

FIRE MANAGEMENT PLAN
FOR
ARAPAHO NATIONAL WILDLIFE REFUGE
Walden, Colorado

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1.0 INTRODUCTION

1.1 General

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.

1.2 Description of Refuge

1.2.1 Location

The Arapaho National Wildlife Refuge (Refuge) is located in North-central Colorado, immediately south of Walden, Colorado, (Figure 1). The Refuge currently encompasses 24,804 acres along the Illinois River, a tributary of the North Platte.

Arapaho is a complex that includes four smaller Refuges in southern and central Wyoming (Figure 1). Bamforth NWR is located immediately west of Laramie, WY and consists of 960 acres of grass/sage/greasewood uplands and 206 acres of ephemeral wetland basins. Hutton Lake NWR is south of Laramie and consists of 1408 acres of sage/greasewood/grass uplands and 560 of open water/marsh in 5 small lakes. Mortenson Lake NWR southwest of Laramie encompasses 1776 acres dominated by short grasses typical of the Laramie Plains, interspersed with sage uplands and 4 lakes totaling approximately 190 acres. Pathfinder NWR is an overlay refuge on Pathfinder Reservoir approximately 50 miles west of Casper, WY. It is predominately sagebrush upland, and open water of the Reservoir, but includes several small wetlands and a few hundred acres of grassland.

Table 1: Management Units

Management Unit	Acres
Arapaho National Wildlife Refuge	24,804
Bamforth NWR	1,166
Hutton Lake NWR	1,968
Mortenson Lake NWR	1,966
Pathfinder NWR	16,807

Figure 1: Vicinity Map - Arapaho NWR, Satellite Refuges, and Vicinity

1.2.2 Topography, Slope, and Soils

The Refuge is made up predominately of rolling sagebrush hills, and riparian areas with associated historic flood plain. Elevations range from 8100-8700 feet above mean sea level.

Soils on the refuge fall into two broad categories, soils of the low terraces, flood plains and irrigated benches, and soils of the benches and uplands. The former are sandy loam, loam and clay loam soils formed in alluvium and outwash. They are poorly to well drained and are generally moderately deep over sand and gravel and are level to gently sloping. The latter are sandy loam, outwash and clay loam soils formed in alluvium outwash or weathered sandstone or shale. They are shallow to deep, nearly level to steep and are well drained. Detailed soil surveys for Jackson County were completed by the Natural Resources Conservation Service in 1980. A copy is available at the refuge office to be used in conjunction with specific prescribed burning plans and other fire management needs.

1.2.3 Water

The various wetlands and rivers are described in Section 1.2.5.

1.2.4 Climate

The area is characterized as a cold desert biome with low precipitation and extreme temperature variations. Average annual precipitation is 9.5 inches with most occurring in the spring and fall seasons of the year. Mean annual temperature is 36.5EF. Temperatures extremes range from - 40E F. in the winter to 95E F. during the summer. There is an average of 30 consecutive frost-free days annually. Evapo-transpiration averages 40 inches per year.

1.2.5 Vegetation

1.2.5.1 Vegetation - Satellite Refuges

Bamforth NWR consists of 960 acres of grass/sage/greasewood uplands and 206 acres of ephemeral wetland basins. Hutton Lake NWR consists of 1408 acres of sage/greasewood/grass uplands and 560 of open water/marsh in 5 small lakes. Mortenson Lake NWR encompasses 1776 acres dominated by short grasses typical of the Laramie Plains, interspersed with sage uplands and 4 lakes totaling approximately 190 acres. Pathfinder NWR is an overlay refuge on Pathfinder Reservoir. It is predominately sagebrush upland, and open water of the Reservoir, but includes several small wetlands and a few hundred acres of grassland.

1.2.5.2 Vegetation - Arapaho NWR

Vegetation types on the Refuge are classified as: wetlands, uplands, irrigated meadows, riparian, and mixed conifer and aspen. Table 2 displays vegetation types and their respective acreage.

Table 2: Arapaho NWR Vegetation Types

VEGETATION TYPE	ACRES
Wetlands	839
Uplands	14,304
Riparian	200
Irrigated Meadows	9,066
Mixed conifer/aspen	320
Administrative areas	75
TOTAL	24,804

Wetlands: Approximately 839 acres of wetland marsh habitat exists on the Refuge. This includes both deepwater and shallow marshes. Hardstem bulrush (*Scirpus acutus*) and cattail (*Typha latifolia*) are the dominant plant species. Wetlands consist primarily of manmade impoundments, varying in size from less than 1 to over 100 acres. There are a few basins and spring fed wet meadows that naturally held water and are now supplemented by irrigation.

Uplands: Approximately 14,304 acres of uplands exist on the Refuge. This type is composed predominantly of mixed grass/sagebrush and native grassland. Dominant plant species in this type are sagebrush (*Artemisia spp.*), greasewood (*Sarcobatus vermiculatus*), rabbitbrush (*Chrysothamnus spp.*), winterfat (*Ceratoides lanata*), various wheatgrass species (*Agropyron*), saltgrass (*Distichlis spicata*) and Indian rice grass (*Oryzopsis hymenoides*).

Riparian: This vegetation type includes the narrow ribbon of willows and trees along the Illinois River. Approximately 200 acres of riparian habitat exists on the Refuge. The dominant plant species are several species of willow (*Salix .*), Nebraska sedge (*Carex nebraskensis*), Baltic rush (*Juncus balticus*), timothy (*Phleum pratense*), and reed canary grass (*Phalaris arundinacea*).

Irrigated Meadows: This vegetation type consists of 9,066 acres scattered throughout the Refuge. These areas used to produce hay for the previously owned ranches and are still irrigated, but the grasses are left for nesting cover for waterfowl. Species are a mix of natives, such as tufted hairgrass (*Deschampsia caespitosa*), Nebraska sedge, baltic rush, and slender wheatgrass (*Agropyron trachycaulum*), and introduced species including timothy, redtop (*Agrostis palustris*), alta fescue (*Festuca arundinacea*), and foxtail barley (*Hordeum jubatum*).

Mixed Conifer/Aspen: The mixed conifer/aspen type is adjunct to the main refuge. This parcel is 320 acres in size and is dominated by Colorado blue spruce (*Picea pungens*), Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and quaking aspen (*Populus tremuloides*).

Noxious Weeds and Other Problem Species: Several non-native species are acting as invasives on the Refuge. Whitetop (*Cardaria draba*), Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans* L.) and yellow toadflax (*Linaria vulgaris* L.), are the non-natives of most concern.

1.2.6 Wildlife

Over 200 species of birds have been identified on the Refuge, eighty-two of which are confirmed nesters. The refuge is most important as a migratory stop-over for water birds. Thirty-three mammal species have also been reported on the Refuge.

Five species of amphibians and one reptile inhabit the Refuge. Nine species of fish have been found in the Illinois River and its tributaries on the refuge. Appendix H contains a species list of the Refuge.

1.2.7 Threatened, Endangered and Special Concern Species

The Refuge provides important habitat for four species of special concern: Bald eagle (*Haliaeetus leucocephalus*); Peregrine falcon (*falco peregrinus*); Northern sage grouse (*Centrocercus urophasianus*); and the North Park phacelia (*Phacelia formulosa*).

The Peregrine falcon is an occasional visitor to the Refuge in the spring, summer and fall, while the Bald eagle is a regular winter visitor. Sage grouse are year round residents, utilizing different parts of the Refuge during the year.

The endangered North Park phacelia, which is endemic to Jackson County, has two known populations on the Refuge.

1.2.8 Land Use and Values and Improvements on and Adjacent to Station

There are six areas of improvements on the Refuge. The headquarters complex consists of Refuge office/visitor center, employee residences, garages, sheds, and refuge maintenance buildings. The estimated value of this complex is \$1,641,504. The second area of improvements on refuge is the Soap Creek Ranch consisting of a house and pump house with an estimated value of \$220,000. There are two barns located at different sites, one at the Hampton ranch site and one at the Case ranch. The Case barn is a historic structure. Estimated value of both barns is \$81,104. In addition, there are 4 Refuge entrance signs, 4 kiosk/interpretive display sites, and one cinderblock outhouse in various locations of the Refuge. Estimated value of these structures is \$200,000.

Adjacent landownership is Bureau of Land Management (BLM) and privately owned lands

consisting of houses on 1-5 acre lots or ranch lands with grazing pastures and hay meadows. The BLM lands are maintained for land management purposes and have no improved value. The town of Walden, Colorado, population 800, is located near the north boundary of the Refuge.

1.29 Cultural Resources

Most of the Refuge has been surveyed for cultural resources. Prehistoric and historic sites have been located and recorded in all areas surveyed. A map identifying these sites is in the office vault and with the Regional Archaeologist. Although there are no sites officially listed on the National Register of Historic Places, there are several of historic value and local interest that need to be protected from fire. Historic structures include the Case Sheep barn, the Hampton barn and the Allard barn located at the Refuge Headquarters.

1.2.10 Intrinsic Values, Socio-Political-Economic

The area was once an active timber industry site. Due to changes in forest practices and other factors, the area's economy is now primarily one of ranching and recreation. State and federal governments have a presence in the community. Wildland fire, including prescribed fire, is viewed as a threat by the local community.

1.3 Historical/Ecological Role of Fire

Historical fire information for the Refuge area is generally lacking, but Bureau of Land Management (BLM) records for North Park indicate little significant wildland fire activity in the past 50 years. Early explorers noted tall grass found in the park, and Native Americans dubbed North Park the "Bullpen" referring to the bison inhabiting the area. This gives an indication that the area may have been more dominated by grasses and thus likely was more influenced by fire than the present condition dominated by sagebrush hills. Fire acts as a disturbance factor in the vegetal development of most plant communities and invokes secondary successional processes (Bunting 1984). Because of the historical prominence of humans in the area it is probable that fire was a disturbance factor in the development of vegetative communities on the Refuge. Whether the descriptions of early Park explorers of grass "belly high on a horse" encompassed the whole Park or just its riparian associated meadows is not clear. Ranching has been the primary land use introduced from Europeans that has affected the vegetative regime. Irrigation, haying and livestock grazing have likely changed the landscape of North Park, at a minimum from a sagebrush/grass/forb regime to one without much of a grass/forb component. The best approach to return fire into the Arapaho 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:

Wetlands: There is little documentation on the historical fire ecology of this type. 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. Prescribed fire can be used as an effective means of reducing vegetative biomass when it is beneficial to do so.

Uplands: Domination of sites by shrub species such as big sagebrush in this type would require a non-disturbance interval of more than 30 years (Petersburg 1992). With disturbance intervals less than 30 years a community of grass and low-growing high altitude shrubs would result.

Riparian: Various species of irrigated/sub-irrigated grasses and willows (*Salix* sp.) indicate this vegetative type. Most fires kill above ground portions of *Salix*, leaving roots to sprout. Only severe fire that consumes organic matter, thus damaging roots, is detrimental to the plant (FEIS 1998). Grasses respond to the increased growing space and pulse of nutrients released by burning.

Irrigated Meadows: These are areas that were historically used as hay meadows, and consist of predominantly introduced grasses that grow well (3+') with managed irrigation. Fire should reduce matting and release nutrients to create healthy, thick stands in succeeding growing seasons.

Mixed Conifer-Aspen: Fire in these areas can rejuvenate or remove the forest component in these areas depending on fuels and burning conditions. A hot crown fire will most likely result in setting back successional stages to a grass forb mix. Cooler ground fires will keep fuel building to a minimum and create an understory of grasses, forbs, and montane shrubs. Top-killing of quaking aspen may result in sprouting from the roots.

1.4 Refuge Fire History

Due to the structure fire which destroyed the Refuge headquarters in 1997, past records and historical documents that may provide additional information for the first 30-years of the Refuge's history available. It is known, however, since 1968, five wildfires have been reported on the Refuge (Shared Applications Computer System 2001). They ranged in size from 0.1 acre to 735 acres. The majority were Class A Fires. There have been no recorded wildfires on the Refuge in the past ten years. The last recorded fire suppression event was in 1989, a year that four were reported. No wildland fires have been reported at any of the Satellite refuges. A complete listing of wildland fire activities occurring in 1981 and later can be found in Appendix A.

Prescribed fire has been utilized minimally as a management tool on the Refuge. This is primarily due to differing management philosophies, small burning windows, and local public perception. A few small burns were conducted in the mid 80's, and the last occurred in the early 1990's.

2.0 POLICY COMPLIANCE - GOALS AND OBJECTIVES

2.1 Compliance with Service Policy

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.

2.2__NEPA Compliance Statement

This plan meets the requirements established by the National Environmental Protection Act (NEPA). Regulations published in the Federal Register (62FR2375) January 16, 1997, categorically excludes prescribed fire when conducted in accordance with local and State ordinances and laws. Wildfire suppression and prescribed fire operations are both categorically excluded, as outlined in 516 DM2 Appendix 1. The Service has determined that prescribed fire activities will tier off a land management plan that has addressed the use of fire as a management tool and has been through the NEPA process. An Environmental Assessment (EA) that addressed the use of prescribed fire was completed in 1984 as part of the original Fire Management Plan development process (Appendix B), therefore an EA will not be completed for this plan.

2.3__Authorities Citation

Authority and guidance for implementing this plan are found in:

- G Protection Act of September 20, 1922, 42 Stat. 857;16 U.S.C. 594.
- G Economy Act of June 30, 1932, 47 Stat. 417; 31 U.S.C. 315.
- G Reciprocal Fire Protection Act of May 27, 1955, 69 Stat.66.67;42 U.S.C. 1856, 1856 a and b.
- G National Wildlife Refuge System Administrative Act of 1966, as amended, 16 U.S.C. 668 dd-668 ee.
- G Disaster Relief Act of May 22, 1974, 88Stat. 143; 42 U.S.C. 5121.
- G Federal Fire Prevention and Control Act of October 29, 1974 , 88 Stat. 1535; 15 U.S.C. 2201.

- G 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.
- G Supplemental Appropriation Act of September 10, 1982, 96 Stat.837.
- G Wildfire Assistance Act of 1989, Pub. L. 100-428, as amended by Pub. L. 101-11, April,1989.
- G Department of Interior Departmental Manual, Part 620 DM-1, Wildland Fire Management (April 10, 1998).
- G U.S. Fish and Wildlife Service Manual, 621 FW1-3 (February 7, 2000)
- G U.S. Fish and Wildlife Service Fire Management Handbook (December 28, 2000)

2.4 Other Regulatory Guidelines

Fire Management activities within the Refuge will be implemented accordance with the following regulations and directions:

- G Departmental Manual Part 519 (519DM)
- G Code of Federal Regulations (36CFR 800)
- G The Archaeological Resources Protection Act of 1979
- G The Archaeology and Historical Preservation Act of 1974, as amended
- G National Historic Preservation Act of 1966
- G The Endangered Species Act of 1973, as amended
- G The Provisions of the Clean Air Act, as amended 1990

2.5 Enabling Legislation and Purpose of Refuge (Mission Statement)

The enabling legislation for Arapaho National Wildlife Refuge included the Migratory Bird

Conservation Act (16 USC 715d). The legal purposes of the Refuge include:

“... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds,” and

“... suitable for-(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species...”

The enabling legislation for Bamforth National Wildlife Refuge included the Migratory Bird Conservation Act (16 USC 715d), and Executive Order 5783, dated January 29, 1932. The legal purposes of the Refuge include:

“...as a refuge and breeding ground for birds and wild animals...”

“... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.”

The enabling legislation for Hutton Lake National Wildlife Refuge included the Migratory Bird Conservation Act (16 USC 715d), Executive Order 5782, dated January 28, 1932, and the National Wildlife Refuge System Administration Act (16USC 668dd(a)(2)). The legal purposes of the Refuge include:

“...as a refuge and breeding ground for birds and wild animals...”

“... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.”

“...conservation, management, and restoration of the fish, wildlife and plant resources and their habitats for the benefit of present and future generations of Americans...”

The enabling legislation for Mortenson Lake National Wildlife Refuge included the Endangered Species Act of 1973 (16 USC 1534). The legal purposes of the Refuge include:

“...to conserve (A) fish or wildlife which are listed as endangered species or threatened species or (B) plants...”

The enabling legislation for Pathfinder National Wildlife Refuge Executive Order 7425 dated August 1, 1936. The legal purposes of the Refuge include:

“...as a refuge and breeding ground for birds and other wildlife...”

2.6 Overview of Planning Documents

There are no land management plans and the Comprehensive Conservation Plan for the Refuge is currently being developed.

2.7 Land Management Goals and Objectives

Arapaho NWR is currently going through the Comprehensive Conservation Planning process, which will develop and refine goals and objectives. Refuge goals and objectives listed below reflect the Refuge Mission and Operating statements approved on August 9, 1989, and modifications that have been made since that time.

2.7.1 Mission

To Manage and Restore all habitats utilized by migratory birds and other indigenous species.

2.7.2 Refuge Goals and Objectives

Goal: Maintain and enhance habitats for migratory birds and other wildlife

Objective: Restore and maintain riparian plant communities.

Objective: Restore and maintain diverse plant communities, irrigated meadows, sagebrush uplands and wetlands.

Goal: Provide habitats that support the recovery of threatened and endangered species on or adjacent to the Refuge

Objective: Maintain populations of the North Park Phacelia.

Goal: Provide high quality upland habitats for migratory birds and resident ungulates.

Objective: Maintain or manage healthy irrigated and sub-irrigated meadows.

Goal: Educate refuge visitors and the local community about the Refuge, the refuge system and the Upper Platte River Ecosystem

Objective: Provide educational opportunities in a natural setting to help Refuge visitors understand and appreciate management activities at Arapaho National Wildlife Refuge.

3.0. 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). All fire management activities will be completed with the consideration of resource values and will consider cost effectiveness.

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

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

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

- Objective:** Use prescribed fire:
 - < To increase vigor in native grasslands
 - < To reset selected habitats to earlier successional stages, as needed for habitat improvements.
 - < To create a mosaic of successional stages within Refuge habitats, to provide habitat for the greatest diversity of wildlife.
 - < As part of an integrated pest management plan to control non-native plants.

4.0 FIRE MANAGEMENT STRATEGIES

4.1 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.

Mechanical treatment of natural fuels will be utilized to reduce potential for damage from wildfire. These treatments must be in compliance with resource management goals and objectives.

The basic fire management strategy for the Refuge 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. An aggressive response will generally be the suppression strategy for the entire Refuge. 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. 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 structures and cultural resource sites. Specific tactics will be determined by the Incident Commander on scene. The matrix in Table 3 is intended to provide an overview of the various options available to the Incident Commander.

Table 3: 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.	<ol style="list-style-type: none"> 1. Holding at natural and man-made barriers. 2. Burning out. 3. Observe and patrol.
<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 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.
<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 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.

4.2 Limits

- G Smoke management will be carefully considered for all prescribed burns and will be addressed in all prescribed burn plans.

- G All fires occurring on the Refuge will be staffed or monitored until declared out.

- G Prescribed burning in areas where threatened, endangered, and candidate species exist will not be conducted if the prescribed fire will be detrimental to the species or any adverse impacts cannot be mitigated, Section 7 clearance will be secured, as appropriate.

- G Heavy equipment (dozers, discs, plows, and graders) will not be used for fire suppression except in life threatening situations without the express approval of the Refuge Manager or his/her designee.

- G The use of prescribed fire to achieve management objectives must be conducted in a cost effective manner.
- G 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.

4.3 Rationale

- G Due to the small size of the refuge and the low number of lightning ignited fires occurring on 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 higher cost than the selected method.
- G Hazard fuel reduction on some areas of the refuge are not 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.

4.3 Effects on Neighboring Lands

The Refuge is bordered predominantly by BLM lands, but also abuts private ranches, smaller acreage (<10acres) homesites, and is within ½ mile of the town of Walden to the north. The Refuge operates under the Jackson County Annual Operating Plan, partnering with local, state and federal agencies in addressing fire issues in the county. Refuge personnel have been first responders to fires on adjoining BLM lands, and the local fire department has responded to Refuge fires.

Surrounding BLM ground is dominated by sagebrush uplands, with grazing being the predominant land use. Escaped Refuge fires have the potential to burn significant pieces of BLM ground, with a potential impact to grazing permittees, depending on the time of the burn.

Adjoining ranchlands comprise some sagebrush upland pastures, grass meadows used for hay production, and nearby hay stackyards. Escaped fire into these areas could impact, grazing lands, or hay production depending on the time of the year, and burning a stackyard could have serious impact to the affected rancher.

The small acre homesites and town of Walden are close enough to the Refuge where the potential for structure damage, and smoke issues need to be addressed when planning prescribed fires. Most of these homesites are along the northeast boundary of the Refuge, while Walden is straight north. With the predominant winds being southwesterly, and southerly winds common, these areas must be given due consideration when writing prescriptions. Fuels along these wildland/urban interfaces do not vary significantly across the Refuge boundary.

5.0 FIRE MANAGEMENT RESPONSIBILITIES

5.1 ___Refuge Staff Responsibilities

All fire management duties on the Refuge are collateral duties. The Refuge Manager is responsible for planning and implementation of an effective and safest possible fire management program at the Refuge. The Refuge Manager is also ultimately responsible for all fire management decisions related to both wildfire and prescribed fire in the Refuge. The fire job responsibilities in the Fireline Handbook (PMS 410-1) and the ones described for the positions below are to be fulfilled. A listing of staff and their qualifications can be found in Appendix C.

5.1.1 Refuge Manager

- G Responsible for the overall management of the refuge including fire management.
- G Insures fire management policies observed.
- G Fosters effective cooperative relations within the refuge, cooperating fire organizations, and adjoining land owners.
- G Within budgetary restraints and other staffing considerations, insures sufficient collateral duty firefighters meeting Service standards are available for initial attack.
- G Prepares annual FireBase budget submissions and approves and tracks use of FireBase accounts.
- G Approves individual prescribed fire plans.
- G Completing daily validation that prescribed fires are under prescription and meet all other Service policy requirements.
- G Serves as burn boss and collateral duty firefighter, as qualified.

5.1.2 Assistant Refuge Manager

- G 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.
- G Responsible for planning and coordinating preparedness activities including:
 - # The Refuge fire training program.
 - # Physical fitness testing and Interagency Fire Qualification System data entry.
 - # Coordinating with cooperative agencies on a regional level. Revising cooperative agreements as necessary.
 - # Insuring the Step-up Plan is followed.
 - # Fire Cache and equipment inventory accountability, maintenance, and operation.

- G Responsible for coordinating prescribed fire activities including:
 - # Reviewing proposed annual prescribed fire program to insure resource management objectives are being met.
 - # Proposes prescribed burn projects.
 - # Writing prescribed burn plans
- G Maintains liaison with Regional Fire Management Coordinator and Cooperators.
- G Maintains fire records, reviews completed DI-1202's for accuracy and submits them to the Zone FMO, and annually reviews and updates as necessary the Fire Management Plan.
- G Serves as collateral duty firefighter, as qualified.
- G Serves as Prescribed Fire Burn Boss, as qualified

5.1.3 Seasonal and Collateral Duty Firefighters

- G Responsible for their own fire records, equipment, and physical conditioning.
- G Qualifies annually by completing the appropriate fitness test between March 15-30, or within 2 weeks of EOD date.
- G Maintains assigned fire equipment in ready state and using all safety gear assigned.
- G Assists the Assistant Refuge Manager maintain accurate fire records by providing documentation for training and experience.
- G Serves as collateral duty firefighter, as qualified

5.1.4 Wildfire Incident Commander (as assigned)

- G The Incident Commander (IC) is responsible for the safe and efficient suppression of the assigned wildfire.
- G Fulfills the duties described for the IC in the Fireline Handbook (PMS 410-1).
- G Notifies the Project Manager or Dispatcher of all resource needs and situational updates, including the need for extended attack.
- G Ensures wildfire behavior is monitored and required data is collected and all firefighters are informed of forecast and expected fire weather and behavior. Informs fire suppression personnel of escape routes and safety zones. Posts lookouts.
- G Ensures personnel are qualified for the job they are performing.
- G Identifies and protects endangered and threatened species and sensitive areas according to the Fire Management Plan.
- G Utilizes minimum impact tactics to the fullest extent possible.
- G Ensures fire is staffed or monitored until declared out.
- G Ensures that the fire site is stabilized and notifies management *if* rehabilitation is required.
- G Submits completed DI-1202 (wildfire report), Crew time reports, a listing of any fire

related expenditures or losses to the Project Manager, and completes taskbooks within 3 days of fire being declared out.

5.1.5 Prescribed Burn Boss (as assigned)

- G Writes or reviews prescribed burn prescriptions for assigned blocks
- G Implements approved prescribed burn plans.
- G Assist with the administration, monitoring, and evaluation of prescribed burns.
- G Submits completed DI-1202 (wildfire report), Crew time reports, a listing of any fire related expenditures or losses to Administrative Officer, and completes taskbooks within 3 days of fire being declared out.

5.2 Cooperator involvement

Arapaho NWR is almost entirely surrounded by federal lands managed by the Kremmling Field Office of the Bureau of Land Management. The Refuge and its cooperators operate under the direction of the Craig Interagency Fire Dispatch Center Annual Operating Plan, and the Annual Fire Operating Plan for Jackson County. The Craig Interagency Fire Center Annual Operating Plan displays suppression responsibilities for the area as well as a list of Refuge cooperators (Appendix D).

Along with other land management agencies, the Service has adopted the National Interagency 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.

6.0 FIRE SEASON

6.1 Refuge Fire Frequency

Prior to 1986, fires were not entered into the Fire Occurrence Subsystem. Since that time, four fires have been recorded. Two of these fires were human caused and two were attributed to lightning (Appendix A). Because there have been no reported fires for the period 1990-1999, the wildfire frequency is 0.0 wildland fires per year. However, this must be tempered with the fact that four fires occurred in 1989. Suffice it to say, the risk is slight.

6.2 Refuge Fire Season

The wildfire season determined by the Craig Interagency Dispatch Center for the Interagency Fire community is June 1 through September 30. However, wildfires have occurred on the Refuge in the late winter and early spring months. The prescribed fire season is from April-June and September-November.

7.0 EQUIPMENT AND STAFFING NEEDS

7.1 Normal Unit Strength

The Refuge is authorized a ten-person fire cache. Recommended cache items and Type 6 Engine inventory are located in Appendix E.

7.1.1 Equipment and Supplies

Engines are the primary initial attack resource on the Refuge because of the predominance of fine fuels and access roads. Earth moving equipment is available, however it will only be used after approval of the Refuge Manager and when no other alternatives exist. Heavy equipment is available for use off refuge per Cooperative Operating plans. Equipment available for fire management purposes is listed in Appendix E.

7.1.2 Personnel and Level of Qualifications

The Refuge is in an unique position. Due to the size of the staff and the low occurrence of wild fire, it is difficult to maintain currency; however, due to the nature of some fuels complexes and the location of the refuge, a higher level of qualification may be appropriate. The minimum staffing needs of the Refuge's Fire Management program are indicated in Table 4.

Table 4: Minimum Staffing Needs - Arapaho NWR

POSITION	WILDFIRE	PRESCRIBED FIRE
Incident Commander (ICT4 or ICT5)	1	
Engine Boss (ENGB)	1	1
Engine Operator (ENOP)	1	1
Prescribed Burn Boss (RXB3)		1
Firefighters	3	3

Note: One person can be qualified for more than one position.

8.0 PREPAREDNESS

8.1 Current Staff Available to meet Position Needs

Current employee qualifications are listed in Appendix C.

8.2 Pre-season Readiness Activities

Table 5: Annual Refuge Fire Management Activities

ACTIVITY	1	2	3	4	5	6	7	8	9	10	11	12
Update Interagency Fire Agreements/AOP's	x											
Winterize Fire Management Equipment										x		
Inventory Fire Engine and Cache			x									
Complete Training Analysis										x		

Prepare Pre-season Risk Analysis				X										
Live Fuel Moisture Sampling							X	X	X	X				

Activities should be completed prior to the end of the month that is indicated.

8.2.1 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.

Refuge shall complete and submit a **copy** of completed National Wildfire Coordinating Group Interagency Training Nomination form (Appendix F) 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.

8.2.2 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 G 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 administer the 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 G). 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.

8.2.3 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.

8.3 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 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://www.boi.noaa.gov/fwweb/fwoutlook.htm>. The Refuge fire staff can also contact the Craig Interagency Dispatch Center (970-826-5936) during periods of high fire danger to track indices and anticipate possible fire activity.

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.

8.4 Step-Up Plan

All preparedness activities will be in accordance with the Refuge's Step-up Plan (Appendix H).

8.5 Severity and Emergency Presuppression Funding

Severity funding is different from Emergency Presuppression funding. Emergency Presuppression funds are used to fund activities during a short-term weather event and/or 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 reposition additional initial attack equipment, augment existing fire suppression personnel, and meet other requirements of the Step-up Plan.

Emergency Presuppression and Severity funds will be requested in accordance with the guidance provided in the Service's Fire Management Planning Handbook. As a general guide, Severity funding will be requested if a severe drought is indicated by a Palmer Drought Index reading of -4.0 or less or a Keetch-Byram Drought Index of 600 or greater and a long-range forecast calling for below average precipitation and/or above average temperatures. Drought Indices can be located at: <http://www.boi.noaa.gov/fwweb/fwoutlook.htm>.

9.0 WILDFIRE PROGRAM

9.1 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 are recognized health concerns 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 RMS or the Missoula Technology and Development Center.

9.2 Prevention Program

Of the four wildland fires that occurred within the Refuge boundary during the 10-year period of 1989-1998, two have been human caused. Although the number of ignitions is low, the human caused fires resulted in the majority of acres burned. The number of human caused fires can be reduced through a well managed fire prevention program. Following are fire prevention steps being used or planned to reduce human caused ignitions on the Refuge.

- G Public contact will be made with Refuge visitors informing them of a fire ban when a fire ban is in effect.

- G Mop-up activities following prescribed burning will be improved and all prescribed fire plan elements will be implemented.

9.3 ___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, the Craig Interagency Fire Center 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.

9.4 Initial Reporting and Dispatching

Initial reporting and dispatching will be completed in accordance with the Craig Interagency Fire Center Annual Operating Plan (Appendix D).

9.5 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 Craig 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:

- G Providing a size-up of the fire to dispatch as soon as possible.
- G Using guidance found in the fire Management Plan or in the Delegation of Authority, determine the strategy and tactics to be used.
- G Determine the resources needed for the fire.
- G 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.
- G Advising dispatch of resource needs on the fire.
- G 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.

9.5.1 Initial Attack Strategies and Tactics

All unplanned ignitions will be suppressed using the appropriate management response concept. Minimum impact strategies and tactics will be used whenever possible. An aggressive suppression 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 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. Specific tactics will be determined by the Incident Commander on site.

9.5.2 Minimum Impact Suppression Tactics

See previous section.

9.5.3 Limits to Suppression Activities

- G Heavy equipment use during high intensity fire events will be allowed only with the approval of the Refuge Manager or his designated representative.

- G Aerial retardant will be allowed only in non-riparian areas.

9.6 Escaped Fires/Extended Attack

A Wildland Fire Situation Analysis (WFSA) 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 (Appendix I). The WFSA 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 WFSA. As indicated, the Zone FMO will provide assistance, as available, with the implementation of the extended attack operations including:

- G Assisting the Refuge Manager complete the WFSA (Appendix I).
- G Assisting the Refuge Manager complete the Delegation of Authority (Appendix I), if needed.
- G Ordering of appropriate resources through the Dispatch Center.

9.7 ___ 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:

- G All trash will be removed.
- G Firelines will be refilled and waterbars added if needed.
- G Hazardous trees and snags cut and the stumps cut flush.
- G 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:

- G **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.
- G **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.
- G 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 Refuge Manager and Regional Director.

10.0 PRESCRIBED FIRE PROGRAM

10.1 Program Overview

Prescribed fire use on the Refuge has been minimal in the past. Although all historical documents for the Refuge were destroyed in a 1997 structure fire that destroyed the office, past and present personnel have been able to supply an adequate recollection of the use of prescribed fire. There have apparently been only three small prescribed burns conducted in the 33 years of Refuge existence, one each in 1984, 1985, and 1988, All were on the Allard tract. Management strategies and objectives at the time, short burning windows, and local sentiment against burning were likely the main deterrents to a more active fire program

The Refuge plans to use prescribed fire as a tool in two management areas - resource management and hazardous fuel reduction. Resource management prescribed burning is used to restore, create, and/or maintain a diversity of plant communities in order to restore and perpetuate native plant and wildlife species. The Refuge may use hazard fuel reduction prescribed burns within or near Refuge development zones, sensitive resources, and boundary area to reduce the risk from wildfire damage. To the greatest extent possible, hazard reduction prescribed fires will only be used when they compliment resource management objectives.

10.1.1 Resource Management Objectives

Prescribed fire alone, or in combination with other vegetation management techniques may be used to achieve the following resource management objectives:

- G Reduce and/or contain the invasion of non-native plants (Canada thistle).
- G Create fuel mosaics with prescribed fire or other means on the Refuge that reduce the potential for wildland fire to damage populations of the North Park Phacelia, an endangered plant on the Refuge.
- G Utilize prescribed fire to promote healthy grassland and sagebrush habitats by removing decadent vegetation and recycling nutrients into living plant material.
- G Provide opportunities for Refuge visitors to understand and view the effects that prescribed fire may have on vegetative and animal communities.

Treatment targets are outlined in the section on planning (Table 6).

10.1.2 Hazardous Fuel Reduction

The Refuge may use hazard fuel reduction prescribed burns within or near Refuge development zones, sensitive resources, and boundary area to reduce the risk from wildfire damage.

10.1.3 Use of Wildland Fire to Achieve Resource Objectives

Wildland Fire Use to Achieve Resource Benefit will not be considered when determining the appropriate management response.

10.1.4 Prescribed Fire Burning Season

The prevailing winds, low humidity, and the resulting fuel conditions would seemingly create ideal conditions for prescribed burning. Prescribed fires have been planned by the various land management agencies in the county, but apparently meeting prescriptions is difficult. Most burning will occur in the period from March through May, and August through October.

10.1.5 Potential Impacts

Smoke and potential for property damage from escaped prescribed fires is a concern along Highways 14 east and 125, and along the northeast boundary of the Refuge and near the Philip Anderson ranch.

The Refuge has a grazing program, and prescribed fire would possibly have a short-term impact to individual permittees. Escaped fires could potentially have severe impacts to ranchers and BLM permittees.

Wildlife related recreation on the Refuge should not be seriously impacted in the long-term. Visits may be disrupted if they occur on the days of burns, and preferred hunting and fishing areas may be impacted on the short term. Tourism, hunting, fishing, and other recreation opportunities throughout the county should not be effected, as there are many places in the county to participate in these activities.

With the closer working relationship with the local fire department, Refuge prescribed burning offers unique and important training opportunities for these volunteers. There is some sentiment in the county that burning is not appropriate, and vegetative manipulation by grazing is a better option. Prescribed burns would be conducted to improve habitat for wildlife, but short term effects could be negative for some species. Waterfowl nesting, sage grouse, and elk use patterns would be altered to some extent, and if more elk move onto private land due to lack of forage on Refuge, increased grazing and potential damage to hay and stackyards are a possibility.

10.1.6 Limits

- G The County Sheriff's Office, Craig IDC, and local 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.

- G The initial fire will be ignited in accordance with air pollution regulations.

- G Prescribed fire activities may be limited during nesting season.

- G 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 400 or higher.

- G The use of heavy equipment and other ground disturbing devices will be approved by the Refuge Manager or his designee.

10.2 Complexity

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

10.3 Planning

Prescribed burns can be conducted at any time of year depending on resource objectives and prescription. The Refuge Manager is responsible for supervising the development of resource management objectives for individual units. The Refuge staff will provide assistance in selection of the appropriate management tool needed to meet objectives. Prescribed fire is just one of a combination of tools available. If needed, the Zone FMO, or Regional Fire Management Specialist will be consulted for assistance in accomplishing the desired objectives.

Throughout the year the Refuge Manager will be monitoring habitat and wildlife populations on Service lands. When it becomes apparent that fire would be an appropriate tool to employ in a certain situation, he will use the information to develop the annual plan. After reviewing the proposal, the Refuge Manager will decide whether to proceed with a planning effort. Guidance provided in the Fire Management Handbook will be adhered to in all prescribed burning activities on the Refuge.

As indicated, an Annual Burning Plan will be prepared according to the Region 6 format and will contain more specific information on areas proposed for burning. Fire prescriptions will be prepared for every planned habitat burn in accordance with established Service and Regional procedures. 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.

The prescribed fire program is considered to be long-term. Annual average acreage is determined from a 10-year projection. There will not necessarily be a consistent burn program from year to year, however, the 10-year goal will meet Refuge habitat management objectives.

Prescribed fire acreage in the following table is 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 a vegetative type. The anticipated prescribed fire program for the next 10 years is outlined in Table 6.

Table 6: Long-Term Prescribed Fire Program

VEGETATIVE TYPE	CONSTRAINTS	10-YEAR ACREAGE (acres)	ANNUAL AVERAGE (acres)
Wetlands	None	100	10
Uplands	None	1000	100
Irrigated meadows	None	1000	100
Riparian	None	0	0
Mixed Conifer	None	0	0
TOTAL		2100	210

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:

- G The individual(s) who has the authority to activate the contingency plan.
- G Clearly defined conditions (“trigger points”) that indicate the contingency plan should be activated.
- G A listing of those to be notified or contacted

- G Who assumes the duties of the Incident Commander and what are the roles of others.
- G The location of values at risk and other resources requiring protection.
- G The preferred strategies and tactics.
- G The location of containment lines or natural fuel breaks outside the burn unit.
- G The location of water refill points, staged equipment, etc
- G Contingency forces (Type, number, location).

At the earliest possible time, but no less than 60 days prior to the expected burn date, the prescribed fire plan for each burn should be completed and presented to the Project Manager. The burn plan will document objectives and the plan of action for achieving them. The plan must also address all training, personnel, equipment, and other requirements as specified in the Service Fire Management Handbook. Burn plans can be written by anyone but must be reviewed by a qualified burn boss prior to implementation. The plan will be reviewed in accordance with Service and Regional policy. When the plans are returned after the review, the Refuge Manager will make changes to the plan as necessary based upon the review's comments, then approve the plan.

Through out the year, the Refuge Manager and Zone Fire Management Officer will conduct informal reviews of the Refuge's fire management activities. As part of the process, all prescribed fires will be reviewed to insure that adequate support is available to conduct planned burns and that habitat management objectives were achieved. Written notes attached to the burn plan and the notes will be used to plan the next year's fire management activities.

The Refuge may also assist private landowners with prescribed burning to improve the value of their land as wildlife habitat. A Wildlife Extension Agreement with a written provision for the use of prescribed fire must be approved prior to implementing burns on private lands. Such assistance is subject to guidance provided within the Fire Management Handbook, private lands program policies, Region 6 Fire Management Guidelines, and funding and staffing restraints.

10.4 Preparation and Implementation

Refuge staff and cooperators will prepare the unit prior to burning. The standards will be outlined in the prescribed burn plan.

At least two days prior to the anticipated implementation date, the Assistant Refuge Manager will contact all the resources identified in the plan to determine availability. In the event a Burn Boss from outside the area is assigned, that individual will report to the Refuge Manager a day prior to the scheduled burn. **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.**

Multiple prescribed fires may be initiated at the same time within the Refuge. A qualified Prescribed Fire Manager will coordinate multiple burns. Depending on the complexity of the burns, the Prescribed Fire Manager need not be on scene but must be readily available by phone.

The maximum number of simultaneous burns will depend upon the cumulative impacts of smoke on sensitive targets and the availability of the prescribed equipment and personnel.

10.5 Monitoring and Evaluation

Prescribed fire monitoring and evaluation will be used to:

- G Determine whether burn plan criteria are being met.
- G Determine whether resource objectives are being met.
- G Document costs and improve economic efficiency.
- G Document data so results can be replicated.
- G Validate fire behavior predictions and refine prescriptions.
- G Provide baseline data for long-term fire effects studies.
- G Provide intelligence for operational decisions during an ongoing fire
- G Meet legal and administrative responsibility to document the fire.
- G 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.

- G 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.
- G Short-term monitoring for any prescribed fire will include the first order fire effects (FOFE) live fuel moisture, 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, % 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. Live fuel moisture will be monitored prior to the burn to ensure that the objectives of the prescription will be achieved.
- G 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.

11.0 FIRE MANAGEMENT UNITS

11.1 General

The Refuge will be divided into three FMU's designated as A, B, and C (Figures 2 - 7). These FMU's are designated to facilitate the implementation of Refuge vegetation management objectives.

Table 7: Fire Management Units

Fire Management Unit	Acres
Unit A	24,484
Unit B	320
Unit C	21,907

11.2 Fire Management Unit A (Arapaho Refuge)

FMU A is represented by the contiguous body of the main Arapaho Refuge. Prescribed fire will be allowed to reduce hazardous fuel concentration and for resource management purposes. Mechanical or chemical treatment of hazard fuels is allowed where necessary.

11.2.1 Fire Management Objectives

- G Ensure the safety of Service staff and the visiting public.
- G Minimize the damage of fire and fire suppression efforts on refuge resources by using Minimum Impact Suppression Tactics.
- G Prevent fires from escaping refuge boundaries onto adjacent private lands.
- G Utilize prescribed fire when it will be useful in achieving refuge wildlife and habitat objectives. On average, treat 210 acres annually.
- G Respond to wildfires in a cost effective manner consistent with the values at risk.

11.2.2 Unit Strategies

All wildfire fires will be attacked aggressively. All fires on the Refuge have the potential to escape into adjacent private land and cause damage to crops, pasture or improvements. For that reason all fires must immediately sized up by the responding Refuge fire personnel and a decision made as to whether the responding initial attack team can contain and control the fire. If there is any doubt, then assistance should immediately be requested from local fire departments or interagency resources.

Figure 2: Fire Management Unit - FMU A Arapaho National Wildlife Refuge

11.2.3 Unit Tactics

- G Fires will be attacked using engines when possible. Roads, wetlands, and other barriers will be used where possible as primary control lines, anchor points, escape routes and safety zones.
- G Burnout operations will be conducted from roads or other barriers when it is safe and effective to do so.
- G Burnouts will also be used to strengthen primary control lines when it is safe and effective to do so.
- G Approved fire retardant chemicals may be deployed by either air or ground forces when their use will be effective in containment, control or facility protection.

11.2.4 Habitat Types

Vegetation types on the Refuge are classified as: wetlands, uplands, irrigated meadows and riparian. Table 2 displays vegetation types and their respective acreage.

11.2.5 Fuels

Wetlands: This type occupies approximately 839 acres and is scattered throughout the Refuge. The main vegetation is bulrush, cattail, and associated smaller rushes and sedges. National Forest Fire Labs (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.

Uplands: This type is by far the predominant vegetative type on the Refuge occurring on approximately 14,304 acres or 50% of the land area. NFFL Fuel Model 2 (NFDRS Fuel Model T) is appropriate for this type. Rates of spread are highly dependent on fuel continuity, wind, and slope gradient. On the Refuge, intensities in this type will vary depending on species composition. Most of the area in this type is composed of sagebrush varying in height from 0.5 to 3 feet, and sparse mixed grass/forb understory. The remainder of this type is composed of greasewood. When greasewood is involved and live fuel moisture is low, intense burning can occur. Generally, the extent of burning in this type could be significant in areas, as there are large sage stands extending off of the Refuge in many spots. A rate of spread of 35 chains/hour could be expected with a flame length of 6 feet. Total live and dead fuel loading averages 3.0 tons/acre with a fuel bed depth of 2.5 feet. Due to the continuity and sparsity of fuels within this type on the Refuge, fire intensity and rate of spread will be highly exaggerated by this fuel model.

Riparian: This type is composed of willows with a thick, tall grass understory. These areas are restricted to river and stream bottoms. This type is represented on 200 acres of the Refuge. Willows along the Illinois River are a mix of new growth and old/decadent trees with a considerable amount of dead fuel. These areas will generally be associated with ground water

moisture, but given the right conditions would burn hot and fast. This type is characterized by NFFL Fuel Model 3 and NFDRS Fuel Model N. Rates of spread average 104 chains/hour with flame lengths of 12 feet. Total fuel loading for both live and dead fuels is 3.0 tons/acre and fuel depths are approximately 2.5 feet.

Irrigated Meadows: This type is unlikely to burn due to irrigation. If the fuels were to dry out and burn, the tall grass would be represented best by NFFL Fuel Model 3 and NFDRS Fuel Model N. Rates of spread average 104 chains/hour with flame lengths of 12 feet. Total fuel loading for both live and dead fuels is 3.0 tons/acre and fuel depths are approximately 2.5 feet.

11.2.6 Fuel Loading and Unusual Fire Behavior

Fuel loading found in the grassy areas of this unit falls within the normal range and are discussed in the previous section.

11.2.7 Expected Fire Effects

11.2.7.1 Noxious weeds

Canada thistle: Spring burning may slow the spread of Canada thistle by reducing the number of mature plants and functional flower heads. Dormant season fire may favor native grass species which in turn may limit growth and reproduction of Canada thistle (FEIS 2000)

Yellow toadflax: Burning is not recommended as a control method for yellow toadflax (Saner, et al 1995). These plants have large, deep root systems which protect them from burning. Areas that are recently disturbed by fire are susceptible to increased toadflax infestation.

Musk thistle: Fire probably kills musk thistle. Seed buried in the soil survives most fires (FEIS 2000).

Whitetop (hoary cress): Hoary cress probably sprouts from rhizomes and would not be damaged by prescribed fire. Severe fires that temporarily reduce competition from native plants may favor hoary cress (FEIS 2000).

11.2.7.2 Species of Conservation Concern:

Bald Eagle: Since bald eagle use is predominantly winter, and the refuge does not have large numbers of cottonwood trees for roosting, effect of fire on this species is negligible. Eagles do not nest on the refuge so loss of nesting is not a consideration.

Peregrine falcon: There would be little effect of fires on refuge to this transient species.

Sage grouse: Sage grouse are dependent upon most areas of the refuge at different times in their life cycle. Fire can improve certain types of habitat by setting back succession and improving plant and invertebrate diversity. Critical habitat areas will be identified and will not be considered for prescribed fires unless recommended by sage grouse specialists.

North Park phacelia: The life history of this plant is not well documented, but it seems to prefer disturbed windswept hillsides. The populations on the Refuge are in areas with sparse vegetation that would likely not carry a fire.

11.2.8 Limits to Strategy and Tactics

- G The use of dozer or plow lines will not be permitted on Service lands except to protect life or improvements such as buildings or bridges, and only with the approval of the Refuge Manager or his acting.
- G Hand line construction which causes soil disturbance is to be avoided.
- G Retardant is not used within 300 feet of a stream or other water feature.

11.3 Fire Management Unit B (Mixed Conifer)

The unit is that portion of the Refuge that is classified as mixed conifer. This FMU is 320 acres and is adjunct from the remainder of the main refuge (Figure 3). Wildfire will be suppressed in this FMU. Prescribed fire is not planned, but is not precluded in this FMU.

11.3.1 Fire Management Objectives

- G Ensure the safety of Service staff and the visiting public.
- G Minimize the damage of fire and fire suppression efforts on refuge resources by using Minimum Impact Suppression Tactics.
- G Prevent fires from escaping refuge boundaries onto adjacent private lands.
- G Utilize prescribed fire when it will be useful in achieving refuge wildlife and habitat objectives. (No projects are currently planned.)
- G Respond to wildfires in a cost effective manner consistent with the values at risk.

11.3.2 Unit Strategies

All wildfire fires will be attacked aggressively. All fires on the Refuge have the potential to escape into adjacent private land and cause damage to crops, pasture or improvements. For that reason all fires must immediately sized up by the responding Refuge fire personnel and a decision made as to whether the responding initial attack team can contain and control the fire. If there is any doubt, then assistance should immediately be requested from local fire

departments or interagency resources.

Figure 3: Fire Management Unit - FMU B - Conifer

11.3.3 Unit Tactics

- G Fires will be attacked using engines when possible. Roads, wetlands, and other barriers will be used where possible as primary control lines, anchor points, escape routes and safety zones.
- G Burnout operations will be conducted from roads or other barriers when it is safe and effective to do so.
- G Burnouts will also be used to strengthen primary control lines when it is safe and effective to do so.
- G Approved fire retardant chemicals may be deployed by either air or ground forces when their use will be effective in containment, control or facility protection.

11.3.4 Habitat Types

The Habitat is classified as Mix Conifer.

11.3.5 Fuels

Mixed Conifer: This type is composed of subalpine fir, spruce and aspen overstory. The conifer overstory is decadent with a heavy accumulation of woody ground fuel. This area is well represented by NFFL Fuel Model 10 or NFDRS Fuel Model G. Rates of spread average 7.9 chains/hour with flame lengths of 4.8 feet. Total fuel loading for both live and dead fuels is 12.0 tons/acre and fuel depths are approximately 1.0 foot. Under drought conditions, this fuel model may exhibit extreme fire behavior.

11.3.6 Fuel Loading and Unusual Fire Behavior

Fuel loading found in this unit falls within the normal range and are discussed in the previous section.

11.3.7 Expected Fire Effects

Fire effects for selected species is discussed in Section 11.2.7.

11.3.8 Limits to Strategy and Tactics

- G The use of dozer or plow lines will not be permitted on Service lands except to protect life or improvements such as buildings or bridges, and only with the approval of the Refuge Manager or his acting.
- G Hand line construction which causes soil disturbance is to be avoided.
- G Retardant is not used within 300 feet of a stream or other water feature.

11.4 Fire Management Unit C (Satellite Refuges)

Fire Management Unit C is the area encompassed by the satellite refuges, Hutton Lake, Mortenson Lake, Bamforth and Pathfinder NWR's. This FMU is entirely within the State of Wyoming. Wildfires will be suppressed by local fire suppression forces and prescribed fire will not be used in this FMU.

Figure 4: Fire Management Unit - FMU C - Pathfinder

Figure 5: Fire Management Unit - FMU C - Bamforth NWR

Figure 6: Fire Management Unit - FMU C - Hutton Lake NWR

Figure 7: Fire Management Unit - FMU C - Mortenson Lake NWR

11.2.1 Fire Management Objectives

- G Ensure the safety of suppression personnel and the visiting public.
- G Minimize the damage of fire and fire suppression efforts on refuge resources by using Minimum Impact Suppression Tactics.
- G Prevent fires from escaping refuge boundaries onto adjacent private lands.
- G Respond to wildfires in a cost effective manner consistent with the values at risk.

11.4.2 Unit Strategies

All wildfire fires will be attacked aggressively using the appropriate management response concept. All fires on the various Refuges have the potential to escape into adjacent private land and cause damage to crops, pasture or improvements. For that reason all fires must immediately sized up by the responding fire personnel and a decision made as to whether the responding initial attack team can contain and control the fire. If there is any doubt, then assistance should immediately be requested in accordance with the local dispatching protocol.

11.4.3 Unit Tactics

- G Fires will be attacked using engines when possible. Roads, wetlands, and other barriers will be used where possible as primary control lines, anchor points, escape routes and safety zones.
- G Burnout operations will be conducted from roads or other barriers when it is safe and effective to do so.
- G Burnouts will also be used to strengthen primary control lines when it is safe and effective to do so.
- G Approved fire retardant chemicals may be deployed by either air or ground forces when their use will be effective in containment, control or facility protection.

11.4.4 Habitat Types

Vegetation types on the Refuge are classified as: wetlands, uplands, irrigated meadows and riparian.

11.4.5 Fuels

Wetlands: This type occupies approximately 839 acres and is scattered throughout the Refuge. The main vegetation is bulrush, cattail, and associated smaller rushes and sedges. National Forest Fire Labs (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.

Uplands: This type is by far the predominant vegetative type on the Refuge occurring on approximately 14,304 acres or 50% of the land area. NFFL Fuel Model 2 (NFDRS Fuel Model T) is appropriate for this type. Rates of spread are highly dependent on fuel continuity, wind, and slope gradient. On the Refuge, intensities in this type will vary depending on species composition. Most of the area in this type is composed of sagebrush varying in height from 0.5 to 3 feet, and sparse mixed grass/forb understory. The remainder of this type is composed of greasewood. When greasewood is involved and live fuel moisture is low, intense burning can occur. Generally, the extent of burning in this type could be significant in areas, as there are large sage stands extending off of the Refuge in many spots. A rate of spread of 35 chains/hour could be expected with a flame length of 6 feet. Total live and dead fuel loading averages 3.0 tons/acre with a fuel bed depth of 2.5 feet. Due to the continuity and sparsity of fuels within this type on the Refuge, fire intensity and rate of spread will be highly exaggerated by this fuel model.

Riparian: This type is composed of willows with a thick, tall grass understory. These areas are restricted to river and stream bottoms. This type is represented on 200 acres of the Refuge. Willows along the Illinois River are a mix of new growth and old/decadent trees with a considerable amount of dead fuel. These areas will generally be associated with ground water moisture, but given the right conditions would burn hot and fast. This type is characterized by NFFL Fuel Model 3 and NFDRS Fuel Model N. Rates of spread average 104 chains/hour with flame lengths of 12 feet. Total fuel loading for both live and dead fuels is 3.0 tons/acre and fuel depths are approximately 2.5 feet.

Irrigated Meadows: This type is unlikely to burn due to irrigation. If the fuels were to dry out and burn, the tall grass would be represented best by NFFL Fuel Model 3 and NFDRS Fuel Model N. Rates of spread average 104 chains/hour with flame lengths of 12 feet. Total fuel loading for both live and dead fuels is 3.0 tons/acre and fuel depths are approximately 2.5 feet.

11.4.6 Fuel Loading and Unusual Fire Behavior

Fuel loading found in the grassy areas of this unit falls within the normal range and are discussed in section 11.2.6.

11.4.7 Expected Fire Effects

Expected fire effects on selected species is discussed in section 11.2.7.

11.4.8 Limits to Strategy and Tactics

G The use of dozer or plow lines will not be permitted on Service lands except to protect life or improvements such as buildings or bridges, and only with the approval of the Refuge Manager or his acting.

G Retardant is not used within 300 feet of a stream or other water feature.

12.0 ADDITIONAL OPERATIONAL ELEMENTS

12.1 Public Safety

Firefighter and public safety will always take precedence over public and private property and cultural and natural resource protection during any fire management activity. Firefighter safety was covered previously. This section will deal with public safety.

Fire fronts in grass fuel models move rapidly and are dangerous. The Refuge staff will attempt to keep the fire scene clear of people except for Service firefighters and cooperating volunteer fire departments.

Smoke from a Refuge fire could impair visibility on roads and become a hazard. During wildfires, the local law enforcement agency having jurisdiction is responsible for managing traffic hazards from smoke. Smoke from prescribed fires is addressed in the prescribed burn plan and its management and mitigation are the responsibility of the burn boss. Actions to reduce the hazards associated with smoke include: use of road guards and pilot car, signing, altering ignition techniques and sequence, halting ignition, suppressing the fire, and use of local law enforcement as traffic control.

Wildfires which might escape Service lands and spread to inhabited private property are also a concern. The IC is responsible for contacting the local law enforcement agency having jurisdiction so that they can warn and/or evacuate the public from potentially dangerous situations. Additionally, the Refuge will use prescribed fire and other management techniques to manage hazard fuels in high risk areas.

12.2 Public Information and Education

Informing the public is an important aspect of fire suppression, fire prevention, prescribed fire, and the Service mission. Information and education are critical to gaining public support for the Refuge's fire management programs.

12.2.1 Wildfire Suppression

During wildfire suppression, the IC is in charge of dispersal of information to the press and or public. The IC may delegate this responsibility if needed.

12.2.2 Prescribed Fire

An informed public is a vital component of the prescribed fire program. During and immediately after, the Burn Boss will be responsible for this aspect of the program. This aspect of the operation may be delegated, as appropriate.

Areas that have been burned will present opportunities for the public to actually see the effects of fires, and offer staff members an opportunity to explain the purpose of the burns to the public. The following will be used to promote the prescribed fire program to the public:

- G Talks in local schools
- G Attendance at local volunteer fire department meetings
- G Including the prescribed fire message in Refuge interpretive publications and
- G Personal contacts with bystanders during prescribed burns
- G Follow prescriptions in burn plans to prevent escapes
- G Developing a quantitative fire effects monitoring program and sharing the results with the public.

12.3 Reports

Following the suppression of a wildfire or the completion of a prescribed burn, the IC and Burn Boss will:

- G Complete a DI-1202 Fire Report.
- G Include a list of all expenses and/or items lost or expended on the incident and list personnel assignments on the DI-1202.
- G Complete a Crew Time Reports for all personnel assigned to the wildfire or prescribed fire.
- G Submit the documents to the Assistant Refuge Manager within 3 days of the fire being declared out.

The Assistant Refuge Manager will send all data to the Refuge FMO to be entered into the FMIS database within 10 days after the fire is declared out.

12.4 Fire Critique and Review

12.4.1 Wildfire Review

Wildfires will be critiqued by the IC and the results documented in the DI-1202. The Regional Fire Management Coordinator and/or Zone FMO will conduct formal critiques in the event of:

- G Significant injury, accident, or fatality.
- G Significant property or resource damage.
- G Significant safety concerns are raised.
- G An extended attack is necessary.

12.4.2 Prescribed Burn Review

Prescribed fires will be critiqued by the burn boss and documented in the prescribed burn plan. The Regional Fire Management Coordinator and/or Zone FMO will conduct formal critiques in the event of:

- G Significant injury, accident, or fatality.
- G An escaped prescribed fire occurs.
- G Significant safety concerns are raised.
- G Smoke management problems occur.

12.6 Annual Fire Management Plan Review

The Fire Management Plan will be reviewed annually to ensure the fire program advances and evolves with the Service's and the Refuge's mission. The plan will also be reviewed following completion of the CCP process and new habitat management plans.

13.0 AIR QUALITY AND SMOKE MANAGEMENT GUIDELINES

The management of smoke is incorporated into the planning of prescribed fires, and to the extent possible, in suppression of wildfires. Sensitive areas are identified and precautions are taken to safeguard visitors and local residents. Smoke dispersal is a consideration in determining whether or not a prescribed burn is within prescription. Generally the fine grass fuels and small burn size generate low volumes of smoke for short duration (4-5 hours).

The Refuge's fire management activities which result in the discharge of pollutants (smoke, carbon monoxide, particulate, and other pollutants from fires) are subject to and must comply with all applicable Federal, State, and local air pollution control requirements as specified by Section 118 of the Clean Air Act, as amended 1990.

Smoke management is administered by the State of Colorado Air Quality Control Division. Requirements of the Division of Air Quality for prescribed burning will be followed.

Appendix K contains the Memorandum of Understanding between the State of Colorado and Federal Agencies concerning smoke management procedures.

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. The use of respirators is not recommended.

14.0 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 outline 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. All fire management activities will be in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

Currently wildfires are suppressed. However, historical evidence demonstrates that natural and artificial fires were regular events in the mixed grass prairie. In recent years, fire suppression has resulted in a steady buildup of grassland and riparian fuel loads, colonization of disturbed soils by invading plant species, and natural vegetative growth, increasing the chances of an uncontrolled wildfire that could potentially endanger the Refuge's cultural resources as well as surrounding private property. 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:

- G 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.
- G 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.
- G The Colorado 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.
- G 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.

- G 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.
- G 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.
- G 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.
- G The location of sites discovered as the result of fire management activities will be reported by the Refuge Manager to the Regional Archeologist.
- G Rehabilitation plans will address cultural resources and will be reviewed by the Regional Archeologist.

15.0 RESEARCH NEEDS

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. In particular, data is lacking on the effects of fire on greasewood, invasive species and the North Park phacelia.

Fire behavior data will be collected on all fires occurring at the Refuge. Long-term monitoring will comply with accepted scientific methods and will be funded from sources other than Fire. These data, along with information gathered through research studies, will be used to improve the effectiveness of the fire management program. The Refuge will continue to encourage fire related research on Service lands where research operations will not conflict with resource management objectives. Research will be conducted on an interagency basis whenever possible.

16.0 CONSULTATION AND COORDINATION

All fire management program activities will be implemented in cooperation and coordination with the State of Colorado Air Quality Control Division and the Interagency Fire Community, including the rural fire protection districts. Other agencies and organizations will be consulted as needed.

General program consultation and coordination will be sought from the Zone FMO, the Regional Fire Management Coordinator, Regional Fire Management Specialist, and National Interagency Fire Center (NIFC).

Copies of this plan will be made available to:

- G Routt National Forest
- G Kremmling Field Office of the BLM
- G Colorado State Forest - Gould Office
- G North Park Fire & Rescue
- G Colorado Division of Wildlife

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

- G Lou Ballard, Fire Management Officer, Colorado/Utah, R6 USFWS
- G Ken Kerr, Zone FMO, Colorado/Kansas/Nebraska, R6 USFWS
- G Rhoda Lewis, Regional Archeologist, R6 USFWS
- G Mark Lanier, Assistant Refuge Manager, Arapaho NWR
- G Phil Street, Regional Fire Management Coordinator, R6 USFWS
- G Carl Douhan, Wildland Fire Planner, Contractor, Littleton, Colorado

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APPENDIX A: FIRE HISTORY

APPENDIX B: NEPA DOCUMENT

APPENDIX C: STAFF AND QUALIFICATIONS

APPENDIX D: INTERAGENCY AGREEMENTS

APPENDIX E: NORMAL UNIT STRENGTH

Normal Unit Strength (NUS) is the amount of non-capitalized fire fighting equipment needed by a refuge to meet 70 percent of suppression needs.

Table 1: Equipment

Item	Year Purchased	percent of Fire Funding	Have	GVW	Need	GVW
Engine Modules Heavy (500-1000 gallon) Medium (200-400 gallon) Light (50 - 150 gallon)						
Slip-on Unit(s)						
Water Tender(s)						
Portable Pump(s) Standard Flot-a-pump						

Power saw(s)						
Mower(s)						
Tractor(s)						
ATV(s)						
Grader(s)						
Plow Unit/Disk						

Other (List)						
Other Equipment Available for Fire Suppression or Prescribed Fire operations Not Fire Funded	Use the table to the left to list capital equipment used for preparedness and initial attack or for prescribed fire activities funded wholly or in part by fire.					
	In the above table, Indicate the year purchased, if known, and the percent of fire funding (e.g.: The station purchased a tractor. Fire paid 25% and the station secured other funding for the remainder.					
	Radios are listed on a separate inventory					

Table 2: Supplies and PPE

Item	Quantity	
	Need	Have
Hose, lightweight, lined 1.5" x 100'	9	
Hose, lightweight, lined 1" x 100'	9	
1" NH gated wye	2	
1.5" NH gated wye	2	
1.5" nozzle	2	
1" Forester nozzle	4	
Hydrant wrench, spanner	2	
Hose clamp	2	
flapper	6	7
Pulaski w/sheath	3	
Shovel w/sheath	6	7
rake	2	4
Combi tool	6	0
Drip Torch	2	4
Fusees	1 Case	
Safety Can: 3 Gallon	2	
Foam	15 gallons	
Backpack Pump	6	3
Canteen, large	2	
Belt Weather Kit	2	
Hard Hat	12	
Goggles	12	
Headlamps	12	
Fire Shelter w/Liner	12	
Line Pack w/harness	12	
Water Bottle	48	
Ear Plugs	12 pks	
Leather Gloves, Assorted sizes	24 pr	
Sleeping Bags	10	

Pearsonal Gear Pak (Red Bag)	12	
Personal First Aid Kit	12	
Nomex Shirts Small Medium Large X-Large	Enter Desired Number should have 18 pr (Men & Women)	
Nomex Pants - Men's 28x30 32x30 32x34 34x30 34x32 34x34 36x30 36x32 36x34 38x34 40x34		
Nomex Pants - Women's Size 10 Size 12 Size 14 Size 16		

APPENDIX F: NWCG TRAINING NOMINATION FORM

Attach additional financial forms as stipulated by the Training Announcement or required by the Training Centers.

Management Code or Charge Code Number

Make payment to Sponsoring Agency.

This agreement constitutes authority for the Vendor (Sponsoring Agency) to submit a bill to the above agency.

Authorizing Signature (Agency Administrator)

Date

APPENDIX G: WORK CAPACITY TESTING

PAR-Q and YOU
(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: Check YES or NO.

YES	NO	
_____	_____	1. Has your doctor ever said that you have a heart condition <u>and</u> that you should only do physical activity recommended by a doctor?
_____	_____	2. Do you feel pain in your chest when you do physical activity?
_____	_____	3. In the past month, have you had chest pain when you were not doing physical activity?
_____	_____	4. Do you lose your balance because of dizziness or do you ever lose consciousness?
_____	_____	5. Do you have a bone or joint problem that could be made worse by changes in your physical activity?
_____	_____	6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
_____	_____	7. Do you know of <u>any other reason</u> why you should not do physical activity?

IF YOU ANSWERED YES TO ONE OR MORE QUESTIONS

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

You may be able to do any activity you want - as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.

Find out which community programs are safe and helpful for you.

IF YOU ANSWERED NO TO ALL QUESTIONS	DELAY BECOMING MUCH MORE ACTIVE: If you are not feeling well because of a temporary illness such as a cold or fever - wait until you feel better; or If you are or may be pregnant - talk to your doctor before you start becoming more active.
If you answered NO honestly to <u>all</u> PAR-Q questions, you can be reasonably sure that you can: Start becoming more physically active - begin slowly and build up gradually. This is the safest and surest way to go. Take part in a fitness appraisal - it is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively.	PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q The Canadian Society for Exercise Physiology, Health Canada and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

You are encouraged to copy the PAR-Q but only if you use the entire form

Note: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction.

Name:

Signature: _____ Date:

Signature of Parent or Guardian:

(For participants under the age of Majority)

Witness: _____ Date:

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Supported by: Health Canada - *Sante Canada*

APPENDIX H: STEP-UP PLAN

APPENDIX I: WILDLAND FIRE SITUATION ANALYSIS AND DELEGATION OF AUTHORITY

WILDLAND FIRE SITUATION ANALYSIS

Incident Name:
Jurisdiction:

Date and Time Completed:

This page is completed by the Agency Administrator(s).

Section I, WFSA Information Page

- A. Jurisdiction(s): Assign the agency or agencies that have or could have fire protection responsibility, e.g., USFWS, BLM, etc.
- B. Geographic Area: Assign the recognized "Geographic Coordination Area" the fire is located in, e.g., Northwest, Northern Rockies, etc.
- C. Unit(s): Designate the local administrative unit(s), e.g., Hart Mountain Refuge Area, Flathead Indian Reservation, etc.
- D. WFSA #: Identify the number assigned to the most recent WFSA for this fire.
- E. Fire Name: Self-explanatory.
- F. Incident #: Identify the incident number assigned to the fire.
- G. Accounting Code: Insert the local unit's accounting code.
- H. Date/Time Prepared: Self-explanatory.
- I. Attachments: Check here to designate items used to complete the WFSA. "Other" could include data or models used in the development of the WFSA. Briefly describe the "other" items used.

I. Wildland Fire Situation Analysis

To be completed by the Agency Administrator(s)

A. Jurisdiction(s)	B. Geographic Area
---------------------------	---------------------------

C. Unit(s)	D. WFSA #
-------------------	------------------

E. Fire Name	F. Incident #
---------------------	----------------------

G. Accounting Code:

H. Date/Time Prepared _____ @ _____

I. Attachments

- Complexity Matrix/Analysis *	_____	
--------------------------------	-------	--

- Risk Assessment/Analysis *	_____	
------------------------------	-------	--

Probability of Success *	_____	
Consequences of Failure *	_____	
- Maps *	_____	
- Decision Tree **	_____	
- Fire Behavior Projections *	_____	
- Calculations of Resource Requirements *	_____	

culturally sensitive areas, irreparable damage to resources or smoke management/air quality concerns. Economic constraints, such as public and agency cost, could be considered here.

II.

Objectives and Constraints

To be Completed by the Agency Administrator(s)

A. Objectives (Must be specific and measurable)

1. *Safety*

- Public

- Firefighter

2. *Economic*

3. *Environmental*

4. *Social*

5. *Other*

B. Constraints

This page is completed by the Fire Manager and/or Incident Commander.

Section III. Alternatives

- A. Wildland Fire Management Strategy: Briefly describe the general wildland fire strategies for each alternative. Alternatives must meet resource management plan objectives.
- B. Narrative: Briefly describe each alternative with geographic names, locations, etc., that would be used when implementing a wildland fire strategy. For example: "Contain within the Starvation Meadows' watershed by the first burning period."
- C. Resources Needed: Resources described must be reasonable to accomplish the tasks described in Section III.B. It is critical to also look at the reality of the availability of these needed resources.
- D. Final Fire Size: Estimated final fire size for each alternative at time of containment.
- E. Estimated Contain/Control Date: Estimates of each alternative shall be made based on predicted weather, fire behavior, resource availability, and the effects of suppression efforts.
- F. Cost: Estimate all incident costs for each alternative. Consider mop-up, rehabilitation, and other costs as necessary.
- G. Risk Assessment - Probability of Success/Consequences of Failure: Describe probability as a percentage and list associated consequences for success and failure. Develop this information from models, practical experience, or other acceptable means. Consequences described will include fire size, days to contain, days to control, costs, and other information such as park closures and effect on critical habitat. Include fire behavior and long-term fire weather forecasts to derive this information.
- H. Complexity: Assign the complexity rating calculated in "Fire Complexity Analysis" for each alternative, e.g., Type II, Type I.
- I. A map for each alternative should be prepared. The map will be based on the "Probability of Success/Consequences of Failure" and include other relative information.

III. Alternatives (To be completed by FMO / IC)			
	A	B	C
A. Wildland Fire Strategy			
B. Narrative			

F. Costs			
G. Risk Assessment - Probability of success - Consequence of failure	<hr/> <hr/>	<hr/> <hr/>	<hr/> <hr/>
H. Complexity			
I. Attach maps for each alternative			

This page is completed by the Agency Administrator(s), FMO and/or Incident Commander.

Section IV. Evaluation of Alternatives

- A. Evaluation Process: Conduct an analysis for each element of each objective and each alternative. Objectives shall match those identified in Section II.A. Use the best estimates available and quantify whenever possible. Provide ratings for each alternative and corresponding objective element. Fire effects may be negative, cause no change, or may be positive. Examples are: 1) a system which employs a "-" for negative effect, a "0" for no change, and a "+" for positive effect; 2) a system

which uses a numeric factor for importance of the consideration (soils, watershed, political, etc.) and assigns values (such as -1 to +1, - 100 to +100, etc.) to each consideration, then arrives at a weighted average. If you have the ability to estimate dollar amounts for natural resource and cultural values, this data is preferred. Use those methods which are most useful to managers and most appropriate for the situation and agency. To be able to evaluate positive fire effects, the area must be included in the resource management plan and consistent with prescriptions and objectives of the fire management plan.

Sum of Economic Values: Calculate for each element the net effect of the rating system used for each alternative. This could include the balance of:

pluses (+) and minuses (-), numerical rating (-3 and +3), or natural and cultural resource values in dollar amounts. (Again, resource benefits may be used as part of the analysis process when the wildland fire is within a prescription consistent with approved Fire Management Plans and in support of the unit's Resource Management Plan.)

IV. Evaluation of Alternatives			
To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander			
A. Evaluation Process	A	B	C
Safety Firefighter Aviation Public			
<i>Sum of Safety Values</i>			

<p><i>Economic</i></p> <p>Forage</p> <p>Improvements</p> <p>Recreation</p> <p>Timber</p> <p>Water</p> <p>Wilderness</p> <p>Wildlife</p> <p>Other (specify)</p>			
<p><i>Sum of Economic Values</i></p>			
<p><i>Environmental</i></p> <p>Air</p> <p>Visual</p> <p>Fuels</p> <p>T & E Species</p> <p>Other (specify)</p>			

<i>Sum of Environmental Values</i>			
Social Employment Public Concern Cultural Other (Specify)			
<i>Sum of Social Values</i>			
Other			

This page is completed by the Agency Administrator(s) and Fire Manager and/or Incident Commander.

Section V. Analysis Summary

- A. Compliance with Objectives: Prepare narratives that summarize each alternative's effectiveness in meeting each objective. Alternatives that do not comply with objectives are not acceptable. Narrative could be based on effectiveness and efficiency. For example: "most effective and least efficient," "least effective and most efficient," or "effective and efficient." Or answers could be based on a two-tiered rating system such as "complies with objective" and "fully complies with or exceeds objective." Use a system that best fits the manager's needs.

- B. Pertinent Data: Data for this Section has already been presented, and is duplicated here to help the Agency Administrator(s) confirm their selection of an alternative. Final Fire Size is displayed in Section III.D. Complexity is calculated in the attachments and displayed in Section III.H. Costs are displayed on page 4. Probability of Success/Consequences of Failure is calculated in the attachments and displayed in Section III.G.

- C. External and Internal Influences: Assign information and data occurring at the time the WFSA is signed. Identify the Preparedness Index (1 through 5) for the National and Geographic levels. If available, indicate the Incident Priority assigned by the MAC Group. Designate the Resource Availability status. This information is available at the Geographic Coordination Center, and is needed to select a viable alternative. Designate "yes," indicating an up-to-date weather forecast has been provided to, and used by, the Agency Administrator(s) to evaluate each alternative. Assign information to the "Other" category as needed by the Agency Administrator(s).

Section IV. Decision

Identify the alternative selected. Must have clear and concise rationale for the decision, and a signature with date and time. Agency Administrator(s) is mandatory.

V. Analysis Summary			
To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander			
Alternatives	A	B	C
A. Compliance with Objectives Safety Economic Environmental Social Other			

The date, time, and signature of reviewing officials are reported in each column for each day of the incident. The status of Preparedness Level, Incident Priority, Resource Availability, Weather Forecast, and WFSA validity is completed for each day reviewed. Ratings for the Preparedness Level, Incident Priority, Resource Availability, Fire Behavior, and Weather Forecast are addressed in Section V.C. Assign a "yes" under "WFSA Valid" to continue use of this WFSA. A "no" indicates this WFSA is no longer valid and another WFSA must be prepared or the original revised.

Section VIII. Final Review

This Section is completed by the Agency Administrator(s). A signature, date, and time are provided once all conditions of the WFSA are met.

VIII.	Daily Review
To be completed by the Agency Administrator(s) or Designate	
Selected to be reviewed daily to determine if still valid until containment or control	

If WFSA is no longer valid, a new WFSA will be completed!

VIII. Objectives

Final Review

The elements of the selected alternative were met on: _____
Date Time

By: _____
(Agency Administrator(s))

A GUIDE FOR ASSESSING FIRE COMPLEXITY

The following questions are presented as a guide to assist the Agency Administrator(s) and staff in analyzing the complexity or predicted complexity of a wildland fire situation. Because of the time required to assemble or move an Incident Management Team to wildland fire, this checklist should be completed when a wildland fire escapes initial attack and be kept as a part of the fire records. This document is prepared concurrently with the preparation of (and attached to) a new or revised Wildland Fire Situation Analysis. It must be emphasized this analysis should, where possible, be based on predictions to allow adequate time for assembling and transporting the ordered resources.

Use of the Guide:

1. Analyze each element and check the response "yes" or "no."
2. If positive responses exceed, or are equal to, negative responses within any primary factor (A through G), the primary factor should be considered as a positive response.
3. If any three of the primary factors (A through G) are positive responses, this indicates the fire situation is, or is predicted to be, Type I.
4. Factor H should be considered after all the above steps. If more than two of these

items are answered "yes," and three or more of the other primary factors are positive responses, a Type I team should be considered. If the composites of H are negative, and there are fewer than three positive responses in the primary factors (A-G), a Type II team should be considered. If the answers to all questions in H are negative, it may be advisable to allow the existing overhead to continue action on the fire.

GLOSSARY OF TERMS

Potential for blow-up conditions - Any combination of fuels, weather, and topography excessively endangering personnel.

Rate or endangered species - Threat to habitat of such species or, in the case of flora, threat to the species itself.

Smoke management - Any situation which creates a significant public response, such as smoke in a metropolitan area or visual pollution in high-use scenic areas.

Extended exposure to unusually hazardous line conditions - Extended burnout or backfire situations, rock slide, cliffs, extremely steep terrain, abnormal fuel situation such as frost killed foliage, etc.

Disputed fire management responsibility - Any wildland fire where responsibility for management is not agreed upon due to lack of agreements or different interpretations, etc.

Disputed fire policy - Differing fire policies between suppression agencies when the fire involves multiple ownership is an example.

Pre-existing controversies - These may or may not be fire management related. Any controversy drawing public attention to an area may present unusual problems to the fire overhead and local management.

Have overhead overextended themselves mentally or physically - This is a critical item that requires judgment by the responsible agency. It is difficult to write guidelines for this judgment because of the wide differences between individuals. If, however, the Agency Administrator feels the existing overhead cannot continue to function efficiently and take safe and aggressive action due to mental or physical reasons, assistance is mandatory.

FIRE COMPLEXITY ANALYSIS

A. FIRE BEHAVIOR: Observed or Predicted

Yes/No

- | | | | |
|----|--|-----|-----|
| 1. | Burning Index (from on-site measurement of weather conditions).
Predicted to be above the 90% level using the major fuel model in
which the fire is burning. | ___ | ___ |
| 2. | Potential exists for "blowup" conditions (fuel moisture, winds, etc.) | ___ | ___ |
| 3. | Crowning, profuse or long-range spotting. | ___ | ___ |
| 4. | Weather forecast indicating no significant relief or worsening
conditions. | ___ | ___ |
| | Total | ___ | ___ |

B. RESOURCES COMMITTED

- | | | | |
|----|--|-----|-----|
| 1. | 200 or more personnel assigned. | ___ | ___ |
| 2. | Three or more divisions. | ___ | ___ |
| 3. | Wide variety of special support personnel. | ___ | ___ |
| 4. | Substantial air operation which is not properly staffed. | ___ | ___ |
| 5. | Majority of initial attack resources committed. | ___ | ___ |
| | Total | ___ | ___ |

C. RESOURCES THREATENED

- | | | | |
|----|---|-----|-----|
| 1. | Urban interface. | ___ | ___ |
| 2. | Developments and facilities. | ___ | ___ |
| 3. | Restricted, threatened or endangered species habitat. | ___ | ___ |
| 4. | Cultural sites. | ___ | ___ |
| 5. | Unique natural resources, special designation zones or
wilderness. | ___ | ___ |
| 6. | Other special resources. | ___ | ___ |
| | Total | ___ | ___ |

D. SAFETY

- | | | | |
|----|--|-----|-----|
| 1. | Unusually hazardous fire line conditions. | ___ | ___ |
| 2. | Serious accidents or facilities. | ___ | ___ |
| 3. | Threat to safety of visitors from fire and related operations. | ___ | ___ |
| 4. | Restricted and/or closures in effect or being considered. | ___ | ___ |
| 5. | No night operations in place for safety reasons. | ___ | ___ |

Total ___ ___

E. OWNERSHIP

Yes/No

- 1. Fire burning or threatening more than one jurisdiction. ___ ___
- 2. Potential for claims (damages). ___ ___
- 3. Conflicting management objectives. ___ ___
- 4. Disputes over fire management responsibility. ___ ___
- 5. Potential for unified command. ___ ___

Total ___ ___

F. EXTERNAL INFLUENCES

- 1. Controversial wildland fire management policy. ___ ___
- 2. Pre-existing controversies/relationships. ___ ___
- 3. Sensitive media relationships. ___ ___
- 4. Smoke management problems. ___ ___
- 5. Sensitive political interests. ___ ___
- 6. Other external influences. ___ ___

Total ___ ___

G. CHANGE IN STRATEGY

- 1. Change in strategy to control from confine or contain. ___ ___
- 2. Large amount of unburned fuel within planned perimeter. ___ ___
- 3. WFSA invalid or requires updating. ___ ___

Total ___ ___

H. EXISTING OVERHEAD

- 1. Worked two operational periods without achieving initial objectives. ____ ____
- 2. Existing management organization ineffective. ____ ____
- 3. IMT overextended themselves mentally and/or physically. ____ ____
- 4. Incident action plans, briefings, etc., missing or poorly prepared. ____ ____

Total ____ ____

Signature _____

Date _____ **Time** _____

DELEGATION OF AUTHORITY

Arapaho National Wildlife Refuge
Waldon, Colorado

As of (Time) and (date) , I have delegated authority to manage the (Fire/Incident Name and Fire Number) , Arapaho National Wildlife Refuge, to Incident Commander (Name) and his incident management team.

As Incident Commander, you are accountable to me for the overall management of this incident including its control and return to local forces. I expect you to adhere to relevant and applicable laws, policies, and professional standards. While the suppression of the fire is your primary task, you are expected to do so in a manner that provided for the safety and well being of involved personnel. Consideration for the needs of local residents and communities is essential for successful management of the incident.

I am assigning (Name) As the line officer representative to act as liaison and provide any help you need. (S)He is authorized to speak for me in the event a decision is needed.

My specific considerations for management of this fire are:

1. Ensure the safety of firefighters, visitors, and public.
2. Protect private and refuge property to the extent possible.
3. Minimize damage to environmental resources
4. Key resource considerations are: protecting rare, threatened, and endangered species; preserving as much wildlife habitat as possible; avoiding wildlife entrapment situations; protecting cultural resources; and limiting degradation of the Complex's aesthetic values.
5. Restrictions for suppression actions are no earthmoving equipment (dozers, discs, plows, graders) without approval of the Refuge Manager or his designee.
6. Manage the fire cost-effectively for the values at risk.
7. Provide training opportunities for Service personnel when ever possible in order to strengthen our organizational capabilities.

Signed: _____ Date:

Refuge Manager

APPENDIX J: COMPLEXITY ANALYSIS

Prescribed Fire Complexity Worksheet

Using the attached criteria, rate each element on a scale of 0 to 9, then multiply by the weighting factor (shown in parentheses in first column) to determine the weighted subvalues. Add the subvalues to determine the total weighted value which is used to determine the complexity of the prescribed burn.

PRESCRIBED FIRES:

COMPLEXITY ELEMENT/ (WEIGHTING FACTOR)	RATING VALUE	WEIGHT SUBVALUE	LOW BURN COMPLEXITY	HIGH BURN COMPLEXITY
1. Potential for escape (10)			Very low probability.	High probability.
2. Values at risk (10)			Very little risk to people, property, resources.	Great risk to people, property, resources.
3. Fuels/fire behavior (6)			Mostly uniform and predictable.	Great variability & unpredictability. Prescription includes very low fuel moisture conditions.
4. Fire duration (7)			Fire generally of short duration & require little management.	Fires of long duration & require continuous management.
5. Smoke/air quality (7)			Smoke impacts are low or insignificant.	Smoke sensitive areas frequently affected.
6. Ignition methods (3)			Simple & rarely hazardous.	Highly technical or frequently hazardous.
7. Management team size (3)			Burn requires a few generalized positions.	Burn requires large team of separate, specialized positions.
8. Treatment objectives (5)			Objectives simple & easy to achieve. Prescriptions are broad & encompass safe burning conditions.	Objectives are difficult to achieve. Prescriptions are restrictive or burning conditions are risky.
Total Weighted Value:				

Low Complexity: 50 - 115 Total Weighted Value Points - Management Level: RXB3

Normal Structure: 116 - 280 Total Weighted Value Points - Management Level: RXB2

Complex Structure: 281 - 450 Total Weighted Value Points - Management Level: RXB1

PRESCRIBED FIRE COMPLEXITY ELEMENT RATING CRITERIA

Complexity elements are used to define the relative complexity of a prescribed fire project. For the 8 complexity elements listed, users assign a complexity score of 0, 1, 3, 5, 7 or 9, based upon the rating criteria described for each numeric score. Even numbers or numbers greater than 9 are not permitted. If a specific prescribed burn does not precisely match the stated criteria in every respect, a station will have to use its best judgment determine which rating is most appropriate. Each prescribed burn does not have to meet all listed rating criteria for a particular numeric score to qualify for that rating. Each higher rating category includes all the rating criteria listed for the previous categories.

These rating criteria will be used for all management ignited prescribed fires (prescribed burns), regardless of size. The complexity score will be included on the Fire Report (DI-1202) in the "Remarks" section. Post-fire complexity ratings are used to compile a summary complexity score for the normal prescribed fire year, which is used in the FireBase budget analysis for funding and staffing needs.

COMPLEXITY ELEMENTS

1. POTENTIAL FOR ESCAPE:

Score Criteria

- | | |
|-----|--|
| [0] | No potential for prescribed fire escape. Burn unit surrounded by non-burnable fuel or water. |
| [1] | Little potential of spot fires outside burn unit. If occurring, only one to two totaling no more than 0.25 acre. Spots can be controlled utilizing on-site holding forces. |
| [3] | Potential for multiple spot fires (more than two) outside the burn unit totaling less than 1 acre, but still controllable utilizing on-site holding resources. One or two dangerous fuel concentrations exist near the burn unit perimeter, and are expected to result in limited torching and spotting potential. |
| [5] | Potential for multiple spot fires outside the burn unit totaling more than 1 acre, requiring greater than average holding capability along certain sections of burn perimeter. Additional holding resources may be needed to control if escape occurs. Fuel outside burn unit is continuous, with limited fuel breaks. Engines and heavy equipment are primary suppression tools. |
| [7] | An escaped fire will exceed the capability of the holding resources on site. Additional resources will need to be requested for suppression. Escaped fire will cause implementation of contingency plan, and prescribed burn will be declared a wildfire. Fuel outside burn unit may be continuous and heavy with no fuel breaks making suppression efforts difficult. Engines and heavy equipment are primary suppression tools. Probability of Ignition greater than 70 percent. |
| [9] | Good potential for multiple fire escapes. An escaped fire will exceed the capability of the holding resources on site and additional resources will need to be requested. Escaped fires will cause implementation of contingency plan and prescribed burn will be declared a wildfire. Fuel outside the burn unit is extensive and heavy, making suppression actions difficult. Prescription calls for |

fireline intensity and fuel moisture in the primary fuel model that are known to cause serious spotting potential. Probability of Ignition greater than 85 percent. Wind speeds at the upper end of prescription.

2. VALUES AT RISK

Score Criteria

- [0] No risk to people, property, cultural and natural resources, either inside the designated burn unit or in the event of fire escape.
- [1] Burn is in an area infrequently visited by people and contains no historic structures, buildings, sensitive biological communities, T&E species, or habitats that could be damaged by prescribed fire. The area adjacent to the burn may contain a few locally significant natural or cultural resources, or structures that could be damaged by fire escapes.
- [3] Burn is in an area occasionally visited by people, and may be adjacent to a primary field unit road. The burn unit contains structures, cultural resources, sensitive biological communities, or T&E habitat that must be protected from fire.
- [5] Burn is in an area that receives moderate use. Public safety is a major concern addressed in the burn unit plan, but still requires a minor commitment of project resources. The unit may contain several significant structures; there may be one or two primary natural or cultural resources (as identified in the station fire management plan) inside or immediately adjacent to the burn unit which must be protected from fire. - OR - the area adjacent to the burn unit contains one or two cultural or natural resources, or structures valued between \$50,000 and \$250,000 that could be threatened by fire escapes.
- [7] Burn is in an area that receives moderate use, and protecting public safety requires a modest commitment of project resources. The burn unit may contain several significant structures, and contain or be immediately adjacent to several sensitive biological communities or habitats (as identified in station fire management plan) that must be protected from fire. - OR - the area adjacent to the burn unit contains three or more cultural or natural resources or developed sites with structures valued between \$250,000 and \$500,000 that could be threatened by fire escapes.
- [9] The burn unit is in an area of concentrated public use, and protecting public safety requires a major commitment of project resources. The unit may contain several major structures (such as residences, historic buildings) and there may be critical natural or cultural resources (such as threatened or endangered species, or major archeological artifacts) inside the burn unit that must be protected from fire. - OR - the area adjacent to the burn unit contains critical natural or cultural resources or developed sites with structures valued at more than \$500,000.

3. FUELS/FIRE BEHAVIOR

Score Criteria

- [1] Fuels are uniform, and fire behavior is easily predicted using the standard fire behavior models and

prediction systems (BEHAVE PROGRAM). Terrain is mostly flat, or the slope is uniform.

- [3] Fuels within the primary model vary somewhat in loadings and arrangement, but are still well represented by one of the standard fire behavior fuel models. There may be small areas of secondary fuel types present, mostly away from the burn unit perimeter. The terrain contains low relief, and slope and aspect cause minor variations in fire behavior. The fire behavior variations present no difficulties in carrying out the burn, and the predominant fire behavior still can be predicted easily under most prescription conditions.
- [5] Considerable variation exists within the primary fuel complex. Prescriptions may be based on two fuel models, or may require a customized model in addition to or in place of a standard model. A few areas of unusual fuel concentrations or atypical fuels not well represented by the prescription-based models may exist on or near the burn unit perimeter. The terrain contains significant relief, but the variations present only minor control problems, and no problems in meeting burn unit objectives. Fire behavior can still be predicted using standard fire behavior prediction systems.
- [7] Major variations in the fuel complex require **two or more** fuel models, and may require several customized models. High fuel concentrations and atypical fuels not well represented by the prescription-based models may be common on or near the burn unit perimeter. The terrain encompasses two or three major vegetative communities through a broad elevational gradient. Variations in slope and aspect have major effects on fuels, fire weather and fuel moisture. The resulting variations in fire behavior may present moderate fire control problems and minor problems in meeting the overall burn unit objectives. Fire behavior cannot be predicted well using standard fire behavior prediction systems without application of adjustment factors.
- [9] The burn unit contains highly variable fuels throughout, making it difficult to utilize standard or customized fuel models. The terrain encompasses more than three major vegetative communities through an elevation gradient so broad that more than one climate zone may be present. Wide variations in slope, aspect and elevation have major effects on fuels, fire weather and fuel moisture. The resulting variations in fire behavior may present major fire control problems and moderate problems in meeting overall burn unit objectives. Fire behavior cannot be predicted well without the aid of local experts (Fire Behavior Analysis).

4. FIRE DURATION

Score Criteria

- [1] Entire burn unit will be burned in one burning period. Some minor residual burning may continue inside the unit, but requires no continued resource commitment. Primarily 1-hour fuels.
- [3] Complete burnout of burn unit requires 1 to 3 days. Some minor residual burning may continue inside the unit, but requires no continued resource commitment. Primarily 10-hour fuels.
- [5] Complete burnout of burn unit requires 2 to 3 days. Significant residual burning inside the burn perimeter may continue for up to 3 days, requiring small holding crew. Primarily 100-hour fuels.

- [7] Complete burnout of burn unit requires 3 days to 1 week. Significant residual burning inside the burn perimeter may continue up to another week, requiring a holding crew on site during the burning period. Primarily 1,000-hour fuels.
- [9] Complete burnout of burn unit requires more than 1 week. Significant residual burning may continue for up to another 3 weeks along most of the burn unit perimeter, requiring a complete holding crew on site.

5. AIR QUALITY

Score Criteria

- [1] Burn is remote from developments or visitor use areas or is of such small size that smoke impacts are insignificant. No critical targets are present. Critical targets are areas that are unusually sensitive to smoke impacts. These include areas such as airports, highways, air quality non-attainment areas, and hospitals in which health and safety are quickly and severely impacted by even minimal amounts of smoke, targets that already have an air pollution or visibility problem, and any targets where the impact of smoke will be compounded by the presence of emissions from other sources. Burning is outside the non-attainment areas, and RACM/BACM eliminates any impacts to these areas.
- [3] One or more minor developments or visitor use areas may experience noticeably impaired visibility and increased particulate concentrations, but not in excess of secondary Federal standards. The impairment is expected to last no more than 3 days. No critical targets are present. There are no impacts to non-attainment areas.
- [5] Several communities or visitor use areas may experience significantly impaired visibility (as defined in State, county, or field station visibility standard) or particulate concentrations exceeding secondary Federal standards. The impairment is expected to last no more than 1 week. Not more than one health-related complaint is likely to be received from health or medical authorities. No critical targets are present. Smoke trajectory is important, but broad.
- [7] One town (more than 20,000 people) or one major visitor use area may experience significantly impaired visibility (as defined in a State, county or field station visibility standard) or particulate concentrations exceeding secondary Federal standards. The impairment is expected to last not more than 1 week. One to three critical targets are present. Smoke trajectory is critical. Mixing height and transport wind speed may be important.
- [9] Several towns (each of 20,000 people or more) or several major visitor areas may experience significantly impaired visibility (as defined in State, county or field station visibility standard) or particulate concentrations exceeding secondary Federal standards. The impairment is expected to last more than 1 week. Any impact likely to result in a violation of a primary Federal air quality standard would also qualify. Smoke trajectory, mixing height, and transport wind speed are critical.

6. IGNITION METHODS

Score Criteria

- [1] Burn is ignited using drip torches, fusees, or other simple ground methods. Ignition requires not more than two personnel. Ignition patterns are simple, with no chance for confusion or hazardous situations to develop.
- [3] Burn is ignited using simple ground methods or Terra Torch device (or equivalent). Ignition requires three to four personnel who may work in small teams igniting separate areas simultaneously. Ignition patterns may be complex enough to require detailed planning, but there is only minor chance of confusion. Ignition team is not expected to become involved in hazardous situations.
- [5] Burn is ignited using a combination of ground methods, or both ground and aerial methods. Ignition requires four to six personnel working in teams to ignite separate areas simultaneously. Burn and ignition complexity requires separate position for ignition specialist. Ignition patterns require detailed planning, coordination between teams, and considerable attention to avoid confusion. Ignition teams may be exposed to hazardous situations for short periods.
- [7] Ignition methods are tailored to accomplish different results in different sections of the burn. Burn unit may be composed of several fuel types requiring different ignition techniques and patterns. Ignition team(s) is composed of six to eight personnel, who may ignite separate areas simultaneously. Several ignition specialists may be required for different segments of the burn. Ignition methods require detailed planning and coordination often including an ignition specialist in aerial command post. Ignition teams are frequently exposed to hazardous situations due to fuels, fire line intensity, and complex terrain. Ignition methods or patterns are subject to revision by burn boss to achieve desired results or due to changing conditions.
- [9] Burn requires a combination of complex aerial and ground techniques, often including helitorch, in complex, hazardous terrain and fuels. Ignition team is composed of more than eight personnel. Ignition methods require detailed planning by experts with extensive experience in specialized techniques. Ignition methods are subject to frequent revision by burn and ignition bosses due to changing or uncertain conditions. Detailed coordination is imperative to avoid placing team members in unacceptably dangerous situations.

7. MANAGEMENT TEAM SIZE

Score Criteria

- [1] Burn team consists of two to three personnel, with the burn boss holding several overhead positions.
- [3] Burn team consists of four to six personnel, including separate positions for Burn Boss and Holding Specialist.
- [5] Burn team consists of seven to nine personnel, including separate positions for Burn Boss, Ignition Specialist, and Holding Specialist.

- [7] Burn team consists of 10-12 personnel, including Burn Boss, Ignition and Holding Specialist, Aircraft Manager (aerial ignitions), and a Fire Weather Observer.
- [9] Burn team consists of more than 12 personnel, including Burn Boss Type I, Holding Boss, Ignition Specialist, Aircraft Manager, Weather Observer, and several ignition and holding foremen.

8. TREATMENT OBJECTIVES

Score Criteria

- [1] Objectives are limited to fuel reduction or maintenance burning and are easily achieved (e.g., removing cured grasses from grasslands or field maintenance). Prescriptions are broad and encompass safe burning conditions.
- [3] Objectives are limited to dead and downed fuel reduction, or simple habitat restoration projects involving minor changes to vegetation. May involve two or three different fuel models. Objectives are easy to achieve using relatively low-intensity surface fires and simple burning patterns. Range of acceptable results for the burn objectives are broad.
- [5] Objectives include dead and downed fuel, and live fuel reduction burns or change to structure of vegetative/habitat communities. Also include habitat conversion projects requiring changes in the composition of two or more vegetation types. Objectives and results are broad and could be moderately difficult to achieve, and may often require moderate intensity fires involving living fuels. Burning patterns are moderately complex. Flame lengths or scorch heights are critical to meet burn objectives.
- [7] Objectives include living and dead fuels. Include habitat restoration projects requiring changes in the structure and composition of two or more vegetative habitats. Narrow burn parameters (prescription) fire behavior, smoke dispersal, operational constraints, and other burn criteria present a limited opportunity of project success with a single burn. The chance of success is heavily dependent on careful planning and precise timing.
- [9] Objectives include living and dead fuels. Fuel reduction, ecological considerations, and political or operational constraints may be conflicting, requiring careful prioritization of objectives and expert planning. The prescription may require a combination of different fire intensities that makes it difficult to achieve objectives. The prescription criteria and window of opportunity are narrow. Burn objectives are specific, and range of results narrow. Project includes a major change in structure and composition of burn area. The prescription requires burning under risky conditions that could lead to fire escape.

APPENDIX K: SMOKE MANAGEMENT AGREEMENT