

**RAPPAHANNOCK RIVER VALLEY  
NATIONAL WILDLIFE REFUGE**

**FIRE MANAGEMENT PLAN**



**2009**

**RAPPAHANNOCK RIVER VALLEY  
NATIONAL WILDLIFE REFUGE  
FIRE MANAGEMENT PLAN**

Prepared by:

Douglas S. Raelum  
Wildland Fire Associates LLC

Date 6/3/2009

Submitted by:

Joseph F. McCauley  
Refuge Manager – Rappahannock River Valley  
National Wildlife Refuge

Date 8/6/2009

Reviewed by:

See next page  
Zone Fire Management Officer

Date \_\_\_\_\_

Reviewed by:

Allen C. Carter  
Regional Fire Management Coordinator – Region 5

Date 6/10/2009

Concurred by:

Anthony J. Lege  
Regional Chief – Region 5 Refuges

Date 8/13/2009

Approved by:

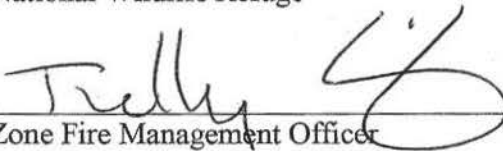
[Signature]  
**Acting** Regional Director – Region 5

Date 8/14/09

**RAPPAHANNOCK RIVER VALLEY  
NATIONAL WILDLIFE REFUGE  
FIRE MANAGEMENT PLAN**

Prepared by: \_\_\_\_\_ Date \_\_\_\_\_  
Wildland Fire Associates LLC

Submitted by: \_\_\_\_\_ Date \_\_\_\_\_  
Refuge Manager – Rappahannock River Valley  
National Wildlife Refuge

Reviewed by:  Date 6/15/09  
Zone Fire Management Officer

Reviewed by:  Date 6/10/09  
Regional Fire Management Coordinator – Region 5

Concurred by:  Date 8/13/09  
Regional Chief – Region 5 Refuges

Approved by: \_\_\_\_\_ Date \_\_\_\_\_  
Regional Director – Region 5

## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION.....</b>	<b>10</b>
	Purpose of the Fire Management Plan.....	10
	Annual Fire Management Plan Review.....	10
	General Description of Rappahannock River Valley National Wildlife Refuge.....	10
	Significant Values to Protect.....	12
	Threatened and Endangered Species .....	12
	Cultural Resources.....	13
	Mission of the Refuge.....	13
<b>2.0</b>	<b>POLICY, LAND MANAGEMENT PLANNING AND PARTNERSHIPS.....</b>	<b>14</b>
<b>2.1</b>	<b>Fire Policy.....</b>	<b>14</b>
	Federal Interagency Wildland Fire Policy.....	14
	National Fire Plan.....	15
	Department of Interior DOI) Fire Policy.....	15
	Interagency Groups That Assist in Fire Management Planning and Implementation.....	15
	U.S. Fish and Wildlife Service Policy.....	16
	Fire Management Policy Specific to Rappahannock River Valley NWR.....	16
<b>2.2</b>	<b>Land and Resource Management Planning.....</b>	<b>17</b>
	Land Management Planning.....	17
	Compliance with Regulatory Acts.....	18
<b>2.3</b>	<b>Fire Management Partnerships.....</b>	<b>18</b>
	Internal Partnerships.....	18
	External Partnerships.....	19
<b>3.0</b>	<b>FIRE MANAGEMENT UNIT CHARACTERISTICS.....</b>	<b>20</b>
<b>3.1</b>	<b>Area-Wide Management Considerations.....</b>	<b>20</b>
	Management Goals, Objectives, and Constraints Identified in the CCP.....	20
	Goals and Objectives .....	20
	Fire Management Strategies .....	21
	Fire Management Strategy Discussion.....	22
	Refuge-Wide Constraints .....	23
	Desired Future Conditions.....	24
	Management Goals, Objectives, and Constraints from Other Sources.....	24
	Threatened and Endangered Species.....	25
	State Historic Preservation Office.....	25
	Climate Change.....	25
	Cost Effectiveness.....	26
	Characteristics Common to All Refuge Fire Management Units.....	26
	Topography.....	26
	Hydrology.....	26
	Soils.....	27
	Natural Communities and Cover Types.....	27
	Wildlife.....	28
	Fire History.....	29



	<b>Fire Season and Occurrence .....</b>	<b>30</b>
	<b>Fire Regime and Fire Regime Condition Class (FRCC).....</b>	<b>31</b>
	<b>LANDFIRE .....</b>	<b>32</b>
	<b>Weather and Climate.....</b>	<b>32</b>
	<b>Cultural Resources.....</b>	<b>32</b>
	<b>Program Guidance and Constraints.....</b>	<b>33</b>
	<b>Management Options and Response to Wildland Fire.....</b>	<b>33</b>
	<b>Goals and Objectives Related to Fire Management.....</b>	<b>33</b>
	<b>Fire Management Strategies.....</b>	<b>34</b>
	<b>Special Concerns.....</b>	<b>35</b>
	<b>Specific Guidelines.....</b>	<b>35</b>
	<b>Constraints on Mechanized Equipment.....</b>	<b>35</b>
	<b>Retardant and Chemical Use.....</b>	<b>36</b>
	<b>Minimum Impact Suppression Tactics (MIST).....</b>	<b>36</b>
	<b>Safety Considerations.....</b>	<b>36</b>
	<b>Operational Considerations.....</b>	<b>37</b>
	<b>Vegetation, Fuel Models and Fire Behavior.....</b>	<b>37</b>
	<b>Air Quality and Smoke Management.....</b>	<b>39</b>
	<b>Communications.....</b>	<b>40</b>
	<b>Potential Incident Command Post Locations.....</b>	<b>41</b>
<b>3.2</b>	<b>FIRE MANAGEMENT UNIT 1- RICHMOND COUNTY.....</b>	<b>41</b>
	<b>Description.....</b>	<b>41</b>
	<b>Adjacent Land Ownership and Potential Fire Spread Consequences.....</b>	<b>41</b>
	<b>Fuels and Vegetation FMU-Specific.....</b>	<b>44</b>
	<b>Unique Characteristics Affecting Fire Management.....</b>	<b>46</b>
	<b>Topography and Soils.....</b>	<b>46</b>
	<b>Hydrology.....</b>	<b>46</b>
	<b>Access .....</b>	<b>46</b>
	<b>Helispots.....</b>	<b>46</b>
	<b>Water Sites.....</b>	<b>46</b>
	<b>Values to be Protected.....</b>	<b>47</b>
	<b>Threatened and Endangered Species and Special Status Species.....</b>	<b>47</b>
	<b>Wildland Urban Interface.....</b>	<b>47</b>
	<b>Air Quality and Smoke Management.....</b>	<b>47</b>
	<b>Cultural and Natural Resources.....</b>	<b>47</b>
	<b>Specially Designated Areas.....</b>	<b>47</b>
	<b>Power Lines.....</b>	<b>47</b>
	<b>Structures and Other Values at Risk.....</b>	<b>48</b>
	<b>Fire Management Unit Guidance.....</b>	<b>48</b>
	<b>Desired Future Conditions (Vegetation).....</b>	<b>48</b>
	<b>Fire Management Objectives.....</b>	<b>48</b>
	<b>Pre-Identified Management Action Points.....</b>	<b>49</b>
	<b>Constraints on Fire Management.....</b>	<b>49</b>
	<b>Safety Considerations.....</b>	<b>49</b>

<b>3.3</b>	<b>FIRE MANAGEMENT UNIT 2- ESSEX COUNTY.....</b>	<b>50</b>
	Description.....	50
	Adjacent Land Ownership and Potential Fire Spread Consequences.....	50
	Fuels and Vegetation FMU-Specific.....	52
	Unique Characteristics Affecting Fire Management .....	52
	Topography and Soils.....	52
	Hydrology.....	52
	Access.....	53
	Helispots.....	53
	Water Sites .....	53
	Values to be Protected.....	53
	Threatened and Endangered Species and Special Status Species.....	53
	Wildland Urban Interface.....	54
	Air Quality and Smoke Management .....	54
	Cultural and Natural Resources.....	54
	Specially Designated Areas.....	54
	Power Lines.....	54
	Structures and Other Values at Risk.....	54
	Fire Management Unit Guidance.....	54
	Desired Future Conditions (Vegetation).....	54
	Fire Management Objectives.....	55
	Pre-Identified Management Action Points.....	55
	Constraints on Fire Management.....	56
	Safety Considerations.....	56
<b>3.4</b>	<b>FIRE MANAGEMENT UNIT 3-KING GEORGE COUNTY.....</b>	<b>56</b>
	Description.....	56
	Adjacent Land Ownership and Potential Fire Spread Consequences.....	58
	Fuels and Vegetation FMU-Specific.....	58
	Unique Characteristics Affecting Fire Management.....	59
	Topography and Soils.....	59
	Hydrology.....	59
	Access .....	59
	Helispots.....	59
	Water Sites.....	59
	Values to be Protected.....	60
	Threatened and Endangered Species and Special Status Species.....	60
	Wildland Urban Interface.....	60
	Air Quality and Smoke Management.....	60
	Cultural and Natural Resources.....	60
	Specially Designated Areas.....	60
	Power Lines.....	60
	Structures and Other Values at Risk.....	60
	Fire Management Unit Guidance.....	61
	Desired Future Conditions (Vegetation).....	61
	Fire Management Objectives.....	61
	Pre-Identified Management Action Points.....	61

	<b>Constraints on Fire Management.....</b>	<b>62</b>
	<b>Safety Considerations.....</b>	<b>62</b>
<b>3.5</b>	<b>FIRE MANAGEMENT UNIT 4-WESTMORELAND COUNTY.....</b>	<b>62</b>
	<b>Description.....</b>	<b>62</b>
	<b>Adjacent Land Ownership and Potential Fire Spread Consequences.....</b>	<b>62</b>
	<b>Fuels and Vegetation FMU-Specific.....</b>	<b>64</b>
	<b>Unique Characteristics Affecting Fire Management.....</b>	<b>64</b>
	<b>Topography and Soils.....</b>	<b>64</b>
	<b>Hydrology.....</b>	<b>64</b>
	<b>Access .....</b>	<b>64</b>
	<b>Helispots.....</b>	<b>65</b>
	<b>Water Sites.....</b>	<b>65</b>
	<b>Values to be Protected.....</b>	<b>65</b>
	<b>Threatened and Endangered Species and Special Status Species.....</b>	<b>65</b>
	<b>Wildland Urban Interface.....</b>	<b>65</b>
	<b>Air Quality and Smoke Management.....</b>	<b>65</b>
	<b>Cultural and Natural Resources.....</b>	<b>65</b>
	<b>Specially Designated Areas.....</b>	<b>66</b>
	<b>Power Lines.....</b>	<b>66</b>
	<b>Structures and Other Values at Risk.....</b>	<b>66</b>
	<b>Fire Management Unit Guidance.....</b>	<b>66</b>
	<b>Desired Future Conditions (Vegetation).....</b>	<b>66</b>
	<b>Fire Management Objectives.....</b>	<b>66</b>
	<b>Pre-Identified Management Action Points.....</b>	<b>67</b>
	<b>Constraints on Fire Management.....</b>	<b>67</b>
	<b>Safety Considerations.....</b>	<b>67</b>
<b>3.6</b>	<b>FIRE MANAGEMENT UNIT 5 – CAROLINE COUNTY.....</b>	<b>67</b>
	<b>Description.....</b>	<b>67</b>
	<b>Adjacent Land Ownership and Potential Fire Spread Consequences.....</b>	<b>67</b>
	<b>Fuels and Vegetation FMU – Specific.....</b>	<b>69</b>
	<b>Unique Characteristics Affecting Fire Management.....</b>	<b>69</b>
	<b>Topography and Soils.....</b>	<b>69</b>
	<b>Hydrology.....</b>	<b>69</b>
	<b>Access .....</b>	<b>69</b>
	<b>Helispots.....</b>	<b>70</b>
	<b>Water Sites.....</b>	<b>70</b>
	<b>Values to be Protected.....</b>	<b>70</b>
	<b>Threatened and Endangered Species and Special Status Species.....</b>	<b>70</b>
	<b>Wildland Urban Interface.....</b>	<b>70</b>
	<b>Air Quality and Smoke Management .....</b>	<b>70</b>
	<b>Cultural and Natural Resources.....</b>	<b>71</b>
	<b>Specially Designated Areas.....</b>	<b>71</b>
	<b>Power Lines.....</b>	<b>71</b>
	<b>Structures and Other Values at Risk.....</b>	<b>71</b>
	<b>Fire Management Unit Guidance.....</b>	<b>71</b>
	<b>Desired Future Conditions (Vegetation).....</b>	<b>71</b>

	Fire Management Objectives.....	71
	Pre-Identified Management Action Points.....	72
	Constraints on Fire Management.....	72
	Safety Considerations.....	72
4.0	WILDLAND FIRE OPERATIONAL GUIDANCE.....	72
4.1	Management of Unplanned Ignitions.....	72
4.1.1	Preparedness.....	73
	Planning.....	73
	Fire Weather and Forecast Information.....	74
	Fire Danger Indices and Staffing (Step-Up) Plan.....	74
	Detection.....	76
	Staffing.....	76
	Fire Cache and Equipment.....	76
	Normal Unit Strength (NUS).....	76
	Training.....	77
	Qualifications.....	77
	Physical Fitness.....	77
	Fire Directory.....	78
	Pre-Season Plan.....	78
	Effects of Regional and National Fire Activity/Preparedness Levels.....	78
4.1.2	Incident Management (Management Direction).....	79
	General Management Constraints.....	80
	Dispatch, Communications, Size-up and Initial Response.....	81
	Dispatch.....	81
	Communications.....	82
	Size-Up and Initial Actions.....	82
	Initial Actions.....	83
	Response Capabilities/Cooperative and Mutual Aid Agreements.....	84
	Extended Attack and Large Fire Management.....	84
	Wildland Fire Decision Support System Analysis (WFDSS).....	85
	Public and Interagency Notification and Information.....	85
	Aviation Operations.....	86
	Post-Incident Actions.....	86
	Reviews and Investigations.....	86
	Reports.....	86
	Daily Reports.....	86
	Individual Fire Reports.....	87
	Records Management.....	87
4.1.3	Emergency Stabilization.....	88
4.2	Burned Area Rehabilitation.....	88
4.3	Management of Planned Fuels Treatments.....	89
	Program Overview.....	89
	Fuels Treatment Objectives, Treatment Types and Targets.....	90
	Prescribed Fire Program for Fuels Treatments and Habitat.....	92
	Prescribed Fire Program Overview.....	92



	Priority Setting and Planning.....	94
	Management Considerations.....	95
	Project Implementation.....	95
	Responsibilities.....	96
	General Discussion Points.....	96
	Exceeding the Parameters of an Existing Prescribed Burn Plan.....	97
	After-Action and Escaped Fire Reviews.....	97
	Reports.....	97
	Non-Fire Fuels Treatment Program.....	98
	Goals Related to Non-Fire Fuels Treatment.....	98
4.4	Prevention, Mitigation, and Education.....	99
	Prevention and Mitigation.....	99
	Education.....	99
5.0	MONITORING AND EVALUATION.....	100
	Background.....	101
	Types of Monitoring.....	101
	Environmental .....	101
	Prescribed Fire.....	101
	Wildland Fire Suppression.....	102
	Habitat Response Monitoring Requirements.....	102
	Treatment Effectiveness.....	103
6.0	FIRE MANAGEMENT PLAN TERMINOLOGY (GLOSSARY).....	104
7.0	LITERATURE CITED.....	104
8.0	APPENDICES.....	111
	Appendix A Maps.....	112
	Appendix B Authority and Policy References.....	120
	Appendix C Staff Responsibilities and Program Organization.....	124
	Appendix D Fire Danger and Staff Readiness.....	128
	Appendix E Fire Directory.....	131
	Appendix F Tables.....	133
	Appendix G Equipment and Cache Items.....	134
	Appendix H Radio Frequencies.....	137
	Appendix I Agreements.....	138
	Appendix J Delegation of Authority.....	139
	Appendix K Fire Report Forms FMIS.....	141
	Appendix L Debris Burning Policy, Procedures, and Checklist.....	145
	Appendix M Annual Fire Management Plan Review Checklist.....	149

## LIST OF TABLES

Table 1	Refuge Habitat Types.....	27
---------	---------------------------	----

<b>Table 2</b>	<b>Wildland Fire Occurrence within Authorized Refuge Boundary.....</b>	<b>31</b>
<b>Table 3</b>	<b>Monthly Summary of Climate in Refuge Area.....</b>	<b>32</b>
<b>Table 4</b>	<b>Guidance, Constraints and Fire Management Unit Applicability.....</b>	<b>34</b>
<b>Table 5</b>	<b>NFDRS Indices and Staffing Class Break Points.....</b>	<b>75</b>

#### **LIST OF FIGURES**

<b>Figure 1</b>	<b>Rappahannock River Valley NWR and Vicinity Map.....</b>	<b>11</b>
<b>Figure 2</b>	<b>Fire Management Unit 1 Map.....</b>	<b>42</b>
<b>Figure 3</b>	<b>Fire Management Unit 2 Map.....</b>	<b>51</b>
<b>Figure 4</b>	<b>Fire Management Unit 3 Map.....</b>	<b>57</b>
<b>Figure 5</b>	<b>Fire Management Unit 4 Map.....</b>	<b>63</b>
<b>Figure 6</b>	<b>Fire Management Unit 5 Map.....</b>	<b>68</b>

## **1.0 INTRODUCTION**

### **Purpose of the Fire Management Plan (FMP)**

Department of Interior (DOI) fire management policy requires that every area with burnable vegetation must have an approved Fire Management Plan (FMP) (620 DM 1.4B). In addition, the U.S Fish and Wildlife Service Fire Management Manual (621 FW 1.4-6) states that "...all refuges with vegetation that can sustain fire must have a Fire Management Plan". The underlying purpose of the FMP is to provide decision support to aid managers in making informed decisions regarding operational procedures and values to be protected and/or enhanced. This FMP for Rappahannock River Valley National Wildlife Refuge (RRVNWR) will provide guidance on a wide range of fire management activities including preparedness, prescribed fire, wildland fire, and prevention and education activities. Values considered in the FMP include: the protection of Refuge property, structures and improvements, cultural and historic sites, neighboring private property, endangered and threatened species of concern, and the enhancement of Refuge wildlife habitat.

This FMP complies fully with Department of Interior and U.S. Fish and Wildlife Service requirements that provide for a review and/or revision at a minimum of a five-year interval, or when significant changes in program direction are proposed (e.g. significant land-use changes are made to FWS lands, etc).

The goal of wildland fire management is to plan and implement actions that help to accomplish the mission of the National Wildlife Refuge System, which 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.

The FMP identifies and integrates all wildland fire management and related activities within the context of an approved refuge Comprehensive Conservation Plan (CCP). RRVNWR is currently in the process of developing a Comprehensive Conservation Plan (2008) that will define a program to manage wildland fires (wildfire, prescribed fire, and wildland fire use) on Refuge lands. The CCP will ensure that wildland fire management goals and objectives are fully integrated into all aspects of Refuge operations.

### **Annual Fire Management Plan Review**

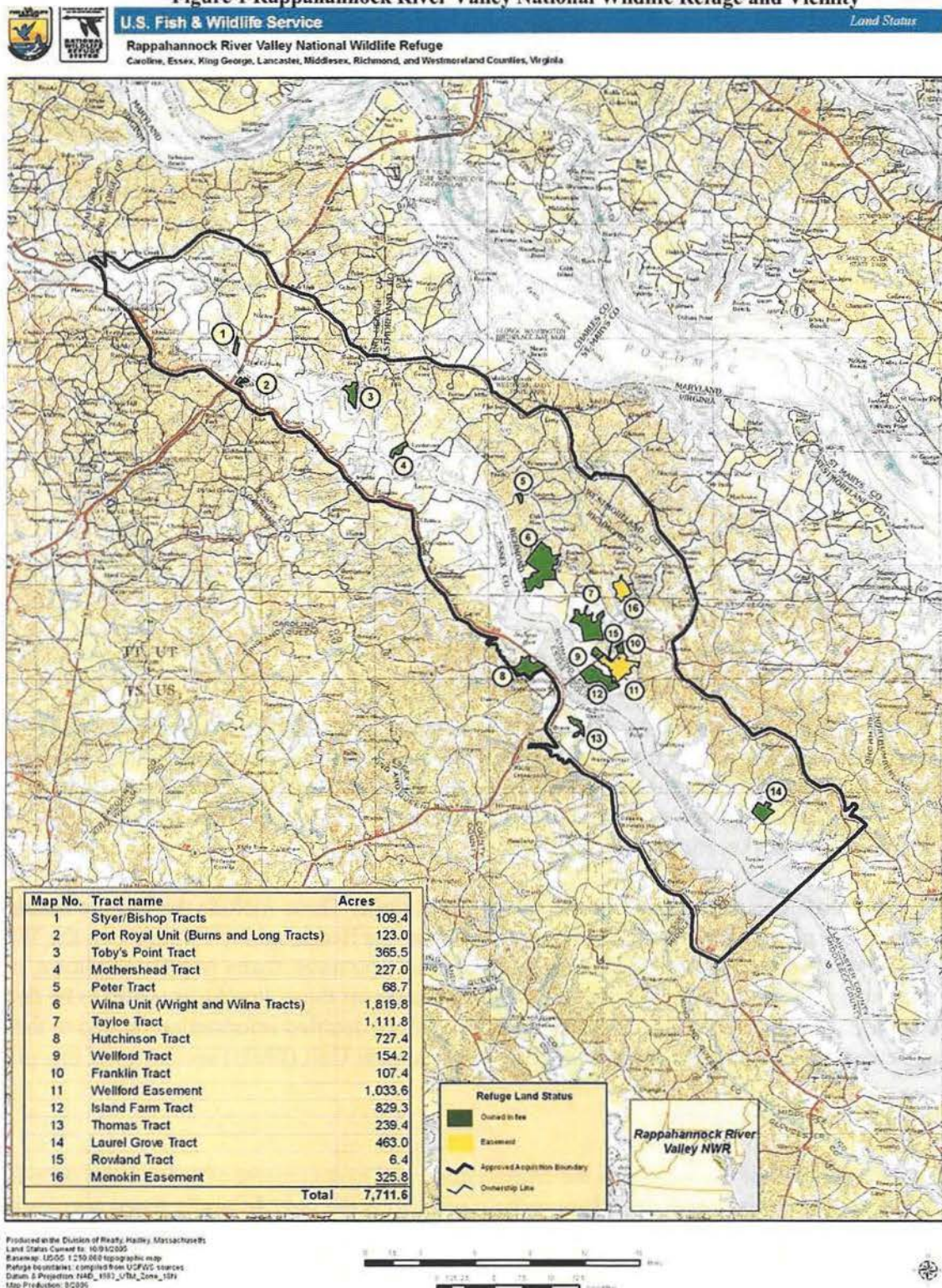
This Fire Management Plan will be reviewed annually and updated as needed, upon local agency administrator approval. Revisions of Fire Management Plans with regional review and concurrence are required every five years and also following the completion of a new (or significantly revised) Comprehensive Conservation Plan or Habitat Management Plan. Appendix M contains the checklist and approval form to be used to accomplish these objectives.

### **General Description of the Area Covered in the Fire Management Plan (Rappahannock River Valley National Wildlife Refuge).**

RRVNWR (Figure 1) is located on the Atlantic Coastal Plain of the Commonwealth of Virginia, in the Rappahannock River Watershed from which the Refuge derives its name. The Refuge is authorized to protect through fee simple purchase or conservation easement up to 20,000 acres in the lower Rappahannock River Valley. Currently (April 2008), the Refuge is 7,711 acres (7,411 acres burnable) in size. Of that total, 6,352 acres are owned in fee and 1,359 acres are in conservation easements. The headquarters of the Refuge is located



Figure 1 Rappahannock River Valley National Wildlife Refuge and Vicinity





approximately 53 miles southeast of Fredericksburg, Virginia and 110 miles southeast of Washington, D.C near Warsaw, Virginia.

The Refuge contains a wide array of habitat types, including mixed hardwood forests, typical of the Chesapeake Lowlands, Ecoregion #58 (TNC, NatureServe), grasslands and agricultural fields, lakes, rivers, streams, wetlands and shallow waters, as well as open water located in tidal rivers and the estuary. This diversity supports more than 2,700 species of plants and animals, including Service trust resources (endangered and threatened species, migratory birds, and anadromous fish). The Refuge is made up of a number of relatively small, but diverse, units that are distributed widely throughout the geographic area. At the present time, most Refuge land is adjacent to private property, although some lands are currently protected by easements that are located within the authorized boundary. For example, the Virginia Outdoors Foundation holds the following acreage in easements:

Caroline County – 293 acres  
Essex County – 1,203 acres  
King George County – 1,031 acres  
Lancaster County – 54 acres  
Middlesex County – 241 acres  
Richmond County – 2,869 acres

The Nature Conservancy has an easement in Essex County (175 acres) and owns two Preserves in Westmoreland (729 acres) and Caroline Counties (350 acres).

### **Significant Values to Protect**

Units of the RRVNWR are surrounded by privately owned land on much of its boundary. A wildfire on Refuge property in most instances would at some point threaten private property. Conversely, wildfires on private lands have the potential to threaten Refuge resources. The greatest threat to structures exists in those areas where private residences are found adjacent to the boundary. These areas will be discussed in detail in the appropriate Fire Management Unit (FMU) section(s) of this FMP.

There are numerous structures that require protection on the Refuge. These include the Refuge Headquarters office, residence, shop, garage, and storage buildings located at the Headquarters Complex on the Wilna Unit. In addition, there are scattered throughout the Refuge a number of structures, many in poor condition, that are remnants of previous private owners. The historical value of many of these structures is still to be determined, however, they could be at risk from the effects of a wildfire. More detailed information related to these and other cultural resources can be found in the appropriate Fire Management Unit (FMU) section(s) of this plan.

### **Threatened and Endangered Species**

One of the highest priorities of the Refuge is the conservation and management of federal and state-listed species. Of these, sensitive joint vetch (*Aeschynomene virginica*) is the only federally listed species with known occurrences. Small whorled pogonia (*Isotria medeoloides*), is potentially found on the Refuge, but has not been located. The bald eagle (*Haliaeetus leucocephalus*), no longer a federally listed species, is still considered a threatened species by the State of Virginia. Thus, it remains a priority species for conservation on the Refuge. The remaining endangered or threatened species are much less common within the Refuge boundary area and

occur only infrequently. A complete list can be found in the Environmental Assessment (2001) prepared for the Refuge fire management program in 2001, and discussion of rare or conservation concern plants can be found in the Refuge's Comprehensive Conservation Plan (2009).

## Cultural Resources

A limited number of cultural resource surveys have been accomplished on the Refuge. Most of these were completed before (1960's and 1970's) the establishment of the Refuge in 1994. Section 3.1 contains a detailed discussion of the cultural resources located on the Refuge and the potential for new discoveries.

## Mission of the Refuge

### Statutory Authority

The National Wildlife Refuge System Improvement Act of 1997 states that each refuge shall be managed to fulfill the mission of the Refuge System. *"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"*. The 1997 Act also states that the *"biological integrity, diversity, and environmental health of the System shall be maintained (Refuge Improvement Act; Public Law 105-57)*.

### Refuge Purpose

The National Wildlife Refuge Improvement Act of 1997 also states that each refuge *"shall be managed to fulfill...the specific purposes for which the refuge was established...."* Purposes of a refuge are those specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge sub-unit.

RRVNWR was established in 1994 to provide "long term protection to important tidal and freshwater wetlands, forested bottomland wetlands, low lying agricultural land, and upland habitat" in the Rappahannock River watershed. Accordingly, this FMP contains fire management objectives intended to support habitat protection, such as restoration and enhancement of wildlife habitats and hazard fuel reduction.

The general goals of the Refuge are applicable for current operations (2008) and apply on an interim basis as the Refuge moves towards the finalization and approval of its Comprehensive Conservation Plan (CCP). Pending CCP completion, this may require amending or complete revision of this FMP. For the interim time period, this FMP will be reviewed annually to ensure its consistency with the goals found in existing management plans and other Refuge documents. Also, an approved Environmental Assessment for the Refuge fire management program was prepared in 2001 can be found under separate cover.

The general management goals (Comprehensive Conservation Plan Draft, 2008) of the Refuge are to:

- Contribute to the biological diversity of the Mid-Atlantic region by protecting, enhancing, and restoring Refuge upland habitats, with an emphasis on breeding, migrating, and wintering birds.
- Maintain the long-term biological integrity of riparian habitats along the Rappahannock River and its tributaries for bald eagles and other migratory birds.

- Maintain and enhance the biological diversity and environmental health of tidal and non-tidal wetlands to benefit Federal listed species, waterfowl, other migratory birds, fish, shellfish, reptiles, and amphibians.
- Promote enjoyment and stewardship of our Nation's natural resources by providing high-quality, wildlife-dependent recreational and educational opportunities on Refuge lands and waters.
- Communicate and collaborate with local communities, Federal and state agencies, and conservation organizations throughout the lower Rappahannock River watershed to promote natural resource conservation and the mission of the National Wildlife Refuge System.

## **2.0 POLICY, LAND MANAGEMENT PLANNING AND PARTNERSHIPS**

The intent of this chapter is to establish the linkage between higher level planning documents, legislation, and the policies and actions described in this Fire Management Plan.

### **2.1 Fire Policy**

Specific high level planning documents, legislation, organizations and associated policies and actions provide guidance and direction to fire management operations described in this Fire Management Plan. These items are discussed in detail in the sections that follow.

#### **Federal Interagency Wildland Fire Policy**

The Guidance for Implementation of Federal Wildland Fire Management Policy (February 2009) provides the following implementation guidelines:

1. Wildland fire management agencies will use common standards for all aspects of their fire management programs to facilitate effective collaboration among cooperating agencies.
2. Agencies and bureaus will review, update, and develop agreements that clarify jurisdictional inter-relationships and define the roles and responsibilities among local, state, tribal and federal fire protection entities.
3. Responses to wildland fire will be coordinated across levels of government regardless of the jurisdiction at the ignition source.
4. Fire management planning will be intergovernmental in scope and developed on a landscape scale.
5. Wildland fire is a general term describing any non-structural fire that occurs in the wildland. Wildland fires are categorized into two distinct types:
  - a. Wildfires – Unplanned ignitions or prescribed fires that are declared wildfires.
  - b. Prescribed Fires – Planned ignitions.
6. A wildland fire may be concurrently managed for one or more objectives. These objectives can change as the fire spreads across the landscape. Objectives are affected by changes in fuels, weather, topography, varying social understanding and tolerance, and involvement of other governmental jurisdictions having different missions and objectives.
7. Management response to a wildland fire on federal land is based on objectives established in the applicable Land/Resource Management Plan and/or the Fire Management Plan.
8. Initial action on human-caused wildfire will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety.

9. Managers will use a decision support process to guide and document wildfire management decisions. The process will provide situational assessment, analyze hazards and risk, define implementation actions, and document decisions and rationale for those decisions.

### **National Fire Plan**

This FMP meets the policy and direction contained in the National Fire Plan because it emphasizes the following primary goals of the 10-year Comprehensive Strategy and Cohesive Strategy for Protecting People and Sustaining Natural Resources:

- Improving fire prevention and suppression.
- Reducing hazardous fuels
- Restoring fire-adapted ecosystems.
- Promoting community assistance.

### **Department of Interior (DOI) Policy**

This FMP incorporates and adheres to DOI policy as outlined in 620 DM 1 by giving full consideration to the use of wildland fire as a natural process and tool during the land management planning process and by providing the following:

- Wildland fires, whether on or adjacent to lands administered by the Department, which threaten life, improvements, or are determined to be a threat to natural and cultural resources or improvements under the Department's jurisdiction, will be considered emergencies and their suppression given priority over other Departmental programs.
- Bureaus shall cooperate in the development of interagency preparedness plans to ensure timely recognition of approaching critical wildland fire situations; to establish processes for analyzing situations and establishing priorities, and for implementing responses to wildland fire in these situations.
- Bureaus will enforce rules and regulations concerning the unauthorized ignition of wildland fires, and aggressively pursue violations.

### **Interagency Groups that Assist in Fire Management Planning and Implementation**

#### **The Department of Interior Fire Coordination Committee (IFCC)**

The IFCC guides and coordinates the development of wildland fire policy among Department of Interior agencies and provides leadership and advice for the development, coordination and maintenance of wildland fire management capabilities, as well as for the standardization of procedures, methods, and practices relating to fire management in the Department.

#### **The Wildland Fire Leadership Council (WFLC)**

The WFLC was chartered in 2002. It is comprised of representatives from the major federal departments, including the Department of the Interior as well as the director of the Fish and Wildlife Service. Their purpose is to ensure the policy coordination, accountability, and effective implementation of the National Fire Plan and the Federal Wildland Fire Management Policy.



## **The National Wildfire Coordinating Group (NWCG)**

The NWCG was chartered in 1976 by the Secretaries of Agriculture and Interior to develop interagency standards and guidelines for incident management. In October 2007 the NWCG was re-structured to incorporate several other wildland fire organizations and reduce redundancy, simplify governance, eliminate confusion concerning roles and responsibilities, and provide improved coordination for policy, standards, and operations.

## **U.S. Fish and Wildlife Service Policy**

This Fire Management Plan addresses a full range of potential wildland fires and considers a full spectrum of tactical options (from monitoring to intensive management actions) for responses to wildland fires in order to meet Fire Management Unit (FMU) objectives. It fully applies procedures and guidelines in the Service Fire Management Handbook and the Interagency Standards for Fire and Fire Aviation Operations and affirms these key elements of FWS fire policy:

- Firefighter and public safety are the first priority of the FWS Fire Management Program. The FWS will not willingly expose an employee, contractor, or cooperator to life-threatening conditions or situations.
- Only trained and qualified fire management leaders and agency administrators will be responsible for and conduct fire management activities.
- Trained and certified employees will participate in the wildland fire management program as the situation requires. Non-certified employees will provide support as required and necessary.
- Fire Management planning, preparedness, wildland and prescribed fire operations, monitoring, and research will be conducted on an interagency basis with involvement by all partners to the maximum extent practicable.
- The responsible agency administrator has coordinated, reviewed, and approved this FMP to ensure consistency with approved land management plans, values to be protected, natural and cultural resource management plans, and that it addresses public health issues related to smoke and air quality.
- Fire, as an ecological process, has been integrated into resource management plans and activities on a landscape scale, and where applicable, across agency boundaries. Its implementation is always based upon the best available scientific information.
- Wildland fire is used to meet identified resources management objectives and benefits when appropriate.
- Prescribed fire and other treatment types will be employed whenever they are the appropriate tool to reduce hazardous fuels and the associated risk of wildfire to human life, property, and cultural and natural resources and to manage FWS lands for habitats as mandated by statute, treaty, and other authorities.
- Response to wildland fire will consider firefighter and public safety, cost effectiveness, values to be protected, and natural and cultural resource objectives.
- Staff members will work with local cooperators and the public to prevent unauthorized ignition of wildland fires on FWS lands.

## **Fire Management Policy Specific to RRVNWR**

RRVNWR will utilize the following procedures for *every* wildland fire occurring on the Refuge:

- In those situations where decisions need to be made regarding suppression actions and their potential impacts upon natural or cultural resources, the Refuge Manager or his/her designee will be immediately

consulted. If life or safety issues exist that require *immediate* attention without a reasonable opportunity for consultation to take place, all actions taken will be fully documented, including the rationale for their implementation.

- The Refuge Manager may have a designated Resource Advisor (RA) from the Refuge staff act in his/her stead regarding management decisions relating to fire management. Where applicable, the RA will be designated by the Refuge Manager as soon as is practical on each incident. This may be accomplished by whatever means the Refuge Manager deems appropriate: i.e. rotation, personal assignment, etc.
- The use of heavy mechanized equipment (e.g. dozers, tractors, etc) requires the approval of the Refuge Manager or his/her designated RA prior to their use on an incident.
- The use of firefighting retardant (aerial or ground delivered) at *any* location on Refuge land requires the approval of the Refuge Manager or his/her designated RA prior to use on an incident. This local policy is more restrictive than FWS Agency policy that prohibits the use of aerial retardants and foaming agents at distances less than 300 feet from riparian resources.

## **2.2 Land and Resource Management Planning**

This section of the RRVNWR Fire Management Plan identifies those documents that establish the goals, objectives, standards, guidelines, desired future conditions, and constraints detailed in Chapter 3.1 of this plan.

### **Land Management Planning**

#### **Comprehensive Conservation Plan (CCP)**

Under the auspices of the National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act), all national wildlife refuges are required to develop a Comprehensive Conservation Plan (CCP). This document provides a framework for guiding refuge management decisions. All refuges are required by law to complete their CCP by 2012. RRVNWR is currently in the final stages of review and approval of a Draft CCP (2008) and expects to have it completed in 2009.

#### **Habitat Management Plans**

The Refuge currently has no Habitat Management Plan (HMP). A HMP will be completed as a step-down plan once the Refuge Comprehensive Conservation Plan is completed. The Refuge is currently operating under internal management plans and an Annual Habitat Work Plan (AHWP).

#### **Annual Habitat Work Plan (AHWP)**

Each year the Refuge prepares an Annual Habitat Work Plan (AHWP). This plan includes recommendations for habitat management strategies and prescriptions for the coming year. It serves as an annual tool to implement the goals and objectives established in the Refuge's CCP. Prescribed fire and non-fire hazardous fuel projects are identified conceptually in this document and then refined/completed in project-specific plans.



## **Regional and State Plans**

The Refuge will continue to work in concert with federal, state, and regional partners in the protection and conservation of resources on the Refuge through the participatory development and implementation of various plans and programs.

The Refuge cooperates with the Commonwealth of Virginia in helping to manage state-listed species of concern through the application of effective habitat enhancement and protection techniques and strategies. One of the primary cooperative efforts in this regard is the partnership that exists regarding the Wildlife Action Plan (WAP), a combined effort of state and federal natural resource agencies, sportsmen, conservationists, and citizens combined in a common vision for the conservation of the Commonwealth of Virginia's wildlife and the habitats in which they live. Virginia's plan identifies 925 species of greatest conservation need, and also focuses on the habitats that support these species. The Refuge is a primary resource for many of these wildlife species and provides much of the key habitat necessary for their conservation.

## **Compliance with Regulatory Acts**

### **National Environmental Policy Act (NEPA)**

The FWS has procedures for assessing environmental effects of specific Service actions. National Environmental Policy Act (NEPA) compliance was accomplished by the completion of an Environmental Assessment (EA) for the fire management program in December, 2001. After a public comment period, the Refuge Project Leader signed a Finding of No Significant Impact (FONSI), which is in the official files at Refuge Headquarters. As a part of that planning process, the Endangered Species Act of 1973 (ESA), the National Historic Preservation Act of 1966 (NHPA), and the Archeological Resources Protection Act of 1979 (ARPA) were included as a part of the EA prepared for the fire management program. All FMP actions comply with Section 106 of NHPA.

In conjunction with the 2001 EA, the Refuge requested a Biological Assessment from Ecological Services seeking concurrence regarding actions authorized by the Fire Management Plan and its potential effects on Refuge resources.

## **2.3 Fire Management Partnerships**

### **Internal Partnerships**

RRVNWR is supported by the Virginia-West Virginia Zone fire program, based out of Great Dismal Swamp NWR. A centralized fire cache, suppression equipment and dedicated fire management staff are located at this hub refuge, and are tasked with supporting the refuges contained within the Zone. A Zone Fire Management Officer (ZFMO), stationed at Great Dismal Swamp National Wildlife Refuge, Virginia, is a shared resource for refuges located in Virginia that are located within Region 5. The ZFMO assists the Refuge in intra-agency and interagency fire management needs. The ZFMO supplies technical assistance relative to fire management activities and is responsible for oversight and coordination of the Refuge's fire management program, including wildfires, prescribed burning, and fire-related dispatch and mobilization. He/she has primary responsibility for matters pertaining to preparation and implementation of the Fire Management Plan and represents the Refuge when coordinating fire related activities with other refuges, the Regional Fire Management Coordinator

(RFMC), and local, state and other federal fire organizations. The ZFMO also maintains training and qualification records for Refuge personnel, coordinates Refuge fire training, maintains fire records and systems, oversees equipment readiness, and coordinates the mobilization of Refuge resources for wildland fire assignments.

### External Partnerships

- RRVNWR is an active partner in the interagency Fire Program Analysis (FPA) system. The FPA is a common interagency decision support tool for wildland fire planning and budgeting. FPA will be used to enable wildland fire managers in the five federal land management agencies (including FWS), as well as state and local organizations, to plan fire management activities jointly. RRVNWR is included in the Del Mar Va (SA\_MD\_001) Fire Planning Unit (FPU) of the Fire Program Analysis (FPA).
- The Virginia Interagency Coordination Center (VICC) is located in Charlottesville, Virginia. VICC, a collaborative interagency effort of the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, and Virginia Department of Forestry, serves as the state dispatch center for a wide range of fire management activities. One of the primary missions of the center is to assist member agencies in receiving the resources they need to suppress wildfires. Once a need for additional resources (personnel or equipment) is determined at the local level, refuges can contact VICC directly with their requests for assistance. VICC can then draw from a full range of available resources to meet the specific needs of the requesting entity. Assistance can be procured from state, regional, and national levels. In its role as a state dispatch center, VICC works closely with the geographic area coordination center discussed in the following paragraph (SACC) and the National Interagency Coordination Center (NICC) located at Boise, Idaho to provide resources to the region as well as to the rest of the United States. VICC also provides a wide range of fire management support activities to its participating agencies, including the collection and dissemination of intelligence data related to fire management (resource availability, fire danger, staffing levels, potential assessment reports related to fire danger, fire occurrence, fire weather, and training). Contact information can be found in the Fire Directory located in Appendix E.
- RRVNWR is located in the geographic area served by the Southern Area Coordination Center (SACC). Federal and state agencies located within the 13-state southern area are served by the center (including Puerto Rico and the U.S. Virgin Islands). They receive logistical support, resource assistance, and intelligence information for anticipated and ongoing wildland fire activity. SACC facilitates movement of resources (people, aircraft, and equipment) among any of the agencies located in the area. In addition, SACC monitors wildland fire potential, weather, and wildland fire use within the area. SACC also responds to requests for support to other geographic areas from the National Interagency Coordination Center (NICC) located in Boise, Idaho. Although the primary focus of SACC is to respond to wildland fire incidents, the center now provides support for a wide range of all-risk incidents such as earthquake, flood, hurricane, hazardous material spills, etc. SACC also provides a vehicle through which its members can attend training, workshops, and/ or special projects.
- The Refuge relies heavily upon local resources to supplement fire management activities. Refuge lands fall within the protection umbrella of each of seven county fire departments where land acquisition has either taken place or is expected to occur in the future (Caroline, Essex, King George, Lancaster, Middlesex, Richmond, and Westmoreland). Each of these entities considers the Refuge as being under its county protection responsibility, and will respond through initial action resources when notified

and/or requested. In addition, local rural communities near Refuge lands are capable of providing fire management resources. Draft Memorandums of Understanding (MOU) have been prepared for fire departments located in the communities of Warsaw, Tappahannock, Oak Grove, Port Royal, and King George

- Virginia refuges have a recently completed Cooperative Agreement with the Virginia Department of Forestry, National Park Service, and the U.S. Forest Service. The Agreement specifies annual meetings between representatives of the interagency partners (including FWS) to update personnel, equipment lists, contact numbers, communications data, and exchange other pertinent information relating to fire management via an Annual Operating Plan (AOP) mechanism.
- A blanket agreement with The Nature Conservancy (TNC) allows for the use of FWS and TNC resources for meeting shared prescribed fire needs, including those involving training and personnel.

### **3.0 FIRE MANAGEMENT UNIT CHARACTERISTICS**

A Fire Management Unit (FMU) is a land management area defined by the objectives, management constraints, topographic features, access, values to protect, political boundaries, fuel types, fire regimes, etc, that set it apart from the characteristics of another land management area. Each FMU may have distinct management objectives and pre-selected strategies designed to accomplish those objectives. The identification of Fire Management Units (FMU) within a refuge represents the cornerstone of fire management planning. The process of creating distinct FMU's divides the larger refuge landscape into smaller geographic areas, allowing them to be more easily described in terms of the characteristics they possess and helps frame associated planning guidance based upon those characteristics.

RRVNWR is divided into five fire management units (FMU's) based primarily on location (response time from local fire suppression resources (county and Refuge), land use and values to be protected. As the land acquisition process for the Refuge continues, additional FMU's are likely to be added to this FMP as a part of the annual review process.

#### **3.1 Area-Wide Fire Management Considerations**

The intent of this section is to document overall wildland fire management program guidance and characteristics that are common to *all* five FMU's of the RRVNWR. Goals and Objectives of the Refuge are consistent with and fully support the principles outlined in the Interagency Standards for Fire and Fire Aviation Operations, 2008 (NFES 2724).

#### **Management Goals, Objectives and Constraints in Comprehensive Conservation Plans**

RRVNWR is currently in the process of preparing a Comprehensive Conservation Plan (CCP). The following goals, objectives, and constraints reflect management direction from the present DRAFT (2008) of the CCP. If necessary, they will be changed or modified to reflect direction in final versions of the CCP.

#### **Goals and Objectives**

- Make firefighter and public safety the highest priority of every fire management activity.

- Suppress all wildland fires in a safe, efficient, and cost-effective manner through the selection and utilization of the proper response to the type and complexity of the fire.
- Protect human life, property, and natural and cultural resources from damage by wildland fire.
- Collaborate with local, state, and federal partners when planning and implementing wildland fire preparedness, prevention, suppression, and prescribed fire activities. Promote an interagency approach to managing wildland fires on an ecosystem basis.
- Identify fire management research needs, work with partners to develop proposals and obtain funding, and apply research results to fire planning through the adaptive management process.
- Educate the public, cooperating agencies and employees about the scope and effects of wildland fire management, including prescribed fire, hazardous fuels management (both fire and non-fire), resource protection, prevention, hazard/risk assessment, mitigation and rehabilitation, and the role of fire in ecosystem management.
- Utilize appropriate fire management activities, including fire suppression, prescribed fire, and non-fire hazardous fuel reduction, to promote and preserve healthy and diverse ecosystems.
- Restore fire as a natural, dynamic ecosystem process to the maximum extent possible, maximizing wildlife and vegetative diversity by maintaining plant communities in various stages of successional development (e.g. early and late successional grasslands and shrubland). Emphasis will be placed on restoration and perpetuation of ecosystems and vegetation native to the Mid-Atlantic region and the reduction of non-native and invasive vegetation.
- Integrate fire management activities with all other aspects of Refuge management programs.
- Maintain a level of fully trained and qualified personnel on the Refuge to meet wildland fire suppression and prescribed fire needs commensurate with values at risk and necessary for natural resource objective accomplishment.
- Actively seek productive relationships with adjacent cooperating agencies (Virginia Department of Forestry, local Fire Departments, The Nature Conservancy (TNC), etc) that both protect and enhance land and resource values of the region. (Refuge DRAFT CCP 2008).

### **Fire Management Strategies**

RRVNWR will adopt the following strategies as a means to meet the goals and objectives of the Refuge:

- All natural and human-caused wildfires on the Refuge will be suppressed. Evaluation and selection of responses to a wildfire will include consideration of risks to the public and firefighter safety, threats to values to be protected, and the costs of various strategies. Under normal conditions, most wildfires on the Refuge can be suppressed by taking quick and aggressive initial action, directly along the fire's perimeter, using available local resources.
- Refuge fire suppression preparedness and Normal Unit Strength (NUS) levels are geared towards initial action on one or two small incidents (less than 5 acres). Assistance from nearby rural fire departments is generally very rapid, often with more suppression resources arriving than are necessary. RRVNWR has no extended action capability. Large fires (a rare event at the Refuge), or fires that escape initial actions will require assistance from surrounding cooperating agencies. The FWS has agreements established with the Commonwealth of Virginia for mutual aid and assistance. The Virginia Department of Forestry can provide the most immediate assistance with heavy suppression equipment, which would be of greatest benefit in the event of a large fire. Service personnel from the Zone fire management program located at Great Dismal Swamp NWR can provide additional resources such as overhead, line support, and additional equipment as needed.



- A basic program of fuel modification commensurate to values at risk is necessary to accomplish the overall fire protection objectives of the Refuge. Determining locations where hazardous fuels exceed acceptable levels is an ongoing process. The use of prescribed fire and non-fire mechanical hazardous fuel reduction are the primary treatment methods utilized to reduce hazardous fuels.
- The Refuge will continue to foster positive relationships with the Virginia Department of Forestry, local rural fire departments and other federal agencies, thus providing the means to promote local, regional and national cooperation. As conditions and events permit, the Refuge will contribute fire fighting resources to meet fire management needs at all levels. Based upon guidance provided by the new Federal Fire Policy, programs to plan, fund, and implement an expanded use of prescribed fire in fire-dependent ecosystems, on a landscape-scale, will be explored with all federal, state and private cooperators. The ZFMO will pursue opportunities along these lines to further resource protection and management needs beyond Refuge boundaries.
- Conduct all fire management programs in a manner consistent with applicable laws and regulations.
- Interior roads, ditch corridors, fire roads, trails, and fuel breaks on the Refuge will be maintained, to the level appropriate and commensurate with natural and cultural resource values, as a means to provide pre-existing barriers to the spread of wildland fire.
- Mechanized equipment will not be used in areas where sensitive natural and cultural resources are located, except in those situations where emergency suppression action must be taken to preserve life and/or property. In either case, Natural and cultural resource professionals will be consulted at the first opportunity.
- Where available, existing natural fuel breaks will be utilized as an alternative to line construction.
- Promote opportunities for training in fire management for Refuge staff and cooperators.
- Prevent un-planned human-caused ignitions. In cooperation with the Virginia Department of Forestry, utilize established fire prevention programs to minimize human-caused wildland fires. Special attention will be given to the establishment of working relationships with adjacent landowners.
- Utilize minimum impact suppression strategies and tactics (MIST), commensurate with safety, as a means to minimize impacts on Refuge natural and cultural resources.
- The use of fire-fighting foams and retardants will not be allowed any closer than 300 feet from water sources unless threats to life and/or property exist. The Refuge Manager's approval is required for use.
- Develop cost-effective fire monitoring procedures to ensure fire management activities (fire suppression, prescribed fire, and non-fire hazardous fuel reduction) meet Refuge goals and objectives.
- Promote public understanding of fire management programs by generating support through effective public education and through the utilization of outreach and education opportunities.

## **Fire Management Strategy Discussion**

### **Background**

RRVNWR is made up of a number of individual land management units, most of which are separated from one another by time and distance. In many units, private lands adjoin or even surround Refuge property and are often located in areas where land ownership and boundary distinctions are difficult to ascertain.

Based upon its dispersion across the landscape, the Refuge land base is small, with relatively high resource values immediately adjacent to the Refuge boundary. By Virginia standards, most of the counties surrounding Refuge lands are not very densely populated, but the potential for a wildfire to spread quickly off of Refuge lands can be relatively high during certain times of the year. During the spring and fall months, an abundance of

continuous and fine fuels can be found that readily supports combustion when exposed to an ignition source. When warmer temperatures and high winds are present, the potential for increased wildfire occurrence is significantly increased. Suppression strategies are ultimately governed by threats to the values at risk, on and off the Refuge, and the costs associated with suppression are likewise overridden by those threats.

### Overall Approach

Based upon the factors discussed in the preceding paragraphs, the Refuge has made a determination that wildland fire use (WFU) is not appropriate for achieving habitat or fuel management goals on its lands at this time. However, the use of prescribed fire is a socially acceptable management technique; one that has been used successfully in the past, both on the Refuge and in the surrounding area. When prescribed fire is used, burn units are generally small, and a full treatment is generally accomplished in one day or less. Smoke management is not usually an issue, as most burns are completed under favorable dispersal conditions and plume trajectory is away from smoke sensitive areas (population centers, roads, structures).

Social issues allowing wildfire to assume a more natural role is another concern. Within the counties surrounding Refuge lands, there is a relatively high occurrence of arson generated ignitions, and strong feelings persist against permitting wildland fire to assume a more natural role.

The implementation of this FMP will allow the Refuge to conduct a fire management program that is safe, cost-effective, and that allows for the suppression of wildfires that threaten Refuge resources and those of its neighbors. In addition, it provides for a pro-active program of fuels and resource management through the use of prescribed fire and non-fire methodologies. Both of these tools are generally cost-effective and are acceptable to the public and other fire suppression organizations in the area. Areas where hazardous fuels are located may be treated through the use of non-fire (mechanical) methods and prescribed burning. From a habitat management standpoint, habitat maintenance achieved through the use of fuels management (non-fire and prescribed fire) is of benefit to most early successional species.

### Refuge-Wide Constraints

Land management units on the Refuge are generally widely dispersed within the acquisition boundary. As a result, Refuge lands can currently be found in five counties (Caroline, Essex, King George, Richmond, and Westmoreland). In addition, Lancaster and Middlesex Counties are located within the land acquisition boundary of the Refuge. In order to provide the highest level of protection from wildfire for Refuge resources, it is essential that effective working relationships with each of the aforementioned counties be developed. To that end, the Refuge will divide its lands into Fire Management Units (FMU's) that facilitate the operational responses of both Refuge and county fire suppression resources when called upon to report and/or respond to a wildfire on or near Refuge lands (Fire Management Units will be discussed in detail beginning with section 3.2 of this FMP).

Heavy mechanized equipment (e.g. bulldozers) should not be used off of designated roadways without authorization from the Refuge Manager. Suppression strategies and tactics that have the potential to impact fragile habitats or private land must be weighed carefully against the need to protect property within and adjacent to the Refuge.

Prescribed burning operations will be curtailed in specified areas of the Refuge during peak nesting or brooding periods. This applies in particular to bald eagle nesting locations. Prior to any prescribed burning, and as a part of the planning process, each prospective unit should be evaluated for the presence of nesting birds and the Refuge Biologist consulted for final determination.

Management of smoke is a prime consideration of Refuge fire management operations. The presence of smoke on roads and in areas and at times when visibility is important to both public safety and viewshed integrity mandates that mitigation measures be given primary emphasis during fire management activities.

The use of firefighting foams and retardants can be damaging to Refuge resources. No foam or retardant will be used within 300 feet of any water source. In addition, the Refuge Manager's approval is needed for use.

### **Desired Future Conditions**

Whenever possible management activities on the Refuge attempt to restore or mimic natural ecosystem processes or functions and thereby maintain biological diversity, integrity, and environmental health. Given the continually changing environmental conditions and landscape patterns of the past and present (e.g. rapid development, climate change, etc) relying on natural processes alone is not always feasible, nor is it always the best management strategy for conserving wildlife resources. Uncertainty about the future requires that the Refuge manage its resources within a *natural range of variability* rather than trying to emulate an exact and arbitrary point in time. This allows species and natural communities to evolve with changing conditions, rather than trying to maintain a condition of absolute stability.

In keeping with the primary Refuge mission of providing healthy and diverse ecosystems, management practices will be utilized that provide the best opportunities for protection and enhancement of wildlife and their habitats. In order to provide the desired future conditions necessary to meet Refuge objectives, the Environmental Assessment (EA) developed for this Fire Management Plan has identified a balanced fire management program that utilizes a combination of different response strategies and tactics. Selection of strategies and tactics will depend upon values such as public and firefighter health and safety, location of the fire, fuel types, fuel conditions, seasonality, smoke considerations, management objectives, vegetation type, implementation costs, and availability of suppression resources. Prescribed fire and non-fire hazardous fuel reduction strategies will also be used in some areas to remove hazardous fuels, enhance wildlife and habitat, reduce invasive species, and meet other resource management goals as identified in current Refuge management.

### **Management Goals, Objectives, and Constraints from Other Sources**

RRVNWR currently is operating under guidance provided by the following approved Management and Operational Plans:

Final Environmental Assessment (FEA) and Land Protection Plan (LPP), 1994.

At this point in time, the operational plan(s) most directly linked to the FMP are the Final Environmental Assessment and the Land Protection Plan, the founding documents for the Refuge. When completed, the Refuge CCP will also be an important guiding document.



In addition to the plans discussed above, the following criteria from other sources (noted in parenthesis) apply at RRVNWR:

A response is required for every wildfire on or threatening Refuge lands (Service Manual 095 FW 3).

- The range of responses to wildfires may include direct or indirect attack of high/low intensity, or surveillance and monitoring to ensure fire spread will be limited to a designated area. (Service Manual 095 FW 3).
- The Refuge will actively seek productive relationships with adjacent cooperating agencies (Virginia Department of Forestry, County and Volunteer Fire Departments, etc) that both protect and enhance land and resource values of the region. (Refuge DRAFT CCP).
- Consultation with the Virginia State Historic Preservation Officer (SHPO) will be undertaken on all projects identified as having possible interaction with cultural resources. (FMP, 2002)

### **Threatened and Endangered Species**

The Refuge evaluates potential impacts to threatened and endangered species prior to the implementation of any prescribed burn. If the Refuge Manager determines that prescribed fire may have an impact on listed species, a Section 7 consultation will be conducted with the Ecological Services Virginia Field Office. The Refuge also takes precautions to protect state species of concern during prescribed burning planning and implementation.

### **State Historic Preservation Office**

RRVNWR utilizes FWS archeologists for work related to cultural resources on the Refuge but has no direct communications with the State Historic Preservation Officer (SHPO). As a matter of policy, regional FWS archeologists *do* consult with the SHPO on matters pertaining to cultural resources found on the Refuge.

### **Climate Change**

There is general agreement among most of the scientific community that global climate change, occurring in part as the result of emissions of carbon dioxide and other greenhouse gases resulting from human activities, will lead to significant impacts across the United States and the world (Joint Science Academics' Statement 2005). The effect of climate change on wildlife and habitats is expected to be variable and perhaps species-specific, with a general trend of ranges shifting northward. Uncertainty about the future effects of climate change requires refuge managers to use adaptive management in order to maintain healthy ecosystems in light of the unpredictability (Inkley et al 2004). This involves improving or adjusting policies, procedures, and practices based upon the outcomes of monitoring of management activities and may result in changes to regulations, shifts in active habitat management plans, or changes in management planning. In response to these potential changes, this Fire Management Plan will rely closely upon the results of its monitoring program and be ready to employ adaptive management techniques where they are needed as a means to maintain healthy, connected, and genetically diverse wildlife populations and the habitat that supports their growth and sustains their viability.

## **Cost Effectiveness**

Maximizing the cost effectiveness of any fire operation is the responsibility of all persons involved. This includes those individuals that authorize, direct, or implement operations. Cost effectiveness is the most economical use of the resources necessary to accomplish project/incident objectives. Accomplishing these objectives safely and efficiently will *not* be sacrificed for the sole purpose of minimizing the costs involved. Care will be taken to ensure that expenditures are commensurate with the values to be protected. Many factors outside of the biophysical environment may influence spending decisions, including those of the social, political, and economic realms.

The Wildland Fire Decision Support System (WFDSS) or other required wildfire decision support tool will be used for the analysis of integrated risk and cost management.

## **Characteristics Common to All Fire Management Units**

Characteristics of the Refuge described in this section are relevant to the entire Refuge and all of the Fire Management Units. Those characteristics specific to a particular FMU will be discussed in the appropriate section (3.2, 3.3, 3.4, 3.5, and 3.6) describing the attributes for that particular FMU.

## **Topography**

The lower Rappahannock River Valley is located within the Coastal Plain Province. Major physiographic units within the area of the Refuge include coastal plain uplands, low marine terraces, and fluvial river terraces. The coastal marine uplands range in elevation from between 90 and 170 feet above sea level. Low marine terraces vary in elevation from 10 to 50 feet above sea level and are generally level. This land feature parallels the Rappahannock River. Fluvial marine terraces range in elevation from sea level to 10 feet above sea level and are located along the Rappahannock River and its major tributaries (1994 FEA). At first glance, the topography of the area would be described as flat to gently rolling. Although this is certainly true in those areas where roads and farm fields are visible, closer to the Rappahannock River many creek drainages can be found that dissect the landscape. Steep ravines, some 80 feet deep or more, are found in many areas. Along some sections of the river, particularly the Fones Cliffs section, steep-faced cliffs of over 100 feet in height are located.

## **Hydrology**

The Rappahannock River, a portion of which flows through the Refuge boundary, is one of several that flow into the western side of the Chesapeake Bay (others are the Potomac, York, and James Rivers). The watershed of the river contains an array of habitat types, including those that are representative of riparian habitats (e.g. lakes, streams, wetlands and associated shallow waters), as well as open water in tidal flats and the estuary. Because the river that lies within the Refuge boundary is saline (0-15 parts per thousand), it supports a wide array of habitat types that provide breeding and living space for an enormous variety of vegetative, fish, and wildlife species.

Given the wide dispersal of wetlands throughout much of the Refuge, there is a potential for degrading water quality as a result of an intense wildfire, either by pollution from chemical sources, or in the long term, sedimentation that results from a loss of ground cover.

## Soils

The top four soil types found on the Refuge, comprising well over 50% of the total area, include Rappahannock muck (tidal flats, depressions, floodplains), Rumford soils (15-50% slopes, depressions and seeps), Tomotely fine sandy loam (marine terraces), and Nanesmond fine sandy loam (marine terraces and depressions).

## Natural Communities and Cover Types

The entire Refuge was mapped according to the National Vegetation Classification System (NVCS) and the "ecological systems" classification system developed by NatureServe. Table 1 represents the number of acres of each community/habitat type found on the Refuge.

**Table 1 Refuge Habitat Types**

Refuge Habitat Types	Refuge Acres
Agricultural land	738
Basin Swamp and Wet Hardwood Forest	453
Beach	3
Coastal Plain Pond Shore/Wet Meadow	57
Developed	55
Early Successional/Shrub/Old Field	1558
Hardwood-Mixed Forest	1563
Loblolly Forest	1771
Northern Brackish Tidal Marsh	936
Northern Freshwater Tidal Marsh	259
Northern Tidal Wooded Swamp	76
Open Water	242
<b>Total</b>	<b>7,771</b>

## Forested Uplands

Most of the Rappahannock River Valley is dominated by forested uplands. These habitats are found on dry, well-drained sites and are vegetated by such species as sweetgum (*Liquidamber styraciflua*), southern red, white and northern red oak (*Quercus spp.*), hickory (*Carya spp.*), yellow poplar (*Liriodendron tulipifera*), beech (*Fagus grandifolia*), and shortleaf, Virginia, and Loblolly pine (*Pinus spp.*). Logging on commercial forest lands in the region is common and has remained a stable enterprise.

## Marshes

A major habitat component of the Refuge includes fresh, brackish, and salt water tidal marsh that flanks the Rappahannock River and its tributaries. Freshwater tidal wetlands occur at salinities from 0.0 parts per thousand to 0.5 parts per thousand. Plant diversity is high and major plant species include wild rice (*Zizania aquatica*), arrow arum (*Peltandra virginica*), bur marigold (*Bidens laevis*), and smartweeds (*Polygonum spp.*) (Odum et al. 1984). The Federally threatened sensitive joint vetch (*Aeschnomene virginica*) is found in freshwater tidal marshes on the Rappahannock River.



Marshes located in the middle and downstream portion of the Refuge boundary area are dominated by those vegetative species that are primarily composed of big cordgrass (*Spartina cynosuroides*), saltmarsh cordgrass (*Spartina alterniflora*), and brackish mixed communities. Interdispersed throughout these marshes are tidal guts (channels), creeks, ponds, and potholes. Salt marshes are major producers of detritus and they serve as a growth of substrate for algae and other organisms (1994 FEA). Marshes, with the dense mat of vegetation found in them, serve to control erosion by buffering wave energy and binding up the marsh substrate.

#### Bottomland Hardwood Wetlands

The Refuge also contains bottomland hardwood wetlands. These systems are dependent upon waterborne sediments to maintain substrate elevation relative to the river. Major components of this habitat type on the Refuge include Horse Head Point, Marsh Point, and the bottomland hardwood wetlands at Green Bay, all of which are found in Essex County. Toby's Point in Westmoreland County also is an area in which this habitat type is present. Smaller tracts are found in the upper reaches of the lower Rappahannock and its tributaries. Dominant tree species in these wetlands include river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), and black gum (*Nyssa sylvatica*), with some bald cypress (*Taxodium distichum*) (1994 FEA).

#### Agricultural Land

Much of the land within the Refuge boundary is still in agricultural use. Major components of this land use type include cropland and, to a lesser degree, pastureland. Major crops include corn, soybeans, wheat, and barley. A significant portion of the pastureland is used for grazing beef cattle (1994 FEA).

### Wildlife

#### Birds

Bird assemblage within the Refuge is as diverse as its habitat variety. Much of the species diversity of Refuge birds lies in the fact that the Refuge is located at the southern geographic limit for many northeastern species, and at the northern geographic limit for many southeastern species. The Refuge is also close to the Chesapeake Bay, which is a significant migratory route for many birds. Approximately 204 confirmed species of birds utilize the Refuge at various times throughout the year. Warblers compose the most species-rich family, with 31 species observed breeding, migrating, or wintering on the Refuge and its environs. A comprehensive list of bird species and their habitats can be found in the Refuge Comprehensive Conservation Plan (CCP).

Large numbers of waterfowl winter on the Rappahannock River within the Refuge. Species commonly seen include Canada goose (*Branta canadensis*), ruddy duck (*Oxyura jamaicensis*), bufflehead (*Bucephala albeola*), scaups (spp.), mallard (*Anas platyrhynchos*), and American black duck (*Anas rubripes*). Two species that are common breeders on the Refuge are the wood duck (*Aix sponsa*) and the mallard. Wood ducks nest in forested wetlands on the Refuge.

Shorebirds and rails make extensive use of wetlands on the Refuge, including the sora (*Porzana Carolina*), king rail (*Rallus elegans*), woodcock (*Scolopax minor*), common snipe (*Capella gallinago*), and a variety of wading birds such as bitterns, herons, egrets, and ibises.

Forests (Riparian, mixed deciduous, coniferous, early successional and bottomland) on the Refuge provide important habitat for at least 37 species of birds of conservation concern. During the breeding season (May – July) bald eagle, Louisiana water thrush, ovenbird (*Seiurus aurocapillus*), worm-eating warbler (*Helmitheros vermivorus*), yellow-throated vireo (*Vireo flavifrons*), wood thrush (*Hylocichla mustelina*), scarlet tanager (*Piranga olivacea*), chuck-will's-widow (*Caprimulgus carolinensis*), whip-poor-will (*Caprimulgus vociferus*), eastern towhee (*Pipilo erythrophthalmus*), and brown thrasher (*Toxostoma rufum*) are frequently seen. Kentucky warbler (*Cistothorus plantensis*) is less frequently observed.

Grasslands and other early successional habitats (e.g. shrubs, agricultural fields), provide habitat for a wide variety of species on the Refuge. These areas provide critical habitat for pollinator groups, such as native bees and wasps, butterflies, moths, and beetles. This functional group of animals provides a critical role in ecosystem balance and functionality of natural and agricultural land uses. Twenty species of birds of conservation concern use these areas of the Refuge, including breeding species such as the American woodcock, bobwhite quail (*Colinus virginianus*), grasshopper sparrow (*Ammodramus savannarum*), dickcissel (*Spiza Americana*), field sparrow (*Spizella pusilla*), eastern meadowlark (*Sturnella magna*), sedge wrens (*Cistothorus plantensis*), and whip-poor-will (*Caprimulgus vociferus*).

### Mammals

A diverse assemblage of mammals inhabits the Refuge. Wetland habitats are dominated by furbearers including muskrat (*Ondatra zibethica*), raccoon (*Procyon lotor*), beaver (*Castor canadensis*), otter (*Lutra canadensis*), and mink (*Mustela vison*). Fields and shrublands are habitats for white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), shorttail shrew (*Blarina brevicauda*), least shrew (*Cryptotis parva*), Southeastern shrew (*Sorex longirostris*), meadow vole (*Microtus pennsylvanicus*), star-nose mole (*Condylura cristata*), and Eastern mole (*Scalopus aquaticus*). Other mammals associated with the uplands in the Refuge include whitetail deer (*Odocoileus virginianus*), gray squirrel (*Sciurus carolinensis*), red fox (*Vulpes fulva*), striped skunk (*Mephitis mephitis*), and opossum (*Didelphis marsupialis*).

### Reptiles and Amphibians

A diverse and abundant herpetofaunal community is found on the Refuge. According to Dr. Joseph C. Mitchell of the University of Richmond, approximately 80% of the frog species, 60% of the reptile species, and 25% of the salamander species native to Virginia are found within the Refuge boundary (1994 FEA). Species of primary management concern that might be affected by fire management activities are the box turtle, spotted turtle, eastern hog-nosed snake, 14 species of frogs and toads, and 3 species of salamanders that inhabit the vernal pools found in forests and along field edges.

### Fire History

#### Historical/Ecological Role of Fire

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 region. However, ignitions that result from human activity have historically and dramatically impacted the ecology of the region, including coastal Virginia (Brown 2000).

Fire has 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 fire use in Virginia. Frost (1998, estimates that fire frequency in pre-settlement, coastal Virginia flatlands occurred approximately every 4-6 years. These fires were largely due to the effects of lightning and anthropogenic burning. It is likely that such fires, especially in coniferous forests, were low intensity ground fires that occurred every 1-10 years, and of stand-replacement intensity every 100-1000 years (Bond and Van Wilgen 1996).

Changes in forest ecology and land use practices also changed the nature of the fires that occur. Heavier fuel loadings, resulting from the conversion of grasslands to timber, and a lack of periodic burns to reduce fuel build-up, have largely changed the Eastern U.S. sequence of fires from frequent low-intensity fires, to infrequent, high-intensity fires (Ladd 1997).

Grasslands, pine and oak communities, and oak forests 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 (Kirwan and Shugart 2000).

### **Fire Season and Occurrence**

Fire season(s):

Virginia has two principal fire seasons. The first occurs in the spring of the year and runs from mid-February through the end of April (February 15 – April 30<sup>th</sup>). During this time of the year, relative humidity is low, wind speeds are generally high, and sunlight reaches available fuels due to the lack of deciduous leaf cover, thus warming and drying fuels more than at any other time of the year. After this time period has expired, fire danger levels drop considerably into a lower range and generally stay at the reduced level throughout the summer months. This is primarily due to shading from broad-leaved species, high humidity levels, and transpiration rates associated with hardwoods. Precipitation remains fairly uniform throughout the year (monthly average 3.55 inches), though the average is slightly higher during the period May through September (between .5 -.75 inch). A second fire season occurs during the fall months (October 15 – November 30). Typically during this time of the year, deciduous vegetation has cured and fresh leaves are on the ground. This loose-leaf litter layer is more easily ignited due to its vertical arrangement and loosely compacted condition.

RRVNWR's fire season(s) will correspond to what is typical of Virginia as was discussed in the previous paragraph. However, recent trends of drought, changing environmental conditions, and human activity, have resulted in an equal or greater number of fires occurring outside of the traditional "fire season". At the present time, fires may occur virtually year-round, and are not considered to be rare events as has been the case in the past.

Fire Occurrence:

Wildfire Occurrence:

No written records are available that document wildfire activity on Refuge land since its inception in 1994. However, anecdotal evidence suggests that fires have occurred on lands now occupied by the Refuge for a very

long time. Further, there is a documented history of wildfire occurrence on lands located within the acquisition area of the Refuge. Wildfires have been documented in every county (Table 2).

**Table 2 Wildfire Statistics for Virginia Counties within the Refuge Acquisition Area (1995-2007)**

<b>County</b>	<b>Total Number of Wildfires</b>	<b>Total Acres Burned</b>	<b>Average Fire Size (Acres)</b>
Caroline	392	867	2.2
Essex	90	961	10.0
King George	48	78	1.6
Lancaster*	154	101	0.7
Middlesex*	90	110	1.2
Richmond	85	128	1.5
Westmoreland	29	21.5	0.7

\*Although portions of the authorized boundary are contained within Lancaster and Middlesex Counties, the Refuge currently owns no land in these areas.

#### Prescribed Fire Occurrence:

RRVNWR has utilized prescribed fire (either individually or in combination with non-fire methodologies) as a management tool since 2002, when the first Refuge Fire Management Plan was written. During the time period 2002 - 2007, the Refuge implemented a total of 13 prescribed burns for 1,247 acres. The majority of these burns were conducted in relatively small grassland units.

#### Fire Regimes and Fire Regime Condition Class (FRCC).

The term fire regime refers to the character of fire occurring over long time periods of time and the fire effects that characterize ecosystems. Descriptions of fire regimes are general because of the enormous variability of fire in time and space. The fire regime concept helps bring about a relationship between fire behavior and fire ecology. It provides a simplified means of communicating information about the role of fire among both technical and non-technical audiences (Brown and Smith 2000). Five natural fire regimes have been developed and are based upon the average number of years between fires (fire frequency) combined with the severity (amount of vegetation replacement). These five regimes are:

- I 0-35 year frequency, low to mixed severity (<75% overstory replaced)
- II 0-35 year frequency, high severity (>75% overstory replacement)
- III 35-100 year frequency, low to mixed severity (<75% overstory replacement)
- IV 35-100 year frequency, high severity (>75% overstory replacement)
- V 200+ year frequency, high severity (>75% overstory replacement)

Overall, the landscape encompassed by RRVNWR is classified as Fire Regime IV (2000).

Fire Regime Condition Class (FRCC) refers to how similar a landscape's fire regime is compared to its natural or historic state. Fire Regime Condition Classes are broken down into three categories: 1, 2, and 3. Landscapes determined to fall within the category of FRCC 1 contain vegetation, fuels, and disturbances characteristic of the natural regime; FRCC 2 landscapes are those that are moderately departed from the natural regime; and



FRCC 3 landscapes reflect landscapes that exhibit significant departure from the natural regime in terms of its vegetation or disturbance or both. RRVNWR is considered to be in FRCC Condition Class 2 (based upon preliminary data gathered in 2000).

## LANDFIRE

LANDFIRE, also known as the Landscape Fire and Resource Management Planning Tools Project, is a multi-year, multi-partner project producing consistent and comprehensive maps and data describing vegetation, wildland fuels, and fire regimes and condition classes across the United States. Once completed, LANDFIRE will produce data products that include layers of vegetation composition and structure, surface and canopy fuel characteristics, and historical fire regimes. It is anticipated that outputs from this program will be complete and available by 2009. Data from the 2000 state of vegetation Fire Regime Condition Class (FRCC) assessment was used in determining baseline indices for RRVNWR.

## Weather and Climate

The climate of the lower Rappahannock River Valley is humid sub-tropical. The climatic conditions (Table 3) are largely determined by the latitude, topography, prevailing westerly winds, and the influence of the Atlantic Ocean. Prevailing winds are westerly with the highest variable wind speeds occurring during the spring months.

**Table 3 Historical Weather Records for Warsaw, Virginia (448894)**

### Period of Record Monthly Climate Summary

**Period of Record: 1/ 1/1893 to 12/31/2007**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>Average Max. Temperature (F)</b>	46.7	49.0	58.3	68.5	77.3	84.5	87.9	86.5	80.6	70.6	59.8	49.2	68.2
<b>Average Min. Temperature (F)</b>	27.4	28.3	35.5	44.1	53.7	62.4	66.6	65.7	59.0	47.7	38.2	30.0	46.5
<b>Average Total Precipitation (in.)</b>	3.15	2.85	3.74	3.10	3.75	3.79	4.48	4.44	3.71	3.20	2.91	3.10	42.22
<b>Average Total Snow Fall (in.)</b>	5.0	4.5	2.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.8	15.6
<b>Average Snow Depth (in)</b>	1	1	0	0	0	0	0	0	0	0	0	0	0

## Cultural Resources

A number of small-scale archeological surveys have been conducted on the Refuge. To date, 36 known archeological sites have been recorded. A total of 16 are Native American sites dating from prior to European contact. Most of these sites, as well as prospective sites that have not yet been identified are likely to be found near sources of water. Prehistoric resources are expected to reflect artifact scatters of indeterminate function (New South Associates, 2007). The remaining 20 sites date from the late 17<sup>th</sup> to the early 20<sup>th</sup> century, and are mostly farm sites (e.g. Tayloe farmstead). The standing house and detached kitchen-laundry of the Wilna Plantation were both built in the 19<sup>th</sup> century (circa 1840). Both structures are on the National Register of Historic Places. They are currently being used as the Refuge office and as a staff residence.

There are three sites that are potentially eligible for the National Register: Site # 44EX265 contains an 18<sup>th</sup> to 19<sup>th</sup> century small farm or slave settlement; Site # 44RD201 is a possible 18<sup>th</sup> or 19<sup>th</sup> century occupation; and Site # 44RD204 possesses an 18<sup>th</sup> century component of indeterminate integrity and function. All three sites are to be protected through avoidance. To provide security for these (and other) sites, maps of archeological and historic sites are not included in this plan. However, copies of site maps are located at Refuge Headquarters and will be utilized in the planning process involving any fire management activity.

### **Program Guidance and Constraints**

Program guidance and operational constraints related to fire management are important elements of any comprehensive Fire Management Plan. They describe the range of operational considerations and restrictions that must be considered by managers when making decisions related to wildland fire management. Some are FMU-specific and require discussion only in the appropriate section of the FMU being considered, while others apply to all FMU's.

As a means to avoid duplication and provide appropriate FMU-specific information, Table 4 was developed to identify elements that are common to all FMU's as well as identify processes requiring discussion at the FMU-specific level as found in sections 3.2, 3.3, 3.4, 3.5 and 3.6.

### **Management Options and Response to Wildland Fire**

Fire Suppression in all Refuge Fire Management Units will be conducted utilizing a suitable action. Detailed descriptions and a discussion of these options can be found in Appendix F.

### **Goals and Objectives Related to Fire Management**

1. Protect human life, property, and natural and cultural resources from damage by wildfire.
2. When possible, suppress all fires through direct attack with full control selected as the strategy. This strategy may be subject to various options and/or constraints.
3. Locate and map hazard fuels on the Refuge.
4. Conduct hazard fuel reduction projects to create and maintain defensible space around structures and values at risk, and maintain or improve existing fuel breaks to prevent or limit the spread of wildland fires.
5. Adopt fire prevention measures to reduce preventable fires.
6. Develop educational opportunities to inform the public about Refuge fire management programs.
7. Explore opportunities to develop and conduct research programs related to fire management.
8. Utilize prescribed fire to accomplish resource management objectives:
  - Restore and perpetuate native Mid-Atlantic ecosystems. Preserve and enhance the Refuge's lands and water in a manner that will conserve the natural diversity of fish, wildlife, plants, and their habitats for present and future generations.
  - Promote wildlife diversity by maintaining a wide range of plant communities, including successional communities. This will be accomplished through the protection and enhancement of waterfowl and other migratory bird habitat, wetlands, and habitats specific to endangered and threatened wildlife and other species of conservation concern.

- Develop a monitoring program that allows Refuge staff to enable comparisons among prescribed fire and non-mechanical techniques of treatment, and link fire behavior with ecological results.
- Develop specific ecological objectives for the Refuge's prescribed fire program; support research to monitor and evaluate how well objectives are being met through prescribed fire application.
- Practice adaptive management based upon results obtained from the Refuge monitoring program.

**Table 4 Fire Management Program Guidance and Constraints and FMU Applicability**

	FMU 1	FMU 2	FMU 3	FMU 4	FMU 5
<b>Management Options</b>					
Suitable Responses	a	a	a	a	a
Prescribed Fire	s	s	s	s	s
Resource Mgt Goals	s	s	s	s	s
FMU Goals and Objectives Related to Fire Mgt	a	a	a	a	a
FMU Strategies Related to Fire Mgt	a	a	a	a	a
Limitations	a	a	a	a	a
Special Concerns	s	s	s	s	s
Smoke	a/s	a/s	a/s	a/s	a/s
<b>Specific Guidelines</b>					
Mechanized Equipment	a	a	a	a	a
Retardant and Chemicals	a	a	a	a	a
Minimum Impact Suppression Tactics	a	a	a	a	a
Burned Area Emergency Rehabilitation	a	a	a	a	a
Safety (General)	a	a	a	a	a
Power Lines	s	s	x	x	x
Access	a/s	a/s	a/s	a/s	a/s
<b>Operational Considerations</b>					
Fuel Models and Fire Behavior	a	a	a	a	a
Communications	a	a	a	a	a
Radio Systems	a	a	a	a	a
Radio Frequencies	a	a	a	a	a
Cellular Phones	a	a	a	a	a
Helispots	s	s	s	s	s
Water Dip Sites	s	s	s	s	s
Potential ICP Locations	s	a	a	a	a

Key: a- Applies to all or multiple FMU's  
x- Not applicable to this FMU

s- FMU specific; see  
appropriate FMU section.

### Fire Management Strategies

- Suppression strategies on *exterior* portions of units of the Refuge will generally focus on aggressive initial action, with the objective of suppressing fires at the minimum acreage possible.
- Suppression strategies on *interior* areas of larger units contained within FMU's (where there is not an immediate threat of fire crossing Refuge boundaries) can usually take full advantage of the extensive network of roads, fire breaks, and natural barriers already available as a means to limit fire spread.
- Develop relationships with cooperators to enhance protection efforts.

- Utilize prescribed fire as a management treatment for achieving hazard fuel and resource management objectives. In those areas where prescribed fire use is not a viable option, the use of non-fire mechanical hazard fuel reduction will be explored to reduce fuels accumulations that pose risks to life and property.

## Special Concerns

### The Commonwealth of Virginia and the 4 PM Burning Law

Annually, from February 15<sup>th</sup> – April 30<sup>th</sup>, the Commonwealth of Virginia enacts a section of the Virginia Code (Section 10.1-1142 B) known as the “4 PM Burning Law” (Appendix B). In brief, the law prohibits burning on private and state lands before 4 PM within 300 feet of woodland, brush, or fields containing dry grass or other flammable material. The law has been deemed very effective in preventing the overall number of human-caused ignitions that might otherwise occur during this time of the year. For a variety of reasons, this same time period is favored by land management agencies as a preferred time to implement prescribed fire programs, particularly when biomass removal during the dormant season is desired. For example, many prescribed burns are best implemented during the daylight hours when fuel moistures are low, fire intensity is more likely to match the levels necessary to achieve vegetation management objectives, and smoke dispersal is optimized due to the presence of unstable atmospheric conditions. As a result, a potential conflict arises between the need to perform effective prescribed burning and the responsibility to adhere to the regulations as established in the 4 PM law. For this reason, the language of the 4 PM law allows federal agencies (and others under the auspices of an issued permit system), to conduct prescribed burns at times when the public is forbidden to use fire as a management tool. Because the public may perceive this as a double standard, a great deal of information exchange and educational effort must be accomplished before prescribed burns are used during the period of time covered by the 4 PM law. This includes close coordination with local fire departments and the Virginia Department of Forestry.

### Smoke

The production of smoke from wildland fires creates potentially dangerous impacts for Refuge neighbors and the visiting public. While the effects of smoke cannot be completely overcome, prompt response to wildland fire ignitions increases the potential to keep fires small, thus reducing the production of smoke. Additionally, prompt notification and prediction of the direction and volume of smoke spread is a priority activity for all initial attack suppression forces. A thorough discussion about smoke and its comprehensive applications to fire management can be found on page 39 of this plan.

## Specific Guidelines

### Constraints on Mechanized Equipment

The use of heavy mechanized equipment (bulldozers, tractor plows) is not recommended *except* in those cases where serious threats to human life, property, or sensitive natural or cultural resources exist. The Refuge Manager or an assigned Resource Advisor (RA) must approve use. At least some portions of each FMU contain land formations that are steep, subject to flooding, or that contain standing water and poorly drained soils. All of these conditions may prevent the safe and effective use of heavy mechanized equipment. The assigned RA will know of potential trouble spots should vehicular access and/or heavy equipment be needed in an area of concern.



NOTE: A Resource Advisor (RA) is an employee of the Refuge (e.g. wildlife biologist) who has a working knowledge of Refuge resources and values at risk. His/her task is to ensure that proposed fire management activities do not negatively impact Refuge resources. Typically, an RA would be assigned to any wildland fire where potential threats exist for Refuge resources.

#### Retardant and Chemical Use

The delivery of aerial retardants should be considered *only* in those instances where the threats to human life, property, and/or cultural and natural resources, are serious enough to warrant their application. The application of retardants and foams in ground-based application systems (engines, back-pack pumps) should *not* be utilized in situations where riparian resources are located closer than 300 feet from the point of application. Consultation with the Refuge Manager is required.

#### Minimum Impact Suppression Techniques (MIST)

The application of MIST techniques will be applied in all wildland fire operations (prescribed and suppression). The Refuge already utilizes elements of MIST by limiting the use of retardants near wetlands and mechanized equipment in sensitive areas. Other key concepts associated with these minimum impact techniques are:

- Cold-trail the fire edge when practical
- Utilize natural firebreaks (trails, impoundments, roads, streams, etc) or use wetlines
- Firelines kept to the minimum width necessary
- Minimize tree-falling. Remove only those that pose a direct safety hazard
- Scatter debris and rehab all fire lines
- Utilize a “consumption strategy” when mopping-up fires. This is accomplished through active patrol and monitoring, but lets fuels be consumed where practical and safe. In no case is the fire left “to its own devices”, but rather a coordinated approach of mop-up activity is applied that minimizes exposure to firefighters. In *no case* will MIST compromise fireline safety.

#### Safety Considerations

##### General

Firefighter and public safety will *always* take precedence over property and resource protection during any fire management activity on the Refuge.

The greatest threat to public safety from Refuge wildland fires is entrapment by extremely fast moving fire fronts or fingers. Of particular concern are hunters or visitors who may be present in the area of the fire, and neighbors who initiate their own suppression actions without proper training, equipment, or communication. Refuge Staff will attempt to keep areas associated with wildland fire operations clear of personnel that are not engaged in operational activities.

Smoke from a wildland fire, particularly smoke that drifts onto a roadway causing reduced visibility for the public, is a major concern. The Refuge will make every effort to notify local law enforcement agencies whenever the Incident Commander (IC) believes that smoke may cause a safety hazard.

The final concern is for fires which might escape from the Refuge and spread to inhabited private property. The IC is responsible for warning and evacuating the public from potentially dangerous wildland fires.

## **Operational Considerations**

### **Vegetation, Fuel Models and Fire Behavior**

**NOTE:** Fuel Models are mathematical representations of wildland fuels (vegetation) that allow fire management personnel to predict the characteristics of wildland fire (e.g. flame lengths, rates of spread) under a wide range of environmental conditions. The fuel models discussed in this plan are referred to as Northern Forest Fire Laboratory (NFFL) Fuel Models (e.g. Fuel Model 3). Corresponding National Fire Danger Rating System Fuel Models (NFDRS) are also listed as the equivalent of the NFFL Fuel Models. NFDRS Fuel Models are designed to predict fire danger at the unit level and to establish staffing and management responses to predicted fire danger predictions.

### **Upland Forests**

#### **NFFL Fuel Model 8 (NFDRS Model H or R).**

Closed to semi-closed canopy stands of pine or hardwoods (or a mixture of both) are representative of this fuel model. The litter layer is compact, composed mostly of needles, leaves, and twigs. Little undergrowth is present. The fuel conditions described for this fuel model as well as for Fuel Model 9 below are found in the same upland forests of the Refuge. Thus, both models may apply, depending upon the time of the year and the environmental and climatic conditions present at any given point in time. For example, after the leaves drop from deciduous vegetation in the fall of the year, the loose leaf litter on the ground generally best fits Fuel Model 9. However, in the spring after the snow-pack has melted, the fuel bed is generally compact and may more closely fit Fuel Model 8. Conversely, if there has been little winter precipitation, and the fuel bed is not compacted, Fuel Model 9 best represents these fuels.

Fires in this fuel model (Fuel Model 8) will normally exhibit low rates of spread (<5 chains/hour) with flame lengths less than 2 feet, except when an occasional fuel concentration is encountered. Fires normally will remain on the surface, except under dry conditions where fires may burn through the deep duff layer. Under severe weather conditions, such as high temperatures, low relative humidity and high winds, moderate fire behavior may occur and pose a hazard. Occasional flare-ups are possible when fires are supported by conifer regeneration.

#### **NFFL Fuel Model 9 (NFDRS Model E)**

This fuel model is composed of open or closed hardwood deciduous stands and mixed stands when the leaves have fallen from the trees. The litter layer is fluffy, composed of fresh leaves from deciduous species. Scattered concentrations of dead-down woody material are greater than in Fuel Model 8 above. The litter layer is subject to diurnal moisture changes and direct sunlight exposure can quickly dry this fine fuel component.

Fires in this fuel type will have a higher rate of spread due to the deciduous leaf litter layer. Under windy conditions ground spotting problems can be expected from rolling and blowing leaves. Fires will generally remain on the surface, and can be a problem in the spring, before green-up. This fuel type can also be a problem

in the fall, if normal moisture is not received and an unwanted ignition source is present. Flame lengths in excess of two feet, rates of spread of 5 to 10 chains/hour and containment problems under windy conditions can be expected.

#### **NFFL Fuel Model 10 (NFDRS Model G)**

This fuel model is represented by over-mature or insect and disease-ridden conifer and/or hardwood stands with larger dead-down limb wood present. Heavy amounts of down material are present, in excess of 16 tons/acre.

Under normal (moist) conditions, larger fuels are shaded most of the time and will not contribute significantly to fire intensity. Otherwise, a wildfire in this fuel type can be expected to be intense and have a high resistance to control. Flame lengths may be in excess of 4 feet, with rates of spread approaching or exceeding 10-chains/hour. An active crown fire is possible under windy, dry conditions (extended drought). Fires may burn deeply in the duff layer, requiring extended mop up time. Long range spotting is likely. Fires in this fuel type will be stand replacing, with considerable resource damage possible. Effective containment tactics require construction of fireline outside the peak burning periods, or through indirect attack methods. Line construction will be hampered due to the large amounts of dead and down fuels and frequent high fire intensity.

#### **Grasslands**

##### **NFFL Model 1 (NFDRS Model L)**

This fuel model represents the old farm fields, clearings, and grasslands found on the Refuge. Cool season perennial grass species predominate, with some annual grasses and other herbaceous fuels present. Fuel loading is generally under 2 tons/acre. Most fields are periodically mowed or burned, thus fuel bed depth is <2 feet for most of the year. A small amount of brush, typically occupying less than 25% of the site and associated with the field perimeters is present.

Coastal plain pondshore and wet meadows comprise a small percentage of this fuel type. These systems are subject to seasonal flooding and at certain times of the year are unlikely to burn. Composed primarily of mixed grass, sedges, and other herbaceous wetland species, these areas are unlikely to exert much influence on fire behavior regardless of the time of the year unless prolonged drought is in place.

Generally fires occurring within this fuel type can be a problem for the Refuge, especially in the spring or late fall (although not as frequently) when perennial grasses are cured. High spread rates can be expected, but fire intensities remain low and short in duration. Flame lengths may approach 4 feet with rates of spread occurring in excess of 50 chains/hour (3,300 ft). Fires in this fuel type usually do little resource damage.

#### **Grasslands/Shrub Lands/Wetlands**

##### **NFFL Fuel Model 3 (NFDRS Model N)**

This fuel model covers emergent vegetation (e.g. cattail and common reed or *Phragmites*) and tall grasses (e.g. switchgrass, big bluestem, and reed canary grass) associated with wetland habitats. The herbaceous component is in excess of three feet in height (3-6 feet) and the total fuel load is in excess of 3 tons/acre. Uncut upland fields may also be represented, although rates of spread will generally be over predicted.

Windy spring or fall days with warm temperatures and low humidity will make this fuel type hazardous. Usually associated with standing water, fire will carry across open water under sustained wind conditions. An extremely fast moving fire front, often in excess of 100 chains/hour, with flame lengths over 12 feet can be expected. A fire of this nature may be safely controlled at the change in fuel type near the wetland edge.

#### **NFFL Model 5 (NFDRS Model F and T)**

This fuel model represents those areas of the Refuge where low shrubs predominate in the understory. Fields where shrubs predominate are typical of the areas on the Refuge where this Fuel Model is used. Fire is generally carried in the surface fuels that are made up of the litter cast by the low shrubs, grasses and forbs found in the understory. These fires are generally of low intensity due to the light fuel loads and the presence of small amounts of dead material. Shrubs are generally short (<2 feet) and may almost totally cover the area. Live vegetation is usually abundant in this fuel model.

#### **Air Quality and Smoke Management**

Visibility and clean air are primary natural resource values at RRVNWR. Maintaining the integrity of these resources is of paramount importance when planning and executing operations involving fire management. The Refuge will comply with all applicable Federal, state, interstate and local air pollution control requirements, as specified within Section 118 of the Clean Air Act, as amended (42 USC 7418). Further guidance is found in the Smoke Management Guide for Prescribed and Wildfire, 2001 Edition and the Smoke Management and Air Quality section of the Red Book.

From a planning and operational standpoint, one of the Refuge's principal management objectives is to take aggressive action to reduce the smoke produced from both unplanned and prescribed fires. This is done in order to minimize adverse impacts to visibility, reduce particulate emissions, and provide a safe work environment. The following guidelines will be adhered to as a means to mitigate the impacts of smoke production that results from a wildfire:

- Provide prompt notification to the public about the potential impacts of smoke produced from a wildfire occurring on the Refuge (e.g. Where is it likely to go? How much smoke will be produced? How long will it last?).
- Where possible, within the constraints established for the safety of personnel and resources at risk, utilize suppression strategies and techniques that minimize the duration of smoke production (e.g. direct attack). This usually manifests itself in the application of procedures that place an emphasis on keeping fires at the smallest possible size, thus reducing the overall time that combustion and smoke are produced during the life of the incident.
- Utilize strategies and tactics that minimize individual exposure to excessive inhalation of particulate matter by rotating suppression crew personnel in and out of smoky areas. As a guideline, a two-hour time limit is generally used.

The following guidelines will be adhered to as a means to mitigate the impacts of smoke production that results from a prescribed fire:



- Smoke sensitive areas, including Class I airsheds, transportation corridors, schools, hospitals, etc, will be identified and addressed within the Annual Prescribed Fire Plan. The direction of wind vector selected will be such that smoke and other particulate matter are transported away from sensitive areas.
- Burning is permitted when visibility exceeds five miles and when the fire weather forecast indicates the presence of an unstable air mass. A minimum transport wind speed of four mph is required.
- No burning will occur if the State DEQ or any other local governing agency has issued an air pollution health advisory, alert, warning or emergency.
- Within the confines of meeting prescribed burn objectives, firing techniques, such as backing and flanking methods, will be used whenever possible. Emission calculations are required for each prescribed burn conducted. This is addressed in the Refuge Annual Prescribed Fire Plan.
- Minimize individual exposure to excessive inhalation of particulate matter by rotating burn team members in and out of smoke areas. As a guideline, limit burn team personal exposure to carbon monoxide to two hours per day.
- Provide adequate public notification of possible short term air quality impairment.

At the present time there is no reporting or permit requirement within the State of Virginia for the application of prescribed fires on Federal lands. A contact number for the Air Permits Manager of DEQ is found in Appendix E.

## **Communications**

### **Radio Systems**

RRVNWR has its own internal radio system which serves as the primary communications link for operational concerns of all types. Refuge staff indicates that this system works reasonably well, noting that there are a few locations where radio communications may not be reliable. An effort will be made to show these areas on risk assessment maps.

Fire radios should be programmed with an adequate range of frequencies to ensure communications within the local response area. This should include local cooperators and other agencies that may become involved in wildland fire management activities.

### **Interagency Radio Frequencies and Use**

Most of the local agencies communicate using a mix of local and/or county frequencies. These frequencies will be identified in MOU's between entities for use by the Refuge (Appendix H).

### **Cellular Phones**

Cell phones can be used as a back-up to the radio system and, according to Refuge staff, provide dependable communications (personal communication 2008).

### **Potential Incident Command Post (ICP) Locations**

Successional fields are scattered throughout the Refuge. Some of these could be adapted as sites for Incident Command Posts. In those FMU's where outstanding opportunities (e.g. presence of power and water, support structures, etc) are already available they will be identified in the FMU-specific section.

## **3.2 Fire Management Unit 1–Richmond County**

### **Description**

The Richmond County FMU-1 (Figure 2) is made up of ten land management tracts (4, 560.6) and two easements (1,359.4acres). The total of all of the units within the FMU is 5,920 acres (approximately 5,683.2 burnable). One piece of property, the Kennedy Tract has not been officially acquired, though acquisition is expected to occur in 2009. Because the Refuge is authorized to acquire up to 20,000 acres within its acquisition boundary, the potential exists for future land acquisition in this FMU. As can be seen in Figure 2, some units within the FMU are located in close physical proximity to one another, while others are separated by considerable time and distance. All of the tracts within this FMU fall within the protection jurisdiction of Richmond County. The Refuge has no fire management responsibility for the easements located in this FMU other than those afforded to private lands adjacent to the Refuge.

### **Adjacent Land Ownership and Potential Fire Spread Consequences**

Generally, lands adjacent to the Refuge in this FMU are largely privately owned. Homes and farms (including associated outbuildings such as barns, sheds, silos, etc) are located in close proximity to Refuge lands in some areas.

#### **Franklin Tract**

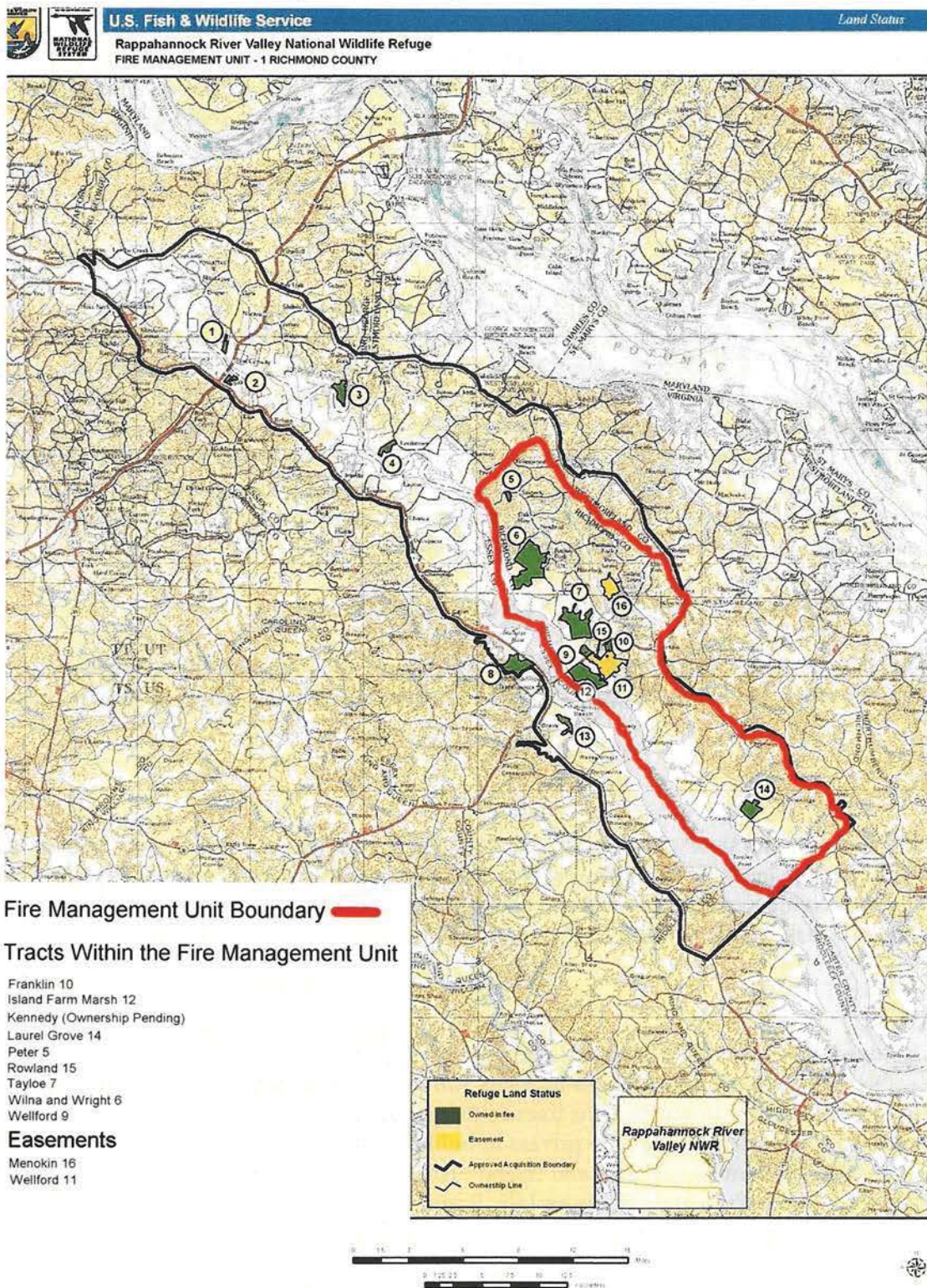
Structures are located within a small parcel of private land that is surrounded on three sides by the Refuge. A fire escaping off of Refuge lands to the northwest would almost certainly present a threat to these structures. There are also private residences located northeast and east (approximately .5 mile from the Refuge boundary) that could be placed at risk from a wildfire on Refuge land.

#### **Wellford Tract**

Southwest of Refuge land is a sizeable farm that is approximately 600' from the boundary. It appears to have excellent defensible space around it, but a high-intensity fire with vertical development could disperse embers in the general area and threaten structures. This tract contains a number of developed structures, located in two separate locations near the central (a one-acre private in-holding) and northwestern portion (an office trailer utilized by the Virginia Department of Game and Inland Fisheries under a Memorandum of Agreement) of the tract. Approximately ½ mile of this tract fronts on U.S. Route 360, a major 4-lane highway. The open field portion of the tract was recently (2006) planted in hardwoods.



Figure 1 Fire Management Unit- 1 Richmond County



### Rowland Tract

This unit is very small and consists almost totally of mixed hardwood forest and agricultural land. A fire in this portion of the Refuge would present little threat to private land.

### Wilna and Wright Tracts

There are a number of important Refuge facilities located on this tract. In addition to the administrative and maintenance complex (offices, caretaker's residence, stable, pole and storage sheds, fuel tanks, barns, etc) a primary concern for a wildfire escaping from this portion of the FMU would be private property located to the east, southeast, south, and southwest. An environmental education classroom located near Wilna Pond could also be at risk from a wildfire. Areas (wetlands, wooded bottomlands, upland critical edge) that contain eagle roosting and nesting sites could also be placed at risk and are priority areas for protection.

### Taylor Tract

The primary concern for a fire escaping from Refuge lands in this tract would be private property adjacent to the Refuge boundary or into the structural interface on the tract itself (a modular building constructed in 2007 is used as a staff residence). A graveyard located in close proximity to the main house (historical significance undetermined), as well as several barns located east of the main residence and three shanties located along Cat Point Creek (historic value undetermined), could all be threatened. As is the case with other areas located within the FMU, intense fires could damage upland critical edge and eagle roosting/nesting sites. This is particularly important along Cat Point Creek, one of the Refuge's highest priority areas for land protection.

### Laurel Grove Tract

This tract is surrounded by private land on three sides. Major consequences could result if a wildfire were to start on Refuge land and spread in a southwesterly direction where homes and outbuildings are located just outside of the boundary. A developed, but abandoned farm site is located in the center portion of this tract.

### Peter Tract

The Peter Tract contains three separate groups of structures that are adjacent to Refuge lands (largely composed of successional and shrub fields near the structures). Any wildfires occurring on this tract spreading in a northerly or southerly direction would place private structures at risk.

### Island Farm Marsh

This unit of the FMU is the exception to the fire protection situation discussed with the previous units. Comprised almost entirely of tidal marsh, the unit is located well away from structures and other resources at risk. However, the tract shares a long border with Route 360 on the eastbound side. Trees and ladder fuels in the right-of-way and potential smoke drift into traffic is a concern. Prescribed fire is not a management tool that will be used with any frequency in this unit.



## **Fuels and Vegetation FMU-Specific**

Fuels are mixed in the FMU with a variety of fuel types and configurations, many of which are the result of combinations of various management activities that have taken place. For example, many of the tracts were actively farmed before acquisition. As a result, there are many successional fields, dominated by a mix of grasses, shrubs, herbaceous plants, and even some woody species. Fire behavior for these fuels is described in detail in Section 3.1 of this FMP. Fuel Model Maps are located in Appendix A.

Unless otherwise specified, those areas of the FMU that are representative of Fuel Model 9 should be considered to be Fuel Model 8 during the summer months. This change reflects the potential effects that deciduous leaf fall has on fire behavior during the fall and spring months.

### **Franklin Tract**

This tract is dominated by early successional fields composed primarily of grasses, forbs, and low brush. Fuel Model 1 is generally used in these areas until fuels attain heights of greater than 3 feet at which time Fuel Model 3 becomes the appropriate choice. Some areas of the tract are more mesic, and contain wet hardwood forests (Fuel Model 8 year-round). Upland portions of the tract contain the mixed hardwood and pine forest that is predominant throughout the region (Fuel Model 9).

### **Wellford Tract**

The Wellford Tract is dominated by early successional old field habitat (93 acres), about 60 acres of which were planted in native hardwoods and shrubs in 2007. Grasses and herbaceous species (Fuel Models 1/3) can be expected to carry fire in these areas until trees and shrubs begin to dominate vegetative cover. Approximately 40 acres of wooded swamp (Fuel Model 8 year-round) and 12-18 acres of tidal marsh and wetland meadow (Fuel Model 3) are located along the southwestern border of the tract. A small percentage of the tract is vegetated with hardwood and mixed forest and is represented by Fuel Model 9.

### **Rowland Tract**

This tract is almost totally composed of early successional fields that are dominated by grasses and herbaceous plants. Fuel Models 1/3 are representative of the vegetation and fuels found in this portion of the FMU.

### **Wilna and Wright Tracts**

The Wilna and Wright tracts of the FMU are located adjacent to one another and form the core of the administrative functions of the Refuge. A series of wetland features (tidal marsh, open water, wooded swamps) separate the two tracts. The Wilna Tract is made up of 507 acres of wooded swamp and upland forest (Fuel Models 8 and 9), and 388 acres of early successional fields composed of both warm and cool season grasses (Fuel Models 1/3). Also represented are mixed forests composed of loblolly and mixed pine/hardwood (Fuel Model 9). Tidal marsh and wet meadow (approximately 61 acres) makes up the remainder of the fuel types (Fuel Model 3) in this tract.

The Wright Tract (924 acres) lies along a high, sandy ridge from which a series of ravines and sloping uplands descend and is bounded on two sides by creeks. A dirt road follows this high ridge and there are four logging

roads that branch from it following the grade of the side slopes. Vegetation and fuels in the more upland portions are dominated by loblolly and hardwood-pine mixed forest types. Fuel Model 9 best represents these fuels, however there may be some areas located within the tract where heavier accumulations of dead and down fuel have accumulated (Fuel Model 10), primarily due to extensive beaver damage, particularly on slopes and uplands along the two creeks that border the tract. There are some patches completely denuded by beavers and thus covered with dead and downed trees. These areas are in early succession currently dominated by tulip poplar, sweetgum, and black locust. The Wright Tract was logged for mature hardwoods in the early 1900's, the slash burned, and then heavily re-seeded in loblolly pine on the more level areas along the ridges and slopes. In most areas throughout the tract, the pines have reached the commercial thinning stage with a closed canopy and a developing native understory composed of mountain laurel, high and lowbush blueberry, holly and dogwood. Vegetation in the ravines ranges from beaver ponds to braided stream and marsh to bottomland forest. Tree species on the steeper slopes and ravine bottoms is composed of oaks, beech, tulip poplar, ash and maple. There are also several acres where very dense, early successional tulip poplar communities form a near monoculture.

#### Taylor Tract

The first property acquired and protected as a part of the Refuge, this portion of the FMU primarily consists of 355 acres of wooded swamp (Fuel Model 8 year-round) and upland forest (Fuel Model 9). Approximately 277 acres of freshwater tidal marsh (277 acres), 225 acres of grassland and early successional habitat (Fuel Model 1/3), 217 acres of agricultural land and 30 acres of wet meadow (fuel Model 1) are also found in this tract.

#### Laurel Grove Tract

Approximately 205 acres of former cropland was planted with hardwood saplings in 2003. This area is dominated by early successional field species (grasses and forbs), intermixed with some shrubs and woody-stemmed saplings. At the present time, Fuel Models 1/3 are most appropriate, but Fuel Model 5 will become more prevalent as succession proceeds with shrubs and saplings becoming predominant. The remainder of the tract is forested with mixed-pine hardwoods (Fuel Model 9) and loblolly forest (240 acres). A small portion (7 acres) of the tract along the river is populated by tidal marsh (Fuel Model 3).

#### Peter Tract

Vegetation and fuels in this portion of the FMU are primarily composed of Fuel Model 9. Hardwood and mixed pine forests are the major vegetative type. In addition, some more homogeneous stands of loblolly pine (Fuel Model 9 year-round) are located in the central portion of the tract and populate the higher topographic features found there. The remainder of the tract is made up of early successional fields (Fuel Models 1/3).

#### Island Farms Tract

This portion of the FMU is composed almost entirely (approximately 95%) of tidal marsh (Fuel Model 3). There are a few isolated pockets of hardwood mixed pine forest (Fuel Model 9).

## Unique Characteristics Affecting Fire Management

### Topography and Soils

Although the land base within this FMU is generally flat, there are areas in the FMU where the terrain is relatively steep. Slopes as much as 60% can be found. These steep areas are generally found near the river where streams have cut distinct channels into the surrounding land. These steep cuts can hamper the effectiveness of suppression activities by limiting access for suppression forces and increasing fire spread rates due to the steepness of the terrain.

### Hydrology

The Rappahannock River flows relatively close to all of the tracts within the FMU (2.94 miles of river frontage in this FMU). In addition, a relatively large number of small streams can be found in the tracts that are close to the river. Generally, these areas provide barriers to the spread of fire. There are also several bodies of standing water located within the FMU, including the Wilna and Laurel Grove Ponds. These open bodies of water also serve as effective barriers to fire spread and provide sources of water for fire suppression equipment (engines/bucket operations).

### Access

Paved highways (improved secondary roads) gravel roads, and dirt roads provide access to most of the FMU as well as providing major barriers to fire spread. There are a series of maintained gravel roads scattered throughout the FMU, particularly in the Wilna and Tayloe Tracts. Most of these roads are of sufficient width and size that they can provide good access to interior portions of the FMU and can serve as locations for anchor points, escape routes, and safety zones. The majority of the roads provide good ingress and egress for fire personnel. Because in most areas the terrain is flat, emergency off-road travel can be conducted to gain access to more remote portions of the FMU, provided vegetation (heavy brush, timber, marsh, bottomlands, etc) does not prove a hindrance to travel. Many of the interior gravel roads in the FMU are gated so that public access is restricted.

An exception to the generally good travel and access conditions is the Island Farms Tract where there are no roads of any kind due to the marshy character and location of the tract.

### Helispots

The Richmond County FMU-1 has several locations that can be used effectively and safely for helicopter operations. At the present time, these have not been pre-identified or equipped with lights and/or wind direction devices, but the variety of successional fields located in several of the tracts (Wilna, Peter, Tayloe, Wellford, Franklin and Laurel Grove) located within the FMU provide opportunities to develop and utilize these areas as temporary helispots. The Wilna Tract in particular has graveled parking areas near Wilna Pond that could be used for helicopter operations.

### Water Sites

The Richmond County FMU - 1 contains a number of locations where water is present in sufficient quantity to provide support for wildland fire operations (engines and pumps). Chief among these are the Rappahannock

River itself, as well as the Wilna and Laurel Grove Ponds. All of these sites provide water depths sufficient to support helicopter bucket operations.

## **Values to be Protected**

### **Threatened and Endangered and Special Status Species**

Although the American bald eagle no longer enjoys Federal Threatened or Endangered Species status, it is still a highly visible and valuable species on the Refuge. The protection of nesting, roosting, and perch sites is of major concern to the Refuge fire management program. Cat Point Creek in the Tayloe Tract has one of the highest densities of bald eagles in the area.

### **Wildland Urban Interface (WUI)**

The FWS Regional Wildland-Urban Interface Specialist consulted with Refuge staff (2007) regarding the potential assessment and inclusion of portions of the Wright Tract of the FMU into a WUI-funded program of hazardous fuel reduction due to the presence of wildland fuels to Refuge structures and facilities.

A detailed discussion about other potential wildland-urbane interface areas in this FMU is contained in section 3.2 (Adjacent Land Ownership and Potential Fire Spread Consequences) of this FMP.

### **Air Quality and Smoke Management**

Issues related to air quality in the Richmond County FMU-1 relate to the relative proximity of the FMU to sensitive receptors such as residences and roads that are traveled by the public. Pertinent areas that will demand attention include any of the heavily traveled highway corridors located within the Refuge boundary, the cities of Warsaw and Tappahannock, and other populated areas adjacent to Refuge lands.

### **Cultural and Natural Resources**

Important cultural resources located within the FMU include the Wilna Plantation (all structures) as well a number of structures that have not yet undergone studies of determination. These include a building of potential historic value located along the river. The Tayloe Tract in the FMU has a graveyard located within its boundary that may have historic value as well as three shanties located along Cat Point Creek. There is a significant potential for the presence of archeological sites of significance (as yet undiscovered), especially in areas along the river and creeks.

### **Specially Designated Areas**

There are no Research Natural Areas (RNA) located within the boundaries of this FMU.

### **Power Lines**

Above ground power lines provide electrical power to Refuge facilities and structures in a number of locations. In some areas they are easily detected and can be avoided and protected (e.g. Wilna grasslands), but in others they are less easily detected and may be hidden by brush and trees. They also can be found next to and on



Refuge lands where they provide power to adjacent landowners. The presence of power lines creates potential hazards for fire personnel. Every effort will be made to exclude fire from power line right of ways and utility corridors.

### **Structures and Other Values at Risk**

In addition to the structures and facilities already discussed in section 3.2.1 of this plan, there are a number of capital improvements on Refuge land that could be placed at risk from a wildfire. These include information kiosks, wooden foot bridges and public viewing piers, portable restrooms, information pavilions, and photography blinds.

### **Fire Management Unit Guidance**

#### **Desired Future Vegetation Conditions**

One of the primary goals of the Refuge is to maintain and manage existing grasslands and old field habitats in such a manner that declining populations of grassland breeding birds will enjoy the benefit of increased high-quality habitat. Grass and herbaceous fields in the FMU will be maintained through a combination of mowing and prescribed burning to maintain a diversity of wildlife habitat. The propagation of native and warm-season grasses is encouraged in most tracts so that the cover of these species types is increased over current levels.

In some areas of the FMU, trees and shrubs have been planted so that habitat for species that require early successional shrub habitat for nesting, migrating, and wintering birds is developed. Mature woodlands and forests will be maintained so that a variety of wildlife including forest birds, reptiles, and amphibians will have habitat that is favorable for their needs. This includes maintaining species richness in fire-adapted oak forests found within the FMU.

Invasive plants, especially in tidal marshes, are monitored and controlled so that high quality habitat can be maintained for waterfowl, marsh birds, and wading birds.

In some areas of the FMU, especially along Cat Point Creek in the Tayloe Tract, the Refuge will strive to maintain an open understory in and around bald eagle roost stands. This may be accomplished in a variety of ways, including the use of prescribed fire.

### **Fire Management Objectives**

All wildfires will be suppressed, regardless of cause, in the quickest, most cost effective manner possible, with the highest regard for human life and safety. A variety of options (Appendix F) are available for the suppression of wildland fires. Resources and tactics utilized should minimize resource damage whenever possible. The availability of a network of administrative roads, wetland areas, and ponds in the FMU (when present) provide good barriers to fire spread and provide opportunities to limit wildfire growth without the need to construct fire line.

### **Pre-Identified Management Action Points**

Generally speaking, the tracts located within this FMU are relatively small, particularly when compared to the overall private land-base that surrounds them. The presence of a wildfire within any of the Refuge tracts, especially under environmental conditions favorable to the rapid spread of fire (e.g. drought, high winds, low humidity, etc) could threaten both Refuge resources and private land. When these conditions are present, the Refuge may consider implementing preventive measures as outlined in the Refuge Step-Up Plan (Appendix D).

Roads provide major barriers to the spread of a potential wildland fire in most portions of the FMU. Most of these roads would be subject to high smoke concentrations in the event of a wildfire, thus requiring traffic management actions to be taken before serious safety problems surface. An inability to stop the spread of a wildfire near major roads would serve as a trigger point in calling for a change in strategy or tactics necessary to prevent further fire spread and accompanying threats to natural and cultural resources, not only in the tract in question, but to private lands outside of the Refuge boundary.

Fires that start outside of the Refuge have the potential, under certain environmental conditions, to burn onto Refuge lands. This is particularly prevalent in Virginia, where human-caused ignitions represent greater than 90% of the total of wildfire activity. For this reason, the Refuge will consider management action, with its cooperators, on fires that may threaten the Refuge boundary. As a rule of thumb, dependant upon size and fire behavior, the Refuge will consider fires up to ½ mile outside of the Refuge boundary as candidates for suppression activity by Refuge personnel and resources.

### **Constraints on Fire Management**

The physical separation of the tracts on the Refuge, even within a specific FMU, can impose significant restraints on fire management. This typically is manifested through increased difficulties in detection of wildfires and response by the appropriate resources in a timely fashion.

Wetlands are present that may prevent the use of heavy mechanized equipment. Equipment venturing into these areas may become mired and inoperable due to the wet, muddy conditions. Assigned RA's will identify areas where vehicular access and/ or heavy equipment are likely to be placed at risk.

Service policy restricts wildland firefighters from engaging in structural fire fighting activity. It does allow for the protection of structural exposures from the impacts of wildfires. The Refuge will rely heavily upon the response and capabilities of Richmond County, not only for wildfire suppression, but for structural protection of facilities and buildings.

### **Safety Considerations**

Hard-surface and secondary roads are located close to most of the tracts in the FMU. For example, U.S. Highway 360 is a major thoroughfare (4-lane) that has an approximate ½-mile frontage on the Wellford Tract in the FMU. Route 360 also fronts on a portion of the Franklin Tract and the Island Farms Tract. Route 634 has an approximate one-mile frontage on the Tayloe Tract of the FMU. The Farnham Road is located adjacent to the Laurel Grove Tract of the FMU, although less traveled than the roads previously discussed, it still has some traffic on it at various times of the day. These roads, as well as others less traveled, could be impacted by fire management operations within the FMU. The presence of personnel, equipment or smoke produced by either a wildfire or prescribed fire would likely impose restrictions on the flow of traffic on these roads.

There is a potential for extreme fire behavior (rapid rates of spread, extreme flame lengths) during periods of prolonged area-wide drought. Although this is a relatively rare event in the area, there is an historical precedence for these types of events and their potential must be considered during those years when conditions are outside the normal range.

### **3.3 Fire Management Unit 2 – Essex County**

#### **Description**

The Essex County FMU-2 (Figure 3) is made up of approximately 966.8 acres (approximately 97% burnable vegetation) and is comprised of the Hutchinson (727.4 acres) and Thomas (239.4) Tracts. The tracts are located approximately 2.5 miles from one another on the western side of the Rappahannock River. Both tracts fall within the protection boundary of Essex County.

#### **Adjacent Land Ownership and Potential Fire Spread Consequences**

##### **Hutchinson Tract**

The Hutchinson Tract is located along Mt. Landing Creek, a tributary of the Rappahannock River. This tract is very close to developed areas, particularly along the southeastern portion of the Refuge boundary. The Tappahannock Municipal airport is located approximately .92 miles from the boundary and the outskirts of the City of Tappahannock are less than .5 mile beyond that point. A major thoroughfare, U.S. Highway 17, passes directly through the tract. A number of expensive homes are located along the river directly to the northeast of the Refuge boundary just across U.S. Highway 17. A barn and silos on private property are located just across the southeast boundary of one of the grassland fields. A wildfire could easily spot into this area. A private residence is located on the southwestern boundary. A wildfire escaping from grasslands in this area could progress uphill through the forest and into the open fields surrounding the house. Wildfires within this tract could directly threaten structures along its boundaries and the smoke produced could have direct impacts upon traffic and the urban areas adjacent to Refuge property. There are a number of structures (several old farm buildings, a visitor pavilion, and information kiosk) located within the Refuge boundary along Highway 17. These structures could be placed at risk from wildfire if fire spread were to occur in a northeasterly direction within the tract.

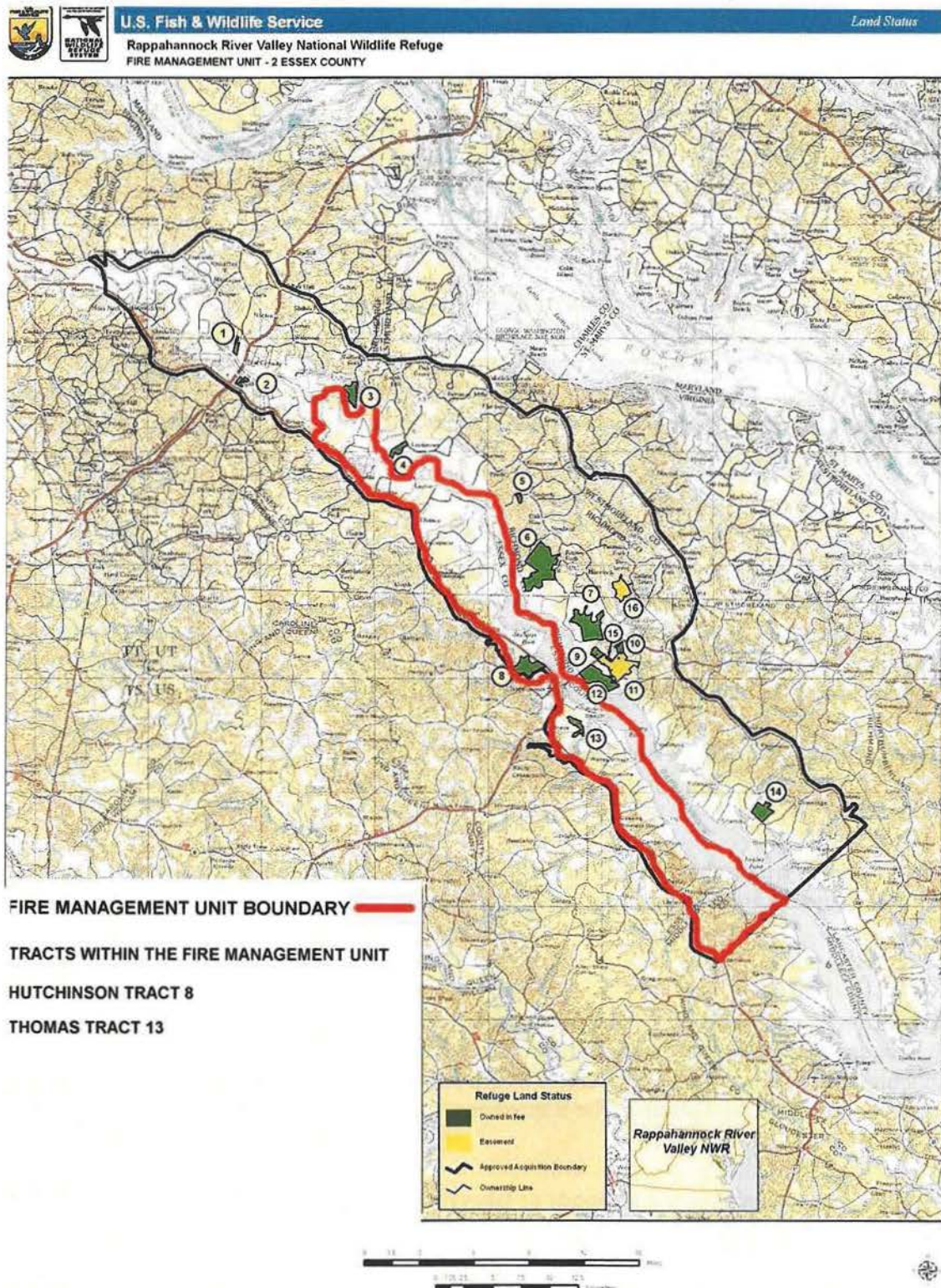
In the future, the Refuge has plans for the construction of a number of visitor use facilities in this portion of the FMU, including a fishing pier, boat launch and parking area(s). An administrative road that roughly bi-sects the tract and that runs from northeast to southwest is managed through a right-of-way easement with a private landowner.

##### **Thomas Tract**

The Thomas Tract of this FMU is located approximately 2.75 miles southeast of the Hutchinson Tract. It lies just south of the City of Tappahannock. The northeastern (housing subdivision) and western (golf course) boundaries of the tract are immediately adjacent to areas of intensive development. Approximately .5 miles to the northeast of the Refuge boundary, another well-developed housing area can be found. This development is separated from the Refuge boundary by a sizeable wetland area. A wildfire spreading from Refuge lands to the



Figure 3 Fire Management Unit – 2 Essex County





northeast or east of the tract could have immediate impacts on development outside of Refuge lands. Smoke production from a wildfire could impact developed resources in all directions except for due south.

### **Fuels and Vegetation FMU-Specific**

Unless otherwise specified, those areas of the FMU that are representative of Fuel Model 9 should be considered to be Fuel Model 8 during the summer months. This change reflects the potential effects that deciduous leaf fall have on fire behavior during the fall and spring months.

#### **Hutchinson Tract**

This portion of the FMU is composed of a mix of fuels. Approximately 197 acres of the tract are composed of planted warm season grasses (Fuel Models 1/3). There are currently 145 acres of young hardwoods (Fuel Model 9 and Fuel Model 5) and 240 acres of mixed upland (Fuel Model 9) and wetland forest (Fuel Model 8 year-round). Slightly less than 130 acres of the tract are composed of tidal marsh (Fuel Model 3). Including open water, there are about 11 acres of the tract that are classified as unburnable (roads, mowed lawn, etc.) A map of fuel models is located in Appendix A.

#### **Thomas Tract**

Fuels in the Thomas Tract portion of the FMU are mixed. Approximately 72 acres are composed of tidal marsh (Fuel Model 3). Roughly 48 acres of the tract are classified as early successional shrub/old field habitat, composed of mixed grass and herbaceous species. These fields are best modeled utilizing a combination of Fuel Models 1/3. A fairly sizeable portion of the tract (79 acres) is loblolly forest (Fuel Model 9 year-round), with the remaining portion of the tract (40 acres) being made up of hardwood and mixed pine forest (Fuel Model 9).

### **Unique Characteristics Affecting Fire Management**

#### **Topography and Soils**

Generally, the land base within this FMU is flat, with very little change in elevation, except for those areas where creeks (Mt. Landing and Piscataway Creeks) cut into the landscape creating steep-banked ravines.

#### **Hydrology**

Mount Landing Creek, a tributary of the Rappahannock River, is a principal feature of the Hutchinson Tract of the FMU. It is of sufficient size and depth that the Refuge has (and plans to expand in the future) a fishing pier and boat launching facility in the area. The creek would serve as an effective water source for engines, helicopter bucket operations, and pumps. The Rappahannock River is a major water source and is 750 feet from the northeastern boundary of the tract.

The Thomas Tract has no standing water (ponds or lakes) within its boundaries, but the southern portion of the tract is composed of tidal marsh with an accompanying tidal creek (Piscataway Creek). Despite considerable frontage with Piscataway Creek, access to the water from land is difficult. The Rappahannock River is a very short distance from the tract boundary (approximately .75 mile) but access is difficult due to terrain, vegetation, and land ownership.

## Access

A major 4-lane paved highway (U.S. Route 17) provides easy primary access to both of the tracts contained within the FMU. It passes directly adjacent to the Hutchinson Tract and connects with secondary roads (Winston and Cold Cheer Roads) to connect with the perimeter of the Thomas Tract. Gravel and dirt roads bisect the Hutchinson Tract, one of which extends from Route 17 to Mt. Landing Road (S.R. 627). Another road ends at the proposed boat launch and fishing pier on Mt. Landing Creek.

Cold Cheer Road, an improved secondary road, provides access to the Thomas Tract and runs parallel along the entire northeast boundary of the tract. Winston Street, paved up to the Refuge gate, provides access to the Thomas Tract from Route 17. The road beyond this point is a dirt logging road.

All of these roads provide effective barriers to fire spread (both in and out of the respective tracts of the FMU). They are of sufficient width and size that they can provide good access to the FMU boundary and can serve as locations for anchor points and safety zones. In addition, they provide good two-way ingress and egress for fire personnel into the area.

## Helispots

At the present time there are no areas within the FMU that have been designated as helispots for landing and/or logistical operations (the use of mechanized equipment, including helicopters, is subject to approval by the Refuge Manager). The area on the Hutchinson Tract along Route 17 where structures and parking areas currently exist could be pressed into service in the event of an emergency need. However, the best approach in this FMU is to take advantage of the Tappahannock Airport and the full range of aviation services and facilities that it possesses to meet any aviation-related needs that might arise during fire management operations. The development of a working agreement for the use of airport facilities is a logical first-step regarding aviation operations in this FMU.

## Water Sites

Access to water from the landward side of the Thomas Tract is problematical. However, in the past, the Refuge has gained access to the community dock that serves the Cold Cheer residential development on the Piscataway Creek. The Hutchinson Tract has good access in the area where the boat launch is located. Overall, the FMU has good access to the Rappahannock River, where water is present in sufficient quantity to provide support for wildland fire operations (helicopter bucket operations, engines, etc).

## Values to be Protected

### Threatened and Endangered and Special Status Species

Although the American bald eagle no longer enjoys Threatened or Endangered Species status, it is still a highly visible and valuable species on the Refuge. The protection of nesting sites in this FMU is of major concern to the Refuge fire management program.

## **Wildland Urban Interface**

A detailed discussion about potential wildland-urban interface areas located within this FMU is contained in section 3.3 (Adjacent Land Ownership and Potential Fire Spread Consequences) of this FMP.

## **Air Quality and Smoke Management**

Fire Management objectives within this FMU call for the suppression of wildfires at the smallest size. By keeping fires at the smallest possible size, the overall production of smoke is minimized thus affording maximum protection for areas where smoke could cause problems (e.g. Tappahannock, airport, highways, etc). As a practical matter, these objectives may sometimes be difficult to achieve, since fires may be too intense for direct attack by personnel on the ground when environmental conditions exist that predispose effective direct attack by suppression forces (e.g. drought, high winds, low humidity, etc). As a result, alternative methods may have to be considered to suppress fires in this FMU, including the use of helicopter bucket operations, burn-out and even backfire operations, and other indirect attack methods.

## **Cultural and Natural Resources**

There are unidentified (Wilderness Study Review) historic and cultural resources contained within this FMU (Hutchinson Tract). These resources will be identified and mapped for protection from potential impacts of fire management operations and/or wildfire at an appropriate time in the future.

## **Specially Designated Areas**

There are no specially designated areas located within this FMU

## **Power Lines**

An above-ground power line provides electricity to structures in the Hutchinson Tract in this FMU. A power line runs parallel to U.S. Highway 17 along the northwestern boundary of the tract. There are no power lines on the Thomas Tract.

## **Structures and Other Values at Risk**

In addition to the structures and facilities already discussed in section 3.3 of this plan, there are a number of capital improvements on Refuge land that could be placed at risk from a wildfire. These include a proposed information kiosk, fishing pier, portable restrooms, and information pavilion.

## **Fire Management Unit Guidance**

## **Desired Future Vegetation Conditions**

Management of the Essex County FMU-2 is governed by direction contained within the Comprehensive Conservation Plan (Draft 2008). In keeping with the guidelines established in this document, Refuge lands within the FMU will be managed primarily to provide suitable habitat for breeding, migrating and wintering birds. This will be accomplished through a variety of management activities that will result in the restoration

and maintenance of a vigorous grassland habitat. The main emphasis of management effort will be placed on the enhancement and maintenance of native warm season grasses and herbaceous species in those communities. Additional efforts will be directed towards restoration of those areas where young hardwoods have been planted. Tidal marsh areas will be closely monitored for the presence of invasive species that can have deleterious effects upon wildlife, and, where appropriate, control measures will be taken to restore native vegetation.

### **Fire Management Objectives**

The protection of human life and the prevention of property loss, performed in a manner consistent with a "safety-first" suppression response, is the top priority for fire suppression in this FMU.

Within this FMU, all wildfires will be suppressed, regardless of cause, in the quickest, most cost effective manner possible. A wide range of actions (Appendix F) are available for full suppression of wildland fire. Resources and tactics utilized will be utilized in a manner so as to minimize resource damage commensurate with minimum impact suppression techniques (MIST).

#### **Strategy:**

All fires will be suppressed, regardless of cause, in such a manner that will minimize unwarranted resource damage or compromise land and resource values. Burnout strategies may be used from pre-existing natural or human barriers. For large fires, the use of helicopter bucket operations can also be an effective strategy in this FMU, primarily due to the close physical proximity to the river and flight facilities.

### **Pre-Identified Management Action Points**

Due to the relatively small size of both of the Refuge land tracts within this FMU, their physical separation from the majority of other Refuge land east of the Rappahannock River and the presence of intense development near the Refuge boundary, the ignition of any wildfire would require an immediate coordinated response from both the Refuge and cooperators.

For the Hutchinson Tract of the FMU U.S. Highway 17 provides a significant barrier to fire spread both to those fires originating in the FMU and those threatening to enter the Refuge via the FMU boundary. Any wildland fire approaching this transition area will be closely monitored. The ordering of additional resources (personnel and equipment) for suppression can best be accomplished by an accurate assessment of the potential for this area to effectively retard or stop the spread of a wildfire.

#### **The Thomas Tract**

Cold Cheer Road runs parallel to most of the northwestern portion of this tract and separates the Refuge from private land, much of which is already developed. Since this road also serves as an effective barrier to the spread of fire, any wildfire approaching it would heighten the level of suppression response within the tract since a fire crossing this barrier would likely burn onto private land and threaten structures and property.



### **Constraints on Fire Management**

The physical separation of the tracts on the Refuge, even within a specific FMU, can impose significant restraints on fire management. This typically is manifested by increased difficulty in detection of wildfires and impacts on response time by suppression resources.

Wetlands are present that may prevent the use of heavy mechanized equipment. Equipment venturing into these areas may become mired and inoperable due to the wet, muddy conditions. Assigned RA's will identify areas where vehicular access and/ or heavy equipment are likely to be placed at risk.

Service policy restricts wildland firefighters from engaging in structural fire fighting activity. It does allow for the protection of structural exposures from the impacts of wildfires. The Refuge will rely heavily upon the response and capabilities of Essex County, not only for wildfire suppression, but for structural protection of facilities and buildings.

Prescribed burning operations will be curtailed during peak nesting or brooding periods. This applies in particular to bald eagle nesting locations during incubation (late Feb into March) close to fledging time (late June). Prior to any prescribed burning, the unit is to be evaluated for the presence of nesting birds and the Refuge Biologist consulted for final determination.

### **Safety Considerations**

U.S. Route 17 is a major thoroughfare that could be impacted by fire management operations within the FMU. The presence of personnel, equipment or smoke produced by a wildfire could likely impose restrictions on the flow of traffic in this area since it serves as the boundary of the Hutchinson Tract of the FMU. The City of Tappahannock and the Tappahannock airport could also be negatively impacted from extended periods of dense smoke.

The presence of snags (standing dead trees) in forested areas of the FMU could present a threat to fire management personnel.

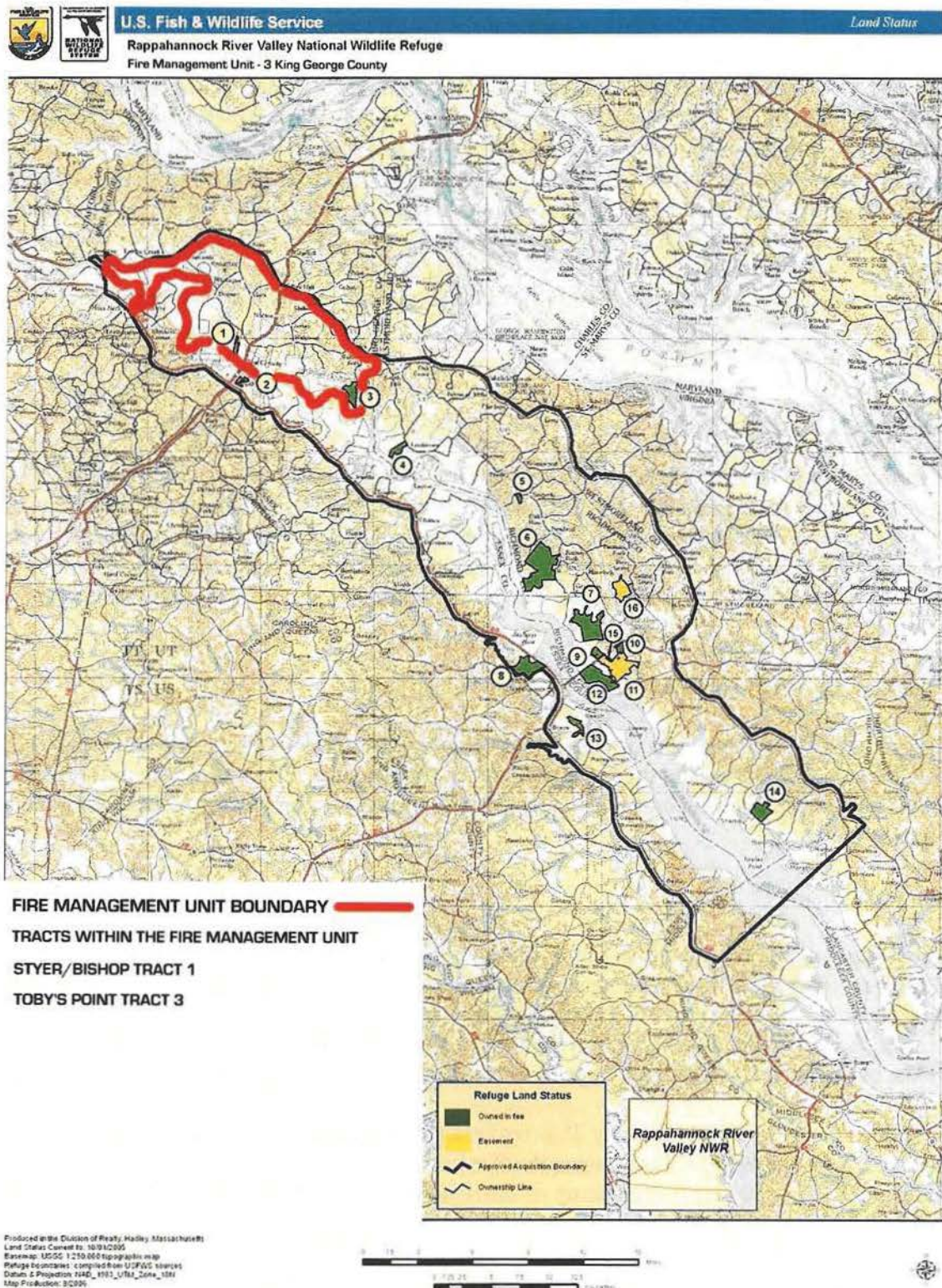
## **3.4 Fire Management Unit 3– King George County**

### **FMU Description**

The King George County FMU-3 (Figure 4) is comprised of approximately 474.9 acres and consists of the Toby's Point (365.5 acres) and the Styer-Bishop (109.4 acres) Tracts. As the name of the FMU suggests, these tracts are both located in King George County. The southern portion of the FMU has a common boundary with the Westmoreland County FMU - 4.

The southern-most tract of the FMU, Toby's Point, is located approximately 15 miles northwest of the Refuge Headquarters located at the Wilna Tract of the Richmond County FMU-1. The northernmost portion of the FMU is the Styer/Bishop Tract, located approximately 7.5 miles northwest of the Toby's Point Tract.

Figure 4 Fire Management Unit – 3 King George County





## Adjacent Land Ownership and Potential Fire Spread Consequences

### Styer/Bishop Tract

The Styer/Bishop Tract of the FMU is bounded by agricultural fields on both the east and west sides of the tract. The southern edge of the tract is bounded by a thin line of hardwood forest, which drops off quickly into the Rappahannock River. There are several private residences located in the proximity of the tract to the northeast. They are located approximately .11 mile due east of the Refuge boundary along State Route 631 (Millbank Road). Another residence is located to the southwest at the terminus of the same road near the Rappahannock River (.17 miles). Because this tract is bound on three sides by agricultural fields and the Rappahannock River, only the northern portion of the tract is susceptible to fire spread consequence of note, though this is unlikely to occur. Mixed hardwood-pine forest provides a buffer along the Refuge boundary between structures and Refuge land. In addition, the Millbank Road is located between Refuge land and the private residences along that same road.

### Toby's Point Tract

The Toby's Point Tract of the FMU is located along the Rappahannock River, which surrounds it on three sides. There are several private residences near the tract. The first is located approximately .25 miles due east of the northeastern-most corner of the tract. The second is approximately .23 miles north of the northeastern corner. This tract adjoins Wilmont Landing, a county-owner and maintained boat landing which includes a fishing pier, informational kiosk, boat ramp, and parking lot. The potential for significant fire spread consequences in this tract are minimal.

## Fuels and Vegetation FMU-Specific

Unless otherwise specified, those areas of the FMU that are representative of Fuel Model 9 should be considered to be Fuel Model 8 during the summer months. This change reflects the potential effects that deciduous leaf fall have on fire behavior during the fall and spring months. A map of FMU fuel models is located in Appendix A).

### Styer/Bishop Tract

The majority of the vegetation in this tract (approximately 50.7 acres) is made up of grass and various herbaceous species (Fuel Models 1/3). Depending upon the time interval between management activities, a considerable amount of woody vegetation may be present in some of the grassland areas (Fuel Model 5). Sweetgum (*Liquidamber styraciflua*) is one of the most persistent of the woody species that attempts to colonize these old fields, but other woody and shrub species are typically present in varying degrees of coverage.

Forested uplands in the tract (approximately 25 acres) are generally made up of stands of mixed coniferous and hardwood species. Fuel Model 9 best represents the fire behavior expected for these fuels. A portion of the upland section of the tract (20 acres) is made up of fairly homogeneous stands of loblolly pine. These are represented by Fuel Model 9 (year-round).

A very small portion of the tract (approximately 10 acres) is composed of wetland forest (Fuel Model 8 year-round).

## Toby's Point Tract

The Toby's Point Tract of the FMU is composed primarily of mixed hardwood forest (291 acres). Loblolly pine forest (66 acres) and some tidal marsh and wetlands are also found in this tract. Fuel Model 9 best represents both of the forested areas and Fuel Model 3 applies for the marsh vegetation in the tract.

## Unique Characteristics Affecting Fire Management

### Topography and Soils

Generally the terrain is flat in both tracts. However, there are portions of the Toby's Point Tract where tidal creeks have carved deep cuts into the landscape, resulting in the presence of many steep ravines and a generally dissected landscape.

### Hydrology

Both tracts are located next to the Rappahannock River. As a result, there is good access and availability to water and in sufficient quantity to provide support for wildland fire operations (helicopter bucket operations, engines, etc). The Toby's Point Tract has approximately 100 feet of river frontage. Wilmont Landing (a developed boat launch and fishing area managed by the State) is located adjacent to the boundary and provides excellent vehicular access to the river. Tidal creeks dissect much of the tract and support numerous tidal marsh and wetland areas. Some of these also serve as effective barriers to fire spread in the event of a wildfire.

### Access

Access to both tracts of the FMU is good. A gravel road, lightly traveled, provides access to the Styer/Bishop Tract. Millbank Road provides good vehicular access to the majority of the tract and parallels its western boundary almost all the way to the river.

In the Toby's Point Tract of the FMU, Wilmont Road provides good vehicular access to the tract. Old logging roads also provide access for foot and ATV travel to some interior portions of the tract, though these may not be available for use other than for escape routes for suppression personnel in the event of a wildfire.

### Helispots

The Styer/Bishop Tract has several locations (grass and/or agricultural fields) that might be used effectively for helicopter operations. However, they have not been pre-identified or equipped with lights and/or wind direction devices. Toby's Point has no suitable locations for helispots.

### Water Sites

See discussion in the hydrology section on this page.



## **Values to be Protected**

### **Threatened and Endangered Species and Special Status Species**

The Federally-threatened sensitive joint-vetch (*Aeschenomene virginica*) is found in marsh areas along the transitional zone from brackish to freshwater, like those found in the Toby's Point Tract of the FMU.

Although the bald eagle no longer enjoys Threatened or Endangered Species status, it is still a highly visible and valuable species on the Refuge. The protection of nesting sites and roosting trees contained within the FMU are of major concern to the Refuge fire management program.

### **Wildland Urban Interface**

A detailed discussion about potential wildland-urban interface areas in this FMU is contained in section 3.4 (Adjacent Land Ownership and Potential Fire Spread Consequences) of this FMP.

### **Air Quality and Smoke Management**

There are no special air quality issues in this FMU that have not already been addressed in section 3.1 (air quality and smoke management) of this plan.

### **Cultural and Natural Resources**

There are potential unidentified (Wilderness Study Review) historic and cultural resources contained within this FMU (Toby's Point). As soon as is practical, these resources will be identified, inventoried, and mapped for protection from potential impacts of fire suppression and/or wildfire.

### **Specially Designated Areas**

There are no specially designated areas located in this FMU.

### **Power Lines**

There are no power lines located on Refuge property within this FMU.

### **Structures and Other Values at Risk**

In addition to the structures and facilities already discussed in section 3.4 of this plan, there are a few capital improvements located near Refuge lands that could be placed at risk from a wildfire. These include a boat launch area (pier and dock) and information kiosk located at Wilmont Landing adjacent to the Toby's Point Tract of the FMU. This facility is managed by the State of Virginia.

## **Fire Management Unit Guidance**

### **Desired Future Vegetation Conditions**

#### **Styer/Bishop Tract**

Grassland fields in this tract best serve the needs of wildlife if they are maintained in an early successional vegetative state. By fostering the growth of native warm season grasses and a variety of native forbs, Refuge habitat improvement objectives are more closely met. Long-term goals are to increase native warm-season grass cover by at least 25% and reduce non-native cool season grasses by at least 25%. In order to maintain the early succession status of the fields in this portion of the FMU, a reduction in woody vegetation and exotic and invasive species by 50% or more is desired. In forested areas of the tract no current management is planned, though anecdotal observations suggest that there may be some accumulations of dead and down trees that will require management action at some point in the future.

### **Fire Management Objectives**

All wildfires will be suppressed, regardless of cause, in the quickest, most cost effective manner possible, with the highest regard for human life and safety. A variety of options (Appendix F) are available for full suppression of wildland fire. Resources and tactics utilized should minimize resource damage whenever possible. The availability of roads and the Rappahannock River close to both tracts in the FMU provide good barriers to fire spread in some directions and also provide opportunities to contain fire growth without having to construct fire line.

Fires that require a suppression action, regardless of cause, will be dealt with in a manner that minimizes unwarranted resource damage or that compromises land and resource values. Burnout strategies may be used from pre-existing natural or human barriers. For large fires, the use of helicopter bucket operations or engines can also be an effective strategy in this FMU, primarily due to the close physical proximity to the river and the large quantities of water available for suppression operations.

### **Pre-Identified Management Action Points**

#### **Styer/Bishop Tract**

State Route 631 (Milbank Road) runs through the tract and separates the Refuge from private land. Since this road also serves as an effective barrier to the spread of fire, any wildfire approaching it would heighten the level of suppression response within the tract since a fire crossing this barrier would likely burn onto private land and threaten structures and property.

#### **Toby's Point**

With the exception of two areas, Wilmont Road and the northern boundary, this tract is surrounded by water (Rappahannock River). Wilmont Road provides a good defensible space for suppression forces in the event of a wildfire, but private lands are located on the opposite side of the road. As a result, any wildfire that approaches within ¼ mile of this road from either direction should be viewed as a trigger point for the ordering of additional resources (personnel, equipment, aircraft, etc) in the event of a wildfire. The same applies to the

northern boundary area, where private lands, including residences and structures, are located as close as .9 mile from the Refuge boundary.

### **Constraints on Fire Management**

Wetlands are present that may prevent the use of heavy mechanized equipment. Equipment venturing into these areas may become mired and inoperable due to the wet, muddy conditions. Assigned RA's will identify areas where vehicular access and/ or heavy equipment are likely to be placed at risk.

In the Toby's Point Tract of the FMU, some areas are not suited for any type of mechanized equipment use due to the steep terrain, sometimes in combination with wetlands and standing water.

Travel time for responding suppression resources is approximately 30-45 minutes. There are limited suppression resources available from the Refuge, which are located at least 15-22.5 miles away.

### **Safety Considerations**

Highway 301, a major four-lane highway, is located approximately .57 miles due east of the Styer/Bishop Tract. The presence of smoke produced by a wildfire on this highway could lead to major traffic problems and personal safety issues with travelers.

Although none of the other roads located in the vicinity of either the Styer/ Bishop or Toby's Point Tracts are classified as major thoroughfares, the presence of smoke on secondary roads (Millbank and Wilmont Roads respectively) could lead to potential traffic problems.

The presence of snags (standing dead trees) in forested areas (Toby's Point Tract) of the FMU, could present a threat to fire management personnel.

## **3.5 Fire Management Unit 4 – Westmoreland County**

### **Description**

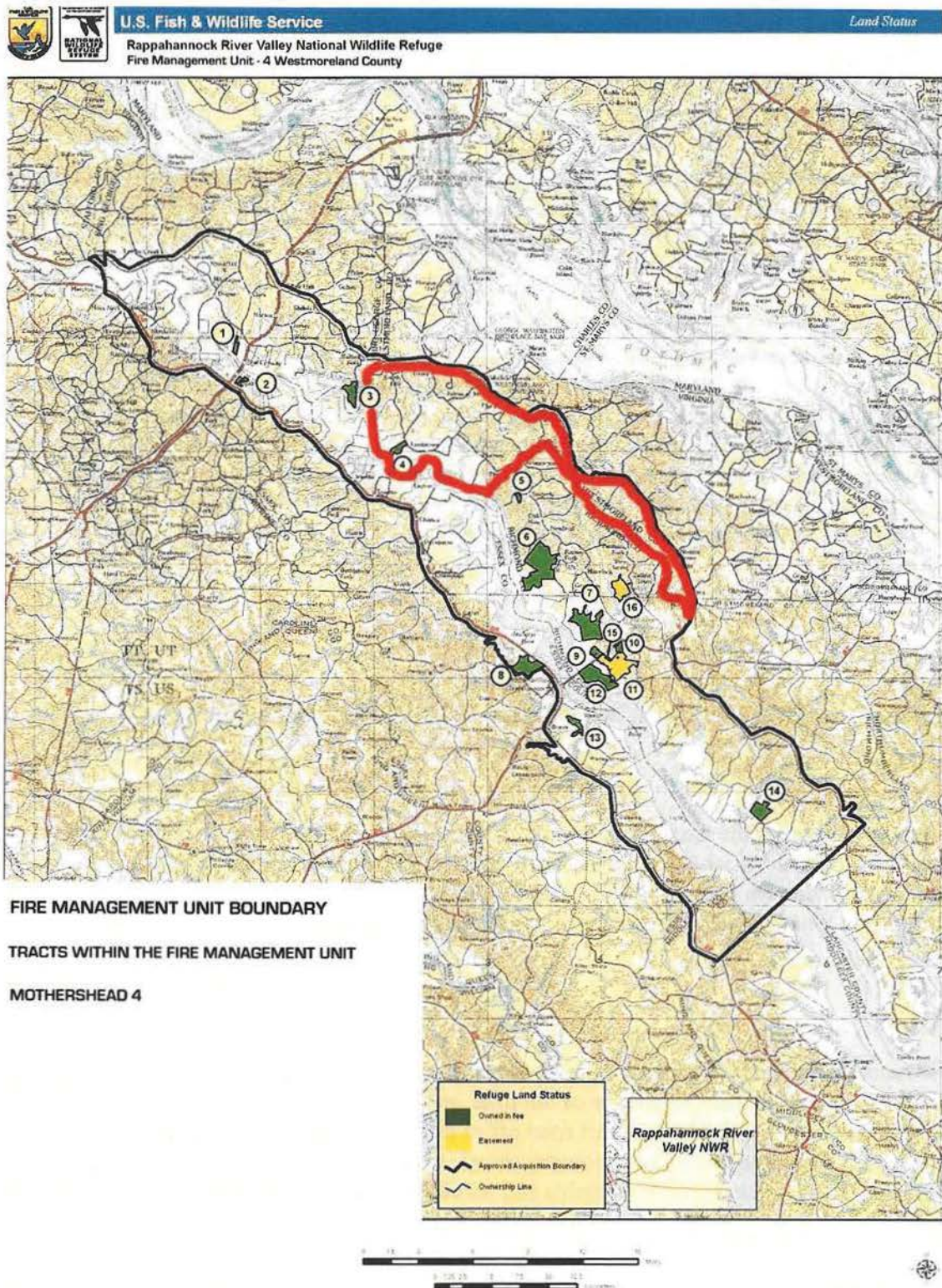
The Westmoreland County FMU-4 (Figure 5) is made up of approximately 227 acres (approximately 98% burnable vegetation) located on the Mothershead Tract of the FMU. At the present time (2008) this is the only land owned by the Refuge within Westmoreland County. The FMU has a common boundary on the north with the King George FMU-3 and on the south by the Richmond County FMU-1. It is located approximately 10 miles (straight-line distance) from the Refuge Headquarters located at the Wilna Unit near Warsaw, VA.

### **Adjacent Land Ownership and Potential Fire Spread Consequences**

Approximately 2/3 of the Mothershead Tract of the FMU is surrounded by active agricultural fields located on private land. In addition, a hard surface road (Leedstown Road) runs parallel to the entire northern boundary of the tract. Another paved road, the Liberty Farm Road, runs the entire northwest quadrant of the tract, along a field's edge, essentially surrounding the tract with effective barriers to fire spread. Structures associated with a large farm (multiple barns, sheds, etc) are located approximately .25 miles due west of the tract. A few scattered



Figure 5 Fire Management Unit – 4 Westmoreland County





private residences are located north and northeast of the tract (.14 miles), though they all are surrounded by expansive open area or roads that provide excellent defensible space in the event of a wildland fire.

An old abandoned farmhouse (proposed for removal) is located on the tract.

### **Fuels and Vegetation FMU-Specific**

Unless otherwise specified, those areas of the FMU that are representative of Fuel Model 9 should be considered to be Fuel Model 8 during the summer months. This change reflects the potential effects that deciduous leaf fall have on fire behavior in the fall and spring months. A map of fuel models is located in Appendix A.

This FMU is composed of approximately 132 acres of old fields and grasslands. Depending upon the height of these grasses and herbaceous plants, either Fuel Model 1 or Fuel Model 3 (>3ft in height) is used to predict fire behavior and effects. A portion of the fields located in the southwestern section of the tract are succumbing to succession and have heavy accumulations of invasives (e.g. honeysuckle), as well as various shrubs, vines, and eastern red cedar (Fuel Model 5). The tract's northeastern portion (approximately 68 acres) is vegetated with a dense loblolly pine (Fuel Model 9 year-round) forest that is approximately 25 years of age. About 28 acres of wet hardwood forest (Fuel Model 8 year-round)) are distributed in a relatively narrow band that runs from southwest to northeast in the lower 1/3 quadrant of the tract.

### **Unique Characteristics Affecting Fire Management**

#### **Topography and Soils**

The terrain is very flat. The land surrounding the tract is used primarily for agriculture.

#### **Hydrology**

The southernmost portion of the tract abuts the Rappahannock River, but access is restricted largely due to vegetation and lack of a serviceable road. Access to the river can be attained by using the Liberty Farm Road located just along the western boundary of the tract, a distance of approximately 1.5 miles. A small pond located near an abandoned farmhouse on the tract is difficult to access due to wet conditions and vegetation (shrubs).

#### **Access**

Hard surface roads provide ready access to the Mothershead Tract of the FMU. State Route 637 (Leedstown Road) parallels the entire northern boundary of the tract, and State Route 696 (Liberty Farm Road) runs adjacent to the northwestern boundary. A dirt road off of the Liberty Farm Road provides access to the interior portion of the lower 1/3 of the tract. Cross-country travel is possible within most of this tract of the FMU because of the flat terrain. Access to lower fields and shrubland may be limited due to beaver activity adjacent to a small pond located near the abandoned farm house.

## **Helispots**

The Mothershead Tract has several locations (grass and/or agricultural fields) that might be used effectively for helicopter operations. However, they have not been pre-identified or equipped with lights and/or wind direction devices.

## **Water Sites**

The southern boundary of the Mothershead Tract FMU-4 is located adjacent to the Rappahannock River (direct river frontage of 1,026 feet). Access to the water can only be attained by driving approximately 1.5 miles to private land just west of the Refuge (a private campground). Water is present in sufficient quantity at this location to provide support for wildland fire operations (engines and pumps). The small pond located near the abandoned farmhouse is difficult to access and is therefore unreliable as a water source. In the past the Refuge has had a verbal agreement with the nursery located to the southwest for access to their water wells.

## **Values to be Protected**

### **Threatened and Endangered Species and Special Status Species**

This FMU contains no known threatened, endangered, or special status species. However, there may be bald eagle nesting and/or roosting sites located within the tract that should be considered priority areas for protection in the event of a wildfire. These specialty trees should not be exposed to the effects of high intensity fires that might damage or destroy them.

### **Wildland Urban Interface**

A detailed discussion about potential wildland-urban interface areas in this FMU is contained in section 3.5 (Adjacent Land Ownership and Potential Fire Spread Consequences) of this FMP.

### **Air Quality and Smoke Management**

This tract of the FMU is located in a rural portion of the county. There are private homes and agricultural land located within <1 mile of the Refuge, but these are widely scattered and not likely to be affected by smoke except under the most extreme environmental conditions. The two State Roads mentioned earlier, Liberty Farm and Leedstown Road are immediately adjacent to the Refuge and could be impacted by smoke produced by a wildland fire.

Fire Management objectives within this FMU call for the suppression of wildfires at the smallest size. By keeping fires at the smallest possible size, the overall production of smoke is minimized thus affording maximum protection for areas where smoke could cause problems (e.g. private residences, roads, etc).

### **Cultural and Natural Resources**

There are no known cultural resources contained within this FMU.

### **Specially Designated Areas**

There are no specially designated areas in this FMU.

### **Power Lines**

There are no power lines in this FMU.

### **Structures and Other Values at Risk**

An old abandoned farmhouse is located within the tract. It has been proposed for removal at some point in the future.

### **Fire Management Unit Guidance**

#### **Desired Future Vegetation Conditions**

Management of the Westmoreland County FMU-4, Mothershead Tract, is governed by the Draft (2008) Comprehensive Conservation Plan for the Refuge. In keeping with the direction provided in the document, the FMU will be managed to maintain the grasslands in such a manner that they will provide the best high-quality habitat for nesting, migrating, and wintering birds. Emphasis will be placed upon the promotion of the native warm-season grasses already present and retarding woody and exotic species invasion. Even though their area in the tract is limited to a relatively small acreage, forested wetlands provide potential valuable nesting and roosting sites for bald eagles. These areas will be monitored and, if necessary, treated for the presence of invasive species that could have negative impacts on wildlife habitat.

### **Fire Management Objectives**

The Mothershead Tract of the Westmoreland County FMU-4 represents a relatively small portion of the general area landscape and is relatively isolated with fairly limited access. It contains resource values worthy of preservation and protection. The protection of human life and the prevention of property loss, performed in a manner consistent with a “safety-first” suppression response, is the top priority for fire suppression in this FMU.

Within this FMU, all wildfires will be suppressed, regardless of cause, in the quickest, most cost effective manner possible. A variety of actions (Appendix F) are available for full suppression of wildland fires. Resources and tactics utilized will be applied in a manner that minimizes resource damage.

#### **Strategy:**

All fires will be suppressed, regardless of cause, in a manner that will minimize unwarranted resource damage or compromise Refuge and private land and resources. If necessary, the Refuge will consider allowing a wildfire to burn to a location where natural barriers and/or mechanized equipment can be effectively utilized for fire suppression. This will be contingent upon a reasonable probability that ensuing suppression actions will be successful. Burnout or even backfire strategies may be used from pre-existing natural or human-made barriers. Helicopter bucket operations can also be effective in this FMU. Initial action to a wildfire in this FMU is most

likely to come from a cooperating agency. This is largely due to the distance of the FMU from the Refuge Headquarters and the isolated nature of Refuge land.

### **Pre-Identified Management Action Points**

Leedstown and Liberty Farm Roads represent barriers to fire spread (north and west/northwest respectively), both to those fires originating in the FMU and those threatening to leave the FMU via the boundary. Any wildland fire approaching either of these boundary transition areas will be closely attended, with accompanying decisions made regarding the ordering of additional resources (personnel and equipment).

### **Constraints on Fire Management**

Portions of the tract are remote with limited access (typically only via foot travel).

Since wildfires in isolated areas are frequently more difficult to access due to the isolated nature of their positioning on the landscape, fires have the potential to become larger and emit more smoke before they can have suppression actions taken on them. Even though the roads in the area are not heavily traveled, smoke could impact traffic using them to access private land. Structures, though few in number and scattered, could also be impacted if a wildfire were to escape Refuge boundaries onto private land.

### **Safety Considerations**

Although none of the roads located in the vicinity of the Mothershead Tract are classified as major thoroughfares, the presence of smoke on these secondary roads (Leedstown and Freedom Farm) could lead to potential traffic problems and is to be avoided if at all possible. .

The presence of snags (standing dead trees) in the northern portion of this tract represents a potential threat to fire management personnel. If fire management operations are undertaken in this area of the FMU, hazard trees should be identified (flagged) and their presence made known to personnel working in the area.

## **3.6 Fire Management Unit 5 – Caroline County**

### **Description**

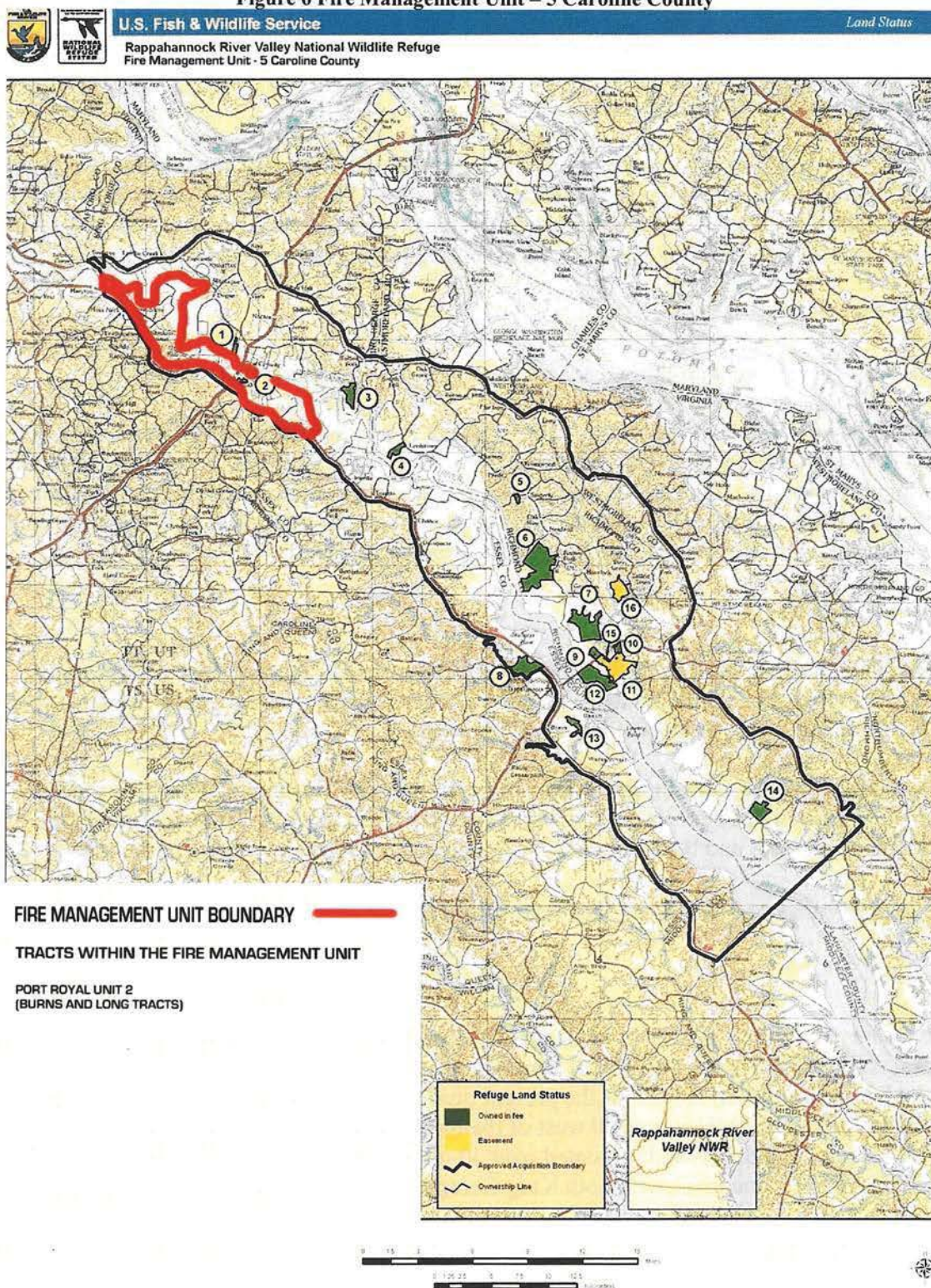
The Caroline County FMU-5 (Figure 6) is made up of 123 acres (approximately 98% burnable vegetation) located on what is referred to as the Port Royal Unit (Burns and Long Tracts) of the FMU, situated on the southern edge of the town of Port Royal. At the present time (2008) this is the only land owned by the Refuge within Caroline County. The FMU is located west of the Rappahannock River at the intersection of two major highways, U.S. Routes 17 and 301, and is located over 30 miles from the Refuge Headquarters at Wilna. The FMU has areas of common boundary with both King George FMU-3 and Essex County FMU- 2.

### **Adjacent Land Ownership and Potential Fire Spread Consequences**

The northwestern boundary of the unit directly borders a sizeable residential community. For approximately 390 feet it directly abuts the backyards of several trailer homes. Another subdivision is located along the southwestern boundary of the unit, though it does not occupy the entire length of the boundary. A new



### **Figure 6 Fire Management Unit – 5 Caroline County**



riverfront home built in 2008 lies within 200-300 feet of the Burns Tract boundary. A few scattered private structures are located approximately 740 feet south of the Refuge boundary. These facilities are afforded the added protection of a tidal creek and accompanying wetlands that separate them from the Refuge boundary. The northeastern portion of the unit abuts the Rappahannock River (approximate 1,600 foot frontage).

### **Fuels and Vegetation FMU-Specific**

Unless otherwise specified, those areas of the FMU that are representative of Fuel Model 9 should be considered to be Fuel Model 8 during the summer months. This change reflects the potential effects that deciduous leaf fall have on fire behavior in the fall and spring months. A map of fuel models is located in Appendix A.

This unit of the FMU is approximately 123 acres in size. Approximately 50 acres are old fields and grasslands. Most of the grassland on the unit is currently in the early successional stages of development, and, although they do contain a native warm-season grass component, they have been heavily impacted by non-native species such as fescue and Johnsongrass (*Sorghum halepense*). The Refuge plans restoration for native warm-season grasses in this unit of the FMU in the future. Fuel Model 1 or Fuel Model 3 (for grasses 3ft+ in height) are the fuel models of choice for these areas. The 25 acre Burns Tract is in an early succession forest stage but contains some open areas of Johnsongrass and blackberry briar patches. This tract is also heavily infested with Autumn Olive which was sprayed in 2007 and 2008. As a result, there is considerable fuel in this portion of the tract. The northeastern portion of the grassland unit contains more woody vegetation and hardwood saplings than in other areas and may be better represented by Fuel Model 5. The majority of the remainder of the unit (45 acres) is mixed hardwood forest (Fuel Model 9). A few acres of wet meadow (Fuel Model 1) and tidal marsh (Fuel Model 3) associated with the small tidal creek that enters the unit from the river are located in the southeastern portion of the unit.

### **Unique Characteristics Affecting Fire Management**

#### **Topography and Soils**

The terrain is very flat. There are no unusual soil conditions present.

#### **Hydrology**

See water sites below.

#### **Access**

Because this unit is located in a developed area, access via a well-developed road system is easy and reliable. A paved road leads to the entrance of the unit from the edge of town and terminates in a cul-de-sac located at the gate to the unit. The unit is close to the intersection of two major highway systems; U.S. Highway 17 and U.S. Highway 301. Cross-country travel is possible within most of this tract of the FMU because of the flat terrain and travel is limited only by the presence of thick vegetation.



## **Helispots**

The Port Royal Tract has excellent potential for the placement and utilization of helispots. Several locations (grasslands) on site are adequate, as are a number of potential sites in the local community. However, no sites have as yet been pre-identified, mapped, or equipped with lights and/or wind direction and signal devices. The small size of this unit makes the selection and preparation of prospective helispots a low priority in the overall Refuge fire aviation management planning process.

## **Water Sites**

The northeastern boundary of the Port Royal Tract FMU-5 is located adjacent to the Rappahannock River (direct river frontage of 1,600 feet). Access to the water can be best attained by utilizing the natural ramp that leads to the waters edge located in the extreme southeast portion of the unit at the river's edge. Water is present in sufficient quantity at this location to provide support for wildland fire operations (engines and pumps). The small pond located near the forest edge is difficult to access and should not be counted upon as a viable water supply.

## **Values to be Protected**

### **Threatened and Endangered Species and Special Status Species**

This FMU contains no known federally listed threatened, endangered, or special status species; however it currently contains an active bald eagle nest (a state-listed species) in the forest bordering the wetland.

## **Wildland Urban Interface**

A detailed discussion about potential wildland-urban interface areas contained within this FMU is contained in section 3.6 (Adjacent Land Ownership and Potential Fire Spread Consequences) of this FMP.

## **Air Quality and Smoke Management**

This tract of the FMU is located immediately adjacent to the town of Port Royal (population 170). Closely spaced private residences associated with the town directly abut Refuge land along two axes of the boundary. In addition, there are private homes and agricultural land located within 1 mile of the Refuge in almost every direction. Still others are more widely scattered and not likely to be affected by smoke except under the most extreme environmental conditions. There are a number of roads located immediately adjacent to the Refuge and could be impacted by smoke produced by a wildland fire. An intersection of the two main highways discussed previously (U.S. Routes 301 and 17) are located approximately 1000' from the Refuge boundary.

Fire Management objectives within this FMU call for the suppression of wildfires at the smallest size. By keeping fires at the smallest possible size, the overall production of smoke is minimized thus affording maximum protection for areas where smoke could cause problems (e.g. town of Port Royal, private residences, major highways, roads, etc).

## **Cultural and Natural Resources**

There are no known cultural resources contained within this FMU. However, the existence of artifacts and/or remains (e.g. Native American, colonial period, Civil War) is highly likely.

## **Specially Designated Areas**

There are no specially designated areas in this FMU.

## **Power Lines**

There are no power lines in this FMU.

## **Structures and Other Values at Risk**

There are no structures or values at risk in the FMU other than those already discussed that are located on private land.

## **Fire Management Unit Guidance**

### **Desired Future Vegetation Conditions**

Management of the Caroline County FMU-5 Port Royal Unit is governed by the Draft (2008) Comprehensive Conservation Plan for the Refuge. In keeping with the direction provided in the document, the FMU will be managed to maintain the grasslands in such a manner that they will provide the best high-quality habitat for nesting, migrating, and wintering birds. Emphasis will be placed upon the promotion of the native warm-season grasses already present and retarding woody and exotic species invasion. Even though limited to a relatively small acreage, forested wetlands still provide potential habitat for some species of wildlife. These areas will be monitored and, if necessary, treated for the presence of invasive species that could have negative impacts on wildlife habitat.

### **Fire Management Objectives**

The Port Royal Unit of the Caroline County FMU-5 represents a relatively small portion of the general area landscape and is relatively isolated from the remaining FMU's and units of the Refuge. It contains resource values worthy of preservation and protection. The protection of human life and the prevention of property loss, performed in a manner consistent with "safety-first" suppression actions, is the top priority for fire management in this FMU.

All fires will be suppressed, regardless of cause, in such a manner that will minimize unwarranted resource damage or compromise either Refuge or private lands and resources. Particular emphasis will be placed upon a rapid response to the report of a wildfire in this unit for two reasons. The first is the physical location of the unit and its close proximity to structures and homes in the town of Port Royal. The second is that the majority of the unit is made up of fine fuels (grasses, shrubs, etc) and, if attacked quickly and effectively with adequate resources, can be quickly suppressed with direct attack techniques (under most conditions) with little or no resource damage resulting. Initial action on a wildfire in this FMU is most likely to come from a cooperating



agency. This is largely due to the distance of the FMU from the Refuge Headquarters and the close proximity to County Fire Departments. Appendix F contains a comprehensive list of strategies and options available for fire management actions within this FMU.

### **Pre-Identified Management Action Points**

Due to the proximity of this unit of the FMU to structures, highways, and other values at risk, the presence of any wildfire in the unit would trigger an immediate response (including structural fire resources and mechanized equipment) by cooperating agencies.

### **Constraints on Fire Management**

Structures could be impacted if a wildfire were to escape Refuge boundaries onto private land. Service policy restricts wildland firefighters from engaging in structural fire fighting activity. It does allow for the protection of structural exposures from the impacts of wildfires. The Refuge will rely heavily upon the response and capabilities of Caroline County, not only for wildfire suppression, but for structural protection of facilities and buildings.

Wetlands (though limited in size) are present that may prevent the use of heavy mechanized equipment. Equipment venturing into these areas may become mired and inoperable due to the wet, muddy conditions. Assigned RA's will identify areas where vehicular access and/ or heavy equipment are likely to be placed at risk.

### **Safety Considerations**

U.S. Routes 17 and 301 are major thoroughfares that could be impacted by fire management operations within the FMU. The presence of personnel, equipment or smoke produced by a wildfire could likely impose restrictions on the flow of traffic in this area since it is so close to the Port Royal Unit of the FMU. The town of Port Royal could also be negatively impacted from dense smoke, especially private residences located immediately adjacent to portions of the Refuge boundary.

## **4.0 WILDLAND FIRE OPERATIONAL GUIDANCE**

The intent of this chapter is to document the procedures used in the Fire Management Plan to *implement* the wildland fire management program. Information pertaining to this management is either provided directly or a reference is cited as to where this type of information can be found.

### **4.1 Management of Unplanned Ignitions**

Responses to unplanned ignitions require that agency administrators possess the ability to choose from a full spectrum of management actions. Not all unplanned fires need to be suppressed with the same level of intensity, and in some cases they may be managed for resource benefits. Responses to unplanned ignitions will be based on considerations analyzed and pre-planned in this Fire Management Plan. The descriptions and/or references that follow describe actions that RRVNWR will take when responding to unplanned ignitions.

Since the establishment of the Refuge in 1994 there have been no documented unplanned ignitions (wildland fires) occurring on Service land. However, occurrences on lands in the general area outside of the Refuge have established a fairly consistent model of both fire occurrences and fire behavior. Over that period of time, a number of small fires of low complexity have occurred, occasionally punctuated by larger episodic fires, likely resulting from the combined influences of drought and the availability of wildland fuels. Table 2 on page 31 of this FMP summarizes the wildland fire occurrence for the time period 1995 – 2007.

Despite the relatively low number, size, and complexity of fires that have occurred, the potential exists for larger and more complex fires. It is anticipated that these types of events would be driven by long-term drought and the presence of significant dead and down fuels. Local environmental conditions would have to be “in-alignment” for a major fire (high winds, dry fuels, unstable atmosphere, etc) to occur. Based upon historical data these types of events would likely only occur every 35 – 100 years.

#### **4.1.1 Preparedness**

Preparedness is the work accomplished prior to fire occurrence that ensures that a suitable response to each and every wildland fire, as outlined in this Fire Management Plan, can be effectively implemented. Preparedness activities include: fire preparedness planning, equipment preparation, equipment and normal unit strength (NUS) activities, training, physical fitness, and budget planning. The overall objective of a good preparedness program is to have a well-trained and equipped fire management organization that is able to effectively manage most fire situations. Preparedness efforts are accomplished prior to the fire season (specific annual Refuge seasonal fire readiness activities are outlined in Appendix D).

Although the Refuge is relatively new, detailed information about wildfire occurrence has been collected by the Virginia Department of Forestry since after the turn of the 20<sup>th</sup> Century. Based upon that data, the primary fire season for RRVNWR runs from February 15<sup>th</sup> to April 30<sup>th</sup>. Fire danger then typically decreases during the summer months, although fires can occur during this time period. Precipitation levels increase slightly, and, more importantly, vegetation green-up takes place, accompanied by high humidity levels and increased shading of forest fuels by the leaves of deciduous trees. Beginning in the fall, usually around October 15<sup>th</sup> when the leaves fall from deciduous trees and accumulate on the ground, fire danger takes an upswing. This increased litter layer is highly available for fire since it forms a very loose, fluffy and dried-out fuel bed on the ground. This second fire season lasts until about November 30<sup>th</sup> when cooler temperatures, snow and rainfall make their normal winter-season appearance.

Thunderstorms can occur in all months of the year, but they are most common in the deep, moist, warm air of tropical origin that is typical of the summer months. Over the past two decades, the State of Virginia has averaged one thunderstorm day per decade in January, compared with nine thunderstorm days per month in July. Lightning is associated with thunderstorm development and lightning-caused fires occurring late in the summer and early fall can become more difficult to suppress when accompanied by prolonged drought and depleted soil and fuel moisture levels.

#### **Planning**

RRVNWR is supported by the Virginia-West Virginia Zone fire program, based out of Great Dismal Swamp NWR. A centralized fire cache, suppression equipment and dedicated fire management staff are located at this hub refuge, and are tasked with supporting the refuges contained within the Zone.

Preparedness planning for RRVNWR is updated on a regular basis (annual review). Planning includes the following activities: updating and approving annual operations plans and agreements, developing and updating detection and dispatch plans, updating communications, developing and updating pre-season plans, updating staffing step-up plans, and ensuring that information relating to wildland fire decision support systems (WFDSS) is current and available.

### **Fire Weather and Forecast Information**

The Refuge does not have its own automated fire weather station on-site. However, data from a catalogued station is available and is obtained from a remote automated weather station (RAWS 446801) located at the James River National Wildlife Refuge, located approximately 55 miles southwest of the RRVNWR Headquarters. It automatically gathers environmental data relating to fire weather and fuels and converts them into National Fire Danger Rating System (NFDRS) outputs (Burning Index [BI], Energy Release Component [ERC], Keetch-Byram Drought Index [KBDI], etc). These outputs provide a broad-based fire danger forecast for the Refuge and surrounding area. Based upon the indices formulated at the station, staffing and preparedness levels are implemented as described in Appendix D. An additional fire danger rating forecast (referred to as Class Days) can be obtained from the Virginia Department of Forestry (VDOF), either via the internet address: <http://www.dof.virginia.gov/fire/danger-rating.shtml> or by contacting the Eastern Regional Office (Tappahannock) of the VDOF (see Fire Directory in Appendix E for phone number).

In addition, the National Weather Service Forecast Office located at Wakefield, Virginia provides a daily fire danger rating weather forecast during the fire season(s). Spot weather forecasts may also be obtained from this office. Menu selections for both of these options are found on the left-hand side of the web page. The internet address is: <http://www.erh.noaa.gov/er/akq/firemain.php>

### **Fire Danger Indices and Staffing (Step-Up) Plan**

A Staffing (Step-Up) Plan (Appendix D) has been developed that provides an effective planning tool for establishing adequate personnel and equipment needs during periods of varied fire danger. The Staffing (Step-Up) Plan takes into consideration a wide range of fire weather conditions, ranging from normal to severe, as well as increased National or Regional preparedness levels (IV or V), when developing recommended management actions. Elements of the plan include: staffing levels and implementation (breakpoints), crew and equipment placement, and funding (additional firefighters may be hired temporarily to supplement existing fire personnel).

There are five staffing levels; Low (I), Medium (II), High (III), Very High (IV), and Extreme (V). Specific breakpoints are established for each level. Table 5 illustrates the fire danger indices break-points where very high and extreme fire dangers are indicated (90<sup>th</sup> and 97<sup>th</sup> percentile break-points respectively). Levels are calculated using a matrix of indices consisting of: the National Fire Danger Rating System (NFDRS) Burning Index (BI), Ignition Component (IC), Spread Component (SC), Energy Release Component (ERC), and Keetch-Byram Drought Index (KBDI). Indices are calculated for a variety of fuel types that can be found on the Refuge. Fuel Model L is used to represent the early successional grass field habitat types found on the Refuge. Fuel models E (in fire season) and R (summer or non-fire season) are used for hardwood leaf litter during the months of the year indicated. NFDRS Fuel Model N represents the course grasses that are found in Refuge marshes. Fuel Model T represents the woody scrub/shrub (30% > cover) that is found in areas where old fields and grasslands are in more advanced stages of vegetation succession



Daily Fire Staffing (Step-Up) Planning will be implemented using either the BI or ERC calculated and tracked by the Zone Fire Management Officer (ZFMO) and FWS Region 5 Staff. The Zone Fire Management Officer (ZFMO) will contact the refuge when periods of fire danger exceed normal limits. These situations typically develop as the result of protracted periods of drought as expressed in indices found in the Keetch-Byrum Drought Index (KBDI). The ZFMO monitors fire potential throughout the year for the Refuge.

Based on current and forecasted conditions, the ZFMO will evaluate the need for additional planning actions and advise the Refuge Manager of such actions or conditions as needed.

Another alternative to determine local staffing based upon NFDRS indices is to utilize internet resources located at the following website: [http://gacc.nifc.gov/sacc/predictive/fuels\\_fire\\_danger/fuels\\_fire-danger.htm](http://gacc.nifc.gov/sacc/predictive/fuels_fire_danger/fuels_fire-danger.htm). Once the connection has been established, look under the section labeled "Predictive Services" on the left side of the web page and click on the tab labeled "Fuels/ Fire Danger". A screen will appear labeled "Wildland Fire Assessment System" (WFAS). Next, click on "Observed Fire Danger". After locating the Refuge on the map, compare the adjective class to the legend found on the map's lower margin, the fire danger staffing class for the current day is shown. By clicking on "Forecast Fire Danger" the predicted staffing class for the following day is shown.

**Table 5 Indices Break Points by NFDRS Fuel Models (FM) representative of the Refuge**

INDICES	FM L		FM N		FM E*		FM R		FM T	
	90	97	90	97	90	97	90	97	90	97
IC	15	28	22	29	19	25	25	35	16	26
SC	27	43	43	32	3	5	1	2	12	18
ERC	3	5	35	38	21	23	15	18	10	15
BI	23	33	70	79	20	24	12	15	26	39
KBDI	593	659	593	659	593	659	593	659	593	659

Key: IC = Ignition Component  
SC = Spread Component  
ERC = Energy Release Component  
BI = Burning Index  
KBDI = Keetch-Byrum Drought Index  
\*Primary Fuel Model (NFDRS) used for day-to-day tracking and Step-Up planning actions.

Fuel Model Key:  
L Open Grass Field  
N Marsh, coarse grass habitat, 25% woody shrub component  
E Deciduous Forest (fire season)  
R Deciduous Forest (summer)  
T Woody shrub/scrub, >30% cover

Using the Keetch-Byrum Drought Index for the Refuge area, modify the staffing class as follows:

**KBDI Range**

**Staffing Adjustment**

0 - 125  
126 - 460

Reduce by one level (Normally 12/15 – 5/20)  
No Change (Normally 5/21-7/14 and 10/15 – 12/14)



461 – 590	Increase by one level (Normally 7/15 -10/14)
>591	Increase by two levels (Rare event)

### **Detection**

According to the standards outlined in the Refuge Step-Up Plan (Appendix D), all employees perform their daily duties with a heightened state of readiness on those days when high fire danger is expected. As fire danger increases, the Refuge will place additional emphasis on detection patrols. More often than not local individuals are quick to report any smoke they see. Under adverse conditions (refer to Step-Up Plan), the Refuge may consider the need for aerial detection coverage but this should only be initiated following a lightning storm which drops a minimal amount of precipitation and when extended drought conditions are present. The Virginia Department of Forestry has the capability to implement aerial detection flights when their Class Days (staffing classes) reach 4 or 5.

### **Staffing**

Normal staffing for the Refuge allows for 3-5 collateral duty firefighter positions. Uncertain funding, more stringent medical standards, and fitness issues may make it difficult to meet even these basic staffing standards. The Refuge will make every attempt to meet minimum staffing levels, but will explore opportunities to utilize firefighting personnel from nearby refuges, national parks, state agencies, the Nature Conservancy (TNC) and local fire departments. Additional FWS resources are located at Great Dismal Swamp National Wildlife Refuge and the other refuges of the Eastern Virginia Rivers National Wildlife Refuge Complex of which RRVNWR is a member (Presque Isle and James River). The National Park Service also maintains suppression resources at Fredericksburg and Spotsylvania National Military Park, approximately 1 hour away, and at George Washington Birthplace National Monument, ½ hour distant.

### **Fire Cache and Equipment**

At the present time, RRVNWR has no fire cache or stock of tools, equipment, or supplies that are dedicated solely to wildland fire management. The Refuge relies upon the other refuges in the region to supply these items when they assist in fire management activities. Refuge personnel do have appropriate Personnel Protective Equipment (PPE) and a few assorted hand tools.

### **Normal Unit Strength**

Refuges that have a Fire Management Plan should also have a cache of firefighting tools and equipment, supplies, and other items (personal protective equipment or PPE) adequate to support initial action personnel. Cache equipment, other than capitalized property (e.g. chainsaws, pumps, etc), is considered to be the station's Normal Unit Strength (NUS). NUS will include personal protective equipment and safety items required by personnel for initial action as well as prescribed fire assignments. All firefighters will be issued the required PPE from the Refuge cache including: Aramid (Nomex) pants and shirts, gloves, helmet, goggles, field pack, fire shelter, overnight pack, sleeping bag, headlamp, and personal first-aid kit. Refuges should develop inventory systems to track equipment levels in their caches. It is the responsibility of the Refuge to establish specific cache and NUS levels. The Zone Fire Management Officer (ZFMO) and the Regional Fire Management Coordinator (RFMC) will assist the Refuge in establishing an inventory of equipment and supplies that will meet Service standards as well as the operational needs of the Refuge. When a supply of items is received, a specific Refuge

employee will be assigned to inventory and manage the fire cache.

## **Training**

### **Annual Fire Refresher**

All personnel involved in fire management activities are required to participate in fire management refresher training annually in order to be qualified for fire management activities in that calendar year. Refresher training will concentrate on local conditions and factors, the Standard Fire Orders, Lookouts, Communications, Escape Routes, and Safety Zones (LCES), 18 Situations, Common Denominators, and NWCG courses Standards for Survival, Lessons Learned, and Look Up, Look Down, Look Around. Current Issues relating to wildland fire safety (WFSTAR) are also required as a portion of each refresher session. Fire shelter use and deployment, including practical and classroom training, *must* be included as part of the annual training.

### **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). RRVNWR will conform strictly to the requirements of the wildland fire management qualification and certification system and FWS guidelines.

A training plan will be developed at the Zone level (with regional concurrence) and updated annually to identify individual training needs and utilize interagency training opportunities. Service policy sets training, qualification, and fitness standards for all fire positions. All fire personnel (full time fire or collateral duty) will be provided with the training (classroom and on-the-job) required to meet Service fire position qualification standards for the positions they are expected to perform. On-the-job training is encouraged and will be conducted at the field level. Whenever appropriate, the use of fire qualification task books will be used to document fire experience of trainees. The Refuge supports the development of individual Incident Command System (ICS) overhead personnel from among qualified and experienced staff for assignment to overhead teams at the local, regional, and national level. The ZFMO will coordinate fire training needs with those of other nearby refuges, cooperating agencies, and the Regional Fire Management Coordinator (RFMC).

### **Physical Fitness:**

The Federal Interagency Wildland Firefighter Medical Qualifications Standards Program (MSP) has been fully implemented by all DOI agencies. All employees and casual (AD) firefighters who participate in wildland fire activities requiring an arduous fitness level must participate in the MSP and be medically cleared prior to attempting the Work Capacity Test (WCT).

Personnel involved in wildland fire operations are required to meet FWS standards for physical fitness as established in the "Red Book" (Chapter 13, Firefighter Training and Qualifications Interagency Standards for Fire and Fire Aviation Operations – 2008). The entire document is available online at the following web address: [http://www.nifc.gov/policies/red\\_book.htm](http://www.nifc.gov/policies/red_book.htm). Chapter 13 of the guide details information pertaining to physical fitness standards, testing procedures, and eligibility requirements. Employees not meeting fitness and training requirements may assist in support capacities, but will not be permitted on the fireline. Personnel will not perform fire jobs for which they are not qualified. Effective in 2008, FWS employees must achieve an

arduous fitness rating when serving on a prescribed burning crew as well as when conducting initial action operations.

### **Fire Directory**

The Refuge relies heavily upon neighbors, visitors, staff, and cooperators to detect and report fires. Effective communication of information received relating to wildland fires can be facilitated through efficient use of contact personnel. A Fire Directory (Appendix E) has been prepared for that purpose. It will be reviewed and updated annually. Copies will be maintained at the Zone Fire Management Office, the Refuge Headquarters, and with the Cooperating Local Agencies. In addition to the Fire Directory, the Refuge maintains a phone list of private landowners that live adjacent to the Refuge (see next section).

### **Pre-Season Plan**

Pre-Season Planning data will be updated annually by Refuge staff. Completed and approved Pre-Season Plans will be placed at Refuge Headquarters alongside a current Dispatch Plan. These plans include:

- Emergency response map(s): roads, gates, trails, water sources, helicopter landing areas, etc.
- Mutual aid zones/fire cooperator districts (include maps with boundaries).
- Hazard/Risk map: rivers and streams, power lines, wetlands, gas lines, potential unexploded ordnance locations, impoundments, high voltage electrical transmission lines.
- Natural and cultural resources map: sensitive zones, non-sensitive zones, restricted vehicle access areas, T&E species, etc. (NOTE: Actual maps do not have to be included in the plan as a means to protect these resources from unauthorized access. However, copies should be made available to personnel involved in emergency operations.
- Capital Improvements list – structures, communications towers, information kiosks, bridges, support structures.

### **Effects of Regional and National Fire Activity/ Resource Commitment (Preparedness Levels)**

National and Geographic Area Interagency Preparedness Levels are established as a means to increase readiness and response to wildland fire incidents over a broad geographic area. The levels range from I to V with V being the most severe. These levels are changed depending on fire activity, weather, and availability of adequate fire personnel. Regional preparedness levels tend to follow national preparedness levels unless the eastern seaboard is experiencing very dry conditions. Normal Refuge operations will continue to occur through Preparedness Level III. At preparedness levels IV and V, the Refuge will seek approval through the RFMC for proposed prescribed burns.

Each level has a set of guidelines as to crew activities and movement that should correspond to Step-up Planning. In the event that Area and National Preparedness Levels are different, the Refuge will follow the guidelines based on the *higher* of the two levels. The ZFMO will keep the Refuge apprised of changes based on these Preparedness Levels. The following are the guidelines for each of the levels:

- Level I: Normal Staffing and activities to include prescribed fires.
- Level II: Normal Staffing and activities to include prescribed fires. Monitor current fire danger, predicted weather, and long-range forecasts.

- Level III: Normal Staffing and activities to include prescribed fires, monitor conditions and activate step-up plan.
- Level IV: Activate the step-up plan. The Regional Fire Management Coordinator (RFMC) must give approval before ignition of all planned and approved prescribed fires. Approval must be based on an assessment of risk, impacts of proposed actions on Area resources and activities, and includes consultation with the Geographic Area Multi-Agency Coordinating Group (GMAC). In extreme cases, dependent upon severity funding, the Refuge may consider additional resources from other areas to meet initial-attack and detection needs. This process would be undertaken in concert with guidance provided by the ZFMO.
- Level V: Activate the step-up plan. The Regional Fire Management Coordinator must give approval, before ignition, of all planned prescribed fires, ensuring that local resources are available to carry out the application without additional outside resource needs. Approval must be based on an assessment of risk, impacts of proposed actions on Area resources and activities, and include consultation with GMAC. If outside resources are required, the FWS representative on the national MAC Group must assess risk and impacts of the proposed action and present the request to the National MAC Group for review prior to proceeding. The FWS Fire Management Branch must be notified by the RFMC of any prescribed burns conducted at Level V, even if no outside resources are needed.

In addition, if the Refuge is at or above the 90th percentile, (five day average BI of 21 or higher NFDRS FM E) the FMO shall inform the RFMC that Refuge fire fighting resources are not available for off-unit assignments. Once local fire conditions moderate, then fire qualified individuals will again be made available for regional and national needs. It is expected that all fire funded individuals are available at all times for national and regional resource needs. Subject to supervisory approval, non fire funded, but fire trained individuals should be made available, especially when the National Preparedness Level is at Level V.

If seasonal fire personnel have already been dispatched to meet other regional or national needs, and the Refuge reaches the 90th percentile, there are several options available to maintain a state of readiness. Qualified non-fire funded personnel could be used to “fill in” for seasonal staff. The actions identified in the Step-Up Plan (Appendix D) could be implemented for the appropriate staffing class. These might include hiring AD firefighters, or detailing personnel from other refuges or agencies to the Refuge until conditions moderate.

#### **4.1.2 Incident Management (Management Direction)**

The evaluation and selection of a response to an unplanned ignition (wildfire) will include consideration of risks to public and firefighter safety, threats to values requiring protection, costs of various mitigation strategies and tactics, and potential resource benefits. A matrix of specific responses for RRVNWR can be found in Appendix F.

Unplanned ignitions will be staffed and monitored during active burning periods as needed to ensure that mitigation actions can be made in order to protect any values that might be threatened.

All unplanned ignitions will be supervised by a qualified Incident Commander (IC) who is responsible to:

- Assess the fire situation and make a report to the appropriate dispatch organization as soon as possible.



- Use the guidance provided in this FMP or in a Delegation of Authority to determine and implement a suitable response.
- Determine organization, resource needs, strategy and tactics.
- Brief incoming and assigned resources on the organization, strategy and tactics, weather and fire behavior, Lookouts, Communications, Escape Routes and Safety Zones (LCES), potential fire behavior, and radio frequencies.
- Order needed resources through the designated dispatch facility.
- Manage the incident until relieved or until the incident is under control.
- Manage suppression operations in the most cost-effective manner possible, without compromising safety.

The FMP and a Delegation of Authority can provide a general strategy to an IC, who has the discretion to select and implement appropriate tactics within the limits described for the FMU's, including when and where to use minimum impact suppression tactics (MIST) unless otherwise specified. All resources, including mutual aid resources, will report to the IC (in person or by radio) and receive an assignment and briefing prior to tactical employment.

### **General Management Constraints**

- Selected strategies and tactics should result in minimum resource damage while accomplishing effective incident stabilization. However, the overall safety and protection of both personnel and property are of paramount importance and must be weighed carefully against the need to utilize suppression techniques that have greater potential for impacts upon values at risk (on both Refuge and on private land). Threats to human life always take precedence over any other management consideration.
- The use of heavy equipment (e.g. bulldozers) off of designated roadways should not be used without specific authorization from the Refuge Manager (or his/her designee).
- Limit suppression actions within designated sensitive areas, such as bald eagle nesting and roosting areas, by adhering to the same guidelines established for fires in areas where fragile resources are located.
- Limit the use of firefighting foams and retardants to no closer than 300 feet from water sources. Authorization from the Refuge Manager is required for use and is dependent upon the values that require protection. Exceptions only apply when the use of these materials is required for the protection of life and/or property, when alternate line construction techniques are not available, or when potential damage to resources from a wildfire outweighs the potential damage to riparian resources.
- Threats to state and federally-listed endangered, threatened, and species of special concern and their habitats, must be considered during the selection of the response.
- Threats to cultural resources from either the fire itself or from suppression operations (whether on-site or suspected), must be considered during the selection of the response.
- Existing roads, ditches, canals, streams, or impoundments will be considered for use in lieu of constructed fireline whenever possible. When constructed fireline is deemed necessary, buffer strips of

100' will be maintained between waterways and the fireline. When fireline must be placed within 100' of a waterway, it will be oriented perpendicular to the waterway (if practicable) to avoid siltation. The use of heavy equipment and the application of chemical retardants should be avoided within buffer strips.

## **Dispatch, Communications, Size-up and Initial Response**

### **Dispatch**

Once notified of a wildland fire on Refuge lands, the Refuge Manager or his/her designee will contact the appropriate County 911 Emergency Operations Center (Dispatch Center) and confirm the presence of a wildland fire on or near Refuge property. Because of the geographical setting of the Refuge, local VFD units are likely to be in a response mode at the time of notification, as well as units from the Virginia Department of Forestry. As soon as contact has been confirmed the FWS ZFMO will be notified of the fire by the Refuge. Qualified and available Refuge staff and equipment will respond to the fire, serving directly on suppression crews. Others may participate in related activities, either as Resource Advisors (RA), or in other support activities related to the safety of Refuge visitors and property (e.g. implementing public closures, preparing Refuge facilities for the potential impacts from wildland fire, etc). Appendix H contains a comprehensive list of interagency communications frequencies for all agencies in the response area of the Refuge.

#### **Local Dispatch(s)**

RRVNWR is located in operational areas covered by County Emergency Operations Centers (911) located in five counties (Caroline, Essex, King George, Richmond and Westmoreland). Emergency (911) and administrative numbers are located in Appendix F.

If additional resources (personnel or equipment) are needed, the first option will be to call the appropriate county fire department closest to the scene of the fire and then the Virginia Department of Forestry (in that sequence). Additional support from federal sources (e.g. other FWS refuges and the National Park Service) should also be considered, though travel time required to get to the fire's location is likely to be an important factor in making the decision to contact these resources. The ZFMO and RFMC located at Great Dismal Swamp NWR will generally be responsible for ordering additional suppression resources needed at the Refuge level in these situations.

#### **Virginia Interagency Coordination Center**

VICC (Virginia Interagency Coordination Center) is a provider for local (in-state) dispatch needs. The Center is located in Charlottesville, Virginia. If fire suppression resources are needed at the Refuge level and are not available through either the ZFMO or RFMC at Great Dismal Swamp NWR, VICC may be contacted for suppression resource requests. If VICC is unable to fill requests utilizing the closest resources available, requests will be forwarded to SACC for action.

#### **Interagency Dispatch Center**

RRVNWR is located in the geographic area served by the Southern Area Coordination Center (SACC). Federal and state agencies, including RRVNWR, located in the 13-state area served by the center, receive logistical

support, resource assistance, and intelligence information for anticipated and ongoing wildland fire activity. SACC facilitates movement of resources (people, aircraft, and equipment) among any of the agencies located in the area. In addition, SACC monitors wildland fire potential, weather, and wildland fire use within the area. SACC also responds to requests for support to other geographic areas from the National Interagency Coordination Center (NICC) located in Boise, Idaho. Although the primary focus of SACC is to respond to wildland fire incidents, the Center now provides support for a wide range of all-risk incidents such as earthquake, flood, hurricane, hazardous material spills, etc. SACC also provides a clearinghouse through which its members can participate in training, workshops, and/ or special projects.

## **Communications**

Fire radios will be programmed with local fire agencies frequencies (Appendix H) to maintain communication within the local response area.

The Refuge radio system is the primary communication link among staff. Cell phones can be used as a back-up to the radio system. An updated list of cell phone numbers will be exchanged.

Most local agencies communicate using local or county frequencies. These frequencies will be identified in the MOU for use by FWS.

## **Size-Up and Initial Actions**

As discussed in an earlier section of this FMP, most wildland fires on the Refuge are likely to be discovered by persons other than Refuge staff and are generally reported through local county 911 dispatch systems. The appropriate fire department having operational responsibility for the area in which the fire is located is then contacted and responds to the fire. Depending upon the specifics of the initial report, the Virginia Department of Forestry may also be dispatched to the fire. Size-up activities related to wildland fire(s) are performed by the first suppression forces to arrive on the scene, with the most experienced firefighter assuming the role of Incident Commander (IC). That individual continues to function as the IC until relieved by an individual with a higher wildland fire qualification. Regardless of who responds first to a fire report, key information must be gathered and transmitted to the personnel who are responding. Information to be gathered includes the following:

- Size of the fire (acres)
- Flame length, direction fire is moving, rates of spread, etc
- Location (Lat/ long, UTM, grid location on refuge map)
- Access (best routes into the scene and routes of egress)
- Roads, trails
- Fuels (present and in the foreseeable future)
- Weather (wind speed, direction, relative humidity, temperature)
- Topography (steep, flat, rolling, etc)
- Resource Needs
- Hazards (power lines, gas lines, etc)
- Values at Risk (structures, communications towers, cultural resources, etc)

## Initial Actions

The Refuge will participate in initial actions, to the extent practicable, on wildland fires that occur both on *and* adjacent to Refuge lands. Fires that occur outside of the Refuge that have the potential to threaten Refuge land may be suppressed utilizing Refuge resources in concert with local and state cooperators. All fires will be managed under the Incident Command System (ICS). As a part of that system, a Unified Command Structure will be established with cooperators in suppressing fires occurring on the Refuge. In the event that no qualified FWS incident commander is available, the Refuge Manager will designate a Resource Advisor (RA) to assist the Incident Commander (IC) from the cooperating agency. The RA's key role is to ensure that the IC has detailed information regarding Refuge resources at risk and understands FWS policies related to fire suppression on Refuge land. A thorough knowledge of these Refuge-specific factors is important since they are likely to have significant influence on the selection of the response selected for management of fires on Refuge land. No matter which agency the IC comes from, he/she will:

- Locate, size-up, and coordinate suppression activities, including briefing incoming personnel, directing their actions and providing the equipment needed to undertake suppression of the fire safely and effectively.
- Provide for public and firefighter safety first.
- Considering current and predicted fire conditions assess the need for additional suppression resources and estimate the final size of the fire.
- Assess the need for law enforcement personnel for traffic control, investigation of fire cause, evacuations, etc.
- Keep the Refuge Manager informed of the situation as it develops.
- Provide information to the Refuge Manager so that a brief report can be transmitted to the ZFMO.
- Notify the Refuge Manager when an initial action is unsuccessful. Initiate the planning for an extended action (WFDSS).
- Other duties as described in the National Wildfire Coordinating Group Fireline Handbook.

Regardless of whether it is a cooperator or Refuge staff initiating suppression operations on fires occurring on the Refuge, the following principles will apply:

- When evaluating a response to wildfires, public and firefighter safety are to receive the highest priority consideration.
- All fires on the Refuge will be staffed during active burning periods until the fire is brought into a controlled status. Staffing is maintained until the fire is declared out.
- The Incident Management System (ICS) will be utilized to manage wildland fires on the Refuge. Regardless of agency affiliation, the Incident Commander will be the individual *best* qualified to assume the duties of that position. Jurisdictional integrity will not be compromised no matter which organization the IC belongs to.
- The Fire Management Plan and the Delegation of Authority provide general strategy options for an Incident Commander (IC). He/she has the discretion to select and implement tactics within the limits described for the appropriate FMU, including when and where to use minimum impact suppression tactics (MIST).
- Suppression operations will be managed in the most cost-effective manner possible.



## **Response Capabilities/Cooperative and Mutual Aid Agreements**

The Refuge maintains a minimum base of fire qualified individuals, equipment and suppression capabilities. Supplemental first response is provided by rural fire departments contained within the counties in which the appropriate Refuge Fire Management Unit is located. RRVNWR also has a Cooperative Fire Agreement with the Virginia Department of Forestry. This agreement is updated, reviewed and amended annually (ZFMU) by April 1st of each year. It should be noted that rural fire departments capabilities to assist are greatly influenced annually by legislated budget decisions, as well as resource availability. Generally this does not create a problem, given the low wildland fire occurrence the Refuge has experienced in the past. Most fire suppression resources at the local and state levels are very supportive and are willing partners for cooperative efforts.

Contact information for off-Refuge resources is included as part of the Refuge dispatch plan and/or local mobilization guide. The Zone FMO should be consulted when considering additional support through neighboring agencies and refuges. Further support may be available through the Virginia Interagency Coordination Center (VICC). If these organizations fail to meet fire suppression needs, then resource requests can be made through the Zone FMO, working in consultation with the RFMC, to the next appropriate dispatch level where resources can be obtained. Copies of existing Agreements can be found in Appendix I. Regardless of which entity the agreement is with, as a minimum, the following should be included as a part of the considerations identified:

- Suppression response procedures
- Incident Command structure
- Current personnel and equipment use costs
- Review of MOU's (5-year cycle)
- Update dispatch and staffing plans
- Review communications plans and assigned frequencies
- Staffing and availability
- Review prescribed burn schedules

## **Extended Attack and Large Fire Management**

### **Extended Attack**

A wildfire occurring on the Refuge exceeding initial action, though rare, would necessitate the application of processes beyond those normally implemented for smaller fires of shorter duration.

First and foremost, a plan of action (strategy and tactics) would have to be formulated to meet the needs of a fire that was outside the range of normal operation response. As with fires requiring only an initial action, an Incident Commander (IC), would be responsible for developing a plan that meets extended action needs when initial action efforts have been deemed unsuccessful. This may occur when a fire exceeds the capability of suppression resources to control the fire in the initial phase, when additional Refuge or private lands are threatened, or when fire complexity exceeds the capability of current command or operational forces.

In any case, the preparation of a Wildland Fire Decision Support System Analysis (WFDSS) is the first step in preparing to meet the challenge of the more complex extended actions. Detailed information relating to the preparation of a WFDSS is included in the following section.

The IC will coordinate with the Refuge Manager to ensure that the appropriate interagency collaboration occurs in the preparation of the WFDSS. In addition, the IC will:

- Order and assign appropriate new and incoming resources
- Complete a Delegation of Authority (Appendix J)

The Refuge Manager will be responsible for coordinating the following:

- Notification of the FWS ZFMO of the situation
- Assist with the transition to the next appropriate management level based on incident complexity.

### **Wildland Fire Decision Support System (WFDSS)**

When a fire escapes an initial action, a new strategy must be developed in order to safely and effectively suppress the fire. This selection process is accomplished through the development of a Wildland Fire Decision Support System (WFDSS) analysis.

The WFDSS is a decision process that employs a systematic and reasonable approach to determine the best strategy for a particular situation. Reasonable management alternatives are identified, analyzed, and evaluated. They are consistent with the expected probability of success /consequences of failure. The Refuge Manager shall approve the WFDSS and any revisions. Evaluation criteria include firefighter safety, anticipated costs, resource impacts, and social, political, and environmental considerations. The evaluation of alternatives becomes the triggering mechanism for re-evaluation of the WFDSS. The ZFMO, with input and assistance from Refuge staff, will prepare this document.

A complete discussion of the management of extended actions and large fires can be found in the Interagency Standards for Fire and Fire Aviation Operations (Red Book) Chapter 11 at:

[http://www.nifc.gov/policies/red\\_book.htm](http://www.nifc.gov/policies/red_book.htm)

### **Public and Interagency Notification and Information**

As with any emergency response, the public will be notified of the presence of an on-going incident and the incident's status. This will be accomplished through the utilization of the telephone contact list mentioned in the previous section. This listing would be used in the event of a prescribed burn or wildfire occurring in the vicinity of a private landowner, notifying them of important general and emergency information associated with the incident (e.g. smoke, burning embers, closures, alternate travel routes, etc). Any special restrictions that may affect the public will be emphasized. Refuge staff will be supportive of public concerns, reporting accurately about incident specifics and briefly summarize the actions being taken.

Within the guidelines (qualifications appropriate and commensurate with incident complexity) established for the Incident Command System, a Public Information Officer (PIO) position is usually implemented on incidents where information dissemination is important. The PIO is responsible for the formulation and release of information about the incident to the news media (local newspapers in Essex and Richmond counties) and, incident personnel and other agencies. The position of PIO may be filled by the Incident Commander on a very

small incident; by Refuge office support personnel; or be assigned to any qualified member of the Refuge staff by the Refuge Manager. Typically at RRVNWR, the Deputy Refuge Manager is assigned this duty.

Public education is necessary to garner support and understanding for the fire management program. A program which informs the public of the current fire danger, but at the same time teaches the value of fire as a management tool to achieve resource objectives will be utilized. For example, the Refuge holds regular meetings with local groups where fire management issues are discussed (e.g. Northern Neck Audubon Society, Rotary Club, the Northern Neck Chapter of the Virginia Master Naturalists, etc).

## **Aviation Operations**

Aircraft operations on the Refuge will adhere to the interagency aircraft use regulations and policies outlined in the Department of Interior National Business Center – Aviation Management Directorate (AMD). The use of aircraft for detection flights and initial action operations is allowed utilizing the closest aircraft resources concept, including those owned by or under contract to the state or local entities. The Virginia Department of Forestry normally provides these services for counties located within the geographic area when they are available. Other potential aircraft resources (both helicopters and sometimes fixed-wing air-tankers) are available from the Virginia Interagency Coordination Center (VICC). Depending on funding and availability, (typically in the spring months) these aircraft may be available and are stationed at the Shenandoah Valley Regional Airport in Augusta County, Virginia. Regardless of which aircraft are used for initial action operations, after the first burning period or during extended actions, AMD certified aircraft and pilot(s) must be utilized.

Aircraft used in prescribed fire and non-fire treatments will also meet interagency standards. Each project utilizing aircraft will have an aircraft use plan prepared as a part of the overall project plan (e.g. prescribed burn plan).

## **Post-Incident Actions**

### **Reviews and Investigations**

Reviews and investigations are used by wildland fire and fire aviation managers to assess and improve the effectiveness and safety of organizational operations. Brief descriptions and discussions of various review types and the associated procedures and requirements, including those for serious wildland fire accidents, entrapments, and fire trespass are listed in Red Book Chapter 18. [http://www.nifc.gov/policies/red\\_book.htm](http://www.nifc.gov/policies/red_book.htm) Incident Commanders and Single Resource Bosses will ensure that after action reviews (AAR) take place in a timely manner and that any significant issues are brought to the attention of the ZFMO and/or Refuge Manager.

## **Reports**

### **Daily Fire Reports**

Units of the National Wildlife Refuge System are required to report wildland fire occurrences on their respective refuges daily. RRVNWR will report directly to the ZFMO, who in turn, will forward the appropriate fire occurrence information to the Geographic Area Coordination Center (GACC). The ICS 209 Form, Incident Status Summary, provides an excellent guide for wildland fire reporting and should be completed for each *large*

(timber fires 100 acres> and grass fires 300 acres>) wildland fire on the Refuge. A copy of this form can be found at the following internet website address:

<http://www.fs.fed.us/r2/fire/docs/ics209.pdf>

### **Individual Fire Reports**

All wildland and prescribed fires on the Refuge will be documented on forms (Appendix K) utilizing the Fire Management Information System (FMIS). Required are reports on:

- All wildland fires on FWS and FWS protected lands including natural outs.
- Wildfires threatening Refuge lands on which suppression action is taken.
- Prescribed fires that remain within prescription. When a fire exceeds prescription criteria, it should be treated as a wildfire, and a separate report should be prepared including acres burned by the wildfire from the time of its discovery until the time of it being declared out.
- All false alarms responded to by Refuge personnel

Reports are required regardless of who makes a response to a wildland fire (e.g. contractor, cooperator, etc). When FWS personnel take initial action on non-FWS lands, the agency with jurisdiction on the land where the fire occurs will file a report and FWS will file a limited report to document the FWS response and to support potential billing to non-federal entities.

FMIS forms contain basic fire information and serve as historic documents used to track the fire history of the Refuge. A hard copy of each report should be kept on file at the Refuge, with a copy being sent to the ZFMO. All reports are to be completed and submitted within 10 days after a fire has been declared out. The Incident Commander (IC) will be responsible for completing the appropriate FMIS fire report or the necessary information to complete the report and providing this information to the ZFMO. The ZFMO will ensure that all expenses and/or items lost on the fire are reported, that the timekeeper is advised of all fire time to be charged to the fire, and that expended supplies are replaced.

### **Records Management**

The Refuge will keep on file a hardcopy of all reports submitted to the ZFMO. In addition, all prescribed burn plans and supporting documents should be retained in a Refuge master file for easy retrieval. They should be filed in an incident-specific format.

Individual Fire Reports, particularly those requiring extensive documentation, should include all documents prepared over the life of the incident, including resource orders and equipment orders, purchases, weather reports, maps, charts, fire weather data, etc. These should all be kept in a separate file named for the fire and maintained by calendar year for easy reference.

Each fire should have a documentation package put together to include:

- Unit Logs
- Maps of the fire area, (7.5 min quad, showing point of origin)
- Dispatch log and telephone log



- Aircraft documentation (if used)
- Resource orders
- Incident Action Plans
- Photographs/slides/videos
- Press clippings
- Accident reports
- Performance ratings
- Other pertinent documents.

Fire related reports and documents will be maintained at the RRVNWR Headquarters. In addition, copies of individual fire reports will be sent to the ZFMO for entry into FMIS. Other reports that should be kept on file include Incident Action Plans, outgoing and incoming correspondence, fire training schedules, qualification information, weather data, situation reports, prescribed burn plans and hazard fuels project reports.

Incident Commanders will provide necessary information to complete the individual fire report to the ZFMO. The FMO assigns the Refuge fire number, the suppression account number and inputs the report information into the FWS Wildland Computer System (FMIS).

### **4.1.3 Emergency Stabilization**

Wildland fires can cause damage to natural and cultural resources as well as to facilities. Immediate post-fire actions may be needed to minimize threats to life and health and prevent unacceptable degradation to natural and cultural resources. In these instances, specific program guidance for Burned Area Emergency Stabilization is found in Departmental Manual Part 620 Chapter 3 (620 DM 3) and the Interagency Burned Area Emergency Response Guidebook. Examples of the types of actions taken include:

- Planning and burned area assessments (anticipated data and technical specialists needed).
- Anticipated post-wildfire issues and values to be protected.
- Treatment maintenance and monitoring.
- Reporting requirements (accomplishment reports and National Fire Plan Operations and Reporting System (NFPORS)).

Allowable ES actions in 620 DM 3 are 3.7M (2) placing structures to slow soil and water movement, (7) seeding or planting to prevent permanent impairment of designated Critical Habitat for Federal and State listed proposed or candidate species, (10) direct treatment of invasive plants and (12) monitoring treatments and activities for up to three years.

## **4.2 Burned Area Rehabilitation**

Rehabilitation and restoration efforts will be undertaken to protect and sustain ecosystems, public health, safety, and to help communities protect infrastructure. The preferred method of repair is through the *natural recovery process*. This may not be possible in all situations. However, most of the habitat types at RRVNWR habitat types fall into this category. When natural recovery is not likely to occur, the Refuge Manager will assign a team headed by a Wildlife Biologist and a Regional Staff member to develop ES or BAR plans.

For these cases, specific program guidance for Burned Area Emergency Stabilization and Rehabilitation (ESR) is found in Departmental Manual Part 620 Chapter 3 (620 DM 3), the Interagency Burned Area Emergency Response Guidebook, and Chapter 11 of the FWS Fire Management Handbook. The following website contains policy and guidance for the implementation of emergency stabilization and rehabilitation at the refuge level:

[http://elips.doi.gov?app\\_DM/act\\_getfiles.cfm?relnum=3610](http://elips.doi.gov?app_DM/act_getfiles.cfm?relnum=3610)

Another valuable resource is the DOI ES and BAR website:

<http://www.fws.gov/fire/ifcc/Esr/home.htm>

Wildfires will be evaluated for fire suppression damage repair needs as soon as safely possible. Required repair of damage resulting from suppression activities will be completed before crews and resources are released from assignment to incident. Costs for these types of damage are to be born by the incident as a part of suppression costs and are *not* considered to be part of emergency stabilization and rehabilitation.

There have been no previous ES or BAR treatments on the Refuge. ES and BAR treatment needs require the development of plans with Regional approval and submission to the National Fire Office in Boise, Idaho. These must be accomplished within the time frames specified in the Fire Management Handbook.

Issues potentially of concern involve habitat loss for species of conservation concern identified in the Refuge CCP and HMP. Another example occurs when an intense wildfire burns into an area and consumes the majority of the vegetation present, leaving large areas open to erosion and soil loss and/or the invasion of species such as Phragmites.

Allowable BAR actions are 3.8M (2) chemical, manual, and mechanized removal of invasive species and planting of native and non-native species, consistent with 3.8F, restore or establish a healthy, stable ecosystem even if this ecosystem cannot fully emulate historical or pre-fire conditions and 3.8M (4) repair or replace fire damage to minor operating facilities (e.g. interpretive signs and exhibits, shade shelters, fences, wildlife guzzlers, etc). It should be emphasized that short-term (within 1 year) effects caused by fire suppression activities, should be done prior to release of suppression resources. Those effects caused by the fire itself, should be accomplished within a 1-3 year period. Longer duration events, such as research, and monitoring beyond a three year period will be funded through normal Refuge funding sources.

ES and BAR actions may not be used to restore or convert to some other desired habitat that was not present when the wildfire occurred. Stabilization and restoration money is quite limited, so the emphasis is to do as much as possible to achieve restoration in the short term and associate expenses as a portion of the fire cost.

## **4.3 Management of Planned Fuels Treatments**

### **Program Overview**

RRVNWR was established primarily for the benefit of migratory waterfowl and upland bird species. In particular, the American bald eagle is a focal species for the Refuge. Much of the habitat work in progress at the Refuge benefits a wide array of wildlife species that require a variety of successional habitat (early, mid-range, mature). This results in both vertical and horizontal plant diversity; a mixture of open and fully closed forest

canopies, maximum vegetation and wildlife diversity, species richness, and protection of sensitive cyclic processes necessary to maintain the various ecosystems located on the Refuge. Prescribed fire has played an important role in shaping much of the vegetation structure that can currently be found on the Refuge.

### **Fuels Treatment Objectives, Treatment Types and Targets**

The development of a Refuge-wide fuels assessment has been identified as a high priority for the Refuge fire management program. The assessment is scheduled for implementation within the five-year period covered in this FMP.

As a minimum, the following will be identified:

- Comprehensive fuels maps for the entire Refuge and adjacent lands (<1/4 mile of boundary)
- Identification of hazardous fuels (fuel types and fuel loading)
- Identification and mapping of historic fuels treatments by treatment type
- Location of values at risk in relation to hazardous fuels (e.g. WUI, Refuge support structures, cultural resources, etc)
- Identify the potential for cooperative fuel reduction projects (e.g. Community Wildfire Protection Plans or CWPP)

Once the identification and assessment of fuels is complete, a prioritization of hazard fuel units will be completed. Those areas presenting the greatest hazard and risk will receive priority in planning and implementation.

In addition to the identification and prioritization process, an assessment of fuel management options (e.g. mechanical, prescribed fire, combinations, etc) should be undertaken, with emphasis upon the impacts of each treatment type on Refuge resources. Where practicable, opportunities will be developed with local landowners and adjacent agencies to prepare and implement joint fuel treatment plans, particularly in those areas where mutual protection interests are present.

One of the principal objectives of this Fire Management Plan is to conduct a thorough fuels assessment of the entire Refuge, and then prioritize those areas that require treatment. Areas where structures and other values currently exist will receive first priority in the assessment process.

A variety of fuels treatments are envisioned for RRVNWR. Treatments vary with each individual Fire Management Unit. Following are descriptions of potential treatments by FMU:

#### **Richmond County FMU-1**

The Refuge has *preliminarily* identified a number of tracts within the FMU where the use of mechanical hazard fuel reduction is the likely treatment of choice to lessen wildfire risk associated with accumulations of heavy fuels. Dense, over-stocked stands of pine and tulip poplar represent good opportunities to reduce fire danger and protect nearby resources through the effective use of non-fire hazardous fuel reduction techniques. Tracts within the FMU that have been identified as potential candidates include: Laurel Grove, Tayloe, Wilna, Wright, and Peter.

To date, hazardous fuel reduction has been considered a secondary goal of prescribed fire operations that have been conducted on the Refuge. The majority of these burns have been implemented in Refuge grass and old field successional vegetation types as a means to improve habitat for a variety of wildlife species. However, the use of prescribed fire to periodically treat grasslands reduces the potential intensity and impacts of a wildfire where large continuous areas are dominated by warm season grasses (e.g. switchgrass). This is accomplished by the removal of heavy thatch layers and by the thinning of scrub/shrubs that are in the process of populating the area.

Within this FMU, a number of wetland areas are impacted by invasive species (e.g. Phragmites) that have the potential to threaten wildlife habitat and reduce the potential for native species to attain their natural role in Refuge ecosystems. When applicable, the Refuge will utilize techniques that reduce the overall cover of these species and allow native vegetation to assume its more natural role in the ecosystem. Since a combination of treatment types appears to be most effective when dealing with these many of these species, a combination of prescribed fire, mechanical reduction, and chemical application will be utilized to achieve the desired reduction. Monitoring activities will determine the effectiveness of treatment(s) and adaptive management techniques will be used to fine-tune treatment parameters.

#### **Essex County FMU-2**

The Hutchinson Tract of the FMU has a few dense stands of pine and hardwoods (tulip poplar) that are likely candidates for non-fire thinning activity in the future. The assessment, mapping, and prioritization of these stands are a priority identified in this FMP.

The use of non-fire hazardous fuel reduction and/or prescribed fire are important management tools that will be used in this FMU as a means to reduce accumulations of biomass that have accumulated over time in grassland, shrub, and forest fuels. Approximately 200 acres of grassland habitat on the Hutchinson Tract are likely to receive the primary emphasis, since management action has been already been implemented in this area.

#### **King George County FMU-3**

The Toby's Point Tract of the FMU has dense stands of pine that are likely candidates for non-fire thinning activity in the future. The assessment, mapping, and prioritization of these stands are a priority identified in this FMP.

The use of non-fire hazardous fuel reduction and/or prescribed fire are important management tools that will be used in this FMU (Styer/Bishop Tract only) as a means to reduce accumulations of biomass that have built-up over time in grassland/shrub fuels. Approximately 51 acres of grassland habitat on the Styer/Bishop Tract are likely to receive the primary emphasis, since management actions (mowing and prescribed burns) have already been implemented in this tract.

#### **Westmoreland County FMU-4**

The 25 year-old stand of loblolly pine located in the northern 1/3 of the tract, has been identified as being a candidate for non-fire mechanical thinning in the future. Since this area comprises the northern boundary of Refuge land, accumulations of excess hazardous fuels beyond normal levels could exacerbate the risk to private lands located outside of the boundary.



The removal of fine fuel biomass (up to 90%) associated with grasslands in the tract is a secondary objective of prescribed burning. This tract has been treated with prescribed fire several times (2004, 2005, and 2008).

#### **Caroline County FMU-5**

The mixed hardwood forest buffer located along the edge of the Refuge boundary in the Port Royal Unit of the FMU may be earmarked for mechanical thinning in future should dangerous accumulations of fuels pose a threat to the private structures located nearby.

The removal of fine fuel biomass (up to 90%) associated with grasslands in the tract is a secondary objective of prescribed burning. Multiple treatments associated with warm-season grass restoration are planned for this unit.

#### **Prescribed Fire Program for Hazardous Fuels and Habitat**

The use of prescribed fire to achieve management objectives on the Refuge is guided by policy. The Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide (2008), the corresponding chapters of the FWS Fire Management Handbook, and Interagency Standards for Fire and Fire Aviation Operations, contain guidance and direction necessary to manage a safe and effective program of hazardous fuels management on the Refuge.

The Zone fire program at Great Dismal Swamp NWR provides prescribed fire advice and support for the planning and execution of projects on the Refuge.

#### **Prescribed Fire Program Overview**

In general, the prescribed fire program at RRVNWR is directed towards habitat improvement and maintenance for wildlife. Its primary focus is on the enhancement of existing populations of native warm-season grasses, the rehabilitation and enhancement of non-native grasslands, and the maintenance of selected grasslands in various successional stages.

In forested habitats, prescribed fire may be utilized as a management tool to restore a more natural fire regime and return upland hardwoods to their natural distribution on Refuge lands.

Prescribed fire has been shown to be an effective management tool in the perpetuation of healthy marsh ecosystems, and is frequently used to reduce populations of invasive species (e.g. common reed, *Phragmites australis*) in selected areas so that native species can resume their more natural role in the ecosystem, providing a valuable source of cover and food for wildlife.

The remainder of the program is directed towards the reduction of hazardous fuels, particularly areas of the Refuge where risks are high.

Goals and Objectives of the program are to:

- Manage grasslands and old farm fields through a program of prescribed burning in order to control woody plant (e.g. sweetgum, *Liquidambar styraciflua*) invasion and encroachment, reduce non-native cool-season grasses, and enhance populations of native grasses and other herbaceous species.
- Reduce hazard fuel concentrations through the use of prescribed fire in areas where it can be effectively and safely implemented.
- As the program develops, the Refuge will consider the use of prescribed fire as a means to restore a more natural fire regime in forest habitats by promoting natural regeneration, stimulate hardwood (oak spp.) growth and reduce competition from other less fire tolerant species.
- Utilize prescribed fire to reduce populations of non-native species, especially in marsh habitats, where their presence limits access to sufficient quantities of natural food and cover for native wildlife species.

Since 2002, the Refuge has implemented a total of 13 prescribed burns for an average of 2.1 treatments per year. The average prescribed burn was 95.9 acres (largest 485 and the smallest 20 acres) in size. Of the prescribed burns implemented, most (54%) were small (64 acres or less) and were conducted in largely homogeneous fuel types (grass/scrub/shrub). The typical prescribed fire size and complexity on the Refuge is best characterized as being in the low to moderate range, where relatively small blocks of largely homogeneous fuels are the treatment norm.

The use of prescribed fire for habitat improvement and hazardous fuel reduction is projected to continue during the life of this plan (5 years). Its overall use will be relatively consistent regarding size and complexity with those burns that have been implemented in the past. Minor variations resulting from deviations in environmental conditions are expected to occur, but these are largely unpredictable and variable.

All prescribed fires must comply with National Environmental Policy Act (NEPA) requirements. An Environmental Assessment (EA) must be prepared for each Prescribed Fire Plan unless: (a) the field office's approved FMP or planning documents and the accompanying environmental document (EA) adequately discuss the action; or (b) a categorical exclusion covers the activity (621 FW 2).

Department of the Interior Categorical Exclusions as listed in 516 DM 8.5 that may apply to FWS and RRVNWR wildland fire activities include:

- Personnel training, environmental interpretation, public safety efforts, and other educational activities, which do not involve new construction or major additions to new facilities.
- Minor changes in existing master plans, comprehensive conservation plans, or operations, when nor or only minor effects are anticipated. Examples could include changes in the type and location of compatible public use activities and land management practices.
- Issuance of new or revised site, unit, or activity-specific management plans for public use, land use, or other management activities when only minor changes are planned. For example, an amended public use plan or fire management plan.
- Fire management activities, including prevention and restoration measures, when conducted in accordance with Departmental and Service procedures.

## Priority Setting and Planning

Normally, a Refuge relies upon the Refuge Comprehensive Conservation Plan (CCP) to serve as the primary document utilized in the prescribed fire planning process. Refuge objectives are outlined in detail and provide guidance that is useful in developing implementation plans for all Refuge operations, including prescribed fire and hazard fuel reduction through non-fire methodologies. Since RRVNWR is in the process of preparing its CCP (Draft 2008), existing management plans will be used to provide operational guidance until such time as the CCP is completed. During the interim time period, annual reviews will be conducted to ensure compliance with changes in guidance and regulation.

A RRVNWR Habitat Management Plan (HMP) will outline the long-term strategy for the use of prescribed fire as an ecosystem maintenance and habitat management tool. This HMP will be developed and completed approximately two years after the CCP approval. Items that will be considered for discussion under the HMP umbrella include:

- The appropriate role of fire in the overall suite of available management tools
- Designation of individual burn units (location, size in acres, maps of each)
- The preferred treatment interval
- The recommended treatment sequence (also called the burn rotation)
- The annual target acreage to be treated
- Monitoring to be performed and the frequency needed

Once the Refuge staff have determined the areas to be burned in a given 1-3 year period, the ZFMO will be responsible for the preparation of the prescribed burn(s) for the units indicated. It is likely that one plan may be prepared that covers multiple units (similar fuels, objectives, techniques, etc). The ZFMO may, at his/her discretion, assign plan preparation to a qualified Burn Boss or other qualified employee. The development of plans that encourage the participation of other agencies and cooperators is encouraged.

## Planning Process

Annual activities typically include the following:

1. Planning starts six months to one year in advance of the proposed burn implementation. Once the burn units are identified, preliminary project requests are developed and submitted early in the year to the ZFMO. This is the first attempt to identify funding needs, time frames, acreage targets, and FTE needs for the ensuing fiscal year.
2. Once all of the units scheduled for burning have been identified, they are priority ranked, and time of year for burning is determined. In general, light fuel units, such as grass and old fields are scheduled for spring burning, prior to green-up. An exception would be the use of a late growing season burn used to control persistent woody species. Slash units are also burned in spring, but can be burned at a later time as they are not dependent on fine fuels (e.g. grass) to aid the spread of fire. Debris burning (landing slash piles) can be accomplished in the spring, summer, or fall, when higher fuel moisture contents minimize rates of spread.

3. Gather base-line data and prepare the annual burn plan. Submit the Annual Burn Plan by March 1 to the ZFMO for necessary approvals.
4. Prescribed burning qualifications are reviewed in the fall, matching available training courses to agency and personal needs. Training requests are submitted to the RFMC, through the ZFMO, for further consideration and scheduling.
5. Monitor annually for insect and disease outbreaks. Incorporate into the burn program if fire treatment is warranted, based on values at risk and cost. Request funding to meet attainment goals.
6. In some units, mowing, fire break construction, and other site preparation activities will be undertaken prior to implementation of the prescribed burn.
7. Monitoring processes are identified, in place, and pre-treatment data collected.

### **Management Considerations**

There are some management considerations specific to RRVNWR that may impose restrictions on the effective use of prescribed fire as a management tool. Although these restrictions present challenges to management, they can be effectively mitigated through identification early in the planning process, followed by the development of strategies and tactics that mitigate the impacts. Potential impacts that have been identified include:

- A relatively small staff available to implement the program and the availability, or non-availability, of resources sufficient to safely and effectively implement prescribed burns.
- A narrow burn window with a limited number of days when prospective burn units are in prescription due to environmental and fuel conditions
- Air quality and smoke management issues
- Potential impacts of an escaped prescribed fire onto private lands
- The need to protect sensitive habitat(s) and nesting birds during certain times of the year when burning conditions may be suitable.
- Regional and National Preparedness Levels are monitored by the ZFMO. The ZFMO advises the Refuge Manager as to reporting requirements and/or limitations placed on prescribed fire operations. Guidelines are set forth in the National Interagency Mobilization Guide and the Southern Area Fire Mobilization Guide. The Refuge will adhere to the direction given as preparedness levels change. Specific Refuge responses to changes in preparedness level are described in Appendix C.
- At preparedness level IV, the Refuge will seek approval through the RFMC for proposed prescribed burns. At Preparedness Level V, prescribed burns are permitted, but communication with the RFMC is necessary prior to implementation and adequate contingency resources must be available locally. In addition, the RFMC will discuss the situation with the Fire Management Branch.

### **Project Implementation**

The Prescribed Burn Plan is a project-specific implementation document. It serves as the written, legal document that provides the Agency Administrator (Refuge Supervisor) the information needed to approve the



project and the designated Prescribed Fire Burn Boss the information needed to implement the prescribed burn project according to the guidelines established in the plan.

The size and complexity of the prescribed fire project will determine the level of detail needed in each plan. Regardless, the plan *must* follow the Prescribed Burn Plan Template found in Appendix B of the Interagency Prescribed Fire Planning and Implementation Procedures Guide (2008).

A Complexity Analysis for each individual prescribed burn will be determined using the Prescribed Fire Complexity Rating System Guide PMS 424, January 2004. Most burns at RRVNWR are expected to be of moderate complexity due to fuel conditions, the presence of WUI, and issues related to smoke.

Prescribed burn plans *must* be prepared by an individual that meets the interagency qualification standards of RXB2 for low or moderate complexity burns, or RXB3 for low complexity burns. Several people may be involved in the preparation, but the Prescribed Fire Plan Preparer is responsible for the final plan content. Specifically, this individual will:

- Prepare the plan in accordance with the policy and guidance as found in the Interagency Prescribed Fire Planning and Implementation Procedures Guide.
- Coordinate with technical specialists (i.e. wildlife biologists/ cultural resource specialists) to ensure that the plan meets management and operational objectives.
- Ensure that a technical review of the plan is conducted by a qualified technical reviewer (the technical reviewer *cannot* be the preparer of the plan).
- Interact with the technical reviewer to ensure that all of the plan elements are adequately addressed.
- Complete and sign the Complexity Analysis.

## Responsibilities

Appendix C of this FMP contains a detailed discussion of the responsibilities related to fuels management for the positions of Regional Fire Management Coordinator, Agency Administrator (Refuge Manager, Project Leader, or Refuge Supervisor), and Zone Fire Management Officer, as well as Refuge-specific positions. However, before a prescribed burn can be implemented, two key documents must be approved and signed:

- The **Prescribed Fire Burn Boss** is responsible for the safe execution of the prescribed burn, within the limits of the approved Burn Plan. On the day of the burn, the Burn Boss completes the GO-NO GO Checklist found in Appendix B of the Interagency Prescribed Fire Planning and Implementation Procedures Guide. The completion of this checklist ensures that all prescription, staffing, equipment, and other plan specifications are met before, during, and after the completion of the prescribed burn.
- The **Agency Administrator** (typically the Refuge Manager) is responsible to sign and approve the Pre-Ignition Approval Checklist (also found in the Interagency Guide).

## General Discussion Points

Cooperators, contractors, and casual hires (AD) may be used to implement prescribed fires. AD personnel must meet all applicable FWS standards. Cooperators, such as members of local Fire Departments, must meet the qualification standards established and certified by their agency. Those who supervise FWS employees during prescribed fires must meet FWS standards.

The public will be informed of prescribed fires through news releases, interpretive messages, and educational programs. Individual prescribed fires should not be conducted without informing those agencies and members of the public likely to be impacted. Even the appearance of smoke produced from a prescribed fire constitutes the threshold necessary for information exchange with the public.

The Refuge will utilize a low complexity debris burn plan for debris disposal projects (Appendix J). The ZFMO will review the complexity of planned projects to ensure use of the plan is consistent with its intent.

### **Exceeding the Parameters of an Existing Prescribed Burn Plan**

The Prescribed Burn Plan will specify who has the authority to declare the prescribed burn a wildfire (typically the Prescribed Fire Burn Boss). A prescribed fire must be declared a wildfire when the Prescribed Fire Burn Boss determines that contingency actions have failed or are likely to fail and cannot be mitigated by the end of the next burning period by on-site holding forces and/or contingency resources. In addition, an escaped prescribed fire must be declared a wildfire when the fire either spreads outside of the project boundary identified in the Prescribed Burn Plan or is deemed likely to do so, and cannot be contained by the end of the next burning period. A prescribed fire can be converted to a wildfire for reasons other than an escape. A formal analysis, using a required wildfire decision support tool (Wildland Fire Decision Support System or WFDSS) will be undertaken when needed, with a response chosen and implemented based on the analysis. The Refuge Manager or Project Leader will be notified of an escaped prescribed fire.

### **After-Action and Escaped Fire Reviews**

Each wildland fire and prescribed fire will have after action reviews done as informal documentation covering what worked, what did not, why, and what could be done better the next time. Prescribed fires will be critiqued by the Burn Boss and documented in the Prescribed Burn Plan. The ZFMO, RFMC, Refuge Manager, Incident Commander, and other subject-matter experts selected by the RFMC will conduct a formal critique in the event of:

- A significant injury/accident
- An escaped prescribed fire
- The presence of any significant safety concerns
- Smoke management problems

The Prescribed Fire Burn Boss will ensure that an informal After Action Review (AAR) is conducted for each operational period on a prescribed fire.

All prescribed fires that are declared wildfires will have an investigative review initiated by the Refuge Manager or Project Leader. The level and scope of the review will be determined by policy and procedures as outlined in the Red Book and the FWS Fire Management Handbook.

### **Reports**

Prescribed burn plans will be the primary document used to record prescribed fire information. Burn plans document air quality requirements, personnel, costs, fire behavior, weather, fire summary, and burn critique information. Like suppression fires, prescribed burns will also be documented on FMIS forms (Appendix K)

and entered into the appropriate operational applications computer system by the ZFMO. A hard copy will be retained at the Refuge in a separate record.

Prescribed Burn Plans will specify information to be included in the project file. The Burn Boss will ensure this information is provided to the Refuge Manager and/or the ZFMO as a complete package. This includes documenting conditions and fire behavior observed during the prescribed fire to help assess how well actual fire characteristics fit those predicted, documenting any unanticipated difficulties encountered during implementation, and assessing how well the fire accomplished the intended objectives.

The Burn Boss will complete an Individual Fire Report (FMIS) (Appendix K) with the ZFMO, who will, in turn, file the report electronically within 10 days of the fire being declared out.

### **Non-Fire Fuels Treatment Program**

Non-fire fuel treatments are an essential component of the Refuge fire management program. When the use of prescribed fire does not present a feasible alternative to accomplish hazard fuel objectives, areas may be identified for non-fire fuels treatment. Typically, this would consist of manual, mechanical, chemical or combination treatments. Not all treatments are suitable for all vegetation types. Treatments vary depending on factors including the condition of the vegetation, vegetation management goals, proximity to development, time of the year, and various environmental factors present at each individual project site. For some sites, a combination of treatments may be the management choice. For example, mechanical treatments may be used to create fuel breaks and/or thin forested stands before prescribed fire is applied as a maintenance tool.

To date, non-fire hazardous fuel reduction on the Refuge has been accomplished through mowing of old fields in early stages of succession, and by applying herbicides to stands of invasive Phragmites.

Plant species removed during mowing operations include early successional types such as red cedar, sweetgum, tulip poplar, blackberry, and various non-native vines and shrubs. In addition, mowing has been used to create boundary fire breaks in preparation for prescribed burn projects.

Phragmites control has occurred both on and off the Refuge, most frequently in fresh and brackish tidal marshes. Some treatments have been implemented near developed areas in and around the Town of Tappahannock. Mowing of treated stands, using a Marsh Master, has also been conducted on private land in order to reduce the potential for high-intensity wildfire.

In the future, nine areas located on different tracts of the Refuge have been earmarked for potential non-fire hazardous fuel reduction. The rationale for these treatments varies from tract to tract, but the primary reason is to remove hazardous fuels from areas where values at risk (structures, cultural resources, etc) are in relatively close proximity to fuels. Each of the five Fire Management Units (FMU's) has at least one tract (or a portion thereof) that has been tentatively identified as being a serious candidate for non-fire hazardous fuel treatment. More specific information is contained within the operational descriptions of each of the Fire Management Units in the appropriate FMU section of this plan.

### **Goals Related to Non-Fire Fuels Treatments**

- Conduct a comprehensive inventory and assessment of fuels on the Refuge.

- Reduce hazardous fuels through the application of mechanical techniques, to maintain fuel loadings within acceptable ranges (determined by fuel type), and reduce the threat of wildland fire to areas of concern by establishing acceptable defensible space around improvements and structures.

#### **4.4 Prevention, Mitigation, and Education**

##### **Prevention and Mitigation**

Fire starts due to human activity are the most likely cause of fire occurrence on the Refuge. Although historically these types of incidents are relatively few in number, the Refuge will make efforts, within the framework of their staffing and expertise, to reduce these occurrences by providing public information, education and enforcement. The Refuge, in a cooperative effort with the Virginia Department of Forestry, will jointly implement the fire prevention program that has been implemented effectively by that agency (e.g. the FIREWISE program) for a number of years. In addition, the Refuge will consider a number of independent actions, in some cases in conjunction with cooperators, relating to fire safety and prevention, to include the following:

- Educational materials pertaining to fire safety, which are available through the National Interagency Fire Coordination Center, will be obtained and made available to visitors at the Refuge Headquarters and other public information areas (e.g. information kiosks, etc).
- Should conditions of high fire danger be present, staff and volunteers will emphasize the need for fire safety as part of their regular programs and visitor contacts.
- Emergency closures and restrictions on the Refuge will be implemented by direction of the Refuge Manager. Refuge restrictions will be consistent with those mandated by the State of Virginia.
- Conduct a Fire Prevention Analysis that identifies the hazards, risks, and values of the existing Refuge and those lands within the approved acquisition boundary. This analysis will be conducted as outlined within the Fire Management Handbook.
- Prevention efforts for the Refuge will be guided by a Fire Prevention Analysis. Those areas identified as having the greatest hazards and risks will be considered for some method of fuels modification such as the use of prescribed fire or various mechanical methods.
- Since inadvertent or intentional ignition of wildland fuels by humans is an illegal activity, the Refuge will investigate, to the best of its capabilities, all human-caused wildfires as soon as possible after discovery. Investigations may range from those conducted by initial action resources, to a full-fledged criminal investigation conducted by a qualified arson investigator.
- Refuge employees will be expected to relate to the public the beneficial effects of prescribed fire as opposed to the negative impacts brought on by unwanted human-caused fires. Primary emphasis will be placed on information dissemination essential to understanding the potential severity of human-caused wildland fires and how to prevent them.

##### **Education**

It is the outreach goal of the Refuge to enhance knowledge and understanding of wildland fire management policies and practices through internal and external communication and education. Public education is necessary to garner support for and understanding of fire management programs on the Refuge. A prevention program which informs the public of the current wildland fire danger, while also teaching about fire's value as a management tool, will be the primary emphasis. Since prescribed fires and non-fire hazardous fuel reduction



operations are planned management activities, coordination with news media can be handled prior to burning using news releases and public service announcements. Members of the Refuge staff, usually the Assistant Refuge Manager or another designee, will serve as Information Officer(s) (IO) for the Refuge, addressing public/media inquiries, and coordinating outreach and educational activities related to the fire program. These releases will be issued to newspapers, radio, and television stations located within the operational influence of the Refuge. Information releases may be issued at certain times of the year. For example, a simple "reminder" concerning the onset of the spring or fall fire season(s) may be adequate. Additional releases may be warranted when summer or unusually large or complex prescribed burns are anticipated. News media can become an advocate for the burn program if invited to witness a prescribed burn in progress and be shown the positive results that can accrue from a properly implemented burn.

Because Refuge Fire Management Units are surrounded by private land, special attention will be given to informing adjacent landowners and other agencies of proposed prescribed burns and/or special conditions on the Refuge. Refuge staff will make efforts to receive feedback from neighbors and integrate their comments and suggestions into Refuge operations through the adaptive management process.

As the Refuge implements its prescribed fire program, it is anticipated that some projects will be conducted in areas accessible to the general public. It will benefit the program to take advantage of opportunities to inform and educate the general public, and to alleviate any concerns and fears that they may have related to fire. This can be accomplished through interpretative signs and displays on site, and guided field trips, which explain fire's role in the ecosystem. Classroom programs and talks, targeting various age groups, can focus on the Refuge's prescribed fire objectives.

Areas that have been treated with prescribed fire provide excellent opportunities for the public and Refuge staff to see first-hand the effects of fire. They also provide superb opportunities to explain the purpose of prescribed burns to the public. When properly implemented, these programs demonstrate the Refuge's capability to safely conduct prescribed burns, increase the public's tolerance of the visual impacts on vegetation that result from the burns, and develop public support for prescribed burn objectives. The Refuge has successfully used "door hangers" with relevant information concerning prescribed fires as its theme and has achieved two important objectives through their use. First, notifying the public of prescribed burns in their area so that they can be informed beforehand and second, providing information about the positive results to be achieved through the implementation of prescribed fire on the Refuge.

## **5.0 Monitoring and Evaluation**

Monitoring and evaluation are essential elements of the Refuge fire management program. They provide the means by which Refuge personnel are able to determine if applicable sections of the Fire Management Plan are being implemented as planned and if fire-related goals and objectives are being achieved.

### **Background**

Monitoring and evaluation are part of both the wildland fire suppression and the prescribed fire programs. Monitoring may be short term, as exemplified in those cases where wildland fires require immediate suppression, or may be long term, as a result of the need to closely monitor habitat changes over an extended period. Monitoring is required to ensure that goals and objectives of the prescribed burn are within acceptable environmental parameters as stated in prescribed burn plans.

## Types of Monitoring

### Environmental Monitoring

Environmental monitoring provides the basic background information needed for decision-making. This information is essential, regardless of whether it involves a suppression response, a prescribed fire, or is being used as a means to determine the relative potential for fire activity. At a minimum, the following information will be collected and disseminated in a manner that is consistent with safe and effective operational programs:

- Weather (temperature, relative humidity, wind speed, wind direction, etc).
- Fire danger rating (Extreme, Very High, High, Moderate, or Low).
- Fuel conditions (fuel moisture).
- Resource availability (local and regional).
- Special concerns and values to be protected.
- Other biological, geographical or sociological data as needed.

This data can be collected hourly, daily, monthly, seasonally, yearly, or as appropriate to the rate of change for the variable of interest, regardless of whether there is an active wildland fire burning on the Refuge. The sampling frequency can be derived from management objectives, risk assessments, resource constraints or the rate of ecological change. The ZFMO can assist the Refuge in establishing an efficient and effective means to gather this data.

### Prescribed Fire Monitoring

Monitoring is conducted in three stages: pre-burn, during the active phase of the prescribed burn, and post-burn. Pre-burn and post-burn evaluations are accomplished with transects or plots depending on the habitat type and fire unit. The ZFMO, in concert with the Regional Fire Biologist, will provide specific guidance as to the type and amount of monitoring to be conducted.

All of the prescribed burning done at the Refuge will be documented. Basic site conditions will be recorded during prescribed burns to ensure that they are conducted within the appropriate range of environmental conditions (prescription). No special equipment is necessary for monitoring fire behavior. Since most burns on the Refuge will be of low to moderate intensity, they can generally be 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 Prescribed Burn Plan.

Basic monitoring to determine habitat response will generally use photo-points. These points will be re-visited and photographed during subsequent seasons. It is vital that Refuge staff devote time to post-burn monitoring of established plots. Comparisons over time will aid in determining if burn and resource objectives are being met. More complex monitoring efforts may be undertaken for research related to prescribed burns, or to answer questions about the effects of prescribed fire on specific wildlife or habitat parameters. Such monitoring can require vegetation transects, breeding bird point counts, presence/absence of target species, etc. An excellent reference resource for monitoring procedures can be found in the Fire Monitoring Handbook, USDI, National Park Service, 2007.

## Wildland Fire Suppression

Reconnaissance monitoring provides a basic overview of the physical aspects of a fire event. On some wildland fires, this may be the only monitoring data gathered. The following data should be collected as a minimum for all fires:

- Fire Cause (Origin) and Ignition Point.
- Fire Location and Size.
- Logistical Information.
- Fuels and Vegetation Description.
- Current and Expected Fire Behavior.
- Potential for Further Spread.
- Current and Forecasted Weather.
- Resource or Safety Threats and Constraints.
- Smoke Volume and Direction of Movement.

If trained staff is available, the following data should be gathered on all fires:

- Slope.
- Aspect.
- Elevation.
- Ambient weather conditions (dry bulb/wet bulb temperature, relative humidity, wind speed, wind direction, shading and cloud cover, fuel moisture, drought index, duff moisture, fuel model).
- Rate of spread.
- Perimeter or area growth.
- Flame length.
- Direction of fire spread.
- Smoke characteristics.
- Mixing height.
- Transport winds

## Habitat Response Monitoring Requirements

Hazard fuel reduction funds may be used to facilitate adaptive management when evaluating the fuels management program and project effectiveness. It can also ensure that Refuge resource management goals and objectives are not compromised by fuels management projects. The use of 9263 or 9264 funds will be limited to monitoring first-and-second-order effects of fuel management projects (prescribed fires, mechanical or chemical fuel treatments, etc.) on fuel and wildlife habitat composition and structure that are recognized and well-described as measurable objectives in an approved Refuge habitat management plan.

Funding wildlife population inventories, fire effects research, or management studies on wildlife is not an appropriate use of fuels funding. Evaluating fuel management treatment effects on wildlife habitat composition and structure is intended to complement these inventories, management studies and research projects. Because fuels management effectiveness monitoring is not an emergency, Base-8 personnel costs or costs associated with back-filling personnel or personnel overtime costs will not be funded.

Fuels management effectiveness monitoring requires the preparation and approval of a monitoring plan. This plan can be a separate Fuels Treatment Monitoring Plan or part of a holistic adaptive management program that integrates all Refuge resource monitoring activities. Whether separate or integrated the plan should contain:

- A full description of the fuel and wildlife habitat monitoring attributes, monitoring objectives, and approved monitoring protocol description in enough detail that a successor could continue the monitoring, and identify the monitoring need.
- A description of management actions to be taken when monitored habitat attributes reach established threshold levels.
- The Refuge's commitment to implementing and completing the monitoring and management actions.

The ZFMO, Regional Fire Management Coordinator and/or Regional Fire Biologist will assure that before any fuel treatment monitoring (beyond the first order fire effects monitoring in the Prescribed Fire Plan) is approved, the following guidelines are met:

- The fuel and wildlife habitat monitoring activities are adequately described in the approved Refuge Fire Management Plan and/or an approved Habitat Management Plan.
- The monitoring protocols meet regionally-established fuel and wildlife habitat monitoring protocols established under the Fulfilling the Promise WH-10(1) action item or the Service's Fuel and Fire Effects Monitoring Guide.
- The monitoring plan is independently reviewed by the Regional Fire Biologist to determine if the proposed protocols are the most cost effective and statistically defensible means of addressing monitoring objectives.
- All stakeholders are made aware of any management changes that may occur as a result of the monitoring effort.

### **Treatment Effectiveness**

Consistent with the direction already discussed in Section 5.0 of this FMP, all prescribed burns, as well as non-fire hazardous fuel reduction projects, will have specific monitoring objectives and protocols established as a part of the planning and implementation process.

Choosing and implementing appropriate monitoring protocols is a critical step in the execution of a fire monitoring program. The appropriate monitoring methods and measures must be determined *prior* to management prescriptions being undertaken. Doing so allows the development of a monitoring program that can be designed to assess the achievement of specific management objectives and address the specific hypotheses outlined in adaptive management actions. There are a myriad of monitoring methods which can be employed by fire management professionals. The criterion for method selections includes the following:

- The complexity of the methodology
- The prospects of long-term consistency
- Time, staffing, expertise, and funding available for implementation

To make the best use of limited time and financial resources, available monitoring alternatives will be thoroughly researched by Refuge staff prior to the selection and implementation of a protocol. Consultation



with other staff members, local scientists and others who may be familiar with the proposed protocol is highly recommended prior to submitting any protocol for approval.

Protocols that the Refuge may consider for use can be found in the following:

- U.S. Fish and Wildlife Service Fire Effects Monitoring Guide
- National Park Service Fire Monitoring Handbook (2003)
- Fire Effects Guide (National Wildfire Coordinating Group 1994)
- Fire Ecology, Wright and Bailey (1982)
- FIREMON Fire Effects Monitoring System

## **6.0 FIRE MANAGEMENT PLAN TERMINOLOGY (GLOSSARY)**

The terminology used in wildland fire management is constantly evolving with new advances in technology and changes in operational policy. A continually updated and complete Glossary of Wildland Fire Terminology is available on the Internet at the following address:

<http://www.nwcg.gov/pms/pubs/glossary/index.htm>

## **7.0 LITERATURE CITED**

Abrams, M.D. 1992. **Fire and the Development of Oak Forests**. Bioscience. 42: 346-353.

Abrams, M.D. 1998. **The Red Maple Paradox**. Bioscience 48:355-364.

Anderson, Hal E., 1982. **Aids to Determining Fuel Models for Estimating Fire Behavior**, USDAFor. Ser. GTR INT-122

Anderson, R. C. 1990. **The Historic Role of Fire in the North American Grassland**. In: *Fire in North American Tallgrass Prairies* (S.L. Collins and L.L. Wallace, eds.). Pp.818. University of Oklahoma Press, Norman, Oklahoma. ISBN 0-8061-2281-1.

Anderson, R. C. 1997. **Summer fires**. In: *The Tallgrass Restoration Handbook, for Prairies, Savannas, and Woodlands* (Packard, S. and C. F. Mutel, eds.). Pp. 245-249. Island Press, Washington, D.C. ISBN 1-55963-320-4.

Anderson, R.C. Laren E. Brown. 1983. **Comparative Effects of Fire on Trees in a Midwestern Savannah and Adjacent Forest**. Bulletin of the Torrey Botanical Club 110:1 P87

Askins, R A. 1997. **History of Grasslands in the Northeastern United States: Implications for Bird Conservation**. In: *Grasslands of Northeastern North America, Ecology and Conservation of Native and Agricultural Landscapes* (Vickery, P. D. and P. W. Dunwiddie, eds.), pp. 119-136. Massachusetts Audubon Society, Lincoln, MA. ISBN 0-932691-25-0.

Bailey, Robert G. 1995, **Description of Eco-Regions of the U.S.**, Internet Access, [www.fs.fed.us](http://www.fs.fed.us).

- Barbour, M. G., J. H. Burk, W. D. Pitts, F. S. Gilliam, M. K. Schwartz. 1999. In: *Terrestrial Plant Ecology, Third Edition*. Pp. 446-447. Benjamin/Cummings, an imprint of Addison Wesley Longman, Inc. ISBN 0-8053-0004-x.
- Bond, W. J., and B. S. Van Wilgen. 1996. *Fire and Plants*. Chapman and Hall, New York
- Braun, E.L. 2001. **Deciduous Forests of Eastern North America**. The Blackburn Press, Caldwell New Jersey.
- Brown, H. 2000. **Wildland Burning by American Indians in Virginia**. *Fire Management Today*. 60: 29-39.
- Brown, J.K.; Smith J. Kapler, eds. 2000. **Wildland Fire in Ecosystems; Effects of Fire on Flora. Gen. Tech. Rep. RMRS-GTR-42-vol 2**. Ogden, UT.: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.
- Calijouw, Caren. 1996. **Role of Fire in Wetland and Riparian Systems**", National Advanced Resource Technology Center, Fire in Ecosystem Management, Marana, Arizona.
1979. **Classification of Wetlands and Deepwater Habitats of the United States**. United States Fish and Wildlife Service, United States Department of the Interior.
- Cook, J. E., I. L. Sharik, and D. W. Smith. 1998. **Oak Regeneration in the Southern Appalachians: Potential Problems, and Possible Solutions**. *Southern Journal of Applied Forestry*. 22(1):11-18.
- Cross, Diana H.; Fleming, Karen L. 1989. **Control of Phragmites or Common Reed**. Fish and Wildlife Leaflet 13.4.12. Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service. 5 p.
- Crow, I. R., W. C. Johnson, and C. S. Adkisson. 1994. Fire and recruitment of *Quercus* in a postagricultural field. *American Midland Naturalist*. 131(1):84-97.
- Dale, V.H., Joyce, McNulty, et al. 2001 **Climate Change and Forest Disturbances**. *BioScience* 51: 723-734
- Day, G.M. 1953. **The Indian as an Ecological Factor in the Northeastern Forest**.
- DeBano, L. F., D. G. Neary, and P. F. Ffolhiott. 1998a. **Chapter 9, Vegetation In: Fire's Effects on Ecosystems**. John Wiley & Sons, Inc. New York ISBN 0-471-16356-2.
- DeGraaf, Richard M.; Scott, Virgil E.; Hamre, R.H.; (and others). **Forest and Rangeland Birds of the United States: Natural History and Habitat Use**. Agriculture Handbook. 688. Washington DC: U.S. Department of Agriculture, Forest Service. 625 p.
- Denevan, W.M., ed. 1992. **The Native Population of the Americas in 1492**. 2<sup>nd</sup> ed. Univ. Wisconsin Press, Madison. 398 pp.
- Dobyns, H.F. 1983. **Their Number Became Thinned**. Univ. Tennessee Press, Knoxville. 378 p.

Drohan, Joy R.; Sharpe, William E. 1997. **Long term Changes in Forest Soil Acidity, USA Water, Air, and Soil Pollution** 95: 299-311

Ehrenreich, J.H. 1959. **Effect of burning and Clipping on Growth of a Native Prairie in Iowa.** Journal of Range Management. 12 pp. 133-137.

Eyre, F.H., ed. 1980. **Forest Cover Types of the United States and Canada.** Washington, D.C.: Society of American Foresters Report.

Finch, Deborah M., 1991. **Population Ecology, Habitat Requirements, and Conservation of Neotropical Migratory Birds.** Rocky Mountain Forest and Range Experiment Station, GTR RM-205.

Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis> [ 2005, May 27].

Frost, C. C. 1998. **Pre-Settlement Fire Frequency Regimes of the United States: a First Approximation.** Pages 70-81 In: Teresa, L. Pruden and Leonard A Brennen (eds.) **Fire in ecosystem management: shifting the paradigm from suppression to prescription.** Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL.

Hagan III, John M., 1992. **Ecology and Conservation of Neotropical Migrant Landbirds,** Smithsonian Institution Press, 609pp.

Heinselman, Miron L. 1978. **Fire Intensity and Frequency as Factors in the Distribution and Structure of Northern Ecosystems,** USDA Forest Service, 1981 Proceedings of the Conference, Fire Regimes and Ecosystem Properties, GTR WO-26. 51pp.

Hensel, R.L. 1923. **Recent Studies on the Effects of Burning on Grassland Vegetation.** Ecology 4: pp. 183-188.

Herkert, J. R 1994b. **Breeding Bird Communities of Midwestern Prairie Fragments: the Effects of Prescribed Burning and Habitat-Area.** Natural Areas Journal 14(2): 128-135.

Howe, H. F. 1995. **Succession and Fire Season in Experimental Prairie Plantings.** Ecology 76(6):1917-1925.

Inkley, D.B., M.G. Anderson, A.R. Blaustein, V.R. Burkett, B. Felzer, B. Griffith, J. Price, and T.L. Root. 2004. **Global Climate Change and Wildlife in North America.** Wildlife Society Technical Review 04-2. The Wildlife Society, Bethesda, Maryland, USA. 26pp.

Johnsgard, Paul A. 1990. **Hawks, Eagles, and Falcons.** Washington D.C. Smithsonian Institution Press. 403 p.

Jones, A and P. D. Vickery. 1997. **Conserving Grassland Birds, Managing Agricultural Lands Including Hayfields, Crop Fields, and Pastures for Grassland Birds.** A handbook published through the Grassland Conservation Program, Center for Biological Conservation, Massachusetts Audubon Society, Lincoln, MA, in

collaboration with Silvio O. Conte National Fish and Wildlife Refuge and the U.S. Fish and Wildlife Service North American Waterfowl Management Program. 17 p.

Jones, A.T., and K.C. Ryan (editors). 1986. **Wildland Fire in Ecosystems: Effects of Fire on Cultural Resources and Archeology**. General Technical Report No. RMRS-GTR-42-Vol.3. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado.

Knapp, A. K., J. M. Briggs, J. M. Blair, and C. L. Turner. 1998. **Patterns and Controls of Aboveground Net Primary Production in Tallgrass Prairie**. In: *Grassland Dynamics, Long Term Ecological Research in Tallgrass Prairie* (Knapp, A.K., J. M. Briggs, D. C. Hartnett, S. Collins, eds.). Pp. 193-221. Oxford University Press, New York, Oxford, ISBN 0-19-511486-8.

Komarek, E. V. 1974. **Introduction to Lightning Ecology**. In: Proceedings, Annual Tall Timbers Fire Ecology Conference; 1973 March 22-23; Tallahassee, FL. No. 13. Tallahassee, FL: Tall Timbers Research Station: 421-427.

Kozlowski, T.T. ;Ahlgren, C.E. 1974. **Fire and Ecosystems**. New York: Academic Press. 542 p.

Ladd, D. 1997. Statement of Doug Ladd, Director of Science and Stewardship, Missouri Chapter of The Nature Conservancy, Before the House Committee on Agriculture, July 15, 1997.

Lyon, L.J., H.S. Crawford, E. Czuhai, R.L. Fredriksen, R.F. Harlow, L.J. Metz, and H.A. Pearson. 1978. **Effects of Fire on Fauna**. National Fire Effects Workshop, Denver, CO. April 1978.

Means, D. Bruce; Campbell, Howard W. 1981. **Effects of Prescribed Burning on Amphibians and Reptiles**. In: Wood, Gene E., ed. Prescribed Fire and Wildlife in Southern Forests; Proceedings of a Symposium; 1981 April 6-8; Myrtle beach, SC. Georgetown, SC: The Belle W. Baruch Forest Science Institute of Clemson University: 89-96.

New South Associates, 2007. Cultural Resource Survey for Rappahannock River Valley National Wildlife Refuge, Warsaw, Virginia.

Orwig, D. A. and M. D. Abrams. 1994. **Land-Use History (1720-1992), Composition, and Dynamics of Oak-Pine Forests within the Piedmont and Coastal Plain of Northern Virginia**. Canadian Journal of Forestry Research.

Patterson, W.A. IH, and K. E. Sassman. 1988. **Indian Fires in the Prehistory of New England**. Pp. 107-135 In: *Holocene human ecology in northeastern North America* (G. P. Nichols, ed.) Plenum, New York.

Pilliod, D.S., R.B. Bury, E.J. Hyde, C.A. Pearl, and P.S. Corn. 2003. **Fire and Amphibians in North America**. Forest Ecology and Management. 178: 163-181.

Plocher, A. 1999. **Plant Population Dynamics in Response to Fire in Longleaf Pine-Turkey Oak Barrens and Adjacent Wetter Communities in Southeast Virginia**. Journal of the Torrey Botanical Society. 126: 213-225.



Pyne, Stephan J. 1982. **Fire in America: A Cultural History of Wildland and Rural Fire**. Princeton University Press, Princeton, N.J. 654 pp.

Rothermel, Richard C., 1983. **How to Predict the Spread and Intensity of Forest and Range Fires**, USDA For. Ser. GTR INT-143.

Rudnick, J. L., W. A. Patterson, III, and R. P. Cook. 1997. **Experimental Use of Prescribed Fire for Managing Grassland Bird Habitat at Floyd Bennett Field, Brooklyn, NY**. In: *Grasslands of Northeastern North America* (Vickery, P. D. and P. W. Dunwiddie, eds). Pp. 99-118. ISBN 0-932691 -25-0.

Russell, E. W. B. 1998. **Indian-Set Fires in the Forests of the Northeastern U.S.** Ecology 64(1):78-88.

Russell, K.R., D.H. Van Lear, and D.C. Guynn. 1999. **Prescribed Fire Effects on Herpetofauna: Review and Management Implications**. Wildlife Society Bulletin. 27:374-384.

Schneider K.J. and D.M. Pence, 1992. **Migratory Non-Game Birds of Management Concern in the Northeast**. U.S. Dep. Inter., Fish and Wildl. Serv., Newton Corner, Massachusetts. 400pp.

Schwartz, M., Heim, J. 1996. **Effects of a Prescribed Fire on Degraded Forest Vegetation**. Natural Areas Journal 16:3.

Sullivan, J 1995. **Oak-Hickory Forest**. In: Simmerman, D. G., compiler. The Fire Effects Information System. Missoula, MT: USDA, USFS, Intermountain Research Station, Intermountain Fire Sciences Laboratory.

Sullivan, B.T., C.J. Fettig, W.J. Otrosina, M.J. Dalusky, and C.W. Berisford. 2003. **Association Between Severity of Prescribed Burns and Subsequent Activity of Conifer-Infested Beetles in Stands of Longleaf Pine**. Forest Ecology and Management. 185: 327-340.

Thompson, D. J.; Shay, J. M. 1985. **The Effects of Fire on Phragmites Australis in the Delta Marsh, Manitoba**. Canadian Journal of Botany. 63:1864-1869.

Tyndall, R.V.J. 1992. **Historical Considerations of Conifer Expansion in Maryland Serpentine Barrens**. Castanea. 57 (2) 123-131.

U.S. Department of the Interior, Fish and Wildlife Service. **Endangered and Threatened Wildlife and Plants**: August 29, 1992. 50 CFR 17.11 and 17.12. Washington DC. 38 p.

Van Lear, D.H. 2000. **Recent Advances in the Silvicultural Use of Prescribed Fire**. Fire and Forest Ecology, Tall Timbers Fire Ecology Conference Proceedings, No. 21. Tall Timbers research Station, Tallahassee, FL.

Wade, D.D.; Brock, B.L.; Brose, P.H.; Grace, J.B.; Hoch, G.A.; Patterson III, W.A. 2000. **Fire in Eastern Ecosystems**. In: Brown, J.K. Smith, J.K., eds., ed. **Wildland Fire in Ecosystems: Effects of Fire on Flora**. GTR RMRS-42, Ogden, UT; USDA Forest Service, Rocky Mountain Research Station: 2: 53-96.

Waldrop, T.A., W.D. Glass, S. Rideout, V.B. Shelburne, H.H. Mohr, and R.J. Phillips. 2004. An Evaluation of Fuel Reduction Treatments Across a Landscape Gradient In Piedmont Forests: Preliminary Results of the

National Fire Surrogate Study. In: K.F. Connor, ed. Proceedings of the 12<sup>th</sup> Biennial Southern Silviculture Research Conference. General Technical Report, SRS-71. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station.

Wigley, T.M.L. & Raper, S.C.B. in **Climate Change: Science, Impacts and Policy** (eds Jager, J & Ferguson, H.L.) 231-242 )Cambridge University Press, 1991).

Windisch, A G., and Good, R. E. 1991. **Fire Behavior and Stem Survival in the NJ Pine Plains**. In: Herman, S.M. Conf. Coordinator. Proceedings 17th Tall Timbers Fire Ecology Conference: High-Intensity Fire in Wildlands, Management Challenges and Options. May 18-21, 1989. Tallahassee, FL. 1991. p.424.

Wright, Henry A., and Arthur Bailey. 1982. **Fire Ecology**. John Wiley and Sons, New York, New York.

Woehler, E.E. 1979. **Establishment of Native Warm-Season Grasses in Wisconsin**. Research Rept. 102, NL54 #29, Wisconsin Dept. of Nat. Res., Madison, WI. 17pp.

Zaremba, R. E., Hubbs, K. 1991. **The Albany Pine Bush: Fire Management Concerns in an Urban Landscape**, In: Proceedings 17th Tall Timbers Fire Ecology Conference: High Intensity Fire in Wildlands, Management Challenges and Options (Herman, S. M., conf. coordinator), pp. 424. May 18-21, 1989. Tallahassee, FL.

## SUPPORTING REFERENCES

Department of Interior Manual (620 DM 1)

Environmental Assessment, Fire Management Program, Rappahannock River Valley National Wildlife Refuge, December 2001. US Fish & Wildlife Service

Final Environmental Assessment (FEA) and Land Protection Plan (LPP), for Rappahannock River Valley National Wildlife Refuge, U.S. Fish and Wildlife Service, 1994.

Fire Effects Guide, National Wildfire Coordinating Group

Interagency Standards for Fire and Fire Aviation Operations (Red Book) 2008

National Interagency Fire Center. 2008. Interagency Prescribed Fire Planning and Implementation Guide: NFES Publication 1279, Boise, Idaho.

National Interagency Fire Center, U.S. Department of the Interior, National Park Service. 2007. Fire Monitoring Handbook. Boise, Idaho. 274 pages.

Rappahannock River Valley National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment (Internal Review Draft) April, 2008.

Rappahannock River Valley National Wildlife Refuge Fire Management Plan, 2002.

Virginia Natural Areas Heritage Program website: [www.dcr.virginia.gov/natural\\_heritage/index.shtml](http://www.dcr.virginia.gov/natural_heritage/index.shtml)

USDA Forest Service and U.S. Department of the Interior, Guidance for Implementation of Federal Wildland Fire Management Policy, February 13, 2009.

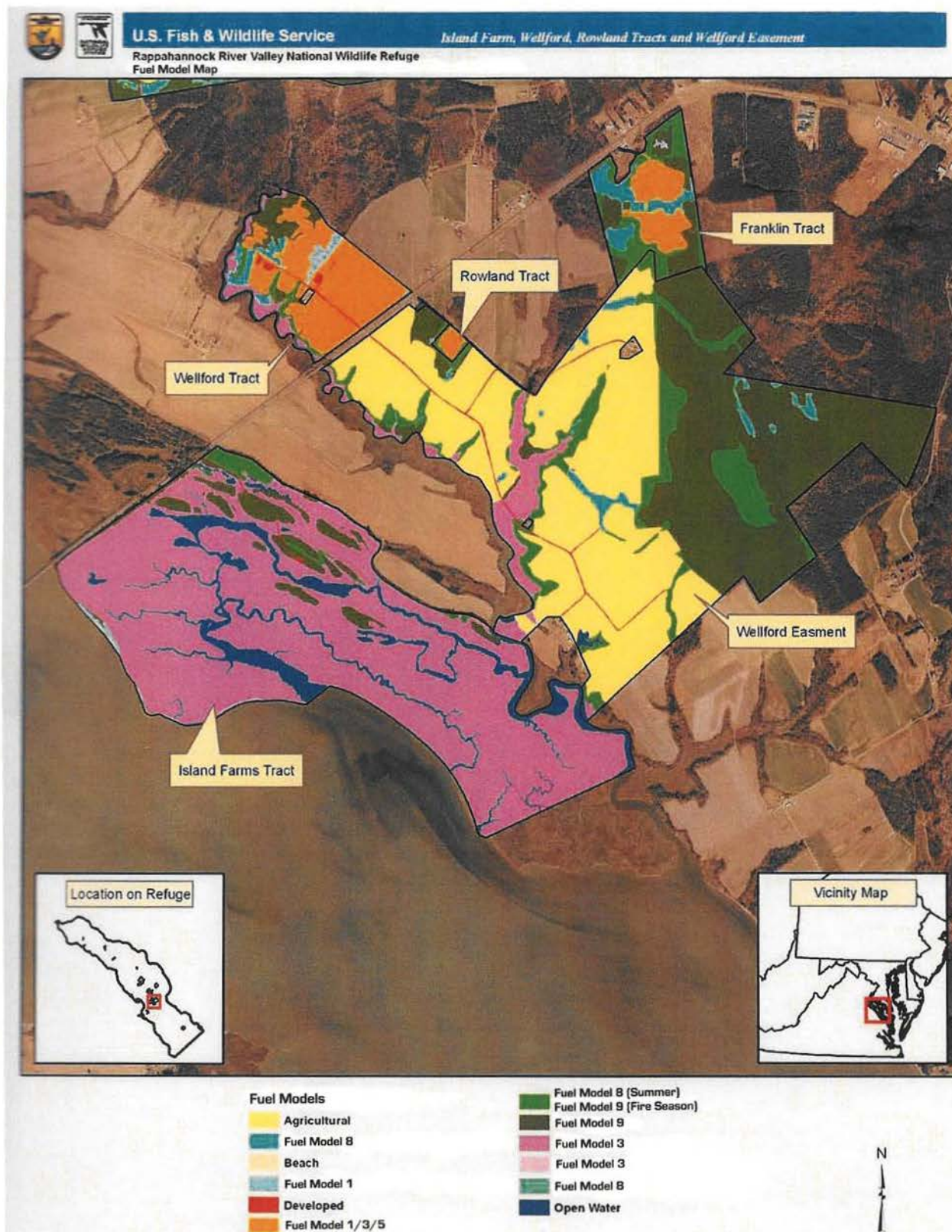
US Fish and Wildlife Service Refuge Manual

## APPENDIX A MAPS

### 1. Fuel Model Maps



Rappahannock River Valley National Wildlife Refuge  
Fire Management Plan



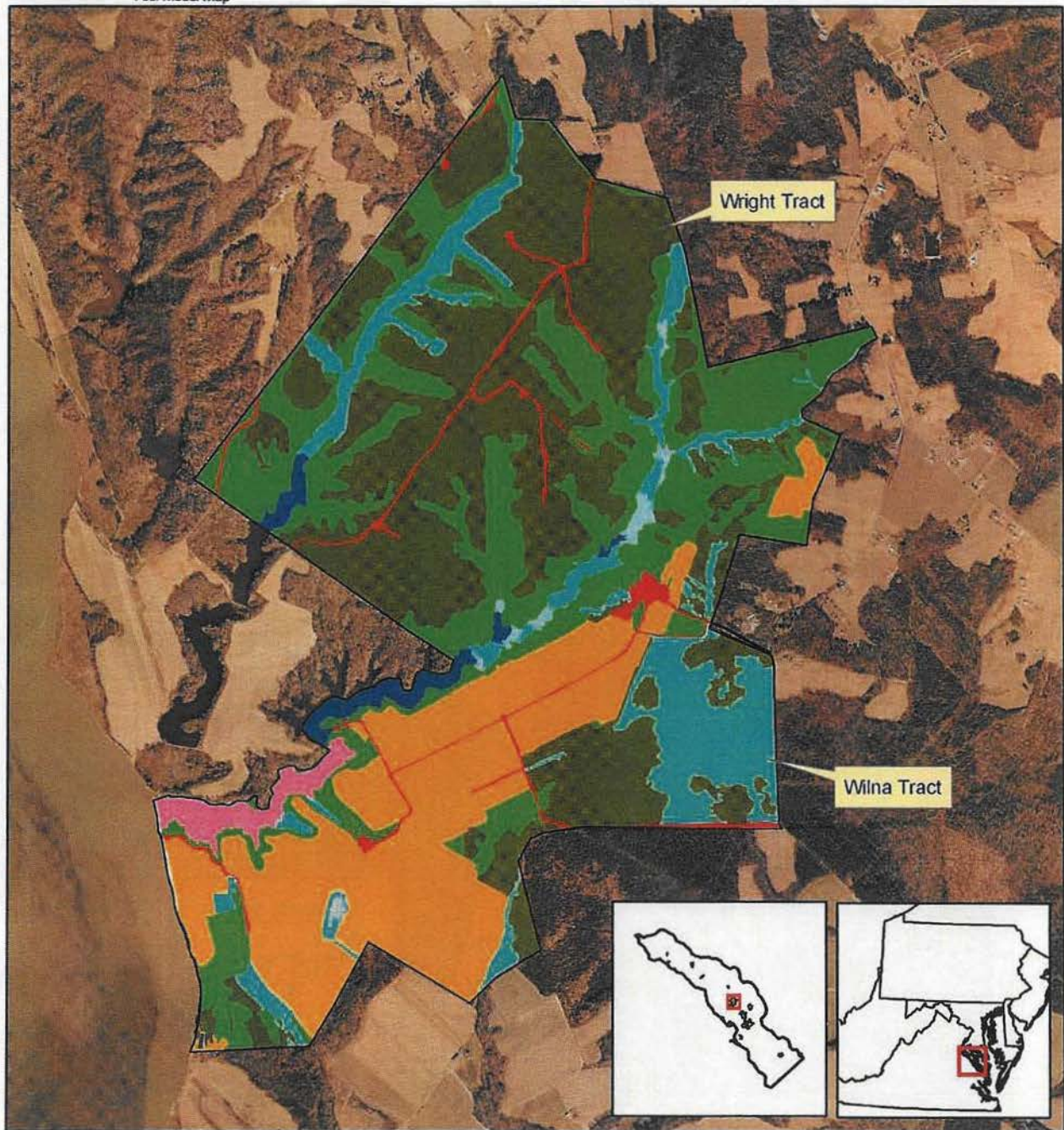


Rappahannock River Valley National Wildlife Refuge  
Fire Management Plan



U.S. Fish & Wildlife Service  
Rappahannock River Valley National Wildlife Refuge  
Fuel Model Map

*Wilna and Wright Tracts*



**Fuel Models**

- Agricultural
- Fuel Model 8
- Beach
- Fuel Model 1
- Developed
- Fuel Model 1/3/5

- Fuel Model 8 (Summer)
- Fuel Model 9 (Fire Season)
- Fuel Model 9
- Fuel Model 3
- Fuel Model 3
- Fuel Model 3
- Fuel Model 8
- Open Water





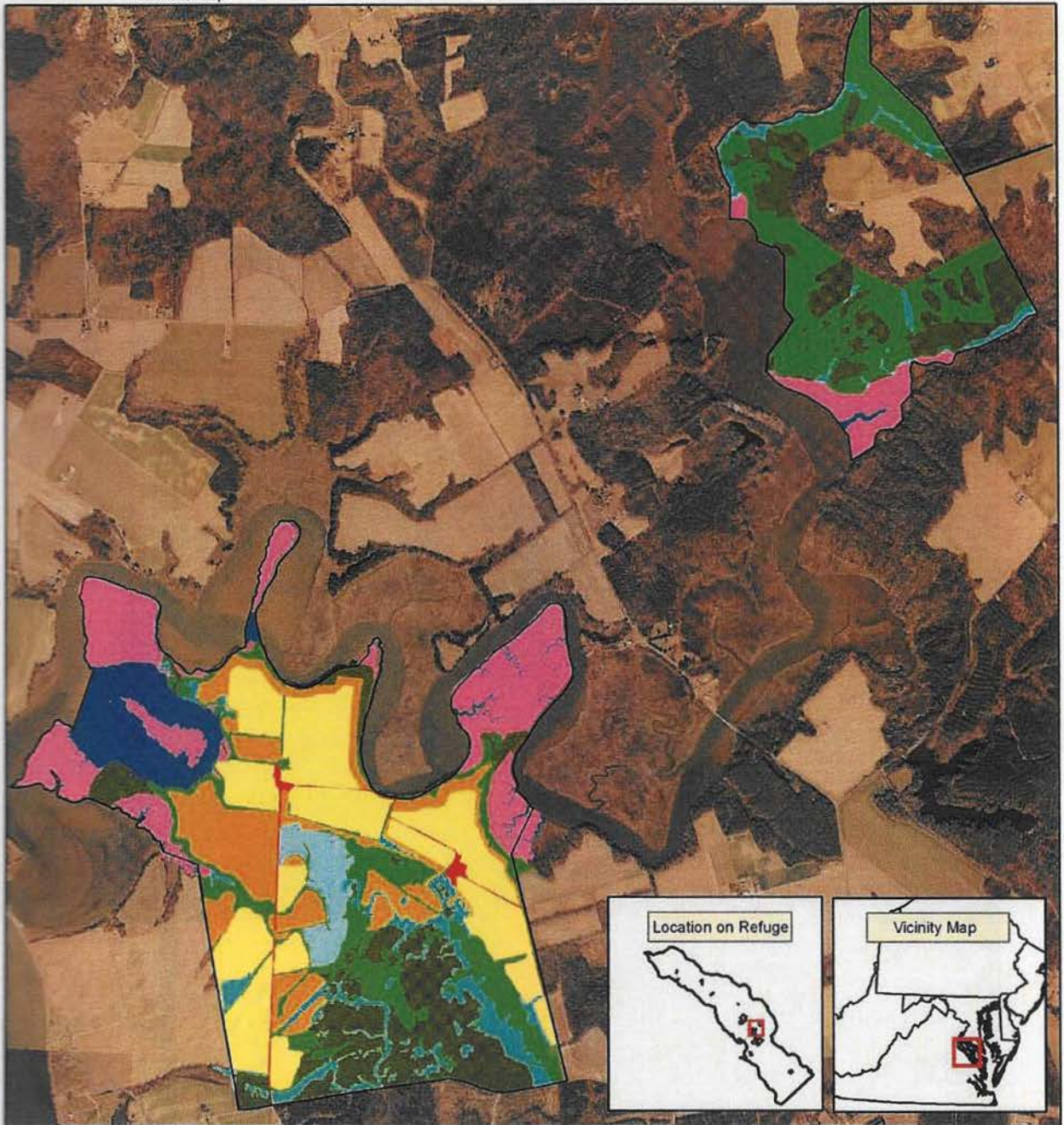
Rappahannock River Valley National Wildlife Refuge  
Fire Management Plan



U.S. Fish & Wildlife Service

Taylor Tract and Menokin Easement

Rappahannock River Valley National Wildlife Refuge  
Fuel Model Map



Fuel Models

- Agricultural
- Fuel Model 8
- Beach
- Fuel Model 1
- Developed
- Fuel Model 1/3/5

- Fuel Model 8 (Summer)
- Fuel Model 9 (Fire Season)
- Fuel Model 9
- Fuel Model 3
- Fuel Model 3
- Fuel Model 3
- Fuel Model 8
- Open Water



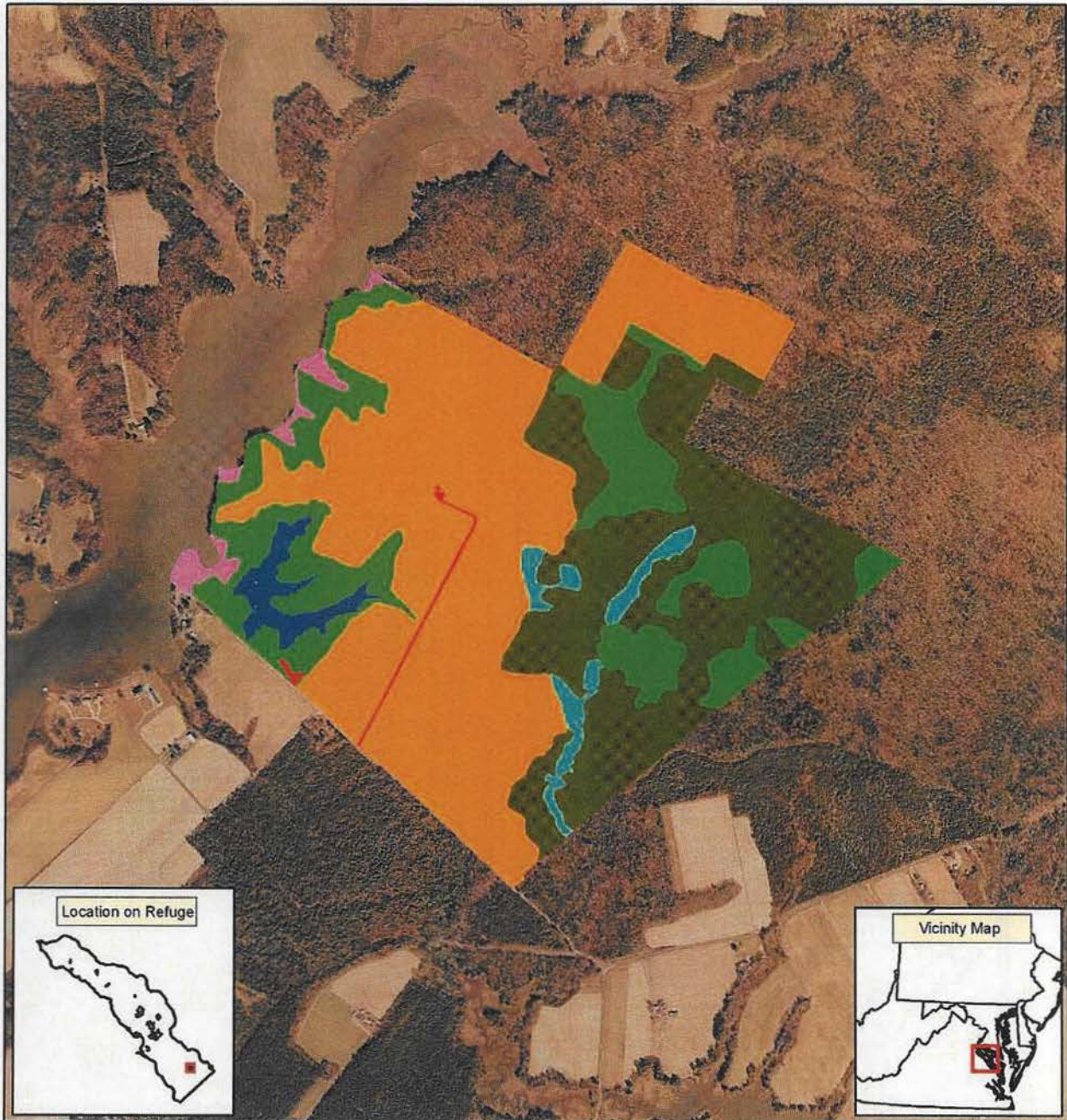


Rappahannock River Valley National Wildlife Refuge  
Fire Management Plan



**U.S. Fish & Wildlife Service**  
Rappahannock River Valley National Wildlife Refuge  
Fuel Model Map

*Laurel Grove Tract*



**Fuel Models**

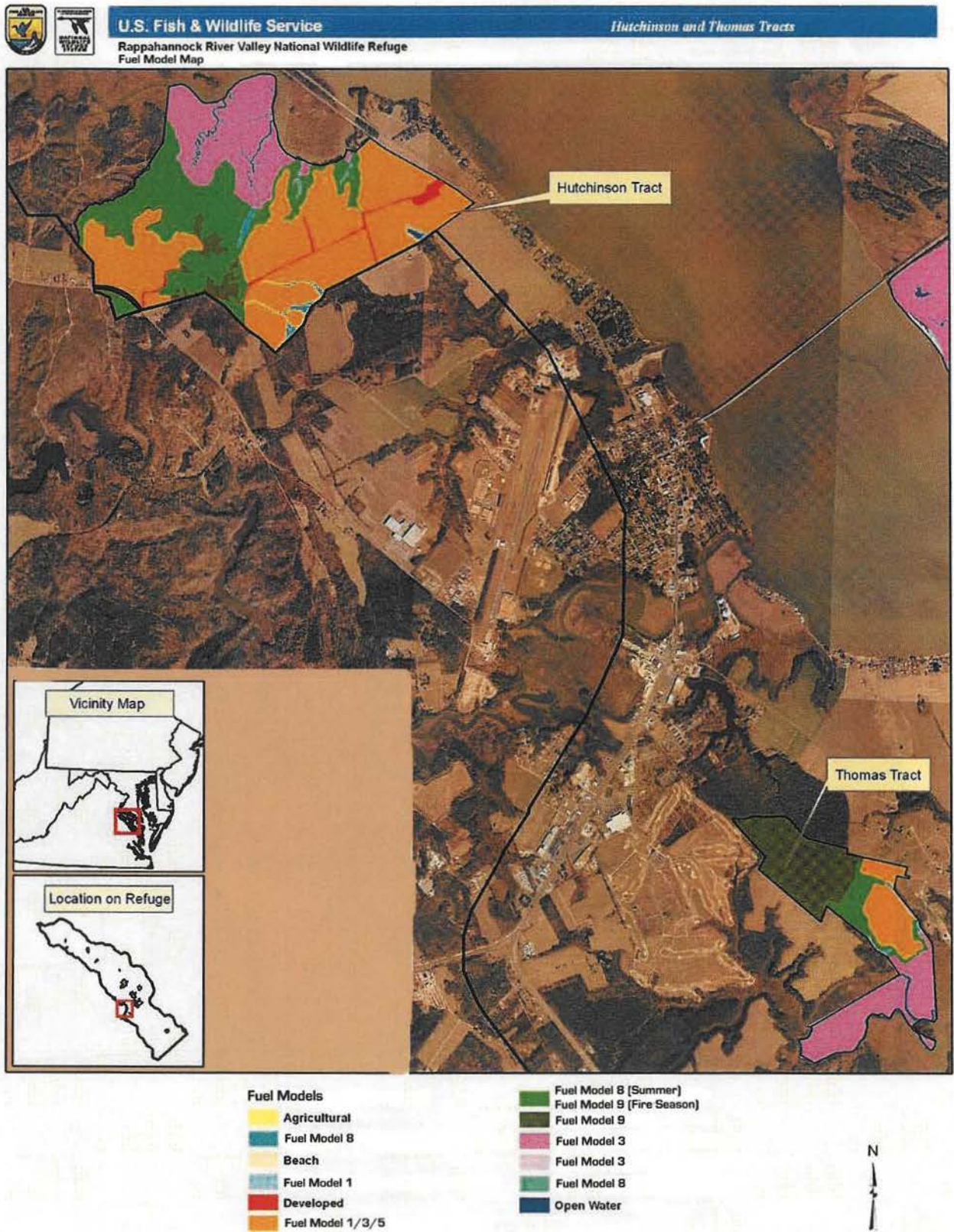
- Agricultural
- Fuel Model 8
- Beach
- Fuel Model 1
- Developed
- Fuel Model 1/3/5
- Fuel Model 8 (Summer)
- Fuel Model 9 (Fire Season)

- Fuel Model 9
- Fuel Model 3
- Fuel Model 3
- Fuel Model 3
- Fuel Model 8
- Open Water



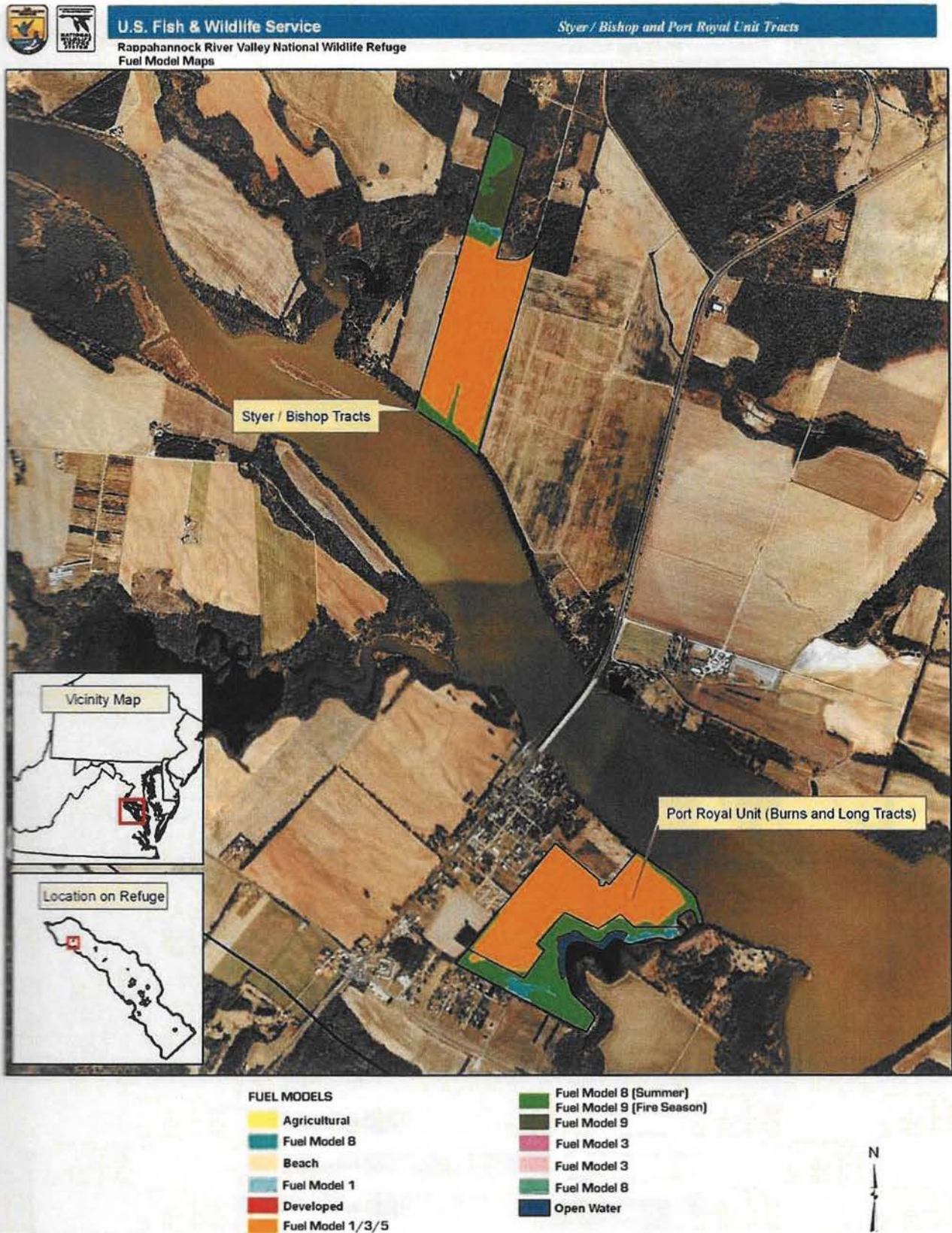


Rappahannock River Valley National Wildlife Refuge  
Fire Management Plan



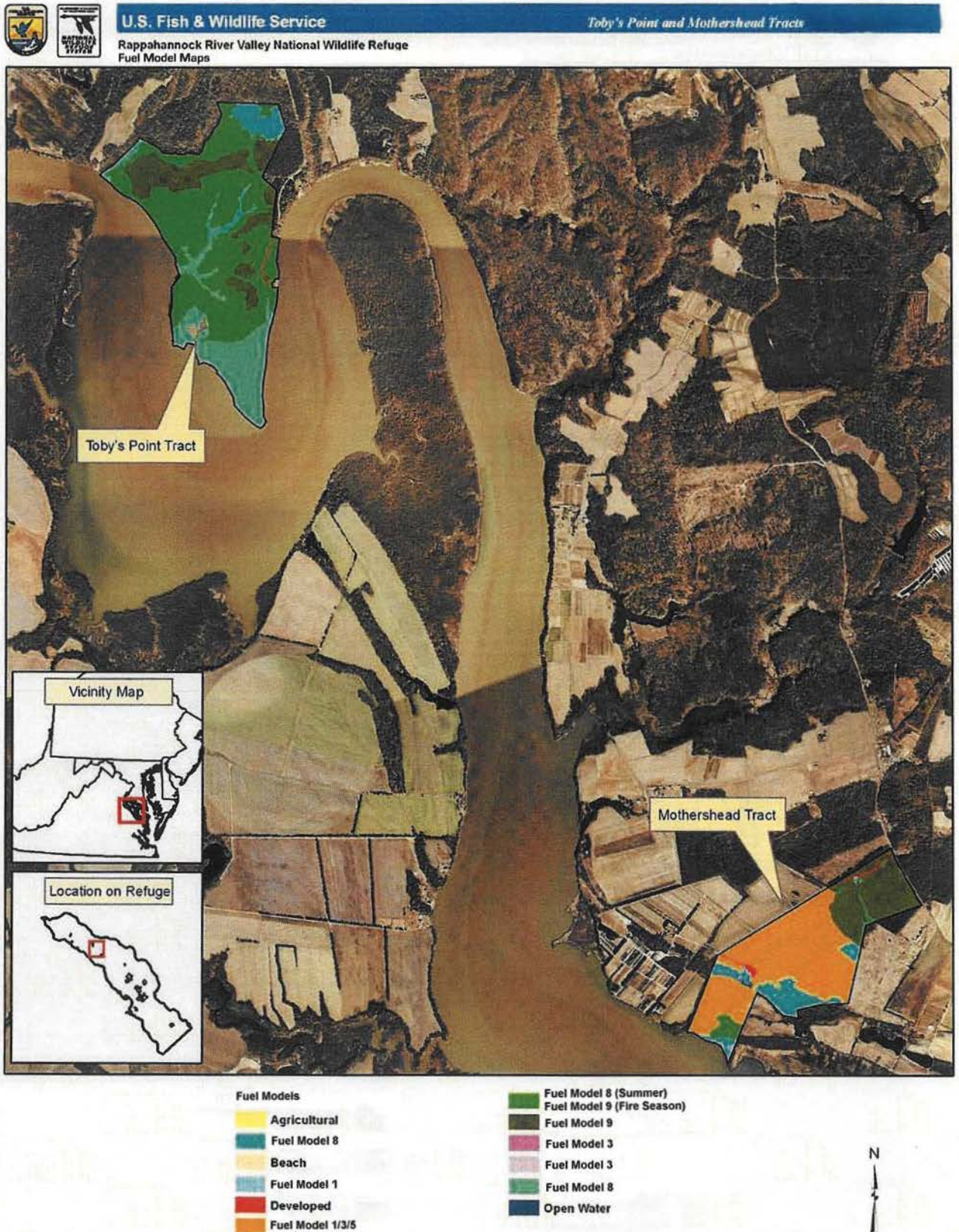


Rappahannock River Valley National Wildlife Refuge  
Fire Management Plan





Rappahannock River Valley National Wildlife Refuge  
Fire Management Plan



## **APPENDIX B**

### **Authority and Policy References**



- A. Protection Act of September 20, 1922** (42 Stat. 857; 16 U.S.C. 594) Authorizes the Secretary of the Interior to protect, from fire, lands under his/her jurisdiction and to cooperate with other Federal agencies, States, or owners of timber.
- B. Economy Act of June 30, 1932** (47 Stat. 417; 31 U.S.C. 1535). Authorizes Federal agencies to enter into contracts and agreements for services with each other.
- C. Reciprocal Fire Protection Act of May 27, 1955 as amended by the Wildfire Suppression Assistance Act of 1989** (69 Stat. 66, 67; 42 U.S.C. 1856a)(102 Stat. 1615). Authorizes reciprocal fire protection agreements with any fire organization for mutual aid with or without reimbursement and allows for emergency assistance in the vicinity of agency facilities in extinguishing fires when no agreement exists.
- D. National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 and the Refuge Recreation Act of 1962.**(80 Stat. 927)(16 U.S.C. 668dd-668ee)(16 U.S.C. 460k-460k4). Governs the administration and use of the National Wildlife Refuge System.
- E. Alaska Native Claims Settlement Act of December 18, 1971.** (88 Stat. 668; 43 U.S.C. 1601). Alaska Natives' lands are to continue to receive forest fire protection from the United States at no cost until they become economically self-sufficient.
- F. Disaster Relief Act of May 22, 1974.** (88 Stat. 143; 42 U.S.C. 5121). Authorizes Federal agencies to assist State and local governments during emergency or major disaster by direction of the President.
- G. Federal Fire Prevention and Control Act of October 29, 1974 et seq.** (88 Stat. 1535; 15 U.S.C. 2201) as amended. Authorizes reimbursement to State and local fire services for costs incurred in firefighting on Federal property.
- H. Federal Grants and Cooperative Act of 1977.** (Pub. L. 95-244, as amended by Pub. L. 97-258, September 13, 1982. 96 Stat. 1003; 31 U.S.C. 6301-6308). Eliminates unnecessary administrative requirements on recipients of Government awards by characterizing the relationship between executive agencies and contractors, States and local governments and other recipients in acquiring property and services in providing U.S. Government assistance.
- I. Alaska National Interest Lands Conservation Act of December 2, 1980.** (94 Stat. 2371, 43 U.S.C. 1602-1784). Designates certain public lands in Alaska as units of the National Park, National Wildlife Refuge, Wild and Scenic Rivers, National Wilderness Preservation, and National Forest systems resulting in general expansion of all systems. Any contracts or agreements with the jurisdictions for fire management services listed above that were previously executed will remain valid.
- J. Supplemental Appropriation Act of September 10, 1982.** (96 Stat. 837). Authorizes Secretary of the Interior and Secretary of Agriculture to enter into contracts with State and local government entities, including local fire districts, for procurement of services in pre-suppression, detection, and suppression of fires on any unit within their jurisdiction.
- K. Wildfire Suppression Assistance Act of 1989.** (Pub. L. 100-428, as amended by Pub. L. 101-11, April 7, 1989). Authorizes reciprocal fire protection agreements with any fire organization for mutual aid with or without reimbursement and allows for emergency assistance in the vicinity of agency facilities in extinguishing fires when no agreement exists.
- L. Other Legal Mandates.** Although Service and Refuge System policy and individual refuge purpose provide the foundation for management, the manner in which refuges are administered mandates that they must also comply with a variety of other Federal laws, executive orders, treaties, interstate compacts, and regulations pertaining to the conservation and protection of natural and cultural resources.

The “Digest of Federal Resource Laws of Interest to the Service” can be accessed at the following website:

<http://laws.fws.gov/lawsdigest/index.html>

#### **Other Policy References**

1. Departmental Manual, 620 DM 1-3, Wildland Fire Management, General Policy and Procedures; Wildland Fire Management, General Policy and Procedures – Alaska; and Burned Area Emergency Stabilization and Rehabilitation.
2. United States Fish and Wildlife Service Manual sections 095 FW 3 Emergency Preparedness and Response -- Wildland Fire Management, 241 FW 7 Wildland Fire Safety, 232 FW 6 Training Standards for Wildland and Prescribed Fire Operations, 621 FW 1 Wildland Fire Policies and Responsibilities, 621 FW 2 Fire Management Planning, and 621 FW 3 Prescribed Fire.
3. United States Fish and Wildlife Service Fire Management Handbook
4. Interagency Standards for Fire and Fire Aviation Operations, also known as the “Red Book.”
5. Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide, September 2006
6. National Wildlife Refuge System Wildland Fire Management Strategic Plan (May 2006)
7. Wildland Fire Use Implementation Procedure Reference Guide, May 2005
8. A Collaborative Approach for Reducing Wildfire Risks to Communities and the Environment: 10-Year Strategy Implementation Plan (December 2006)
9. National Fire Plan (September 2001) and Healthy Forest Initiative (August 2002)



**FACT SHEET**  
**PRESCRIBED FIRE AND THE VIRGINIA 4:00 PM BURNING LAW**

- ❑ The Virginia Department of Forestry (VDOF), United States Forest Service (USFS), National Park Service (NPS), and United States Fish and Wildlife Service (FWS) all have wildland fire management responsibilities, and all cooperate in wildfire suppression, prevention, and prescribed fire programs. While the overall missions of the four agencies are similar in respect to wildland fire, there are some differences as well.
- ❑ Virginia Code Section 10.1-1142 B, known as the "4 PM Burning Law", comes into effect each spring, which is when the state generally experiences its highest fire dangers. In brief the 4 PM Burning Law prohibits burning before 4:00 PM, from February 15 through April 30 of each year, within 300 feet of woodland, brush land or fields containing dry grass or other flammable material.
- ❑ The 4 PM Burning Law specifically exempts burning conducted on federal lands. While it may initially appear otherwise, prescribed burning by the federal wildland fire agencies is not in conflict with the intent of the 4 PM Burning Law.
- ❑ The 4 PM Burning Law is intended to prevent wildfires originating from escaped trash and debris fires. These types of fires are often conducted by individuals not making proper precautions, and often on days when high fire danger exists. Escaped trash and debris fires account for one-third of Virginia's wildfires.
- ❑ Federal natural resources agencies are mandated to implement prescribed fire on their lands in a manner that is consistent with their respective agency policies. In order to meet specified objectives, prescribed burns must be conducted only when weather, fuel, soil, and smoke dispersal conditions are within pre-determined parameters. These parameters are used to develop a "prescription" for the burn. This "prescription" identifies the conditions that allow the burn to meet the management objectives without jeopardizing the safety of the land and people nearby.
- ❑ The period of time when these prescription parameters can be met are often extremely limited. The objectives of most federal burns are for ecological purposes such as vegetation and wildlife habitat improvement, and prescription requirements can usually only be met in the spring during the time period covered by the 4 PM Burning Law.
- ❑ VDOF also conducts prescribed burning. However, most of the VDOF burns are conducted for preparation of cutover areas to be replanted, and these burns can be conducted during summer and fall months when the 4 PM Burning Law is not in effect.
- ❑ When conducting prescribed burns, agencies make every effort to keep the burns under control. Part of the prescription specifies the equipment and personnel required to have on site prior to starting the burn. The personnel assigned are primarily fire suppression personnel, and must meet certain qualifications. In addition to federal qualification requirements, most federal burn managers are certified under Virginia's "Prescribed Burn Manager" program, though not required by law to do so.

For more information, contact \_\_\_\_\_.

**APPENDIX C**  
**STAFF RESPONSIBILITIES**  
**AND**  
**PROGRAM ORGANIZATION**



## **PROGRAM ORGANIZATION/ STAFF RESPONSIBILITIES FIRE MANAGEMENT**

### **Introduction:**

The standards described here are truncated and are provided to serve as a general outline for overall fire program guidance. They have been taken directly from the Interagency Standards for Fire and Fire Aviation Operations (Red Book), Chapter 4 found at the following website:

[http://www.nifc.gov/policies/red\\_book/2008/CH04FWS.pdf](http://www.nifc.gov/policies/red_book/2008/CH04FWS.pdf)

### **Agency Administrator Roles:**

#### **Regional Director**

The Regional Director is responsible to the Director for fire management programs and activities within their region. The Regional Director will meet the required elements outlined in the *Management Performance Requirements for Fire Operations* and ensure training is completed to support delegations to line managers and principal acting personnel.

#### **Regional Chief and Refuge Supervisors**

Regional Chiefs and Refuge Supervisors are delegated specific leadership responsibilities by the Regional Director. They provide oversight and direction, in coordination with the Wildland Fire Management Program for the National Wildlife Refuge System. These responsibilities occur through established lines of authority as assigned by the Regional Director.

#### **Project Leader**

The Project Leader is responsible to the Regional Director for the safe and efficient implementation of fire management activities within their unit, including cooperative activities with other agencies or landowners in accordance with delegation of authorities.

### **Fire Management Staff Roles**

#### **Regional Fire Management Coordinator (RFMC)**

The Regional Fire Management Coordinator provides the coordination, training, planning, evaluation, and technical guidance for the region and is available to provide assistance for intra-agency and interagency wildland fire management needs. The RFMC will meet the qualification requirements established by the Service for the position. The RFMC, through written delegation by the Regional Director, is delegated the authority to represent the region on the Geographic Multi-Agency Coordinating Group (GMAC Group). The RFMC is responsible for implementing the decisions of the MAC Group as they affect U.S. Fish and Wildlife areas. The decisions of the GMAC Group include the

prioritization of incidents, and the allocation and reallocation of firefighting resources to meet wildland fire management priorities.

During prescribed fire planning, along with the technical reviewer, provides a second review of the individual prescribed fire burn plan and recommends approval to the Refuge Supervisor (subject to any needed modifications).

### **Zone Fire Management Officer**

An FMO may be assigned to provide wildland fire management support to a group of refuges (zone or district) when individually each Refuge does not warrant a fulltime FMO, as is the case with RRVNWR. This individual, the Zone Fire Management Officer (ZFMO), provides many of the day-to-day needs of refuges in his/her assigned area. Responsibilities include, but are not limited to: providing technical expertise, gathering and disseminating applicable fire intelligence data (e.g. information on weather, fuels, personnel allocations, etc), providing assistance in program management for individual refuges to include: training, personnel administration, documentation and records, and developing and implementing prescribed and non-fire fuel treatments. The ZFMO serves as the focal point for fire management and coordinates closely with both the Refuge and the RFMC. Refuges can also communicate directly with the RFMC in the absence of the ZFMO. A Refuge fire contact may be assigned the duties of working directly with the ZFMO; providing appropriate assistance and information as needed and serving as a communication link between Refuge staff and the ZFMO.

The ZFMO will assign the appropriate Prescribed Fire Burn Boss to implement each prescribed burn project. Prescribed burns require a Prescribed Burn Boss that possesses qualifications matching the complexity level of the burn. The ZFMO recognizes the requirements needed to match the appropriate level of command with the complexity of the prescribed burn. The Zone FMO will ensure that the prescribed burn plan receives technical review by a qualified individual. Prior to and during prescribed fire implementation the ZFMO will ensure that weather, fuel conditions, and other environmental factors, are monitored and documented for project files. This information will be transmitted in a timely fashion to the Refuge Manager and/or cooperators involved in the project.

### **Refuge Specific Fire Management Responsibilities**

#### **Refuge Manager**

The Refuge Manager is responsible for the full range of management activities of the Refuge, including fire management. Primary responsibilities include signature authority for the delegation of authority, fire management plan, prescribed burn plans, developing cooperative agreements, and associated management plans. Other responsibilities include the designation of Resource Advisors (RA) on suppression fires, as well as authorization for the use of mechanized equipment and fire suppression foam in applicable tactical applications. The Refuge Manager approves the complexity analysis and pre-ignition approval checklist for prescribed burns (which constitutes final approval for burn implementation).

### **Deputy/Refuge Operations Specialist**

The Deputy Refuge Manager or Refuge Operations Specialist oversees the day-to-day operations of the Refuge. In the absence of the Refuge Manager, he/she assumes the role of Acting Refuge Manager, and, in the context of the fire management program, may be assigned any number of duties, depending upon the individual refuge's particular needs (e.g. Information Officer, Education Coordinator, etc).

### **Refuge Biologist**

The Refuge Biologist may serve as a Resource Advisor on initial and extended action wildland fires. Reviews prescribed burn plans for compatibility with Refuge land management plans. Serves as key member of the Annual Prescribed Burn Plan development team, providing input as required on issues relating to wildlife and habitat. He/she manages the Refuge fire monitoring and evaluation programs.

### **Maintenance Worker**

The maintenance worker is responsible for the general maintenance of the Refuge including fire suppression equipment. He/she may serve as a firefighter/ crew member on suppression fires and prescribed burn operations.

### **Office Assistant**

The Office Assistant provides administrative assistance and support for Refuge suppression and prescribed fires. He/she may also provide dispatch services for fire management operations.



## APPENDIX D

### Rappahannock River Valley National Wildlife Refuge Fire Danger and Staff Readiness/Step-Up Plan

#### *Annual Refuge Fire Management Readiness Activities*

<i>Activities – Complete before end of month</i>	<i>J</i>	<i>F</i>	<i>M</i>	<i>A</i>	<i>M</i>	<i>J</i>	<i>J</i>	<i>A</i>	<i>S</i>	<i>O</i>	<i>N</i>	<i>D</i>
<i>Update Interagency Fire Agreements/AOP's</i>	X											
<i>Winterize Fire Management Equipment</i>												
<i>Medical Tests/ other Pre-Hire Requirements</i>										X		
<i>Complete Annual Fire Physicals</i>										X		
<i>Reporting Dates for Seasonal Workforce</i>												
<i>Inventory Fire Cache, Engine, Slip-on Unit(s) and Water Tender</i>												
<i>Meet PL/RM's for annual work plan/treatments</i>	X											
<i>Complete Training Analysis</i>										X		
<i>Annual Refresher Training</i>		X										
<i>Annual Fitness Testing</i>			X									
<i>Pre-Season Engine Preparation</i>												
<i>Review and Update Agreements with Cooperators</i>			X									
<i>Prescribed Fire Plan Preparation and Approval</i>		X										
<i>Review and Update Fire Management Plan</i>												X
<i>Prepare Pre-season Risk Analysis</i>			X									
<i>Contact Servicing National Weather Service Office for updated Operations Plan/ Procedures.</i>	X											
<i>Ensure the operational status and access to Remote Automated Weather Station (RAWS)</i>			X									

Staffing Class	Step-up Action
<b>I (Low)</b> <b>BI = 0-5</b>	<b>Normal tours of duty and operations.</b> <b>Fire Agreements reviewed; current by 4/01.</b> <b>Fire season readiness evaluations &amp; Pre-season risk analysis completed by Zone FMO by 4/15.</b>
<b>II (Moderate)</b> <b>BI = 6-10</b>	<b>Normal tours of duty and operations.</b> <b>Consider equipping Refuge vehicles with fire suppression tools.</b>
<b>III (High)</b> <b>BI = 11-20</b>	<b>Normal tours of duty with special emphasis of fire detection.</b> <b>Fire suppression tools located in vehicles.</b> <b>If applicable, daily checks of prescribed burn units, consider 100% mop-up above BI 11 and/ or KBDI&gt;301.</b> <b>Visitors warned of Fire Danger (Verbal/signs).</b> <b>Cooperators informed of Refuge fire danger.</b> <b>Smoking on the Refuge is prohibited</b>
<b>IV (Very High)</b> <b>BI = 21-24</b>	<b>Normal tours of duty. Above a BI of 21 for average 5 day period, consider week-end and after-hours coverage to 1800 hrs or later.</b> <b>Stepped-up notification/coordination with Cooperators, including both short and long range planning, public notification and coordinated prevention activities.</b> <b>Consult with ZFMO, RFMC the need for emergency pre-suppression activation.</b> <b>No off-unit fire assignments.</b> <b>Curtail prescribed burning operations, or if within prescription, seek FMO approval. 100% mop-up required of active prescribed burn units.</b>

<p><b>V (Extreme)</b> <b>BI = 25+</b></p>	<p><b>Implement short-term severity account 51620-9141-PER5. Normal tour of duty extended 6 to 7 days/week, 10-12 hours/day, to cover peak burning period each day. Refuge fire staff on standby, including at least one overhead position.</b>  <b>Increase standard patrols to at least twice daily (or more).</b>  <b>Close refuge to open fires, post NO OPEN FIRES signs.</b>  <b>Consult ZFMO for pre-positioning of additional resources, based on long range weather outlook.</b>  <b>Adhere to state fire closure restrictions, or consider closing Refuge to the public.</b>  <b>No prescribed burning conducted on the Refuge</b></p>
---	--

Procedures for determining staffing class:

Step1. Obtain forecasted or actual Burning Index (BI) and Keetch Byrum Drought Index (KBDI) from the ZFMO who can supply forecasted or actual index values on a daily basis. Compare current BI with the Staffing Classes above (NFDRS Fuel Model E is used during the fire season).

Step2. Using the KBDI value obtained, modify the staffing as follows:

KBDI Range   Staffing Adjustment

0 - 100	Reduce 1 Class
101 - 300	No change
301 - 450	Increase 1 Class
>451	Increase 2 Classes

This staffing determination should reflect actual conditions and be in line with what the State of Virginia is forecasting for daily fire danger. If not, then adjustments are needed, especially as more historical weather data is collected. Consult the ZFMO for revisions and assistance.



## APPENDIX E

### FIRE DIRECTORY

#### RAPPAHANNOCK RIVER VALLEY NATIONAL WILDLIFE REFUGE

INDIVIDUAL / AGENCY:	CONTACT INFORMATION:
ALLEN CARTER-U.S. FISH AND WILDLIFE SERVICE; REGIONAL FIRE MANAGEMENT COORDINATOR; REGION V	OFFICE: (757) 986-3409 X 101 FAX: (757) 986-3929 CELL: (757) 647-1992
TIM CRAIG-U.S. FISH AND WILDLIFE; ZONE FIRE MANAGEMENT OFFICER, GREAT DISMAL SWAMP NWR	OFFICE: (757) 986-3409 X CELL: (757) 647-1596 HOME: (757) 416-2638
JOE MCCAULEY -U.S. FISH AND WILDLIFE; REFUGE MANAGER, RRVNWR	OFFICE:(804) 333-1470 CELL: ( ) HOME: (804) 445-1955
(VACANT), U.S. FISH AND WILDLIFE SERVICE; DEPUTY REFUGE MANAGER, RRVNWR	OFFICE: (804 ) 333-1470 CELL: ( ) HOME: ( )
SANDY SPENCER, U.S. FISH AND WILDLIFE; REFUGE BIOLOGIST; RRVNWR	OFFICE: (804) 333-1470 CELL: ( ) HOME: (804) 333-0152
RRVNWR, REFUGE HEADQUARTERS	MAIN OFFICE: (804) 333-1470
PRESQUE ISLE AND JAMES RIVER NATIONAL WILDLIFE REFUGES, HOPEWELL, VA	MAIN OFFICE (804) 829-9020
CAROLINE COUNTY DISPATCH	PHONE: 911 (NON-EMERGENCY) (804) 633-1120 (AFTER HOURS) (804) 633-5400
ESSEX COUNTY DISPATCH	PHONE: 911 (804) 443-3346
KING GEORGE COUNTY DISPATCH	PHONE: 911 (540) 775-2049
RICHMOND COUNTY DISPATCH	PHONE: 911 (804) 333-3611
WESTMORELAND COUNTY DISPATCH	PHONE: 911 (804) 493-8066
VIRGINIA DEPARTMENT OF FORESTRY, EASTERN REGION OFFICE, TAPPAHANNOCK, VA REGIONAL FORESTER	(804) 443-2211
VIRGINIA DEPARTMENT OF FORESTRY, CAROLINE COUNTY OFFICE, BOWLING GREEN, VA.	(804) 633-6992
VIRGINIA DEPARTMENT OF FORESTRY, ESSEX COUNTY OFFICE, TAPPAHANNOCK, VA.	(804) 443-2211
VIRGINIA DEPARTMENT OF FORESTRY, KING GEORGE COUNTY, KING GEORGE, VA	(540) 633-0181
VIRGINIA DEPARTMENT OF FORESTRY, RICHMOND COUNTY, WARSAW, VA	(803) 493-9440

<b>VIRGINIA DEPARTMENT OF FORESTRY, WESTMORELAND COUNTY, MONTROSS, VA</b>	<b>(804) 493-9440</b>
<b>FREDERICKSBURG AND SPOTSYLVANIA NATIONAL MILITARY PARK, FREDERICKSBURG, VA</b>	<b>(540) 371-0802</b>
<b>GEORGE WASHINGTON BIRTHPLACE NATIONAL MONUMENT, POPES CREEK, VA</b>	<b>(804) 224-1732</b>
<b>NATIONAL WEATHER SERVICE FORECAST OFFICE, WAKEFIELD, VIRGINIA</b>	<b>(757) 899-2415 FAX (757) 899-3605</b>
<b>VIRGINIA INTERAGENCY COORDINATION CENTER (VICC), CHARLOTTESVILLE, VA.</b>	<b>(434) 977-1375 x 3450 FAX (434) 977-3115</b>
<b>RICHMOND COUNTY VOLUNTEER FIRE DEPARTMENT, WARSAW, VA</b>	<b>911/ (804) 333-3753</b>
<b>WESTMORELAND COUNTY VOLUNTEER FIRE DEPARTMENT, MONTROSS, VA</b>	<b>911/ (804) 493-9596</b>
<b>OAK GROVE VOLUNTEER FIRE DEPARTMENT, COLONIAL BEACH, VA</b>	<b>911/ (804) 224-0213</b>
<b>PORT ROYAL VOLUNTEER FIRE DEPARTMENT, PORT ROYAL, VA</b>	<b>911/ (804) 742-5505</b>
<b>KING GEORGE COUNTY DEPARTMENT OF EMERGENCY SERVICES, KING GEORGE</b>	<b>911/ (540) 775-4584</b>
<b>VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY, AIR PERMITS DIVISION, PIEDMONT REGIONAL OFFICE (AIR PERMITS MANAGER)</b>	<b>(804) 527-5047</b>

## **APPENDIX F**

### **TABLES**

### SUMMARY OF WILDAND FIRE ACTIONS

Situation	Strategy	Tactic	Pros	Cons
Wildland fire on refuge lands which does not threaten life, natural or cultural resources or property values.	Restrict the fire within pre-defined boundaries established either prior to or during the progress of the fire.	<p>Full perimeter control</p> <p>Hold the fire's spread with natural and/or constructed barriers.</p> <p>Utilize firing operations (burn-out) to secure lines.</p> <p>Observe and patrol.</p>	<p>Generally accepted and non-controversial</p> <p>Well-understood by firefighters and the public</p> <p>Likely to keep the fire to the smallest size</p>	<p>Can be more expensive than alternate strategies.</p> <p>May need extensive resources to implement</p> <p>May result in increased exposure to firefighters.</p>
<p>Wildland fire on refuge lands with low values to be protected.</p> <p>Escaped prescribed fire where values at risk are low in adjacent units.</p>	Take suppression actions, as needed, which can reasonably be expected to check the spread of the fire under prevailing environmental conditions.	<p>Direct and indirect line construction.</p> <p>Use of natural and man-made barriers.</p> <p>Utilize firing operations (burn-out).</p> <p>Patrol and mop-up of the fire perimeter.</p>	<p>Line construction may be more efficient due to the ability to utilize natural barriers and indirect attack.</p> <p>Fewer suppression forces needed.</p> <p>Less stress on suppression forces.</p> <p>More cost-effective than some methods.</p>	<p>A larger fire area may result.</p> <p>Fire duration may be increased.</p> <p>Smoke production increased over time.</p>



Situation	Strategy	Tactic	Pros	Cons
Wildland fire that threatens life, property, or sensitive resources.	Aggressively suppress fire using direct or indirect attack methods, holding the fire to the fewest acres burned as possible.	Direct and parallel line construction.	Generally accepted and non-controversial	Generally the most expensive.
Wildland fire on refuge lands with high resource values to be protected.	Utilize point protection in areas where highest resource values are at risk (if suppression resources are limited).	Mechanized resources may be used to construct/hold fireline (dozers, engines, etc).	Well-understood by firefighters and the public	Greater risk to firefighters and suppression resources.
Observed and/or forecasted extreme fire behavior.		Aerial delivery of water and retardant.	Likely to keep the fire to the smallest size	Potential for resource damage from suppression effort itself.
			Provides maximum opportunities for the protection of resources at risk.	

## **APPENDIX G**

### **FIRE EQUIPMENT/ VEHICLE LIST AND FIRE CACHE**

RRVNWR does not currently have a fire cache of tools and equipment.

**APPENDIX H**  
**RADIO FREQUENCIES USED IN FIRE MANAGEMENT OPERATIONS**  
**RAPPAHANNOCK RIVER VALLEY NWR**

	<b>Rx Freq</b>	<b>Rx Tone</b>	<b>Tx Freq</b>	<b>Tx Tone</b>	<b>Assignment</b>	<b>Remarks</b>
<b>RRVNWR</b>	<b>163.150</b>	<b>103.500</b>	<b>163.150</b>	<b>103.500</b>	<b>Tactical Ops</b>	<b>Fireline</b>
<b>SE Compact</b>	<b>159.285</b>		<b>159.285</b>		<b>Tactical Alt</b>	<b>Fireline/Log</b>

## **APPENDIX I**

### **AGREEMENTS/ MOU's**

#### **RAPPAHANNOCK RIVER VALLEY NATIONAL WILDLIFE REFUGE**

**NOTE:**      **Listed below are current agreements related to fire management for  
Rappahannock River Valley NWR.**

1.      Master Cooperative Wildland Fire Management and Stafford Act Agreement between USDO National Park Service, U.S. Fish and Wildlife Service, USDA Forest Service, and Virginia Department of Forestry (2009).
2.      Memorandum of Understanding, USFWS and The Nature Conservancy, Virginia Chapter (2007).
3.      Memorandum of Understanding, USFWS and Virginia Department of Conservation and Recreation (2007).



## **APPENDIX J**

### **DELEGATION OF AUTHORITY**

*NAME OF INCIDENT COMMANDER* IS ASSIGNED AS INCIDENT COMMANDER OF THE *NAME OF INCIDENT*, RAPPAHANNOCK RIVER VALLEY NATIONAL WILDLIFE REFUGE FOR THE US FISH AND WILDLIFE, EFFECTIVE *TIME AND DATE*.

THE INCIDENT COMMANDER HAS FULL AUTHORITY AND RESPONSIBILITY FOR MANAGING THE FIRE SUPPRESSION ACTIVITIES WITHIN THE FRAMEWORK OF THE LAW AND FISH AND WILDLIFE SERVICE POLICY AND DIRECTION AS PROVIDED BY THIS OFFICE. HABITAT MANAGEMENT PLANS AND OTHER APPROPRIATE DOCUMENTS WILL BE PROVIDED BY THE RESOURCE ADVISOR.

*NAMES OF RESOURCES ADVISORS AND CONTACT INFORMATION* ARE ASSIGNED AS RESOURCE ADVISORS. THEY OR THE REFUGE MANAGER WILL BE CONSULTED IN SITUATIONS WHERE NATURAL RESOURCE DECISIONS OR TRADE OFFS ARE INVOLVED UNLESS LIFE SAFETY ISSUES REQUIRE IMMEDIATE ATTENTION AND THOSE ACTIONS WILL BE DOCUMENTED.

SPECIFIC DIRECTION AND FIRE SUPPRESSION PRIORITIES FOR THE *NAME OF INCIDENT* ARE AS FOLLOWS, AND ARE IN PRIORITY ORDER:

1. PROVIDE FOR FIREFIGHTER AND PUBLIC SAFETY.
2. USE OF MINIMAL IMPACT TECHNIQUES SHOULD BE EMPLOYED TO REDUCE HABITAT DAMAGE. USE NATURAL BARRIERS AND ROADS IF POSSIBLE FOR BURNOUT OPERATIONS.
3. USE OF DOZERS OR TRACTORS REQUIRES APPROVAL OF THE REFUGE MANAGER OF THEIR DESIGNATE (RESOURCE ADVISORS) PRIOR TO IMPLEMENTATION. THE USE OF FIRE RETARDANT (CLASS A FOAM), DELIVERED EITHER AERIALY OR FROM GROUND RESOURCES REQUIRES APPROVAL OF THE REFUGE MANAGER. IN NO CASE WILL ITS USE BE ALLOWED CLOSER THAN 300' FROM RIPARIAN RESOURCES UNLESS HUMAN LIFE OR PROPERTY IS THREATENED. *INCLUDE OTHER STANDARDS OR CONDITIONS AS NEEDED.*

#### **TURN BACK STANDARDS**

1. ALL *NAME OF INCIDENT* CONTRACTS, AGREEMENTS, BILLS, MEDICAL PROBLEMS, EQUIPMENT REPAIRS, AND FIRE CACHE RE-SUPPLY SHALL BE CLOSED OUT PRIOR TO TEAM BEING RELEASED.
2. ROAD DAMAGE DURING SUPPRESSION EFFORTS WILL BE REPAIRED PRIOR TO THE TEAMS DEPARTURE.
3. FIRE PERIMETER MOPPED-UP *SPECIFY* AND ALL LINES CHECKED FOR HEAT AND INTEGRITY.
4. REHABILITATION PLAN WILL BE COMPLETED IN COORDINATION WITH THE REFUGE BIOLOGISTS AND RESOURCE ADVISORS.

**5. FIRE PERIMETER MAPPED BY GPS AND LOADED INTO THE REFUGES GIS DATABASE.**

**6. TORT CLAIMS REVIEWED BY REFUGE MANAGER OR THEIR DESIGNEE.**

**AN INDIVIDUAL DESIGNATED BY THE REFUGE MANAGER WILL REPRESENT HIM/HER ON ANY OCCASION  
WHERE THE REFUGE MANAGER IS NOT IMMEDIATELY AVAILABLE.**

**REFUGE MANAGER, \_\_\_\_\_**

**RAPPAHANNOCK RIVER VALLEY NATIONAL  
WILDLIFE REFUGE    *DATE AND TIME.***

## **APPENDIX K**

### **FMIS Report Forms (Suppression and Prescribed)**

# WILDLAND FIRE REPORT

## GENERAL TAB

(1) Fire Type: \_\_\_\_\_ (7) Fire Subtype: \_\_\_\_\_  
 (2) Org. Code: \_\_\_\_\_ (8) Measurement Method: \_\_\_\_\_  
 (3) Fire Name: \_\_\_\_\_ (9) Ignition Owner: \_\_\_\_\_  
 (4) Discovery Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ (10) Ignition State: \_\_\_\_\_  
 (5) County: Code: \_\_\_\_\_ (11) Ignition Cause: \_\_\_\_\_  
 (6) Cong. District: \_\_\_\_\_ (12) WFDSS? Yes or No  
 (13) If WFDSS = yes, Date: \_\_\_\_\_

Burn State: \_\_\_\_\_ Burn Owner: \_\_\_\_\_ Burn Acres: \_\_\_\_\_  
 Burn State: \_\_\_\_\_ Burn Owner: \_\_\_\_\_ Burn Acres: \_\_\_\_\_  
 Burn State: \_\_\_\_\_ Burn Owner: \_\_\_\_\_ Burn Acres: \_\_\_\_\_  
 (14) Burn State: \_\_\_\_\_ (15) Burn Owner: \_\_\_\_\_ (16) Burn Acres: \_\_\_\_\_

(17) Management Level: \_\_\_\_\_

(18) <u>Resource Type</u>	(19) <u>Quantity</u>	<u>Resource Type</u>	<u>Quantity</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

## Values at Risk

(20) <u>Type</u>	(21) <u>Subtype</u>
_____	_____
_____	_____
_____	_____

(22) Discovery Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ (23) Time: \_\_\_\_:\_\_\_\_ (24) Initial Action Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ (25) Time: \_\_\_\_:\_\_\_\_  
 (26) Control Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ (27) Time: \_\_\_\_:\_\_\_\_ (28) Out Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ (29) Time: \_\_\_\_:\_\_\_\_

## LOCATION TAB

(30) Latitude: \_\_\_\_\_ (31) Longitude: \_\_\_\_\_  
 (32) Aspect: \_\_\_\_\_ (33) Lay of Land: \_\_\_\_\_ (34) Slope: \_\_\_\_\_  
 (35) Position of Slope: \_\_\_\_\_ (36) Elevation: \_\_\_\_\_  
 (37) Special Area Type: \_\_\_\_\_

## EMISSIONS TAB

(38) Fire Danger Index: \_\_\_\_\_ (39) Value: \_\_\_\_\_

## FINAL TAB

(40) Person Completing Form: \_\_\_\_\_ (41) Title: \_\_\_\_\_ (42) Date: \_\_\_\_/\_\_\_\_/\_\_\_\_  
 (43) I.C.: \_\_\_\_\_  
 (44) Narrative: \_\_\_\_\_



**PRESCRIBED FIRE/MECHANICAL/CHEMICAL/OTHER TREATMENT REPORT**

**GENERAL TAB**

(1) Fire Type: Rx, Mech, Other (circle) \_\_\_\_\_ (7) Fire Subtype: \_\_\_\_\_  
 (2) Org. Code: \* \_\_\_\_\_ (8) Measurement Method: \* \_\_\_\_\_  
 (3) Fire Name: \* \_\_\_\_\_ (9) Ignition Owner: \* \_\_\_\_\_  
 (4) Initiation Date: \_/ \_/ \_ (10) Ignition State: \* \_\_\_\_\_  
 (5) County Code: \* \_\_\_\_\_  
 (6) Cong. District: \* \_\_\_\_\_

Burn State: \* \_\_\_\_\_ Burn Owner: \* \_\_\_\_\_ Burn Acres: \* \_\_\_\_\_  
 Burn State: \_\_\_\_\_ Burn Owner: \_\_\_\_\_ Burn Acres: \_\_\_\_\_  
 Burn State: \_\_\_\_\_ Burn Owner: \_\_\_\_\_ Burn Acres: \_\_\_\_\_  
 (11) Burn State: \_\_\_\_\_ (12) Burn Owner: \_\_\_\_\_ (13) Burn Acres: \_\_\_\_\_

(14) Complexity Level: \_\_\_\_\_

(15) <u>Resource Type</u>	(16) <u>Quantity</u>	<u>Resource Type</u>	<u>Quantity</u>
* _____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

**Values at Risk**

(17) Type \_\_\_\_\_ (18) Subtype \_\_\_\_\_  
 \* \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

(19) Initiation Date: \_/ \_/ \_

(20) Start Date: \_/ \_/ \_ (21) Completion Date: \_/ \_/ \_

**LOCATION TAB**

(22) Latitude: \* . \* . \* \_\_\_\_\_ (23) Longitude: \* . \* . \* \_\_\_\_\_  
 (24) Aspect: Flat \_\_\_\_\_ (25) Lay of Land: Flat \_\_\_\_\_ (26) Slope: <25% \_\_\_\_\_  
 (27) Position of Slope: L \_\_\_\_\_ (28) Elevation: 0-500 \_\_\_\_\_  
 (29) Special Area Type: \* \_\_\_\_\_

**PRESCRIBED TAB**

(30) Proj. Area Size (Ac): \* \_\_\_\_\_  
 (31) Local Contract Used?: Yes or No \* (circle or highlight)  
 (32) FireBase Project Number: \* \_\_\_\_\_  
 (33) RX Fire Type: \* \_\_\_\_\_ (33b) Black-line Average Percent Cover: \_\_\_\_\_  
 (34) Pattern: \_\_\_\_\_  
 (35) Method: \_\_\_\_\_  
 Aerial: \_\_\_\_\_ (or) Ground: \* \_\_\_\_\_  
 (36) Treatment Objective \* \_\_\_\_\_

**EMISSIONS TAB**

(37) Fire Danger Index: \_\_\_\_\_ (38) Value: \_\_\_\_\_  
 (39) WX Station Type: \_\_\_\_\_ (40) Station ID: \_\_\_\_\_  
**NFDRS Emissions** (must be completed for each fuel model)  
 (41) NFDRS Acres: \_\_\_\_\_ (42) NFDRS Fuel Model: \_\_\_\_\_

Rappahannock River Valley National Wildlife Refuge  
Fire Management Plan

(43) Emissions: Complete the % Consumption for FWS acres.

Fuel Model Parameters	% Consumption
0 - 1/4"	
1/4" - 1"	
1" - 3"	
3"+	
Woody	
Herbaceous	
Duff (In)	

**FINAL TAB**

(44) Person Completing Form: \_\_ \* \_\_\_\_\_

(45) Title: \_\_\_\_ \* \_\_\_\_\_

(46) Date: \_\_\_\_ / \_\_\_\_ \* \_\_\_\_ / \_\_\_\_

(47) Burn Boss: \_\_ \* \_\_\_\_\_

(48) Narrative: \*

## APPENDIX L

### DEBRIS BURNING POLICY AND PROCEDURES



United States Department of the Interior

FISH AND WILDLIFE SERVICE  
300 Westgate Center Drive  
Hadley, MA 01035-9589j



In Reply Refer To:  
FWS/Region 5

#### Memorandum

To: Region 5 Refuge Managers  
Region 5 Hatchery Managers

From: Regional Chief, National Wildlife Refuge System  
Chief, Division of Hatcheries

Subject: Debris Disposal Burns

Prescribed burning of vegetation stands for habitat improvement and hazard fuel reduction is a traditional management practice that has long been used on National Wildlife refuges, and is beginning to see some limited use on National Fish Hatcheries as well. Policies and procedures for conducting prescribed burns are established at the interagency, national, and regional levels, and are well-documented and familiar to most managers. Less familiar to most Service employees are the policy requirements and guidelines for conducting small, simple, "maintenance" or "debris pile" burns typically used for the disposal of construction materials or vegetative waste.

To provide some clarification and establish standard operating procedures for Region 5 field stations, the following protocol should be followed when considering the use of fire to dispose of debris. These guidelines comply with and elaborate on policy contained in section 2.2.5 of the Service Fire Management Handbook.

1) Determine if burning the debris pile is environmentally acceptable considering local, state, and EPA regulations. Combustion of environmentally hazardous materials, such as certain types of treated lumber, is not an acceptable practice on Service lands and could be in violation of state and local air quality regulations. Even if the debris materials are "natural" vegetative waste with no chemical additives, the smoke produced by burning could be a public health and safety menace if persons with respiratory ailments are situated downwind or if highway visibility is obscured. Whenever possible, debris material should be recycled into a useable material such as wood chips, mulch, firewood, etc. When recycling is not feasible, debris materials should be transported to a landfill or appropriate area where they can be safely disposed of. Consistent with Service policies regarding solid waste (561 FW 5); stations are encouraged to reduce solid waste by promoting waste reduction, re-using and recycling materials, and proper disposal.

2) If logistics or cost considerations make transportation and landfill disposal prohibitive, and there are no state and local air quality ordinances against burning, then fire may be considered as a disposal tool. All debris disposal burns must be reviewed for complexity by your Zone Fire Management Officer (FMO). This can often be handled by a single phone call or email, or the FMO may wish to see a written description or photograph of the project. In a few cases he/she may actually need to visit the burn site.

**Type A** debris disposal burns would be those where burn piles are completely surrounded by non-combustible barriers such as a body of water, gravel parking lot, bare soil, or snow and there is no chance the fire could spot into nearby combustible vegetation. Burn piles are relatively small and fuels are consumed quickly. The Project Leader will need to complete the Debris Burning Checklist (attached) which must be discussed with and approved by the Zone FMO. FMO approval may be by signature or verbal (phone call). In these cases the FMO may decide to treat this as a simple maintenance operation and no burn plan would be required. No qualified Prescribed Burn Boss or prescribed burn crew members would need to be present, and the burn operation may proceed at the Project Leader's discretion.

**Type B** burns would be slightly more complex, but still surrounded by non-combustible barriers with no chance of escape. Examples would be large debris piles which burn more intensely than Type A, or old wooden buildings which need to be destroyed. These burns may be ideally suited as training exercises for local fire departments, who could perhaps be persuaded to burn the debris for free. The Project Leader will need to complete the Debris Burning Checklist (attached) which must be discussed with and approved by the Zone FMO. As in Type A, no burn plan is required and a qualified Burn Boss and crew are not necessary; however, the FMO may wish to consult closely with the Project Leader or fire department chief to ensure the operation is conducted safely.

**Type C** would be the most complex of the debris disposal burns, characterized by a greater chance of escape into adjacent combustible vegetation, smoke-sensitive areas which could potentially be downwind, or large piles with high volumes of fuel producing high fire intensities. Type C burns will require that the FMO, or an individual of his choosing qualified as a Burn Boss at the appropriate complexity level, develop a Prescribed Burn Plan following the standard format located in the Fire Management Handbook and reviewed and approved by the appropriate Regional Office staff. The burn will be conducted by the Burn Boss and qualified prescribed burn crew, working in support of the Project Leader. The Burn Boss and crew will most likely be detailed in from another field station or group of refuges, and costs will be covered by the Regional Fire Management Office. Project Leaders and FMO's are encouraged to anticipate Type C burns a year or more in advance so that funding can be programmed.

3) Project Leaders are encouraged to send staff members to wildland fire training so that they can participate on normal prescribed burns and on Type C debris disposal burns. The minimum required training is S-130 Basic Firefighter and S-190 Introduction to Fire Behavior, about a week long total. Contact your Zone FMO for details on available training classes, and to schedule employees for the work capacity tests (Pack Test, Field Test) required to wear the appropriate personal protective equipment (PPE) such as helmet, Nomex shirt and pants, leather boots and gloves, fire shelter, and eye and ear protection. Your Zone FMO or Regional Fire Management Coordinator will be able to assist you in obtaining these items for your employees. Zone Fire Management Officers are as follows:



Rick Vollick, Wallkill River NWR, Sussex, NJ (refuges and hatcheries in New England)  
Phone 973-702-7266 x 19

Mike Durfee, Wallkill River NWR, Sussex, NJ (refuges and hatcheries in NY, PA, NJ)  
Phone 973-702-7266 x 16

KellyAnn Gorman, Chesapeake Marshlands NWR, Cambridge, MD (refuges in MD and DE)  
Phone 410-228-2692 x 128

Tim Craig, Great Dismal Swamp NWR, Suffolk, Virginia (refuges and hatcheries in VA, WVA.)  
Phone 757-986-3480

You can also contact Regional Fire Management Coordinator Allen Carter at 757-986-3409 x 101.

Attachment

## DEBRIS BURNING CHECKLIST

What type of debris disposal burn is planned?

\_\_\_\_\_ Type A

\_\_\_\_\_ Type B

\_\_\_\_\_ Type C

Have all other disposal alternatives been considered?

Have State and local air quality requirements been considered and met?

Has a burn permit been obtained through the local fire department, town, county, or State Fire Warden?  
If so, are all requirements of the permit going to be met during implementation?

What is the local Fire Danger rating Level or Class Day rating? (Burning is permitted in Low and Moderate days – Class 1 and 2 ONLY).

List fire suppression steps taken in the event of an escape.

What contingency steps have been taken in the event of an escape?

Localities may require complete extinguishment prior to leaving a fire unattended. How will this requirement be met?

Contact and discussion with the Zone Fire Management Officer has taken place?

\_\_\_\_\_ Zone Fire Management Officer Approval

\_\_\_\_\_ Project Leader (Refuge Manager) Approval

## APPENDIX M - ANNUAL FMP REVIEW CHECKLIST

Element	Yes	No	Comment
1. Date FMP was approved _____ <ul style="list-style-type: none"> <li>Annual Review yrs 1 – 4 by Refuge Manager</li> <li>Year 5 of Plan, Contact District FMO. FMP requires revision and Regional Director approval.</li> </ul>			
2. Will the FMP continue to adequately provide for firefighter and public safety as the first priority in every fire management activity this year?			
3. Does this FMP continue to support land and resource management Plans? <ul style="list-style-type: none"> <li>Completion of CCP or new habitat management plan might require more extensive FMP revision.</li> </ul>			
4. Were there any significant fire management activities from the previous year that were not adequately addressed within the scope of this FMP?			
5. Does the direction in this Plan remain economically viable given the values needing protection, and the costs to administer?			
6. Does this FMP continue to be based on best available science?			
7. Does the FMP provide for adequate response to wildland fire (wildfire) and prescribed fire (if applicable)? <ul style="list-style-type: none"> <li>Directories/Contact List(s) updated</li> <li>Agreements and Operating Plans current</li> <li>Staffing/equipment meet Service policy and ready</li> <li>Annual work and Prescribed Burn Plans completed</li> <li>Seasonal Assessment made by District FMO</li> </ul>			
8. Were there additional lands added to the Refuge last year? <ul style="list-style-type: none"> <li>Total acres to amend _____</li> <li>Burnable acres _____</li> </ul>			
9. If additional lands were added, will environment compliance requirements (EA for this FMP) adequately allow for fire management program activities to be conducted if appropriate?			
10. Based on FMO advice, are there changes in national fire policy or direction that now conflict with direction within the FMP? <ul style="list-style-type: none"> <li>Policy changes warrant an amendment.</li> <li>Policy changes are significant – need for immediate revision.</li> <li>Policy changes can be incorporated within the 5-year revision.</li> </ul>			
11. Considering the responses above, can this FMP be amended without further review? <ul style="list-style-type: none"> <li>If yes, attach amended information, including maps. Refuge Manager approval. Notify the District FMO.</li> <li>If no, most likely the FMP and/or environmental compliance require Plan revision and Regional Director approval. Contact District FMO for assistance.</li> </ul>			

Having reviewed the FMP for calendar year \_\_\_\_\_, and addressed the questions above, I find that the Plan continues to support fire program needs (safety, resource protection, hazard fuel treatments, wildlife enhancement, and ecosystem restoration as applicable). The Plan amendments are attached, and require no further review or approval. This is the (please circle) 1<sup>st</sup> 2<sup>nd</sup> 3<sup>rd</sup> 4<sup>th</sup> 5<sup>th</sup> implementation year for this Plan.

\_\_\_\_\_  
Refuge Manager

\_\_\_\_\_  
Date