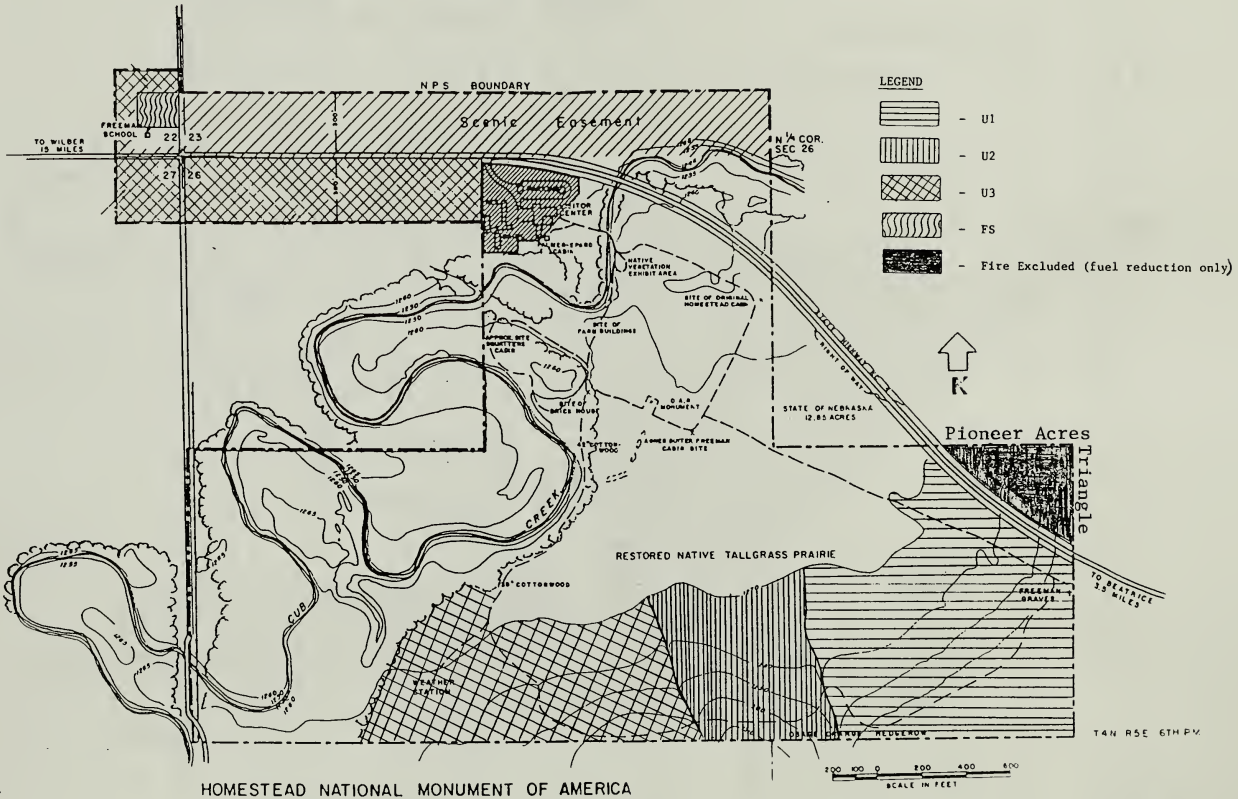


HOMESTEAD NATIONAL MONUMENT OF AMERICA
GAGE COUNTY NEBRASKA

BASIC DATA NM/HOM 2002-1 Dated 4-69

FIRE MANAGEMENT UNITS

UPLAND PRAIRIE



HOMESTEAD NATIONAL MONUMENT OF AMERICA
GAGE COUNTY NEBRASKA

BASIC DATA NM/HOM 2002-1 Dated 4-69

PRESCRIBED FIRE HISTORY
HOMESTEAD NATIONAL MONUMENT

	UNIT							
YEAR	FS	L1	L2	L3	U1	U2	U3	PA
1970			A		B	A	A	
1980		A						
1982								
1983	A	A	A	A	B	A	A	
1984								A
1985	A	A	A	A	A	A	A	
1986		A	A		B	B	B	B
1987	A	B						
1988	A	A	A	A	A	A	A	
1989								
1990		A	A	A	B		B	
1991	A	A	A	A	A	A	A	
1992	R							

Key: A = Unit completely burned.
B = Unit partially burned.
R = Research plots burned.

HOMESTEAD NATIONAL MONUMENT
PRESCRIBED FIRE MATRIX

	FIRE MANAGEMENT UNIT						
YEAR	U1	U2	U3	FS	L1	L2	L3
1993	X			X	X		
1994			X			X	
1995		X					X
1996	X			X	X		
1997			X			X	
1998		X					X
1999	X			X	X		
2000			X			X	
2001		X					X
2002	X			X	X		

PRESCRIBED BURNS - 1993

Prescribed fire will be used in 1993 in the lowland prairie burn unit L-1, the upland prairie burn unit U-1, and at the Freeman School. The objectives of these burns are as follows:

LOWLAND PRAIRIE BURN UNIT, L-1

1. Monitoring activities in restoration area R-1 indicate a need to reduce the density of exotic species. Concentrations of exotic species will be mowed after the growth point has reached sufficient height so that cutting will be below the growth point (typically late May). This will weaken the plant so that carbohydrate reserves are needed for new growth. After cutting, and once the clippings have dried, fire will be applied with a propane torch to further damage the exotics and aid in germination of warm season grasses that may be present.

2. Restoration area R-2 will be seeded to native species in early spring of 1993. Observations in 1992 indicate a widespread presence of exotic vegetation in this unit due to repeated plowing and planting of corn for nitrogen removal. Exotic grasses will be allowed to achieve a height where the growth point can be observed above-ground (typically late May) and will then be cut. Fire will be applied using a propane torch to further damage the plants and allow warm season grasses access to nutrients and moisture in the soil for below-ground growth.

3. Areas of pure smooth brome (Bromus inermis) stands on the south and west portions of the burn unit will be cut and burned as described in 1. above. The objectives are the same as indicated in 1. above.

The application of fire with a propane torch will be utilized to obtain further data for research purposes as is being collected at the Freeman School research plots.

4. The remainder of the burn unit is fairly well established with native vegetative species and will have prescribed fire applied prior to green-up (April) to maintain and/or increase species diversity.

Specific information for each burn is contained in the burn plans for burn unit L-1.

UPLAND PRAIRIE BURN UNIT, U-1

1. Smooth brome along the Hedgegrow Trail will be cut after the growth point has reached sufficient height to allow cutting below the growth point (typically late May). A propane torch will be used to apply fire to the smooth brome concentrations to further damage the plants and allow native vegetative species to invade.

2. The remainder of the burn unit will have prescribed fire applied prior to green-up to maintain species diversity.

Specific information for each burn is contained in the burn plans for burn unit U-1.

UPLAND PRAIRIE BURN UNIT, FS

1. The entire Freeman School unit, excluding the brome research area, will have prescribed fire applied prior to green-up to increase forb production for species diversity.

Specific information for this burn is contained in the burn plan for burn unit FS.

APPENDIX F

SOILS PROFILE
HOMESTEAD NATIONAL MONUMENT

Information source: Soil Survey Gage County, Nebraska
USDA SCS 1964

The following soils series are present at Homestead National Monument:

CRETE SERIES: deep, dark-colored nearly level to gently sloping soils on the loess-mantled uplands. Soils formed under mid- and tall-grass prairie vegetation.

CrA - Crete silty clay loam, 0-3% slopes. Runoff medium, soils not eroded. Surface layer 8-16" deep. Friable and easily worked. Subsoil 30". Location: along eastern boundary.

GEARY SERIES: deep, dark-colored soils on gently sloping to sloping loess-mantled uplands. Formed under mid- and tall-grass vegetation.

GeC2 - Geary silty clay loam, 5-8% slopes, eroded. Medium runoff. Surface layer 5-9". Moderately slow permeability. Roots penetrate readily. Location: 1) upland along hedgerow/south boundary and 2) most of Pioneer Acres Triangle.

MORRILL SERIES: deep, dark-colored gently sloping to moderately steep upland soils, formed under prairie vegetation.

ME3 - Morrill soils 8-18% slopes, severly eroded. Strongly sloping and moderately steep soils on valley sides. Rapid runoff. Rills and shallow gullies numerous. Surface layer 3-5". Poor for cultivation. Subsoil 20", gritty clay loam. Location: southeast corner, steepest upland slopes.

JUDSON SERIES: deep, dark-colored nearly level to gently sloping soils on the foot slopes.

JuB - Judson silt loam 3-5% slopes. Gently sloping, foot slopes at base of uplands and valley sides along small drains. Runoff medium. Surface layer 12-18", friable and easily tilled. Silt loam subsoil to 30". Easily permeable. Locations: 1) bulk of upland slopes and 2) Freeman School Prairie.

JfB - Judson fine sandy loam 3-5% slopes. Same as JuB except surface layer 8-18", moderate permeability, fertile and productive. Runoff from surrounding slopes can cause deep rilling and gullying. Location: small area on south boundary.

ROKEBY SERIES: deep, dark-colored nearly level soils on low alluvial terraces; formed under tall grass vegetation.

Rt - Rokeby silty clay loam. Level or nearly level on low terraces of larger valleys. Slow runoff. Surface layer 8-16". Subsoil 30". Locations: 1) Developed area northwest corner of park and 2) central lowland area to which most of upland drains.

MUIR SERIES: deep, dark-colored nearly level soils on lowland alluvial terraces; formed under tallgrass vegetation.

Mu - Muir silt loam. Level or nearly level soils on low terraces in major valleys. Slow runoff. Surface layer 10-18", friable and easily worked. Subsoil 20" is silty clay loam. Moderately permeable. Fertile and productive. Location: lowland area stretching northeast from south boundary, including much of prairie/woods edge ecotone.

HOBBS SERIES: deep, dark-colored nearly level soils on the bottom lands.

Hb - Hobbs silt loam, seldom flooded. Soil on high bottom lands. Nearly level. Slow runoff. Surface layer 10-24". Fertile and productive. Moderately permeable. Location: lowland area extending from historic tree line to north boundary; contains most recent prairie restoration areas.

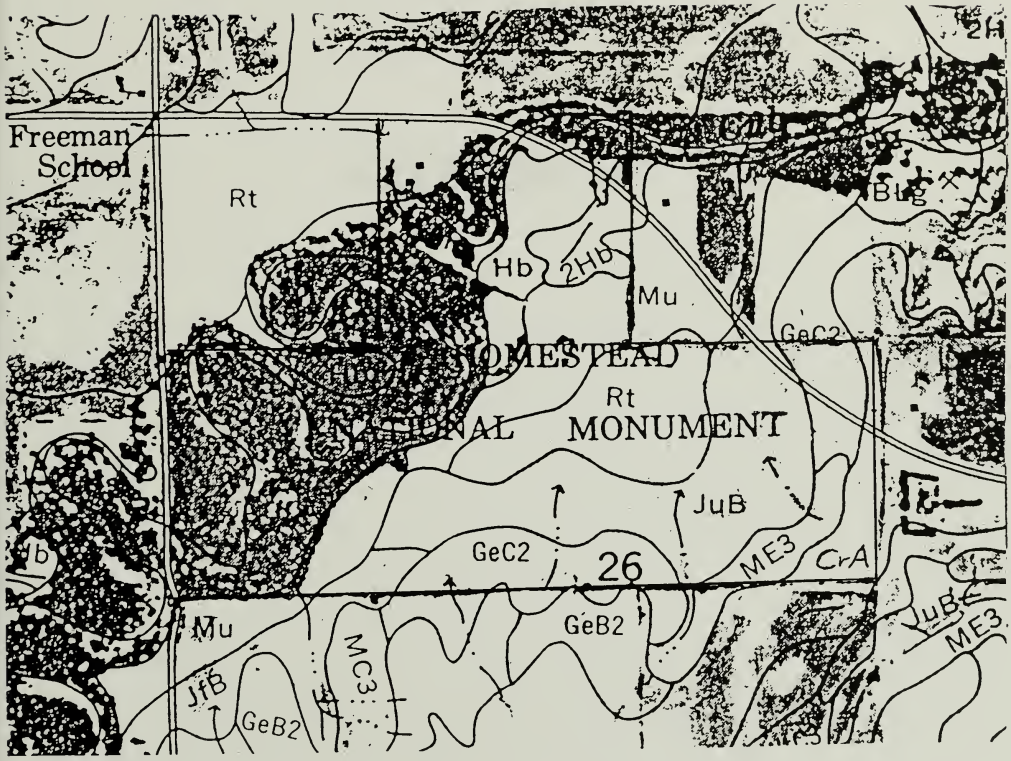
2Hb - Hobbs silt loam, occasionaly flooded. Soil on low bottom lands. Nearly level. Slow runoff, but flooed waters drain readily after stream recedes. Surface layer 10-24". Light colored in places of recent overwash. Moderately permeable. Fertile and productive. Location: lowland area near northeast corner of park.

ALLUVIAL LAND: mixed river sediments recently deposited along streams; generally stratified, varying texture. Silty sediments derived from eroding surface soil and sediment washed from surrounding glacial and loessal uplands.

Sy - Alluvial land. consists of layered stream sediments along meandering stream channels which are subject to frequent overflow. Plants are washed out or covered up by overflow after heavy rains. Annual weeds are hard to control. Location: entire woodland area along Cub Creek including whole western portion of park.

SOIL TYPES

HOMESTEAD NATIONAL MONUMENT



Source: Soil Survey Gage County, Nebraska
USDA, SCS 1964

APPENDIX G

SITE PLAN
R-2 RESTORATION AREA
HOMESTEAD NATIONAL MONUMENT

INTRODUCTION

The R-2 restoration area is a portion of the lowland prairie that lies between the 1265 and 1270 foot contour. The soils in this unit are Hobbs silt loam, seldom flooded (Hb). The site is nearly level and is bounded on the north by Cub Creek, on the west by the woodland edge, on the south by restored lowland prairie, and on the east by the Farm Loop Trail. The site is approximately one acre in size. Historically, this area was a part of the Freeman barnyard. The area was first planted to corn in 1985 as a means to reduce the level of nitrogen in the soil and this practice continued annually through 1992. In the fall of 1992, the last corn crop was cut, the residue from the crop removed and the area tilled under.

The R-1 restoration area, which is adjacent to the R-2 area to the east, was also a part of the Freeman barnyard and has been under restoration since 1985. A variety of techniques were used to restore the area to that of a lowland prairie. Forb seedlings were transplanted, the area was seeded to grasses and forbs, and sod was transplanted from the Mattoon Prairie.

Prior to 1992, the only follow-up documentation of restoration results in the R-1 area consisted of general visual observations by park staff. In October, 1992, the area was monitored using the modified step-point method. The results (see Table 1) show that although the area still displays a high composition of exotic vegetative species, the number of native species present is impressive for the short time span the area has been under restoration. Therefore, similar restoration techniques will be utilized for the R-2 area.

The primary objective for the R-2 unit is to restore it to a lowland, tallgrass prairie ecosystem. Typical of this system are the dominant grasses big bluestem, Indiangrass, and switchgrass. These species, along with a variety of forbs and minor grasses found in this ecosystem, are available for transplant from other areas of the Homestead lowland prairie unit, the Mattoon Prairie and can be re-introduced through seeding.

Sutton et.al. (1984) suggested a "rough target" species composition for lowland prairie (see Table 2) based on the composition figures of Weaver (1954). However, due to the park's objective of

increased diversity to represent a wider range of tallgrass prairie vegetation, the targeted species composition will include:

Big bluestem	70%	
Indiangrass	8%	
Switchgrass	4%	(seeding rate 1-2%)
Other grasses	2%	
Forbs	16%	

This reduction in the percentage of big bluestem, Indiangrass, and switchgrass allows for a wider variety of forbs, that may have been found in a lowland prairie, to be initially established during the restoration process. For further background information, see the following planning documents:

1. Resource Management Plan
2. Environmental Assessment for the Draft General Management Plan

1993 WORK PLAN - R-2 RESTORATION AREA

1. Late March/early April - seed the restoration area to native grasses and forbs using seed collected from the Homestead prairie in 1992 and seed purchased from a local seed source. The Aero Seeder will be utilized to plant the seed to the appropriate depth.

2. April - transplant sod containing native grasses from the old highway 4 right-of-way (ROW) and adjacent lowland area to the restoration area. Map locations of sod transplants. Backfill holes with soil that was removed during trail construction in 1992.

3. May - evaluate new growth in restoration area.
(a) If cool season exotic vegetation predominates, scrape the area utilizing the tractor and scraper blade. The blade depth will be set to just make contact with the surface of the ground.
(b) If native species are present, but exotic vegetation comprises a high percentage of the vegetative composition, mark desired species and mow/cut exotics when growth points are at a sufficient height above ground to be able to cut below the growth point.
(c) Upon completion of (b), burn using propane torch to further damage exotic species.
(d) Identify locations of forbs in R-1 restoration area that have a high incidence of occurrence. Transplant individual plants and sod to R-2 restoration area. Mark transplants with colored stake-wired flags and map locations.

(e) Monitor transplants and new growth. Manually remove exotic species of vegetation from around transplants. Irrigate as needed.

4. June-August - Monitor restoration area for growth of exotic species. When growth points of exotic species are at a sufficient height above-ground for cutting below the growth point, mow/cut to cause plants to use carbohydrate reserves for new growth. This action should prevent any new growth from reaching the seed-head stage.

5. September - Use modified step-point method to monitor entire area for species composition.

R2 RESTORATION AREA

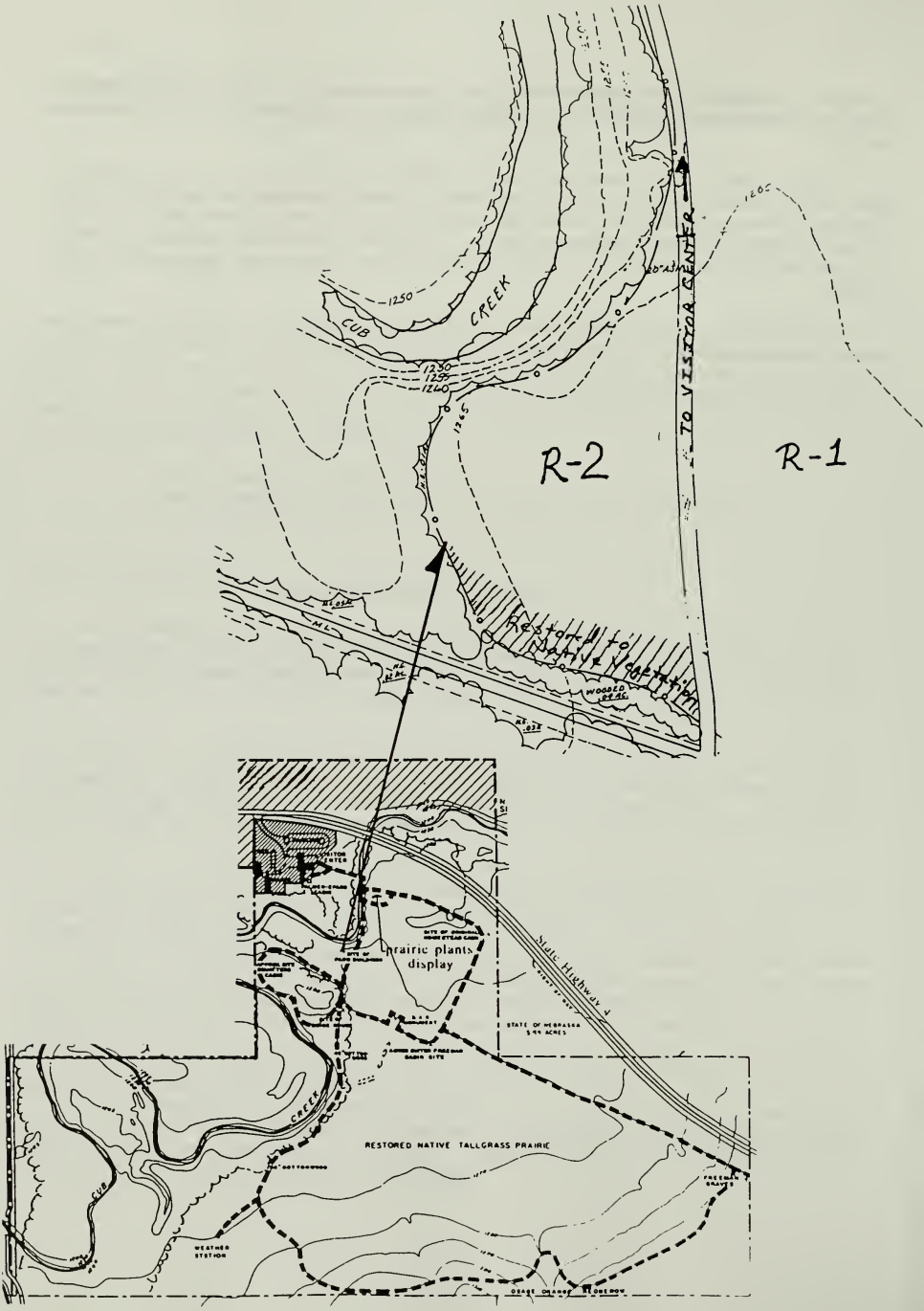


TABLE 1

RESTORATION AREA - R1
HOMESTEAD NATIONAL MONUMENT
OCTOBER, 1992

SPECIES	FREQUENCY	DIRECT HITS	PERCENT COMP.
LITTER	93	---	74.4
BARE GROUND	24	---	19.2
Big Bluestem	13	3	10.4
Little Bluestem	10	0	8
Indiangrass	21	0	16.8
Switchgrass	16	3	12.8
Sideoats Gramma	6	1	4.8
Reed canarygrass	1	0	0.8
Cordgrass	2	0	1.6
Dropseed sp.	1	0	0.8
Green foxtail*	1	0	0.8
Giant foxtail*	6	0	4.8
Large crabgrass*	14	1	11.2
Sedge sp.	1	0	0.8
Unk. grass sp.	1	0	0.8
Canada goldenrod	4	0	3.2
Late goldenrod	2	0	1.6
Goldenrod sp.	9	0	7.2
Prairie rose	2	0	1.6
White vervain	2	0	1.6
Blackeyed susan	2	0	1.6
Lambs quarters*	1	0	0.8
Unk. forb sp.	9	0	7.2
Elderberry	1	0	0.8
TOTAL	125	8	100

Target species composition (%) for restoration of the dry lowland prairie, between contours 1265 and 1270. Seeds form species marked with * were collected in 1984 by Kathy Patrick.

Species	Target Species Composition
	-----%-----
Major grasses:	
Big bluestem*	
Andropogon gerardii	76.0
Indiangrass*	
Sorghastrum nutans	8.5
Switchgrass	
Panicum virgatum	8.0
Canada wildrye*	
Elymus canadensis	0.5
Prairie cordgrass*	
Spartina pectinata	3.0
Forbs and minor grasses (total to 4%):	
Catchweed bedstraw (Galium aparine)	
Wild strawberry (Fragaria virginiana)	
Canada goldenrod (Solidago canadensis)	
Compassplant (Silphium laciniatum)*	
Wholeleaf rosinweed (silphium integrifolium)	
Golden alexanders (Zizia aurea)	
Prairie dogbane (Apocynum sibiricum)	
Meadow violet (Viola pratincola)	
American licorice (Glycyrrhiza lepidota)*	
Smooth milkweed (Asclepias sullivantii)	
Purple loosestrife (Lythrum salicaria)	
Fleabane (Erigeron philadelphicus)	
Grayhead prairieconeflower (Ratibida pinnata)*	
Cup rosinweed (Silphium perfoliatum)*	
Illinois tickclover (Desmodium illinoense)*	
Cudweed sagewort (Artemisia ludoviciana)	
Violet woodsorrel (Oxalis violaceae)	
Little bluestem (Schizachyrium scoparium)*	
Panic grasses (Dichanthelium spp.)	
Prairie dropseed (Sporobolus heterolepis)*	

Table 2 - Sutton, et. al. (1984) suggested target composition figures for lowland restoration area.

APPENDIX H

FREEMAN SCHOOL RESEARCH PLOTS

PROBLEM STATEMENT

The Freeman School upland prairie is significant because it represents the only unplowed, non-restored prairie at Homestead National Monument and it is highly visible to passing travelers. Due to its small size, approximately 0.75a, maintaining this prairie remnant is critical. The edges of the prairie are being invaded by the exotic, smooth brome (Bromus inermis), from adjacent farmland. Continued deterioration of this area will result in the loss of the only remaining unplowed prairie remnant at the monument. In 1992, the NPS acquired 1.19 acres of land adjacent to the original land acquisition. The newly acquired land will be restored to tallgrass prairie and will serve as a buffer for the native prairie remnant.

The literature reviewed suggests mowing, use of herbicides, and fire as methods of control for brome. In the past, fire and the use of atrazine (now banned from use) have been applied to this prairie unit. Fire alone does not appear to be stopping the brome invasion, however, there is no scientific data to determine this. Test plots are needed to determine the success or failure of various treatments for brome control.

METHODS

On May 4, 1992, six research plots were established at the Freeman School prairie. The research will test three techniques to reduce the tiller density of smooth brome. Each technique will be replicated for statistical purposes.

Test plots #1 and #2 will be used to test the effects of mowing for brome control. Mowing will occur when the growth point is sufficiently above-ground so that the cut can be made internodal.

Test plots #3 and #4 will test the effects of mowing in combination with fire, and in particular, fire by use of a propane torch. Mowing will occur as discussed for plots #1 and #2 and then the plots will be burned.

Test plots #5 and #6 will test the effects of fire for brome control. No other treatments will occur on these two plots.

The test plots are located as described below (see attached map):

1. Each test plot is $6m^2$ and there is a 2m wide path between plots #1 and #2. Between plots #2 and #3 there is a 5m wide path. Between plots #3 and #4 there is a 2m wide path. Plots #1 through #4 are in a general line running from south to north. Plots #5 and #6 are in a general line running west to east. There is a 2m wide path between plots #5 and #6.

2. The location of the south corners of plot #1 are:
   a) the SE corner is located 19.85m SW of the stride-swing pole and 16.20m WNW of the NE corner of the school.
   b) the SW corner is located 23.35m SW of the stride-swing pole and 21.40m WNW of the NE corner of the school.

3. The location of the east corners of plot #6 are:
   a) the SE corner is located 20.35m NE of the stride-swing pole and 30.75m WSW of the phone co. junction box.
   b) the NE corner is located 26.05m NE of the stride-swing pole and 29.35m WSW of the phone co. junction box.

Once the four corner points are located, the remainder of the corner points can be found by measuring off the size of the plots and the pathways between the plots, to the north for plots 1 through 4 and to the west for plots 5 & 6.

Each plot will be measured for density of smooth brome and other species present using ten random sub-plots of $0.1m^2$ grids. The grids will be laid down at random and each tiller within the grid counted and recorded. The measurements will be taken prior to the research action designated for the plot.

Research Actions:

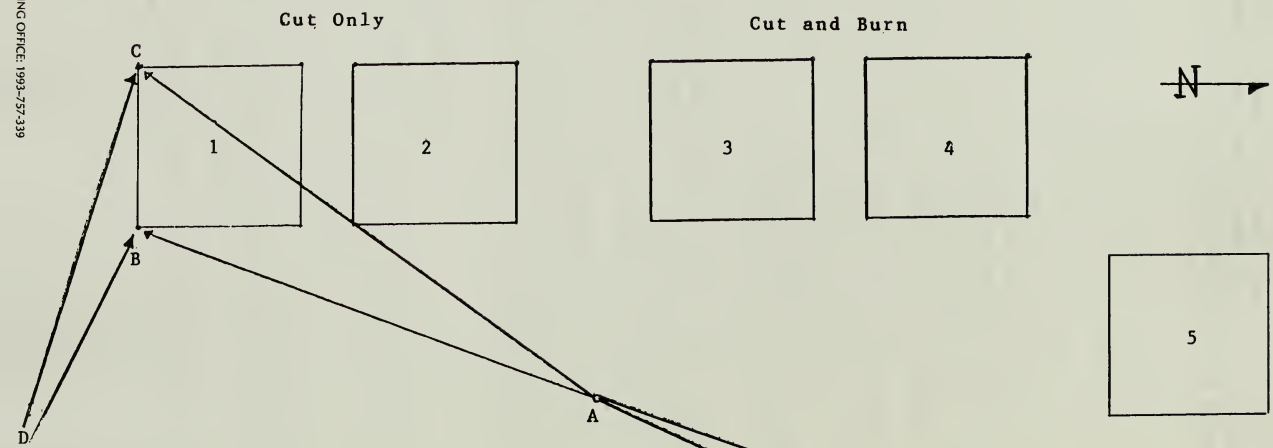
Plots #1 and #2 will be mowed as indicated by internodal growth, at the point where the growing point is far enough above ground so that the cut can be made below the growing point. No other treatments will be applied.

Plots #3 and #4 will be mowed as described above for plots #1 and #2. After mowing is completed and the cut brome has been allowed to dry, a propane torch will be used to burn the residue and the plants within the plots.

Plots #5 and #6 will be burned with a propane torch and no other treatments applied.

Initial density measurements will be recorded and annual density measurements will be made thereafter, for each plot, and compared to previous density measurements to determine success or failure of the treatments.

FREEMAN SCHOOL
RESEARCH PLOTS



A-B = 19.85m
A-C = 23.35m

D-B = 16.20m
D-C = 21.40m

A-E = 20.35m
A-F = 26.05m

G-E = 30.75m
G-F = 29.35m

Pt. A - Pole
Pt. B - SE corner, plot #1
Pt. C - SW corner, plot #1
Pt. D - SE corner, School
Pt. E - SE corner, plot #6
Pt. F - NE corner, plot #6
Pt. G - Base, phone co. pedestal

= 1m