

**National Park Service
U. S. Department of the Interior**



**Knife River Indian Villages National Historic Site
North Dakota**

Knife River Indian Villages NHS
Fire Management Plan 2008





Table of Contents

I.	Introduction.....	6
A.	Requirements.....	6
Other Authorities.....		7
Interagency Fire Policy.....		8
National Park Service Policy.....		10
II.	Relationship to Land Management Planning and Fire Policy	
A.	NPS Management Policies.....	II
B.	Enabling Legislation.....	II
C.	Desired Conditions.....	14
General Management Objectives.....		14
Resource Management Objectives.....		15
D.	Cultural and Natural Resource Descriptions.....	16
III.	Wildland Fire Management Strategies.....	37
A.	General Management Considerations.....	37
B.	Wildland Fire Management Goals.....	37
C.	Wildland Fire Management Options.....	40
D.	Strategies for KNRI Fire Management Unit.....	41
a.	FMU Characteristics.....	42
b.	FMU Objectives.....	42
c.	Management Considerations.....	42
d.	Historic Role of Fire.....	46
e.	Wildland Fire Management Situation.....	49
IV.	Wildland Fire Management Program Components.....	55
A.	General Management Considerations.....	55
B.	Wildland Fire Suppression.....	56
C.	Wildland Fire Use.....	78
D.	Prescribed Fire Program.....	78
E.	Non- Fire Fuel Treatment Processes.....	86
F.	Emergency Rehabilitation and Restoration.....	86



V.	Organizational and Budgetary Parameters.....	87
	A. Organizational Structure and Fire Management Responsibilities..	87
	B. FIRE PRO Funding.....	92
	C. Fire Management Responsibilities: North Dakota Group Fire Management Area.....	92
	D. Interagency Cooperation and Coordination.....	95
VI.	Monitoring and Evaluation.....	97
VII.	Fire Research.....	98
VIII.	Safety.....	99
	Public Safety.....	99
	Firefighter Safety.....	101
IX.	Public Information and Education.....	102
X.	Protection of Sensitive Resources.....	104
XI.	Fire Critiques and Annual Plan Review.....	105
XII.	Consultation and Coordination.....	106
XIII.	Appendices	
	A. References /A- 1 to A- 4/	
	B. Definitions /B- 1 to B- 4/	
	C. Threatened and Endangered Species List /C- 1/	
	D. NEPA and NHPA Compliance, Environmental Assessment	
	E. Knife River Indian Villages NHS Fire Ecology /E- 1 to E- 10/	



E.I Supplemental Information

- a. Fire Call- Up List
- b. Preparedness Inventory
- c. Cooperative Agreements

F. Wildland and Rx Fire Monitoring Plan /F- 1 to F- /

G. Pre- Attack Plan /G- 1 to G- 2/

H. Long Term Prescribed Fire and Hazard Fuel Reduction Plan

I. Multi- Year Prescribed Fire Schedule /H- 1 to H- 2/

I. Fire Prevention Plan /I- 1 to I- 4/

J. Fire History /J- 1 to J- 3/

Map: Wildfire Locations

Table: Wildfire Acreages, Dates and Case

Map: Prescribed Fire Locations Map

Chart: Prescribed Fire Acreages, Year and Month

K. Size up Report /K- 1/

L. Contracts for Suppression and Prescribed Fire Resources
None as of 2007

M. Burned Area Emergency Stabilization and Rehabilitation Plan
None



List of Figures

Fig. 1	Park Location	p. 16
Fig. 2	Park Map	p. 17
Fig. 3	3- Dimensional View of KNRI	p.19
Fig. 4	Topographic View of KNRI	p. 20
Fig. 5	Soil Texture Map	p.23
Fig. 6	KNRI FMU	p. 41
Fig. 7	Prescribed Fire Units	p. 44
Fig. 8	Step- Up Plan	p. 63
Fig. 9	KNRI Fire Organization	p. 87
Fig. 10	Resource Order Logistical Support Sequence	p. 95

List of Tables

Table 1	Average Monthly Temperature, Rainfall and Vegetation Stage	p.21
Table 2	Soil Textures within KNRI	p. 22
Table 3	Acreages of plant associations and other mapping units present within KNRI and mapping boundary	p. 33
Table 4	Prescribed Fire Unit Dimensions	p. 45
Table 5	Potential Fire Behavior	p. 57
Table 6	Reports and Records Required for Implementation of KNRI Fire Management Plan	p. 77
Table 7	Targeted Fire Management/Incident Management Positions	p. 94



I. INTRODUCTION

The Knife River Indian Villages National Historic Site (KNRI) Fire Management Plan (FMP) is an addendum to the existing Resource Management Plan (NPS 1986). An environmental assessment (EA) was prepared and made available for public review prior to implementation of this document (see appendix D). This FMP and the accompanying EA meet the requirements of the National Environmental Policy Act (NEPA, 42 U.S.C. §4321 et seq.) and the National Historic Preservation Act of 1966 (NHPA, 1966). It will serve as a detailed program of action, providing specific guidance and procedures for accomplishing wildland fire management objectives.

A. Requirements

This document is mandated by and complies with National Park Service (NPS) *Director's Order #18: Wildland Fire Management* (DO- 18, USDI 2005), which outlines NPS fire management policy that requires that “every park area with burnable vegetation must have a fire management plan approved by the Superintendent”. More specific guidance is found in Reference Manual 18 (RM- 18, USDI 2006). This plan also complies with the Service's policy guidance, the *Management Policies* (USDI 2006). The Organic Act of the National Park Service (16 U.S.C. §1 et. seq.) provides the primary authority for implementation of this plan.

This plan will implement fire management policies and help achieve resource management and fire management goals as defined in: (1) the 2001 *Federal Wildland Management Policy and Program Review* (USDA/USDI 2001); (2) *Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy* (USDI/USDA); and (3) *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10- Year Comprehensive Strategy Implementation Plan*.

As NPS management planning is becoming more science- based and proactive, fire management is assuming a role of greater importance. This FMP has been prepared to serve as a detailed program of action, which provides specific guidance and procedures for accomplishing park fire management objectives. The implementation of this plan will define levels of protection necessary to ensure both firefighter and public safety, protection of facilities, protection of cultural and natural resources and minimize undesirable environmental impacts of fire management. This FMP will also define proper use of fire to restore and perpetuate natural processes given current understanding of the complex relationships in natural ecosystems.



Other Authorities

The authority for NPS Fire Program funding (Normal Fire Year Programming) and all emergency fire accounts is found in the following authorities:

- Section 102 of the General Provisions of the Department of Interior's (DOI) annual Appropriations Bill - provides the authority under which appropriated monies can be expended or transferred to fund expenditures arising from the emergency prevention and suppression of wildland fire.
- Public Law 101- 121, DOI and Related Agencies Appropriation Act of 1990 - established the funding mechanism for normal year expenditures of funds for fire management purposes.
- 31 U.S.C. §665 (E) (1) (B) - provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.

Authorities for procurement and administrative activities necessary to support wildland fire suppression missions are contained in the Interagency Incident Management Handbook. Authorities to enter into agreements with other federal bureaus and agencies; with state, county, and municipal governments; and with private companies, groups, corporations, and individuals are cited in *Director's Order #20: Agreements* (DO- 20, USDI 1999).

Authority for interagency agreements is found in "Interagency Agreement between the Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS) of the United States Department of the Interior (USDI) and the Forest Service (USFS) of the United States Department of Agriculture (USDA)" (1982). Authority for rendering emergency fire or rescue assistance outside the National Park System is the Act of August 8, 1953 (16 U.S.C. §1b(1)) and the Department of the Interior Manual (910 DM).

Existing agreements pertaining to implementation of the fire management program are cited or included in *Appendix E- 3*. As a general rule, these agreements give guidance on mutual aid zones for wildland fire suppression activities and specify procedures for billing and payment between agencies for wildland fire management activities.



Interagency Fire Policy

Federal wildland fire policy is established in the *Federal Wildland Fire Management Policy & Program Review of 1995* (USDA/USDI 1995). This policy was reviewed following 2000 fire season (USDA/USDI 2001). The 2001 Working Group found that the policy is generally sound, but recommended changes:

In summary, the Working Group finds and recommends that federal fire management activities and programs are to provide for firefighter and public safety, protect and enhance land management objectives and human welfare, integrate programs and disciplines, require interagency collaboration, emphasize the natural ecological role of fire, and contribute to ecosystem sustainability.

Recognizing the ecological role of fire and the goal of ecosystem sustainability in federal policy is a fundamental change in perception of fire in our society and its role in land management. Principal conclusions of the Working Group included:

- *As a result of fire exclusion, the condition of fire- adapted ecosystems continues to deteriorate; the fire hazard situation in these areas is worse than previously understood.*
- *Changes and additions to the 1995 Federal Fire Policy are needed to address important issues of ecosystem sustainability, science, education, communication, and to provide for adequate program evaluation.*

In addition, the review stated, "The 2001 Federal Fire Policy and its implementation are founded on the following Guiding principles:"

1. *Firefighter and public safety is the first priority in every fire management activity.*
2. *The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process.*
3. *Fire management plans, programs, and activities support land and resource management plans and their implementation.*
4. *Sound risk management is a foundation for all fire management activities.*
5. *Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives.*
6. *Fire management plans and activities are based upon the best available science.*



7. *Fire management plans and activities incorporate public health and environmental quality considerations.*
8. *Federal, State, tribal, local, interagency, and international coordination and cooperation are essential.*
9. *Standardization of policies and procedures among federal agencies is an ongoing objective.*

This plan is intended to follow these principles and incorporate them into all aspects of the KNRI's Fire Management Program.

DOI policy, as specified in *Wildland and Prescribed Fire Management Policy: Implementation Procedures Reference Guide* (1998), states that all fires in wildland fuels will be classified as either "wildland fire" or "prescribed fire".

Wildland fire is defined as any non- structure fire, other than prescribed fire, that occurs in the wildland. These fires can, but do not always, achieve burning intensities capable of causing loss of life, detrimental impacts upon natural resources, and damage to, or destruction of, man- made developments. With the implementation of this plan, managers will have a wide range of appropriate management responses to naturally ignited wildland fires, while all human- caused fires will be suppressed. The management of naturally ignited wildland fires to accomplish specific pre- stated resource management objectives in pre- defined geographic areas outlined herein is defined as wildland fire use.

Prescribed fire is defined as any fire ignited by management actions to meet specific objectives. These fires are conducted under prescription, and on a predetermined area that will produce the fire intensity and rate of spread required to accomplish certain management objectives. Overall, prescribed fire objectives are to employ fire scientifically to realize maximum net benefits at minimum impact and acceptable cost to achieve the desired results.

Within the framework of management objectives and plans, overall negative wildland fire impacts will be held to the minimum possible giving full consideration to:

1. firefighter and public safety,
2. an aggressive fire suppression program,
3. the least expenditure of public funds for effective suppression,
4. the methods of suppression least damaging to resources (cultural and natural) and the environment,
5. integration of cooperative suppression actions by governmental agencies or with



other qualified suppression departments or organizations.

National Park Service Policy

NPS management policy directs each park to prepare a wildland fire management plan appropriate for that park's purpose and resources. As stated previously, fire management at KNRI is based upon this policy and the guidance found in *Director's Order #18* and the supporting *Reference Manual 18*. These guidelines identify fire as the most aggressive tool for managing natural resources employed by the NPS. NPS policy also directs that all fires burning in natural vegetation will be classified as either wildland fires or prescribed fires. Prescribed fires may be authorized by an approved fire management plan and can be of significant importance in achievement of the park's resource management objectives.

DO- 18 identifies the goals of the NPS wildland fire management program. These goals are:

1. *Conduct a vigorous and safe wildland fire management program with the highest professional and technological standards.*
2. *Identify the type of wildland fire that is most appropriate to specific situations and areas.*
3. *Efficiently accomplish resource management objectives through the application and management of prescribed and wildland fires.*
4. *Continually evaluate the wildland fire program operations and accomplishments to better meet program goals by refining treatment and monitoring methods, and by integrating applicable technical and scientific advancements.*



Mallards nest saved during a Rx fire, NPS photo



II. RELATIONSHIP TO LAND MANAGEMENT PLANNING AND FIRE POLICY

A. NPS MANAGEMENT POLICIES

NPS *Management Policies* (USDI 2006) provide the guidance for integration of fire into overall park management and resource management objectives:

Naturally ignited fire is a process that is part of many of the natural systems that are being sustained in parks. Human- ignited fires often cause the unnatural destruction of park natural resources. Wildland fire may contribute to or hinder the achievement of park management objectives. Therefore, park fire management programs will be designed to meet park resource management objectives while ensuring that firefighter and public safety are not compromised.

Each park with vegetation capable of burning will prepare a fire management plan and will address the need for adequate funding and staffing to support its fire management program. The plan will be designed to guide a program that responds to the park's natural and cultural resource objectives; provides for safety considerations for park visitors, employees, neighbors, and developed facilities; and addresses potential impacts to public and private property adjacent to the park. An environmental assessment developed in support of the plan will consider the effects on air quality, water quality, health and safety, and natural and cultural resource management objectives. Preparation of the plan and environmental assessment will include collaboration with adjacent communities, interest groups, state and federal agencies, and tribal governments.

B. ENABLING LEGISLATION

Public Law 93- 486 passed on October 26, 1974 established KNRI. The following excerpt from Section 101 of that document states:

“for establishment as the Knife River Indian Villages National Historic Site, North Dakota, those lands depicted on the map entitled Boundary Map, Knife River Indian Villages National Historic Site, North Dakota Numbered 468- 20, 012 and dated July 1970.”



The only other reference in this, the establishing legislation, was in Section 104 and delineated the limits of appropriation and the number of acres to be purchased.

Hence, the public law did not specifically state the purpose for which the park was to be created, however, two key elements of the legislative history, House Report No. 93-1285 and Senate Report No. 93-1233 specifically state that the park was to be established to “*preserve certain historic and archaeological remnants of the cultural and agricultural lifestyle of the Plains Indians*” (the language is identical in both reports). It is also clear from a reading of the legislative history of Public Law 93-486 that it was the intent of Congress to have the park’s historic and archeological resources interpreted for the benefit of the public and that study of these resources be conducted. (See the Congressional Record, Volume 120, August 19, 1974, especially the section entitled “Brief Background of Components of H.R. 13157” on page 8621.) The “Final Environmental Statement” (p. 6) for the proposed establishment of KNRI also clearly anticipates an ongoing program of archeological research in the park. It is also clear from a reading of the legislative history of Public Law 93-486 that it was the intent of Congress to have the park’s historic and archeological resources interpreted for the benefit of the public and that study of these resources be conducted. In order to preserve these values, an active fire management program is required to maintain the fire dependent ecosystem. The FMP is a working document that details how the park will control and/or use fire to preserve park resources for future generations. The primary values to be protected include scenic values, cultural deposits, expanses of remnant native mixed- grass prairie, riparian woodlands and the native wildlife species associated with these ecosystems and the human occupation story for the past 11,000 years.

Consequently, it must be concluded that the park was created to serve three major purposes: preservation, interpretation and research. Obviously, the three purposes are closely interrelated. Preservation and interpretation cannot take place without knowledge of the resources gained through research, and the research value of the park would be severely compromised if the resources were allowed to deteriorate. Without research, the information needed for management and interpretive purposes will be incomplete. Also, research activities in the park can be guided to a large extent by identified interpretive needs, i.e., information needed to fill gaps in the interpretive story of the park. KNRI is one of the few areas in the NPS that provides for continuing research. The responsibilities and opportunities that this entails and the ramifications for the park’s natural resources must be considered in planning for the management of the park’s cultural resources and historical landscape.

Significant in the documented legislative history are two excerpts from verbal and written testimony:



- I. “The third component of H.R. 13137 is the Knife River Indian Villages NHS located in the State of North Dakota. The new unit will add to the National Park System several important archeological sites where the life of the Plains Indians can be studied and interpreted. At one time, it was a hub for trading between tribes, as well as the white fur traders. In addition, it is important as a place Indian culture and agriculture developed. Protection of the archeological sites in this area is needed, but equally important is the need to properly study, develop and interpret the area for the visiting public.”
2. The office of the Secretary’s letter to the Chairman of the House and Senate Committees on Interior and Insular Affairs signed by Nathaniel Reed on November 6, 1973 emphasizes the following:
 - a. The archaeological value of KNRI
 - b. The historical associations with Lewis and Clark, Bodmer, Lisa, Catlin, Maximillian, Henry, Bradbury, and Audubon.
 - c. The importance of agricultural phases of the Plains Indian Development.
 - d. The trade regime and its effect on the spread of horses.

Mr. Reed made the following statement:

“Interpretation of the site by the National Park Service would deal with the agricultural village life, the nomadic life of the Plains Indians, the visiting of the villages by the Lewis and Clark expedition, and early European visitors to the villages.”

The only other legal reference pertaining strictly, or even primarily to KNRI is an increase in the appropriation limit for the purchase of authorized lands.

As we define the intent for which the park was established, the lack of legislative history is further compounded the drastic change that occurs in our baseline resource data as the results of the intensive archeological research program are made public. In short, both the purpose for which the park was established and the resources which were to be preserved are far greater in scope that was originally envisioned. For example, it was believed in 1976 that the park contained four village sites that were hundreds of years old; we now know it contains at least 65 sites of which some are thousands of years old. We also know that archeological resources comprise 25% of our public land base.



The Kreiger Parcel, an additional 465 acres, was authorized by Public Law 101- 430, on October 15, 1990. This law did not change or add to the stated purposes of the park.

Fire represents an ecological factor of significant importance in the development and structure of nearly every terrestrial ecosystem in North America. It has been present in natural ecosystems since the origin of climate on earth (Wright and Bailey 1982). It has been well established that the plains ecosystem has historically experienced frequent, fast running, short duration fires. From the recorded accounts of early European explorers and settlers, fires were a common occurrence on the plains (Higgins 1986). Fires were often ignited by lightning activity during the late spring to early autumn season. The writings note that the plains were often on fire as a result of Indian activities, e.g., to signal others, to herd game, wage war, alter vegetation composition, and to clear campsites. Following the influx of European settlers in the mid- to- late 1800's, most human- caused prairie fires resulted from the carelessness of cowboys and cooks, rather than Indians (Wright and Bailey 1982).

C. DESIRED CONDITIONS

- **General Management objectives**

As stated in the park's GMP, one objective of the natural resource management effort is to "Restore and maintain, to the extent feasible, the endemic plants and animals and ecological processes...". To reach this objective, one method available to park resource managers is the use of management ignited prescribed fires. To assist the managers in completing the return of the park lands to their more "natural" state, a detailed study of the vegetation community was completed in 1993 (Lenz 1993). This study resulted in the listing of 8 habitat types representative of endemic vegetation communities found within the park. Current resource management objectives include shaping the park vegetation mosaic to match, to the extent feasible, the composition of species described in the 8 habitat types, while reducing or eliminating the occurrence of undesired species. The 8 habitat types represent the associations of climax vegetation found on the land area which supports that association.

The NPS is in the process of adopting a new park program document for resource management called the Resource Stewardship Strategy (RSS). The RSS tiers directly from the GMP and supersedes the Resource Management Plan (RMP) that had been the principle document for resource management. The RSS is not an implementation plan and does not contain implementation details or specific actions. Instead, it focuses on park- specific desired conditions and provides a series of logical, tracked Comprehensive Strategies that inform park strategic planning in order to facilitate achieving those identified desired conditions. Until that time when an RSS is developed for Knife River Indian Villages National Historic Site, this FMP will strive to



reach the objectives of the park's GMP and RMP and may likely serve to achieve some of the objectives of an RSS. In the interim, the success of the FMP in meeting certain resource goals of the park's GMP and RMP will be checked and measured by the fire-monitoring program. When development of an RSS is eventually undertaken by the park, the superintendent and resource manager will ensure that the tenets of the FMP in force at that time will be incorporated into the development of the Comprehensive Strategies of the park's RSS.

Restoring the natural fire regime to park lands will help to reproduce pre-European settlement conditions, which will allow native fire dependent species to complete their natural lifecycles and compete with undesirable noxious and exotic species.

- **Resource management objectives**

KNRI will be managed to protect and interpret the ecosystems along the Knife and Missouri Rivers and the cultural resources resulting from human habitation of the area. Of primary importance is the management of the park as a natural ecosystem, influenced by human activities over time, and the continuation of natural process function.

- 1) Use prairie restoration processes to return old-field areas to native prairie. If left alone, natural plant succession would take over 100 years if at all, to complete and this is without the presence of exotics. With the presence of persistent exotic species smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*) and crested wheat (*Agropyron cristatum*), natural succession of native species may never occur. Restoration of fire dependent native grasses is only one benefit of maintaining historic fire intervals on the park's prairies.
- 2) Promote hardwood generation in the floodplain forests as well as the woody draws that border grassland areas. Without the presence of flooding and fire, many of these areas have become decadent and without these rejuvenating effects, nutrient levels in these areas will remain low, thus reducing natural regeneration, species composition and ecosystem diversity.
- 3) Shift species composition in natural areas from exotic species (Kentucky bluegrass, smooth brome) to native plant species.
- 4) Restore the mosaic pattern of different plant communities associated with post fire stages.
- 5) Restore fire as a critical component of the ecosystem.



- 6) To the extent practical, use fire as a tool to restore the ecosystem to a condition that resembles pre- European settlement periods. This may be accomplished by reproducing natural fires as well as Native American ignited fires.
- 7) Incorporate prescribed burning in accordance with strategies outlined in the park's prairie management plan (draft) to enhance the vigor of native grassland while reducing exotic species populations to levels determined by the prairie management plan.

D. CULTURAL AND NATURAL RESOURCE DESCRIPTIONS

The data which comprise the general description of the area are summarized from the existing Resource Management Plan (RMP) and General Management Plan (GMP) written for KNRI.

Figure 1.- Park Location

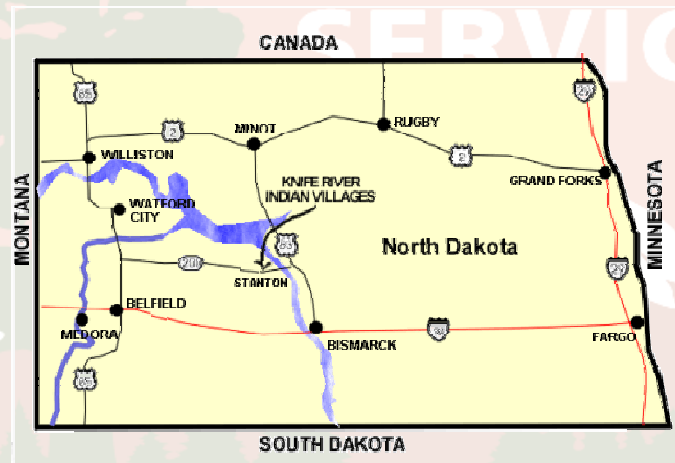
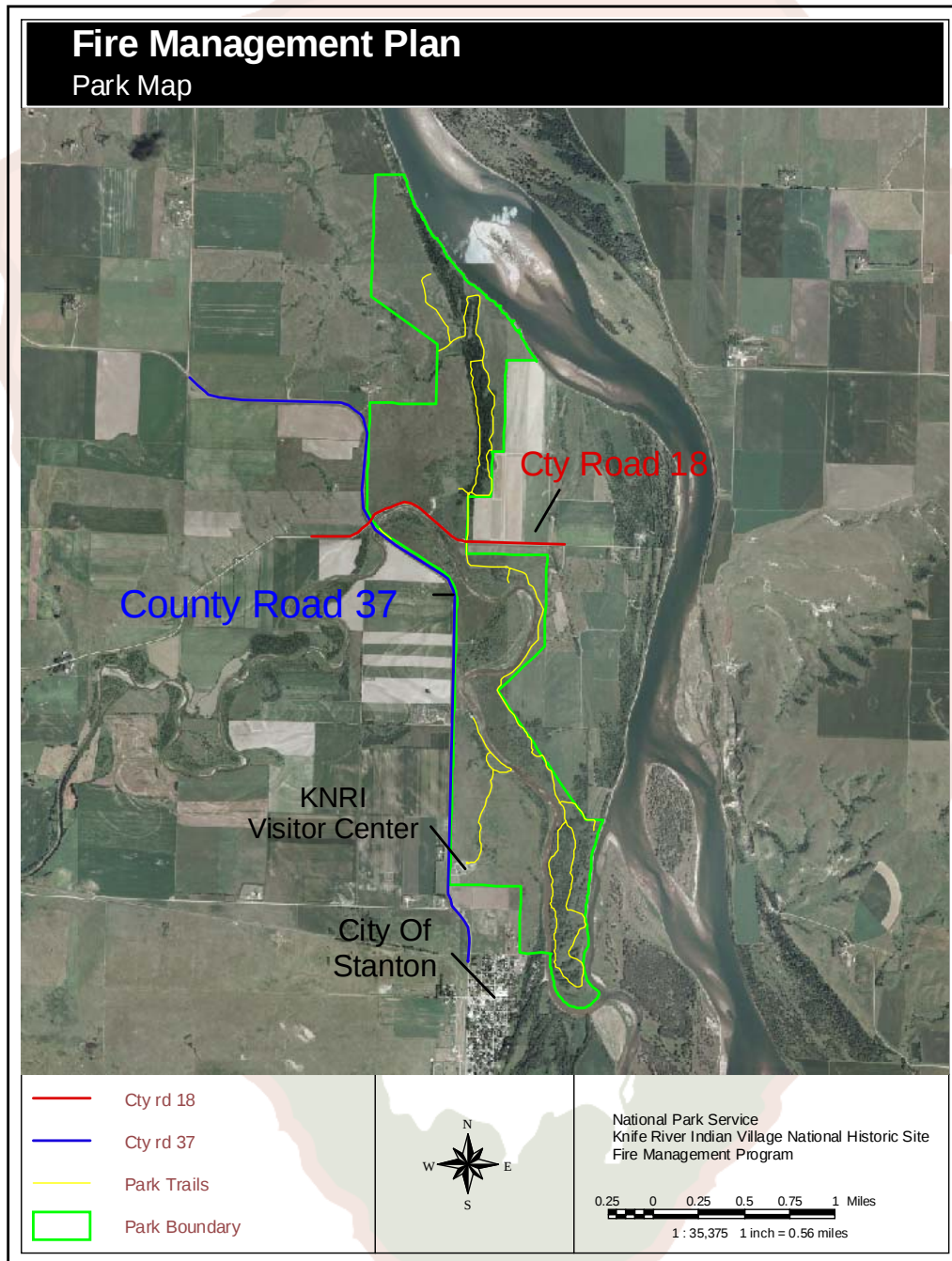




Figure 2.- Park Map



Plot date: February 9, 2005 nil



- **Location**

Knife River Indian Villages National Historic Site is composed of approximately 1758 acres of land situated in central western North Dakota, ½ mile north of the town of Stanton in Mercer County. The park is surrounded by agricultural tracts that are mostly grazed or tilled. The Knife River traverses the middle of the park with the Missouri River forming most of the eastern boundary. County Road 37 forms approximately 80 % of the western boundary.

- **Fee and easement lands**

The total area in which the National Park Service has land interests in is 1758 acres. Most of this land is held by the National Park Service in fee ownership, while a narrow strip of land on its western boundary (west of county road 37) is covered by an easement which limits private use of the land to agricultural purposes. The area covered by the easement totals 136.41 acres. It is important to recognize the easement lands remain in private ownership and consequently the National Park Service is limited in its ability take suppression or prescribed fire actions which affect those properties.

- **Topography**

The entire park lies within the Missouri River Corridor. The land form now ranges from the river bottom land (with an elevation of 1,670 feet) to flat- topped hills (with a high elevation of 1,800 feet). These lands are marked by wooded draws and numerous erosion drainages (slopes range generally from 10 to 70%) which dissect the larger, contiguous tracts of rolling hill- like grasslands within (and extending beyond) Park boundaries.

The topography of the local area is dominated by two former meltwater trenches derived from previous glaciations. These are the drainages for the Knife and Missouri Rivers (Reiten 1980).

Three physiographic zones exist within the mapping boundaries. The first and lowest of these is the floodplain. It is found immediately adjacent to the rivers, and is where historically both the Knife and Missouri floodplains were subject to inundations during spring runoffs or excessive rainstorms. Historically the floodplain was forested and much of it is now comprised of a forest type known as "Missouri River bottomlands". These floodplains, since the earliest of human occupations until present day, have been intensely impacted and altered. A second zone is a sloping area that leads to the upper most terraces. This zone creates a distinct scarp or terrace edge separating the terrace zone from the floodplain zone. These slope areas are typically steep, rugged badlands or flat terraces and terrace slopes. The third zone is the high "terrace" which is the older and higher floodplains. It is comprised of gently sloping to nearly level surfaces..



Prairie grasses dominate vegetation on the terraces (Reiten 1980). Figures 7 and 8 provide 3D and planimetric perspectives of the mapping area.

There are a number of terraces within the Park. Reiten (1980) identified 7 terraces in his mapping area, five of which lie within the mapping boundary for this project (Figure 9). The A and B terraces are Holocene in age and occur from 0 to 8 meters above the Missouri River. The Stanton, Hensler and McKenzie terraces are Pleistocene in age and range from 8 to 42 meters above the Missouri River.

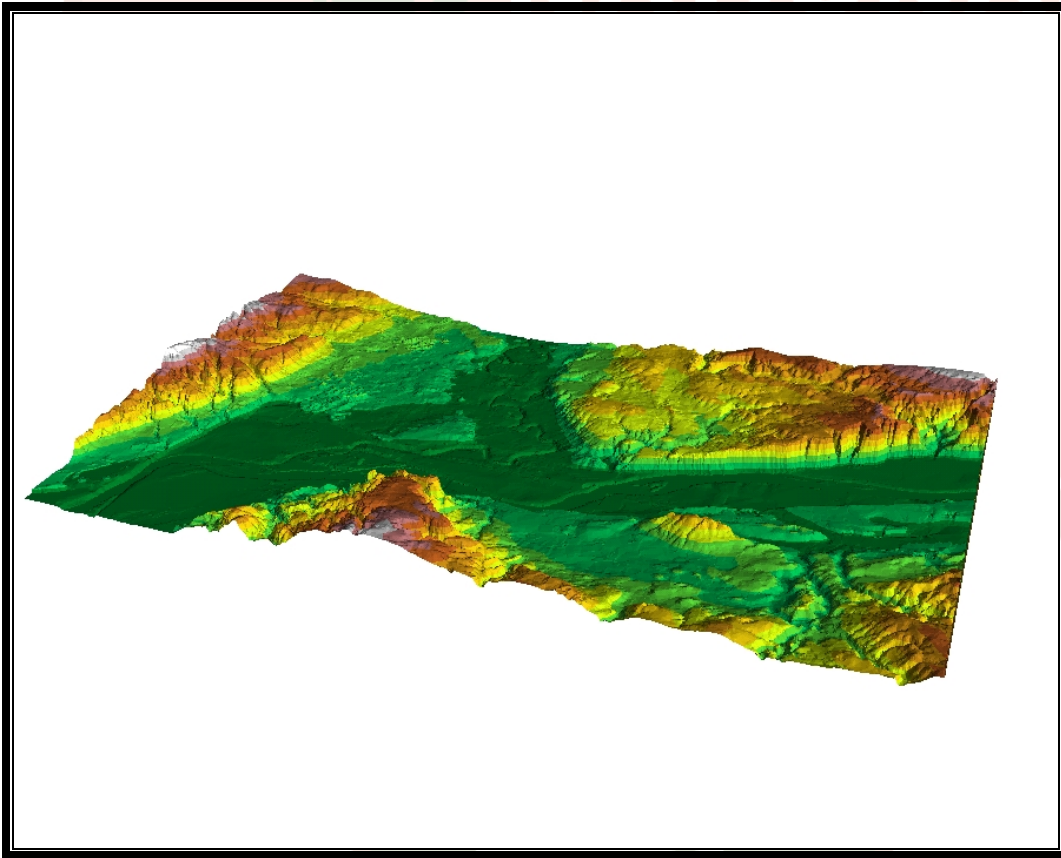


Figure 3. Three dimensional view of KNRI and surrounding area. View is looking toward the west southwest.

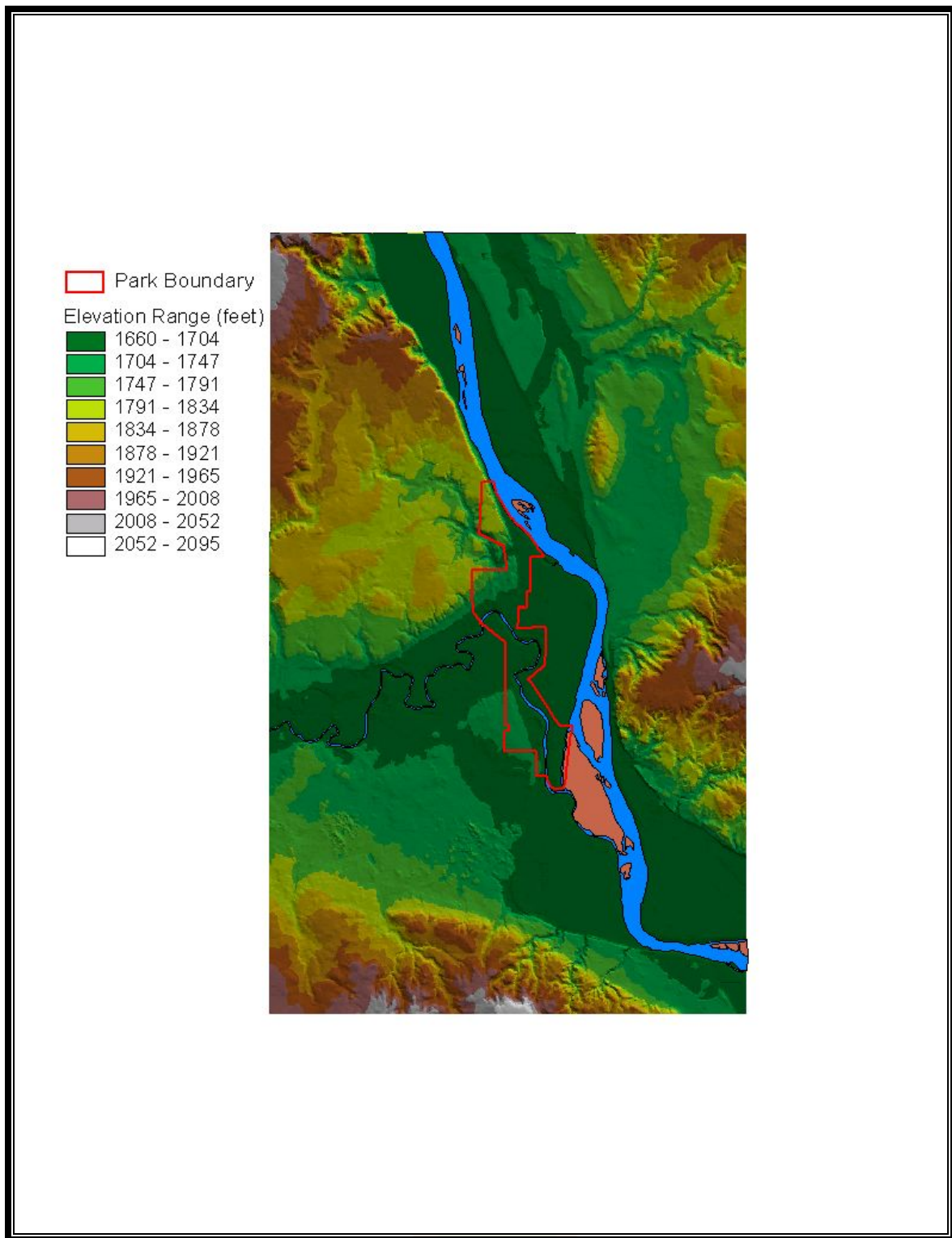


Figure 4. Topography of KNRI and surrounding area



• Climate

In an average year, the Park's continental- type climate results in cold winters and short, warm to hot, summers. Winter snow accumulation is generally light so that approximately 75% of the precipitation comes in the form of the rain which falls from April through September. June, July and August often yield severe thunderstorms with active lightening. The frequency of wildfire as a result of these lightening busts is relatively low due to the fact that the storms are often accompanied by wetting rains.

Table 1: AVERAGE TEMPERATURE, RAINFALL, AND VEGETATION STAGE

Period of Record: 9/ 1/1948 to 9/30/2005

Recorded at Riverdale Station, Riverdale ND

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	15.5	22.2	33.0	50.5	65.0	74.2	81.3	80.8	69.5	57.6	38.2	24.0	51.0
Average Min. Temperature (F)	-4.0	1.7	12.8	29.1	41.0	51.3	56.4	54.4	43.8	33.1	18.2	5.0	28.6
Average Total Precipitation (in.)	.43	.33	.44	1.41	2.31	3.61	2.32	2.00	1.65	0.75	0.40	0.36	16.01
Average Total SnowFall (in.)	6.5	3.2	3.3	2.1	0.2	0.0	0.0	0.0	0.1	0.5	2.7	3.3	22.0
Average Snow Depth (in.)	5	5	3	0	0	0	0	0	0	0	1	2	1
Vegetation Stage	C	C	T	G	G	G	T	T	C	C	C	C	

Vegetation Stages: C=Cured T=Transition G=Greenup



•Geology and soils

Geologic conditions in the area have been reported in a study of a 300 square km radius of the park (Reiten, 1980), and in a study of the Knife River Basin and adjacent areas (Clayton, et.al., 1976).

The geology of KNRI and the immediate area was studied in some detail by Reiten. This emphasis was on the Quaternary (Pleistocene and Holocene) geology of the area. One goal of his research was to define surface geologic units and a chronology of near- surface sediments in the area which would assist the archeologist in identifying locations of early, possibly buried archeological components by dating the strata that contained them and by establishing a "chronology of strata". A second purpose was to address the climatic changes.

Soils of the site were mapped as part of the county wide soil survey in 1978. Seventeen soil mapping units and several slope variants were recognized. Figure 6 shows the distribution of soil texture within the mapping boundary. Figure 6 and Table 1 were derived from digitizing soils maps and associated tables from Mercer County and McLean County soils reports (Wilhelm 1978, Brockman et al. 1979).

Soil Texture	Acres Within KNRI
Riverwash	-
Silty Clay Loam	56.6
Channeled	7.1
Complex	9.2
Fine Sandy	
Loam	27.4
Loam	567.5
Loamy Fine	
Sand	102.4
No Descrip.	52.9
Silt Loam	226.0
Silty Clay	94.4
Silty Clay Loam	439.6
Very Fine Sandy	
Loam	-
Water	122.9
Total	1706.0

Table 2. Soil textures within KNRI

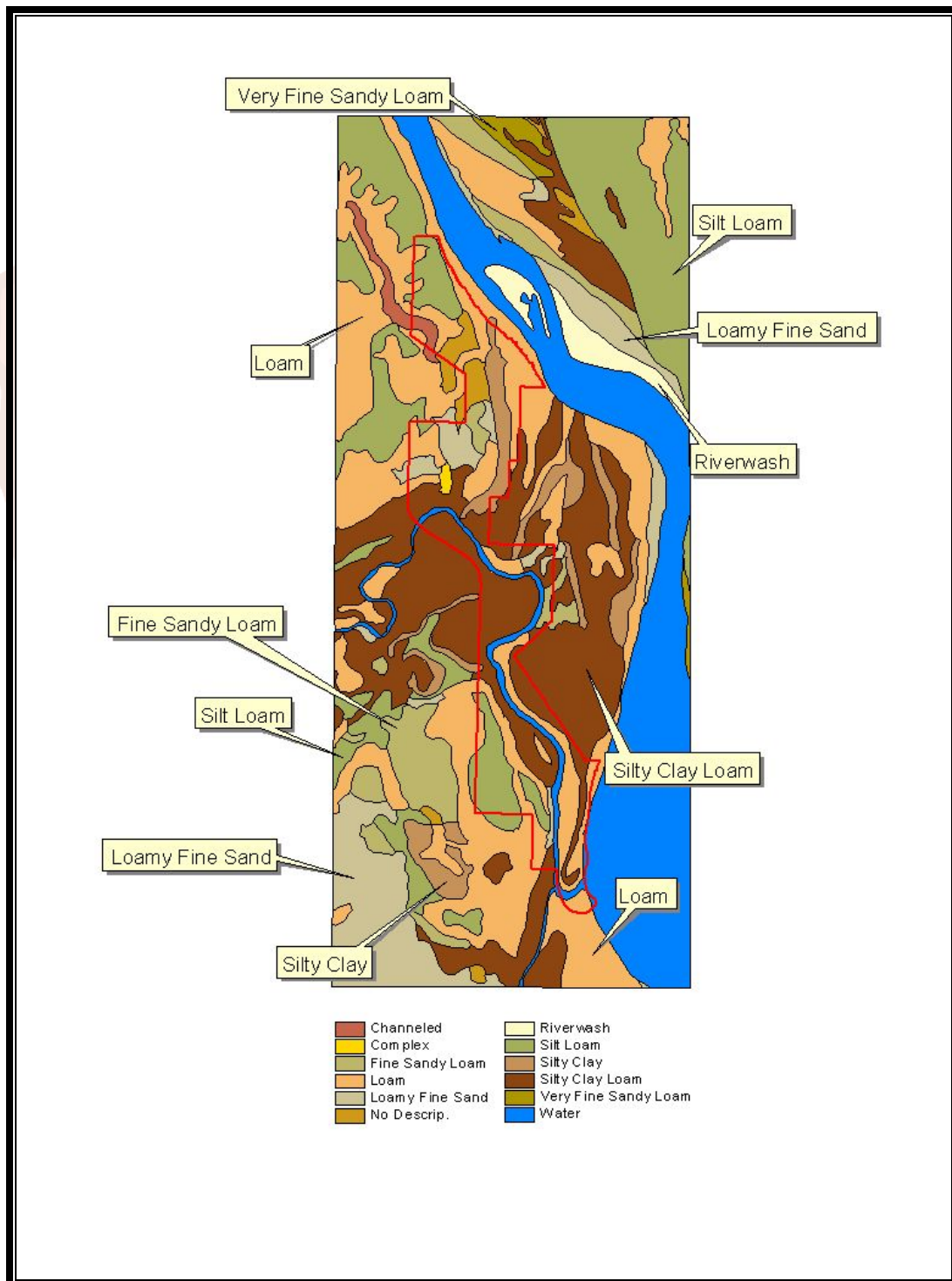


Figure 5. KNRI soil texture map



- **Air quality**

Historically, the Park and surrounding area have enjoyed excellent air quality, with only occasional, short- term air pollution from transient wildfire smoke, blowing dust, and power plants. Since the early 1970's, large scale coal mining has been undertaken on lands surrounding the Park. There are several local coal burning electrical generation plants as well as numerous plants located north of the park in Canada. These energy development sites have resulted in occasional air pollution within Park boundaries.

- In 2002, tests were conducted by the Northern Great Plains inventory and monitoring staff at KNRI to determine ozone levels and its effect on foliar injury. These tests compared ozone levels in the air and weighed them against soil moisture using the Palmer Z Drought Index. The results showed only one hour in which concentrations exceeded 80 ppb and no years in which concentrations reached 100 ppb. These levels of exposure are not likely to injure vegetation (NPS 2004).

- **Water quality**

Portions of KNRI are located in a floodplain and contain wetlands. As such, they are covered under the requirements of Executive Order 11988, 11990, and the Fish and Wildlife Coordination Act.

- **Wildlife**

Wildlife populations given major consideration in existing Park management plans include: white- tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), porcupine (*Erethizon dorsatum*), beaver (*Castor canadensis*), prairie sharp- tail grouse (*Pedioecetes phasianellus*), ring- necked pheasant (*Phasianus colchicus*), bald eagle (*Haliaeetus leucocephalus*) and wild turkey (*Meleagris gallopavo*).

Generally, the direct impacts of fire on wildlife include dislocation and mortality of individuals or groups of individuals. The park's larger mammalian vertebrates (whitetailed deer, mule deer, pronghorn, coyote, red fox, raccoon and badger) will generally move away from fire.

A bat inventory was conducted at KNRI in July of 2003. Using mist nets, two species of bats were captured, the hoary bat (*Lasiurus cinereus*) and the little brown bat (*Myotis lucifugus*). An acoustical inventory was also conducted; however the results of this survey have not yet been completed (Schmidt 2004).



Fish certification files, as taken off of *NPSPECIES*, in conjunction with a 2003 USGS vertebrate survey show KNRI as having 51 identified or probable fish species. Some of the major species inhabiting park waters are the walleye (*Sander vitreus vitreus*), Northern Pike (*Esox lucius*), channel catfish (*Ictalurus punctatus*) and the introduced German Brown Trout (*Salmo trutta*).

Seventy- two bird species were observed during a survey conducted in June 2002, all of which were likely breeding or summering in the area (Punjabi 2002).

The high number of bird species observed in the park is due largely to the great extent and excellent condition of the diverse habitats found here, including the riparian woodlands, the rivers and sandbars, the native grasslands and the hayfields. By far, the greatest number of bird species was found in the “North Woods” area. This area consists of an exceptionally dense, mature riparian forest, with an abundance of dead and downed wood, and adjacent clearings, shrub lands and wetlands. An area with similar diversity and abundance of birds as the North Woods is located at the south end of the park, just north of the Stanton City park campground. However, this area is much smaller than the North Woods, and it consequently supports fewer birds (Punjabi 2002).

A significant difference was observed between species and abundance of birds in the North Forest verses the Peninsula Forest. Species types and populations were markedly higher in the North Forest area of the park as compared to the Peninsula area. Many factors may have contributed to this difference. Follow- up surveys may be needed to obtain more data on the species abundance in each area.

Also present in the Park are other populations of mammalian and avian carnivores, reptiles, amphibians, birds, and other small mammals. Resource Management Plans strive to maximize the existence and mix of the naturally- occurring wildlife species.

• Endangered Species

There are no threatened or endangered wildlife species currently known to inhabit the park, although some species have been observed with in and around the park. Bald eagles, a federally listed threatened species, are known to have nested in the park and to this day, hunt extensively in park waters. Eagles also use perch trees in the park during their hunts. There have been infrequent sightings of other federally listed threatened species such as the interior least tern; however, these may be connected to migration visits rather than park habitation. Piping plovers also nest and forage with in the Missouri River cooridor, however no known nest sites exist within the park. With that in mind, park management policy is to continue searching for signs of any threatened and/or



endangered species, and as time and money permit, to continuing studying methods of managing park lands which will protect and enhance the habitat for all native species.

The North Dakota Natural Heritage Program's listing of threatened and endangered wildlife includes a number of species once found in the state; none of the listed species are currently known to inhabit the park. The park is considered to represent potential range and habitat for any and all species indigenous to mixed prairie grassland ecosystems. With that in mind, park management policy is to continue observing for signs of any threatened and/or endangered species, and as time and money permit, to continuing studying methods of managing park lands which will protect and enhance the habitat for all native species.

Mitigation issues related to threatened and endangered species depend on the species themselves. In the case of nesting bald eagles, a 100 yard no burn zone around active nest sites will be enforced to reduce stress to the nesting pair and eaglets. Burns may also be conducted before nesting begins. Mitigation issues involving other threatened and endangered species may include: conducting pre burn surveys to identify possible habitat and nesting locations and using mosaic burning patterns to leave adequate habitat while still obtaining the objectives of the burn program.

- **Locally rare plant communities**

Observations taken in the park indicate that there are no plant species found from the state or federal endangered or threatened species list (Clambey 1985 and Lenz 1993).

- **Paleontological resources**

Paleontological resources have not been documented at KNRI.

- **Cultural Resources**

Although the park contains cultural deposits dating back 11,000 years, the accumulated deposits of Native American culture spanning the most recent 3,500 years represents the primary cultural resource at KNRI. Three large villages sites located within the park are among the best surviving examples of aboriginal habitation in the Missouri River Valley environment of the Northern Great Plains.

Much of the archeological evidence lies buried beneath the surface and is not readily visible to the untrained eye; however, three of the four main village sites are quite prominent. At the time KNRI was established, only 4 village sites, Big Hidatsa, Sakakawea, Lower Hidatsa, and Buchfink were known to exist within the authorized



boundary. Research has shown that the historical and archeological significance is of far greater scope than first envisioned.

Intensive archeological research has expanded the resource database tenfold, to include 64 sites comprising 25% of the park area. The majority of the sites are comprised, to some degree, of village occupations; however, village periphery zones, off- village activity areas, burial sites, trails and debris- scatter areas also contribute to the database. Most recently the Elbee site has also been identified as a linear village. KNRI remains one of the few areas of the National Park System in which such an intensive, park wide archeological survey has been completed.

Previous burns and fire management decisions were based on the report, Impacts of Prescribed Burning on Archeological and Biological Resources of the Knife River Indian Villages NHS (Saylor, Seabloom, and Ahler 1989). Within this report, the park was delineated into 3 levels of recommended treatment relative to the density of surface artifacts observed at each site. High, medium and low- density sites were to receive different levels of prescribed fire treatments.

In 2005, the Midwest Archeological Center conducted two- rounds of fire experiments at Knife River Indian Villages National Historic Site (KNRI) to evaluate the impacts of prescribed fire on archeological sites judged to have a “medium density” of surface artifacts, as observed in the 1970’s (Lovick and Ahler 1982). Medium density archeological sites are clustered in the southern area of KNRI, an area of formerly cultivated fields and pasture land that is now heavily vegetated with non- native grasses such as smooth brome (*Bromus inermis*). KNRI management staff has determined that the preferred alternative for the restoration of native prairie in these areas is to use prescribed fire in conjunction with re- seeding of native grass species.

Each round of experiments was designed to evaluate the conditions and effects of fire under separate seasonal conditions (early Spring and late Summer). The first round of experiments was conducted the week of April 25, 2005 (Sturdevant and Thiessen 2005). The second round was undertaken from September 26 – October 1, 2005 (Sturdevant 2005). These investigations will be discussed and synthesized in a final report (in preparation) and will include final recommendations on the treatment of medium density archeological sites subjected to prescribed fire (Sturdevant n.d.). The following memorandum includes our initial recommendations concerning the fire/archeology interface on surface artifacts at medium density sites within KNRI. These recommendations are provided prior to the completion of the final report for use by KNRI staff to draft the park’s Fire Management Plan.

Both rounds of the 2005 experimental research program included test plots at the Poly (32ME407) and Youess (32ME415) sites in areas not subjected to total surface collections by Lovick and Ahler (1982) (Figures 1- 3). Twelve 20 x 20 meter blocks (six at each site) were burned during the 2005 experimental study. An initial walkover of each



block was planned prior to burning; however, based on the limited surface visibility encountered during the spring burns, surface artifacts were only observed on the exposed back- dirt piles from rodent burrows. Each burn block contained electronic data collectors that use six thermocouples to collect data on temperature and duration of the fire (Figures 4- 13). Post- burn inspection of the burn blocks was then conducted to evaluate the specific effects of fire on any visible archeological materials. All burn blocks, data collector locations, and artifact locations were recorded at sub- meter accuracy using a Trimble Power Pro GPS.

A previous experimental study conducted by Saylor, Seabloom, and Ahler (1989:61) for KNRI had recommended that moderate density sites “*which exhibited moderate densities of surface- visible artifacts when examined during previous surveys and which are known to contain items, such as bone and chipped stone material, particularly sensitive to fire damage. These sites will require pre- burn surface examination to determine if artifacts are still visible at the surface now that vegetation has covered them more completely. These surveys are required to determine if such a surface collection program would effectively mitigate potential fire damage, and to determine how to conduct such a collection program if it is deemed necessary*”. Post- burn collections and evaluations of archeological materials were also recommended “*if a prescribed burn occurs at known archeological sites in the KNRI, detailed examination of the ground surface should be conducted after the burn and controlled post- burn collection and attendant processing of visible artifacts should occur...analysis of postburn artifacts should focus on evaluating the negative effects on the collected materials*” (Saylor, Seabloom, and Ahler 1989). However, current conditions, both vegetative and financial, have led KNRI management to consider alternatives to the recommendation of total surface collection for mitigation of adverse impacts to surface archeological materials. Recent experimental research at several National Park Service units indicates that fire in grassland settings poses a minimal risk to the surface archeological record (Buenger 2003; Hough et al. 2005). Temperatures observed during these studies were generally within the 100- 300°C range with short durations of 10- 30 seconds of maximum temperature (Buenger 2003:16- 18; Hough et al. 2005:339). In addition, artifact classes such as wood, which may be most vulnerable from grassland fires, are generally not found in surface contexts at KNRI medium density sites. Based on this information, indications are that grassland fires only have a limited potential to thermally alter or damage most classes of surface artifacts at KNRI.

The on- site pre- and post- fire evaluations undertaken in 2005 documented vegetative conditions that are significantly changed from the late 1970’s, when many of the areas in question were only recently coming out of cultivation. The dense grass and vegetation that has developed over formerly cultivated fields and pastures has resulted in the development of a thick layer of duff and thatch overlying the present ground surface. The combination of dense grass and duff layer constrain present surface



investigations to the point that there is a very low probability for identifying surface artifacts.

Initial analysis of local fire conditions and impacts to surface archeological resources observed during the 2005 experiments indicates that although temperature spikes do occur and reach levels that could potentially damage surface archeological materials, the durations of direct contact with the flame front were relatively short and would not have exposed surface artifacts to high temperatures for an extended period of time. Therefore, based on the combination of current vegetative conditions (i.e. thick duff layer and grass fuels), the relatively low fire temperatures and brief durations observed during the 2005 experiments, and previous experimental studies (Buenger 2003; Seabloom Sayler, and Ahler 1989) it is recommended that prescribed fire be utilized for the purposes of native prairie restoration in a manner that will have a minimum impact to surface archeological materials, thus avoiding the need for a total surface collection strategy to mitigate the impacts from fire. Prescribed burns should be undertaken within a set of pre- defined prescriptions that help to minimize the peak temperatures and durations of the fires and thereby reduce the potential impacts to archeological resources. The following conditions and treatments are recommended as the best alternatives to minimize the impacts to surface archeological materials on archeological sites classified as “Medium Density”

- 1) Burning in the Spring/Early Summer (April- May) is preferred since this will help to reduce the intensity and duration of the prescribed burns due to increased live fuel moistures, higher soil moistures and lower ambient air temperatures. If summer/fall burning is required, executing the burns during times of higher humidity and/or increased soil and thatch moistures would be desirable. The higher moisture contents in the thatch and soil will serve as a buffer to offset lower live and dead fuel moistures.
- 2) Schedule prescribed burns when conditions will avoid the upper end of the wind prescription. Avoiding the upper end of the wind prescription will decrease the flaming area, thereby decreasing flame depth, durations, and intensities.
- 3) Utilize, to the maximum extent possible, flanking fires and/or backing fires, avoiding the use of head fires, which uniformly achieved maximum temperatures above acceptable limits (Figures 8- 9, 12- 13). If head fire is required, short strip head is recommended to minimize intensities.
- 4) Reduce the amount of 10, 100, and 1000 hour fuels (such as bushes, trees, and fallen timber) in the burn units. Reduction of these fuels will ensure shorter durations and decreased BTU's (British Thermal Units).
- 5) Ground disturbing activities, such as hand dug fire breaks, should not be undertaken at any of the archeological sites outside of the full Sec. 106 compliance framework unless in an emergency situation where lives and property are at risk.



- 6) Archeological sites with known human burials should be excluded from the prescribed burn units.
- 7) Each Fire Monitoring Report should contain documentation of fire conditions observed in order to determine if the prescription targets are being met and to evaluate the effectiveness of the 2005 experimental burn program.
- 8) Copies of the Fire Monitoring Report from each prescribed burn or wildfire should be filed with the Midwest Archeological Center in order to maintain an active record of the KNRI burn program.
- 9) KNRI staff should request a review of its burn program by Midwest Archeological Center personnel after 5 years following the initial prescribed burn.
- 10) KNRI staff should work with the Midwest Archeological Center to set up a small experimental plot in a non- site area representative of the conditions found at Medium Density sites in order to monitor the cumulative short- and long- term effects on replica and/or de- accessioned archeological materials that are subjected to multiple prescribed burns over a 5 to 10 year period.

Due to the complex nature and interactions of the cultural landscape and archaeology at KNRI, this plan provides recommendations for the use of fire as a tool; however it does not delineate archaeological site boundaries or specific details about sites, that information should be obtained from KNRI's Cultural Resource Plan (NPS 1983).

• Ethnographic resources

In 2006 a Cultural Affiliation Study was completed for the Knife River Indian Villages NHS. During the study, representatives from Northern Plains tribes visited the park and were interviewed by Ethnographers. All of the representatives identified plants and plant communities that were very important culturally and that needed protection. Based in part on these comments, an ethnobotanical survey is being conducted and will be completed in 2008. The representatives were asked about prescribed fire as a management tool. Overall, they found it to be an acceptable practice. Comments from the survey include:

"In terms of resource management, the consultants (from the Blood Nation) stated that prescribed fires were used traditionally, at the end of the winter, to thin the woods and make room for understory species, particularly berries. Thus they support, at least in principle, the use of this managing tool by KNRI."

"Representatives were generally in favor of prescribed fires as a means for managing the native species, as this practice is most definitely a traditional Native American activity."



- **Cultural resource surveys**

The earliest known archeological investigation at KNRI was in 1883 when Theodore H. Lewis visited the area. Between 1896 and 1913, extensive mapping of the sites was conducted, much of it under the auspices of the North Dakota State Historical Society. More extensive excavations were conducted in 1938 (W. D. Strong) and 1941 (G.F. Will and T.C. Hecker) In 1965 excavations were conducted at the Sakakawea Village and the Lower Hidatsa Village (D.J. Lehmer).

After the creation of the park in 1974, an extensive program of investigations was conducted under the direction of the Midwest Archeological Center (MWAC) in partnership with the University of North Dakota. Between 1976 and 1983, remote sensing magnetic surveys, surface collections and test excavations were employed to develop an understanding of the archeological story at Knife River. From 1978 to 1980 a systematic surface reconnaissance was conducted at the park to determine the extent of archeological resources at KNRI. Summaries of these investigations are found in the report The Phase I Archeological Research Program for the Knife River Indian Villages National Historic Site, Part I: Objectives, Methods, and Summaries of Baseline Studies (Thomas D. Thiessen, editor, 1993). In 1994, Metcalf Archaeological Consultants, Inc conducted a Cultural Resources Inventory of the newly acquired Krieger parcel on the northern end of the park (Metcalf, 1995).

In the fall of 2002 a team from MWAC conducted a magnetic survey of the northern portion of the Elbee site (Volf, 2002) which was followed by test excavations the following summer (Toom, 2003). In 2006, a second survey was conducted on the south portion of the site and further funds have been requested for continued investigations at this site.

By the conclusion of the surveys, 58 specific archaeological sites have been identified and mapped.



- **Cultural resource mapping**

To facilitate the decision making process during any proposed or occurring fire event, a detailed set of digital cultural resource maps needs to be developed and incorporated into the park's geographic information system (GIS). The data set should include location, site number, site type, and site evaluation. This information could then be readily available for prescribed fire planning and to incident commanders for wildland fire management. These digital maps should also include information that will identify preferred fire management activities in regard to specific sites and site types. Actions that could be identified include site avoidance (buffer area), use of physical or applied barriers, mechanical reduction of fuel loads, collection of certain artifact classes prior to burn, follow- up survey, and collection post- burn.

- **Wilderness areas**

There are no designated wilderness areas within the park.

- **Human resources**

Visitor use within the park is highest from April through August, with approximately 40,000 people visiting yearly. Most visitors view the orientation program and browse the museum, earthlodge and Cooperating Association bookstore. Approximately 25% of the park's visitors hike all or a portion of the maintained trail system. There are 8 buildings owned and managed by the NPS situated within park boundaries. There are no livestock grazing allotments or permittees regularly using parklands. Mercer County has a Right-of- Way for a maintained gravel road (County Road 18), running east/west, through the center of the park and also for County Road 37, running north to south along the park's west boundary.

- **Vegetation**

Mixed grass prairie vegetation, characteristically diverse, is found throughout the park. The vegetative mix must be evaluated in terms of what mix currently exists and in terms of what mix is desired in the park's resource management objectives. The basis for the difference is found in past livestock grazing practices, elimination and reduction of native wildlife and total suppression fire management policies.

A ground survey of all of KNRI by Salas in 2002 shows 19 vegetation associations or vegetation map units. The survey was conducted at landscape scale and the complete mapping area was larger than the park boundary. Table 3 shows the vegetation association and acres within KNRI and the mapping boundary.



Vegetation / Map Unit Description	Acres	
	Within KNRI	Within Mapping Boundary
Agricultural	118	2909
Forest - Green Ash / Snowberry	100	234
Woodland - Green Ash / Chokecherry	220	586
Woodland - Cottonwood / Coyote Willow	52	668
Herbaceous - Big Blue Stem / Little Blue Stem	126	180
Herbaceous - Smooth Brome	256	698
Herbaceous - Canada Thistle	32	58
Herbaceous - Western Wheatgrass / Blue Grama	171	930
Herbaceous - Western Wheatgrass	0	120
Herbaceous - Crested Wheatgrass	21	21
Herbaceous - Riverine Sand Flats	4	309
Herbaceous - Hardstem Bulrush Marsh	3	6
Planted - Big Blue Stem	45	46
Planted - Smooth Brome	52	108
Planted - Grass Forb Mix	205	206
Shrub - Coyote Willow	15	193
Shrub - Silver Buffaloberry	12	51
Shrub - Western Snowberry	34	168
Shrub - Chokecherry	2	2
Total **	1468	7493

**290 additional acres located within park boundary are not listed and categorized as former croplands

Table 3. Acreages of plant associations and other mapping units present within KNRI and mapping boundary



Formation class

The physiognomic class is based on the structure of the vegetation as defined by the type, height, and relative percentage of cover of the dominant, uppermost life- forms. There are seven mutually exclusive classes:

- Forest: Trees with their crowns overlapping (generally forming 60% - 100% cover).
- Woodland: Open stands of trees with crowns not usually touching (generally forming 25% - 60% cover).
- Shrubland: Shrubs generally greater than 0.5 meter tall with individuals or clumps overlapping to not touching (generally forming greater than 25% cover, with trees generally less than 25% cover). Vegetation dominated by woody vines is generally treated in this class.
- Dwarf- shrubland: Low- growing shrubs, usually less than 0.5 meter tall. Individuals or clumps overlapping to not touching (generally forming greater than 25% cover; with trees and tall shrubs generally less than 25% cover).
- Herbaceous: Herbaceous plants dominant (generally forming at least 25% cover, with trees, shrubs, and dwarf- shrubs generally with less than 25% cover).
- Nonvascular: Nonvascular cover (bryophytes, non- crustose lichens, and algae) dominant (generally forming at least 25% cover).
- Sparse Vegetation: Abiotic substrate features dominant. Vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources (total vegetation cover is typically less than 25%).

• Former croplands

Manipulation of the soils by agriculture in and around KNRI has continued, more or less unabated, since they were occupied by its original inhabitants, the Mandans and Hidatsas. During the acquisition process, landowners were required to plant some form of perennial grass cover. These efforts resulted in a mixed bag of species and success (Clambey 1985). Figure 34 shows plant cover on former cropland (from Clambey 1985). The current situation shows little resemblance to this figure. In fact Clambey (1985) also noted the little resemblance to these descriptions. In most cases Smooth Brome has taken over most of these areas and in some cases forms a monoculture. In other areas weedy species form some of the total cover. These include *Cirsium arvense*, *Sonchus arvensis*, *Conyza canadensis*, and in some areas that have been disturbed by animals, *Salsola tragus*. Most of these weedy species are also noted by Clambey (1985). In some cases Smooth Brome has usurped the species previously planted and the current vegetation map reflects this change. In other cases,



primarily in the lower Hidatsa, some elements of the planting exist. These areas have been mapped as former croplands and labeled with the species originally planted. This situation is not likely to persist as Smooth Brome continues to colonize these areas. The Grass – Forb mixture in the lower Hidatsa is reported as only partially successful or reseeding was not done (Clambey 1985). The other smaller areas of Grass – Forb include *Bromus inermis*, *Poa pratensis*, *Rosa woodsii*, *Melilotus* sp. and others.

- **Vegetation Community Assemblages**

The 19 vegetation associations found at KNRI can be grouped as follows:

Mixed Grass Communities/Herbaceous and Planted Communities

KNRI contains 2 areas of native mixed grass prairie, which are in degraded condition, comprising approximately 915 acres (52%) of the park. These units are dispersed throughout the park. Previous ranching and/or agricultural practices have affected most of these communities. Wooded areas have been cleared of trees for agricultural reasons and without the benefit of natural flooding; most of these areas will remain grass covered. Revegetation of these areas back to a mix of densely wooded areas, shrub thickets, and prairie openings would return these communities to a pre dam, or immediate post dam condition.

Forest/Woodland and Shrub Communities

There are seven areas within the park listed as forest, woodland or shrub. These areas make up approximately 435 acres (25%) of the park.

The "North Forest" is a narrow strip of woodland found along the bottom of a low escarpment marking the edge of an old floodplain terrace. There is a marked difference between the health and form of these trees and the trees found in the "Peninsula Forest". The trees of the North Forest are tall and well formed versus the short, stunted growth found in the Peninsula Forest. Within the North Forest, natural regeneration is taking place in areas where exotic grasses do not encroach. It appears that the woodland community of this area will remain viable.

At the north end of the park is a very steep wooded bluff leading down to the Missouri River. This area contains some of the highest plant diversity within Knife River Indian Villages. It is relatively undisturbed, except for narrow game trails. It contains components of woodland and mixed grass prairie communities. There are no major threats to this community at this time.



The bottom of this wooded bluff is composed of a mix of densely wooded areas, shrub thickets, and prairie openings. This area may represent what portions of the Missouri River floodplain looked like in presettlement periods. Although portions of this unit have been disturbed and have heavy encroachment of non- native species, this area provides clues to the original vegetation structure of the Missouri River floodplain.

The “Peninsula” area of the park is approximately 200 acres of flood plain forest. This section of forest is in a degraded condition. Previous sheep and goat ranching practices in combination with the lack of natural flooding and the invasion of smooth brome (*Bromus inermis*) have severely limited natural tree regeneration as well as stunted the growth and development of existing stands.

Former Croplands

The acreage listed as former croplands totals 290 acres (16%). These areas are easily accessible and are being intensely managed. Management practices range from mowing to complete defoliation and reseeding.

The remaining 118 acres or 7% of parklands are held in easement and are not available for NPS management other than scenic.



III. WILDLAND FIRE MANAGEMENT STRATEGIES

A. GENERAL MANAGEMENT CONSIDERATIONS

Management strategies for wildland fire at KNRI are limited. Due to the size of the park, cultural resources located within the park and the close proximity of adjacent private holdings, full and immediate suppression of wildfires through an appropriate management response (AMR) is a necessity. Due to the propensity of wildfires located within the park to escape the boundaries within one burning period, fire use is not an option and will not be considered at KNRI. Fires occurring within KNRI will be suppressed as quickly and safely as possible using AMR and Minimum Impact Suppression Tactics (MIST).

B. WILDLAND FIRE MANAGEMENT GOALS

The following KNRI fire management goals support the park's resource management objectives:

Goal 1: Minimize both the incidence and extent of human- caused fires.

- Prevent unplanned human- caused ignitions through a cooperative fire prevention program aimed at the park visitor, staff and neighbors.
- Minimize the occurrence of unwanted (human- caused) fires through reduction of hazard fuels by prescribed fire and/or mechanical treatment in and around developed areas and along park boundaries.

Goal 2: Restore fire to 95% of the vegetated landscape within the next 10 years.

- Perpetuate, restore, replace or replicate natural processes to the greatest extent practicable.

Goal 3: Restore fuel and vegetation mosaics to pre- European contact conditions on 50% of the landscape within the next 15 years.

- Create and/or maintain defensible wildland fire boundaries.
- Where applicable, restore fuel loads and plant community structure and composition to ranges of natural variability comparable to pre- European settlement using prescribed fire. Prescribed fire is an integral tool for managing prairie ecosystems. Implemented with a "patchwork" approach to planning burn areas, the prescribed fire program will replicate historic fire occurrences. The



intention of the park is to reintroduce fire into all areas of contiguous- mixed grass prairie (where feasible) in an effort to replicate that ecosystem's historical fire return interval of 5- 25 years (Wright and Bailey, 1980). A burn sequence has been developed that is intended to mimic this natural fire cycle. Approximately 100- 400 acres of grasslands will be burned in the park each year through the use of prescribed fire (*Appendix H*). Repeating this burn cycle will yield the fire return interval.

- Minimize the occurrence of unnaturally intense fires through reduction of hazard fuels by prescribed burning. Mechanical treatment is unlikely to play a major role in this predominately grassland ecosystem, although some mechanical treatment *may* be necessary to retain woody draws and areas of wanted regeneration.
- Train park staff to conduct safe, objective- oriented prescribed fires consistent with *DO- 18* requirements.
- Provide opportunities for public understanding of fire ecology principles, smoke management, and prescribed fire program objectives.
- Monitor and evaluate the effectiveness of the prescribed fire program.
- Encourage research to advance understanding of fire behavior, effects, ecology, and management.
- Establish a database on the long- term effects of wildland fire on vegetation and other resources in the park. Utilize the results from the fire effects monitoring program to refine/adjust burning prescriptions to better meet the objectives of the hazard fuel reduction and prescribed fire programs.
- To control exotic grasses at the level recommended by the prairie management plan (10% of overall herbaceous cover), the park will need to adjust its current burning strategies. Prairie restoration may require increased frequency of prescribed fire. Some areas may even require burning in three consecutive years. To control cool season, exotic grasses (bromes and bluegrasses) the park will need to burn in spring instead of late fall. It is recognized that this “out of season” burning will be necessary to prepare some areas for “in season” burning, promote native species, and allow for wildland fire use in other areas.
- Control areas will be established in representative examples of park vegetation types where wildland and prescribed fire may be excluded if possible. Location and methodology for these control plots will be added to this plan as an appendix at a later date. These areas will be long term study areas for comparison to fire effects.



Goal 4: Incur zero fatalities and an injury rate no higher than the national NPS average in association with wildland fire management activities.

- Provide for the safety of park visitors, neighbors, and employees during all phases of wildland fire management operations.
- Suppress all unwanted wildland fires in the park and in the interagency mutual aid zone. All suppression efforts will be directed toward safeguarding life and property while protecting park resources from harm. All fires will be evaluated to determine the appropriate management strategy.
- Cooperate extensively with adjacent landowners to facilitate safe and prompt suppression of unwanted wildland fire. Promote an interagency approach to managing fires on an ecosystem basis.
- Provide opportunities for public understanding of the wildland urban interface problem.

Maintain a level of presuppression readiness commensurate with fire danger as indicated by selected National Fire Danger Rating System (NFDRS) indices and components.

- Train selected personnel to achieve or maintain qualifications consistent with fire management responsibilities. Provide opportunities for training in fire behavior and planning functions.

Goal 5: Limit impacts from fire suppression activities to less than 5% of the estimated monetary value of the impacted resource.

- Suppress unwanted fires commensurate with values at risk.
- Use minimum impact fire suppression techniques and rehabilitate disturbed areas to protect natural, cultural, wilderness and scenic resources from adverse impacts attributable to fire suppression activities.
- Engender understanding among park staff and firefighters about the impacts of fire suppression on sensitive park resources.
- Ensure that a resource manager is present on all major suppression actions.
- Utilize appropriate suppression responses to wildfires, commensurate with resource values at threat, which will:
 - * minimize long- term impacts of suppression actions.
 - * accomplish protection objectives cost effectively



More specific objectives related to individual vegetation types may be found in the Knife River Fire Monitoring Plan (*Appendix F*).

C. WILDLAND FIRE MANAGEMENT OPTIONS

At KNRI, with its predominately grassland vegetation communities, fires are generally fast moving, short in duration, and intensive fuel reduction is not necessary. Also, with the Missouri forming a portion of the park's eastern boundary and the Knife River coursing through the center of the park, natural firebreaks make fire management considerably less difficult than in the vast tracts of open prairie found throughout much of the Western Dakotas.

Suitable wildland fire management options available, include suppression of human-caused and natural caused fire, by using the AMR.

Due to staff limitations, small land management area, rapid rates of spread, long response times, valuable resources, and values at risk on neighboring lands, this plan does not allow wildland fire use as a management option for the Park.

In general, fuel reduction beyond prescribed fires for grassland management objectives is not a viable option in the park. Manual fuel reduction along the boundary, via mowing and or thinning of brush may reduce fire intensities to manageable levels. Fire breaks are mowed and maintained along the park's southern boundaries. The parks trail systems are either graveled or mowed and can be used as control lines in prescribed or wildfire operations. Woodland tracts located within the park may receive mechanical thinning. The thinning process is generally in response (but not limited to) to major wind events that often require the removal of trees for hazard and fuel mitigation purposes.

Due to current fire hazards, the relatively small size of park, the fuel types, associated rates of fire spread, historic fire duration, park staffing, and budget limitations, this plan utilizes a combination of appropriate management responses and prescribed fire, for resource objectives as fire management tools.

Due to the fuel model that surrounds the park, high winds and the rapid the rates of spread associated with a grass fuel model, a 3 mile boundary surrounding the park has been established as an immediate suppression line.

KNRI through a general agreement with the Stanton Rural Fire Protection District (SRFPD) may take immediate, initial attack suppression action on fires burning within 3 miles of the park boundary and within the SRFPD jurisdiction. Upon request by SRFPD, KNRI may take action on fires burning outside the 3 mile boundary but still within SRFPD jurisdiction.

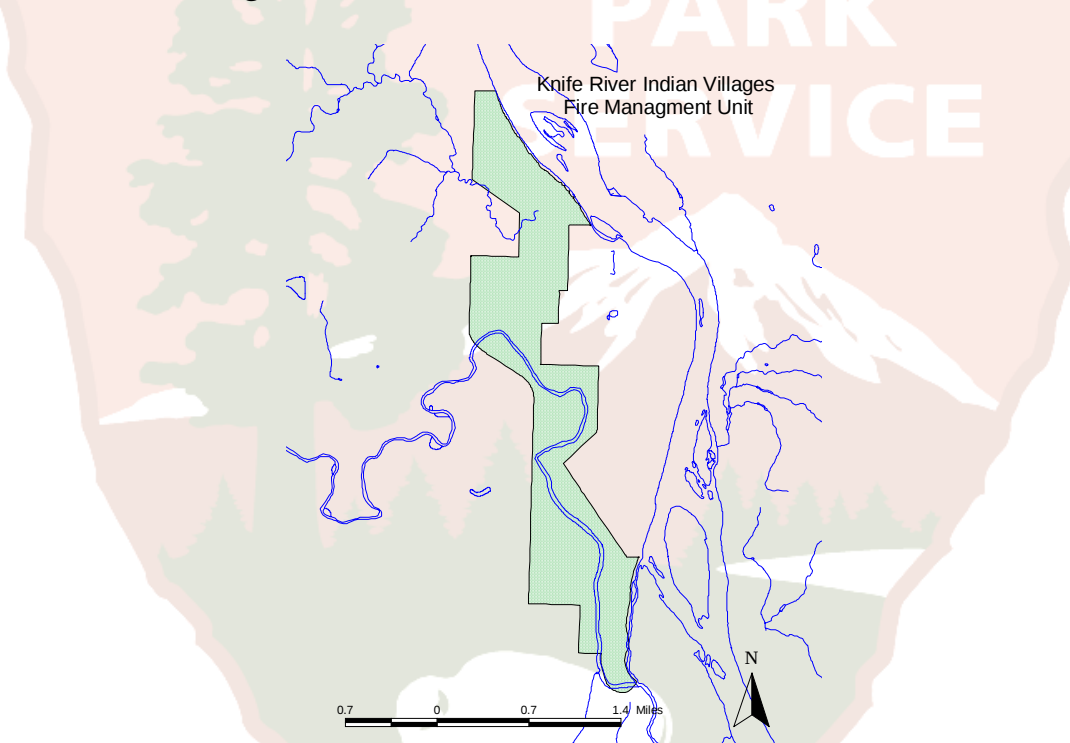


D. STRATEGIES FOR KNRI FIRE MANAGEMENT UNIT

Under the 1997 Fire Management Plan, the park was divided into two “Fire Management Units” (FMU), (grasslands and forest) which are managed in a combination mode of wildfire suppression and management ignited prescribed fire. In both of these units, aggressive and appropriate management actions were to be employed for all wildfires. Management ignited prescribed fires were to be implemented in all zones when it had been determined that they could successfully accomplish the desired objective.

For the purposes of this Fire Management Plan, the park will consist of only one “FMU”, due to the size of the park and similar management actions that would take place between the units. See Fig. 3

Figure 6.- Fire Management Unit



A FMU is defined as any land management area definable by objectives or features that set it apart from the management characteristics of an adjacent FMU. FMU's may also have pre- selected strategies assigned to accomplish land management objectives. Within each FMU, prescribed fire units are delineated and labeled as burn units (*see Fig. 4 below*). The single new Fire Management Unit described in this plan will consist of 14 prescribed fire units or blocks and 4 fire exclusion zones, collectively managed as a whole, but separated by geographic features, vegetation types or archaeological boundaries.



Prescribed fire units simply delineate the geographical extent of each planned prescribed fire treatment. The FMU will be used to drive fire management actions in various areas of the park through a combination of wildland fire suppression and prescribed fire. The appropriate management response will be employed for all wildland fire occurring as the result of human or natural ignitions. Prescribed fire will be implemented when it has been determined that it can successfully accomplish the desired resource objective.

a. FMU CHARACTERISTICS

See Section II, D for physical and biotic conditions. pp. 16- 36

b. FMU FIRE MANAGEMENT OBJECTIVES

See Section III, B for fire management objectives. pp. 37- 40

c. Management Considerations

- All fire management activities will consider safety of personnel and the public as the highest priority.
- Smoke management reporting procedures for burning in North Dakota will be followed for all fire operations.
- Employ Minimum Impact Suppression Tactics.
- Park neighbors, park visitors and the local residents will be notified of all fire management activities that have the potential to impact them.
- Aircraft resources may be used with Forest Service/Bureau of Land Management (FS/BLM) approved retardants, but retardant will be kept out of streams. Low level aircraft use and retardant must be approved by the Superintendent.
- Bulldozers will not be used in prescribed fire operations. Only in extreme wildfire conditions bulldozer use may be authorized by the superintendent.
- During extended wildland suppression actions that require ground disturbance, a trained archeologist will be consulted and should be on-site.
- All appropriate cultural clearances will be obtained as part of the planning process for prescribed fires.
- Socio- political economic impacts, including wildland urban interface, will be considered in the development of implementation plans.
- All park closures are at the discretion of the Superintendent.



- No fire management operations will be initiated until all personnel involved receive a safety briefing describing known hazards and mitigating actions, current fire season conditions and current and predicted fire weather and behavior.
- Fire management operations will be carried out by qualified individuals that promote the safe and skillful application of fire management strategies and techniques.
- Smoke impacts to visibility along county roads 37, 18 and Highway 200, and resulting traffic safety concerns must be factored into selection of suppression tactics and prescribed fire implementation.
- Engines and other off- road activities will be restricted from areas identified as potentially affected by vehicle traffic where rutting, soil compaction or other habitat damage could occur.



Headfiring a research plot, NPS photo



FIG 7. Prescribed Fire Units

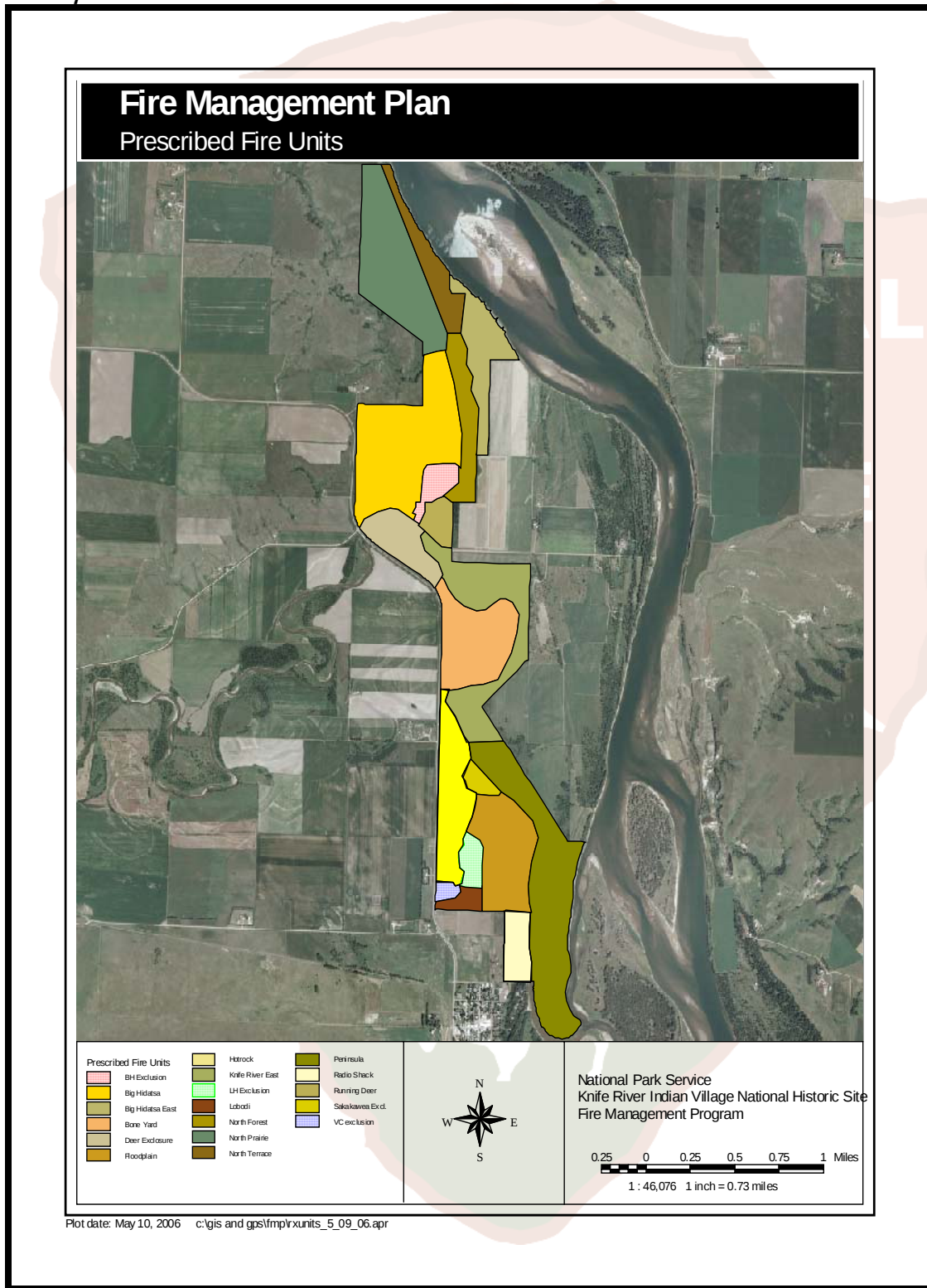




Table 4: Prescribed Fire Unit Dimensions

Unit Name	Acres	Perimeter	Area
North Prairie	175	662104	3996
North Terrace	56	187144	3274
Big Hidatsa	223	822412	4895
North Forest	74	257962	3984
Big Hidatsa East	78	315103	3998
Running Deer	28	1003	325
BH Exclusion	40	141576	1693
Deer Exclosure	51	183201	1846
Bone Yard	116	430842	2799
Knife River East	140	566360	6090
Hotrock	97	376028	3800
Sakakawea Excl.	14	56416	1025
LH Exclusion	21	85552	1287
VC exclusion	7	30376	564
Lobodi	19	60345	1024
Floodplain	123	455839	2937
Radio Shack	39	139796	1666
Peninsula	320	1222469	6368

The prescribed fire accomplishments within the Boundary FMU will be roughly 150 acres per year averaged over fifteen years. Each of the prescribed fire units has been placed in a burning cycle based on past burns, as well as on park needs and objectives. Boundaries for the prescribed fire units were decided upon by using aerial photography, vegetation breaks and GIS vegetation maps to determine physical barriers (rivers/roads). Further refinements in prescribed fire units may be made in development of individual Prescribed Fire Plans for individual units.



d. HISTORIC ROLE OF FIRE

FIRE ECOLOGY

With large tracts of continuous, fine fuels, frequent periods of hot, dry weather, prolonged drought and recurrent lightning, the mixed grass prairie in and around the park represents a classic grassland fire regime. The prairie grasslands ecosystem has historically experienced fire as an integral part of the ecological process shaping the form and content of the area's vegetation and wildlife composition. The mixed prairie grasslands are characterized by vegetation which grows rapidly, dies back annually above the ground, and decomposes slowly, with an average height of 2 to 4 feet (grasses) and small trees and low brush.

Historically, frequent, low- intensity surface fires with a return interval of 2 to 25 years typify this ecosystem (Pyne, et al. 1996). The effect of this is exemplified in the composition of plant and animal species. The extent of species diversity can be directly related to the fire return interval. From documented reports of early pioneer settlers in the west, the mixed grass prairie was influenced by fires (both purposeful and accidental) set by Native Americans. Fires occurring in the mixed prairie typically have been fast burning surface fires which tend to leave a mosaic of vegetation. The randomness of the fire mosaic often determines species location and dispersal. The importance of disturbance in this ecosystem is paramount. Fire, drought, flooding, erosion and animal grazing all should be present to offer the greatest potential for disturbance in the system.

The effect of fire in prairie grasslands is complex; thus ecologists hesitate to generalize. Fires can increase the number of species, especially annuals, or they may create monotypes, or permit invasion by short- lived perennials, weeds, or aggressive exotics. Seed production, germination, and seedling establishment of both annuals and perennials are commonly encouraged by fire. Since perennials, such as most exotic species, are capable of vegetative reproduction, they often survive fires.

There is no doubt that fire restricts shrub and tree growth; frequent fires reduce encroachment of woody vegetation into grassland regions. After prairie fires, trees and shrubs most often survive if they are sheltered in rocky breaks and draws, or lowlands where fire would not penetrate due to natural fire breaks or higher moisture contents. Frequency, intensity, and especially timing of burning are thus extremely important. Research indicates that fire, together with climate and topography, plays a major role in maintaining the grassland ecosystem and restricting the growth of trees and shrubs to the drier, rocky breaks, less frequently burned draws and riparian lands (Dix, 1960).



FIRE HISTORY

Examining the fire history of the region gives us insight as to the processes that have determined the past and current vegetative patterns. Ultimately, it is this view of fire over time that should guide the use of fire in the park. Development of burning prescriptions necessary for the restoration and maintenance of vegetation cover types to preparedness conditions can be guided by this standpoint.

Official recording of fire starts within park boundaries was initiated with the park's first fire in 1979. Given the nature of the mixed grass prairie vegetation, evidence in the form of fire scars has not been available as a tool to estimate the pre-1979 fire frequency. However, it has been established that the plains ecosystem has historically experienced frequent, fast running, short duration fires. From the recorded accounts of early European explorers and settlers, fires were a common occurrence on the plains (Higgins 1986). Fires were often ignited by lightning activity during July and August (Higgins 1984). According to historical records, Indian set fires occurred in all months except January, and showed two main periods of fire activity. One was from March through May, with a peak in April, and the other was from July through early November, with a peak in October (Higgins 1986). The peak historical periods coincide with the current fire seasons peaks.

The writings note that the plains were often on fire as a result of Indian activities, i.e., to signal others, to herd game, to adjust the vegetation mix, to clear campsites, etc. Following the influx of settlers in the mid- to- late 1800's, most human- caused prairie fires resulted from the carelessness of cowboys and cooks, rather than Indians (Wright and Bailey 1980). Although somewhat speculative, different estimates place the typical fire frequency of the northern mixed prairie from 5 to 10 years (Wright and Bailey 1980) or 2 to 25 years (Pyne, et. al. 1996). This estimate is based on fire frequency research in ecosystems having types of prairie vegetation composition and topography similar to those features found in the area of the park and adjacent lands. A search of KNRI's fire records since 1979 indicates an average of .26 wildfires per year over the past 27 years (7 fires).

Probably the major difference between the fire regime of the mixed grass prairie historically versus the present is the extent of the fires. Prior to large scale cultivation of the Great Plains, fires could run for long distances, checked only by major river systems, topography, or weather. Presently, with large scale cultivation in place, together with the network of roads and highways dividing up the lands, few fires are able to make the extensive runs historically recorded. The long distance fire is now the exception. A second probable difference is the human- caused fire frequency. With replacement of the Native American cultures and the lessening of open range cattle ranching practices, most of the historical human causes of fires ceased to be a threat.



In comparison of historical and modern human caused fires it is important to note from Higgins (1986):

“Fires of large magnitude undoubtedly occurred in open grassland landscapes, but there is not strong evidence that Indians tried to purposely set large grassland conflagrations, unless perhaps as infrequent malicious acts. More likely, large fires were set either accidentally or by lightning. Large recurrent fires probably would have created substantial difficulties for Indian during spring and fall, because these were the seasons used primarily to hunt, gather, and prepare stores for winter and for trade products”.

The large fires may have consumed thousands of acres of prairie and undoubtedly entered the river bottoms and wooded flood plains where the Indians made their winter homes. A fast moving, intense fire would have severely depleted the fire wood stores that the Indians depended on for warmth and cooking during the winter months. That being said it is not unreasonable to project the frequency of large human caused fires located in the floodplains forests to be considerably less than the frequencies of fires in the grasslands.

A large proportion of recently recorded fires are still human- caused, but these tend to be the result of careless campers or accidents. Today, as in the past, fires in the mixed grass prairie tend to be surface fires, occurring with warm temperatures and dry conditions. The flaming front may exhibit flame lengths of 2- 4 feet to 10's of feet, depending on the speed of winds and the depth or height of the fuels burning. Generally, the flaming front has high intensity of short duration, spreads quickly and irregularly and does not spot ahead of the front (Vogl 1979).

Available evidence suggests that the frequency of lightning- caused fires in the western North Dakota mixed grass prairie is approximately 24.7/yr/10,000 km². (For comparison, the same research indicates the average to be 6.0/yr/10,000 km² in eastern North Dakota, 22.4/yr/10,000 km² in south- central North Dakota, and 91.7/yr/10,000 km² in the pine- savanna lands of northwestern South Dakota and southeastern Montana (Higgins 1984). Lightning- caused fires were recorded in all months from April to September with 73% of the 294 recorded fires occurring during July and August. There were multiple starts on 44 (86%) of the days experiencing fire. Eighty- eight percent (88%) of these fires burned an area of 3.64 ha or less, although all of these fires had suppression action taken on them. Of four fires where no suppression action was taken, 8.1 ha or less was the mean size of the burned area. Records of fires at Knife River Indian Villages are illustrated in **Appendix J**.

From the inception of the park in 1974, fire management has pursued a policy of full and immediate suppression of all observed fires. The recorded, observed numbers of fires do not include fires occurring on any lands bordering the park boundaries.



e. WILDLAND FIRE MANAGEMENT SITUATION

1. Historical Fire Weather Analysis

Records at the National Weather Service, Bismarck, ND, indicate KNRI (Zone 5) has a continental climate characterized by cold winters and hot summers with high variations from day to day. Annual precipitation is approximately $16\pm$ inches, most of which falls during the spring and summer, usually with thunderstorms. Average annual snowfall is approximately $20\pm$ inches, with snow cover possible from October to April. June is the month receiving the highest average precipitation during the year.

Average maximum daytime temperatures reach their highest levels during summer months. Average summer minimum temperatures range from nearly 21°F to 57°F . Extremes of over 100°F occur during the summer months while sub- zero $^{\circ}\text{F}$ temperatures can and often do occur during the winter months.

Winds show little annual variation with normal speeds ranging from 8- 11mph. However, during thunderstorms or winter storms, locally strong winds are possible, up to and often in excess of 50 mph, occurring both before and after the frontal passage.

Fuel moisture content distribution shows maximums for live woody and herbaceous plants during the spring and early summer months when plants are actively growing. Dead fuel moisture contents in all size classes show little fluctuation but reach minimum values during the late summer and fall months.

Indicators of fire danger as computed through the National Fire Danger Rating System (NFDRS) show that fire danger is highest when fuel moisture contents are lowest and when plants are not actively growing.

2. Fire Season

The fire season at KNRI is generally the period from after snow melt in April through October each year. This is the period during which 100% of the fires have occurred. This period represents situations from before spring green- up until after curing. Also during this time, climatic conditions are most favorable for ignition. The majority of annual rainfall is received during May and June, but severe thunderstorms can occur in July and August which are responsible for lightning caused fires.

3. Fuel Characteristics and historic fire regime

KNRI is predominantly mixed- grass prairie, which has been altered historically by grazing and the influx of non- native species such as yellow sweetclover (*Melilotus officinalis*) and smooth brome. Principle native species include western wheatgrass



(*Pascopyrum smithii*), little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), gramas (*Bouteloua* spp.), and green needlegrass (*Nassella viridula*). Along and between the Knife and Missouri Rivers, forest communities are present. The woody draws and forested floodplains dominate the immediate bottomlands. The floodplain forests and stream courses consist of hardwood species such as plains cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*), American elm (*Ulmus americana*), sandbar willow (*Salix exigua*), and peachleaf willow (*Salix amygdaloides*). The woody draws reaching into the prairies are a mixture of green ash, chokecherry (*Prunus virginiana*), silver buffaloberry (*Shepherdia argentea*), and other shrubs as minor components.

Grassland fuels burn rapidly when dry. Most grassland plants are surface deciduous with aboveground parts dying back at least once each year. As a result, grasslands are particularly vulnerable to fires during stages when standing plant parts are dry and cured. Most species are xerophytes, often with stiff, scabrous leaves and rigid stems. Associated herbs also orient their leaves to minimize exposure to sun and air to reduce transpiration. Shoots produced after fires have also been found to have a stiffer composition and more erect form than ordinary shoots. This rigid structure and erect nature not only helps to keep stems upright well after growth terminates, but also exposes the understory and soil surface to sun and wind. These xerophytic properties create conditions ripe for combustion and sustained fire spread. Compaction of grassland fuels is nearly always conducive to fire propagation but seldom reaches the degree attained by heavier fuels, even after heavy snows or rains.

Because of these characteristics, conditions do not usually facilitate the rapid decomposition of plant materials by bacteria, fungi, and soil invertebrates. Therefore, grassland plant debris often accumulates faster than it decomposes, with variations in decomposition rates being largely determined by temperature, amount of rainfall, and moisture present in litter. Accumulation not only results from slow breakdown of plant materials, but from rapid and prodigious growth characteristics of many grassland plants, with entire plant tops being added to litter layers at the end of each growing season.

Rapid growth and accumulation, slow decomposition rates, chemical and physical composition of grassland plants, and the highly flammable nature of plant debris lead to a vegetation type that can readily burn. Grasslands that can be readily and repeatedly burned have apparently evolved with fire, becoming dependent upon it as the primary decomposition agent and key method of nutrient recycling. At the same time, grassland plants create conditions that make fires almost inevitable.

The physical nature of grassland fires is simple in comparison to fires in more stratified vegetation types. Rapidly moving head fires consume most of the vegetation and often develop broad fronts due to the continuity of the fuels and the level to rolling terrain



usually associated with grasslands. These fire fronts tend to become irregular in outline as topography, fuel loads, winds, natural barriers, and developing convective columns speed up or retard movements. Head fires in dense fuels and tall grasslands often generate large flames, but sparks or embers that cause fires to spot ahead of the main fire front are generally not produced because most grassland fuels are consumed too quickly and thoroughly. Live fuel moisture content or a measure of greenness of the fuel load further affects fuel moisture. Green- up of cool and warm season grasses is dependent on precipitation and soil moisture. Drought years often produce little or no green- up for that growing season. Year- to- year variations in the timing of green- up and curing of grasses affect fire danger throughout the growing season (*see Table 1, pg.17*). Fire behavior is significantly reduced immediately after green- up. Rates of spread increase dramatically, as the vegetation cures. Due to the normally high rate of spread and short residence time after grasses cure, long- lasting effects to soils (e.g. hardness, composition, and hydrophobicity) are few. Key nutrients supplied by the fire's potash are quickly recycled into grassland communities, since soil properties are unchanged.

Most of the park's grassland areas fit fuel model "L" (NFDRS) (Fire Behavior Fuel Model 1) which represents perennial grasslands with no overstory.

The forested floodplain areas of the park fit into one of two categories:

North Forest- Fuel Model "E" (NFDRS) (Fire Behavior Fuel Model 9) which represents a timber model with leaf litter as the primary carrier

Peninsula Forest- Fuel Model "C" (NFDRS) (Fire Behavior Fuel Model 2) which represents a savannah like structure with grass as the primary carrier

5. Control Problems

Control problems can be expected on fires burning in the peak fire season. When continuous fuels and warm, dry, windy environmental conditions are encountered, high fire intensities and rapid spread rates can be achieved within a short time. In these situations, firefighter safety may dictate use of indirect attack suppression methods.

A few areas within the park present hazardous conditions, such as steep slopes with unstable footing, densely wooded draws, and continuous fuels. Suppression activities in such areas must be carefully planned and executed.

Fires burning during the non- peak period of fire season are less likely to attain the same intensities, spread rates, and durations as high risk fires, thus presenting less hazards and control problems to firefighters.



- **Fire Effects**

Effects of fire can vary, depending on the season the burn occurred, time since last burned, grazing history, precipitation before and after burn, vegetation composition, fire intensity and severity, and topography (Anderson 1990, Collins and Gibson 1990). Fire can influence both plant community productivity and structure. Productivity may be increased following fire as a result of reduction in the litter layer and grazing may have similar effects (Anderson 1990). In mixed- grass prairie, with both warm- and cool- season species, season of burn can strongly affect species composition. Generally, spring and fall burns favor warm- season grasses while summer burns tend to favor cool- season grasses (Steuter 1987, Howe 1994).

Researchers are in agreement that fire provides an overall benefit to the continued growth, health, and maintenance of the mixed grass prairie ecosystem (Vogl 1979, Wright and Bailey 1980). And although there appears to be some conflict in research findings relative to whether fire benefits or harms particular species (and the degree of benefit or harm resulting to affected species), there is essential agreement that for the mixed grass prairie, fire plays an integral role in maintaining the ecosystem.

Given the rapid growth characteristics and the chemical composition of most mixed grass species, decomposition occurs slowly in the absence of fire in the ecosystem. Fires thus remove stagnant, dead plant accumulations while converting that mass to ashes and charcoal. The blackened, burned areas protect underlying soils by joining remaining unburned vegetation and charcoal bits and help to raise the soil temperature by several degrees, particularly in the spring. The ash/charcoal material returns a number of minerals and salts to the soil, thus recycling them for new plant growth. More importantly, the higher temperatures increase fungal, bacterial, and algal activity, which in turn increases available nitrogen. The increased microorganism activity also helps to increase soil temperatures while aiding in nutrient recycling. Fire generally improves mixed grassland soils without leading to increased erosion. Steep, sandy soils are more susceptible to erosion because of their steepness. Fire should be managed to avoid burning previously eroded soils and those most susceptible to erosion. In addition to increasing nitrification of the soils and increasing minerals and salt amounts in the soil, the ash and charcoal residue resulting from incomplete combustion aids in soil buildup and soil enrichment by being added as organic matter to the soil profile. The added material works in combination with dead and dying root systems to make the soil more porous, better able to retain water, and less compact while increasing needed sites and surface areas for essential microorganisms, mycorrhiza, and roots. In general, fires tend to stimulate plant growth, resulting in larger, more vigorous plants, greater seed production, and increased protein and carbohydrate contents. Herbivores prefer post- fire vegetation because it is more palatable and nutritious. Fires tend to increase species diversity, and



reduce woody species relative to grass and forb species (Vogl 1979, Wright and Bailey 1980).

Research data relative to fire's effects on a great number of mixed grassland vegetation species is lacking. However, there are some data available for some species. This may result from the type of fire (wildland v. prescribed), season of fire (winter, spring, summer, or fall), climatic conditions (lightning fires accompanied by rain v. lightning starts during drought conditions), area of study (park or park-type lands v. similar lands located further from the park), and research methods used. Thus, data summarized here can serve as only general guides for expected effects of fire on a particular species. It is imperative that as part of the overall fire management program, site-specific and species-specific monitoring be conducted. These observations will be permanently recorded to ensure more accurate conclusions can be drawn to decide the best method of returning the park to a more natural fire regime.

Existing findings pertinent to fire management of several species found in the park are located in **Appendix E- Fire Ecology**.

6. Values to be protected

Wildland urban interface

All structures within the Park the city of Stanton and all other private structures within 1/4 mile of the park boundary need to be identified and protected in wildland fire situations.

Park Infrastructure

Due to the makeup and composition of park trails, fire impacts will be negligible, however roads, utilities and other infrastructure within the Park need to be identified and protected in wildland fire situations.

Archeological sites

Not all archeological sites within the Park require protection from wildland fire, those that do will be identified and protected in wildland fire situations.

Fences

Damage to boundary fences and other fences within the Park will be minimized and given priority during wildland fire situations.



Protecting the earthlodge during prescribed burns, NPS photo



IV. WILDLAND FIRE MANAGEMENT PROGRAM COMPONENTS

A. GENERAL IMPLEMENTATION CONSIDERATIONS

Fire Management strategies in the Park require suppression of all wildfires regardless of cause. Wildland Fire Implementation Plan (WFIP) Stage 1 Initial Fire Assessment will be completed by the incident commander for each incident. The Stage 1 WFIP provides the decision framework for selecting the appropriate management response. Operational management decisions are described in the WFIP. Specific WFIP requirements are outlined in Chapter 4 of the Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide. Since suppression is the only appropriate response in the fire management unit (FMU), the requirement for a decision checklist as part of the Stage 1 analysis is met at the programmatic level with the completion of a Size-up report.

- **Water Availability**

Water sources for fighting fires are abundant within the park. The Knife and Missouri rivers transect or border the park at numerous locations. Due to the vertical structure of the river banks and amount of head required, most engines would not be able to draft from some of the access locations throughout the park. In these locations a Mark III or a Floto- Pump would be required to fill engines or holding tanks. Helicopter dip sites are numerous, as any section of the river large enough to safely operate a helicopter could be utilized.

The maintenance shop contains a well system that can serve as a water source. The Visitor Center has two fire hydrants, both of which are connected to the water supply from the City of Stanton. Also located throughout the park are numerous artesian wells. These wells could also serve as a water source.

- **Equipment**

The park currently has two type 6 wildland engines. Both of these engines are located at the fire cache. The park has sufficient supplies to equip a crew of ten firefighters. There are also 3 chainsaws (044,044 and 066), a Mark 26 pump and a floto- pump, all of which are located at the fire cache (see appendix E). In fire situations, the Superintendent may authorize the use of other vehicles/equipment for fire fighting needs (i.e. mowers, brush cutters etc.).



Personnel

The park usually has between six and 10 firefighters meeting minimum NWCG qualifications. Availability of qualified personnel is one area that can be a problem. The park has a commitment to have 4 qualified wildland fire personnel available for fire response, however due the small staff size and nature of collateral duty job positions that number is seldom attainable at any one time. See page 91 of this plan for targeted staffing levels in support of fire management at Knife River Indian Villages NHS.

KNIFE RIVER FIRE MANAGEMENT PROGRAM

There are two components to the Knife River Fire Management Program: Wildland Fire Suppression and Prescribed Fire.

B. WILDLAND FIRE SUPPRESSION

1. Potential fire behavior

The combination of grassland fuels, relatively flat topography, and wind patterns in the Park generally result in wind- driven fires that move rapidly through fine fuels. Wind-driven head fires observed in the areas around the park, consume most of the vegetation in front of the fire, have rapid rates of spread, and frequently develop wide heads. These fire fronts often become elliptical in outline as topography, fuel loads and smaller natural barriers are often overridden by the power of the wind. Head fires in dense fuels and tall grasslands have the capability to generate large flames in excess of 10 feet. In the taller fuel types, wind blown embers can cause short range spotting ahead of the main fire front but generally don't significantly contribute to the rate of spread or difficulty in control. Due to the normally high rates of spread, and relatively short duration of heat production, few long- lasting impacts to soils occur and key nutrients supplied by ash are quickly recycled into grassland communities.

Woody draws and forested areas, located primarily in the 10 year flood plain, exhibit fire behavior markedly different from fires in grasslands. Spotting potential and fire intensity are generally much higher in woody fuels. Due to the presence of shelf fungi in the parks green ash trees, broken tops and rotten interiors are the norm, creating a receptive landing site for fire brands and contributing significantly to the spotting potential.

The Park's fuels fall into Fire Behavior Fuel Models 1, 2 and 9. Fuel Model 1 is represented by grassland and grass/shrub combinations. Fuel Model 2 is represented by hardwood stands with a widely spaced canopy and an open grass understory. Fuel



Model 9 is represented by closed stands of hardwoods with 2- 4 inch deep leaf litter. The potential fire behavior for average and extreme conditions, are listed as follows:

Table 5: Potential Fire Behavior

Fuel Model 1: Average Fire Behavior

Inputs		Outputs	
Fuel Model	1	Rate of Spread (chains/hour)	135
1 hour fuel moisture	6	Heat/Unit Area (BTU/ft ²)	91
Mid- Flame Wind Speed (mph)	6	Fireline Intensity (BTU/ft/s)	224
Slope(%)	10	Flame Length (feet)	5.4

Fuel Model 1: Extreme Fire Behavior

Inputs		Outputs	
Fuel Model	1	Rate of Spread (chains/hour)	446.5
1 hour fuel moisture	3	Heat/Unit Area (BTU/ft ²)	103
Mid- Flame Wind Speed (mph)	20	Fireline Intensity (BTU/ft/s)	844
Slope(%)	0	Flame Length (feet)	10

Fuel Model 2: Average Fire Behavior

Inputs		Outputs	
Fuel Model	2	Rate of Spread (chains/hour)	48.4
1 hour fuel moisture	6	Heat/Unit Area (BTU/ft ²)	476
10 hour fuel moisture	7	Fireline Intensity (BTU/ft/s)	423
100 hour fuel moisture	12	Flame Length (feet)	7.3
Herbaceous Fuel Moisture	100		
Mid- Flame Wind Speed (mph)	6		
Slope (%)	0		



Fuel Model 2: Extreme Fire Behavior

Inputs		Outputs	
Fuel Model	2	Rate of Spread (chains/hour)	674.9
1 hour fuel moisture	3	Heat/Unit Area (BTU/ft ²)	563
10 hour fuel moisture	5	Fireline Intensity (BTU/ft/s)	6961
100 hour fuel moisture	10	Flame Length (feet)	26.4
Herbaceous Fuel Moisture	30		
Mid- Flame Wind Speed (mph)	20		
Slope (%)	0		

Fuel Model 9: Average Fire Behavior

Inputs		Outputs	
Fuel Model	9	Rate of Spread (chains/hour)	11.7
1 hour fuel moisture	6	Heat/Unit Area (BTU/ft ²)	370
10 hour fuel moisture	10	Fireline Intensity (BTU/ft/s)	79
100 hour fuel moisture	12	Flame Length (feet)	3.4
Mid- Flame Wind Speed (mph)	6		
Slope (%)	0		

Fuel Model 9: Extreme Fire Behavior

Inputs		Outputs	
Fuel Model	9	Rate of Spread (chains/hour)	117.6
1 hour fuel moisture	3	Heat/Unit Area (BTU/ft ²)	448
10 hour fuel moisture	5	Fireline Intensity (BTU/ft/s)	966
100 hour fuel moisture	10	Flame Length (feet)	10.6
Mid- Flame Wind Speed (mph)	20		
Slope (%)	0		



2. Wildland fire preparedness

Preparedness includes activities conducted before a fire occurrence to ensure the ability of the park's fire management organization to initiate effective action. This action may include the evaluation of the situation and selection of appropriate suppression strategies. Preparedness activities include recruitment, training, planning, and organization, fire equipment maintenance and procurement of equipment and supplies. The objective of preparedness is to have a well- trained and equipped fire management organization in place to manage all fire situations that confront KNRI managers.

a. Wildland fire prevention program

A major goal of the park fire management program is to reduce the threat and occurrence of human caused wildland fires. The Fire Prevention Plan (*Appendix I*) seeks to accomplish this goal through an analysis of the risk of human caused ignitions within an area; hazards within that area; and values of resources found within that area. Prevention activities developed for specific areas include education aimed at park visitors, employees, local schools and adjacent landowners; engineering (or the use of appropriate equipment, methods, and projects); and enforcement of regulations aimed at preventing human caused fires.

The Superintendent is responsible for overall fire prevention within the park and shall initiate prevention action as indicated within the park's Wildfire Prevention Plan found in the park's Emergency Operations. General activities identified through the analysis are summarized below. Detailed information can be found in *Appendix I*.

Educational activities will focus on educating park visitors, local school groups and adjacent landowners about fire prevention regulations, appropriate prevention activities, and current fire danger ratings using media, signs, and verbal contact. Educating park employees on fire prevention activities they can integrate into their jobs and working cooperators to develop appropriate fire prevention messages for properties adjacent to the park.

The Fire Program Coordinator (FPC) or his/her designee will provide and maintain fire prevention devices (e.g., spark arrestor) on appropriate field equipment, inspect other potential sources of ignition on a yearly basis, and evaluate park structures for flammable construction materials. The FPC will also evaluate the condition of existing fire breaks and the need for hazard fuel reduction work.

Resource Protection Rangers will conduct routine patrols and enforce regulations regarding smoking and other components of the Fire Prevention Plan, as appropriate.



- **Pre- Season Risk Analysis**

Risk analysis shall be completed by the North Dakota Group Fire Management Office (NDGFMFO) by April 15 of each year. NPS- 18, Section III, Chapter 7, Exhibit 2, page 1, contains a sample comparison chart.

If the park risk analysis suggests that an abnormal fire season might be anticipated, the area NDGFMFO shall notify the Midwest Regional Office and request additional resources commensurate with the escalated risk.

- b. Annual training**

All training and qualifications of wildland fire personnel are based on the standards developed by National Wildland Fire Coordinating Group (NWCG) and may be found in the *Wildland and Prescribed Fire Qualification System Guide PMS 310-*

1. Employee qualifications are tracked and archived through the Incident Qualifications and Certification System (IQCS).

The park goal is to have basic firefighter training, annual fire refresher and fitness testing for permanent employees completed prior to February 15th of each year and by June 5th for all others.

Advanced training, above 200 levels, will be coordinated through the North Dakota Group Fire Management Office (NDGFMFO). Whenever possible, trainee assignments will be made to further develop skills.

Prior to and during the fire season, the North Dakota Group (NDG) Fire Management Office along with Knife River personnel will take the following measures to ensure adequate fire preparedness:

- c. Fire Inspections**

Normal fire season for the Northern Great Plains Area is Mid- April through the end of October. The FMS will conduct annual preseason fire readiness inspections (prior to April 15) which will address detection, communications, dispatch, current training levels, equipment inventories, organizational structure, and response capabilities. The fire readiness inspections checklist identified in NPS- 18, Section III, Chapter 7, Exhibit 5, page 1, will be adapted for park specific needs and used to conduct and document the inspection.

January 1 - April 30: Submit updates to the North Dakota Group Fire Management Specialist (FMS) and maintain accurate employee training and qualification records. Review Cooperative Agreements with surrounding fire management agencies. Prepare



plans for any management ignited prescribed burn projects for hazard fuel reduction and resource management projects. Order fire cache supplies and replacement equipment as needed. Perform annual maintenance on fire weather station. Obtain necessary personal fire physical fitness evaluations. Provide updates or changes to cooperators for local and regional mobilization plans.

May 1 - June 15: Inventory fire supplies and equipment and update list. Inspect fire cache to ensure equipment is ready. Check operation of all slip- on and portable pumps. Outfit field vehicles and all initial attack personnel. Review fire weather station observation, recording, and weather station equipment maintenance procedures. Review established procedures for utilizing suppression and emergency presuppression accounts. Evaluate the need for basic firefighter training and schedule if necessary.

June 16 - September 30: Maintain state of readiness as identified in the Step- Up Plan (Figure 6). Operate all slip- on units and portable pumps at least weekly.

October 1 - December 31: Critique fire season. Evaluate individual performance ratings of fire personnel and correct deficiencies and recommend training as needed. Review and revise Fire Management Plan as needed.

I. WEATHER STATIONS AND NATIONAL FIRE DANGER RATING SYSTEM

Emergency preparedness describes actions to provide extra capability during times of extreme or unusual fire danger caused by meteorological influences on the park's natural fuel complexes. Activities will be based on Burning Index (BI) outputs as calculated by the National Fire Danger Rating System (NFDRS). The 90th percentile Burning Index (BI) for Knife River is based on Fuel Model "L" (sub- humid with rainfall deficient during the summer). The park uses the NFDRS as the basis for all its wildland fire programming. The area falls into the NFDRS climate class #2. The park utilizes outputs of the Remote Automated Weather Station "Knife River" located on the park.

Unusual occurrences will be addressed by planned use of emergency preparedness funds linked to the National Fire Danger Rating System (NFDRS) burning index and described in the step- up plan (Figure 6). The park's authority to expend emergency preparedness funds is detailed in RM- 18. Appropriate actions for use of emergency preparedness funds include: hiring of temporary emergency firefighters; placing existing staff on extended tours of duty; increasing or initiating special detection operations; pre- positioning additional wildland fire resources in the park; and hiring fixed wing or rotary aircraft to accomplish necessary preparation. These are planned to ensure the capability of prompt response with adequate forces to whatever specific fire situation develops. Expenditures of these funds will be coordinated with the NDG FMS.



This Plan uses the BI, derived from the NFDRS (Deeming et al. 1977), as an important measure for basing determinations regarding the scope and extent of fire management activities. Depending on the BI derived from the daily NFDRS/WIMS data, predicted fire danger is classified as low, moderate, high, very high, or extreme. A set of staffing classes which have a corresponding set of actions that the park will initiate to meet potential fire danger has been developed and is presented in Fig. 6 below as the Step-up Plan.

e. Step up and staffing plan

Burning indexes utilized in development of Knife River Indian Villages' staffing classes were taken from an historical analysis of fire weather observations taken from a Remote Automated Weather Station (RAWS) site, stationed at Watford City, ND. For these observations, the low fire danger rating (Staffing Level I) equates with BI's ranging from 0 to 11; moderate (Staffing Level II) equates with the range of 12 to 22; high (Staffing Level III) at 23 to 44; very high (Staffing Level IV) at 45 to 57; and extreme (Staffing Level V) at 58 or greater. Breakpoints for staffing level IV and V are derived from the 90th and 97th percentiles respectively. Breakpoints for staffing levels III, II and I are calculated by dividing the breakpoint for the next higher staffing level by two, as per RM- 18.

Actions taken under staffing classes I - III are funded through the normal park budget. Additional actions detailed under staffing classes IV - V can be supplemented by emergency preparedness funding coordinated through the NDG FMS. Burning index, associated staffing classes, and designated prevention, detection, and preparedness actions to be taken with each level are discussed in the Step- up Plan below.



Fig. 8: STEP- UP PLAN FOR KNIFE RIVER INDIAN VILLAGES NHS

Staffing class	Burnin g Index	Actions
I (Low)	0 – 11	◆ Prevention – Fire Prevention activities can be grouped into three categories: in- Park activities, out- of- Park activities, and coordination with other agencies. During low fire danger situations, in- Park activities will represent the majority of the prevention activities. Visitors, upon entering the Park, will be instructed to restrict vehicle travel to constructed Park roads only; to make no open fires except in designated campgrounds and picnic areas and only in existing, constructed fire places; and to totally refrain from the use of any fireworks or explosives. ◆ Detection – Park personnel will carry out normally assigned duties. ◆ Get Away Standard (the goal for the length of time required to staff an engine)– None ◆ Preparedness – A minimum of one engine will be prepared for operation. Park personnel will carry out normally assigned duties.
II. (Moder ate)	12- 22	<i>All Staffing Class- 1 actions apply with further considerations noted below</i> ◆ Prevention - The in- Park and out- of- Park actions described above will be sufficient. ◆ Detection – Personnel to carry out normally assigned duties. ◆ Get Away Standard – 10 Minutes ◆ Preparedness - Two engines will be prepared for operation. Fire suppression tools will be added to Park vehicles involved in field operations.
III (High)	23- 44	<i>All Staffing Class- 1 and 2 actions apply with further considerations noted below</i> ◆ Prevention - Restrictions may be implemented against any smoking outside of Visitor Center Compound. Out- of- Park activities may include notification to local media services of increasing fire danger. ◆ Detection – Personnel to carry out normally assigned field duties with special emphasis on fire detection. At the discretion of the Chief of Resource Protection, one or more individuals may be assigned road patrol at set times during the day. ◆ Preparedness - Fire suppression tools will be added to designated



Staffing class	Burning Index	Actions
		Park vehicles. A minimum of two engines will be operable. The Get Away Standard – 5 Minutes ◆ Fire Management Officer has the authority to increase the Staffing Class by one level if warranted by current and/or forecasted burning conditions.
IV (Very High)	45- 57	<i>All Staffing Classes- 1, 2, and 3 actions apply with further consideration noted below.</i> ◆ Prevention - Out- of- Park activities will be stepped- up to include notification of local and regional media services. Coordination with other agencies will increase in terms of both short and long range planning, public notification, coordinated prevention activities, and increased cooperation. ◆ Detection – Park personnel will carry on normally assigned detection duties. Superintendent or Chief of Resource Protection may designate one or more personnel to part or fulltime road patrol ◆ Get Away Standard – 5 Minutes ◆ Preparedness – Preparedness overtime may be authorized by NDG FMS, Fire Program Manager, or Fire Program Coordinator if necessary to conduct these activities. An initial attack crew of at least 2 personnel, will be identified and available to staff an engine. An ICT IV will be available. All available engines will be made fire- suppression ready. All Park personnel qualified and assigned fire suppression duties will be notified about the fire danger Notice will be forwarded to the cooperator offices of the very high fire danger condition. Daily availability of additional local and regional resources will be monitored. Temporary closures may be imposed upon areas in the park or for certain activities in conjunction with similar impositions by adjacent land managing agencies.
V (Extreme)	58+	<i>All Staffing Classes- 1,2,3,4 actions apply with further consideration noted below .</i> ◆ Prevention - Visitors to the Park will be verbally warned of the fire danger, all smoking on trails and in moving vehicles will be expressly prohibited, and no open fires or stove fires will be permitted anywhere in the Park. Cooperators will be advised in regard to conditions and opportunities for bans on open burning.



Staffing class	Burnin g Index	Actions
		◆ Detection - Fire patrols will be increased. ◆ Get Away Standard – 2 Minutes ◆ Preparedness –Consideration will be given to prepositioning additional local or regional suppression resources in the park to supplement suppression capabilities.

3. PRE ATTACK PLAN

This is a checklist of items to be considered prior to wildland fire occurrence. The table is divided into four parts that correspond to four of the functions found in the Incident Command System and is located in Appendix G.

4. INITIAL ATTACK

All suppression actions will be governed by consideration of human safety; availability of effective, appropriate equipment; and management objectives and constraints. KNRI will initiate aggressive initial attack, using the appropriate management response on all wildfires occurring within the Park. In general, the goals can be met most effectively and cost- efficiently by quickly evaluating each fire occurrence within the Park for location, spread potential and amount and type of force(s) needed for effective suppression, and providing rapid, aggressive initial attack for those fires to be suppressed.

• Wildland fire detection

All smoke and fire reports will be made to the park's visitor center. If a dispatcher cannot be reached, a report will be made to appropriate Park Ranger. The NDGFMO will be notified of all fire or smoke reports as soon as possible. To enhance communication with cooperators and the public, notification of cooperators, fire management offices, and the local radio station can also be made.

Visitors and employees will report most fires. Any park employee to whom a fire is reported shall obtain complete information regarding the following:

1. location
2. fire behavior and smoke dispersal
3. approximate size



4. *name, address, and phone number of reporting party*

These personnel are instructed to take fire reports from visitors and relay the pertinent information to the park dispatch office or Fire Management Office. **If possible, have them remain in contact until the fire is confirmed and located.** Further investigation may be necessary if park staff in the field cannot verify a reported fire. Park Rangers will look for new fire starts as part of their routine duties.

a. Initial attack priorities

The occasions in which two or more fires are ignited can be generally associated with days when high to extreme fire intensity condition exists. Suppression actions taken on multiple fires can quickly deplete KNRI's fire suppression resources. At least two individuals will be dispatched to each fire reported on days experiencing multiple starts. However, if sufficient personnel are not immediately available, additional resources will be ordered through dispatch, and priority order will govern which fires in which units will receive the first available resources. Priority of initial attack on days of multiple fire starts will be:

1. Fires threatening life or property within park boundaries;
2. Fires starting within the park which are adjacent to park boundaries and which are likely to burn across the boundary and onto non- park lands;
3. Fires starting outside the park which are within three miles of park boundaries and which are on lands controlled by private landowners. Initial attack on fires starting on such lands is allowed through a Memorandum of Understanding between Stanton Rural Fire Department and the NPS.
4. All other park lands.

b. Appropriate management response/fire suppression

KNRI is a full suppression area. The limited size of the park, heavy fuel loads, rapid rates of spread and mixed ownership patterns adjacent to the park dictate this strategy. All fires will be suppressed according to the following strategies:

Control- This strategy reflects aggressive suppression efforts and will be the strategy of choice whenever the eminent threat to life or property exists or when fire behavior is potentially extreme.

Containment- This strategy entails the use of natural or constructed barriers to the fullest extent possible to minimize resource damage. This strategy will be utilized when



no significant values are at risk and fire behavior predictions preclude direct attack to ensure firefighter safety. Consultation with cooperators will be initiated before this tactic is selected.

c. Confinement strategy

Confinement- - Confinement entails minimal suppression action intended to limit fire spread to a certain acceptable geographic area. Due to the size of the park and the value of resources adjacent, this strategy will not normally be utilized. As previously stated, confinement strategies will not normally be used; however, certain circumstances may determine this type of suppression action within the park. If in the opinion of the Initial Attack Incident Commander, direct suppression would put firefighters at risk due to terrain considerations, lack of adequate IA staffing or other safety issues, a full or partial confinement strategy may be employed.

Consideration of human safety, availability of equipment, management objectives and constraints will govern all suppression actions. Current suppression objectives include appropriate management response by NPS personnel of all fires occurring within the park. In general, these can be met most effectively and cost- efficiently by:

1. Quickly evaluating each fire occurrence within the park for geographic location, spread potential, and amount and type of force(s) needed for effective suppression.
2. Providing rapid, aggressive initial attack for those fires to be suppressed.
3. Using appropriate management response methods and tactics designed to efficiently and effectively suppress fires while accomplishing resource management objectives so that park personnel can return to their normal duties as soon as possible.

d. Typical unit response times

Due to the size of the park, and ease of access, response times by KNRI personnel or equipment to any incident within the park during normal hours should be 10 minutes or less. Response times for local VFD cooperators will vary from 10 to 45 minutes, depending on the location of engine operators when assistance is requested.

e. Restrictions and special concerns for KNRI

Fire management constraints applicable to all park areas include:

- Use of helicopters for aerial ignition, transport of personnel, supplies or



equipment will be evaluated for each fire situation. Improvement of landing sites shall be kept to a minimum and requires approval of the Superintendent. Helibases will be located in designated areas, preferably outside park boundaries. Landing sites within the park will be rehabilitated to pre- fire conditions, to the extent reasonably possible.

- The superintendent may authorize the construction of handline and use of power saws. When handline construction is required, construction standards will be issued by the superintendent requiring the handline to be built with *minimum impact suppression tactics (MIST)* to wilderness characteristics. The Superintendent may authorize use of power chain saws, although such use should be kept to a minimum. Handlines constructed by exposing mineral soil will be rehabilitated and erosion control methods used on slopes exceeding 10%.
- Incident Command Posts and camps will be located within designated areas.

Minimum impact suppression is defined as the aggressive application of those strategies and tactics that effectively meet suppression and rehabilitation objectives with the least cultural and environmental impact. Minimum Impact Suppression is the policy of the NPS, and KNRI will adhere to minimum- impact suppression guidelines as outlined therein. In addition to the minimum impact guidelines the following constraints applicable to all suppression actions include:

- Whenever consistent with safe, effective suppression techniques, the use of natural barriers, areas void of vegetation should be used as extensively as possible. The use of backfire techniques, burnout lines improvement, and wetting agents (ground and airborne) is authorized. Fire retardant agent used must be on the approved list of retardant for utilization by the Forest Service and Bureau of Land Management.
- All extended attack and project fire operations should have a park employee designated and available to assist suppression forces in the capacity of Resource Advisor.
- Stream crossings should be limited to established locations.
- Except for spot maintenance to remove obstructions, no improvements should be made to roadways, trails, water sources, or clearings. All sites where improvements are made or obstructions removed should be rehabilitated to pre- fire conditions, to the extent reasonably possible.
- Earth moving equipment such as tractors, graders, bulldozers or other tracked vehicles should not be used for fire suppression. If special circumstances warrant extreme measures to ensure protection, the Superintendent can authorize the use of heavy equipment.



- Fireline location shall be outside of highly erosive areas, steep slopes, and other sensitive areas. Following fire suppression activities, firelines on slopes should be recontoured and water- barred.

Whenever fire is reported within park boundaries, the following steps will be taken:

1. Report of the fire to the Superintendents Office, followed by a report to NDGFM. The park does not have a full- time dispatcher. The Administrative Assistant will begin dispatch duties and radio operation.
2. Determine the location, legal description, and land ownership at the occurrence site.
3. A crew of two personnel (ICT4or ICT5 +1) will be dispatched to the location of the fire. Personnel dispatched will be qualified and equipped to undertake initial attack action. If personnel are not available, closest resources will be notified.
4. Division Chiefs will be notified of the need to put their available personnel on standby (during normal duty hours). All personnel placed on standby will assemble at the appropriate staging area.
5. Upon determination of actual fire location and based on the information reported following the initial fire size- up, the, IC- 4, or his/her designee will develop a Stage I Wildland Fire Implementation Plan (WFIP). Information found in the Stage I WFIP includes a report of the fire size, behavior, environmental conditions, fuels, terrain features, existence of special hazards or threats to persons or improvements, and any other factors observed which could affect fire behavior and suppression efforts. Knife River is not a Wildland Fire Use park unit so WFIP criteria will be met with the completion of a Size- up Report. The FMU is a suppression only FMU, this simplifies the WFIP process. Since suppression is the only appropriate management response, the requirement for a decision checklist as part of the Stage I analysis is considered to be met. The Stage I WFIP analysis is satisfied at the programmatic level by the completion of a Strategic Fire Size- Up or "Size- Up Report", a form taken directly from the appendix section of Interagency Standards for Fire and Fire Aviation Operations 2006 Edition ("Red Book") and included as Appendix K in this document. Specific WFIP requirements are outlined in Chapter 4 of the Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide. Ultimately, the Superintendent will be responsible for completing the WFIP Stage I, this task can be delegated to any personnel at the park At KNRI this duty will be completed by the FPC. This information will be reported to the KNRI's Superintendent. These fire size- up observations will be immediately forwarded to the NDGFM.



6. Upon determination of actual fire location and based on the information reported following the initial fire size- up, the NDG FMS, FPC or his/her designee will develop the appropriate suppression response, giving consideration to applicable resource management constraints, together with considerations of personnel safety and economics. Data gathered in the size- up will be utilized to determine an appropriate strategy for managing the fire.

The FPC will monitor the BI daily. Whenever a fire is reported on park lands, forces and equipment dispatched for initial attack will be based on daily BI, fire location, existing and predicted environmental conditions and any other factors pertinent to making sound fire management decisions.

All wildland fires will receive an immediate and aggressive initial attack suppression response. The first qualified Incident Commander on- scene will be assigned to determine the appropriate suppression strategy to be utilized. The Resource Manager or his/her designee will keep the Superintendent updated of the fire situation. The goal in initial attack actions is to limit damage to threatened values, while minimizing the area burned and preventing escape of the fire. An Incident Commander will be responsible for all actions taken on the fire. The will inform the Area Fire Management Officer of the fire situation as soon as possible after arrival on the scene. If NDG FMS arrives on scene, control of fire may be relinquished to the FMS. If the fire behavior and complexity continue to increase, the IC may be replaced by a higher qualified IC along with additional support personnel and equipment. The Area Fire Management Officer, IC, or his/her designee is responsible for the selection of a replacement Incident Commander. If the fire threatens to exceed all initial attack capabilities, the fire will become an extended attack action.

5. EXTENDED ATTACK AND LARGE FIRE SUPPRESSION

Extended attack actions occur when fires have not been contained or controlled by initial attack forces. Extended attack continues until either the transition to a higher level incident management team is completed or the fire has been contained or controlled. The Wildland Fire Situation Analysis (WFSA) must be completed by park staff when a fire escapes initial attack, and if the action escalates to incident management team levels, the incoming team will be briefed by the Superintendent (Agency Administrator's Briefing) and current Incident Commander.

The team will be given a written delegation of authority and will have an Agency Administrator's Representative assigned as a staff member to the incoming Incident Commander. The delegation of authority will provide the Agency Administrator's priorities, constraints, and other guidelines prerequisite to effective suppression of the fire. When the team has accomplished its assigned tasks, the fire will be transferred back to the park. A local Incident Commander will be assigned, and a debriefing will be



held by the departing team to provide for an orderly transfer of command. The Superintendent will conduct a closeout session that will include a performance evaluation of the departing team. The transition Incident Commander will assume command at the agreed upon time. The departing team will then be demobilized.

Extended Attack Process

- a. Extended Attack Needs – Based on the fire history, few fires will remain uncontrolled past the first burning period. Historically, most fires have been adjacent to roads in the area or contained on one or more sides by the Knife or Missouri Rivers, making most fires easily accessed and quickly suppressed.
- b. North Dakota Interagency Dispatch (NDC) and NDG FMS will be informed of any fire activity at the Park. NDC also processes requests for additional resources.
- c. Implementation Plan Requirements – A Wildland Fire Implementation Plan (WFIP) will be required on initial attack fires as full suppression is established as the Appropriate Management Response. WFSAs development will be required at the point when the check of fire spread is determined to be un- attainable during the second burning period. At this point a WFSAs will be completed each day until the fire is surrounded by firelines or natural or other barriers that will stop fire spread.
- d. Complexity Decision – When a WFSAs has been completed for use during the operations on a second burning period, the fire will be considered to be an extended attack fire.
- e. Based on the complexity and size of fire or fires, command will change from a type 5 to a type 4, 3, 2, or 1 as necessary.
- f. Delegation of Authority – A sample limited delegation of authority to an Incident Commander.

6. EXCEEDING EXISTING WILDLAND FIRE IMPLEMENTATION PLAN OR WFIP

The WFIP will be periodically reassessed to determine if a change in strategy is needed. If the fire is the result of an escaped prescribed fire, a Wildland Fire Situation Analysis(WFSA) will be completed and a new strategy selected based on the results. If



the initial attack management response was a confinement strategy, a WFSA will be completed and new strategy selected as appropriate.

Safety in fighting fire is extremely important. Firefighting is hazardous work, sometimes performed in unfamiliar surroundings and under emergency conditions. Special hazards are almost always present and danger from fatigue conditions can give only subtle warnings. It is the responsibility of every incident commander to ensure that safety instructions are given and followed during all suppression actions. It is the responsibility of every employee to perform only jobs that they are qualified for, to wear personal protective equipment at all times, and to ensure that adequate water, food, and rest are provided to firefighters so that high standards of safety can be maintained. Ultimately, each firefighter is responsible for their individual safety.

7. MINIMUM IMPACT FIRE SUPPRESSION AND REHABILITATION PROCEDURES

Fire suppression is taking on increased emphasis in accomplishing protection objectives while minimizing environmental degradation. It is appropriate that fire management activities be planned to accomplish objectives in the most ecologically sound, economically efficient, and safe manners as possible. Actual fire conditions and sound judgment will dictate specific actions taken during any suppression action. However, consideration of what is specifically necessary to halt fire spread and control it within firelines should include as standard procedure, incorporation of Minimum Impact Suppression Tactics (MIST) into all action plans and strategic decisions. Minimum impact suppression tactics will be used and included into Agency Administrator's Briefing and Delegations of Authorities to incoming Incident Management Teams and all other out-of-park resources. Suppression tactics will stress the use of methods and equipment commensurate with threats to life and property, suppression needs, and the chosen strategy of control, contain, and confine, or a combination which will least impact the landscape or disturb park resources. Development of specific tactics at KNRI shall include consideration of the following items:

I. Safety:

*Safety is of utmost importance.

*Constantly review Watchout Situations and Fire Orders and maintain situational awareness.

*Use particular caution when working with burning snags, burning or partially burned trees, dead trees and unburned fuel situations between personnel and fire.

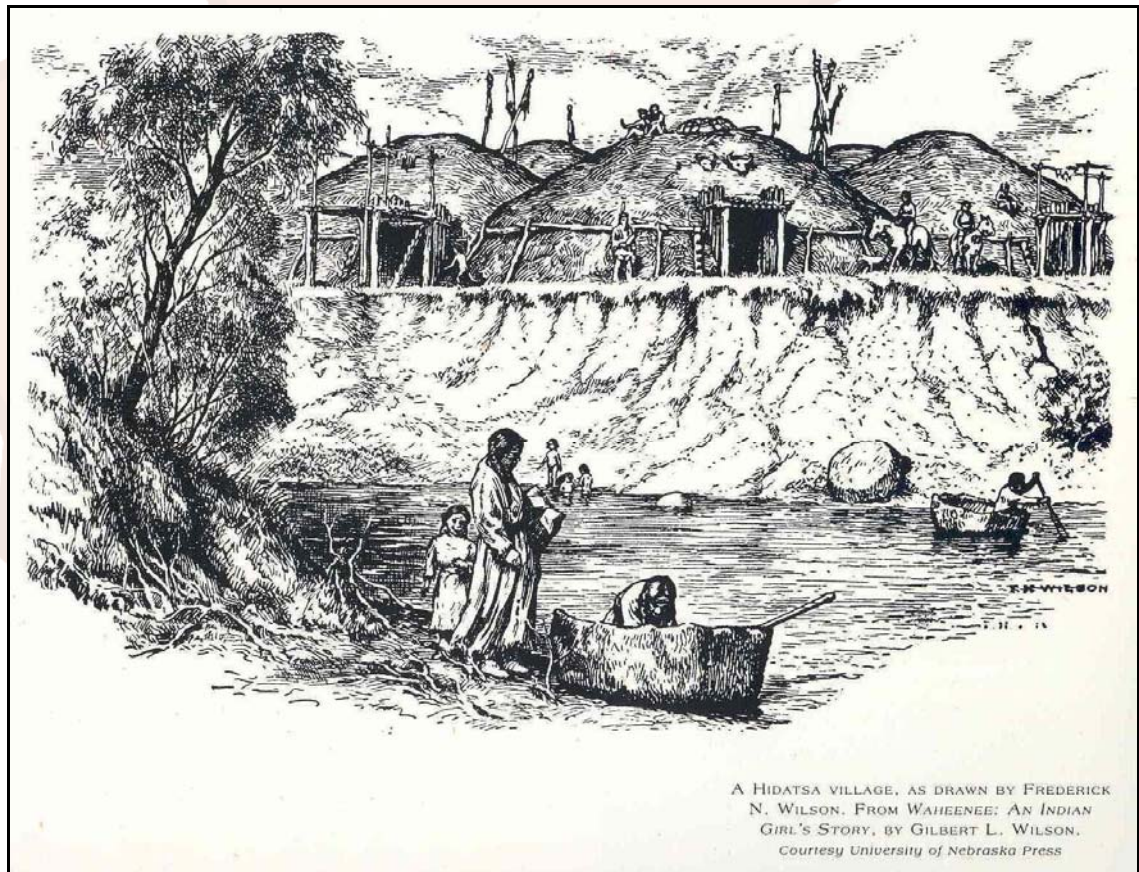


- *Be constantly aware of surroundings, expected fire behavior, and possible future fire perimeter.
2. Fireline Construction:
- *Select procedures, tools, and equipment that least impact the environment such as water and swatters.
- *Give serious condition to water use as opposed to surface disturbance.
- *In light fuels, consider cold trailing line; allowing fuels to burn out and use swatters or equivalent; constantly recheck cold- trailed line; use minimum width and depth of constructed fireline.
- *In medium to heavy fuels, consider using natural barriers as much as possible, cold- trailing fireline; cooling with dirt and water; using minimum width and depth constructed firelines; minimize felling and bucking of woody materials; building line around logs.
- *In aerial fuels, brush, burned trees, and snags, consider limbing only enough fuel adjacent to fireline to prevent additional fire spread; removing or limbing those fuels inside firelines which if ignited would have potential to spread fire outside the fireline; cutting brush and small trees flush with ground.
- *In trees, burned trees, and snags, consider minimizing all cutting of trees, burned trees, and snags while complying with safety objectives; cutting only live trees when absolutely necessary; cutting stumps flush with ground; scrape around tree bases near fireline if hot and likely to cause fire spread.
- *During indirect attack, consider not felling snags on the planned unburned side of fireline unless they constitute a safety hazard; fell only those snags that could reach across firelines.
3. Mop- up Phase:
- *In light fuels, cold trail areas adjacent to unburned fuels. Use only water or swatter.
- *In medium and heavy fuels, cold- trail charred logs near fireline; keep spading to a minimum; minimize bucking of logs; return logs to original position; refrain from piling logs or heavy fuels; minimize bucking of heavy woody materials.



*In aerial fuels remove only those fuels which, if ignited, have the potential to spread fire across firelines.

*In burning trees and snags, allow them to burn themselves out while ensuring personal safety; use felling as a last resort.



A HIDATSA VILLAGE, AS DRAWN BY FREDERICK
N. WILSON. FROM WAHEENEE: AN INDIAN
GIRL'S STORY, BY GILBERT L. WILSON.
Courtesy University of Nebraska Press



8. REHABILITATION GUIDELINES

Immediate rehabilitation actions to prevent further land degradation or resource loss, or to ensure safety, may be carried out as part of the incident. Post- incident rehabilitation actions will be specified in the rehabilitation plan approved by the Branch of Fire Management.

Following suppression actions, it may be necessary to rehabilitate damaged areas. When feasible, rehabilitation will be initiated as soon as possible after the fire; and in many instances, it is desirable to initiate such activities during final stages of suppression. During this time, effective use can be made of personnel and equipment still on the firelines.

Restoration of fire suppression activities should include the following *where appropriate*:

I. Firelines:

- *fill in firelines with soil and organic materials.

- *utilize cup trenches and water bars as necessary to prevent erosion, use woody material to act as sediment dams.

- *cut, lop, and scatter any trees or large size brush that was downed during fireline construction - not to exceed 15 inches in length.

- *ensure that stumps from cut trees or large size brush are flush with ground.

2. General:

- *remove any and all signs of human activity (including crew generated litter).

Rehabilitation by reseeding of native species of areas burned by wildfires or management ignited prescribed fires will be considered in some exceptional circumstances. Two primary circumstances which may warrant such action are:

1. Sensitive areas subject to significant visitor use when it would be impractical to defer such use and where such use may unreasonably modify natural succession.
2. Areas where non- native species might reasonably be expected to dominate natural regeneration without the seeding of native species.

Rehabilitation by seeding of native species primarily uses those species which occur in early seral stages. Local seed sources will be used as much as possible.



The Fire Program Coordinator (FPC) is responsible for preparation of any annual reports dealing with fire activity. Such reports will be submitted to the Superintendent for approval. They will remain on file in the Resource Management Office.

- **Wildland fire monitoring**

Wildland fires will be monitored at levels 1 and 2 with observations entered into the park's monitoring database. In the event that long- term fire effects plots are burned in a wildland fire they will then be sampled by the NGPA Fire Effects crew, according to the schedule of plot visits following a burn treatment. Level 1 and 2 monitoring observations will be filed with the final fire package and a copy placed with the records for the Fire Management Unit that was burned.

9. Wildland fire documentation, reports, and records

Individual Fire Reports (Wildland Fire Reports) - Procedures are outlined in RM-18. Fire reports will be completed by the Incident Commander, submitted to the Fire Program Coordinator, and then forwarded to the NDG Fire Management Office for approval and input into WFMI. Individual fire reports will be completed for KNRI wildland fires, cooperative agreement fires, and all other fire responses, including all out- of- park fire assignments. Each wildland fire suppression documentation package will include the following:

- Individual Fire Report Form (DI- 1202)
- Fire Weather Observations
- Situation Reports and fire updates
- Incident Maps
- Wildland Fire Situation Analysis (if appropriate)
- Narrative Summary (if appropriate)



Table 6 below shows the reports and records necessary for implementation of the park's fire management program:

Reports and Records Required to Implement the Knife River Fire Management Program

RECORD/REPORT	FREQUENCY	RESPONSIBLE PARTY	DISTRIBUTION
DI- 1202 Fire Report	Per Incident, w/in 5 days	IC	FPC, FMS
DI- 1202 Computer Entry	Within 10 days	FMS	IQCS
Fire Weather Records	Daily	FMS	Park
Wildland Fire Preparedness Review	Annual	FPC	Park, FMS
Fire Atlas	As Needed	FPC	Park
FMP revision and EA	5 years	FPC, FMS	Park, FMS, MWRO
Situation Report	As Needed	FMS	Park, FMS, MWRO
Fire Danger/Staffing Class	Daily During Fire Season	FPC	Park
Wildland Fire Situation Analysis (WFSA)	Per Extended Attack Fire	IC, Supt	FMS, Supt, FPC
Rx Fire Plan	Per Rx Fire	Rx Fire Burn Boss, FMS	Supt, FMS, MWRO FPC
Red Cards	Annual	FMS	FPC, Park
Hazard Fuel/RM Project Accomplishment Reports	Per Project	FMS	Park, IQCS, NFPORS
Funding requests for Rx Fires	Annual	FMS	FMS, MWRO
Supplemental Budget Requests	Annual	FPC, FMS	FPM, FMS, MWRO
Fire Reviews	As Needed	FMS	Park, FMS, MWRO
Fire Critique	As Needed	FMS, FMT	Park



Abbreviations: FMS = North Dakota Group Fire Management Specialist
MWRO = Midwest Regional Office
Supt = Knife River Park Superintendent
FMT = Knife River Interdivisional Fire Management Team
FPC = Knife River Fire Program Coordinator
IC = Incident Commander
IQCS = Incident Qualifications Certification System
(interagency fire database)

C. Wildland Fire Use

KNRI has a total of 1758 acres. Due to staff limitations, small land management area, rapid rates of spread, long response times, valuable resources, and values at risk on neighboring lands, this plan does not recommend wildland fire use as a management option for the Park.

D. PRESCRIBED FIRE

I. PRESCRIBED FIRE DOCUMENTATION AND REPORTING

Prescribed fires are utilized as a tool to achieve management goals. Prescribed fire will reflect and support resource management objectives as stated in the Park's Draft Prairie Management Plan (2007) and General Management Plan (1986). The prescribed fire program will also facilitate the accomplishment of the resource management objectives listed in this plan.

To promote the overall fire management program, park management may use prescribed fires to create fuel breaks, reduce unnatural fuel loads, and reduce fire hazards around structures inside and adjacent to the Park, and along boundary areas. Prescribed fire may also be used in conjunction with mechanical hazard fuel reduction in order to burn fuels that accumulate from fuel reduction operations such as burn piles. Research burning may also take place when it is determined necessary for accomplishment of research project objectives.

Prescribed fire may be conducted anytime of the year, depending when the area to be burned is in prescription. The preferred time for burning will be during times of low visitation and potential fire intensity.

The Park has 14 units delineated as prescribed fire units. See Figure 7 (page 44) for map.

These fires may be used whenever it is determined by resource management and fire management personnel that prescribed fires are necessary as a substitute for naturally occurring fires. Prescribed fire will also be used to restore fuel loading and vegetative



composition to the natural conditions that existed prior to the beginning of fire exclusion within the Park. In addition, it will be used to restore fire as a critical component of the ecosystem.

Actions included in the prescribed fire program include: selection and prioritization of projects to be carried out during the year, prescribed fire plans, prescription preparation, documentation, reporting, and prescribed fire critiques. Measures to ensure successful implementation of prescribed fires will include: prescribed fire plans prepared by a qualified Prescribed Fire Burn Boss (RXB2); prescribed fire plans will be reviewed by a qualified RXB2 at a minimum, and a technical expert to verify the proposal in regard to fire behavior, fuel conditions, operational assignments, contingency plans, and safety; prescribed fires will be conducted by a qualified Prescribed Fire Burn Boss with qualified support personnel present to accomplish objectives; adequate number of personnel to monitor, control hot-spots and fires outside control lines, support ignition needs, and complete initial attack on escape fires. Prescribed fire plans will be approved and signed by the Park Superintendent. Outside support in the form of NPS prescribed fire management teams, interagency incident management teams or other external interagency fire personnel may be requested for support in planning, implementation, or supplemental management stages.

a. Annual activities

Prescribed fire may be used throughout KNRI to accomplish resource management objectives as outlined in this plan. The Fire Program Coordinator will prepare the annual prescribed fire schedule with assistance from the NDG FMS, the Resource Management Division Chief, and the fire ecologist stationed at Wind Cave National Park. The program will detail all burn projects proposed for the coming year and will specify objectives of each burn. The program plan will be submitted to and reviewed by the Superintendent for approval.

The Fire Program Coordinator will recommend a Prescribed Fire Burn Boss for each specific planned fire. The Fire Program Coordinator and Burn Boss will conduct a field reconnaissance of proposed burn locations with park staff to discuss objectives and special concerns and to gather all necessary information to develop the Burn Plan. After completion of field reconnaissance, a prescribed fire plan will be developed.



• Individual Prescribed Fire Plans

The individual prescribed fire plan is a site specific action plan that describes the purpose, objectives, prescription, operational procedures, contingency actions, monitoring actions, and safety concerns involved in prescribed fire preparation and implementation. The treatment area, objectives, constraints, and alternatives will be clearly outlined, and no burn will be ignited unless all prescriptions in the plan are met. The factors considered in all prescribed fire plans are described in DO- 18. Prescribed fire plans will be prepared by a qualified burn boss, with technical assistance provided by the NDG Fire Management Office. All plans will be reviewed by the NDG Fire Management Office, Midwest Regional Office Fire Management staff and approved by the Park Superintendent.

The fifteen- year prescribed fire schedule is included in Appendix.H. This schedule is to serve as a plan and not be absolute. Prescribed fire projects may be added or removed from the plan to either a) conduct specific exotic species control, b) to simulate natural processes c) implement research burns within the park, d) aid in fuel reduction or e) expedite seed bed preparation prior to prairie restoration efforts.

b. Prescribed fire strategy

The long term prescribed fire strategy is to a) use prescribed fire to maintain the natural ecosystem, b) return the historic fire return interval to the FMU, c) restore the FMU to it's historic condition class.

Through the use of prescribed fire, approximately 70% of the FMU has been restored to a condition class II. Areas not currently at a condition class II or better are areas that are forested or heavily wooded and are not as easily restored at grassland units. The 15 year prescribed fire plan encompasses these units in an effort to improve condition class.

c. Prescribed fire operations

Prescribed fires shall be conducted under the direction and control of a Prescribed Fire Burn Boss designated by the Park. The project Burn Boss will be certified for that position according to standards currently utilized by the National Wildfire Coordination Group. All positions required to conduct the prescribed fire will be filled with qualified personnel. All personnel listed in the plan must be available for the duration of the burn or it will be postponed.

Operational guidelines, allowable ranges of fire behavior and allowable ranges in weather conditions shall be specified in the prescribed fire plan drafted for each prescribed fire project. Each prescribed fire project shall include monitoring and



evaluation as part of the project. This monitoring and evaluation must be a continuous activity during the actual burn operation. Its purpose is to ensure that the ongoing fire behavior and weather conditions remain within the prescribed fire plan parameters. The individual responsible for the ongoing fire monitoring/evaluation shall keep the project Burn Boss informed of significant changes that might result in changes of fire behavior or damage to resources.

When all prescription criteria are within the desired ranges, the Prescribed Fire Burn Boss will select an ignition date/dates based on current and predicted weather forecasts and available resources. If possible all personnel and equipment will be assembled on the day prior to the planned ignition date. A thorough briefing will be conducted stressing personnel assignments, resource placements, contingency actions, and safety concerns and measures to mitigate these concerns. Assigned personnel will be qualified and competent, and will know the locations of sensitive areas to be excluded from treatment. A current spot weather forecast will be obtained on the day of ignition, and all prescription elements will be rechecked to determine if all parameters are within the desired ranges. If all prescription criteria meet the planned ranges, a test fire will be ignited to determine on- site fire behavior conditions. If these conditions appear satisfactory and consistent with the plan, the fire will continue. If the test fire indicates the fire behavior to be outside the desired ranges, the test fire will be suppressed and the main burn will be postponed until conditions are more favorable.

The Prescribed Fire Burn Boss will, at a minimum, be a qualified Incident Commander Type IV (ICT₄). In the event a prescribed fire escapes the assigned holding resources, ignition of the prescribed fire in progress will cease. The on- scene IC or designee, will then assume control of the escaped fire and take appropriate suppression actions as discussed in the pre- burn briefing and identified in the contingency planning of the burn plan. If the prescribed fire does escape the predetermined area, suppression efforts, as discussed in the preburn briefing and identified in the contingency plan, will be initiated. The Superintendent, Fire Program Coordinator and NDG Fire Management Office will be notified immediately of the current escape and prescribed fire status. If an escaped prescribed fire declaration has been made, the project cannot return to a prescribed fire designation. For all escaped prescribed fires converted to wildland fire status, a Wildland Fire Situation Analysis will be prepared and appropriate resource orders will be placed.

d. Fire behavior and fire effects monitoring

Operational guidelines, allowable ranges of fire behavior and allowable ranges in weather conditions shall be specified in the prescribed fire plan drafted for each prescribed fire project. Each prescribed fire project shall include monitoring and evaluation as part of the project. This monitoring and evaluation must be a continuous activity during the actual burn operation. Its purpose is to ensure that the ongoing fire



behavior and weather conditions remain within the prescribed fire plan parameters. The individual responsible for the ongoing fire monitoring/evaluation shall keep the project Burn Boss informed of any and all changes which might result in the fire exceeding the prescribed fire plan parameters. Monitoring methods are found in the Fire Monitoring Handbook (NPS2003).

Weather and fuel moisture conditions must be monitored closely in planned burn units to determine when the prescription criteria are met. Weather data will be gathered prior to burn implementation to enable calculations of fuel moistures, energy release component, ignition component, and burning index can be completed. Fuel moisture samples of dead fine fuels, fine dead woody fuels (if appropriate), and live fuels will be collected, weighed, oven dried, and percent moisture contents calculated to assist in determining when conditions are consistent with the prepared prescription. This fuel moisture testing will occur at the designated locations in the Park.

Prescribed fire can be successfully used to return fire as an ecosystem process and to move plant communities toward more desirable compositions. Prescribed fires will be used at KNRI to meet a number of resource management objectives. Monitoring is used to help write measurable objectives and then observe if these objectives were met.

The Park will use the protocols in NPS Fire Monitoring Handbook (2003) to examine short and long- term fire effects. More details about this program will be found in the Fire Effects Monitoring Plan (Appendix F).

e. Prescribed fire critique

The Superintendent may convene a review committee for any prescribed fire. A report detailing the actual burn will accompany any recommendations or changes to the program identified. The report will be submitted to the Superintendent, the Area Fire Management Officer, and the Regional Fire Management Officer for review.

f. Reporting and documentation for accomplishments and prescribed fires

All prescribed burn documentation will be completed by the Prescribed Fire Burn Boss and the NDG FMS. Fire monitors will collect all predetermined information and complete all necessary forms prior to, during, and after the burn. All records will be archived in the park's fire records and stored in the Fire Management or Resource Management Office for future use and reference.

The Prescribed Fire Burn Boss will prepare a final report on the burn for the Superintendent. Information will include a narrative of the burn operation, a determination of whether or not the objectives were accomplished, weather and fire



behavior data, a map of the burn area, photographs of the burn, number of hours worked, and final cost of the project.

Each prescribed fire documentation package will include the following:

- Documentation of all management decisions concerning the project
- Prescribed Fire Plan
- On- site Weather Observations
- Project Maps
- Open Burning Permits
- Spot Weather Forecasts
- Narrative Summary Analyzing Costs, Objectives, and Chronology of Events
- Individual Fire Report Form (DI- 1202)
- Fire Monitoring Report (forward to MWAC)
- g. Fuel treatment history maps**

After all prescribed fires or other fuel treatments, information will be updated to the Historic Fuel Treatment Map file. Current fuel treatment history map is located in Appendix H- 3.



h. Park Specific Prescribed Fire Plan Requirements

All prescribed fire plans will at a minimum contain the following information (*outline in RM- 18 Chapter 10 from The Interagency Prescribed Fire Planning and Implementation Guide 2006*):

- | | |
|--|--------------------------------------|
| 1. Signature page | 18. Wildfire Conversion |
| 2. GO/NO- GO Checklists | 19. Smoke Management and Air Quality |
| 3. Complexity Analysis | 20. Monitoring |
| 4. Description of the Prescribed Burn Area | 21. Post- burn Activities |
| 5. Goals and Objectives | <u>Appendices</u> |
| 6. Funding | 1. Maps |
| 7. Prescription | 2. Technical Review Checklist |
| 8. Scheduling | 3. Complexity Analysis |
| 9. Pre- burn Considerations | 4. Job Hazard Analysis |
| 10. Briefing | 5. Fire Behavior Modeling |
| 11. Organization and Equipment | Documentation or Empirical |
| 12. Communication | Documentation (unless empirical |
| 13. Public and Personnel Safety | documentation is included in |
| 14. Test Fire | the fire behavior narrative in the |
| 15. Ignition Plan | Element 7. Prescription) |
| 16. Holding Plan | D. Monitoring |
| 17. Contingency Plan | |

A sample of a burn plan is located in the Appendix H- 4.

2. EXCEEDING EXISTING PRESCRIBED FIRE BURN PLAN

In instances where the Wildland Fire Transition Plan is implemented, a WFSA will be completed and an appropriate management response will be initiated based on the WFSA.

3. AIR QUALITY AND SMOKE MANAGEMENT

National Park Service fire management activities which result in the discharge of air pollutants, (e.g., smoke, carbon monoxide, and other pollutants from fires) are subject to, and must comply with, all applicable federal, state, interstate, and local air pollution control requirements. These requirements are specified by Section 118 of the Clean Air Act, as amended (42 U.S.C. §7418). It is not the primary intent of the Clean Air Act to manage the impacts from natural sources of impairment (i.e., wildland fire use for resource objectives and unwanted wildland fire). Smoke from these fires is an inevitable by- product. Fires are not considered



point sources of emissions, but tend to be spatially distributed singular events, and temporary impacts to visibility and visitor enjoyment must be recognized, expected, and managed. This may include temporary closures or warnings during the progress of management approved prescribed fires. Smoke drift affecting neighbors and public roads is a concern.

Pertinent areas that will demand attention include County Road 37 which borders the West edge of the park, the County Road 18 corridor which splits the park North to South.

Other areas include the City of Stanton and numerous private homes that border the park on all sides.

KNRI is designated a Class II air shed under the Clean Air Act. Air quality and meteorological data is neither monitored nor maintained at the park.

KNRI will comply with Air Quality- Smoke Management Guidelines listed in RM- 18. The fire management program will be in compliance with interstate, state, and local air pollution control regulations, as required by the Clean Air Act. The procedures to ensure compliance will include:

- The NDG Fire Management Office will contact local and state authorities to ascertain all procedures prerequisite to compliance with regulations or permits will obtain any necessary permits or ensure in writing that regulatory requirements will be met. A copy of the KNRI Fire Management Plan and Prescribed Fire Plans will be forwarded to the appropriate authorities, if necessary. Personnel from permitting agency will be allowed on- site during prescribed fires and wildland fires used for resource objectives for observational purposes if necessary for their agency needs.
- Prescribed burning will be conducted only on days that are acceptable to the permitting agency, local authorities will be contacted and kept informed of current status of fire(s). Any monitoring activities will be coordinated with the permitting agency and information collected will be made available to them as requested. If needed, the park will also notify local Federal Aviation Administration offices so that pilots may be made aware of possible temporary visibility impairments.
- All Prescribed Fire Plans will have clear objectives and will monitor impacts of smoke on the human and natural environments. Current and predicted weather forecasts will be utilized along with test fires to determine smoke dispersal. The fine- grass fuels in the park generate low



volumes of smoke for short duration and are not usually a smoke management problem. An air dispersion analysis using the Simple Approach Smoke Estimation Model (SASEM), or a similar model, may be used to assess the impact to surrounding areas and detail the atmospheric conditions under which a burn can be successfully completed within the ambient standards.

Prescribed burns ignited in proximity to structures will be ignited only after careful considerations are given to levels of visitation and impacts upon visitation and local residents.

Considerations useful in managing smoke from longer duration fires include:

- Develop contingency plans to limit smoke production if the need arises (may involve suppression on portions of the line).
- Establish and maintain close communication with state and local air regulatory agencies regarding status of such fires.

E. NON- FIRE FUEL TREATMENT APPLICATIONS

While not anticipated to be necessary at this time, limited mechanical treatments, including mowing or light thinning with chain saws may also be used as needed, so long as impacts to other park resources are adequately considered. These could be tools used to meet the objectives specified earlier in this plan.

F. EMERGENCY REHABILITATION AND RESTORATION

Because of the rapid post- burn regeneration of the grassland communities in the park, emergency rehabilitation and restoration is not expected to be needed for any aspect of the fire program.



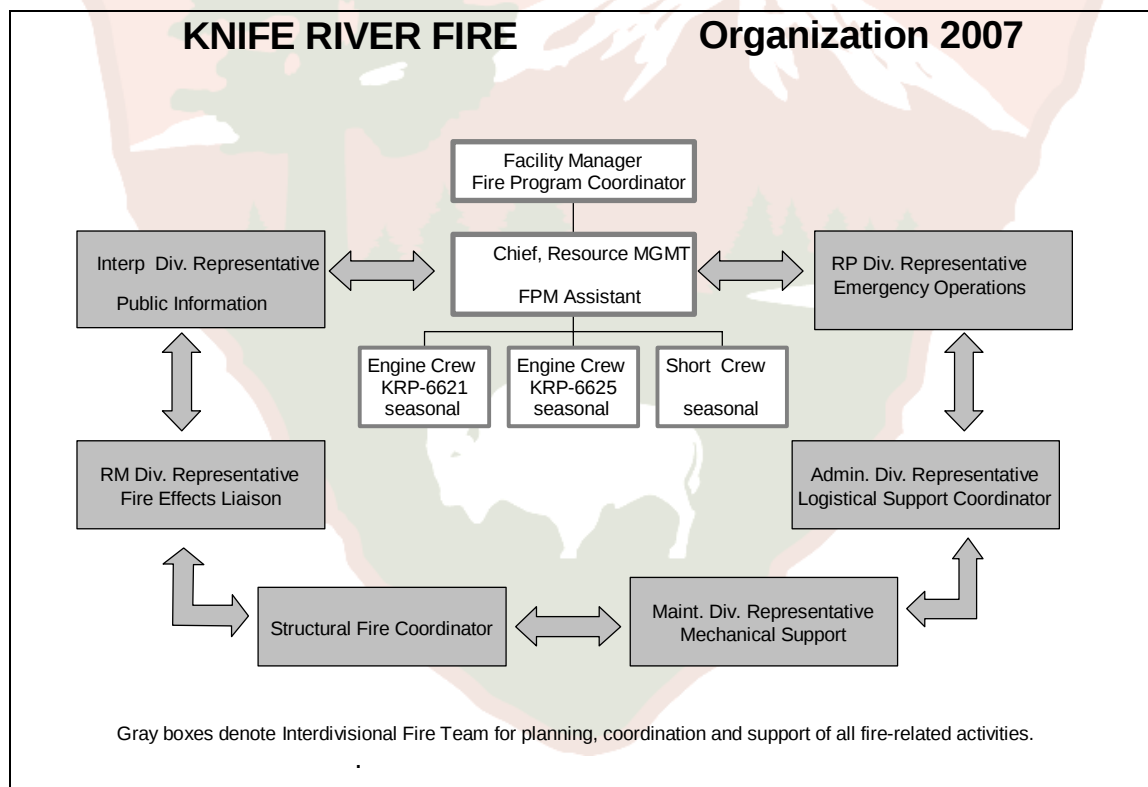
V. ORGANIZATIONAL AND BUDGETARY PARAMETERS

This chapter describes the key personnel for fire management at KNRI. The sections below delineate the chain of command, describe responsibilities, and recommends targeted fire qualifications needed to ensure safe and efficient fire operations. It also describes interagency roles and responsibilities for coordination and cooperation.

A. ORGANIZATIONAL STRUCTURE AND RESPONSIBILITY

• KNRI organizational structure and responsibility

While direct oversight of the Fire Management Program at Knife River is the responsibility of the FPC, participation from all divisions is necessary to ensure all fire management activities are conducted safely and according to legal and policy constraints. The park utilizes a team approach to share responsibility and ensure input from across the park staff. Below is Fig. 9, the general organizational structure for the KNRI Fire Program:





Individual roles and responsibilities for the KNRI Fire Management Program are as follows:

Park Superintendent:

- Responsible for overall operation and management of the park, ensures that Department, Service and park policies are maintained and followed.
- Secures funds and personnel needed to meet the objectives of the park's Fire Management Program.
- Responsible for overall fire prevention within the park.
- Approves decisions to manage wildland fire as a suppression incident.
- Signs Go/No Go checklist for each prescribed fire.
- Signs verification forms for fuel management activities.
- Ensures that all park divisions support the team effort to maintain a fire management program.
- Approves Fire Management Plan and all burn plans.
- Responsible for implementation of the Fire Management Plan.

Fire Program Coordinator (Facility Manager):

- Provides oversight for the park Fire Management Program as part of the Resource Management Program.
- In coordination with the NDG FMS, ensures that the fire management program complements resource management objectives and complies with NPS and interagency fire policy.
- Coordinates the approval process for the FMP including public scoping, internal and public review, and other NEPA compliance.
- Obtains input from technical experts for all fire planning.
- Ensures training opportunities for park fire personnel across all park divisions based on identified park needs and individuals' interest, and with supervisors' support.
- Provides general oversight for monitoring and research programs designed to evaluate fire effects on resources.
- Ensures technical staff for natural and cultural resources are trained to function in the Resource Advisor capacity.
- Ensures that appropriate fire management activities are incorporated into the park's Geographic Information System database.
- Ensures pre- and post- burn archaeological surveys are conducted in areas of potential impact from planned fire management activities.
- Serves as Team Leader for the park Fire Management Team.
- Ensures fire preparedness; maintains readiness for one type six and one type seven engine throughout the year; notifies Maintenance of equipment and vehicle repair needs via work requests; maintains fire cache; manages



support budget; requisitions fire equipment; utilizes support funding to the benefit of the park.

- Organizes, coordinates and conducts fire training for park staff, including annual refreshers, in cooperation with NDG FMS.
- Maintains individual park firefighter files; ensures all documentation is complete for each firefighter; ensures files are reconciled with IQCS database.
- Administers pack tests, coordinates physical exams, submits documentation to NDG FMS; ensures firefighters are issued red cards from NDG FMS correctly and in a timely manner.
- Ensures all documentation for park fires (including DI- 1202 reports) is completed and provided to NDG FMS for input into the national database; ensures fire spatial data is input to the park's relational (GIS) database.
- Coordinates with the NDG FMS and Knife River staff to plan and implement prescribed fires under the FMP; assists NDG FMS in writing prescribed fire plans.
- Qualified as an Incident Commander Type IV (ICT₄) and Prescribed Burn Boss Type 2 (RXB₂) within the National Wildfire Coordination Group (NWCG) fire qualification system.
- Coordinates park personnel dispatches for in- and out- of- park fire assignments with NDG FMS and North Dakota Interagency Dispatch Center (NDIAC).

Fire Management Team:

- This team consists of the Park Superintendent, the Facility Manager (Fire Program Coordinator), the Chief of Resource Management, and representatives from each division as identified by each division chief. The Park Superintendent may, at his/her discretion, designate other personnel to serve on the Fire Management Team.
- Meet at least once between fire seasons to review fire operations, identify problems/issues, and make recommendations for changes at the park or North Dakota Area level as needed to improve the program; discuss upcoming fire budget for the park and make recommendations for use of support funds.
- Review the Fire Management Plan, particularly the prescribed fire schedule, making revisions as deemed necessary.
- May be convened by the Park Superintendent whenever fire and/or weather conditions present a serious threat to park facilities or resources, or neighboring property, to evaluate fire potential, weather and management concerns; determine an appropriate course of action, using the Fire Management and Resource Management Plans as guidelines and



any prepared Wildland Fire Situation Analysis for ongoing fires.

Fire Effects Liaison (Facility Manager):

- Primary park contact for the Northern Great Plains (NGP) Fire Ecologist and Fire Monitoring Team.
- Responsible for ensuring ecological aspects of fire are incorporated into all aspects of the park Fire Management Program.
- Coordinates environmental compliance process for all fire- related activities.
- Lead author for NEPA- related documents pertaining to the Fire Management Program. Establishes interdisciplinary teams for completing environmental assessments of impact statements as needed.
- Serves as park liaison with the NGP fire monitors; coordinates monitoring and research programs designed to evaluate fire effects on resources.
- Works with NGPA Fire Ecologist to ensure fire effects monitoring is integrated with the NPS Northern Great Plains Inventory and Monitoring Program.
- Assists in development of five- year plan for prescribed fire activities.
- Develops information base on fire behavior and effects.

Chief of Resource Protection:

- Ensures fire suppression activities are integrated with other emergency operations (law enforcement, search and rescue, structural fire protection) in the park.
- Coordinates, with NDG FMS and Fire Program Coordinator to determine appropriate suppression actions for fires.
- Provides a member of division, as well as the Structural Fire Coordinator, for participation on Fire Management Team.
- Supports and encourages fire training and assignments for staff, particularly higher- level skill positions.
- Supports the fire program by making personnel available for park fire operations, out- of- park fire assignments, and fire training to the extent possible.

Chief of Interpretation:

- Incorporates fire management information into interpretive programs, when appropriate.
- Advises of cultural resource concerns; notifies State Historic Preservation Officer (SHPO) of planned fire activities for Section 106 compliance.
- Provides fire information to park staff and visitors.



- Ensures that accurate information is incorporated into park books, brochures, and exhibits.
- Provides for on- site interpretation of fires when appropriate and safe.
- May serve as Fire Information Officer (FIO), as appropriate.
- Supports the fire program by making personnel available for park fire operations, out- of- park fire assignments, and fire training to the extent possible.

Administrative Assistant:

- Provides overall administrative support for the fire management program to include budget support, personnel services, contracting and purchasing.
- Provides a member of division for participation on Fire Management Team.
- Supports the fire program by making personnel available for park fire operations, out- of- park fire assignments, and fire training to the extent possible.
- Completes travel documents for fire personnel from all park divisions dispatched on assignment; maintains assignment log.
- Completes time recording for firefighters on park fires, and submits to appropriate timekeepers for payroll purposes.
- Serves a dispatch for in- park fire suppression activities.
- Assists Fire Coordinator in maintaining fire personnel files and all park fire records; tracks training and fire experience.
-

Facility Manager:

- Responsible for overall maintenance of fire cache building, equipment and fire fighting vehicles.
- Provides a member of division for participation on Fire Management Team.
- Supports the fire program by making personnel available for park fire operations, out- of- park fire assignments, and fire training to the extent possible.
- Completes travel documents for fire personnel from all park divisions dispatched on assignment; maintains assignment log.
- Completes time recording for firefighters on park fires, and submits to appropriate timekeepers for payroll purposes.
- Maintains fire personnel files and all park fire records; tracks training and fire experience.



All qualified park personnel will be subject to occasional fire duty. The order of preference shall be dependent on availability/response time, level of qualification, and complexity of fire assignment. Division Chiefs are also responsible for making a reasonable effort to provide qualified firefighting personnel from their staffs to assist with wildland and prescribed fire support efforts, both locally and nationally.

B. FUNDING

Funding may be available for approved equipment needs and prescribed fire operations. Project proposals, for prescribed fire and mechanical projects, are submitted through normal channels for approval.

C. NORTH DAKOTA GROUP FIRE MANAGEMENT OFFICE RESPONSIBILITY

The North Dakota Group Fire Management Office (located at Theodore Roosevelt National Park) was established to provide guidance and technical support for participating national park units (Theodore Roosevelt, Knife River and Fort Union) The following are the key positions associated with this shared office and their responsibilities in the Knife River Fire Management Program.

Fire Management Specialist (FMS):

- Responsible for overall safety of the Fire Management Program.
- Coordinates fire management activities within the North Dakota Group, providing technical assistance and advice to parks as needed. Reviews and advises the Superintendent at KNRI on requests for fire emergency assistance, operational activities required for the implementation of this Fire Management Plan, and completeness and correctness of all final fire reports.
- In cooperation with the Superintendent, is responsible for assisting and coordinating the park's fire management program. This responsibility includes coordination and supervision of all prevention, pre- suppression, detection, prescribed fire, suppression, monitoring, and post- fire activities involving park lands. Submits budget requests and monitors support funds allocated to Knife River Indian Villages National Historic Site.
- Nominates personnel to receive fire- related training as appropriate.
- Coordinates the implementation of the Fire Management Plan with other governmental agencies administering adjacent lands and with local landowners. Develops and implements cooperative fire management agreements with other federal, state, and local agencies and with the local



landowners.

- Coordinates, prioritizes, and submits all funding requests for fire program activities. Reviews all burn plans and Fire Reports (DI- 1202).
- Approves IQCS qualifications, incident qualification cards (REDCARDS) and certifies Task- books (certifies).
- In cooperation with the park FPC, develops short and long- range plans for prescribed fires. Is responsible to coordinate Prescribed Fire Plans for individual projects.
- Responsible for coordinating development of Prescribed Fire Plans for individual projects.
- Makes entries into NFPORS database for prescribed fire and fuels treatment planning.
- Coordinates preparation and implementation of prescribed fire and fuels treatment projects.
- Coordinates annual firefighter refreshers.
- Develop, coordinate and conduct fire training as necessary to meet wildland fire needs of the park according to approved Fire Management Plan and local and national guidelines.
- Coordinates Fire Preparedness Reviews and site reviews.

The fire ecologist position is located at Wind Cave National Park and will have the following duties.

Fire Ecologist NGP:

- Analyze and interpret fire effects data and report findings to Park Superintendent and fire staff.
- Manage fire effects database (monitoring plot database, spatial data, photographic images).
- Assists with describing monitoring types and developing prescribed fire objectives.
- Coordinates fire- related research.
- Assists with writing various management plans and compliance documents; helps ensure ecological implications of fire are included in all park planning.

Lead Fire Monitor NGP:

- Responsible for implementing the park's Fire Monitoring Plan and descriptions of monitoring types.
- Responsible for all standard (NPS Fire Monitoring Handbook 2003) fire effects monitoring activities in the park; will coordinate with the FPC and Fire Effects Liaison.



PARK FIRE QUALIFICATIONS

The park will target the following minimum number of qualified people for the identified fire management positions. Additional wildland qualifications will be developed from park staff as interest, training and physical fitness requirements allow. (see Table 7)

Table 7: Targeted Fire Management/Incident Management Positions

Fire Organization Position	Number Targeted for Park
Firefighter – Type II (FFT ₂)	6
Crew Boss	1
Squad Boss	2
Engine Boss (ENGB)	2
Ignition Specialist	1
Burn Boss - Type II	1
Incident Commander - Type V (ICT ₅)	2
Incident Commander - Type IV (ICT ₄)	2
Public Information Officer	2
Resource Advisor	2

The park has identified a need for personnel familiar with park- specific natural and cultural resource issues, as well as local terrain, land ownership, and access routes. These personnel would be used as resource advisors and would advise cooperating agencies on park resource issues, serve as lookouts, advise on access routes, and serve as liaison with landowners. A minimum of two people should be qualified in this capacity.

All personnel, seasonal and permanent, involved in wildland fire suppression, prescribed burning, or fire monitoring will meet national standards as determined by the Interagency Wildland Fire Qualifications System. Park personnel assigned fire management responsibilities and tasks are to meet the minimum training and experience guidelines for the position held. All personnel involved in fire management operations will have their qualifications, training, and experience entered into the NPS Fire Qualifications System (IQCS Database).

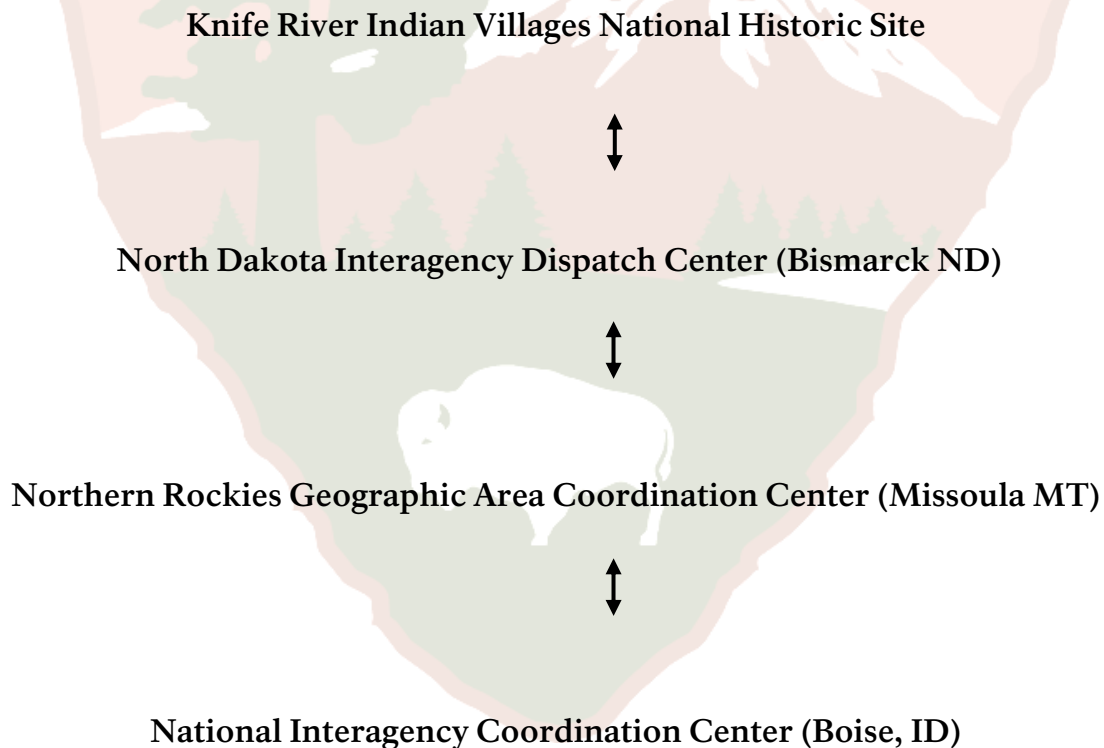


D. Interagency contacts, coordination and agreements

An Interagency Cooperative Fire Protection Agreement (Six Party Agreement) exists between the US Department of Interior, BLM- Montana, NPS- Midwest Region, BIA- Great Plains and Rocky Mountain Regions, US FWS- Mountain Prairie Region, USDA- Forest Service North Region and the State of North Dakota- NDSU, NDFS. This agreement allows exchange and use of resources for interagency assistance. Knife River Indian Villages NHS also has a Memorandum of Understanding with Stanton Rural Fire Department to provide initial attack response if required.

From an interagency standpoint, Knife River Indian Villages National Historic Site is situated in the Northern Rockies Geographic Area. Coordination for resource orders for in- park needs and out- of- park needs are served through the following logistical support sequence:

Fig. 10: Logistical Support Sequence





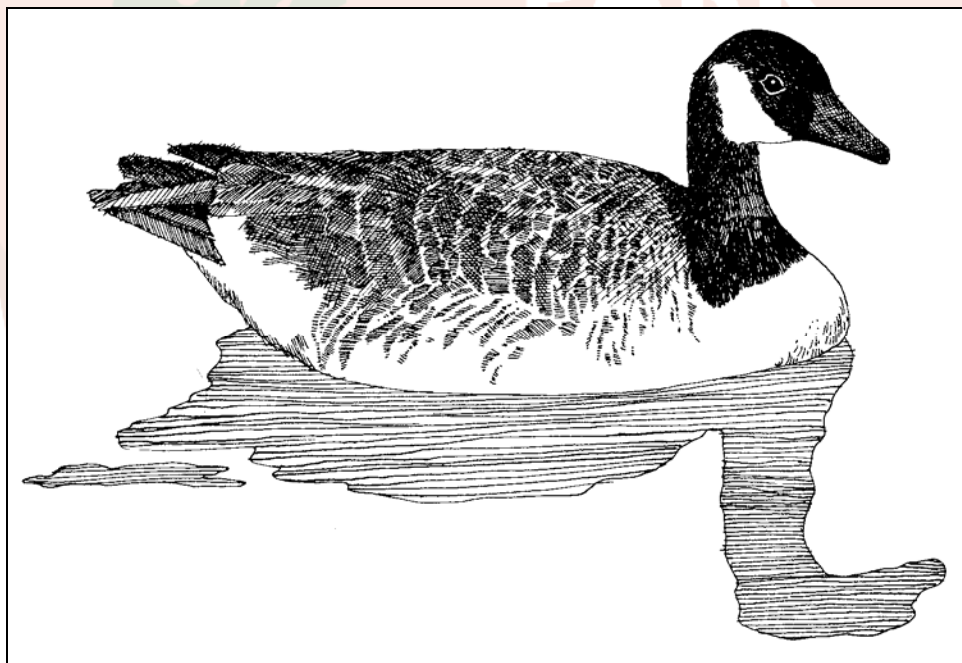
The North Dakota Interagency Dispatch Center (NDIDC), located at Upham ND, provides the primary wildland fire dispatching function for KNRI. The North Dakota Interagency Dispatch Center tracks the availability of KNRI's resources during fire season. Procedures for requesting assistance are found in the North Dakota Dispatch Center Mobilization Guide, published annually.

KEY INTERAGENCY CONTACTS

Interagency contacts are found in appendix M.

FIRE- RELATED AGREEMENTS

All fire related agreements are found in appendix E.



Canada Goose



VI. MONITORING AND EVALUATION

NPS fire management funds limited long- term fire effects monitoring, targeted only at vegetative responses to fire. Fire effects monitoring involves systematic collection and recording of fuels, topography, weather, air quality, and fire behavior data during prescribed fires. Monitoring will follow the protocols outlined in the NPS *Fire Monitoring Handbook* (2003). This monitoring will be completed by the Northern Great Plains Area Fire Monitoring Team, duty stationed at Wind Cave National Park, with assistance provided by park FPC and other park staff. Monitoring is the key to a successful understanding of prescribed fires by evaluating the long- term achievement of the established, measurable resource management objectives described in the individual prescribed fire plan. Plots, photo points, and vegetation transects will be included as part of the monitoring program to document burn results and long-term vegetation response. Monitoring data will be archived and reviewed for future refinement of prescriptions and to determine program success.

The KNRI Fire Monitoring Plan, included as *Appendix F* of this plan, details the fire effects monitoring program, including monitoring design, vegetation monitoring types, and data management protocols.

The park would like to institute an intensive ecological fire monitoring program that provides a more comprehensive analysis of the broad range of fire effects various prairie community components, such as ground- nesting birds, lepidoptera, raptors, small mammals, rare plants, ungulates. However, funding for such comprehensive monitoring is non- existent. The NPS Northern Great Plains Inventory and Monitoring Program (NGP I&M), is part of a servicewide program, and is currently conducting baseline inventories of vascular plants, mammals, fish, herpetofauna, and birds for thirteen park units in the northern plains. The program will soon transition to targeted “vital sign” monitoring for key ecosystem indicators across the parks, and this monitoring will be integrated with the fire funded fire effects monitoring, leading to more ecologically- based, long- term monitoring. The Knife River Resource Management Program, the NGP I&M Program, and the NDG Fire Program will work with various cooperators to effect this monitoring.

Targeted short and long- term plant, animal and archaeological resource monitoring key to a particular Prescribed Fire Unit may be stated in the specific Prescribed Fire Plan for that unit. At a minimum, monitoring will comply with NPS monitoring protocol identified in the *Fire Monitoring Handbook* (2003). Data collected from short term monitoring will be attached to the fire report along with any narrative completed by the Fire Monitoring Team.



VII. FIRE RESEARCH

Fire research and long- term monitoring needs beyond the fire effects monitoring conducted by the NGPA Fire Monitors can be addressed by submitting project statements into the NPS PMIS project database.

These projects may include planned long- term work to research fire effects beyond the monitoring provided for in the *Fire Monitoring Handbook (2003)*. Additional work is needed to develop fire programs that better approximate natural fire results. Studies are needed to determine the effects of fire on invasive non- native plant species. Some research has been done on the effects of burns at different times of the year, but further work is needed. Projects should also be submitted to more accurately depict current fuel loading and project future loading with respect to archaeological resources, increasing fuel loads and impacts of wildfire on archaeological resources when burned in abnormally high fuel loads.



Firefighters conduct post burn reads on a research plot at KNRI, NPS photo



VIII. SAFETY

PUBLIC SAFETY

Because wildland fires are dynamic and can be hazardous, they must be given very high priority during certain critical conditions. Employees responsible for and involved in any wildland fire management activity must always consider the safety of human life above all other values. Assuring visitor safety takes priority over other activities at all times; being able to provide a consistent and accurate evaluation of fire behavior is the basis for contingency plans, contacts, and briefings that ensure public and personnel safety. The following are KNRI's public and employee safety considerations:

- There are limited opportunities to find safety zones for escaping from a fast moving wildland fire on the park trail and road system. Park visitors will likely not be able to recognize a safe area so emphasis will be to sweep potentially affected areas as quickly as possible.
- Certain areas may be closed to use when the risk to visitors is too high or there are not enough personnel to handle the situation any other way. The authority to close areas is cited in 36 CFR 1.5.
- Information concerning fire danger will be disseminated through entrance station and visitor center contacts and trailhead/bulletin board signing.
- Any time human life may be endangered, all necessary means will be taken to warn or evacuate visitors and neighboring landowners and other users.
- Smoke on roadways may create a vehicle visibility hazard, from a fire burning nearby or at night under light wind conditions. It could also occur on roadways outside the park.

The NDG Fire Management Office will inform the FPC and the Superintendent of all potentially hazardous fires in the park. The FPC and the Superintendent will then coordinate public and interagency notifications and implement suppression actions to mitigate the fire's impact within and outside the park. The extent of public notice will depend on the specific fire situation. The following actions should be considered:

- When fire affects travel along any roads in or near KNRI, rangers will be dispatched to stop or control traffic. The State Patrol and Mercer County Sheriffs office will be informed and assistance requested as needed.
- When evacuation of an area is recommended, the Superintendent and the Park's law enforcement officer will be informed immediately.



- When heavy smoke impacts trails, park personnel will be sent to inform visitors, and depending on the situation, assure them of their safety, or ask them to leave. Notices will be posted at trailheads, prior to conducting prescribed fire projects.
- When fire is projected to rapidly spread and threaten trails where hikers are known or strongly suspected to be, a park employee will be dispatched to the area by best possible means to notify visitors of the danger. Such individuals will be knowledgeable of fire behavior and fire safety principles to be able to stay with visitors as long as needed to assist them to safety.
- As part of initial and continuing size- up, the incident commander will determine the proximity to the fire of any visitors or other land users, inform them of potential hazards, and aid in evacuation if needed. If life is threatened, and the parties do not cooperate, law enforcement assistance may be requested through Mercer County Sheriffs office.
- When needed, information on location, behavior, expected dangers, areas to avoid, and other precautions will be posted on park bulletin boards, at the entrance stations, local post offices, and businesses.
- When the risks from a wildland fire are high, precautionary signs will be posted on roads and trails leading into the fire area. Trails and day use sites will be closed if deemed necessary by the Superintendent. The Prescribed Fire Burn Boss will ensure that closure and/or informational signs on prescribed burns are properly posted.

An Incident Status Summary (ICS- 209) for all fires burning over 24 hours will be provided to the park information officer. Information on the fire activity will be broadcast on the park radio as part of a morning report. The status summary will be distributed to all park divisions on a daily basis.

Smoke plume trajectories from large fires will be plotted using computer programs, weather information and onsite monitoring. Expected smoke impacts on off- park communities and roadways will be evaluated and information shared with the respective agencies. If needed, vehicular or air patrols will be used to monitor smoke plumes.

The Fire Information Officer will notify and make media releases to local TV and newspapers, and through electronic mail. If needed, a park information "hot line" will be installed, and the Fire Information Officer will update the message whenever new fire information is available. Additional notification will be made



to cooperating agencies, as appropriate, about park fires through the Fire Information Officer.

FIREFIGHTER SAFETY

Ensuring and maintaining firefighter safety is of the utmost importance and takes precedence over rapid suppression targets or goals. On all actions on wildland fires in KNRI, the Fire Orders and the Watch- Out Situations will be strictly adhered to. Failure to maintain communications and to obtain fire behavior predictions and weather forecasts constitute grounds for suppression forces to withdraw from firelines and re- establish tactics. It will be the responsibility of the Fire Safety Officer or the Park Safety Officer to ensure that all safety measures are implemented and anyone failing to adhere to fireline safety will be removed from the fire.

The Incident Commander or Prescribed Fire Burn Boss will ensure that:

- All firefighters will wear proper personal protective equipment.
- All firefighters will have completed basic wildland fire training S- 130/190.
- Communications are possible with all people involved with the fire.
- Fire weather will be taken at minimum every hour during on going fires.
- Any significant change in fire behavior or weather will be communicated immediately to everyone on the fireline.



IX. PUBLIC INFORMATION AND EDUCATION

Good public relations can engender public support and is prerequisite to a successful fire management program. Failure to provide good public information can be responsible for collapse of the program. On the prairie, fires can spread very quickly and visibly, necessitating that timely, accurate wildland fire information be provided to park visitors and adjacent land owners.

The Superintendent's Office will issue all press releases regarding fire danger levels, closures, special precautions, and prescribed fires to newspapers, radio and television stations, unless this task is specifically delegated to the Incident Commander or Incident Management Team. The Chief of Interpretation or other designated staff member, when necessary, will function as Public Information Officer, and provide for effective communication between park personnel, the public, and the media. The fire management program will be incorporated into the park's overall interpretive program and explained when possible and appropriate. At higher staffing classes and/or during periods of high fire activity, a Public Information Officer may be ordered from outside the park. Prior to prescribed fires, the FPC will inform project personnel on details of the burn. Landowners or agencies located near the prescribed burn will be contacted and the Superintendent will initiate a press release. On the day of the burn, all staff should be notified as to the burn's location and any special safety warnings to pass on to visitors, i.e., caution to watch for smoke on the road, or advice not to hike in the area. Key visitor use or access sites where visitors could likely observe or approach the burn area should have temporary signs indicating a management fire is occurring. This provides for public safety and education, and decreases the likelihood that visitors will report or attempt to put out a wildland fire use or prescribed fire accomplishing resource objectives.

Post- season activities will include those tasks necessary to adequately assess how the local public and cooperators received the park's fire management efforts. This will be accomplished through coordination with neighbors, local groups, and the State Department of Air Quality. The bulk of this coordination will be performed by the park's FPC, though the rest of KNRI staff may be involved, depending on interest and need. The purpose of this feedback is to revise plans, procedures, and educational efforts regarding overall fire management at KNRI.

The Fire Program Coordinator will cooperate with the Chief of Interpretation on the following programs:

- Development of a brief interpretive handout which will discuss the basic



objectives of using both Prescribed Fire and Wildland Fire Use.

- Develop an outline and materials for an evening program that contains a prevention message and describes the park's fire program.
- Maintaining a file of public comments received concerning prescribed burns, and using them to improve communication efforts targeted at increasing support for the fire management program.



Bull Snake crossing Knife River, NPS photo



X. PROTECTION OF SENSITIVE RESOURCES

The Fire Management Specialist will work closely with the park's Chief of Resource Management and/or Chief of Resource Interpretation to identify all historic, ethnographic and archeological resources; cultural landscapes; habitat for threatened, endangered, or other species of concern; and collections that need special attention to provide protection from fire. KNRI archeological sites are described in the *Cultural Management Plan* maintained in the office of the Chief of Interpretation. The Inventory and the Cultural Component of the Cultural Management Plan will be consulted when planning prescribed burns or during preparedness activities. Protective measures may be used around sensitive sites. All sensitive sites will be addressed in site specific Prescribed Fire Plans, or as required by the Cultural Resource Specialist.

When making decisions regarding management actions for wildland fire, incident commanders will consider potential impacts to resources including cultural resources prior to implementation. Cultural resource protection actions will be utilized when necessary and or safely possible. A variety of fire management techniques including black lining, foam and or water application, and mechanical fuel removal may be utilized to protect sensitive areas.

As a general rule, vehicle traffic is limited to established roads in the park and is strictly regulated in high density archaeological areas. Fire suppression and prescribed fire activities involve construction of black- line and scratch line, use of swatters, and direct attack with water, all primarily in fine fuels. Soil disturbance is not encouraged and will not likely occur under most fire management events. Consequently, cultural resources are not likely to be adversely affected. The order of attack, to minimize soil disturbance, is as follows:

- (1) Direct attack with water resources (engine use only from established roadways).
- (2) Use of swatters.
- (3) Burning- out to create a black- line.
- (4) Direct attack with water resources (off- road).
- (5) Construction of a scratch line.



XI. FIRE CRITIQUES AND ANNUAL PLAN REVIEW

This FMP will be reviewed and evaluated annually to determine if the resource objectives are current and being met, and to make necessary revisions. The NDG Fire Management Office and Knife River Fire Management Team will conduct this evaluation. Any problems associated with the guidelines or standards set for fire management, cost effectiveness and suppression will be addressed through revision or addendum and made a part of this plan. The Superintendent will approve all revisions.

Fire reviews will be conducted in accordance with procedures found in *RM- 18*. Each review will be documented and filed with the final fire documentation. The Fire Management Officer will retain a file copy.

The Knife River Fire Management Team and cooperators will critique all suppression actions on fires having extended attack and multi- period activities, if appropriate. If the need exists, the Regional Fire Management Officer can be included in such reviews and a national review by the National Fire Management Program Center can be requested.

All entrapment and fire shelter deployments will be reviewed in accordance with NWCG "Wildland Fire Entrapment/Fatality Initial Report and Entrapment Investigation Element Matrix" (*RM- 18*, Chapter 13).



XII. CONSULTATION AND COORDINATION

The primary duty of the park staff is to carry out the fire management program with emphasis on human safety and prevention of damage to threatened and endangered species, natural resources, private and public buildings and facilities. Careful planning, good public information and a well- trained staff can provide for a safe and effective fire program.

The NDG Fire Management Officer is responsible for coordination and consultation with cooperators regarding fire management activities. This includes involvement with the Midwest Regional Office; Northern Rockies Coordinating Group; North Dakota Interagency Dispatch Center; North Dakota Interagency Fire Council; U.S. Forest Service, U.S. Fish and Wildlife Service; North Dakota State Forestry Department, Bureau of Indian Affairs, Bureau of Land Management and local cooperators.

The following staff participated in the planning and preparation of this fire management plan:

Knife River Indian Villages NHS

Rod Skalsky, Facility Manager
Brian McCutchen, Superintendent KNRI
John Moeykens, Chief of Resource Management
Terry O'Halloran, Chief of Interpretation

North Dakota Group Fire Management Office (Theodore Roosevelt)

Gary Luce, NDG FMS

Northern Great Plains Area Fire Management Office

Jim McMahon, Fire Management Officer
Cody Wienk, Fire Ecologist
Andy Thorstensen, Lead Fire Effects Monitor
Dan Morford, Prescribed Fire Specialist

Others Assisting

Doug Alexander, Midwest Region Chief of Fire and Aviation
J.P. Mattingly, Midwest Regional Fire Management Specialist
Scott Beacham, Midwest Region, Fuels Management Specialist
Paul Mancuso, Midwest Region Fuels Management Specialist
Jay Sturdevant, MWAC, Archaeologist
Paul Picha, North Dakota SHPO, Chief Archaeologist
Cheryl Schreier, Superintendent Herbert Hoover NHS