

I. INTRODUCTION

One of the primary objectives of the U.S. Fish and Wildlife Service (Service) in managing natural areas is the maintenance of ecosystems and their dynamic processes to ensure as nearly as possible a functional natural environment. As one of these processes, fire can constitute one of the greatest influences on an ecosystem.

U.S. Fish and Wildlife Service policy requires that an approved Fire Management Plan must be in place for all of Service lands with burnable vegetation. This plan meets that requirement.

II. REFUGE DESCRIPTION

The Boyer Chute National Wildlife Refuge (hereinafter referred to as the Refuge) is located in Eastern Nebraska, three (3) miles east of the town of Ft. Calhoun and about 10 miles north of Omaha (Map 1). Currently, the Refuge boundary encompasses 3,121 acres which the Service acquired from Papio-Missouri Natural Resources District (NRD). Of the 3,121 acres within the Refuge boundary, 3,065 is considered flammable fuel. The remaining acreage is open water. All land bordering the Refuge is in private ownership with the exception of a small border of Natural Resource District property. Currently, the Refuge is undergoing an expansion (Map 2). When completed, the Boyer Chute NWR will total 9,912 acres with 8,602 acres in Washington County, Nebraska and 1,310 acres in Pottawatomie County, Iowa.

A. Topography & Soils

Elevation within the Refuge ranges from 990' mean sea level (msl) to 995' msl. The Refuge lies within the 10 year or less floodplain of the Missouri River; therefore, topography is flat.

Soils of the Missouri River floodplain are highly variable, ranging from light sandy soils to dense clays, which are nearly impermeable barriers to water movement under old oxbows of the Missouri River. Most of the soils within the refuge are Haynie silt loam (He), Onawa and Haynie silty clay loam (OH), Sarpy loamy fine sand (Sg), and Sarpy loam (SI). Within the current Refuge boundary, the majority of soils are Class IV and V (Soil Survey of Washington County, 1957). A soils map and explanation are located in Appendix A.

The Natural Resource Conservation Service (NRCS) classifies soil types, with the wetter soils being termed hydric soils. All soils within the current Refuge are classified as hydric.

The major influence on hydrology is the Missouri River (Map 3). Historically, the

Map 1: Vicinity Map

Map 2: Boyer Chute National Wildlife Refuge - Flood Plain Elevations

Map 3: Acquisition Priorities by Phases

river had tremendous fluctuations in flows, with typically two (2) flood periods, the major flooding period during a spring melt caused by prairie rivers rising, and a secondary smaller flooding period in June and July, caused by mountain snow melts. Upstream reservoirs have provided some control, and reduced flooding in both periods in dry and normal years. All of the current Refuge lies within the ten-year floodplain elevation of 994.2' msl.

B. Climate

Washington County has the typical climate of the interior of large continents in middle latitudes. Some of the main characteristics of such a climate are rather light rainfall, hot summers, severe winters, great annual variations in temperature and rainfall, and frequent daily or weekly changes in weather.

Weather observations were recorded at US Weather Bureau Stations at DeSoto from 1867 to 1895 and at Blair, 5 miles northwest of DeSoto from 1896 to 1961. The average annual range in temperature at Blair is approximately 117⁰. The range has exceeded 128⁰ in a few years and has reached a high of 140⁰. Temperatures above 100⁰ have been recorded in the 5 months, May through September; and temperatures below 0⁰ have been recorded in the 5 months, November through March.

The average date of first freezing temperature in fall at the Blair station is approximately October 11. The average date of the last freezing temperature in spring is about April 28. There are rather wide variations from these average dates in individual years.

The average annual precipitation is 26.52 inches. The driest year recorded was 1936 with 15.22 inches, and the wettest year recorded was 1869 with 47.49 inches. The majority of precipitation occurs during the growing season. Precipitation averages 19.18 inches (72% of annual amount) during the months of April through September (Soil Survey Washington County, 1957).

C. Vegetation

Vegetation types within the current Refuge boundary are classified as: 1) Riverine; 2) Wetlands; 3) Grassland; and 4) Cropland; and 5) Riparian Forest. An additional vegetation type - Upland Forest - will be added when the Refuge expands. Table 1 displays current vegetation types and their respective acreage. Map 4 displays the proposed distribution of vegetative types on the Refuge.

Table 1. Boyer Chute NWR Vegetation Types

VEGETATION TYPE	ACRES
Riverine	56
Wetlands	135
Grassland	1,239
Cropland	917
Riparian Forest	774
TOTAL	3121

1. Riverine

The riverine system has been dramatically altered with the channelization of the Missouri River. The riverine vegetation type consists of the open water areas of the Boyer Chute and Missouri River. Vegetation is dominated by aquatic plant species - mostly Potamogetons. The Refuge currently has 56 acres of this vegetative type.

2. Wetlands

The wetland vegetative community composes about 135 acres of current Refuge land. Vegetation within this system is dominated by Cattail (*Typha spp*), Phragmites (*Phragmites australis*), and Smartweeds (*Polygonum spp.*). Also present in this system is non-native Purple loosestrife (*Lythrum salicaria*).

3. Grassland

This vegetative type composes about 1,239 acres of Refuge. Historically, lowland areas were probably dominated by Prairie cordgrass (*Spartina pectinata*) due to frequency of flooding. These areas would have contained hundreds of micro-depressional wetlands (Gilgai) each supporting its own flora and fauna based on hydrology. Upland areas would have been dominated by warm and cool season grasses with forbs and shrubs present. Prior to Refuge establishment, these grasslands were drained and converted to farmland. In addition, the Missouri River was dammed and channelized to reduce flooding occurrence.

Former cropfields are now being re-seeded to grass species including Sand lovegrass (*Eragrostis trichodes*), Sand bluestem (*Andropogon gerardii* var. *paucipilus*), Big bluestem (*A. gerardii* var. *gerardii*), Switchgrass (*Panicum virgatum*), Sideoats grama (*Bouteloua curtipendula*), Little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), Canada wildrye (*Elymus canadensis*), Virginia wildrye (*E. virginicus*), and Tall wheatgrass (*Agropyron elongatum*). In addition, non-native vegetation found in this area includes Smooth brome (*Bromus inermis*), Reed canarygrass (*Phalaris arundinacea*), and Velvet leaf (*Abutilon theophrasti*).

4. Cropland

Cropland currently composes about 1,239 acres of Refuge land. This acreage is dominated by corn, soybeans, and winter wheat. Many of these cropfields are being re-seeded to grasslands.

5. Riparian

This vegetative type includes the narrow ribbon of trees along the Boyer Chute and Missouri River. This area is dominated by Eastern cottonwood (*Populus deltoides* var. *occidentalis*), and species of willows with the most dominant being Peachleaf willow (*Salix amygdaloides*) and Sandbar willow (*S. Exigua*). Also present in this area are introduced Chinese elm (*Ulmus parvifolia*), Siberian elm (*U. pumila*), and Tree of heaven (*Ailanthus altissima*). The Refuge currently owns about 774 acres of riparian vegetative type.

Map 4: Vegetation Habitats

D. Noxious Weeds and Other Problem Species

Several non-native plant species are acting as invasives on the Refuge. These plant species include Phragmites (*Phragmites australis*), Smooth brome (*Bromus inermis*), Reed canarygrass (*Phalaris arundinacea*), Musk thistle (*Carduus natans*), Purple loosestrife (*Lythrum salicaria*), Common mullein (*Verbascum thapsus*), Velvet leaf (*Abutilon theophrasti*), Chinese elm (*Ulmus parvifolia*), Siberian elm (*Ulmus pumila*), and Tree of heaven (*Ailanthus altissima*).

E. Threatened, Endangered, and Special Concern Species

The Refuge will implement its fire management program within the restraints of the Endangered Species Act (1973), as amended, and will take appropriate action to identify and protect from adverse impacts any rare, threatened, or endangered species and its habitats located within the Refuge.

Boyer Chute NWR provides possible habitat for four (4) Federally-listed endangered species: pallid sturgeon, peregrine falcon, interior least tern, and piping plover. Two (2) candidate fish species, the sicklefin chub and sturgeon chub, could be present at times in appropriate habitats on the area (Environmental Assessment for Boyer Chute National Wildlife Refuge Expansion, 1997).

F. Fauna

1. Birds

A comprehensive survey and bird list have yet to be developed for the Refuge. However, a species list of birds that historically utilized the area was compiled for the expansion project EA.

The Missouri River is a major migration route for birds in the Central Flyway. Highly visible species include the snow goose (with populations more than 500,000) and numerous duck species that spend several months in the fall and spring in this area. Bare cropland and other agricultural practices have left very little habitat for the 261 bird species that have been documented along the Missouri River, either as breeding species, migrants during spring and fall migration periods, or as winter visitors. These species represent a broad spectrum of birdlife, from resident game birds such as bobwhite quail, ring-necked pheasant, and wild turkey to shorebirds, waterfowl, neotropical migrants, short distance migrants, resident songbirds, hawks and owls. More than 135 species historically nested in this vicinity of the Missouri River utilizing the wetlands, forests, and grasslands that were present (Environmental Assessment for Boyer Chute National Wildlife Refuge Expansion, 1997). See Appendix B for a listing of fauna that is expected to utilize the Refuge.

Bird species evolving with fire may show fire adapted behavior and responses, whereas other species exposed infrequently to fire in their evolutionary history may be severely inhibited by it (Best 1979). Hawks and purple martins are attracted to fire and the fire front to locate prey (Lehman and Allendorf 1989). Edwards and Ellis observed four bobwhite quail flying directly to a burn and landing within a few meters of the flames. However, Tester and Marshall (1961) indicate that bobolinks, savannah sparrows, and Le Conte's sparrows avoided recently burned grasslands. Fire's direct and indirect effect to bird species depends upon each individual species of bird.

2. Mammals

A comprehensive survey of mammals that inhabit the Refuge has yet to be developed. However, a species list of mammals that historically utilized the area was compiled for the expansion project EA.

More than 30 species of mammals are present along the river, though currently the limited habitat quality and quantity do not provide habitats for many animals. Habitat restorations, both aquatic and terrestrial, would benefit big game animals, such as white-tailed deer and furbearers such as beaver, muskrat, mink, coyotes, fox, and raccoons. Smaller, less obvious species, such as deer mice, shrews, and bats also will benefit from habitat restorations (Environmental Assessment for Boyer Chute National Wildlife Refuge Expansion, 1997). See Appendix B for a listing of fauna that is expected to utilize the Refuge.

Fire tends to have little direct effect on large mammals mainly due to their ability to move. The major indirect effect to large mammals is an increase in available forage. Fire removes standing dead vegetation making new growth more accessible to grazers. In addition to bison, elk, pronghorn, and "rabbits" concentrate on burned areas in North American grasslands (Lewis 1973, Evans and Probasco 1977). Burning up to 70% of a home range did not cause deer to change their range (Ivey and Causey 1984).

3. Reptiles and Amphibians

Currently, due to fragmentation, the available habitat is very limited for reptile and amphibian species, with the area along Boyer Chute and Nathans Lake the only significant habitat areas. The mix of aquatic and upland habitats that are capable of being restored would provide homes for 26 species of reptiles and 15 species of amphibians that are generally present along the Missouri River. Common reptile species include snapping turtles, false map turtles, softshell turtles, water snakes, and

garter snakes. Common amphibian species are spadefoot toads, leopard frogs, and salamanders (Environmental Assessment for Boyer Chute National Wildlife Refuge Expansion, 1997). See Appendix B for a listing of fauna that is expected to utilize the Refuge.

4. Fish

A comprehensive survey of fish species that inhabit the Refuge has yet to be developed. However, a species list of fishes that historically utilized the area was compiled for the EA completed for the expansion project. See Appendix B for a listing of fauna that is expected to utilize the Refuge

More than 80 species of fish were historically present in the Missouri River's main channel, oxbows, chutes, backwaters, and associated tributary streams and wetlands. The majority of these species are still present in the Lower Missouri, but in greatly reduced numbers and limited to particular areas of the river. Hesse et al. (1989) noted, "Nearly one-third of the Missouri River has been impounded, one-third channelized, and the hydrologic cycle, including temporal flow volume and sediment transport, has been altered on the remainder. The changes in basin and floodplain physiography and channel morphologies have reduced commercial fish harvest by more than 80% and are implicated in the demise of native species".

Presently, the restoration of Boyer Chute has provided additional areas for game fish such as channel and flathead catfish, walleye, sauger, bass, panfish, and drum. The restoration also provides habitat for forage fish, including numerous species of chubs, shiners, shad, and minnows that are the food for larger gamefish and fish-eating birds along the river (Environmental Assessment for Boyer Chute National Wildlife Refuge Expansion, 1997).

Fire's effect of fish should be minimal except for potential of increased erosion from recently burned areas.

5. Invertebrates

Comprehensive inventories of invertebrates have not been completed for the Refuge. However, the Refuge does have the potential to provide habitat for a number of invertebrate species including mussels. Fire's effects on invertebrate species is not well documented. Some potential threat to mussel species could occur from increased run-off from recently burned areas.

6. Insects

Insect life and range of occurrence have not been documented for the Refuge. Effects of burning on insects is quite variable. As a group, insects do not appear to experience a severe decline following a fire, suggesting that they have adaptations that allow at least some of the individuals to survive periodic burning (Bragg 1994). Inappropriately timed fires, however, can result in extirpation of butterflies and other prairie insects in isolated areas (Panzer 1988).

Grasshoppers and leafhoppers have been shown to increase with burning in tallgrass prairie in Kansas, Illinois, and Minnesota (Knutson and Campbell 1976). Varying fire conditions effected the response of these organisms. Early-spring burns in tallgrass prairie resulted in more grasshoppers than late-spring burns (Evans 1984).

Ants have also been found to increase with burning. Ants spend much of their time below ground, thus, at least some of the colony survives. In addition, their scavenging behavior and general adaptation to hot, dry conditions make them one of the animals that most rapidly increases in population size in burned areas (Bragg 1994).

Spiders, centipedes, and millipedes are species that are drastically reduced by fire (Bragg 1994).

G. Cultural / Archeological Resources

Fire management activities at the Refuge will be implemented in accordance with the regulations and directions governing the protection of cultural resources as outlined in Department Manual Part 519 (519M), Code of Federal Regulations (36 CFR 800), the Archeological Resources Protection Act of 1979, and the Archeological and Historic Preservation Act of 1974. All fire management activities will be in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

Within the current boundaries of the Refuge, no cultural or archeological resources have been documented. The proposed expansion area was referred to the Nebraska State Historical Preservation Officer and was found to have two sites on property adjoining the boundary. One site has historic lime kilns (Neal Woods). The other site was used by aboriginal residents in the Nebraska Period (1000 AD to 1450 AD).

H. Improvements

There are an estimated \$550,000 of improvements on the Refuge. These include public use facilities (restrooms, kiosks, etc), fences, and signs. Some structures

have recently been acquired and estimated replacement value has yet to be determined. These include a maintenance shed, cabin, residence, and garage. Other improvements are located on the Refuge such as parking lots etc; however, these items were not considered to be at risk from fires. Appendix L is a Real Property Inventory for Boyer Chute NWR. Highlighted items on the list were considered to be at risk from fire.

Adjacent land ownership is mostly private. This adjacent land is managed for agricultural purposes (cropland, grazing, etc). A number of private residences are located near the current Refuge boundary. In addition, the town of Ft. Calhoun is located about three (3) miles west of the Refuge boundary.

I. Socio-Political-Economic

Land practices in the area are changing. Once the area was predominantly rural in nature, now Omaha is expanding northward at a quick pace. Small family farms are giving away to corporate farms and increased urbanization. Quite a few negative comments were received when the Refuge was expanded. Several of the issues are being resolved. However, it is important that the Refuge's resources be managed in a responsible manner and in a way that keeps the public informed.

J. Fire Ecology

Since the Refuge was established in 1992, historical fire information for the Refuge area is generally lacking. Fire acts as a disturbance factor in the vegetal development of most plant communities and invokes secondary successional processes (Bunting 1984). The Refuge lies within the Northern Floodplain Forest and Bluestem Prairie (Kuchler 1964).

Conversion of prairie to agricultural practices by European settlers in the late 19th century and into the 20th century has disturbed the pre-European fire regime. The best approach to return fire into the Boyer Chute ecosystem is to determine a desired condition, develop fire strategies to achieve the condition, and then to monitor the results of the action.

Following is a brief summary of the fire ecology of the vegetative communities identified on the Refuge:

1. Riverine

Vegetative species within this community consist of aquatic plants with little to no above water growth. This area is the open water channels of the Boyer Chute and Missouri River; therefore, fire would not play a role in this system.

2. Wetlands

Fire would not have been necessary to maintain the species composition in these wetland systems. Hydrologic factors are more likely the force behind the development of this vegetative community. Vegetative species such as cattail and Phragmites have rhizomes which are buried deep in the soil and may be under water. Dormant season fires remove large quantities of litter and temporarily open up the areas; however, the rhizomes will send up new shoots. Prescribed fires during drought periods can kill cattail and Phragmites when these fires burn deep into the peat layer. Early to mid-summer burning of Phragmites during the peak of plant growth reduces stem density and aboveground biomass for two to four growing seasons (FEIS). Summer burning of cattail in drained wetlands or dormant season burns followed by flooding which overtops the stalks reduces cattails (FEIS). Prescribed fire can be used as an effective means of reducing vegetative biomass when it is beneficial to do so.

3. Grasslands

Wildfire is one of the primary natural forces which created native prairie. Historic records describe huge prairie fires started by lightning or humans. Fires consumed millions of acres of prairie vegetation as there were few natural firebreaks and no suppression. Wright and Baily (1982) estimate fire frequency in pre-settlement tallgrass prairie ranged from every 5 - 10 years; however, Hulbert (1973) estimated fire frequency to be two to five times every 10 years.

Historical reviews indicate the July-August period, to varying degrees, as a seasonal fire peak (Hamilton 1996). Moore (1972) reports for the southern plains region that October and then July-August as the peak fire seasons with a smaller season in April-May.

Obviously, lightning was an important source of fire in the central grasslands. However, fires during July and August are generally small

due to tallgrass prairie being lush and green, thereby reducing fire spread and intensity.

Conversely, fires during the dormant season of spring and fall (while of lower frequency) had a larger spacial influence on the pre-settlement landscape. Rates of fire spread and intensity have been measured as high as 15 to 20 times the July-August period (Steuter 1986).

Fire's effect on the grassland depends upon a number of variables. Some of these variables include species of plant, timing of burn, frequency of burn, type of burn, and climatic conditions before, during, and after the burn. The tallgrass prairie is located in the eastern portion of the Great Plains where precipitation is sufficient to support trees. Historically, therefore, one of the major effects of fire is the prevention of woody plant invasions (Bragg 1994). Within 10 years of fire suppression, there can be a noticeable increase in woody plants that ultimately will eliminate prairie plants (Gehring and Bragg 1992). Once established, many of these woody species are extremely difficult to remove due to their ability to resprout from roots. Problem woody invaders include shrubs (Rough-leaved dogwood, smooth sumac, and willow) and trees such as eastern red cedar, ash, elm, cottonwood, and some oaks.

Besides preventing woody invasions, fire also affects the non-woody component of the prairie although the effects vary by season. Mid - to late spring burning increases the productivity of the tallgrass prairie although it is more visible in some species, such as big bluestem, than in others, such as indiagrass. Fires in this season also increase forb species such as tall gayfeather and white aster. While favoring warm season species, late spring burns adversely effect cool season native grasses (such as porcupine grass, needle-and-thread, and prairie junegrass) and forbs such as purple coneflower (Bragg 1994). Henderson (1992) reported that frequent (8 out of 10 years), late spring burns result in a substantial decline in species diversity that primarily represents effects on cool season species. However, late spring burns are also detrimental to non-native cool season plants such as smooth brome, musk thistle, and Kentucky bluegrass, which are presently invaders into remnant prairies. The use of backing fires in late spring has proven very effective at controlling non-endemic grasses.

Dormant season fall and winter fires remove litter which, with little regrowth to shade the soil surface, allows the soil to warm more rapidly in the spring. This gives cool-season species (both native and non-endemic) an advantage over warm season grasses. Winter fires also tend to reduce the productivity of the dominant warm season species including big bluestem, little bluestem, and indiagrass. These general results suggest that, over time, winter burning may cause a shift in the species

composition to cool season plants (Bragg 1994).

Summer burns are also damaging to warm season grasses since they kill the above ground parts when the plants are most rapidly growing. However, summer burns also increase species diversity by benefitting cool season plants. Summer burns can also be effective at reducing woody encroachment as burn occurs when plants are most rapidly growing.

4. Cropland

These areas are dominated by cultivated crops including corn, soybeans, and winter wheat. Fire would most likely be utilized in this habitat type for debris removal or seed bed preparation.

5. Riparian

The riparian community of the Refuge is dominated by Eastern cottonwood and willows (predominantly peachleaf and sandbar). The effects of fire to Eastern cottonwood vary as to tree size, fire intensity, and fire frequency. Mature cottonwoods have a bark thickness of up to 4 inches thus affording fire protection. Trees less than 20 years old are susceptible to fire but may resprout. Plains cottonwood (var. *occidentalis*) is able to produce sprouts from the rootcrown and the stump after fire. (FEIS 1998).

Cottonwood seedling regeneration is favored following disturbances such as fire and flood. Fire thins the overstory, allowing more light to penetrate and exposes the soil so that seeds are able to establish if conditions are right. The understory species in this vegetative type will generally respond favorably to fire.

Peachleaf and sandbar willows generally are top killed by most fires. However, these willow species readily sprout from roots following fires. These species produce numerous wind born seeds which are important to revegetate areas following fire (FMIS 1998).

Refuge staff has determined not to utilize prescribed fire within the riparian area at the current time.

K. Refuge Fire History

Since the refuge was established in 1992, it has a very limited fire history. To date one wildfire (45 acres) has occurred on the refuge.

Prescribed fire has been utilized to a limited extent with twelve prescribed fires being accomplished since 1998.

III. POLICY COMPLIANCE - GOALS AND OBJECTIVES

A. Service Policy Compliance

U.S. Fish and Wildlife Service policy requires that an approved Fire Management Plan must be in place for all of Service lands with burnable vegetation. Service Fire Management Plans must be consistent with firefighter and public safety, protection values, and land, natural, and cultural resource management plans, and must address public health issues. Fire Management Plans must also address all potential wildland fire occurrences and may include the full range of appropriate management responses. The responsible agency administrator must coordinate, review, and approve Fire Management Plans to ensure consistency with approved land management plans.

Service policy allows for a wildland fire management program that offers a full range of activities and functions necessary for planning, preparedness, emergency suppression operations, emergency rehabilitation, and prescribed fire operations, including non-activity fuels management to reduce risks to public safety and to restore and sustain ecosystem health. This plan provides fire management guidelines for the Refuge.

B. National Environmental Protection Act Compliance

Regulations published in the Federal Register (62 FR 2375) January 16, 1997 categorically excludes prescribed fire when used for habitat improvement purposes and conducted in accordance with local and State ordinances and laws. Wildfire suppression actions are categorically excluded, as outlined in 516 DM 2 Appendix 1. The Service has determined that prescribed fire activities will only be carried out in accordance with a Fire Management Plan that tiers off a land management plan that has addressed the use of fire as a management tool and has been through the NEPA process, or a Fire Management Plan that has been through the NEPA process. An Environmental Assessment (EA) has been completed for this plan. The EA provided the basis for the Finding of No Significant Impact (FONSI) for the implementation of the proposed Fire Management Program (Attachment 1).

C. Authorities Citations

The statutes cited herein authorize and provide the means for fire management activities on lands under the jurisdiction of the Department of the Interior, or lands adjacent thereto.

1. Protection Act of 1922 (42 Stat. 857; 16 U.S.C. 594)
2. Economy Act of 1932 (47 Stat. 417; 31 U.S.C. 1535)
3. Taylor Grazing Act of 1934 (48 Stat. 1269; 43 U.S.C. 315)
4. Reciprocal Fire Protection Act of 1955 (69 Stat. 66; 42 U.S.C. 1856a)
5. National Wildlife Refuge System Administration Act of 1966 as amended (80 Stat. 927; 16 U.S.C. 668dd-668ee)
6. Federal Fire Prevention and Control Act of 1974 (88 Stat 1535; 15 U.S.C. 2201)
7. Wildfire Suppression Assistance Act of 1989 (PL 100-428 as amended by PL 101-11)
8. Disaster Relief Act of May 22, 1974. (88 Stat. 1431 42 U.S.C. 5121)
9. Federal Grants and Cooperative Act of 1977 (Pub. L. 95-244, as amended by Pub. L. 97-258, September 13, 1982. 96 Stat. 1003 31 U.S.C. 6301-6308)
10. Department of Interior Manual, 620 DM-1, Wildland Fire Management (April 10, 1998).
11. United States Fish and Wildlife Service Wildland Fire Management Handbook (December 28,2000)
12. United States Fish and Wildlife Service e Manual, 621 FW 1-3 (February 7, 2000)

D. Enabling Legislation

The Refuge was authorized in August 1992 under the authority of the Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j) and the Emergency Wetland Resource Act of 1986 (16 U.S.C. 3901-3931). The U.S. Fish and Wildlife Service (Service) and the Papio-Missouri Natural Resources District (NRD) participated together in a project entitled the Missouri River Corridor Project. The purpose of this project was to identify sites along a 137 mile stretch of the River between Sioux City, Iowa and Plattsmouth, Nebraska. The Boyer Chute area ranked as the highest priority site of all sites identified for restoration and management of fish and wildlife resources.

Refuge purposes for the original and expanded Refuge are to restore, preserve, and maintain fish and wildlife habitat, with special emphasis to threatened and endangered species, migratory birds, and preservation of the natural biodiversity of the Missouri River floodplain.

E. Land Management Goals and Objectives

An Environmental Assessment (EA) was completed in July 1997, for the Boyer Chute National Wildlife Refuge Expansion. As part of the assessment process, a Conceptual Management Plan was completed and attached to the EA as an Appendix. The EA describes the expected land management actions and public uses outlined in the Conceptual Management Plan. No other formal planning document has been completed or undertaken to date.

The land management goals outlined in the Conceptual Management Plan include:

- < Restoration of wetlands, chutes, back water, streams, and upland habitats.
- < Restoration of major plant communities such as tall-grass prairie, riparian woodlands, and upland woodlands.
- < Once restored, maintaining the environs in as natural a state as possible.

IV. REFUGE FIRE MANAGEMENT OBJECTIVES

The goal of wildland fire management is to plan and make decisions that help accomplish the mission of the National Wildlife Refuge System. That mission is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. Fire management objectives (standards) are used in the planning process to guide management to determine what fire management responses and activities are necessary to achieve land management goals and objectives.

The primary goal is to provide for firefighter and public safety, public and private property, and cultural and natural resource values. Service policy and the Wildland Fire

Policy and Program Review direct an agency administrator to use the appropriate management strategy concept when selecting specific actions to implement protection and fire use objectives. The resulting Appropriate Management Response are specific actions taken in response to a wildland fire to implement protection and fire use objectives. With an approved Fire Management Plan, the Refuge staff may use wildland fire in accordance with local and State ordinances and laws to achieve resource management objectives (habitat improvement).

A. Goal: Protect life, property, and other resources from unwanted fire.

Objectives:

- a. Safely suppress all wildfires using strategies and tactics appropriate to safety considerations, values at risk, and in accordance with Service policy.
- a. Minimize the cost and impact of wildland fire suppression activities.
- b. Prevent human-caused wildfires.
- c. Take actions to reduce vulnerability of refuge resources to fire.

B. Goal: When practical, use prescribed fire as a tool to accomplish habitat management objectives.

Objectives:

- 1. To increase vigor in native grasslands.
- 2. To reset selected habitats to more productive early successional stages.
- 3. To create a mosaic of successional stages within Refuge habitats, to provide habitat for the greatest diversity of wildlife.
- 4. To prepare non-native plant infestations for more efficient herbicide treatments as part of an integrated pest management plan to control non-native plants.
- 5. To educate the public regarding the role of prescribed fire at the Refuge.

V. FIRE MANAGEMENT STRATEGIES

A. General

It is the intention of the U.S. Fish and Wildlife Service to continue to manage all wildland fires occurring within the Complex using the appropriate management concept. Prescribed fire will be utilized under controlled conditions and defined weather variables to achieve resource management goals and objectives, including the reduction of hazardous fuel loadings.

The basic fire management strategy for the Complex will be to use the appropriate management response concept to suppress all wildfires commensurate with values at risk. Strategies employing a range of suppression options may be considered by the Incident Commander. The primary suppression strategy employed will be direct attack. However, there may be occasions when direct attack on high intensity, rapidly spreading wildland fire would jeopardize firefighter safety and not be appropriate. In these cases indirect attack will be employed utilizing natural and human-made features as wildfire control points. Minimum impact suppression techniques (MIST) will be utilized, where appropriate.

The matrix in the following table is intended to provide an overview of strategies and tactics available to the incident commander. The fire management plan and the Refuge Manager provide guidance, but it is up to the Incident Commander to select the appropriate management response based on the situation.

Table 2: Appropriate Management Response

SITUATION	STRATEGY	TACTIC
1. Wildland fire on Refuge lands which does not threaten life, natural or cultural resources or property values.	Restrict the fire within defined boundaries established either prior to the fire or during the fire.	1. Holding at natural and man-made barriers. 2. Burning out. 3. Observe and patrol.
1. Wildland fire on Service property with low values to be protected. 2. Wildfire burning on to Service lands. 3. Escaped prescribed fire entering another unit to be burned.	Take suppression action, as needed, which can reasonably be expected to check the spread of the fire under prevailing conditions.	1. Direct and indirect line construction. 2. Use of natural and man-made barriers. 3. Burning out 4. Patrol and mop-up of fire perimeter.
1. Wildland fire that threaten life, property or sensitive resources. 2. Wildland fire on Service property with high values to be protected. 3. Observed and/or forecasted extreme fire behavior.	Aggressively suppress the fire using direct or indirect attack methods, holding the fire to the fewest acres burned as possible.	1. Direct or indirect line construction. 2. Engine and water use. 3. Aerial retardant 4. Burn out and back fire. 5. Mop-up all or part of the fire area.

All fire management activities will be conducted in a manner consistent with applicable laws, policies, and regulations.

B. Selected Strategies

Strategies are as follow and will be employed to meet refuge fire management objectives. Minimum impact strategies and tactics will be used whenever possible.

1. An aggressive response will generally be the suppression strategy for the entire Refuge. The use of natural or manmade barriers to contain the fire is also appropriate when increased safety or reduced cost over aggressive attack can be attained. Tactics will be unique to each incident and are dependent on safety considerations, weather conditions, cost of suppression, fuel conditions, availability of resources, and location of the

fire in relation to structures and cultural resource sites.

2. Prescribed fire will be utilized to modify vegetative communities for improved wildlife habitat, ecosystem function and fuel reduction.
3. Mechanical treatment of natural fuels may be utilized to reduce potential for damage from wildfire. These treatments must be compatible with resource management goals and objectives.

C. Constraints on Refuge Fire Management Strategies

1. Utilization of heavy equipment during high intensity fires will be allowed only with the approval of the Refuge Manager or his/her designee.
2. Aerial Retardants and foams will not be used within 300 feet of any waterway as described in the Guidelines for Aerial Delivery of Retardant or Foam near Waterways.
3. Any fire management activity occurring within the Refuge will be implemented in such a way as to provide the appropriate level of protection for species of special concern, Section 7 clearance will be secured, as appropriate.
4. Due to lack of staffing, equipment, and the Refuge's proximity to town, local fire agencies (volunteer fire departments) will be utilized for initial attack on wildfires. Memorandums of Understanding (MOU's) with local fire agencies will be completed and maintained to provide for cooperative suppression actions.
5. The use of prescribed fire to achieve management objectives must be conducted in a cost effective manner.

D. Rationale for Determining Fire Management Strategies

1. Due to: a) the small size of the Refuge; b) the low number of lightning ignited fires occurring on the Refuge; and c) values at risk adjacent to the Refuge, Wildland Fire Use for Resource Benefit (WFURB) was determined to not be an efficient option at this time. Planning and implementing WFURB was deemed a higher cost than the selected method.
2. Hazard fuel reduction on some areas of the refuge may not be conducive to the use of prescribed fire due to potential damage to resource values. Prescribed fire would be an option for the maintenance of these areas after

mechanical treatment of high fuel loading has been completed.

E. Affects of Fire Management Activities

Boyer Chute NWR is located in an area dominated by agricultural interests consisting almost entirely of row-crop production. The Refuge property is very similar to the surrounding area, and prior to Refuge establishment, was largely cultivated. These cultivated acres are decreasing on the refuge as they are slowly being converted to native prairie.

There is potential for Refuge fire management activities to have an adverse impact on adjacent landowners, although the potential for this is small. There is some potential for a prescribed burn in the fall to cause some heat damage to unharvested row crops adjacent to the prescribed burn unit.

There are currently no burning activities conducted by neighboring landowners, so there is no impact on the refuge.

Boyer Chute NWR is located in close proximity of Omaha, Nebraska, and Epply Airfield. Scattered farmsteads are located near the refuge boundaries, and the town of Fort Calhoun is located 3 miles to the west. Fire management activities could have impacts on these areas, primarily in the area of smoke management. Wind directions and smoke lofting heights must be taken into consideration when planning prescribed fires.

VI. FIRE MANAGEMENT RESPONSIBILITIES

The Refuge Manager is responsible for planning and implementing an effective fire management program at Boyer Chute NWR. This individual is the official ultimately responsible for all fire management decisions concerning both wildfire and prescribed fire on the Refuge. The Refuge Manager will be responsible for the daily determination if prescribed burn units are within prescription. During the absence of the Refuge Manager, the Assistant Refuge Manager will be delegated the authority to make decisions concerning both wildfire and prescribed fire on the refuge.

A. Refuge Manager

1. Responsible for the overall management of the Refuge, including the fire program.
2. Insure that Department, Service, and Refuge policies are followed and maintained.
3. Insure sufficient collateral duty firefighters meeting Service standards are available for initial attack.
4. Supervise the writing of prescribed burn plans for the Refuge.
5. Serves as prescribed fire burn boss, as qualified.
6. Approves prescribed fire plans.
7. Prepares annual FIREBASE budget request, approves and tracks use of FIREBASE accounts.

B. Assistant Refuge Manager

1. Provide input to the resource management activities on the Refuge including the selection of objectives and tools to be used in achieving objectives (including prescribed fire).
2. Serves during suppression action, as qualified.
3. Responsible for planning, coordinating, and directing preparedness activities including:
 - a. Fire training.
 - b. Physical fitness testing and Interagency Fire Qualification System (IFQS) data entry.
 - c. Fire cache and equipment inventory accountability, maintenance, and operation.
 - d. Coordinate with cooperative agencies. Revises cooperative agreements as necessary.
 - e. Insures step-up plan is followed.

4. Insures fire management policies are observed.
5. Has lead responsibility for managing the prescribed fire program including:
 - a. Serves as prescribed fire burn boss, as qualified.
 - b. Propose prescribed fire projects.
 - c. Write prescribed fire plans.
6. Maintains liaison with Regional Fire Management Coordinator and Fire Management Officer.
7. Updates the Fire Management Plan, maintains fire records, reviews fire reports (DI-1202) for accuracy.
8. Submits DI-1202 to Zone FMO within 10 days of fire declared out.

C. Seasonal and Collateral Duty Firefighters

1. Maintain assigned fire equipment in ready state and use required safety gear.
2. Responsible for their personal protective equipment and physical conditioning.
3. Qualify annually with the work capacity test before March 1 or within two weeks after reporting for duty.

D. Wildfire Incident Commander (as assigned)

1. The Incident Commander (IC) will be responsible for the safe and efficient suppression of the assigned fire.
2. Fulfill the duties described for the IC in the Fireline Handbook (PMS 410-1)
3. Notify dispatch and/or FMO of all resource needs and situation updates, including the need for an extended attack.
4. Ensure that personnel are qualified for the job they are performing.

5. Ensure that fire behavior is monitored, data collected and recorded.
6. Identify and protect sensitive areas.
7. Utilize minimum impact strategies whenever possible.
8. Ensure that the fire site is fully rehabilitated or that the management of rehabilitation has been assigned.
9. Submit completed DI-1202 wildfire report, crew time sheets, and a listing of any other fire related expenditures or losses to Assistant Refuge Manager within 3 days of fire being declared out.

E. Prescribed Fire Burn Boss (as assigned)

1. Implement approved prescribed burn plans within prescriptions.
2. Assist with the administration, monitoring, and evaluation of prescribed burns.
3. Document weather and fire behavior (including rates of spread and flame length) and submit to Assistant Refuge Manager.
4. Document necessary information to complete DI-1202 (fire report) and submit to Assistant Refuge Manager within 3 days of fire being declared out.

F. Cooperators and Fire Related Agreements:

Until the Refuge has adequate staffing and equipped, the initial attack forces are local VFD personnel stationed at Ft. Calhoun. Currently, there is an agreements with local fire suppression agencies which addresses fire suppression (Appendix O).

Incident Management System (NIIMS) Wildland and Prescribed Fire Qualification Subsystem Guide, PMS 310-1 to identify minimum qualification standards for interagency wildland and prescribed fire operations. PMS 310-1 recognizes the ability of cooperating agencies at the local level to jointly define certification and qualification standards for wildland fire suppression. Under that authority, local wildland fire suppression forces will meet the standards

established for their agency or department. All personnel participating in prescribed fire management activities must meet Service fitness and training standards.

Cooperators will :

1. Provide assistance in suppression of wildfires as defined in cooperative agreements and memorandums of understanding.
2. Assist, as needed, in the investigation of suspicious fires.

VII. FIRE SEASON

A. Wildfire

There has been one recorded wildfire (45 acres) on the Refuge since it was established in 1992. Therefore, a meaningful static average of wildland fire occurrence cannot be determined.

B. Prescribed Fire

Prescribed fire has been utilized in a limited capacity since 1998. Only five prescribed fires were completed on the refuge prior to 2001 for a total of 51 acres. All of these fires were completed during spring (April and May). The largest of these fires occurred in 1999 and was 15 acres. Seven prescribed fires for a total of 456 acres were conducted in the spring of 2001 with the aid of Flint Hills NWR and DeSoto NWR staff. The largest prescribed fire was 411 acres. An accurate determination for prescribed fire seasons cannot be determined with the limited number of prescribed fires that have been accomplished to date. However, depending on conditions, a prescribed fire may be carried out any time of the year on the Refuge.

VIII. EQUIPMENT AND STAFFING NEEDS

A. Equipment

Currently, the Refuge does not have fire suppression equipment. It is anticipated that engines will be the primary initial attack resource on the Refuge because of the predominance of fine fuels and access roads. ATV's would also be a valuable tool especially for prescribed fire. DeSoto NWR has currently been conducting prescribed fire operations at Boyer Chute NWR and Flint Hills NWR fire staff assisted with prescribed burning in the spring of 2001. DeSoto has some fire

suppression equipment, ATV's, and earth moving equipment. However, earth moving equipment will only be used with approval of the Refuge Manager and when no other alternatives exist. Heavy equipment is not maintained specifically for fire use and will be used on refuge fires only.

B. Normal Unit Strength

Normal Unit Strength (NUS) has not been determined for Boyer Chute NWR. However, recommended basic equipment, cache items and Type 6 engine inventory are located in Appendix E.

C. Personnel and Level of Qualification

The following table outlines the anticipated position needs of the Fire Management program at Boyer Chute NWR.

Table 3. Fire Management Organization

Position	Minimum # Required
Incident Commander Type 5 (ICT5)	1
Prescribed Fire Burn Boss Type 3 (RXB3)	1
Engine Boss (ENGB)	1
Engine Operator (ENOP)	1
Fire Fighter Type 2 (FFT2)	2

The following table displays current refuge staff fire qualifications.

Table 4. Current Employee Qualifications

Position	Current Fire Qualifications
Refuge Manager	FFT2
Refuge Operations Specialist	FFT2
Biological Technician	FFT1 FFT2 ENOP RXB3

IX.

PREPAREDNESS

A. Annual Fire Management Activities

Table 5 displays annual preparedness actions that will be accomplished prior to the end of the month which is identified. Some of these items are currently not applicable to the Refuge since the Refuge does not have fire suppression equipment.

Table 5. Annual fire Management Activities

ACTIVITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Update Annual Fire Management Operating Plan	X											
Winterize Fire Management Equipment									X			
Inventory fire engine and cache equipment			X									

Identify Refuge Fire Management Training Needs										X		
Annual Refresher Training			X									
Annual Work Capacity Test			X									
Pre-season Engine Preparation			X									
Update Fire Management Plan			X									
Review Fire Agreements for Currency			X									

Prescribed Fire Plan Preparation	X																		
Weigh engines to determine GVW compliance		X																	
Prepare pre-season risk analysis		X																	

B. Training

The Refuge shall complete and submit a **copy** of completed National Wildfire Coordinating Group Interagency Training Nomination form (Appendix D) either as a hard copy or electronically for each course to the Zone FMO. The Zone FMO will review the nomination and approve or deny the request. The Zone FMO will notify the Refuge via E:mail of their decision and provide an account number to be used for travel and other costs associated with training.

C. Annual Refresher Training

The safety of firefighters and the public is the first priority. Persons engaged in fire suppression activities are exposed to a high element of risk. The Refuge Manager and fireline supervisors must make every effort to reduce the exposure to risk and enhance performance. One way is through formal and on-the-job training and improved physical fitness. The Service has adopted the training and fitness standards established in 310-1, and all firefighters must meet these and other standards established by the Service to participate in fire management activities.

All personnel involved in Fire Management activities are required to annually complete fire management refresher training in order to be qualified for fire management activities in that calendar year. Refresher training will concentrate on local conditions and factors, the Standard Fire Orders, LCES, 18 Situations, and Common Dominators. NWCG and other courses are available that meet the firefighter safety requirement; but, efforts will be made to vary the training and use all or portions of other NWCG courses to cover the required topics. Fire shelter use and deployment under adverse conditions, if possible, must be included as part of the annual refresher.

D. Physical Fitness

All personnel involved in fire management activities will meet the fitness standards established by the Service and Region. At this point in time, firefighters participating in wildfire suppression must achieve and maintain an Arduous rating. Firefighters participating in Prescribed Burns must achieve and maintain a Moderate rating. Information found in **Appendix D** provides specific instructions to administer the tests, a health screening questionnaire to aid in assessing personal health and fitness of employees prior to taking the test, an informed consent form, and safety considerations. A trained and qualified American Red Cross First Responder (or equivalent) who can recognize symptoms of physical distress and appropriate first aid procedures must be on site during the test.

Wildland fire fitness tests shall not be administered to anyone who has obvious physical conditions or known heart problems that would place them at risk. All individuals are required to complete a pre-test physical activity readiness questionnaire prior to taking a physical fitness test. They must read and sign the Par-Q health screening questionnaire, an informed consent form (Appendix D). If an employee cannot answer NO to all the questions in the PAR-Q health screening questionnaire, or is over 40 years of age, unaccustomed to vigorous exercise, and testing to achieve a Moderate or Light rating, the test administrator will recommend a physical examination. As noted below, all individuals over 40 years of age must receive an annual physical prior to physical testing.

E. Physical Examinations

In keeping with Service Policy, a physical examination is required for all new permanent employees and all seasonal employees assigned to arduous duty as fire fighters prior to reporting for duty. A physical examination may be requested for a permanent employee by the supervisor if there is a question about the ability of an employee to safely complete one of the work capacity tests. All permanent employees over 40 years of age who take the Pack or Field Work Capacity Test to qualify for a wildland or prescribed fire position are required to have an annual physical examination before taking the test.

F. Impacts of Regional and National Preparedness Levels on Station Activities

As indicated previously, periods of drought can greatly impact fire behavior and resistance to suppression. For that reason the Rangeland Fire Danger Index, Palmer Drought Index, and the Keetch-Byram Drought Index will be monitored at a minimum on a weekly bases throughout the year. All are available on the Internet at <http://ndc.fws.gov>. The Refuge fire staff can also contact the Custer Interagency Dispatch Center during periods of high fire danger to track indices and anticipate possible fire activity. Preparedness actions have been identified in the Step-Up Plan to respond to unusual conditions associated with drought and other factors (See following section).

The Rangeland Fire Index is calculated daily during the fire season by the National Weather Service (NWS) in Sioux Falls, South Dakota. Greenness factors of fuels are calculated by an Advanced Very High Resolution Radiometer (AVHRR) onboard NOAA weather satellites. Satellite calculated greenness factors are combined with forecasted windspeed and relative humidity. The data is accurate enough to calculate greenness factors and fire danger ratings on a county by county basis. The Range Land Fire Index is available on the Internet at:

<Http://www.crh.noaa.gov/fsd/forprod.rfdfsd>

Large scale fire suppression activities occurring in various parts of the country can have an impact on local fire management activities. For example, resources may be limited to implement prescribed fire activities because the closest available resources may be assigned to fire suppression duties or Refuge personnel may be involved as well. Regional drought conditions may also tie-up local resources that would normally be able to assist with Refuge fire management activities. It may be necessary to go out of Region to get the resources needed to staff the Refuge engine during periods of extreme drought or high fire danger.

The Refuge is in the Rocky Mountain Area. During National and Regional Preparedness Levels IV and V, it is necessary to receive approval from the Regional Fire Management Officer and the concurrence of the Rocky Mountain

Area Coordination Group to conduct prescribed burns during PL IV and the National Coordination Group during PL V. Prescribed fire activities will not be conducted when the National Preparedness is at Levels IV or V without approval of the Rocky Mountain Area Coordination Group.

G. Step-Up Plan

All preparedness activities will be in accordance with the Complex Step-up Plan (Appendix J).

H. Severity and Emergency Presuppression Funding

Severity funding is different from Emergency Presuppression funding. Emergency Presuppression funds are used to fund activities during short-term weather events and increased human activity that increases the fire danger beyond what is normal. Severity funding is requested to prepare for abnormally extreme fire potential caused by an unusual climate or weather event such as extended drought. Severity funds and emergency presuppression funds may be used to rent or preposition additional initial attack equipment, augment existing fire suppression personnel, and meet other requirements of the Step-up Plan.

X. FIRE MANAGEMENT UNITS (FMU)

The Refuge will currently be divided into two FMU's (Map 5 and Table 6). These FMU's are designated to facilitate the implementation of Refuge vegetation management objectives and are delineated by the vegetation types referenced previously in this plan. Both FMU 1 and FMU 2 will utilize a suppression response strategy when managing wildland fire. Following is a brief description of the two FMU's.

A. FMU 1

FMU 1 consists of wetlands, grasslands, and croplands located on Refuge. These areas consist of National Forest Fire Labs (NFFL)¹ Fuel Models 1 and 3 (NFDRS Models A, L, and N). Wildfires will be suppressed in this unit. It is anticipated that approximately 500 acres/year will be prescribed burned.

B. FMU 2

FMU 2 is that portion of the refuge consisting of the riparian vegetation type.

¹NFFL Fuel Models are used to predict fire behavior. NFDRS Fuel Models are used to predict fire danger.

This area is located along both banks of the Boyer Chute as well as the banks of the Missouri River generally surrounding the stream corridors within the Refuge boundary. The riparian vegetation type delineates this FMU. NFFL Fuel Models 8 and 9 (NFDRS Models H, R, & E) best describe this area. The boundary of this FMU does not correspond to refuge roads. The boundary is a vegetation boundary best seen visually. Wildfires will be suppressed and no prescribed burning is currently planned within this FMU.

Table 6: Vegetation Types by Fire Management Unit (FMU)

FMU	CORRESPONDING VEGETATION TYPE	ACRES
1	Wetlands, Grasslands, Cropfields	2,291
2	Riparian	830

Map 5: Fire Management Units

C. **Expected Fire Behavior**

Severe fire behavior may occur throughout the period from February through May and from September through November. During the season of February through May, warm season grasses are still dormant and severe fire behavior can be anticipated from these tall grasses. In addition, heavy winds from frequent frontal passages create the potential for extreme rates of spread and high spotting potential. However, riparian areas and shelterbelts usually produce low fire behavior during the spring due to leaf litter being wet. The majority of ignitions in this time period are human-caused.

During the September through November season, warm season grasses are again cured and severe fire behavior can be anticipated. In addition, these fuels are usually taller during this season as snow pack has yet to compact the grasses. Riparian areas and shelterbelts also produce increased fire behavior during this season as leaves are dry and freshly fallen. Frontal systems also increase during this time of year leading to increasing wind speeds.

During the summer months (June through August), high relative humidity and lush, green vegetation lead to a drastic reduction in fire behavior. Thunderstorms are frequent during this season. However, fire starts occurring from lightning strikes are usually small due to precipitation rapidly extinguishing the fire.

During the winter months (December and January), severe fire behavior can occur during periods of no snow pack due to vegetation being cured. However, cold temperatures generally decrease fire behavior from fall to late spring.

Live fuel moisture (LFM) is a good indicator of larger fuel conditions and how well they will burn. They are also a good indicator of long-term drying. Live fuel moisture for key species which will indicate that intense burning will occur if weather conditions are favorable are as follows:

Table 7: Live Fuel Moisture

Species	LFM INDICATING SPECIES WILL BURN	LFM INDICATING INTENSE BURNING IS PROBABLE
Cottonwood	<120%	<100%
Grass	<80%	<60%

Following are descriptions of fire behavior and their respective fuel models for the five vegetation types described in the vegetation section of this document.

1. Riverine

Fire behavior is not a factor in the riverine vegetation type.

2. Wetlands

This type occupies approximately 135 acres of Refuge. The main vegetation is cattail, phragmites and smartweed. NFFL Fuel Model 3 and National Fire Danger Rating System (NFDRS) Fuel Model N represent this type. Fire in this fuel model is the most intense of grass fuel models and displays high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the grass and across standing water. Fuel loads consist of fine and course dead fuels averaging 3.0 tons/acre and a fuel bed depth of 2.5 feet (Anderson, 1982).

3. Grassland

This type occupies about 1239 acres. The main vegetation in this area consists of re-seeded warm season grasses. NFFL Fuel Models 1 and 3 and National Fire Danger Rating System (NFDRS) Fuel Model A, L, and N represent this type.

a. NFFL Fuel Model 1

Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area. Fine fuel loads average 0.74 tons/acre with a fuel bed depth of 1 foot (Anderson, 1982).

b. NFFL Fuel Model 3

Fire in this fuel model is the most intense of grass fuel models and displays high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the grass and across standing water. Fuel loads consist of fine and course dead fuels averaging 3.0 tons/acre and a fuel bed depth of 2.5 feet (Anderson, 1982).

4. Cropland

This vegetation type constitutes about 917 acres of current Refuge land. Dominant species include corn, soybeans, and winter wheat. NFFL Fuel Models 1 and 3 and NFDRS Fuel Models, A, L, and N best describe this vegetation type. See Fire Behavior within Grasslands above for a description.

5. Riparian Forest

This type is composed of cottonwood stands with an understory of willow, young cottonwoods, timber litter, and grass. These areas are restricted to river and stream bottoms. This type is represented on 774 acres of the Refuge. Generally fire is restricted to the leaf litter and grassy understory in this type, however when fuel jackpots are burned, intense heavy fuel burning on the forest floor can cause mortality in live cottonwoods. This type is characterized by NFFL Fuel Models 8 and 9 and NFDRS Fuel Models H, R, and E.

a. NFFL Fuel Model 8

Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs. Fine fuel loads average 5.0 tons/acre with a fuel bed depth of 0.2 feet (Anderson, 1982).

b. NFFL Fuel Model 9

Fires run through the surface litter faster than model 8 and have longer flame height. Both long-needle conifer stands and hardwood stands, especially oak-hickory types, are typical. Fall fires in hardwoods are predictable, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling and blowing leaves. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning. Fine fuel loads average 3.5 tons/acre with a fuel bed depth of 0.2 feet (Anderson, 1982).

D. Fire Effects

Fire effects for species of special concern will be characterized below. The majority of information below was obtained from the Fire Effects Information

System (1998). This information is included in Appendix C.

1. Smooth Brome

Late spring (such as April 1 in east central Kansas and mid May in north central Nebraska) can dramatically reduce smooth brome. Back fires ignited on days with high temperatures and low relative humidity have the best effect. Dormant season burns will increase smooth brome.

2. Reed Canarygrass

Reed canarygrass can be controlled to a limited extent by burning every 2 to 3 years during the dry season. Fire's effect on reed canarygrass is similar to smooth brome.

3. Phragmites

Most fires cause little damage to common reed because the rhizomes are sufficiently protected by soil. Rhizomes can be damaged, however, by deep-burning fires which can occur when the soil is dry and the humidity of the litter and stembase is low. The effects of severe burning depend on the degree of damage inflicted upon the rhizomes. The most damaging fires occur during drought years when entire peat layers can be consumed.

1. Musk Thistle

The role of fire in musk thistle management has not been fully explored. In the Konza Prairie Research Natural Area in Kansas, burning favored seedling establishment of musk thistle in areas where grazing had reduced the vigor of prairie grasses. However, on sites where grasses were vigorous, musk thistle was crowded out whether the site was burned or not. Frequent burning to maintain vigorous prairie plants is recommended to prevent the invasion of exotic plant species.

2. Purple Loosestrife

Fire is an ineffective method of purple loosestrife control because few plants are killed. Also, because purple loosestrife begins growth after its common associates, spring burning in mixed stands may favor purple loosestrife over native marsh emergents.

3. Bald Eagles

The greatest effect to bald eagles on the refuge is through the loss of roosting habitat when cottonwood trees are killed by intense fire behavior. Eagles currently do not nest on the refuge so loss of nesting is not a consideration.

4. Peregrine Falcon

The falcon nests on buildings within the city limits of Omaha. There has not been documented nesting on the refuge. There would be little effect to peregrine falcons from fires occurring on refuge.

5. Fish

Wildland fire at the scale experienced at the Refuge are not expected to affect the endangered fish in the Missouri River or the Boyer Chute.

6. Soils

Soils should be unaffected by fire in light fuels on the Refuge. Fuels are generally flashy and will not provide for a fire that has a long enough residence time to cause significant soil damage due to heating. In heavier fuels such as would occur in cottonwood areas, soils could be damaged by smoldering, high fire intensity and lengthy fire residence time. Fire management activities that would occur in these heavy fuels should be limited to mechanical removal or burning when fuel moisture is such that prolonged burning or high fire intensity would not occur. Soil erosion caused by removing vegetation from the land is not likely since most areas that will burn on the Refuge do not have a steep slope.

7. Non-biological Resources

a. Air Quality

Any fire on the Refuge will cause a temporary degradation in the local air quality. The air quality in the area around the refuge is very good and can absorb and buffer the effects of smoke from fire burning on refuge. However, smoke management is a major consideration with the city of Omaha approximately 10 miles south of the Refuge.

b. Cultural Resources/Refuge Improvements

No cultural resources exist within the current refuge boundary. However, if any are located, care will be taken during suppression activities or fireline construction to prevent damaging these sites.

XI. FIRE OPERATIONS

A. Special Safety Concerns and Firefighter Safety

Safety of Service employees and cooperators involved in fire management activities is of primary concern. Only trained and qualified employees will be assigned to fire management duties. All fire management personnel will be issued appropriate personal protective equipment and will be trained in its proper use. No Service employee, contractor or cooperator will be purposely exposed to life threatening conditions or situations except when necessary to save the life of another person.

The primary threat to firefighter safety is from fast moving, wind-driven wildfires that can quickly over take and trap firefighters. Due to terrain, soil conditions, and the location of various wetlands and water courses, it may be difficult for an engine to out-run a fast moving fire. It is important that firefighter practice **LCES at all times!** Spot weather forecasts should be requested early-on during initial attack to gain insight into the possibility of shifting winds from thunderstorms, approaching fronts, and other weather related phenomena.

Smoke from wildfires and prescribed fires is a recognized health concern for firefighters. Prescribed burn bosses and wildfire incident commanders must plan to minimize exposure to heavy smoke by incorporating the recommendations outlined in the publication Health Hazards of Smoke (Sharkey 1997), which is available from PMS or the Missoula Technology and Development Center.

B. Wildland Fire

1. Fire History

Since the refuge was established in 1992, one human-caused wildfire has occurred within the refuge boundaries.

2. Fire Occurrence

Fire occurrence data cannot be calculated do to the low frequency of wildfire occurrence.

3. Fire Season

A fire season for Boyer Chute NWR cannot be determined at this time due to a lack of data. One wildfire has occurred on the refuge and twelve (12) prescribed fires have been accomplished.

4. Initial Attack Strategies and Tactics

All unplanned ignitions will be managed using the appropriate management response concept. Minimum impact strategies and tactics will be used whenever possible. Aggressive attack will generally be the suppression strategy for the entire Refuge. The use of natural or manmade barriers to contain the fire is also appropriate when increased safety or reduced cost over aggressive attack can be attained. Tactics will be unique to each incident dependent on safety considerations, weather conditions, cost of suppression, fuel conditions, availability of resources and location of the fire in relation to values at risk. Specific tactics will be determined by the Incident Commander on site.

5. Limitations on Suppression Activities

- a.** Heavy equipment use during high intensity fire events will be allowed only with the approval of the Refuge Manager or his/her designee.
- b.** Aerial retardant and foam will be allowed only in non-riparian areas.

6. Prevention

The refuge currently has only had one wildfire. However, if the refuge should have an increase in human caused wildfires, the following steps would be utilized to reduce the number of unplanned ignitions.

- a.** Public contact will be made with Refuge visitors informing them of a fire ban when a fire ban is in effect.
- b.** Mop-up activities following prescribed burning will be improved and all prescribed fire plan elements will be implemented.

7. Detection

There are no permanent detection facilities located on the Refuge. Detection of wildland fire is dependent on individuals reporting fires to the Refuge staff or the local Sheriff's Department.

There may be occasions when unqualified personnel discover a wildland fire. When this occurs, the employee should report the fire and request assistance before taking action to suppress or slow the spread of the fire. If the fire poses an imminent threat to human life, the employee may take appropriate action to protect that life before requesting assistance. The unqualified personnel will be relieved from direct on-line suppression duty or reassigned to non-fireline duty when qualified initial attack forces arrive.

8. Initial Reporting and Dispatching

All fires occurring within the Refuge will be reported to Boyer Chute NWR headquarters. The person receiving the report will be responsible for implementing the Fire Dispatch Plan (Appendix M) and assume duties of Fire Dispatcher.

Requests for assistance by cooperators on fires not threatening the Refuge must be made to the Project Leader or designee. Only qualified and properly equipped resources will be dispatched off of the Refuge.

For local fires, the Fire Dispatcher will stay on duty until: (1) all Refuge resources return; (2) relieved by another dispatcher; or (3) advised by IC that he/she can leave. The Fire Dispatcher will not be required to stay on duty if the fire occurs outside Refuge radio coverage.

The Fire Dispatcher will be responsible for coordinating the filling and delivery of any resource orders made by the IC including engines, aircraft, tools, supplies, and meals. The IC will place all resource orders through the Dispatcher, and specify what is needed, when it is needed, and where it is needed. The Dispatcher will promptly determine if the resource orders can be filled or procured locally and notify the IC. If a resource order can not be filled locally, the Dispatcher will place the order with the Custer Dispatch Center Dispatcher. The Zone FMO or District FMO will generally be able to assist with ordering resources from outside the area.

9. Fire Suppression

Service policy requires the Refuge to utilize the ICS system and firefighters meeting NWCG and Service qualifications for fires occurring on Refuge property. All suppression efforts will be directed towards safeguarding life and property while protecting the Refuge's resources and other values at risk from harm.

All fires occurring on the Refuge and staffed with Service employees will be supervised by a qualified incident commander (IC). If a qualified IC is not available, one will be ordered through the Custer Interagency Dispatch Center. Until the IC arrives, the highest qualified firefighter will assume the duties of the IC until relieved by a qualified IC or the fire is suppressed. The IC will be responsible for:

- < Providing a size-up of the fire to dispatch as soon as possible.
- < Using guidance found in the fire Management Plan or in the Delegation of Authority, determine the strategy and tactics to be used.
- < Determine the resources needed for the fire.
- < Brief assigned resources on the strategy and tactics to be used, expected fire behavior, historic weather and fire behavior patterns, impacts of drought, live fuel moisture, escape routes and safety zones, and radio frequencies to be used.
- < Advising dispatch of resource needs on the fire.
- < Managing all aspects of the incident until relieved or the fire is suppressed.

The IC will receive general suppression strategy from the Fire Management Plan, but appropriate tactics used to suppress the fire will be up to the IC to implement. Minimum impact suppression tactics should be used whenever possible.

Upon arriving at the scene, all resources, including mutual aid resources, will report to the IC (either in person or by radio) prior to deploying to the fire. Mutual aid forces will be first priority for release from the fire. Procedures outlined in the dispatch section and elsewhere in this plan will be used to acquire Service and Interagency fire personnel and resources.

10. Wildland Fire Situation Analysis (WFSA)

A Wildland Fire Situation Analysis will be prepared in the event that a wildland fire exceeds the capabilities of the initial attack forces or a

prescribed burn exceeds the maximum allowable area defined in the prescribed fire burn plan. The WFSAs will be completed by the Refuge Manager assisted by the Fire Management Officer. Due to the size of the Refuge and the adjacent land holdings it may be necessary to consult with the adjacent landowners in the preparation of the WFSAs. A blank WFSAs and Delegation of Authority are included in Appendix I.

11. **Mop up Standards and Emergency Stabilization and Rehabilitation**

The IC will be responsible for mop-up and mitigating suppression impacts incurred on Refuge fires. The mop-up standards established in the Fireline Handbook will be followed. Refuge fires will be patrolled or monitored until declared out.

Prior to releasing all firefighters from a wildland fire the following actions will be taken:

- a. All trash will be removed.
- b. Firelines will be refilled and waterbars added if needed
- c. Hazardous trees and snags cut and the stumps cut flush.
- d. Disked firelines should be compacted as soon as possible to preserve the living root stock of natives grasses.
- e. Overturned sod resulting from plowing must be rolled back with a grader or by hand and compacted to preserve native grass root stock.

Other emergency stabilization and emergency rehabilitation measures may be taken in accordance with Chapter 5 of the Fire Management Handbook. Briefly:

Emergency stabilization is the use of appropriate emergency stabilization techniques in order to protect public safety and stabilize and prevent further degradation of cultural and natural resources in the perimeter of the burned area and downstream impact areas from erosion and invasion of undesirable species. The Incident Commander may initiate Emergency Stabilization actions before the fire is demobilized, as delegated by the Agency Administrator, but emergency stabilization activities may be completed after the fire is declared out.

Rehabilitation is the use of appropriate rehabilitation techniques to improve natural resources as stipulated in approved refuge management plans and the repair or replacement of minor facilities damaged by the fire. Total "rehabilitation" of a burned area is not within the scope of the Emergency Rehabilitation funding. Emergency Rehabilitation funding can

be used to begin the rehabilitation process if other funding is committed to continue the rehabilitation throughout the life of the project (beyond the initial 3 years of Emergency Rehabilitation funding). Major facilities are repaired or replaced through supplemental appropriations of other funding.

Because of the emergency nature of the fire event, the emergency stabilization section of the **Emergency Stabilization and Rehabilitation Plan** (ESR Plan) must be developed expeditiously and is frequently developed by a local unit or designated burned area ESR team. The rehabilitation section of the ESR Plan is not considered an emergency, and is developed as other refuge land use plans. The refuge manager is responsible for preparing all ESR Plans. In order to be funded, ESR plans must meet resource management objectives and be approved by the Project Leader and the Regional Director.

C. Prescribed Fire

1. Overview

The land management goals outlined in the Conceptual Management Plan include:

- < Restoration of wetlands, chutes, back water, streams, and upland habitats.
- < Restoration of major plant communities such as tall-grass prairie, riparian woodlands, and upland woodlands.
- < Once restored, maintaining the environs in as natural a state as possible.

Prescribed fire will be used to meet resource management objectives by reducing vegetative biomass in wetland areas and enhancing grassland production in the uplands. Prescribed fire in conjunction with herbicides or other vegetation management techniques will be utilized to reduce the incidence of noxious and invasive weed species. Prescribed fire will be used to reduce hazardous concentrations of wildland fuel.

Boyer Chute NWR was not established until 1992 and prescribed fires were not used as a management tool on the Refuge until 1998. A complete listing of historical prescribed fire activity on the Refuge can be found in Appendix N.

2. Long-term Prescribed Fire Program

The long-term prescribed fire program to achieve resource management objectives is based on a 10-year anticipated burn program. Annual target

acreage is determined based on an average of the 10-year projection. The Refuge will not necessarily be able to conduct prescribed burns consistently from year-to-year. This is primarily due to conditions outside the control of Refuge management and include factors such as too much or too little moisture, lack of personnel or funding, and similar elements. By taking these factors in to account when establishing the annual burn targets, the 10-year goal will meet Refuge habitat management objectives. Over a ten-year period, 5,000 acres will be treated in Fire Management Unit 1, which is primarily grass fuel models. Fuels in Fire Management Unit 2 will not be treated with prescribed fire at this time.

Prescribed fire acreage will be calculated by vegetation type. The acreage planned for prescribed fire may be reduced by the number of acres consumed by wildland fire in a vegetative type if it is deemed to be a significant impact to the desired habitat condition of that vegetative type.

3. Burn Season

Prescribed burning can occur at any time during the year depending on resource and management objectives. Most burning will occur in the period from February through October. A prescribed fire plan will be prepared and approved prior to the accomplishment of any prescribed burning activities. The prescribed fire plan will follow the format approved by the Regional Fire Management Coordinator.

4. Prescribed Fire Complexity

The complexity of a prescribed fire is dependent upon fuels/vegetation, objectives, smoke management, values at risk, burn boundaries, size, and number of personnel involved. Most prescribed fires on the Boyer Chute NWR will be Type 3 burns, low complexity burns; however, moderate and high complexity burns are possible. Type 2 and 1 burns will only be undertaken if a burn boss II (RXB2) or burn boss I (RXB1) and adequate resources are available. Prescribed fire complexity will be determined by the U.S. Fish and Wildlife Service Region 6 Complexity Analysis (Appendix H).

5. Limits

- a.** A permit is required from the Fort Calhoun Volunteer Fire Department prior to burning on the refuge.
- b.** The County Sheriff's Office, area and regional media, and fire departments will always be notified by the Burn Boss prior to ignition. Private landowners adjacent to the proposed burn will also be notified. The required notifications will be included in each burn plan.

- c. Prescribed fires will adhere to State of Nebraska and/or State of Iowa regulations regarding open burning. These regulations can be found in Appendix K.
- d. Control lines that disturb the soil will be avoided, and the use of earth moving equipment will be permitted only with the approval of the Refuge Manager or his designee.
- e. Foam retardants will not be used within 300 feet of a water feature.
- f. Drought can have an effect on fire severity and control. It is important to track one or more of the drought indicators. Prescribed burns should not be initiated if the Keetch-Byram Fire Danger Index is 600 or higher.
- g. The use of prescribed fire to accomplish objectives must be cost effective

6. Impact of Regional and National Preparedness Levels on Prescribed Burning

Prescribed burning may be conducted without additional constraint during Preparedness Levels I, II and III. The following is required if prescribed fire application is to be initiated or continued during regional or national Preparedness Levels of IV or V:

a. Preparedness Level IV

1. Local VFD's Notification

Contingency forces will generally be VFD's. Therefore, prior to initiating a prescribed fire, VFD's will be notified to ensure adequate contingency resources are available.

2. Regional / National Notification

Regional or State level agency representative must concur with local agency recommendations for managed fires. Evaluation of significant risk is made by Regional or State agency representative in presentation of prescribed fire implementation proposal to geographic multi-agency coordinating (MAC) group prior to any prescribed fire approval (Rocky Mountain Interagency Incident Mobilization Guide 1999).

b. Preparedness Level V

Approval from the Service Fire Management Coordinator at the National Interagency Fire Center (NIFC) in concert with the Geographical Area Coordination Group is required.

7. Planning and Implementation

All prescribed burns will be accomplished with an approved Prescribed Fire Burn Plan. Plans prepared by other than the Zone Fire Management Officer (FMO) will be evaluated by the Zone FMO. If the burn plan is completed by the Zone FMO, evaluation and approval will be completed by the Regional Fire Management Specialist.

Individual prescribed burn units will be identified by the Refuge manager and their staff as part of an annual wildland fire review process. Specific objectives for the burns will be determined at that time and indicated in the prescribed burn plan.

The units will be prepared in advance by the Refuge staff or other Service or contract personnel. Due to fuel arrangement and continuity, little line construction is necessary. All personnel and contingency forces will be notified by the Burn Boss prior to the day of the burn, and equipment will be checked and made ready at least one day prior to the burn. Resources will be pre-positioned to the fullest extent possible.

8. Contingency Planning Elements

Contingency planning is an integral part of the prescribed fire planning process, and begins with the first visit to the burn unit. It is important to identify in advance, circumstances or conditions that may require the implementation of the contingency plan. Each prescribed burn plan will include a section that thoroughly addresses the actions to be taken in the event a prescribed burn must be suppressed or managed as a wildfire.

The contingency plan will identify:

- a. The individual(s) who has the authority to activate the contingency plan.
- b. Clearly defined conditions (“trigger points”) that indicate the contingency plan should be activated.
- c. A listing of those to be notified or contacted.
- d. Who assumes the duties of the Incident Commander and what are the roles of others.
- e. The location of values at risk and other resources requiring protection.
- f. The preferred strategies and tactics.
- g. The location of containment lines or natural fuel breaks outside the burn unit.
- h. The location of water refill points, staged equipment, etc.
- i. Contingency forces (Type, number, location).

Due to fragmented habitats on the refuge, the number of contingency forces required to safely conduct the burn is fairly low. If contingency forces are needed, additional Service personnel and members of local Volunteer Fire Departments may be available.

If identified resources are identified in the plan as being on standby, they must be identified in the plan and how they are to be contacted. For example, cooperator resources can be ordered directly by calling 911, through the Washington County Sheriff’s office at 402-426-6866, or the Fort Calhoun Volunteer Fire Department at 402-468-5861. Refuge office at DeSoto NWR can be called by radio and refuge staff calling above numbers for assistance if needed.

The plan must also include other operational elements. For example, to provide good communications, the Refuge will provide Volunteer Fire Department with refuge Radios or Refuge will use radios which are capable of transmitting on Fort Calhoun VFD frequencies.

A prescribed burn will not be implemented unless all contingency forces are confirmed as being on-site or in standby status, as specified in the plan, unless an amendment to the prescribed fire plan has been approved by Project Leader (or person designated by Project Leader).

9. Potential Impacts

The limited scope of the fire management program at the Refuge should

have little if any impact on the local community. In fact, the fire management program may actually increase support for the Refuge through proper management of resources and the creation of habitat suitable for wildlife viewing and the associated economic contribution to the community.

All prescribed burns must be conducted in a manner that insures the fire will accomplish resource management objectives, while minimizing the possibility of escape. Were a fire to escape and damage private property or kill a large section of riparian habitat, creating a “scar” that would take a long time to heal, public perception of the program may not be favorable.

Perhaps, the greatest threat to the prescribed fire program at the Refuge is a public perception that a prescribed fire is a wildfire that is threatening surrounding communities. This can be mitigated by issuing press releases in advance of the burning season and creating media awareness of the program.

10. Prescribed Fire Monitoring

Prescribed fire monitoring and evaluation will be used to:

- a.** Determine whether burn plan criteria are being met.
- b.** Determine whether resource objectives are being met.
- c.** Document costs and improve economic efficiency.
- d.** Document data so results can be replicated.
- e.** Validate fire behavior predictions and refine prescriptions.
- f.** Provide baseline data for long-term fire effects studies.
- g.** Provide intelligence for operational decisions during an ongoing fire.
- h.** Meet legal and administrative responsibility to document the fire.
- i.** Provide justification for continuation of the project or program.

Monitoring is divided into 3 categories for prescribed fire; pre-burn, short-term and long-term.

Pre-burn monitoring will consist of monitoring live fuel moisture, atmospheric factors to develop weather trends, dead fuel moisture and changes to the fuel loading. Live fuel moisture plots will be permanently established across the Refuge in representative fuel types as well as temporary plots on the prescribed burn unit.

Short-term monitoring for any prescribed fire will include the first order fire effects (FOFE), smoke, fire behavior and weather. First order fire effects are the immediate results of the fire and relate directly to fire treatment objectives. Examples of FOFE include plant mortality, duff consumption, fuel consumption, percent of area consumed, etc. These effects should be listed in the prescribed fire plan for a burn unit. Fire behavior and smoke should be monitored during the burn to ensure that the objectives of the prescribed fire plan is being met. Weather will be monitored before and during the actual prescribed burn.

Monitoring of second order or longer term fire effects will be addressed in the Refuge Habitat Management Plan. Items to be considered in long-term monitoring might include: plant community change, increase or decrease in individual species as a result of burning or the overall juxtaposition of successional types on the Refuge.

D. Non-fire Hazard Fuel Reduction

Prescribed fire will be used to reduce hazardous concentrations of wildland fuel. Other means may be used as well. A project work plan for this work must be submitted and approved by the Regional Fire Management Coordinator prior to expending fire management funds.

XII. ADDITIONAL OPERATIONAL ELEMENTS

A. Public Safety

Firefighter and public safety will always take precedence over property and resource protection during any fire management activity. The greatest threat to public safety from Refuge wildfires are entrapment by fast moving fire fronts. The Refuge's first priority during fire management activities will be to keep the area near the fire clear of bystanders. The local law enforcement agency having jurisdiction will maintain order at the scene and enforce evacuation orders. Service personnel may assist with the evacuation process in cooperation with the law enforcement officer in charge. This priority will be reviewed as part of the annual fire fighter refresher.

Reduced visibility from smoke is another public safety concern. In the event of a wildfire or prescribed burn emitting heavy smoke on to a primary roadway, top priority will be given to safeguarding the travelers using the roadway versus suppressing the fire. The local law enforcement agency having jurisdiction is responsible for managing traffic hazards from smoke. Specific smoke management strategies will be identified in all prescribed fire burn plans.

B. Public Information and Education

The public's perception of wildland fire is slowly changing. The beneficial effects of fire are being recognized by the general public, however views that all fire in the wildlands is bad persist. A successful prescribed fire program cannot occur without broad public support. Public information and education are an important part of the fire management program on the Refuge. Fire has in the past and will continue to shape landscape vegetation and animal behavior patterns on the landscape in the Boyer Chute area. Efforts will be made to incorporate fire effects information into interpretation and environmental education projects on the Refuge and through presentations at local community meetings.

C. Records and Reports

The incident commander (IC) on a wildland fire or the prescribed fire burn boss on a prescribed burn will be responsible for the completion of a DI-1202 Fire Report as well as Crew Time Reports for all personnel assigned to an incident and return these reports to the Assistant Manager. The IC or burn boss should include a list of all expenses and/or items lost on the fire and a list of personnel assignments on the DI-1202. The Assistant Refuge Manager will submit the DI-1202 to the District Fire Management Officer within 10 days of the fire declared out. The District FMO will enter the information into the Fire Management Information System (FMIS). The Assistant Refuge Manager will also inform the timekeeper of all time and premium pay to be charged to the fire and ensure expended supplies are replaced.

D. Fire Critiques and Annual Review

The Refuge's Fire Management program will be reviewed periodically in an effort to improve performance and efficiency. The Fire Management Plan will be reviewed annually for currency and applicability and updated as necessary. A prescribed fire monitoring checklist will be used as a guide in critiquing the success or failure of a prescribed burn (Appendix L). Other reviews and the circumstances when they would occur are indicated in the following sections.

E. Prescribed Fire/Wildfire Review

All prescribed fires reclassified as wildfires will be reviewed by the Refuge Manager or their designated representative. A formal report will be prepared, signed by the Refuge Manager and a copy forwarded to the Regional Fire Management Coordinator and the Fire Management Branch.

1. Refuge Level Review

This review is conducted by the refuge manager or their designee to

provide information to recognize commendable actions and to take needed corrective actions after an incident. An oral review is the required minimum report.

2. Regional Level Review

A regional level review will generally be conducted for any fire that:

- a.** Crosses the Refuge's boundary into another jurisdiction without the approval of an interagency agreement.
- b.** Results in adverse media attention.
- c.** Involves a fatality, serious injury, or significant property damage.
- d.** Results in controversy involving another agency.

3. National Level Review

A national level review will generally be conducted for any fire that involves Service-wide or national issues, including:

- a.** Significant adverse media or political interest.
- b.** Multi-regional resource response.
- c.** A substantial loss of equipment or property.
- d.** Multiple, serious fire-related injuries.
- e.** Any other fire that the director wants reviewed.

Additional information on reviews can be found in the Fire Management Handbook, section 3.4, Reviews.

F. Air Quality and Smoke Management

Smoke management is administered by the Nebraska Department of Environmental Quality and Iowa Department of Natural Resources - Air Quality Bureau. Requirements of these agencies for prescribed burning will be followed.

A prescribed burn will not be implemented unless the Smoke Mixing Height is a minimum of 1650' and Transport Windspeed is a minimum of 9 mph. These criteria are determined daily by the National Weather Service and will be part of the prescribed burn spot weather forecast. Further information on smoke management is contained in Appendix K.

G. Cultural Resources

Fire Management activities at the Refuge will be implemented in accordance with the regulations and directions governing the protection of cultural resources as outlined in Departmental Manual Part 519, Code of Federal Regulations (36 CFR 800), the Archeological Resources Protection Act of 1979, as amended, and the Archeological and Historic Preservation Act of 1974. The National Historic Preservation Act of 1966, as amended, Section 106 clearance will be followed for any fire management activity that may affect historic structures or archeological resources.

Although over 20 years of fire ecology research allows ecologists to predict impacts on biotic communities, the possible impacts of prescribed burning (and wildfires) on archeological resources are not well known. Research conducted in North Dakota indicated that fire-related impacts to buried artifacts are negligible, but effects on surface-exposed artifacts will be significant, depending on artifact type and size (Seabloom et al. 1991).

Impacts to archeological resources by fire resources vary. The four basic sources of damage are (1) fire intensity, (2) duration of heat, (3) heat penetration into soil, and (4) suppression actions. Of the four, the most significant threat is from equipment during line construction for prescribed fires or wildfire holding actions (Anderson 1983).

The following actions will be taken to protect archeological and cultural resources:

1. Files and records of cultural resources should be consulted by the staff when planning prescribed burns, developing pre-attack plans, and performing other preparedness actions. The potential for adverse impacts to cultural resources will be evaluated prior to prescribed burning and in the selection of fire suppression strategies during wildfires.
2. The Regional Archeologist will be contacted during the development phase of the burn plan writing process when cultural resources are suspected or known to exist in the project area.
3. The Nebraska State Historic Preservation Officer (SHPO) will be contacted by the Regional Archeologist when it is known a planned management action may impact archeological or cultural resources. The SHPO has 30-days to respond. The Refuge will follow any programmatic archeological/cultural resources management plan that may be implemented in the future.
4. Low impact wildfire suppression tactics (cold-trailing, use of foam/wet-water/water, use of natural and manmade barriers, change in vegetation,

mowing, etc.) will be used to the fullest extent possible. Line construction for prescribed fire activities will follow the same principle. Maps indicating the known location of significant cultural resources will be consulted prior to laying out burn units, and whenever possible, before constructing fireline to halt the spread of a wildfire.

5. Prescriptions for management ignited prescribed fires will take into account the presence of known cultural sites. Cooler fires with short residence time will be used in areas containing known cultural sites, whenever possible.
6. Known surface sites will be marked, protected, and excluded from the burn, if possible. Foam will not be used in areas known to harbor surface artifacts.
7. The use of mechanized equipment within the refuge must be approved by the Refuge Manager on a fire by fire basis, and the use these resources will be considered in the approval process for any planned management actions. When the use of heavy equipment is authorized, its use will be monitored.
8. The location of sites discovered as the result of fire management activities will be reported by the Refuge Manager to the Regional Archeologist.
9. Rehabilitation plans will address cultural resources and will be reviewed by the Regional Archeologist.

H. Fire Research and Monitoring

The need for improved fire effects information on Refuge plant and animal species is evident. Past monitoring and evaluation has not been thorough enough to improve prescription writing capabilities and improving the probability of successful prescribed fire prescriptions.

XIII. CONSULTATION AND COORDINATION

Copies of this plan will be made available to the Nebraska Game and Parks Commission, Iowa Department of Natural Resources, Ft. Calhoun Fire Department, Missouri Valley Rural Fire Department, and Blair Rural Fire Department.

The following individuals were consulted in the development of this plan:

Lou Ballard, Zone Fire Management Officer, KS, NE, CO, UT, R6 USFWS

Carl Douhan, Fire Management Planner, Contractor

Jim Kelton, Prescribed Fire Specialist, R6 USFWS

Mindy Sheets, Refuge Operations Specialist, DeSoto NWR

Phil Street, Regional Fire Management Coordinator, R6 USFWS

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