

FIRE MANAGEMENT PLAN



PRESQUILE NATIONAL WILDLIFE REFUGE CHESTERFIELD COUNTY, VIRGINIA

2005

WILDLAND FIRE MANAGEMENT PLAN

Presquile National Wildlife Refuge

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I. INTRODUCTION

A. PURPOSE

This document establishes a Fire Management Plan (FMP) for Presquile National Wildlife Refuge (NWR). Presquile NWR is one of four refuges that comprise the Eastern Virginia Rivers NWR Complex (EVRNWRC). All resource related activities for the complex are managed by the EVRNWRC headquarters in Warsaw, VA, with a sub office in Charles City, VA to support Presquile and James River NWR. This Plan addresses resource protection from wildland fires, and meets U.S. Fish and Wildlife Service and Departmental requirements for suppression, as well as prescribed fire, and related activities, such as mechanical fuels treatments.

This plan relates to existing land management policy, however, comprehensive resource plans, such as a Habitat Management Plan or Comprehensive Conservation Plan are not yet developed for Presquile NWR. This plan will assist in achieving overall management objectives in the interim, as planning documents, such as a Comprehensive Conservation Plan, are developed. Protection of life, property and natural resources from the harmful and unwanted effects of wildland fire remains the priority of this plan, however, this plan has been developed to provide direction and continuity in establishing operational procedures to guide all fire management activities, in addition to fire suppression.

B. REGULATORY COMPLIANCE

This plan meets the requirements of the National Environmental Protection Act (NEPA). Accordingly, an environmental assessment (EA) was prepared to accompany this plan, and was made available for public review and comment. The EA evaluates fire suppression and the use of prescribed fire on the Refuge, and potential environmental impacts of these activities.

The mission of the National Wildlife Refuge System 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” (National Wildlife Refuge Improvement Act, 1997). This directive clearly supports a two-pronged approach to fire management on National Wildlife Refuges (NWR): 1) suppression or pre-suppression of wildfire in order to protect refuge resources from catastrophic effects; and 2) application of prescribed fire for habitat restoration and enhancement. The highest priority of the Refuge FMP is the protection of life, property, and natural resources from fire.

The Refuge was established in March 1953 under the authority of the Migratory Bird Conservation Act (16 U.S.C. 715d). Its official purpose is “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” Accordingly, this Plan contains fire management objectives intended to support habitat protection, such as restoration and enhancement of wildlife habitats and hazard fuel reduction. This Plan will help achieve specific, interim resource management objectives as defined in the Environmental Assessment (EA) for

the Fire Management Plan for Presquile NWR (copy of EA available at Refuge and Region 5 Headquarters). Interim objectives are being used until specific Habitat Management Plans are developed and the Refuge's Comprehensive Conservation Plan (CCP) is prepared.

Each refuge in the National Wildlife Refuge System is mandated by the National Wildlife Refuge System Improvement Act (1997) to prepare a Comprehensive Conservation Plan by the year 2012.

C. AUTHORITIES

This FMP is governed by several related statutory authorities. They include the Clean Air Act, the Clean Water Act, the National Environmental Policy Act and the Antiquities Act. Departmental Manual (620 DM 1.1) and the Fire Management Handbook (621 FW) and other Authorities listed below:

1. Protection Act of September 20, 1992 (42 Stat. 857; 16 USC 594)
2. Economy Act of June 30, 1932 (47 Stat. 417; 31 USC 1535)
3. Federal Property and Administration Services Act of 1949.
4. Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66; 42 USC 1856a)
5. National Wildlife Refuge System Administration Act of 1966, as amended.
6. Disaster Relief Act of May 22, 1974 (88 Stat. 1431; 42 USC 1521)
7. Federal Fire Prevention and Control Act of October 29, 1974 (88 Stat. 1535; 15 USC 2201)
8. Federal Grants and Cooperative Act of 1977.
9. Wildfire Suppression Assistance Act of 1989, (Pub. L. 100-428, as amended by Pub. L. 101-11, April 7, 1989)
10. Department of Interior Manual, Part 620 DM-1, Wildland Fire Management, April 1998
11. USFWS Refuge Manual, 621 FW 1-3, Fire Management, February 2000
12. USFWS Wildland Fire Management Handbook, e-book, last update September 2003

D. COLLABORATIVE OPPORTUNITIES

Presquile NWR is managed as part of the Eastern Virginia Rivers National Wildlife Refuge Complex (EVRNWRC). To implement this Plan, the refuge will utilize the local fire departments, EVRNWRC refuge staff, FWS fire management staff, and cooperating agencies to meet fire suppression and prescribed burn goals and objectives.

Cooperative agreements for operational fire support currently exist between the U.S. Fish and Wildlife Service and the Virginia Department of Forestry (DOF), Virginia Department of Conservation and Recreation (DCR), and the Virginia Chapter of The Nature Conservancy (TNC).

II. RELATIONSHIP TO LAND MANAGEMENT PLANNING/FIRE POLICY

A. USFWS POLICY

Departmental policy states that “every area with burnable vegetation must have an approved Fire Management Plan” (620 DM 1.4B). The following Fire Management Plan (FMP) meets these directives, and will serve Presquile NWR from the date of approval until such time that it is revised or otherwise modified. The Plan is intended to provide overall fire management objectives and operational and planning information for the Refuge, and meets the requirements set forth in the Service chapters of the Interagency Standards for Fire and Aviation Operations “Red Book” as of 2005.

B. REFUGE DESCRIPTION AND PURPOSE

Presquile NWR is a 1,329-acre (3322 hectares) island, composed of 5 general types of habitats: Tidal Marsh (252 acres/630 hectares), Swamp (777 acres/1942 hectares), Open Field (234 acres/585 hectares), Forestlands/Brushlands (51 acres/127 hectares), and River Escarpment (15 acres/37 hectares). The island was bequeathed to the U.S. Fish and Wildlife Service in 1952 in the will of Dr. A.D. Williams, and was established as a refuge in March 1953. Dr. Williams had maintained a dairy farm and country estate on the island.

The refuge was established primarily for the benefit of thousands of waterfowl that have traditionally wintered in the area. It is the fall and winter home to Canada geese and ducks. Farming and grazing occurred on the Refuge until the late 1990’s. The varied habitat is now being managed to provide food and cover for a diversity of wildlife species native to this section of Virginia, particularly for migratory birds, which include the federally threatened bald eagle (USFWS 1984).

Access to the refuge has traditionally been via ferry, operated along a steel cable. In 2001, public access on the ferry was halted due to safety concerns. The ferry is still operational for refuge management purposes, which would include prescribed fire and fire suppression activities. Logistical considerations could hinder rapid response to wildfire, however. These special considerations include high tide water, low tide water, commercial shipping traffic, and mechanical breakdown of the ferry.

Besides the management of its land for species and habitat conservation, the refuge supports structured wildlife-oriented recreation programs, when not in conflict with its primary objectives. Wildlife observation, photography, hunting, environmental education, and interpretation are all public uses encouraged on the refuge. Most of the public use activities were discontinued in 2001 as a result of the ferry access issues. In 2004, upon acquisition of a 16-passenger pontoon boat, public use opportunities were once again offered on a limited basis.

C. REFUGE RESOURCES

1. Location

Presquile NWR is an island, located in the James River near the city of Hopewell, Virginia. It is situated in the northeast corner of Chesterfield County and borders both Charles City County and Henrico County (See Appendix A - Location Map). Prior to 1934 the island was a peninsula. The James River had formed an oxbow bend, encompassing approximately six miles (13 kilometers) of shoreline. In a successful effort to reduce travel time along the busy shipping channel, the peninsula was severed at its narrowest point to create a navigational cut-through. This cut made Presquile a true island.

2. Archaeological/Cultural/Historic Resources

Cultural resources on the refuge are represented in several historic building sites (some still with foundations) and a small cemetery (complete with headstones and partial fencing). The Williams home site contained the largest and most ornate building constructed on the island, but it has since been demolished. Other buildings consist of smaller quarters and outbuildings. Artifacts collected on the refuge confirm the prehistoric presence of Native Americans. Historical documentation and archival material is limited. The Virginia Department of Historic Resources has identified five known archaeological sites on the refuge; most within the Bermuda Hundred Archaeological and Historic District. These sites include prehistoric camps, the remains of an 18th century Randolph house, and sites of unknown age and function.

3. Fish and Wildlife

Endangered Fauna

Threatened or endangered wildlife includes two avian species- bald eagle (*Haliaeetus leucocephalus*) and least tern (*Sterna albifrons*). The bald eagle is commonly seen throughout the year. The least tern is only occasionally seen.

Birds

The varied habitats of the refuge encourage a diversity of avian species. To date approximately 200 bird species have been identified on the refuge. In addition to Savannah sparrow (*Passerculus sandwichensis*), waterfowl such as, Canada geese (*Branta canadensis*) and wood duck (*Aix sponsa*) and raptors, such as northern harrier (*Circus cyaneus*) and red shouldered hawk (*Buteo platypterus*) provide a dominating presence in the winter months. Marsh birds, songbirds and other neo-tropical migrants visit the refuge in the warmer months. High priority species that nest on the refuge include the bald eagle, prothonotary warbler (*Protonotaria citrea*), northern bobwhite (*Colinus virginianus*), Eastern meadowlark (*Sturnella magna*), and grasshopper sparrow (*Ammodramus savannarum*).

Mammals

Twenty-two mammal species occur on the island. Mice are the most abundant and are found in all habitat types. Deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), grey squirrel (*Sciurus carolinensis*), woodchuck (*Marmota monax*), eastern cottontail rabbit (*S. floridanus*), striped skunk (*Mephitis mephitis*) and muskrat (*Ondatra zibethicus*) are common and frequently seen. Little brown bat (*Myotis lucifugus*), red fox (*Vulpes vulpes*), and American beaver (*Castor*

canadensis) are known to live on the refuge. Two relatively uncommon mammals, the cotton mouse (*Peromyscus gossypinus*) and the cotton rat (*Sigmodon hispidus*) have been record on the island and are either near, or at, the edge of their ranges in the United States (Blem 2004).

Reptiles and Amphibians

The marsh and swamp habitats are especially rich in reptilian life. Two *Eumeces* species of skinks, black rat snake (*Elaphe obsoleta obsoleta*) and brown water snake (*Nerodia taxispilota*) are the most common reptiles. Numerous amphibians, such as spring peepers (*Hyla crucifer*) and spotted salamander (*Ambystoma maculatum*) can also be found in these moist areas. Green frog (*Rana clamitans*) is the most common amphibian on the island.

Invertebrates

The refuge hosts many individual invertebrate species, but this taxon is the least studied and understood group of animals on the refuge. A full range of aquatic insects, butterflies, beetles and other species are easily found during the warmer seasons. Two butterfly species, Monarch (*Danaus plexippus*) and Red Admiral (*Vanessa atalanta*), are particularly prevalent during the summer. Additionally, two dragonfly species, Common Whitetail (*Libellula lydia*), and Green Darner (*Anax junius*) are frequently seen in the grasslands of the Refuge.

Fish

Considering the island setting of the Refuge, a variety of fish species are also common. White perch (*Morone Americana*), channel catfish (*Ictalurus punctatus*) and striped bass (*Morone saxatilis*) are three such species that have been identified. Additionally, two large creeks that bisect the refuge offer a safe haven for spawning and foraging.

4. Vegetation

Endangered Flora

The Virginia Department of Agriculture and Consumer Services indicates that the sensitive joint vetch (*Aeschynomene virginica*), a plant species listed by state and federal governments as threatened, is known to occur on the refuge. It is located in the tidal marsh portion of the Refuge. There is no evidence of other threatened or endangered plant species on the refuge. (See Appendix A – Refuge Boundary Map)

Marsh

Two areas of tidal marsh comprise 252 acres (630 hectares). Both areas are about the same in size and contain essentially the same plant composition. Predominant plants are rice cutgrass (*Leersia crysoides*), arrow arum (*Peltandra virginica*), beggertick (*Bidens sp.*), and smartweeds (*Polygonum sp.*). In the southeastern marsh a stand of the primitive vascular plant, horsetail (*Equisetum hyemale*) has established itself among the other wetland plants. Woody trees and shrubs are limited mainly to narrow interrupted bands along the river border, although some patchy intrusions occur elsewhere.

Swamp

The main body of the refuge (777 acres/1942 hectares) is occupied by swamp vegetation. About 80 percent of the trees are over 60 years of age. The most abundant species are white ash (*Fraxinus americana L.*), blackgum (*Nyssa sylvatica*), baldcypress (*Taxodium distichum*) and red maple (*Acer rubrum L.*). The dominant understory species is ironwood (*Ostra virginiana*) which

is widespread throughout the community. Herbaceous plants are poorly represented in the swamp due to the dense canopy cover of the trees and susceptibility of the area to inundation by water. Two large creeks and numerous tidal coves penetrate the swamp.

Open Field/Grasslands

A total of 234 acres (585 hectares) of the refuge are old croplands or grasslands. Historically this land was cultivated annually and planted to soybeans, corn, and wheat, or was used as pastureland for cattle. Most of that uncultivated cropland is overgrown with Johnson Grass, Canada Thistle, fescue, and rye. Approximately 94 acres (235 hectares) are in clover or a combination of grasses (orchard grass and fescue) and clover.

Forestlands and Brushlands

These plant communities are restricted to 51 acres (127 hectares) in the southeast corner of the island in the spoils area. The dominant tree species in the higher elevations are black locust (*Robinia pseudoacacia* L.) and eastern red cedar (*Juniperus virginiana* L.). These trees occur in small, open stands separated by a thin cover of herbaceous vegetation. The lower elevations nearer the river are dominated by such species as sycamore (*Platanus occidentalis* L.), red maple (*Acer rubrum* L.), and cottonwood (*Populus deltoids*). Ground cover here is sparse, due to dense tree canopy.

River Escarpment

A river escarpment dominated by trees and woody vines extends from the ferry landing to the southwest point of the island and from there northeast and north to the wooded swamp, a distance of 1.6 miles (2.57 kilometers). Width of the escarpment averages about 50 feet (15.24 meters). Slopes of 45 degrees are common and are somewhat stabilized from erosion by woody vegetation. Trees are generally younger than 35 years, with the older trees being restricted to the upper edge. A majority of the trees are hackberry (*Celtis occidentalis* L.) (USFWS 1984).

5. Climate and Physical Resources

Temperatures normally range from a high of around 37.77 degrees Celsius (100 degrees Fahrenheit) to a low of -15 degrees Celsius (5 degrees Fahrenheit). Precipitation averages 42 inches (107 centimeters) annually with peak rainfall occurring in the summer. See Table 1. Average relative humidity is 71 percent. South-southeast winds prevail in the spring and summer while north-northwest winds prevail in the fall and winter. Average wind velocity is 7.9 miles per hours (12.72 kilometers per hour).

Table 1 Monthly average temperature and precipitation for the area.

	Average Temperature		Average Precipitation	
	Celsius	Fahrenheit	Centimeters	Inches
January	4.44	40	7.24	2.85
February	5.55	42	7.82	3.08
March	9.44	49	8.10	3.19
April	15.55	60	7.59	2.99
May	20	68	9.37	3.69
June	23.33	74	10.03	3.95
July	26.11	79	13.36	5.26
August	25.55	78	11.53	4.54
September	21.66	71	9.24	3.64
October	16.11	61	7.39	2.91
November	10.55	51	7.44	2.93
December	5.55	42	7.85	3.09
TOTAL	15	59	107	42.12

The City of Hopewell is a heavily industrialized area. Four industrial plants are within one mile (1.6 kilometers) of the refuge. Occasionally, when wind and other factors are unfavorable, odor and haze from these plants are quite evident.

The maximum elevation on the refuge above sea level is twenty feet (6 meters). Surface areas of this elevation are restricted primarily to the southwestern part of the island. Approximately 80 percent of the island's surface is subject to inundation by the James River.

Most of the island's surface is characterized by either tidal marsh or mucky peat soils (swamp), both of which are subject to inundation by the James River and are poorly drained. Most of the upland portion is in Pamunkey or Toccoa loam soils developed from alluvium transported by the James River. The James River collected these soils, that eroded from the Piedmont Plateau (upstream-to the west), and deposited them at present locations. This section was part of a large oxbow in the river, prior to 1934. The Pamunkey or Toccoa loam soils are generally deep, well drained soils with high moisture supplying capabilities.

During the formation and subsequent maintenance dredging of the Turkey Island Cutoff, approximately 50 acres (125 hectares) of uplands, know as the spoils area, were developed in the 1930's and 1940's from dredged material. Soils here are generally sandy, dry and low in organic matter.

All refuge waters are tidal waters of the James River with average daily amplitude of three feet (.9 meters). Rain, wind and/or full moon tides can cause the river to fluctuate several feet (1 meter) from normal. Submergent vegetation is sparse in the James itself due to the polluted, turbid condition of the water. Pollutants are thought to be mainly a result of industrial discharges and effluent from sewage treatment plants. The James is slightly brackish in the area of the

refuge with salinities normally ranging from a high of around 25 parts per million (PPM) in the summer to a low of 10 PPM in the winter (USFWS 1984).

6. Structures and Facilities

Government-owned facilities, used for administration of the refuge, exist on Presquile NWR. The facilities include a house formerly used as refuge quarters, the visitor contact building, maintenance shed, carpentry and mechanical buildings, four concrete out buildings, pump house, storage shed, a portable restroom, ferry landing ramp, and a twenty-foot wooden observation tower. The replacement value of the structures (and equipment) is roughly estimated at \$700,000. (Vick 2004). These facilities are located in an elongated compound covering approximately six acres of the refuge.

Many structures and improvements owned or operated by refuge neighbors are located on the opposite banks of the James River. These buildings, docks, etc. are not likely to be affected by wildfire due to the large water buffer provided by the river.

D. REFUGE GOALS AND OBJECTIVES SUPPORTED BY FIRE PROGRAM

This FMP establishes General Fire Management Objectives, intended to protect resources at risk, and to guide the fire program at the Refuge in accordance with the overall mission of the Refuge.

1. General Objectives:

Protect human life, property and natural and cultural resources from damage by unwanted fire.

- Suppress all naturally occurring or human-caused fires at the minimum acreage possible, commensurate with acceptable suppression impacts and safety standards.
- Provide protection for Refuge buildings and facilities.
- Implement cooperative agreements and programs with other agencies for mutual aid, coordinated management of resources, and increased training opportunities.
- Adopt fire prevention measures to reduce preventable fires, and provide for the safety of visitors and employees.
- Remove hazardous fuels through mechanical removal or successive low intensity prescribed burning until fuel loads represent natural levels.

Use fire to accomplish resource management objectives.

- Restore and perpetuate native mid-Atlantic ecosystems.
- Promote wildlife diversity on the Refuge by maintaining a diversity of plant communities, including early successional communities.
- Develop a program of data collection on prescribed fire behavior and effects, to enable comparisons among prescribed fire techniques, and to link burn behavior with ecological results.

- Establish specific ecological objectives for prescribed fire program; support research to monitor and evaluate how well objectives are met by management-ignited fire.
- Practice adaptive management, based on prescribed fire monitoring information.

2. Specific Objectives

Presquile National Wildlife Refuge does not have a Master Plan, or a CCP. Therefore, this plan contains the Specific Refuge Fire Management Objectives, which were developed in advance of the forthcoming CCP. The Refuge biological staff is initially interested in using prescribed fire to maintain remnant native grasslands found on the Refuge, and to enhance/rehabilitate other, non-native grasslands such as agricultural fields and pastures. Prescribed fire will be used to reduce woody invasion (e.g. sweetgum, Liquidambar styraciflua), recycle nutrients, reduce litter layers, increase native, warm season grasses, and reduce non-native, cool season grasses. In addition, the Refuge biological staff plans to use fire as part of a program to eliminate tall fescue and other non-native plants (Canada thistle and Johnson grass), and to establish native grasses on the Refuge.

Prescribed fire can be a cost-effective alternative to mowing and herbicide applications in grasslands. Fire has been shown to be more effective at reducing litter layers than mowing (Rudnicki et al. 1997), and is recommended for maintaining grassland habitats for grassland birds such as grasshopper sparrow and vesper sparrow (Jones and Vickery 1997).

The following interim goal and objectives guide management of the 234 acres (585 hectares) of field habitat, now dominated by invasive plant species, over the next three to five years.

The interim goal states: Refuge uplands and wetlands are protected and managed to provide high quality, native habitats for nesting, migrating, and wintering birds, including the Federally-threatened bald eagle. Interim objectives are: 1) halt the spread of invasive plant species in the upland portion of the Refuge; 2) reduce the area dominated by invasive plant species by 90%; 3) maintain at least 200 acres (500 hectares) of early successional grassland habitats as nesting cover for ground-nesting birds; 4) provide green browse on at least 150 acres (375 hectares) of upland fields for migratory Canada geese.

Halt the spread of invasive plant species in the upland portion of the Refuge.

Fire may be used to maintain a diversity of open habitats on the refuge, including early and late successional grasslands, and shrublands. Prescribed burns may be used to increase native plant diversity and reduce non-native vegetation, in some cases precluding the need to use chemical herbicides.

Reduce the area dominated by invasive plant species by 90%.

The use of fire as tool to reduce invasive plants and litter associated with non-native species will improve native plant diversity. Native plant will be better able to compete for sunlight and nutrients when not overwhelmed by the dominance of invasive plants.

Maintain at least 200 acres (500 hectares) of early successional grassland habitats as nesting cover for ground-nesting birds.

Fire may be used to restore Refuge habitats, used by neotropical migratory birds, to create a more natural structure and vegetative composition. Fire may also be used to restore early successional habitats for declining grassland breeding birds by eradicating exotic, invasive plant species, stimulating germination of fire-dependent native plant seeds, and maintaining stands of native, warm-season grasses.

Provide green browse on at least 150 acres (375 hectares) of upland fields for migratory Canada geese.

Rotational applications of prescribed fire in open fields may enhance Canada goose habitat by removing monotypic stands of exotic invasive plant species that maintain little food value, such as Johnsongrass (*Sorghum halepense*).

There may be opportunities at the Refuge to use prescribed fire to protect, restore and enhance native mid-Atlantic plant communities, migratory bird habitats, and other wildlife resources managed by the Refuge. However, use of prescribed fire in Refuge forests is unlikely due to the wet soils and daily tidal inundation.

III. WILDLAND FIRE MANAGEMENT STRATEGIES

Fire suppression will continue to be the primary objective of the fire management program. Overall, the FMP is designed to implement a safe, cost-effective program of fire protection, fuels management, and resource enhancement through prescribed fire strategies. With limited refuge staffing, local fire departments will provide initial attack response. Staff with fire training from Eastern Virginia Rivers NWR Complex will provide additional support. Presquile NWR is part of the Region 5 South Zone Fire Management grouping. Support resources and expertise for both fire suppression and prescribed fire will be provided by the South Zone Fire Management Officer, stationed at Great Dismal Swamp NWR in Suffolk, Virginia.

A. GENERAL MANAGEMENT CONSIDERATIONS

Presquile NWR is an island, and presents considerable constraints with regard to response to wildfire. No staff lives on the island. Vehicle or heavy equipment can access the island by a cable ferry (when mechanically operational and a trained operator is present). Boat access to the island is possible only at specific locations. These factors will dictate the speed of response, and the amount and type of resources able to respond.

Selected methods should cause minimum resource damage while accomplishing effective incident stabilization. Heavy equipment (e.g., bulldozers) off designated roadways should not be used without specific authorization. The safety and property of private citizens and incident personnel are paramount concerns. Suppression methods that impact fragile habitats should be weighed carefully against the need to protect property within and adjacent to the Refuge, provided there is minimal threat on human life.

Fire inhibiting chemicals (e.g., aerially applied retardants and Class A foam solutions) may only be used with the concurrence of the Refuge Manager, except in the case of life-threatening situations. Direct application of these chemicals into waterways such as impoundments, inflows, stream channels, or drainage ditches must be avoided. Guidance issued in March 2000 by the Assistant Director, Refuges and Wildlife prohibits aerial application of retardant or foam within 300 feet of waterways. Exceptions apply when the chemical is necessary to the protection of life or property, when alternate line construction techniques are not available, or when potential damage to natural resources outweighs possible loss of aquatic life.

Wildfire size-up should include an assessment of the threat to state and federally-listed endangered, threatened, and special concern species and their habitats from the fire and suppression measures. Similarly, wildfire size-up requires an assessment of the threat to cultural resources from the fire itself or suppression measures. Should either situation occur, advice will be sought from the appropriate sources in the fire management hierarchy.

Existing roads, ditches, canals, streams, or impoundments will be used instead of constructed firelines whenever possible. When constructed firelines are necessary, buffer strips of 30.5 m (100.0 ft) will be maintained between waterways and firelines. When firelines must be placed within 30 m of waterways, they will be oriented perpendicular to the waterway, if practicable, to avoid siltation. Use of heavy equipment and application of chemical fire retardant will be avoided within the strip.

B. WILDAND FIRE MANAGEMENT GOALS

The Plan is designed to implement a safe, cost-effective program of fire protection, fuels management, and resource enhancement through prescribed fire strategies. These strategies include:

1. Protect life, property, and other resources from unwanted fire. *Fire fighter and public safety are of highest priority.*
2. All wildland fire, whether natural or human-caused, will be suppressed commensurate with safety, resource management objectives, and constraints. This means an initial attack that is quick, aggressive, and results in minimal spread.
3. Only prescribed fires will be used to accomplish land use and resource management objectives. These fires will be carried out only under a written and approved Prescribed Fire Plan within defined management units. Wildland fire use to achieve resource objectives is inappropriate for the Refuge.

4. Perimeter fuel breaks may be constructed on the edges of high-risk interface areas to break up combustible fuel continuity and to provide safe access, anchor points, and escape routes for suppression resources.
5. Specific fuel loadings will be evaluated in high-risk areas; hazard reduction strategies will be used to reduce excessive fuel hazards.
6. Interior road/ditch corridors, access roads, and fuel breaks will be maintained in appropriate areas of the Refuge.
7. Mechanical equipment will not be used in cultural resource areas without first consulting with the Regional archeologist, except for emergency suppression.
8. Agreements will be pursued with cooperators at all levels to facilitate efficient fire management activities within and adjacent to the Refuge. The Refuge will continue to promote and maintain inter-agency coordination to foster local, regional, and national cooperation in incident management. Based on local Refuge conditions, Refuge firefighting resources may be provided to meet incident management needs at all levels.
9. Within designated sensitive habitats national policy will be followed to limit suppression tactics that will have long term, unnatural environmental effects. This includes limiting the use of retardant or heavy equipment to life-threatening situations without the specific approval of the Refuge Manager.
10. Refuge staff will work with Refuge visitors to prevent human-caused wildfires and their potential adverse impacts on human life, facilities, or Refuge cultural or natural resources.
11. The Refuge will consider the historical role of fire in Refuge ecosystems, and will provide the best scientific information concerning the natural effects of fire in refuge habitats.
12. Management-ignited prescribed fires will be used to achieve resource management goals. Further details about these uses of prescribed fire are provided in section IV, C. Prescribed Fire.

C. WILDLAND FIRE MANAGEMENT OBJECTIVES

A full range of suppression strategies are available to achieve resource management objectives, with the exception of wildland fire use. Suppression response must minimize threats to human life, be cost effective, and be considerate of adverse resource damage. In most cases, the aggressive suppression of wildfires is the least costly. In all cases, having an initial attack force available to suppress new fire starts while they are small will reduce overall cost.

Suppression strategies are ultimately governed by the threat to values at risk, on and off the Refuge, and costs associated with suppression are likewise overridden by those threats. The

Refuge is located on an island, where it is unlikely that escapes from Refuge lands will create significant wildland/urban-interface situations. The Refuge itself is unique in its values at risk (historical buildings and sites, structures and improvements). Suppression costs, whatever they may be, are justifiable when weighed against the potential loss due to a fire that escapes initial attack.

Modifying fuels through prescribed fire and maintaining fuel breaks provides additional support of wildland fire suppression through the creation of defensible barriers and by “buying time” for suppression forces to arrive. Reducing fuel hazards can reduce fire intensities, and wildfires can more easily be caught under all but the most severe conditions.

Habitat maintenance and enhancement through the use of prescribed fire is based upon the cost effectiveness of achieving resource objectives identified above. For example, periodic use of prescribed fire may be more cost effective than annual mowing programs, or intermittent use of heavy land-clearing machinery (disc, root-rake, and hydro-axe) to maintain diverse grassland habitats. Prescribed fire can be more cost effective, have fewer adverse impacts (to adjacent waterways, wildlife habitats) than logging activities for the recruitment of oak/hardwood species. Prescribed fire may diversify uniform blocks of conifers, grasses, or other flammable fuel types.

D. MAJOR REFUGE FUEL TYPES

1. Grassland/Shrub Lands Fire Behavior Fuel Model 1 (NFDRS L)

This model represents grassland fields found within the Fire Management Units. Short and medium cool season grasses with some broadleaf herbaceous vegetation and few encroaching woody plants characterize these fields. Fuel loading is generally less than 2.0 tons per acre. Fields that fall under this model are mowed periodically. Thus, the fuel bed is under 0.6m (2.0 ft) for much of the year.

The fine and continuous herbaceous fuels that have been completely or partially cured govern fire spread. Surface fires that move rapidly through the cured vegetation are possible. Fires occurring within fuel model 1 can be a problem at the Refuge in spring and occasionally in fall when perennial grasses are cured. High spread rates can be expected, but fire intensities remain low and are short in duration. Flame lengths may approach 1.2 m (4.0 ft). Significant wind events may yield a rate of spread greater than 50 chains (3300 feet) /hr. A fire in this fuel type will usually do little permanent damage to resources.

2. Grassland/Shrub Lands, Wetland Fire Behavior Fuel Model 3 (NFDRS Model N)

The vegetation, which characterizes this fuel model, includes emergent wetland plants (e.g., cattail and *Phragmites*) and tall grasses (e.g., switchgrass, big bluestem, and reed canary grass). This fuel type typically exceeds 1.8 m (6.0 ft) in height and the total fuel loading present exceeds 3.0 tons per acre.

Fires in this fuel model are the most intense of the grass group and display high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the vegetation and

across standing water. Windy spring or fall days with high temperature and low relative humidity make this fuel type hazardous. An extremely fast moving fire front exceeding 100 chains (6600 feet) /hr with flame lengths greater than 3.7 m (12.0 ft) can be expected. A fire in this fuel type will normally be controlled only at the change in fuel type near the edge of the marsh or firebreak.

3. Fire Behavior Fuel Model 5 (NFDRS Model F or T)

This fuel type consists of under story grasses and forbs, and litter cast by shrubs. The shrubs are young with little dead material and the foliage contains little volatile material. Thus, fire intensity is generally low.

Slow-burning fires are expected with rates of spread less than 5 chains (330 feet) /hr and flame lengths under 0.6 m (2.0 ft). Fire is ordinarily carried in the surface fuel.

E. FIRE MANAGEMENT UNIT (FMU) AND STRATEGIES

For the purposes of this initial version of the FMP, three Fire Management Units (FMU) are described. These units contain the most sensitive refuge habitats and facilities and represent the greatest potential habitat and structural losses in the event of wildfire. (See Map Appendix A.v.)

1. Open Field Unit – 234 Acres

Strategic objectives: Protect private property, minimize damage to refuge resources, prevent the fire from burning off of the refuge onto adjacent lands, and provide for firefighter safety. When possible, suppress all wildfires through direct attack with full control as the suppression strategy.

Relationship to FMP objectives: Protect life, property, and refuge resources from the effects of unwanted fire.

Tactical objectives: Aggressive initial attack would be the preferred tactic, however access to the refuge will impact the timing and the nature of the response. A fire start in this FMU may well burn itself out, or burn into another FMU, before a suppression response can be mounted. Direct attack with engines is a viable strategy, provided they could be transported to the island, as terrain is conducive to vehicular access. Indirect attack may be used, with structure protection for the refuge facilities being the primary focus of effort. Protection of life and property will be the overriding priorities. Utilize existing roads and trails, bodies of water, areas of sparse or non-continuous fuels as primary control lines, anchor points, escape routes, and safety zones.

Management constraints: No constraints other than Service policy. Service policy restricts firefighters from engaging in structural firefighting activities, but not structural (exposure) protection.

FMU physical description: The Open Field Unit is 234 acres and very accessible, once on the island. The road system consists of gravel or dirt roads accessing the majority of the area and cross-country travel is possible in most areas because of the level to gently rolling terrain. The unit contains managed grasslands, river shoreline, and old cropland. Visitor use is minimal, with less than 500 visitors per year. Public use is expected to increase gradually as facilities and programs are developed.

Values to be protected and special concerns: The primary concern would be the structures and cultural resources within a six acre portion in the middle of the unit. The Open Field Unit has: 1) the public use area (incl. main house, picnic area with mature trees, visitor contact station, observation platform, and restroom, 2) maintenance area (incl. fuel tank, carpentry building, outbuildings and an equipment sheds, and 3) a cemetery (complete with headstones) and a foundation of a historic building located on the river. Fire in these areas could pose a serious threat to natural resources as well as cultural resources. Wetlands and wooded bottomland areas with adjacent upland critical edge and eagle roosting and nesting sites are considered the priority areas requiring protection. These areas should be protected from intense fires that may damage trees if escaped from the open field.

2. Marsh and Swamp Unit – 1011 Acres

Strategic objectives: Protect private property, minimize damage to refuge resources, prevent the fire from burning off of the refuge onto adjacent lands, and provide for firefighter safety.

Relationship to FMP objectives: Protect life, property, and refuge resources from the effects of unwanted fire and prevent adverse impact from fire suppression.

Tactical objectives: Primary suppression tactic within the unit will be aggressive direct attack. Indirect attack may be used to prevent a wildfire from spreading into this unit, or to protect structures, or if equipment can not be used because of wet soils. If values are not at risk, a less aggressive response may be used such as allowing a fire to burn out to a natural barrier such as a water body. Utilize existing roads and trails (located near, but outside the habitat type), bodies of water, areas of sparse or non-continuous fuels as primary control lines, anchor points, escape routes, and safety zones. Protection of life and property will be the overriding priorities.

Management constraints: No constraints other than service policy.

FMU physical description: The Marsh/Swamp unit is 1011 acres and accessed by the open field or water corridors of the James River. The road system is good with gravel or dirt roads accessing the some of the area and cross-country travel is possible in the western areas because of the level to gently rolling terrain. Road access dictates suppression resource response time and existing fuel types dictate fire intensity and spread rate. The unit consists of wetland species, brush, some forested uplands and emergent wetlands and extensive shoreline on the James River. Visitor use is limited.

Values to be protected and special concerns: The primary concern would be escape of fire from this unit onto private property or into the refuge wildland/structural interface. The Marsh/Swamp Unit has wetlands and wooded bottomland areas with adjacent upland critical edge. Eagle roosting and nesting sites are considered the priority areas requiring protection. These areas should be protected from intense fires that may damage trees.

3. Forestland/Brushlands Unit – 51 acres

Strategic objectives: Minimize the damage to refuge resources from suppression efforts. Prevent the fire from burning off of the refuge onto adjacent lands. Provide for firefighter safety.

Relationship to FMP objectives: Protect life, property, and refuge resources from the effects of unwanted fire and prevent adverse impact from fire suppression.

Tactical objectives: Primary suppression tactic within the unit will be aggressive direct attack. Protection of life and property will be the overriding priorities. Utilize existing roads and trails, bodies of water, areas of sparse or non-continuous fuels as primary control lines, anchor points,

escape routes, and safety zones. Indirect attack may be used to prevent a wildfire from spreading into this unit, or onto private land.

Management constraints: No constraints other than service policy.

FMU physical description: The Forestland/Brushlands unit is 51 acres and accessed boat and land. Access is limited to an all terrain vehicle. There are no roads within the unit itself, only an infrequently mowed path. Cross-country travel is possible in most of the open areas because of the level to gently rolling terrain. Access dictates suppression resource response time and existing fuel types dictate fire intensity and spread rate. The unit consists of grassland, brush, some forested uplands and emergent wetlands and river shoreline. Visitor use is limited.

Values to be protected and special concerns: The primary concern would be escape of fire from this unit into the refuge wildland/structural interface (if any exists). Wetlands and wooded bottomland areas with adjacent upland critical edge and eagle roosting and nesting sites are considered the priority areas requiring protection. These areas should be protected from intense fires that may damage trees.

IV. WILDLAND FIRE MANAGEMENT PROGRAM COMPONENTS

The Refuge will make every effort to suppress all wildfires through initial attack actions. All available Refuge and local firefighting resources will be utilized as necessary to limit damage to values at risk, prevent escape of wildfires, and prevent the spread of wildfires across refuge boundaries.

A. WILDLAND FIRE SUPPRESSION

Constraints applicable to all suppression actions include:

- Whenever consistent with safe, effective suppression techniques, the use of natural barriers will be used as extensively as possible. The use of backfire techniques, burnout lines improvement, and wetting agents (ground and airborne) is authorized. Fire retardant agent used must be on the approved list of retardant for utilization by the Forest Service and Bureau of Land Management. Guidance issued in March 2000 by the Assistant Director, Refuges and Wildlife prohibits aerial application of retardant or foam within 300 feet of waterways. Exceptions apply when the chemical is necessary to the protection of life or property, when alternate line construction techniques are not available, or when potential damage to natural resources outweighs possible loss of aquatic life.
- All extended attack and project fire operations will have a refuge employee designated and available to assist suppression forces in the capacity of Resource Advisor.
- Stream crossings will be limited to set locations.
- Except for spot maintenance to remove obstructions, no improvements will be made to ways, trails, water sources, or clearings. All sites where improvements are made or obstructions removed will be rehabilitated to pre-fire conditions, to the extent reasonably possible.
- Earth moving equipment such as tractors, graders, bulldozers or other tracked vehicles can be used for fire suppression upon refuge manager's discretion to ensure protection.

- Fireline location will be outside of highly erosive areas, steep slopes, and other sensitive areas. Following fire suppression activities, firelines will be recontoured and water-barred where needed.
- Riparian areas, which have been completely burned, will be seeded.
- When handline construction is required, construction standards will be issued requiring the handline to be built with minimum impact. Use of power chain saws is authorized although such use should be kept to a minimum. Handlines constructed by exposing mineral soil will be rehabilitated and erosion control methods used on slopes exceeding 10%.
- No wilderness issues at this time.

1. Historical Role of Fire

“It has often been assumed...that the pristine vegetation of the United States first viewed by Euro-Americans was also a ‘climax vegetation’ in which fire played little or no role. On the contrary, fire has always been, and continues to be, a common element in the functioning of many ecosystems. Little vegetation is normally spared from the influence of naturally occurring fire in these ecosystems...” (De Bano et al. (a) 1998).

A combination of fire types, including naturally-occurring (lightning-caused) fires (Kirwan and Shugart 2000), and fires associated with the activities of Native Americans and European colonists (Patterson and Sassman 1988) have historically influenced vegetation in the eastern U.S. Naturally occurring fire is infrequent in the mid-Atlantic, however, human-set fire has historically, dramatically impacted the ecology of the region, including coastal Virginia (Brown 2000).

At the time of European contact, the natural landscape in much of the East supported open stands of trees with some savannahs, shaped by short-interval, low-intensity fires. Grasslands and prairies were common in Ohio, Pennsylvania and Virginia, primarily as a result of introduced or naturally-occurring fire (Brown 2000). Many open areas had been created by slash-and-burn agricultural practices of Native Americans, and as a result of gathering and clearing for firewood.

Fire influenced eastern forests (Day 1953), included pine and oak "barrens" in the northeast (Windsch and Good 1991, Zaremba and Hubbs 1991, Tyndall 1992) and oak-hickory forests throughout the eastern U.S. (Sullivan 1995), including Virginia (Orwig and Abrams 1994, Kirwan and Shugart 2000). Grassland communities are found on the Refuge today. Some of these communities were likely influenced by anthropogenic or natural fire, and may be perpetuated by the reintroduction of fire.

The burning practices of Native Americans ceased as native peoples were decimated and most wildfires were suppressed. Suppression has had profound ecological effects on forests (Abrams 1996) and grasslands (Tyndall 1992, Latham et al. 1996, Askins 1997) in the eastern U.S. In the absence of periodic fire, eastern landscapes changed rapidly from grasslands to shrublands and dense forests (Brown 2000), and fire intolerant species, such as American beech (*Fagus grandifolia*) and red maple (*Acer rubrum*), have increased in distribution and abundance (Brown 2000, Kirwan and Shugart 2000). The absence of fires has allowed dense forest undergrowth.

Fire-tolerant natural communities have undergone major changes in vegetation structure, including loss of biological richness and invasion by non-native plants (Ladd 1997).

Changes in forest ecology and land use practices also changed the nature of the fires that occur. Heavier fuel loadings, as a result of conversion from grasslands to timber, and a lack of periodic burns to reduce fuel build-up, have largely changed the Eastern U.S. fires from frequent, low-intensity fires, to infrequent, high-intensity fires.

a. Refuge Fire History

Fire has occurred infrequently at Presquile NWR. In the early 1970's prescribed burning of the marsh was attempted, but all attempts were unsuccessful because the area lacked suitable, continuous fuel. In the late 1980's, a field fire and a barn fire were ignited on the refuge from lightning strikes. The field fire burned approximately two to three acres (five to seven hectares) before refuge staff could suppress the slow low-burning fire. The fire was contained prior to local fire company's response. On a separate occasion, a refuge barn was struck by lightning and burned to the ground in twenty minutes. The efforts by refuge staff to suppress the fire were futile, largely due from the dry wood construction of the c.1924 barn.

In 1984, the Presquile NWR Fire Management Plan was submitted by refuge management and approved by the FWS regional director. The document outlined plans to burn the two units of marsh (northern section and eastern section). The purpose for the prescribed burn would enhance food availability for waterfowl, retard plant succession, and prevent brushy vegetation from invading the marsh. The plan was attempted, but never reached anticipated success rate (removing 30 percent or more of the marsh vegetation within the treated area).

Spread of fire to the refuge from non-refuge lands is unlikely. Most lands bordering the river across from the refuge are used for agricultural purposes. With the exception of Curles Neck Swamp which remains wet all year, there are no large forested areas nearby. According to local fire officials, occasional grass and brush fires are the only wildfires that take place in the area.

Fire history for the site prior to the 1900s is unknown. However, considering that native Americans once were present on the, then, peninsula fire may have served a role. Fire historically influenced forest habitats in the mid-Atlantic Coastal Plain (Komarek 1968, Orwig and Abrams 1994, Frost 1998, Kirwan and Shugart 2000). Brown (2000) notes that there is considerable historical evidence of Native American pyroculture in Virginia. Frost (1998) estimates that fire frequency in presettlement, coastal Virginia flatlands was every 4-6 years, due to the effects of lightning and anthropogenic burning. It is likely that such fires, especially in coniferous forests, were low intensity ground fires every 1-10 years, and of stand-replacement intensity every 100-1000 years (Bond and van Wilgen 1996).

b. Fire Effects

Grasslands/shrublands - Fire can be used to restore early successional habitats, by increasing grass cover and reducing cover of tall forbs (Herkert, 1994, Jones and Vickery 1997), remineralizing litter (Anderson 1990); increasing grass productivity (Anderson 1990, Knapp et al. 1998), retarding woody plant invasion (Anderson 1997), and increasing community diversity

(Howe 1995). Prescribed fire also may be used to maintain an interspersed of shrub- and grass-dominated communities attractive to mid-successional, shrubland passerines.

Wetlands - Fire is a natural, cyclic process in many wetland systems, and may be used, on a rotational basis, to enhance productivity of some marsh plants; increase waterfowl foods such as certain invertebrates and seeds; and remineralize accumulated litter. In addition, fire may be used to open dense stands of vegetation, such as cattails, or as a component in a *Phragmites* control program. The refuge should consider historic marsh fire regimes, the phenological cycle of native marsh plants, the life cycle needs of marsh wildlife, and the potential presence of threatened or endangered wetland species such as Sensitive Joint Vetch, when developing burn prescriptions for wetlands habitats.

Wildlife - Most Eastern U.S. ecosystems that have developed since the last ice age evolved with fire as a natural disturbance, with various return frequencies according to site. Fire is therefore a natural, important ecological force in the development of most natural communities (Barbour et al. 1999). Most species have evolved responses and adaptations to fire; some cannot be maintained in a region without fire's periodic influence (DeBano et al. 1998a).

One of the primary objectives of the Refuge System is to contribute to wildlife habitat diversity. A variety of successional stages may be maintained with prescribed fires, contributing to overall habitat diversity across the landscape. In general, catastrophic, stand-replacing fires cause significant, but often short-term adverse impacts on large areas of wildlife habitat. Such sites eventually revegetate and repopulate through secondary successional processes. Fire may also be used to ensure that particular fire-tolerant or fire-adapted species and communities are maintained, further contributing to species diversity.

It is important to consider the life cycles of plants and other species, and the fire regimes to which they are adapted, when assessing the effectiveness of fire in wildlife management. Prescriptions for prescribed fire take into account the following factors: 1) fire frequency, 2) season of fire, and 3) severity, duration, and extent of burning (DeBano et al. 1998a). Each of these aspects of fire behavior can have specific consequences for a plant or animal species. For example, a plant or insect species may be eliminated from a site if fire occurs too often, or during the wrong part of the organism's life cycle.

2. Preparedness

Preparedness is the work accomplished prior to fire occurrence to ensure that the appropriate response, as directed by the Fire Management Plan, can be carried out. Preparedness efforts are usually accomplished outside the normal fire season dates, and then adjusted as necessary.

Prior to and during the fire season, the Refuge Manager, or designee, and South Zone FMO will take the following measures to ensure adequate fire preparedness:

- Update and maintain accurate employee training and qualification records. Review Cooperative Agreements with surrounding fire management agencies. Prepare plans for any prescribed burn projects for hazard fuel reduction and resource management projects.
- Order fire supplies and replacement equipment as needed. Obtain necessary physical

fitness evaluations. Provide updates or changes to cooperators for local and regional mobilization plans. Evaluate the need for basic firefighter training and conduct if necessary. Review and revise Fire Management Plan as needed.

Fire Season

Given the historically low occurrence of fires on the Refuge, and limited data for analysis, the fire season for the Refuge will be considered what is typical for the State of Virginia. Historic records show the fire seasons to be early spring (mid Feb–April) and late fall (Oct–Nov), although fires can occur during any season, if conditions such as prolonged drought exist. Most fires in the State of Virginia are caused by human actions. Statistically there are very few lightning caused fires, therefore wildland fires are more likely to start where public access is permitted.

Precipitation is fairly uniform throughout the year (Table 1). During early spring, snow cover is uncommon, fine fuels are cured, and windy conditions are frequent; during this time period fires can be fast spreading, short-lived, and mainly confined to surface fuels. Relatively low fire hazards exist between May and September due to the abundance of green vegetation. Fall fires are possible once deciduous vegetation has cured and leaves are on the ground, especially if precipitation is below normal.

Thunderstorms can occur most months of the year, but are most common in the deep, moist, warm air of tropical origin that is typical of summer. Over the past two decades, the state has averaged one thunderstorm day per decade in January, compared with nine thunderstorm days per month in July. Lightning is associated with many of the thunderstorms of the region, lightning-caused fires late in the summer and early fall can become severe when prolonged drought conditions deplete fuel and soil moisture.

Potential Fire Behavior

Fire Behavior Fuel Model 1 is the most probable starting fuel model. Cured grasses are typically the source of the high rate of spread associated with grasslands. Fire intensities however, remain low and of short duration, with flame lengths approaching 1.2m (4.0 ft). Keeping fire out of more flammable fuel models, such as coarse marsh-grasses, reduces the wildland fire threat.

A wildland fire exhibiting extreme fire behavior should be a rare event at the Refuge. However, this does not remove the threat to human health and welfare. Wildland fire and prescribed fire remain a hazard and prescribed safety measures are to be followed. Control problems can be expected on fires burning in the peak fire season (Spring and Fall). When continuous fuels and warm, dry, windy environmental conditions are encountered, high fire intensities and rapid spread rates can be achieved within a short time. In these situations, firefighter safety may dictate use of indirect attack suppression methods. (USFWS, 2002)

Most of the areas within the Refuge are level fields or wet marsh and swamp. Hazardous conditions, such as unstable footing in dense wet areas may result in fire control problems. Suppression activities in such areas must be carefully planned and executed.

a. Fire Prevention

An active fire prevention program will be conducted in conjunction with other agencies to protect human life and property, and prevent damage to cultural resources or physical facilities. The Virginia DOF has an active public awareness program, targeting human-caused ignitions, and along with the Firewise program, are the two best sources for prevention and education materials.

During periods of extreme or prolonged fire danger emergency restrictions regarding refuge operations or area closures may become necessary. Such restrictions, when imposed, will usually be consistent with those implemented by cooperators. Closures will be authorized by the Refuge Manager.

b. Education

A program of internal and external education regarding potential fire danger will be implemented. Visitor contacts, bulletin board materials, handouts and interpretive programs may be utilized to increase visitor and neighbor awareness of fire hazards. It is essential that Refuge employees be well informed about fire prevention, as well as the objectives of the refuge's fire management program. Employees need to relate to the public the beneficial effects of prescribed fires as opposed to unwanted human-caused fires, with emphasis on information essential to understanding the potential severity of human-caused wildland fires and how to prevent them. Further, employees must be kept informed about changes in existing conditions throughout the fire season.

c. Training and Qualifications

Departmental policy requires that all personnel engaged in suppression and prescribed fire duties meet the standards set by the National Wildfire Coordinating Group (NWCG). Presquile NWR will conform strictly to the requirements of the wildland fire management qualification and certification system and USFWS guidelines.

Annual wildland fire training refreshers are required for participation in wildfire or prescribed activities. Additional fire training is available through various sources throughout the year. The Zone FMO will coordinate fire training needs with the Refuge.

Fire suppression is considered arduous duty, and requires successful completion of a fitness pack test. Personnel must complete a three mile hike with a 45 pound pack in less than 45 minutes. Personnel participating in prescribed fire activities are required to successfully complete a moderate duty pack test, consisting of a two-mile hike with a 25 pound pack, in under 30 minutes. On prescribed fires, personnel may be required to shift from implementation/monitoring activities to suppression. Only those personnel certified at the arduous duty level may transition to suppression operations.

d. Detection

Presquile NWR will rely on ground based fire detection and location determination systems. Visitors, Refuge employees, boaters on the James River, and cooperators will report most fires. The Refuge headquarters will be notified of any smoke and fire reports, and the Refuge Manager will be notified of all fire or smoke reports as soon as possible. To enhance communication with cooperators and the public, notification of cooperator's fire management offices can also be made.

Any refuge employee who receives a fire report shall obtain complete information regarding the following: location; fire behavior and smoke dispersal; approximate size; and name, address, and phone number of reporting party. These personnel are instructed to take fire reports from visitors and relay the pertinent information to the refuge office. If possible, have them remain in contact until the fire is confirmed and located. Further investigation may be necessary if refuge staff in the field cannot verify a reported fire. During field operations Refuge staff will look for new fire starts as part of their normal routine.

e. Communication

The Refuge currently has no radio system. The Refuge will rely on land line telephone and cellular phone communication to receive and report any fire activities.

f. Aviation Operations

Aircraft may be used in all phases of fire management operations, however because of the Refuge's small size, and infrequent fire occurrence, use of aircraft will be rare. All aircraft must be Office of Aircraft Services (OAS) approved. Currently, two OAS-carded helicopter vendors are based out of Richmond International Airport. If air resources were needed, these would be the mostly likely to be used. Helicopters may be used for reconnaissance, bucket drops and transportation of personnel and equipment. Parking areas and fields would be the most readily available helispots. Only qualified aviation personnel will be assigned to flight operations.

3. Initial Attack

All wildland fires will be suppressed with fire fighter and public safety as the highest priority. Fires will be suppressed in a prompt, safe, aggressive, and cost-effective manner to produce smallest resource/acreage adverse impacts. Generally direct attack is the most cost effective tactic, provided it can be done safely. Otherwise indirect tactics are necessary, as determined by the Incident Commander.

The Refuge currently has one fire qualified individual and a minimum base of equipment for suppression activities. Therefore the Refuge depends heavily on cooperators for suppression resources. Local fire departments are the most likely to receive and respond to fire reports. Not all department members may meet NWCG standards for wildland fire suppression. Though not ideal, this will not be a limiting factor for the first burning period during initial attack. Should the fire

extend into additional burning periods, then by policy, all suppression personnel will need to meet NWCG standards.

The closest forces to respond are fire department members from Enon Fire Department and Chesterfield County (see Appendix C). Additional resources can come from the Virginia DOF, and Service fire fighters stationed at Great Dismal Swamp NWR. Response time from Great Dismal Swamp is approximately 1 hour, depending on traffic and time of day.

a. Refuge Response

If notified of a fire, the Refuge Manager or designee will contact one of the two above-mentioned fire departments. The Refuge Manager will also inform the Zone FMO. Qualified, and available refuge staff should respond as well, and/or gather more information as to best way to arrive at the fire, securing the fire origin, checking for refuge visitors at risk, and implementing public closure to the scene. If fire threatens to burn outside refuge boundary, the manager will notify adjacent landowners.

b. Incident Commander

Presquile NWR will use the Incident Command System (ICS) as a guide for fireline organization. When the volunteer fire department arrives, the senior officer of that department will serve as the Incident Commander responsible for the incident. The Refuge Manager or representative will brief the Incident Commander on the location and status of the fire, as well as on pertinent details of this Fire Management Plan (e.g., protection of special natural or cultural resources.) If initial attack is not successful, the Manager will notify the Zone FMO to prepare extended attack actions.

The Incident Commander will:

1. Locate, size-up, and coordinate suppression actions, including briefing subordinates, directing their actions and providing work tools. Depending on fire complexity, some positions may be filled by the same person. The Incident Commander will complete a pre-attack planning checklist.
2. Provide for public and firefighter safety.
3. Assess need for additional suppression resources, based on current and predicted fire conditions, and estimate the final size of the fire. The potential for spread outside of the refuge should be predicted, as well as the total suppression force required to initiate effective containment action at the beginning of each burning period.
4. Assess the need for law enforcement personnel for traffic control, investigations, evacuations, etc., and make requests to the Refuge Manager.
5. Document decisions and complete a fire report (Agency Wildland Fire Report).
6. Keep Refuge Manager informed.

7. Notify Refuge Manager when initial attack is not successful, so that a Wildland Fire Situation Analysis (WFSA) can be developed for next operational period.

Other duties of the Incident Commander are described in the National Wildfire Coordinating Group Fireline Handbook.

c. Public Safety

Public safety will require coordination between all refuge staff and the Incident Commander. Notices should be posted to warn visitors, areas may be closed, and traffic control will be necessary if smoke crosses roads. If needed, individuals not involved in suppression efforts may be evacuated. Virginia DOT and local law enforcement officials will also be contacted, if closures become necessary.

Personnel and equipment must be efficiently organized to suppress fire effectively and safely. To this end, the South Zone FMO will assume the command function on major or multiple fire situations, setting priorities for the use of available resources and establishing a suppression organization.

4. Extended Attack

For fires that cannot be contained in one burning period, a Delegation of Authority to a new Incident Commander may occur and a WFSA must be prepared. The purpose of the WFSA is to consider alternatives by which a fire may be controlled. Damages from fire, suppression costs, safety, and probable character of suppression actions are all important considerations. The Incident Commander, in conjunction with the South Zone FMO, will prepare the WFSA. Approval of the WFSA resides with the Refuge Manager.

5. Air Quality

The Refuge has not been designated as a Federal area where visibility is an important issue (Federal Class I Area) under the Clean Air Act Amendments of 1977. The areas in the vicinity of the Refuge are classified as a non-attainment area for the pollutant ozone. This is largely due to the heavy industry and urbanization in and around the Richmond-Petersburg area, with pollutant levels exceeding standards in the summer months.

Visibility and clean air are valued natural resources for the Refuge and the protection of them will be given full consideration in fire management planning and operations. The station will comply with all applicable federal, state, and local air pollution control requirements, as specified within Section 118 of the Clean Air Act, as amended (42 USC 7418). Further guidance is in the Service's Fire Management Handbook.

An issue with wildland fire is public and fire fighter safety and health. The Refuge is to take aggressive action to manage smoke so as to minimize negative impacts to visibility, public safety, fire fighter exposure, and overall air quality (reduce particulate emissions). By

minimizing the acreage burned, notifying the public, and restricting access this issue can be mitigated.

6. Other Management Considerations

a. Step-Up Actions

A “step-up” plan is commonly used at larger stations to determine the appropriate level of readiness, based on National Fire Danger Rating System (NFDRS) fire danger indices, such as burn index, energy release component, or Keetch-Byrum Drought Index. Due to the low fire occurrence on the Refuge, and the fact that Refuge staff are unlikely to be directly involved with initial attack actions, a step-up plan is not considered essential at this time. Under rare event, or drought conditions, the South Zone FMO will make a determination as to the need and possible pre-positioning of resources.

b. Regional and National Concerns

The regional preparedness level tends to follow the national preparedness level unless the eastern seaboard is experiencing very dry conditions and a high potential for wildfire. Expect normal refuge operations to occur through National Preparedness Level IV.

At National Preparedness Level V, when local fire conditions permit, and subject to supervisory approval, all individuals with fire training should be made available to meet regional and national needs. It is expected that all fire funded individuals are available at all times for national and regional resource needs.

c. Protection of Resources

Natural and cultural resources will be protected to the maximum extent feasible, but their protection will not be the highest priority. Appropriate suppression action will first and foremost ensure firefighter and public safety. Critical protection areas, such as the Refuge buildings and facilities, will receive priority consideration in fire control efforts. When no threat to human life exists, protection of natural and cultural resources from fire or suppression damage will be the next highest priority.

It is the responsibility of the Incident Commander to establish the minimum impact suppression tactics (MIST) to protect natural and cultural resources. All personnel involved with Fire Management are expected to have an understanding of minimum impact suppression tactics such as indirect or parallel attack (instead of direct attack), utilization of existing barriers for control lines, and cold trailing. Further guidelines can be found in the Fire Management Handbook, FM 3.2.6.

Heavy equipment such as crawlers, tractors, bulldozers, or graders will not be used within the refuge boundaries to suppress fire unless their use is necessary to prevent a fire from destroying privately-owned and/or government buildings and cultural resources. The use of heavy equipment requires approval from the Refuge Manager. If new natural or cultural resources of concern are discovered during fire suppression activities, the Refuge Manager

will ensure their protection from damage related to fire activities to the extent appropriate and possible. The manager will consult with the regional historic preservation officer to avoid, minimize, or mitigate potential or actual damage to cultural resources. A Resource Advisor will be used on any fire that has the potential for significant resource damage caused by suppression operations or whenever the Incident Commander requests the position. The Resource Advisor should be an employee with resource management knowledge to advise the Incident Management Team on issues related to mitigating the affects of suppression operations on cultural and natural resources.

d. Community Grant Assistance

The Department's Rural Fire Protection Program (RFA) has been established as a means to properly train and equip local fire departments eligible for the program. To date, numerous Fire Departments have received grant money for suppression equipment, and is the best alternative to supply suppression forces which the Refuge depends on. Providing the RFA program remains in effect, additional grant requests should consider fire training, and prevention awareness to further assist the Refuge fire program.

e. Refuge Response

All suppression actions will be governed by consideration of human safety; availability of effective, appropriate equipment; and management objectives and constraints. Current Refuge goals include aggressive initial attack and/or appropriate management response by FWS personnel of all fires occurring within the Refuge. In general, the goals can be met most effectively and cost-efficiently by:

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

All wildfires will receive an immediate initial attack response. Degree of response will depend on human safety factors and values at risk. Given the precarious location and access limitations of the island refuge, additional time for response and action will have to be considered. The Refuge Manager will assign an Incident Commander who will determine the appropriate suppression strategy to be utilized. The Incident Commander will keep the Refuge Manager updated of the fire situation. The goal in initial attack actions is to limit damage to threatened values, while minimizing the area burned and preventing escape of the fire. Whenever fire is reported within Refuge boundaries, the following steps will be taken:

1. Report of the fire to the Eastern Virginia Rivers NWR Complex Headquarters, and subsequently to District FMO or RFMC.
2. Dispatcher determination of location, legal description, and land ownership at the occurrence site.
3. Cooperative partners (i.e. Local fire department and/or Virginia Department of Forestry) will possibly be the first on the scene, followed by Refuge manager or whoever is in charge at the time. The FWS fire team from Great Dismal Swamp NWR will respond, as needed.
4. Immediately upon arrival at the fire location, an initial fire size-up (report of the fire size, behavior, environmental conditions, fuels, terrain features, existence of special hazards or threats to persons or improvements, and any other factors observed which could affect fire behavior and suppression efforts etc.) will be completed. For purposes of fire investigation, any people or boats observed in the area will be noted and the fire origin will be protected. This information will be reported to Refuge dispatch. These fire size-up observations will be immediately forwarded to the Refuge Manager.
5. Upon determination of actual fire location and based on the information reported following the initial fire size-up, the Refuge Manager or Incident Commander will develop the appropriate suppression response, giving consideration to applicable resource management objectives and constraints, together with considerations of personnel safety and economics. Data gathered in the size-up will be utilized by the Incident Commander to determine an appropriate strategy for managing the fire.

B. WILDLAND FIRE USE

Wildland Fire Use fires are not authorized on the refuge at this time.

C. PRESCRIBED FIRE

The Refuge will add prescribed fire to its program to meet its resource management objectives. Prescribed fire at the Refuge will be carefully guided to meet the overall Refuge Management objective to ensure biological diversity. The Prescribed Fire Plan will support interim resource management objectives, described previously. Prescribed fire may be used to reduce hazard fuel concentrations. (See Appendix A – Prescribed Burn Unit Map)

There is ample information in the literature to assist Refuge staff in developing fire prescriptions for grasslands. As the fire program develops, burn prescriptions may be developed for other habitats. A thorough literature search, an inventory of evidence such as fire scars, an inventory of soils distributions, and consultation with regional forest ecologists, is needed to develop ecological “targets” for forest restoration and management with prescribed fire for the Refuge.

Annual Activities for Prescribed Burn Program

Planning will start several months to one year in advance of implementing the burn program. In the case of some fields densely populated with non-native, invasive plants, fields may be pre-

treated with herbicide, such as Roundup© or Plateau©, before burns. These herbicides will kill non-natives, and leave dead above-ground fuels. Prescribed fire may then be used to remove litter and prepare seed beds for native plantings.

All potential burn areas will be identified and ranked, and time of year for burns will be scheduled. In general, grassland units will be burned during the early spring (March – April), prior to emergence of native, warm season grasses, or late fall (Oct-Nov). Debris and hazard fuel can be burned during any season when adequate fuel moisture is present to minimize the rate of fire spread.

Fields will be burned on a rotational basis, approximately every 3-5 years, to ensure a variety of successional habitats for grassland birds, and other wildlife. For species such as Henslow's Sparrow, or sedge wren that require accumulated vegetation and deep litter layers, a less frequent fire frequency may be appropriate. This information will be included in the Refuge's future Habitat Management Plan. Mowing and other site prep will be accomplished for necessary firebreaks. Baseline vegetation and fuel information will be collected and compiled.

An Annual Prescribed Burn Plan will be prepared and submitted for necessary approvals.

The prescribed fire burn plan is a site specific action plan which describes the purpose, objectives, prescription, operational procedures, go/no go check list, organization chart, weather forecasts, contingency actions, monitoring actions, and safety concerns involved in burn preparation and implementation. The treatment area, objectives, constraints, and alternatives will be clearly outlined, and no burn will be ignited unless all prescriptions of the plan are met. The factors considered in all burn plans are described in the FWS Fire Management Handbook.

Follow-up vegetation and wildlife monitoring, evaluation, and reporting requirements will be accomplished following completion of all prescribed burning activities.

Prescribed burning qualifications will be reviewed in the fall, matching available training courses to agency and personnel needs. Training requests are submitted to the RFMC for further consideration and scheduling. At the Refuge level, most of the burning is of low complexity, requiring at a minimum qualifications of Firefighter 2 rating. At least one individual, who meets the qualifications for Prescribed Fire Burn Boss (RXB3), is required as the Burn Boss.

Correlation with Strategy and Objectives/Burn Season

The prescribed fire program described in this Plan is consistent with the resource management and wildlife research objectives enumerated above. In addition, the Refuge wildfire strategy is enhanced through the treatment of natural and management generated fuel loads, which might pose a threat to resource values.

A normal fire season at the Refuge offers sufficient burning conditions for implementing a prescribed burn program. Most burning will be conducted in spring. Debris burning could carry into the summer months, as conditions permit. Opportunities for fall burning are possible, although drought conditions are common. The Refuge may develop spring, summer, and fall prescriptions for certain units, if these treatments coincide with appropriate plant community and wildlife cycles.

Fire Effects/Fire Behavior Monitoring

All of the burning done at the Refuge will be well documented. Basic site conditions will be recorded during prescribed burns, to ensure that prescribed burning activity is within prescription, as required by Refuge Annual Prescribed Burn Plans. Site conditions monitored generally include temperature, relative humidity, mid-flame wind speed, cloud cover, 1 hr. fuel moisture, and 10 hr. fuel moisture. Additional, optional site conditions measurements include fuel loading, soil moisture, and soil temperature. Measuring these additional parameters may yield important information for research-related prescribed fire.

In addition, basic fire behavior will be recorded. This will aid in post-burn evaluation, to determine if 1) the fire behaved as predicted; and 2) specific fire behavior can be linked to specific vegetation/habitat effects. Fire behavior to be monitored includes type of fire (backing, heading, flanking), rate of spread, and intensity (inferred from flame length). Other possible parameters include percent surface fuels burned, fuel consumption, burning duration, maximum temperatures, and soil heating. Measuring these additional parameters may yield important information for research-related prescribed fire.

Basic monitoring to determine habitat response will use photo-points, which will be re-visited and photographed during subsequent seasons. *It is vital that the Refuge devote time to post-burn monitoring of burn plots. Comparisons over time will aid in determining if burn objectives and resource objectives are being met.* More complex monitoring efforts may be undertaken for research-related prescribed burns, or to answer question about the effects of prescribed fire on specific wildlife parameters. Such monitoring can require vegetation transects, breeding bird point counts, presence/absence of target species, etc.

Recent vegetation sampling, as defined by US Fish and Wildlife Service Region 5 Grassland Bird Study, Protocols-2002, (see Appendix D) provided information on the presence and dominance of species, and the percentage of frequency, litter cover, and litter depth. The purpose of the study was to determine the presence or absence of native and non-native plant material (and the dominance of each) prior to the proposed prescribed burn. Results of the study will provide a benchmark to which a post-burning vegetation sample can be compared. This data will help determine if the objectives of the burn were realized.

No special equipment is necessary for monitoring fire behavior. Most burns will be low to moderate in intensity and easily measured through rate of spread and flame length observations. Should more comprehensive fire behavior and effects information be necessary, it will be outlined in the Annual Prescribed Burn Plan.

Prescribed Fire Complexity

A Project complexity determination of low, moderate or high is required as an input to the FIREBASE workload analysis and budget allocation system to determine funding and staffing needs for an individual project. This analysis will be done by the Zone FMO in conjunction with the Refuge. A second, more detailed, complexity analysis is also required for individual burn

plans. The development of this analysis is accomplished using the NWCG Fire Complexity Rating System Guide, and is intended to identify risks, potential consequences, and technical difficulty associated with implementing the plan. Results of the complexity analysis will determine overall complexity of a project (1, 2 or 3) and will dictate the qualifications required to execute the project.

Potential Impacts

The Refuge's Prescribed Fire Program is sensitive to potential adverse impacts. Visitors and neighbors will be notified prior to a planned burn. All of the planned grassland burn blocks are well within the Refuge boundary; easily accessible, away from public roads, and present few control problems. Threats to human life and property are minimal. The Refuge is bounded by a rural landscape; fire is sometimes used in such a setting – to reduce slash in timber operations, to prepare agricultural fields, to get rid of debris. Significant public opposition to prescribed fire for fuels reduction and wildlife habitat enhancement is not likely.

Smoke management is a critical element of prescribed fire planning at the Refuge. Wind direction and ignition patterns will be carefully prescribed to carry smoke away from all potentially impacted roadways and populated areas. As a further precaution, warning signs or guards will be used on public roads to advise motorists of a burn in progress, if smoke could reduce visibility. Refuge access will be closed to the public during prescribed burn activities. A similar approach will be taken to protect the nearby industrial plants and Shirley Plantation, both of which are less than one mile across the river from the Refuge.

Additional information regarding smoke management can be found in the following publications:

Southern Forestry Smoke Management Guidebook. Mobley et al., USDA Forest Service. GTR SE-10, December 1976.

Prescribed Fire Smoke Management. National Wildfire Coordinating Group. Publication No. 420-1, February, 1985.

With the exception of smoke, there are no other known negative environmental impacts associated with prescribed fire implementation at the Refuge. Much of the burning at the Refuge will be conducted on fine fuels, which burn out quickly and normally do not produce lingering smoke problems. Fires in other fuel types will be carefully prescribed and implemented to avoid smoke problems.

Documentation Requirements

To implement prescribed fire on the Refuge, an Annual Prescribed Burn Plan will be prepared, which addresses the required elements as outlined by Service guidelines. Policy requires that the plan be prepared or co-prepared by a qualified burn boss of the appropriate level of the project, and submitted by the Refuge Manager. The Plan is then reviewed by the RFMC and Burn Boss and given approval by the Refuge Supervisor. Final approval and execution of the project remains with the Refuge Manager.

Prior to burn implementation, a Go-No Go checklist of burn-day actions, as specified within the burn plan is completed and becomes part of the final burn report. Additional documentation includes burn day notifications and contacts, and documentation of current, expected, and extended forecasted weather conditions for a 3 to 5 day period beyond the day of the burn. The Burn Boss is responsible for gathering and documenting the above information prior to burn implementation.

Normally the position of a Prescribed Fire Behavior Analyst is not activated. The Burn Boss assumes this role, predicting and documenting all fire behavior and weather readings specified within the burn plan. A critique is made for each burn; the Burn Boss documents burn plan implementation. The Burn Boss also will evaluate burn objective accomplishment in consultation with the Refuge Biologist.

Post-burn monitoring and follow-up evaluation will be the responsibility of the Refuge Biologist. It is important that this documentation be completed, attached to the burn report, and sent to the Regional Fire Ecologist and RFMC as feedback to wildlife objective accomplishment.

Each individual burn will be entered into the Fire Management Information System (FMIS). The Refuge Biologist is responsible for gathering information and submitting it to the Zone FMO for input into FMIS. A hard copy report, along with the documentation listed above, will be kept on file at the Refuge office.

Critiques will follow the format specified by Service guidelines. This will be the minimum standard. Additional critique documentation, such as prescribed burn summaries and cost documentation, will be prepared as necessary based on Refuge or Regional needs.

Debris Burning

The incidental burning of debris will follow approved Region 5 policy. While debris burning is permitted, within policy guidelines, hauling the debris to a landfill should be considered a preferred alternative.

D. NON-FIRE FUEL APPLICATIONS

Non-fire fuel applications, such as mechanical and manual cutting of vegetation is permitted within this Plan, providing the need has been identified as an approved prevention treatment. This activity also is permitted when considering adjacent communities at risk for hazard fuel abatement.

E. EMERGENCY REHABILITATION AND RESTORATION

Post-fire repairs will fall into one of three categories: fire suppression activity damage, emergency stabilization, and rehabilitation (620 DM 3). Fire suppression activity damage is damage to resources, lands, and facilities resulting from wildland fire suppression actions, in contrast to damages resulting from the fire itself. Repair actions are planned and performed primarily by the suppression incident organization as soon as possible prior to demobilization. The incident management team, during transition back to the local unit, must document the fire

suppression activity damage repair actions accomplished and those which are still needed. Fire suppression activity damage is paid by the same Wildland Fire Suppression Operations subactivity (9141) and project code as the fire suppression effort.

Emergency stabilization may be defined as planned actions to stabilize and prevent unacceptable degradation to natural and cultural resources, to minimize threats to life or property resulting from the effects of a fire, or to repair/replace/construct physical improvements necessary to prevent degradation of land or resources. Emergency stabilization actions must be taken within one year following containment of a wildland fire. Stabilization actions must be documented in an approved plan which will described in detail the actions proposed and costs, provision for monitoring of results, delineation of funding, and responsibilities for implementation. Funding is provided under the Wildland Fire Suppression Operations account but using a different subactivity (9142, Emergency Stabilization) than suppression only. Funding up to \$500,000 may be approved at the Regional Director level, and larger requests must be approved by the Director. Examples of emergency stabilization actions that may be permitted include replacing or repairing minor facilities essential to public health and safety when no other options are available; placing structures to slow soil and water movement; stabilizing soils; increasing road drainage frequency and/or capacity to handle additional post-fire runoff; installing protective fences or barriers to protect treated or recovering areas; seeding to prevent establishment of invasive plants, and direct treatment of invasive plants; using integrated pest management techniques to minimize the establishment of non-native species within the burned area; and monitoring of treatments and activities for up to three years.

Rehabilitation efforts are undertaken within three years of containment of a wildland fire to repair or improve fire-damaged lands unlikely to recover naturally to management approved conditions, or to repair or replace minor facilities damaged by the fire. These are long-term actions that have been already identified in approved land management plans. A rehabilitation plan will be written as a separate plan, independent of an emergency stabilization plan. Funding must be approved on a priority basis by the National Burned Area Emergency Rehab (BAER) Coordinators in consultation with the Office of Wildland Fire Coordination. Funds will fall under a burned area rehabilitation subactivity, not the Wildland Fire Operations account. Allowable actions may include chemical, manual, and mechanical removal of invasive species, and planting of native species to restore or establish a healthy, stable ecosystem; tree planting to reestablish burned habitat, reestablish native tree species lost in fire, and prevent establishment of invasive plants; and repair or replace fire damage to minor operating facilities such as campgrounds, interpretive signs and exhibits, and fences

V. ORGANIZATION AND BUDGET

Presquile NWR is managed as part of the EVRNWRC. To meet most fire needs within this Plan, fire funded staff and resources at EVRNWRC can be assigned.

A. FIRE MANAGEMENT TEAM RESPONSIBILITIES

Wildland fires on the Refuge, or on lands threatening the Refuge, constitute an emergency situation, and activities associated with suppressing or managing these fires will take priority over all other activities, except the activities involved with safeguarding human life. Refuge

employees will be available to assist with emergency suppression needs on the Refuge. Actual fire duty assignments will include only those duties for which each employee is personally qualified under the National Interagency Fire Qualification System. Individuals must meet training, experience and physical fitness requirements to serve in fire line positions. Support duties will be filled as needed. Qualified individuals will be made available for off-Refuge assignments if the national fire situation warrants, or to further career development, subject to staffing needs. Members of the Refuge Fire Management Team are listed in the Dispatch Plan, in Appendix C, which shall be updated as needed.

The Refuge has insufficient number of qualified firefighters and equipment for normal prescribed fire and suppression activities (fields, forests ranging in size from 10-100+ acres). Additional assistance from nearby NWRs (e.g., Great Dismal Swamp; Rappahannock River Valley) is needed for prescribed fire and suppression activities. The Refuge falls within the protection of the Chesterfield County Fire Department. The county agency regards the Refuge as under county protection, and will respond with initial attack forces when notified or requested. The Refuge also has a cooperative agreement with the Commonwealth of Virginia, Department of Forestry. The Refuge will rely on them for suppression support, if fires escape initial attack, or are beyond the capability of the Refuge or the respective county Fire Departments. Prior to prescribed burns, the Refuge Manager, or designee, will notify the local fire departments and police departments (Appendix C, Refuge Fire Dispatch Plan). Additional fire suppression resources include Great Dismal Swamp NWR. Requests for additional support will be made through the Regional Fire Management Coordinator (RFMC). A blanket agreement with The Nature Conservancy (TNC) allows for the use of FWS and TNC resources for meeting shared prescribed fire needs.

B. REFUGE FIRE MANAGEMENT TEAM

Refuge Manager (RM): The Refuge Manager will have final responsibility for the development and implementation of the fire management plan, and will annually review the fire management plan. The Refuge Manager will also be responsible for oversight and coordination of the Refuge fire management program. The Refuge Manager will have final approval of cooperative and interagency agreements, and of all prescribed fire plans. This position may be delegated to another staff member. If delegated to a position already listed, those duties will be in addition to those listed for that position.

Deputy Refuge Manager (DRM): The Deputy Refuge Manager is responsible for management of the fire program in the absence of the Refuge Manager.

Refuge Biologist (RB): The Refuge Biologist will be responsible for the overall management of the fire program, and will assure that all fire management activities are consistent with and meet resource objectives. The Refuge Biologist will assist in developing cooperative agreements with adjacent agencies and landowners, developing all management-ignited fire plans to insure that they meet resource objectives, serve as resource advisor on wildfires, and oversee fire behavior, effects, monitoring, and ecological studies.

Public Information Officer: The Deputy Refuge Manager will serve as the Public Information Officer for the Refuge, addressing public and media inquiries regarding the fire program, and coordinating outreach and educational activities related to fire program.

Fire Management Officer (FMO), Southern District: The FMO advises the Refuge Manager and staff on matters relative to fire preparedness, suppression and prescribed burning; assists in intra-agency and interagency fire management needs; and serves as Incident Commander on wildfires and Burn Boss on prescribed fire operations. The FMO supplies technical assistance relative to fire management activities and also advises the Project Leader on priorities, strategies and tactics to reduce adverse fire impacts. The FMO is responsible for oversight and coordination of the Refuge's fire management program, including wildfires, prescribed burning, and fire related dispatch and mobilization; has primary responsibility for matters pertaining to preparation and implementation of the FMP; represents the Refuge and coordinates fire related activities with other refuges, Regional Fire Management Coordinator, and local, state and other federal fire organizations; maintains training and qualification records for Refuge personnel; coordinates Refuge fire training; maintains fire records and systems; coordinates fuel management and prescribed fire projects; oversees equipment readiness; and coordinates mobilization of Refuge resources for off-Refuge assignments.

Regional Fire Management Coordinator (RFMC): The Regional Fire Management Coordinator provides policy, coordination, training, planning, evaluation and technical guidance, as requested, to the Refuge; and reviews the Refuge annual prescribed burn plan and approves budget requests. The Regional Fire Management Coordinator will be informed of all wildfire suppression activity occurring on the Refuge. As conditions warrant, the RFMC approves the Refuge step-up plan implementation and may request fire personnel from the Refuge to meet suppression needs elsewhere. He/she similarly may be called upon to gather additional resources to implement the fire management program.

Office Assistant (OA): The Office Assistant serves as the communications link for on-going wildfires and prescribed fires. He/she maintains a unit log during a wildfire. He/she is responsible for posting of firefighter time and meeting procurement needs at the local level during an on-going incident.

C. BUDGET

No fire funds are allocated for Presquile NWR. Fire funds can be requested to conduct fire management activities, such as hazard fuel treatment needs, other prevention needs, NUS (see Appendix B), and PPE through the Zone FMO on an annual basis. Other funds from regional fire program sources are available to cover training for the staff within EVRNWRC.

VI. MONITORING AND EVALUATION

A. FIRE INVESTIGATION

After a wildland fire has been detected, refuge personnel should be wary of suspicious individuals or vehicles. Refuge personnel should not disturb a fire location in case an investigation is needed. Fire management personnel from the responding fire department will

attempt to locate and protect the probable point of fire origin and record pertinent information required to determine fire cause. They will be alert for possible evidence, protect the scene, and report findings to the fire line supervisor. All suspicious fires will be promptly and efficiently investigated. Fire management personnel other refuge staff should not question suspects or pursue the fire investigation unless they are currently law enforcement commission qualified. Personnel from other agencies may investigate wildland fire arson or fire incidents involving structures.

B. REQUIRED REPORTING

The refuge manager must report all wildland fires to the Zone FMO. The incident commander will be responsible for documenting decisions and completing a fire report. Fire reviews will be documented and filed with the final fire report. This report will document fires by type, acres burned by fuel type, cost summary, personnel utilized, and fire effects.

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

The Refuge Manager is responsible for coordination and consultation with cooperators regarding fire management activities. This includes involvement with the Region 5 FMC; Region 5 Fire Ecologist; Region 5 South Zone FMO; Southern Area Coordination Center; Virginia Interagency Coordination Center; Virginia Multi-Agency Coordination Group; U.S. Forest Service, National Park Service; Virginia State Department of Forestry; and local cooperators (fire departments).

C. ANNUAL FIRE MANAGEMENT PLAN REVIEW

This Fire Management Plan will be reviewed and evaluated annually to determine if the objectives have been met and to make necessary revisions. The Refuge staff will conduct this evaluation. Any problems associated with the guidelines or standards set for fire management, cost effectiveness and suppression will be addressed through revision or addendum and made a part of this plan. The Refuge Manager and Regional Fire Management Coordinator will approve all revisions, with concurrence of the Regional Director. Fire reviews will be conducted in accordance with procedures found in The Fire Management Handbook. Each review will be documented and filed with the final fire documentation. The District Fire Management Officer will retain a file copy. Staff and cooperators will critique all suppression actions on fires having extended attack and multi-period activities. If the need exists, the Regional Fire Management Coordinator can be included in such reviews and a national review by the National Fire Management Program Center can be requested.

Glossary of Fire Terminology

Anchor Point - An advantageous location, generally a fire barrier, from which to start constructing a fireline; used to minimize the chance of being outflanked by the fire while the line is being constructed.

Appropriate Management Response - Specific actions taken in response to a wildland fire to implement protection and fire use objectives.

Backfire - A predetermined strategy where a fire is set along the inner edge of a fireline to consume fuel in the path of a wildfire and/or change the direction of force of the fire's convection column.

BEHAVE - A system of interactive computer programs for modeling fuel and fire behavior, comprised of two subsystems; BURN and FUEL.

Blackline - Preburning of fuels adjacent to a control line, where there is no unburned material between the fireline and edge. A fireline reinforcement tactic.

Burning Index - An estimate of the potential difficulty of fire containment as it relates to the flame length at the head of the fire. In general, BI divided by a factor of 10 indicates approximate flame length, it traces seasonal trends reasonably well and is used by the agency for determining initial action resource needs (Step-Up Planning) based on fire potential only.

Burning Period - A 24-hour period ending at 10 a.m. The first burning period of a fire would be from the time of ignition until 10 a.m. the following day.

Burning Out - Setting fire inside a control line to consume fuel between the edge of the fire and the control line. Used to widen control lines during line construction or to eliminate unburned fuels inside the control lines after containment.

Chain (ch) - A unit of measure equal to 66 feet. 80 ch equals 1 mile; 10 ch² equals 1 acre. Commonly used to report fire perimeters and calculating fire size.

Confine/Contain/Control - These terms, when used in the context of suppression strategies, are confusing since they also have tactical meanings. Containment and control are assumed to maintain their definition for fire reporting purposes, where "containment" implies the completion of a fireline around a fire and any associated spot fires which can reasonably be expected to stop the fire's spread. "Control" is a point in time where fire suppression actions have removed any threat of fire escape, and at which time hazard pay stops.

Energy Release Component (ERC) - A NFDRS value related to the 24-hr potential worst case, total energy released per unit area within the flaming front at the head of a fire. It is directly related to the available energy (BTUs) per unit area (ft²) within the flaming front. **The** importance of this component is that the day-to-day variability is minimal as the value is not affected by wind speed. This is the best component for indicating the effects of intermediate to long-term drying on fire behavior.

Firebreak (Fuel Break) - A natural or constructed barrier used to stop or slow the spread of a fire, or, to provide control line from which to work.

Fire Hazard - A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree and ease of ignition and/or resistance to control.

Fire line - The removal or alteration of fuel from a narrow area of a control line by the use of hand tools, power equipment, etc. to control a fire. It implies mineral soil exposure.

Fire Management Plan (FMP) - A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. the plan is supplemented by operational procedures such as preparedness plan, preplanned dispatch plan, prescribed fire plans and prevention plans.

Fire Management Unit - Area within the refuge where there are common fire management goals, objectives, fuels, and resource use have been defined. the size of the unit is not important, however an FMU should relate well to overall suppression and prescribed fire strategies defined within a Fire Management Plan.

Fire Risk - The chance of fire starting, as affected by the nature and incidence of causative agents; an element of the fire danger in any area; any causative agent.

Hazard Reduction - The manipulation or removal of fuels to reduce the likelihood of ignition and lessen potential damage from wildfire. Normally hazard reduction is done to reduce the chance of major fire but can also be done to protect the resource or facility.

Ignition Component (IC) - A NFDRS value rating the probability that a fire brand will cause a fire requiring suppression action. Theoretically, on a day which registers an IC of 60, 60% of all firebrands which contact wildland fuels will start fires.

Incident Command System (ICS) - A combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure with responsibility for management of assigned resources to effectively accomplish stated objectives pertaining to an incident.

Indirect Attack - Method of fire suppression in which the control line is located a considerable distance from the fire's active edge; generally used in the case of a fire with rapid rate of spread or high intensity to utilize natural or constructed fire breaks or fuel breaks and favorable breaks in topography. Intervening fuel is usually burned out, but occasionally the main fire is allowed to burn to the control, depending on conditions.

Initial Attack - An aggressive suppression action consistent with firefighter and public safety and values to be protected.

Mixing Height - Height a column of smoke will rise in the atmosphere.

Mutual Aid - Any form of free direct assistance from one fire agency to another during an emergency, based upon a prearrangement between agencies involved and generally made upon the request of the receiving agency.

National Wildfire Coordinating Group (NWCG) - A national interagency operational group authorized by the Secretaries of Agriculture and the Interior designed to coordinate fire management programs of the participating agencies providing a means of constructively working together. The group provides a platform to agree upon policy, standards of training, equipment, aircraft, suppression priorities, and other operational considerations.

Normal Fire Year - The year with the third greatest number of fires in the past ten.

Normal Unit Strength - The amount of non capitalized fire fighting equipment needed by a refuge to meet 70 percent of suppression needs.

Preparedness - Activities that lead to a safe, efficient and cost effective fire management program in support of land and resource management objectives through appropriate planning and coordination. Replaced the term “presuppression”.

Prescribed Fire - Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition. the terms, “Prescribed Natural Fire and Management Ignited Prescribed Fire,” are no longer valid.

Prescription - Measurable criteria which guide selection of appropriate management response and actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social or legal considerations.

Resource Advisor - Resource specialist responsible to the Refuge Manager for gathering and analyzing information concerning natural resources and their uses that may be impacted by the fire or fire suppression activities.

Smoke Sensitive Area - Area in which smoke from outside sources is intolerable, for reason such as heavy population, existing air pollution, intensive recreation or tourist use, including designated wilderness areas of the refuge.

Spread Component (SC) - An NFDRS rating term related to the potential 24-hr worst case forward rate of spread of a head fire. A value numerically equivalent to the predicted forward rate of spread of a head fire in feet/minute.

Strategy - Overall plan of attack for fighting a fire which gives regard to the most cost-efficient use of personnel and equipment in consideration of values threatened, fire behavior, legal constraints, and objectives established for management of natural resources. Actual decisions on tactical use of personnel and equipment are left to the assigned Incident Commander of an incident.

Tactics - Planned operational actions that determine specific fire suppression measures are used to extinguish a fire. They must be consistent with the strategy established for suppressing the fire.

Urban/Wildland Interface - Area or zone where structures and other human development meets or intermingles with underdeveloped wildland or vegetative fuels capable of sustaining wildfire.

Wilderness - An area established by the Federal Government and administered by various agencies in order to conserve its primeval character and influence for public enjoyment, under primitive conditions, in perpetuity.

Wildfire - An unwanted wildland fire.

Wildland Fire - Any non-structure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Management Program - The full range of activities and functions necessary for planning, preparedness, emergency suppression operations, emergency rehabilitation and prescribed fire operations, including non-activity fires management to reduce risks to public safety and to restore and sustain ecosystem health.

Wildland Fire Situation Analysis (WFSA) - A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economical, political, and resource management objectives as selection criteria. Replaces the term, “Escaped Fire Situation Analysis”.

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APPENDICES

Appendix A. Maps

Following, on unnumbered pages:

- i. Location Map
- ii. Refuge Boundary Map
- iii. Prescribed Burn Unit Map

Appendix B. Normal Unit Strength

The following information is taken from the Fire Management Handbook and should be used as a guideline by the Refuge to build an inventory for NUS.

Normal Unit Strength (NUS) – Refuges that have a Fire Management Plan should also have a cache of firefighting tools and personal protective equipment (PPE) adequate to support all refuge initial attack staff. The numbers, types, and distribution of materials in caches will be dictated by the staffing, suppression strategy, fuels and fire history of the refuge. Cache equipment, other than capitalized property, is considered to be the station's Normal Unit Strength (NUS). It is the responsibility of the Refuge to establish specific Refuge and complex initial attack NUS levels. Requirements beyond the initial attack level will be supported through the regional and national fire cache system. Maintenance of NUS is the responsibility of the Refuge. NUS is a maximum level of all items for initial attack fire suppression efforts, not for support of fires exceeding initial attack or prescribed fire activities. NUS will include personal protective equipment and safety items required by personnel for prescribed fire assignments. Personnel ordered for extended attack activities are not to be equipped from the Refuge's NUS, but will either come equipped or equipped by a ground support facility. All refuges will develop a NUS list and have it approved by the RFMC. The list will become an attachment to the refuge's Fire Management Plan. Only those approved items may be replaced. The initial stocking of the cache with NUS items is a one-time expenditure of preparedness funds. If additional items are needed, they must be approved through the RFMC. All NUS items are to be maintained in such a way that they are not used for routine Refuge operations. This may be accomplished by storing equipment in designated areas protected by a seal or in an individual locked enclosure. The inventory and location of these items should be included in the pre-attack plan. Excess and unneeded supplies and equipment should be transferred to other refuges or interagency caches

Once a NUS level of equipment and PPE is established, routine replacement of lost, broken or worn out equipment should be through the normal GSA supply channel. Items can be ordered by using the National Stock Number found in the NWCG National Fire Equipment System Catalog, Part 1: Fire Supplies and Equipment, or through the GSA Wildfire Protection Equipment and Supplies catalog. GSA should be considered the first source of supply, but other sources can also be used

Supporting Ongoing Fires – Ordering – During wildland and prescribed fire operations, support in the form of NUS supplies, other fire suppression equipment, crews and overhead can be ordered through the local interagency zone dispatch/coordination center. In most areas of the country, your order for supplies and/or equipment will not come directly from NIFC, but from the nearest fire cache operated by another Federal agency. Crews and overhead are brought in using the closest forces concept. Resource Order Forms are available that simplify tracking orders from initiation to receipt. These forms are color coded for overhead, crews, supplies and equipment. Fire Management Officers or Regional Fire Management Coordinators can assist in preparing requests.

NUS Determination Criteria

<u>Item</u>	<u>NUS Formula</u>
Rations, Shelters, Hard Hats, Head Lamps, Goggles, Packs, Line Gear, First Aid Kits, Sleeping Bags, Water Bottles	1 per red-carded individual plus 20%
Tents	1 per red-carded individual
Aramid Pants, Aramid Shirts, Gloves	2 per red-carded individual plus 20% for each size issued
Shovels, Pulaskis, McLeods, Flaps, Fire Rakes (Hand Tools)	2 per red-carded individual plus 10% for each type of tool. Mix of tools is determined by station based on local needs.
Flight Helmets	6 per helicopter contract plus 2 spares. Stations w/o contract aircraft that frequently use helicopters for fire activities should obtain 4.
Back Pack Pumps	1 per 2 red-carded individual
Chain Saws, Portable Pumps, Fold-A-Tank	As approved by the RFMC depending on firefighting tactics.
Foam	15 gallons per engine
Hose - Portable Pump used for hose lays or any size engine	1.5 inch -900 feet
Nozzles (1" and 1.5" - total)	1 inch - 900 feet
	2 - Portable Pump
	4 - Light Engine
	5 - Medium or Heavy Engine
	Plus 20% for total number of nozzles on engines, water and foam combined
Wyes, Tees, Wrenches, Relief Valves, Hose Clamps, etc.	2 - Portable Pump
	2 - Light Engine
	3 - Medium Engine
	4 - Heavy Engine
	Plus 10% for each item listed as required in the inventory

Adapters and Reducers (Based on local and anticipated needs)

2 - Portable Pump

2 - Light Engine

4 - Medium Engine

5 - Heavy Engine

Plus 10% for each item listed as required in the inventory.

Normal Unit Strength – Presquile NWR

Based on the above criteria, following is a list of NUS items on hand or needed at the Refuge.

<u>Item</u>	<u>Quantity required</u>	<u>Quantity on hand</u>	<u>Deficit</u>
Shelters	2	1	1
Hard hats	2	1	1
Head Lamps	2	0	2
Goggles	2	1	1
Packs	2	2	0
Line gear	2 sets	0	2
First aid kits	2	1	1
Sleeping bags	2	0	2
Water bottles	4	2	2
Tents	1	0	1
Pants, shirts, gloves	4	1	3
Hand tools	2 sets	0	2
Flight helmets	1	0	1

Back pack pumps	1	0	1
Chain saws	2	2	0
Portable pumps	TBD	0	TBD
Foam	TBD	0	TBD
Engines, hose, nozzles, etc.	TBD	0	TBD

TBD = To be determined in consultation with FMO and RFMC

Appendix C. Refuge Planning Documents

PRESQUILE NATIONAL WILDLIFE REFUGE DISPATCH PLAN

Dispatch Center: Eastern Virginia Rivers NWR Complex Office–804/333-1470.

All radio transmissions will utilize (163.150 MHz RX/TX, with 103.500MHz channel guard on transmit and receive).

RADIO COMMUNICATIONS:

Channel	Name	Frequency (MHz)	Usage
2	Talk-around	Tx: 163.150 CG 103.500 Rx: 163.150	Tactical
3	SE Compact	Tx: 159.285 Rx: 159.285	Tactical-alt.

(TX=transmit, CG=code guard, RX=Receive, SE compact is a interagency group for emergency response (mainly wildfire)).

When report of smoke or fire is received get as much information as possible from the caller. The following list should be filled in:

Location of smoke or fire:

Location of caller:

Name and telephone number of caller:

Color of smoke:

Size of fire:

Type of Fuel:

Character of fire (running, creeping, etc.):

Anyone on the fire:

See anyone in the area or vehicles leaving the area:

DISPATCH CHECK LIST

- ☐ Check map location and ownership/protection status.
- ☐ If fire is on or threatening refuge, dispatch small (200 gal.) pumper and three qualified staff.
- ☐ Notify Refuge Manager

Office(804) 333-1470
Home(804) 445-1955

- ☐ Notify State Forest Office

Chesterfield County-Pocahontas SP (804) 796-4360

Henrico County-Richmond Office (804) 328-3031

New Kent -Charles City County (804) 966-2209

- ☐ Notify County Sheriff's office

Chesterfield County 911

Non-Emergency (804) 748-1261

Henrico County 911

Non-Emergency (804) 501-5860

Charles City County 911

- ☐ If fire danger very high or extreme, put reconnaissance aircraft over the fire. Carded aircraft: Contact Forester
- ☐ Maintain log of all radio and telephone communications.
- ☐ Remain on duty and dispatch further assistance as ordered from the fire.

SUPPORT ITEMS

List of Selected Landowners Adjacent to Presquile NWR:

Dick Watkins	(804) 795-5470
Shirley Plantation	(804) 829-5121
Rudy Horvak	(804) 530-5321
Phillips Morris USA, Park 500	(804) 751-2000
Honeywell International, Inc.	(804) 541-5735
Mrs. Fred Grey (End of Bermuda Hundred Road)	(804) 530-2231

REFUGE PERSONNEL

Name	Qualification	Home Phone Number
Joe McCauley		(804) 445-1955
Kathryn Owens,	EDRC (Dispatch)	
	RADO (Radio)	(804) 493-7236
Sandy Spencer		(804) 333-0152
Luther Vick		(804) 458-3168
Frances Murphey		(804) 333-6626

Cyrus Brame	(804) 564-3170
Greg Owens	(804) 493-7236

DIRECTORY

Fish and Wildlife Service

District FMO

Timothy Craig, Great Dismal Swamp National Wildlife Refuge

Office (757) 986-3480

Cell (757) 647-1596

Regional Fire Mgt. Coordinator

Allen Carter, Great Dismal Swamp National Wildlife Refuge

Office (757) 986-3706

Home (757) 468-4769

Cell (757) 472-2876

Refuge Supervisor (or Acting)

Office (413) 253-8568

State Forestry Department

Chesterfield County- Pocahontas SP

Office (804) 796-4360

Forester, Rich Reuse

Forest Technician, Jeff Darr

Henrico County-Richmond Office

Office (804) 328-3031

Forester, Lisa Kragewski

Technician, Jeff Darr

New Kent-Charles City County

Office (804) 966-2209

Forester, Will Scoup

Technician, Paul Reier

OTHER SERVICES

W F Parker Oil Co.

(804) 458-1213

John Randolph Medical Center (Hopewell)

(804) 541-1600

Ambulance

911

State Police

911

Sheriff

911

Appendix D Vegetation Sampling Protocol II

Grassland Breeding Bird Use of Managed Grasslands on National Wildlife Refuges within Region 5

FIELD PROTOCOLS

This document describes the field protocols to be used by refuge personnel at refuges participating in the Region 5 Grassland Bird Project. This document only contains the protocols for collecting field data, other details of the experimental design (selection of experimental units, treatments, etc.) are described elsewhere. The first page gives an overview of the data collection process, subsequent pages describe the specific techniques.

Overview

Timing Protocol

- | | |
|----------------|---|
| 2 Weeks | Ia. Grassland bird surveys: Maximum density sampling
Ib. Grassland bird surveys: General procedures
Ic. Grassland bird surveys: Double-observer technique |
|----------------|---|

Surveys will be made from late May through late June. The surveys will be 2 discrete, 5-day periods, separated by a period of 2 weeks when no bird surveys will take place. The first survey period will take place during the historic peak of breeding grassland bird activity at each refuge. A double, simultaneous, independent observation procedure will be used (Ic). Survey points within the fields have been selected according to a maximum point density procedure (Ia).

- | | |
|--------------------|--|
| Once/season | II. Vegetation sampling: Location of random points
IIIa. Vegetation sampling: Archival photographs
IIIb. Vegetation sampling: Height-density
IIIc. Vegetation sampling: Percent frequency and litter depth
IIId. Vegetation sampling: Dominant species |
|--------------------|--|

Protocols II - IIIc need to be made only once per season in each study field. Protocol IIId is completed twice. Sampling points within the fields have been selected according to a random sampling procedure (II). At each point, vegetation measurements (IIIa - IIId) are taken. All vegetation sampling should be accomplished during the 2-week gap between the two bird survey periods (with an exception for Protocol IIId, dominant species, which also needs to be repeated in mid-summer to identify dominant, warm season plants).

Contacts Regional Fire Ecologist Laura Mitchell (302) 684-5401, Laura_Mitchell@fws.gov Patuxent Scientists Michael Runge, (301) 497-5748, Michael_Runge@usgs.gov Bill Kendall, (301) 497-5868, William_Kendall@usgs.gov

Region 5 Grassland Bird Study, Protocols (5/14/02), FINAL Revision for 2002 Field Season 1

Protocol II: Vegetation sampling: Location of random points

Goals: To choose random points within each study field as anchor-points for vegetation sampling.

Personnel: Selection and mapping of vegetation sampling points will be carried out by study coordinators (Mitchell and Runge). Field observers will be responsible for finding survey points using provided maps and refuge GPS equipment.

Equipment: GPS receiver.

Steps: The refuges provide study coordinators with topographic maps and aerial photographs of the study fields as well as UTM locations of the field boundaries/corners. If a refuge does not have a GIS, the study coordinators will collect UTM locations of field boundaries during refuge site visits.

The study coordinators will select vegetation sampling points within each field, using the following three-step process, using ArcView®:

1. Overlay field boundaries on photos or DOQQs, checking that boundaries are correct.
2. Run an Avenue script, “random_p.ave”, to place 4-6 sampling points randomly within each field. Each point should be at least 30 m from the edge of the field, and 125 m from all other points.
3. The program is re-run until at least 4, and preferably 5-6, sampling points lie within each field.

The UTM locations of the sampling points will be provided along with a map of the study fields and avian survey points. Vegetation sampling personnel should locate the points using the GPS unit.

At each vegetation sampling point, 4 measurements need to be made: an archival photograph (IIIa), height-density (IIIb), percent frequency and litter depth (IIIc), and dominant species (IIId).

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Protocol IIIa: Vegetation sampling: Archival photographs

Goal: To visually characterize each study field.

Personnel: Only one person is needed.

Equipment: A digital camera, Robel pole, sight pole, 4-m tape measure.

Steps: (see DATA FORM for Protocol IIIa, “Vegetation Point Photographs”) Place a Robel pole at each vegetation anchor point.

Place the sight pole 4 m to the north. Take a single photograph of the Robel pole from a height of 1 m, alongside the sight pole (being careful not to include the sight pole in the photograph). Note that this photograph should be taken of undisturbed vegetation, so it is advisable to take the picture before doing the other vegetation measurements (IIIb – IIIId). Use only a digital camera (set at its highest resolution, and widest view). Record the vegetation sampling point number (for which you know the UTM coordinates), field name, and date. If for some reason, you cannot take the photograph facing south, record the direction you were facing.

When you download the photographs from the camera, give them names that contain the Refuge, Field, and Vegetation point (e.g., BMH_101_v1.jpg for Bombay Hook, Field 101 vegetation point 1). Provide the make, model, resolution, and focal length (or magnification) for the camera used.

All photographs, as well as all vegetation measurements, should be made in the two-week period between the two avian survey bouts. The rationale for this timing is that we would like to measure the vegetation structure at about the same time the birds are establishing territories, but we don’t want to disturb the birds during the weeks of the avian point counts. The window in which to do the vegetation surveys is narrow to control for vegetation growth. If this narrow window will pose logistical problems due to availability of personnel, please contact Laura or Michael as much in advance as possible to discuss alternatives.

Continue with Protocol IIIb.

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Protocol IIIb: Vegetation sampling: Height-density

Goal: To obtain an index of height-density at each sampling point within each study field.

Personnel: Only one person is needed, but a team of two will be more efficient.

Equipment: Robel pole, sight pole, 25-m tape, 4-m tape, clipboard.

Steps: (see DATA FORM for Protocol IIIb, “Robel Pole”)

Locate four height-density stations, each 25 m and in a cardinal direction (N, S, E, W) from the vegetation sampling point. At each height-density station, plant the Robel pole firmly in the ground. Take four readings of the Robel pole, each 4 m and in a cardinal direction from it. Thus, there should be 16 measurements made at each vegetation sampling point (4 at each of 4 stations). To make a reading, place your eye at the 1 m mark on the sight pole. A Robel pole is marked in $\frac{1}{4}$ -decimeter intervals for the first 2 decimeters, and $\frac{1}{2}$ -decimeter intervals thereafter. Height-density measurements are taken at the lowest interval where the pole can be seen, at least partially, through the vegetation.

The Robel poles that were prepared for this study are labeled a little differently than standard Robel poles. Fig. 1 indicates how the readings should be recorded. *Example 1.* Suppose the vegetation completely obscures the white interval with the “3” in it, but only partially obscures the black interval above that. This should be recorded as 3.5. *Example 2.* Vegetation obscures the lowest white interval, but the first black interval is partially visible. This should be recorded as 1.25. *Example 3.* Note that bare ground with no vegetation obscuring the pole would be recorded as 1.00.

Continue with Protocol IIIc.

Protocol IIIc: Vegetation sampling: Percent frequency and litter depth

Goal: To obtain the percent frequency of several general categories of vegetation structure at each sampling point within each study field.

Personnel: Only one person is needed, but a team of two will be more efficient.

Equipment: Field tape measure (minimum 30 m), a pin or stake to anchor the tape, a 4 mm diameter metal rod (~2 m in length), a random number table (random list of numbers 1 through 360), a compass, a collapsible tape measure, and fluorescent pin-flags.

Steps: (see DATA FORM for Protocol IIIc, “Percent Frequency, Litter Cover, Litter Depth”)

Prior to the start of vegetation sampling, permanently mark the field tape at 0.5-m intervals from 0 m to 30 m. Make every third mark (starting at 1.5 m) a double mark, for litter depth readings.

To establish the transect, anchor one end of the 30 m field tape at the survey point. For each sampling point, choose and record a random bearing. Use the compass to orient the tape on this bearing. [Note: for the 2nd and 3rd years of the study, use the same bearing as selected for the 1st year.] Place fluorescent pin-flags at both ends of the transect, to assist you in relocating this transect in late summer. Ensure the flags do not extend above the tallest vegetation in the plot.

At each of the 60 systematically spaced points, place the metal rod directly next to the field tape, perpendicular to the ground. Make an attempt to avoid “aiming” the rod at any particular plant; simply allow the rod to drop next to the tape.

Determine all vegetation that touches the metal rod. Record the presence or absence of interceptions by each vegetation category, at each point. A vegetation category is counted as intercepting the rod only once, per point, no matter how many plants from that category intercept the rod (this is a frequency measure, not dominance). Record interceptions with tally marks on the data sheet. Vegetation categories are: shrub >0.5 m, shrub <0.5 m, live graminoid, live forb, and standing dead vegetation. *Live graminoid* is defined as plants with aboveground live tissue, that are members of the families *Poaceae*, *Juncaceae*, or *Cyperaceae*. *Live forb* is defined as all other live herbaceous plants, including, for the purposes of this study, prostrate vines. *Standing dead vegetation* is dead plant material that stands at an angle greater than 45° from the ground.

Where the rod touches the ground, note if the ground is bare (as opposed to being covered by litter). This should be a visual estimate made from above; do not move vegetation aside to determine this. If the ground is bare, make a tally mark in the appropriate data column.

Measure litter depth to the nearest 0.5 cm at every third point along the transect. Place the tape measure directly next to the metal rod, and gently work the end of it to the soil

surface. Measure the depth of litter at this point. *Litter* is dead plant material that is horizontal, or is leaning at an angle less than 45° from the ground and part of a continuous layer to the ground.

Continue with Protocol IIIId.

Region 5 Grassland Bird Study, Protocols (5/14/02), FINAL Revision for 2002 Field Season 14

Protocol IIIId: Vegetation sampling: Dominant species

Goal: To determine the dominant species of vegetation at sampling points within each study field.

Personnel: Only one person is needed, but a team of two will be more efficient.

Equipment: 1-m² frame, table of random numbers (random list between 1 and 30), zip-lock bags (gallon size).

Steps: (see DATA FORM for Protocol IIIId, “Dominant Species”)

Prior to the start of vegetation sampling, mark two sides of the 1-m² frame (quadrant) in the manner shown in Fig. 2 (at distances of 0.224 m and 0.5 m along the side). These provide references for estimating the cut-off points of the cover class scale (5%, 25%, 50%, 75%, and 100%).

Use the same sampling transect as in Protocol IIIc, walking it a second time.

At four random points per transect (random numbers between 1 m and 30 m), place the 1-m² frame on the ground, over the vegetation. Use different random numbers for each transect. [*Note:* for the second and third years of the study, use the same placement of quadrants as in the 1st year.] Place the frame parallel to and flush with the transect tape, on the side opposite of where you have been walking. Use the 0.5-m mark on the frame to align the frame with the random locations on the measuring tape. Place fluorescent pin-flags at the upper left-hand and lower right-hand corners of the quadrant. Ensure that the flags do not extend above the tallest vegetation in the plot. These flags will help you relocate the quadrant in late summer.

In each frame, visually estimate cover per plant species, using a modified Daubenmire scale (Table 5). Record dominant species in the following manner:

1. Note the total number of species of live, vascular plants in the square. You *may not have to* identify all of them. You may need to look quite carefully to find them all. It is permissible (advisable!) to move vegetation aside to conduct this search.

2. Make a quick visual estimate of the ranking of species by cover class.

3. Beginning with the plant species with the greatest percent cover, identify the plant, and estimate the cover class (Daubenmire scale). This is a measurement of aerial cover, so consider how much light is intercepted by each species from above.

NOTE: *We have modified the Daubenmire scale this year. Specifically, we have split the cover class “B” (5-25%) in to two classes, “B1” (5-15%) and “B2” (15-25%). Be sure to use this modified Daubemire scale, including these more finely defined cover classes, in making your cover estimates.*

Continue this process with the plant species with the next greatest percent cover. Keep a running total of the sum of the midpoints of the cover classes.

4. Continue until the sum of the midpoints of the cover classes for each species exceeds 50% AND until there are no more species that are in cover class B1, B2, C, D, or E (5-15% or above).

5. In addition, note the presence of any noxious weeds of concern to Region 5 Refuges (Table 6), and estimate the cover class. If one of the dominant species already identified is a noxious weed, put an asterisk by it on the data sheet.

For the species noted in the total in step 1, but not included in the dominance list (i.e., the incidental “A” species), it is not necessary to identify the plant.

All plants included in the dominance list should be identified to species except graminoids and late-season flowering forbs (i.e., *Solidago* spp.), which *may* be identified to genus only. However, please identify any of these plants to species if you are familiar with them. If there is a *forb* species that you cannot identify, collect appropriate botanical samples, store them in zip-lock bags, and arrange to have them identified, either through botanical keys in the office, if you are qualified, or else by a local expert. As a last resort, arrange to mail or transport plant samples in moist zip-loc bags to Laura Mitchell at Prime Hook (please contact her in advance). *Please ensure that all plants are identified with their scientific names on the data sheets.*

Cool-season grasses should be flowering, and readily identifiable. Warm-season grasses will be difficult to identify, because they do not form an inflorescence until mid-to-late summer. In the burned fields, there will be no above-ground material from last year to help identify WSG grasses. If you can identify warm-season grasses with other clues (such as habit, or the presence of dead material from the previous year), do so. If there are warm-season grasses you cannot identify at the time of the survey (and we fully expect there will be), you should name these plants on your data sheet, “unidentified WSG #1,” “unidentified WSG #2,” etc.

NOTE: In August, you will need to revisit all fields, and repeat Protocol IIIc for all live (aboveground tissues) plants in the quadrants. You do not need to collect additional

information on invasive species. Follow the procedure for sampling dominant species, as outlined above, recording information on all of the green, late-season plants in the quadrant. Do not count cool season plants that are dormant. Warm-season grasses and forbs will be readily distinguishable from cool season species, since the mature plant will be present, the culms/stems and leaves will be green, and the plant will be close to flowering, flowering, or forming seeds. Culms, leaves, and inflorescences of cool season plants will be dry, brown, and most of the seeds of these plants will have fallen off of the plants.

Table 5. Modified Daubenmire Cover Classes.

Class	Cover	Midpoint
A	1 – 5 %	2.5 %
B1	5 – 15 %	10.0 %
B2	15 – 25%	20.0%
C	25 – 50 %	37.5 %
D	50 – 75 %	62.5 %
E	75 – 100 %	87.5 %

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50 % 25 % 5 % 0.224 m 0.50 m **Figure 2.** Diagram of 1-m² sampling frame (quadrant). The marks are placed on the two sides at 0.224 m and 0.5 m. The areas circumscribed by invisible lines at the various marks correspond to the cut-off points for the cover classes. Comparison of aerial cover of plants to these references should help with cover class determination.

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