

WILDLAND FIRE MANAGEMENT PLAN
BACK BAY NATIONAL WILDLIFE REFUGE



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EXECUTIVE SUMMARY

When approved, this document will be the Fire Management Plan for the Back Bay National Wildlife Refuge (Back Bay NWR). Major components include:

- Updated policies, objectives and strategies for prescribed fire and wild fire management at Back Bay NWR.
- Establishment of Back Bay NWR Prescribed Fire Management Policies to manage critical habitats, reduce hazardous fuels, protect structures and facilities, coordinate fire operations and insure public and firefighter safety.
- Format changes under the direction of the U.S. Fish & Wildlife Service Fire Management Handbook (Release Date 6/8/01).
- This Plan operates under the auspices of the Back Bay NWR Comprehensive Conservation Plan; and in conjunction with the Marsh & Water Management Plan. In addition, future management plans, such as the “umbrella” Habitat Management Plan and Forest Management Plan, will be coordinated with this Fire Management Plan, in order to insure consistency and eliminate conflicts in management guidelines.

The Plan is written to provide guidelines for appropriate suppression and prescribed fire programs at Back Bay National Wildlife Refuge. Prescribed fires may be used to reduce hazard fuels, restore natural ecosystem processes and vitality, improve wildlife habitat, remove or reduce non-native species, and/or conduct research. Wildfires will be suppressed where possible.

Appendices contain technical information and forms/formats for carrying out specific policies and activities discussed in the text.

I. INTRODUCTION

This plan will establish a Fire Management Plan for Back Bay National Wildlife Refuge.

A. Background

Back Bay NWR contains vegetation and habitats capable of sustaining wildland fire, thereby requiring a fire management plan. Loblolly pine (*Pinus taeda*) habitats within the Refuge have been historically maintained by lightning and anthropogenic fires. Rapid agricultural, residential and commercial land development along Refuge boundaries have placed people and their property in close proximity to dense, combustible wildland fuels. Invasive and exotic species such as *Phragmites sp.*, Japanese honeysuckle (*Lonicera japonica*), etc. are already present and displacing native vegetation. There is also a need to encourage and provide training opportunities in wildland fuel settings to neighboring fire protection organizations. Prescribed burns offer such opportunities for interagency training and cooperation. This plan is written as an operational guide for managing the Refuge's wildland fire and prescribed fire programs. It defines levels of protection needed to ensure safety, protect facilities and resources, and restore and perpetuate natural processes, given current understanding of the complex relationships in natural ecosystems. It is written to comply with a service-wide requirement that refuges with burnable vegetation develop a fire management plan (620 DM 1).

B. NEPA and NHPA Compliance

This FMP is subject to National Environmental Policy Act (NEPA) compliance, since other related resource management activities do not address environmental impacts with regards to fire management. All potential environmental impacts resulting from this plan will be reviewed as required by law. The public is invited to comment on the draft plan during succeeding stages of the review process. Wildfire suppression operations on all Department of Interior administered lands have been Categorically Excluded from further NEPA analysis and documentation (516DM2, Appendix 1). An environmental assessment that analyzes this plan's environmental impacts, accompanies this plan and was made available to the public for review.

That Environmental Assessment was reviewed for compliance with the National Historic Preservation Act (NHPA) of 1966 (Section 106), the Endangered Species Act, as amended in 1973, (Section 7), and the Alaska National Interest Land Conservation Act (ANILCA) of 1980, Section 810. This compliance review documentation is also on file at refuge headquarters. This plan includes all constraints or limitations imposed on the refuge wildland fire management program by those reviews. Mitigation measures resulting from the environmental analysis included:

1. Prescribed burn units containing organic soils will not be ignited if the Keetch-Byram Drought Index is greater than 510, or if the average depth to water table over the site exceeds 12 inches.
2. Impacts from smoke on sensitive areas will be mitigated by incorporating and documenting smoke plume, emissions, and visibility range modeling during prescription development. In addition, all prescribed burning will be conducted within all State and Local air quality regulations, including any required permits, that are in effect at the time.
3. Conduct site surveys to verify the suspected presence or absence of threatened, endangered or other special concern species, or cultural or historic resources within areas proposed for prescribed burning prior to constructing or improving control lines, or igniting the burns as is needed. If such resources are determined to be present, measures that will protect the sites from damage during burn-related activities will be incorporated into individual prescriptions, or the burn postponed or canceled. Such measures will be developed in consultation with U.S. Fish & Wildlife Service (FWS) Ecological Services

staff, Virginia Field Office, when dealing with endangered species; or the appropriate State Historic Preservation Officer in the case of cultural or historic resources through the (Northeast) Regional Historic Preservation Officer (RHPO) of the FWS. All prescribed burning activities shall be conducted in accordance with the conditions in the existing Incidental Permit to Take endangered or threatened species.

Refuge staff will work together with other agencies and potentially affected groups and individuals to prevent unauthorized ignition of wildland fires. The Refuge role as a partner in wildland/urban interface areas shall be by providing wildland firefighting, hazardous fuels reduction, cooperative prevention and education, and technical assistance to other partners. Structural fire protection on and off the Refuge, shall continue to remain the responsibility of State and local governments.

II. COMPLIANCE WITH USFWS POLICY

A. Enabling Legislation and Refuge Purpose

Executive Order #7907 of June 6, 1938 established Back Bay NWR "...as a refuge and breeding ground for migratory birds and other wildlife." Another of the Refuge's primary purposes (for lands acquired under the Migratory Bird Conservation Act) is "... use as an inviolate sanctuary, or for any other management purpose, for migratory birds." Management objectives have been developed and expanded over the years, to provide for a broad spectrum of wildlife, with special emphasis on waterfowl, shorebirds and threatened and endangered species. The Refuge also provides a program of wildlife-oriented recreation and environmental education for the visiting public that is consistent with Refuge objectives.

This FMP strives to protect the unique features of the Back Bay ecosystem from damage by wildland fires and suppression activities. It also strives to maintain and perpetuate the biodiversity of the ecosystem dependent upon naturally recurring fire through use of prescribed fire. Prescribed fire will also play a role in managing shrub cover and dense perennial grasses within and around refuge impoundments (for purposes of wildlife habitat management) and adjacent to residential housing developments in the neighboring community of Sandbridge (for purposes of public safety, and to protect refuge resources from human-caused wildfire).

Unique values protected under this plan include: several threatened, endangered or rare plants and animals; sensitive and increasingly uncommon vegetative communities such as bald cypress-gum, mesic hardwoods and open, seasonal freshwater marshes; refuge headquarters, visitors and maintenance facilities and buildings; and private properties adjacent to the Refuge.

The Fire Management Plan defines a wildland fire management program to manage prescribed and wildland fires that will help achieve resource management objectives, as defined in the Back Bay NWR Master Plan (1972), the Station Management Plan (1993), the Refuge Water Management Plan (1993), and other soon-to-be established Refuge operational plans, including, but not limited to, the Habitat Management Plan and Comprehensive Conservation Plan.

The Department Manual, DM 620 (USDI 1998) states the following regarding wildland fires:

Firefighter and public safety is always the first priority. All Fire Management Plans and activities must reflect this commitment.

Every area with burnable vegetation must have an approved Fire Management Plan. Fire management plans must be consistent with firefighter and public safety, values to be protected, and land, natural, and cultural resource management plans and must address public health issues. Fire management plans must also address all potential wildland fire occurrences and include the full range of wildland fire management actions. Bureau fire management plans must be coordinated, reviewed, and approved by responsible agency administrators, to insure consistency with approved land management plans.

Bureaus will ensure their capability to provide safe, cost-effective fire management programs in support of land, natural, and cultural resource management plans through appropriate planning, staffing, training, and equipment.

Management actions taken on wildland fires must be cost effective, consider firefighter and public safety, benefits, and values to be protected, and be consistent with natural and cultural resource objectives.

Protection priorities are (1) human life and (2) property and natural/cultural resources. If it becomes necessary to prioritize between property and natural/cultural resources, this is done based on relative values to be protected, commensurate with fire management costs.

Once people have been committed to an incident, these human resources become the highest value to be protected.

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.

The authority for funding (normal fire year programming) and all emergency fire accounts is found in the following authorities:

Section 102 of the General Provisions of the Department of Interior's annual Appropriations Bill provides the authority under which appropriated monies can be expended or transferred to fund expenditures arising from the emergency prevention and suppression of wildland fire.

P.L. 101-121, Department of the Interior and Related Agencies Appropriation Act of 1990, established the funding mechanism for normal year expenditures of funds for fire management purposes.

31 US Code 665(E)(1)(B) provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.

Authorities for procurement and administrative activities necessary to support wildland fire suppression missions are contained in the Interagency Fire Business Management Handbook.

The Reciprocal Fire Protection Act of May 27, 1955 (42 USC 815a; 69Stat 66) provides Authorities to enter into agreements with other Federal bureaus and agencies; with state, county, and municipal governments; and with private companies, groups, corporations, and individuals regarding fire activities.

Authority for interagency agreements is found in AInteragency Agreement between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, US Fish and Wildlife Service of the United States Department of the Interior and the Forest Service of the United States Department of Agriculture@ (1996). Other Authorities found in Appendix A, references cited.

III. FIRE MANAGEMENT OBJECTIVES

A. Refuge Master Plan Objectives Pertinent to This Fire Management Plan

1. Refuge Master Plan - The 1972 Back Bay NWR Master Plan included the following long-range natural resource objectives that guide the Refuge wildland fire management program:

a. "To develop and manage the Refuge for a full spectrum of wildlife with special emphasis on waterfowl and shorebirds, and cooperate with other agencies in improving and maintaining good waterfowl habitat in Back Bay.

b. "To help save all species of wildlife on the Refuge whose survival is in jeopardy; mainly the Ipswich sparrow , Peregrine falcon, bald eagle and the osprey.

3. "To provide Refuge visitors with opportunities for conservation education and wildlife-oriented recreation:

4. "To preserve the Refuge beach for wildlife-oriented recreation and for the basic needs of nesting shore birds.
5. "To provide universities, colleges, and public schools with an outdoor classroom for environmental education with special emphasis on wildlife and habitat management.
6. "To preserve portions of the Refuge in a natural state, including a stand of live oaks near the northern limits of the live oak range."

Additional management issues and policy direction is provided in the July 1993 Back Bay NWR Station Management Plan (pages 34 - 39). They include the following long-range, National Wildlife Refuge System objectives (given in priority order):

1. "To preserve, restore and enhance in their natural ecosystem (when practicable) all species of animals and plants that are endangered or threatened with becoming endangered.
2. "To perpetuate the migratory bird resource.
3. "To preserve a natural diversity and abundance of fauna and flora on Refuge lands.
4. "To provide an understanding and appreciation of fish and wildlife ecology and people's role in their environment, and to provide Refuge visitors with high quality, safe, wholesome and enjoyable recreational experiences oriented toward wildlife to the extent these activities are compatible with the purposes for which the Refuge was established."

This Plan strives to protect the unique Refuge wildlife resources at risk from wildland fire, through appropriate management actions (hazard fuels reduction, emergency suppression and rehabilitation operations), and to perpetuate species and communities that are dependent upon fires of specific intensity and regimes through prescribed fires. The wildland fire portion of the program emphasizes public and firefighter safety above all other priorities. Ecological monitoring and research on the effects of both wildland fire and prescribed fire is included under this Plan. The Plan also provides for minimizing short-term environmental impacts from fires, including smoke, suppression and prescribed fire site preparation impacts. Emphasis is placed on minimizing potential soil, water, vegetation, wildlife and cultural resource impacts. This plan contains the following general fire management objectives, that support the Refuge Master Plan Objectives, and 1993 Back Bay NWR Station Management Plan (as outlined above):

1. Protect life, property, and other resources from unwanted fire.
2. Use fire to accomplish resource management objectives.
3. Restore fire as a natural ecological process.
4. Develop and implement a process to ensure the collection, analysis and application of high quality fire management information needed for sound management decisions.
5. Restore and perpetuate native wildlife species by maintaining a diversity of plant communities.
6. Maintain natural fire as a dynamic ecosystem process to the maximum extent feasible.
7. Remove ladder fuels through successive low intensity management ignited understory burning until fuel loads represent natural levels

B. Fire Management Objectives & Related Strategies

Back Bay NWR fire management objectives are to:

1. Reduce the incidence and extent of human-caused fires.
2. Restore fire as a natural ecological process.
3. Use fire as a tool to meet Fire Management Objectives.
4. Protect life, property, and refuge resources from the effects of unwanted fire.
5. Prevent the adverse impacts of sustained fire suppression.

The following **fire management strategies** will help maximize opportunities for implementing the above objectives.

Objective 1: Reduce the incidence and extent of human-caused fires.

- a. Prevent unplanned human-caused ignitions through a cooperative fire prevention program aimed at Refuge visitors, staff and neighbors.
- b. Minimize the occurrence of unwanted (human-caused) fires through reduction of fuel hazards/build-ups by prescribed fire and/or mechanical treatment in and around developed areas and refuge boundaries.

Objective 2: Use fire to meet management objectives.

- a. Create and/or maintain defensible wildland fire use boundaries.
- b. Where applicable, restore fuel loads, plant community structure, species composition and processes of native ecological communities and ecosystems to ranges of natural variability using prescribed fire (ie. Periodic prescribed fires within natural needlerush marshes to provide waterfowl access to natural foods.)
- c. Minimize the occurrence of unnaturally intense fire through reduction of hazard fuels by prescribed burning.
- d. Avoid prescribed fire use that would reduce air quality in the surrounding communities.
- e. Train refuge staff and cooperators to conduct safe, objective oriented prescribed fires and fire use consistent with USFWS policy.
- f. Provide opportunities for public understanding of fire ecology principles, smoke management, and wildland fire program objectives.
- g. Monitor and evaluate the effectiveness of the fire program.

Objective 3: Protect life, property, and refuge resources from effects of unwanted fire.

- a. Provide for the safety of refuge visitors, neighbors, and employees during all phases of wildland fire management operations.
- b. Where possible, suppress unwanted fires on the refuge and in the interagency mutual aid zone.
- c. Cooperate extensively with adjacent landowners through Memoranda of understanding to facilitate safe and prompt suppression of wildfires.
- d. Where possible, suppress wildfires with minimum cost, environmental and cultural resource impacts.

- e. Provide opportunities for public understanding of the wildland-urban interface problem.

Objective 4: Prevent the adverse impacts of prolonged fire suppression.

- a. Suppress unwanted fires commensurate with values at risk.
- b. Use minimum impact fire suppression techniques and rehabilitate disturbed areas to protect natural, cultural, wilderness and scenic resources from adverse impacts attributable to fire suppression activities.
- c. Engender the understanding among refuge staff and firefighters about the impacts of fire suppression on sensitive refuge resources.
- d. Ensure that a resource advisor is present on all major suppression actions.

IV. DESCRIPTION OF REFUGE

A. Location

Back Bay National Wildlife Refuge was established by Executive Order #7907 on June 6, 1938.

Back Bay NWR is located entirely within the City of Virginia Beach, in southeastern Virginia. It encompasses the northern two-thirds of the Back Bay ecosystem. The Refuge currently totals approximately 8,600 acres, of which 4,600 acres are open water and marsh islands within Back Bay. The barrier beach portion extends 4.2 miles along the Atlantic Ocean shoreline, and is bordered on the north by Little Island City Recreational Park and on the south by False Cape State Park. The Refuge's southeastern boundary is approximately 4.5 miles from the North Carolina border. The Refuge headquarters and 880 acre impoundment complex are located on the barrier island portion, south of the Town of Sandbridge. Figure #1 shows the Refuge general vicinity and its boundary. Specific information not provided in this Description section relating to history, geology, habitats, wildlife and socioeconomic resources, are provided in pages 3 - 15 of the Refuge umbrella document, The Station Management Plan (Leger. 1993).

Figure 2 - Old Color Map of Refuge and Surrounding Vicinity (Areas to the north and south of Sandbridge Road are now part of the Refuge - See Figure 1)

B. Cultural Resources

Cultural resources within Back Bay NWR consist of two suspected old cemetery sites in the following areas: 1) Within the woods edge adjacent to an existing agricultural field on the eastern side of Colechester Road. 2) Within the woods edge adjacent to an old field, on northern Long Island, south of the “Boy Scout Bridge” canal. Although these two cemeteries are reported to exist on old maps and according to some long-time, local residents; no headstones or other signs are known to have been seen by Refuge staff. The actual grave-sites can not be confirmed.

A number of prehistoric archaeological sites are also reported to exist within present Refuge boundaries, and the probability of further sites within tracts not yet acquired by the Refuge is probably high, especially on terrace edges that border wetlands.

The Refuge Station Management Plan reports on page 15 that, “Documented historic settlement of the Ashville Bridge Creek and Nanney’s (Nawney’s) Creek area dates from the second half of the 17th Century onward, with several plantations occupying the mainland uplands along the edge of the Refuge boundary. In the early 18th Century, at least some of these had landings at the present wetland edge, and subsidiary plantations on islands within the present Back Bay Refuge. The probability for presence of standing buildings from these plantations or archaeological remains of vanished plantations is high within this area. The Refuge does not have any historical or archaeological sites listed on the National Register of Historic Places or the Virginia Landmarks Register.....” (Leger. 1993.)

A 19th Century farmhouse (“The 1820 House” or “Witch of Pungo House”) acquired by the Refuge in 1990 was scheduled for listing on the National Register of Historic Places. Unfortunately arsonists set fire to it on 2-3 different occasions since 1990; with the last fire burning it to the ground. It no longer exists.

The Regional Archaeologist and/or his/her staff have worked with Refuge staff in prior wetlands restoration projects along Muddy Creek and Colechester Roads in the past. They will also work with fire staff, project leaders, and incident commanders to ensure that cultural resources are protected from fire and fire management activities. The “Request For Cultural Resource Compliance” form (RCRC, Ref. Appendix I) will be used to inform the Regional Archaeologist of impending activities, thereby meeting the regulations and directions governing the protection of cultural resources as outlined in Departmental Manual Part 519, National Historic Preservation Act (NHPA) of 1966, Code of Federal Regulations (36CFR800), the Archaeological Resources Protection Act of 1979, as amended, and the Archaeological and Historic Preservation Act of 1974. The NHPA Section 106 clearance will be followed for any fire management activity that may affect historic properties (cultural resources eligible to the National Register of Historic Places).

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

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

1. Wildland Fires

- Minimum impact fire suppression tactics will be used to the fullest extent possible.
- Resource Advisors will inform Fire Suppression personnel of any areas with cultural resources. The Resource advisor should contact the Regional Archaeologist and/or his/her staff for more detailed information.
- Foam will not be used in areas known to harbor surface artifacts.
- Mechanized equipment should not be used in areas of known cultural significance.
- The location of any sites discovered as the result of fire management activities will be reported to the Regional Archaeologist.
- Rehabilitation plans will address cultural resources impacts and will be submitted to the Regional Archaeologist using the RCRC.

2. Prescribed Fires

- Refuge Fire staff will submit a completed RCRC to the Regional Archaeologist and/or his/her staff as soon as the burn area is identified.
- Upon receipt of the RCRC, the Regional Archaeologist and/or his/her staff will be responsible for consulting with the FMO and evaluating the potential for adverse impacts to cultural resources.
- When necessary, the Regional Archaeologist and/or his/her staff will coordinate with the State Historic Preservation Officer (SHPO). The SHPO has 30 days to respond. The Refuge will consider all SHPO recommendations.
- Mechanized equipment should not be used in areas of known cultural significance.
- The location of any sites discovered as the result of fire management activities will be reported to the Regional Archaeologist.

C. Fish and Wildlife

1. Birds - Due to the variety of its habitats, Back Bay NWR has a rich and diverse bird population. The January 1992 Refuge "Birds of Back Bay" brochure lists 288 bird species, as well as an additional 31 accidentals (seen just once or twice). Thirty-four percent of these species are known to nest on the Refuge; 33% are year-round residents.

The spring (April-May) and fall (August-September) migrations bring the greatest species diversity and populations of shorebirds, wading birds and songbirds. The sanderling (*Calidris alba*) and yellowlegs (*Tringa* spp.) are the most common shorebirds then; and the snowy egret (*Egretta thula*) and great (*Casmerodius albus*) egrets are the most common waders. The summer season typically maintains low populations of all bird groups except songbirds and wading birds, when only breeding species are present.

During winter (November-January) annual peak waterbird (waterfowl and marsh-birds) populations occur. Thousands of widgeon (*Anas americana*), gadwall (*Anas strepera*), mallard (*Anas platyrhynchos*), black duck (*Anas rubripes*), pintail (*Anas acuta*), green-winged teal (*Anas crecca*), tundra swan (*Cygnus columbianus*), snow goose (*Chen caerulescens*), Canada goose (*Branta canadensis*) and American coot (*Fulica americana*) winter within the Back Bay and impoundment complex vicinities in winter.

The raptor migration generally occurs during February and early March, with good numbers of accipiters and falcons passing through the barrier beach vicinity then.

2. Mammals - At least 47 mammal species are known to use the Refuge. They include otter (*Lutra canadensis*), nutria (*Myocastor coypus*), white-tailed deer (*Odocoileus virginianus*),

raccoon (*Procyon lotor*), red fox (*Vulpes fulva*), marsh (*Sylvilagus palustris*) and eastern cottontail (*S. floridanus*) rabbits, bobcat (*Lynx rufus*), red (*Tamiasciurus hudsonicus*) and gray (*Sciurus carolinensis*) squirrels, mink (*Mustela vison*), bats, rice rat (*Oryzomys palustris*), bats, and numerous other small mammals.

3. Herpetofauna - The Refuge hosts numerous snake species including the more common eastern cottonmouth (*Agkistrodon piscivorus piscivorus*), northern watersnake (*Natrix sipedon sipedon*), northern black racer (*Coluber constrictor constrictor*), and black rat (*Elaphe obsoleta obsoleta*), hog-nosed (*Heterodon platyrhynchos*), rainbow (*Farancia erythrogramma*), rough-green (*Opheodrys aestivus*), eastern garter (*Thamnophis sirtalis sirtalis*), and eastern ribbon (*Thamnophis sauritus sauritus*) snakes.

Yellow-bellied (*Chrysemys scripta*), red-bellied (*Chrysemys rubriventris*), eastern painted (*Chrysemys picta picta*) and eastern mud (*Kinosternon subrubrum subrubrum*) turtles are often seen within the impoundment complex and adjacent bay vicinities. While green (*Rana clamitans melanota*), northern leopard (*Rana pipiens*), bull (*Rana catesbeiana*), chorus (*Pseudacris* spp.), green tree (*Hyla cinerea*) and other peeper (*Hyla* spp.) frogs and toads (*Bufo* spp.) are also seen in those same wetlands vicinities. A mix of lizard and salamander species have also been observed on the Refuge, although no data on their numbers exists.

4. Fish - The impoundment complex houses a surprisingly diverse freshwater fish populations. Surveys by FWS (Gloucester) Fisheries Biologists during 1993-1998 have revealed good numbers of game and bait fish including: white (*Micropterus americanus*) and yellow (*Perca flavescens*) perch, chain pickerel (*Esox niger*), largemouth (*Micropterus salmoides*) and smallmouth (*M. dolomieu*) bass, bluegill (*Lepomis macrochirus*), brown bullhead (*Ictalurus nebulosus*), pumpkinseed (*Lepomis gibbosus*), creek chub-sucker (*Erimyzon oblongus*), black crappie (*Pomoxis nigromaculatus*), blue-spotted sunfish (*Enneacanthus gloriosus*), American eel (*Anguilla rostrata*), bowfin (*Amia calva*), golden shiner (*Notemigonus crysoleucas*), banded killifish (*Fundulus diaphanus*), mosquitofish (*Gambusia affinis*) and a few common carp (*Cyprinus carpio*).

The Back Bay vicinity supports similar fish species. Currently, the most common are: white perch, catfish, common carp, chain pickerel, bluegill, pumpkinseed, American eel and blue-spotted sunfish. The fish population of Back Bay corresponds with the predominance of submerged aquatic vegetation (SAVs). Currently, SAV densities are low, and confined to the most sheltered coves and shorelines of Back Bay. Without this underwater vegetation structure, food/bait fish populations remain low; and without the baitfish prey populations, game fish numbers remain low.

5. Invertebrates - The principal foods of many fish, amphibians, migratory birds and mammals of the Back Bay vicinity are invertebrates. The groups of invertebrates most commonly associated with the Back Bay Refuge vicinity include: at least six orders of insects with aquatic larvae - particularly midges (*Chironomidae*), biting flies (*Diptera*), mayflies (*Ephemeroptera*), dragonflies and damselflies (*Odonata*) - and scuds (*Amphipoda*). Other invertebrates include: worms (*Oligochaeta*), snails (*Gastropoda*), other crustacea (*Isopoda* and *Decapoda*), and clams (*Pelecypoda*). Management within the impoundment complex is aimed at supporting a high population of invertebrates, as food for migrating shorebirds and other waterbirds during the spring, fall and winter.

D. Vegetation

The current Refuge acreage is approximately 8,600 acres. General habitat types that make up Back Bay NWR include: barrier beach/dunes, impounded (and intensively managed) emergent

wetlands, maritime (barrier beach) woodlands, maritime (barrier beach) shrublands, natural emergent wetlands, principally open-water aquatic bed wetlands, wooded/forested swamps, former agricultural old fields, farmed croplands, and lowland forests. General species compositions of each habitat type are listed below.

1. Barrier Beach/Dune - An estimated 800 acres of this habitat exist, or approximately 9% of the Refuge. The following species are principally found in the drier, more eastern, oceanfront areas of this barrier island habitat: sea rocket (*Cakile edentula*), beachgrass (*Ammophila breviligulata*), sea oats (*Uniola paniculata*), evening primrose (*Oenothera humifusa*), seaside goldenrod (*Solidago sempervirens*), beach pea (*Strophostyles helvola*), sandspur (*Cenchrus tribuloides*), daisy fleabane (*Erigeron canadensis*) and seaside spurge (*Euphorbia polygonifolia*).

Wetter, interdunal depressions frequently contain: saltmeadow cordgrass (*Spartina patens*), various rushes (*Juncus* spp.), common threesquare (*Scirpus americanus*), broomsedge (*Andropogon virginicus*), various lobelias (*Lobelia* spp.), water pennyworts (*Hydrocotyle* spp.), sea purslane (*Ludwigia palustris*) and some spikerush (*Eleocharis parvula*). Woody vegetation includes groundsel-tree (*Baccharis halimifolia*), waxmyrtle (*Myrica cerifera*), bayberry (*Myrica pennsylvanica*), black cherry (*Prunus serotina*) and southern live oak (*Quercus virginiana*).

2. Impounded (intensively managed) Emergent Wetlands - An estimated 880 acres of this habitat exist, or approximately 10.2% of the Refuge. The interior areas of this 880 acre impoundment complex consist primarily of: cattails (*Typha angustifolia*), water hyssops (*Bacopa* spp.), saltmarsh bulrush (*Scirpus robustus*), sedges (*Cyperus* spp.), smaller spikerushes (*Eleocharis* spp.), giant spikerush (*Eleocharis quadrangulata*), beggar ticks (*Bidens cernua* and *B. laevis*), black needlerush (*Juncus roemerianus*), smartweeds (*Polygonum* spp.), marsh fern (*Dryopteris thelypteris*), common three-square, saltmeadow cordgrass, various rushes (*Juncus* spp.) and phragmites reed (*Phragmites australis*). Semipermanent water areas contain coontail (*Ceratophyllum demersum*), milfoils (*Myriophyllum* spp.), fragrant water lily (*Nymphaea odorata*), arrowheads (*Sagittaria* spp.), pickerelweed (*Pontederia cordata*), millets (*Echinochloa walteri* and *E. crusgalli*) and sago pondweed (*Potamogeton pectinatus*).

Higher elevations contain waxmyrtle, live oak, red maple (*Acer rubrum*), loblolly pine (*Pinus taeda*), black willow (*Salix nigra*), poison ivy (*Rhus toxicodendron*), highbush blueberry (*Vaccinium corymbosum*), broomsedge, switchgrass (*Panicum virgatum*) and greenbriers (*Smilax* spp.).

3. Maritime Shrublands and Woodlands - An estimated 65 acres of this habitat "strip" exist, (approximately 0.8% of the Refuge), along the barrier island portion. A north-south, shrub-thicket line extends along the western ecotone of the barrier island habitat, where the oceanfront sand dunes meet the high marshes of the bay/impoundment shorelines. The dominant plants of these thickets are: highbush blueberry, American holly (*Ilex opaca*), yaupon (*Ilex vomitoria*), persimmon (*Diospyros virginiana*), waxmyrtle, live oak, red cedar (*Juniperus virginiana*), groundsel-tree and hudsonia (*Hudsonia tomentosa*). Woody vines are also found within these shrub-thickets, including: greenbriers, Virginia creeper (*Parthenocissus quinquefolia*), wild grapes (*Vitis* spp.) and poison ivy. The understory of the shrub-thicket community is sparse, and consists mostly of seedlings of the above species.

Woodland habitats are found to the west of the shrub-thicket community, in higher elevation areas. These maritime woodland remnants generally consist of trees and shrubs that reach heights of <20', with dense lateral branching. "Salt-pruning" by spray and winds from the ocean accounts for this low height and lack of tall trees. Live oaks, loblolly pine, pond pine (*Pinus serotina*), red cedar and other oaks (*Quercus* spp.) are the predominant species. Preservation of Live oak stands is a priority; not only because of their mast value, but also because the Refuge straddles the northern limit of the Live oak's geographic range. Understory shrub species

include American holly, black cherry, red cedar, poison ivy, Virginia creeper and grapes. Examples of this habitat exist within the "Green Hills" area of Back Bay Refuge, along the western side of the Town of Sandbridge, and throughout False Cape State Park immediately to the south.

4. Natural Emergent Wetlands - An estimated 3,200 acres of this habitat exist, or approximately 37% of the Refuge. Erosion has been steadily reducing the shoreline acreage of this habitat, to the point that actual island shapes no longer resemble USGS maps photorevised in 1971 and 1985. This common Bay habitat exists along the western shorelines of the barrier island, and throughout Ragged and Long Islands, the remaining unnamed "Western Islands," and the shorelines of North, Redhead and Shipps Bays.

Most natural emergent Refuge wetlands consist of black needlerush (*Juncus roemerianus*) dominated marshes. Other common needlerush marsh associates include narrow-leaved cattail (*Typha angustifolia*), seashore mallow (*Kosteletzkya virginica*), Phragmites reed and waxmyrtle shrubs. The more open, mucky areas within these needlerush marshes support arrowheads (*Sagittaria falcata* and *S. latifolia*), spikerush, smartweeds, saltmarsh bulrush, softstem bulrush (*Scirpus validus*), various sedges (*Cyperus* spp.), common threesquare, millets (*Echinochloa* spp.) and various panic-grasses (*Panicum* spp.). Underwater plants, or submerged aquatic vegetation (SAV), within these open areas (especially within the Ragged Island area) often include water milfoils, sago pondweed, coontail, wild celery (*Vallisneria americana*) and scatterings of widgeongrass (*Ruppia maritima*) and assorted pondweeds (*Potamogeton* spp.).

5. Open-water Aquatic Bed Wetlands - An estimated 1,900 acres of this habitat exist, or approximately 22% of the Refuge. This common habitat is predominantly bay, creeks (Nawney, Beggar's Bridge, Ashville Bridge/Hell Point Creeks) and coves (in North Bay Marsh, Black Gut, Ragged Island, Western Islands & Crystal Lake) within Back Bay NWR. Nearly all associated plant life consists of SAV species, including: water milfoils, sago pondweed, other pondweeds, wild celery, widgeongrass, naiads (*Naja* spp.), muskgrass (*Chara* spp.) and duckweeds (*Lemna* spp., *Spirodella* spp. and *Wolffia* spp.). SAV concentrations have been highest in the cove areas and lowest in the open Back Bay areas for the past 20-25 years.

6. Wooded/forested Swamps - An estimated 650 acres of this habitat exist, or approximately 8% of the Refuge. These habitats are principally located in the low-elevation, marsh-forest ecotone, that forms a strip along Back Bay, Black Gut and Ashville Bridge, Nawney, Beggar's Bridge, Muddy and Hell Point Creeks' shorelines, and east of Muddy Creek Road. Dominant overstory plant species include red maple, bald cypress (*Taxodium distichum*), sweetgum (*Liquidambar styraciflua*), black gum/tupelo (*Nyssa sylvatica*) and black willow. Understory species include waxmyrtle, inkberry (*Ilex glabra*), shrubs, false nettle (*Boehmeria cylindrica*), marsh fern, royal fern (*Osmunda regalis*), sensitive fern (*Onoclea sensibilis*), greenbriers, poison ivy and immature canopy species.

7. Former Agricultural Fields - An estimated 35 acres of this habitat exist to the north and south of Sandbridge Road, or approximately 0.4% of the Refuge. Marshes and forested swamp habitats gradually grade upwards into low-lying, poorly drained, old fields that were crop-farmed prior to Refuge acquisition. These fields generally maintain elevations below 5' msl. These old fields support dense groundsel-tree, waxmyrtle, loblolly pine, mixed perennial grasses including the Phragmites look-alike, woolly beardgrass (*Erianthus giganteus*), plus a variety of sedges and rushes.

Approximately 50 acres east of Muddy Creek road and north of Beggar's Bridge Creek, and north of Sandbridge Road, are being managed as two "mid-successional" old field, nesting areas for declining songbirds species such as the field sparrow (*Spizella pusilla*) and LeConte's sparrow (*Ammodramus leconteii*). These habitats are permitted to succeed to the early shrub stage, in consecutive strips, prior to being mowed (every 4 - 5 years). Common plant species within those old fields include: groundsel and waxmyrtle shrubs, loblolly pine and red maple saplings, Blackberry (*Rubus alleghiensis*) and a variety of tall forb/herb and grass species.

8. Farmed Croplands - An estimated 211 acres of this habitat, or approximately 2.5% of the Refuge, are farmed in agricultural and wildlife crops, by a local, cooperative farmer, under a Refuge Cooperative Farming Agreement. These fields exist along the northern and western borders of Back Bay NWR (adjacent to Sandbridge, Colechester and Muddy Creek Roads). Crops being grown on those lands include corn, wheat, soybeans, wild bird seed and natural moist soil plants.

9. Mid-successional Lowland Forests - An estimated 750 acres of this habitat exist, or approximately 8.7% of the Refuge. Lowland forests primarily occur around the Black Gut vicinity north of Sandbridge Road. Some smaller stands also occur to the south of Sandbridge Road and east of Muddy Creek Road, and are surrounded by agricultural lands. Those forests are typically not suitable for agriculture because of their wetness. Overstory species include loblolly pine, red maple, sweetgum, laurel oak (*Quercus laurifolia*), white oak (*Quercus alba*), tulip tree (*Liriodendron tulipifera*), southern magnolia (*Magnolia grandiflora*), hickories (*Carya* spp.), American basswood (*Tilia americana*) and black cherry. Understory species include flowering dogwood (*Cornus florida*), waxmyrtle, highbush blueberry, Virginia creeper, greenbriers, poison ivy, honeysuckles (*Lonicera* spp.) and immature canopy species.

10. Wetlands Restoration Sites - An estimated 30 acres of this habitat exist, or approximately 0.3% of the Refuge, at two sites along Colechester and Sandbridge Roads, in prior-converted wetlands/agricultural fields. The Sandbridge Road site (approx. 15 acres of a "Forested Wetlands Restoration Site") was planted to White cedar (*Thuja occidentalis*), Bald cypress (*Taxodium distichum*), Green ash (*Fraxinus pennsylvanica*), Water oak (*Quercus nigra*), Swamp white oak (*Quercus bicolor*), and inkberry, high-bush blueberry and sweet pepperbush (*Clethra alnifolia*) shrubs, in 1994 and 1995 (to replace dead White cedar seedlings). A variety of other shrubs (Groundsel, waxmyrtle, etc.) and grasses (Switchgrass, Giant reed-grass, etc.) have also established themselves naturally and require periodic controlling, to prevent killing of white cedar and bald cypress saplings.

The Colechester Road restoration site consists of 15 acres of diked impoundments that have been subdivided into three water management units, with a "farm pond" to serve as a water pumping source. This site is expected to be completed during 2001. Two more, potential restoration sites have been identified along Muddy Creek and Sandbridge Roads, but work has not yet started on them.

E. Physical Resources

The flatness of lands surrounding Back Bay is the central topographic characteristic of the watershed. Princess Anne Road runs along the western side of the Bay, along Pungo Ridge. The Ridge has the highest land elevation (15' - 20' above mean sea level [msl] at several points) in that vicinity. Along the eastern side of Back Bay, the sand dunes present a second high elevation line; ranging from 21' - 47' at several points, and approximately 54' at the highest point, just east of False Cape Landing, in False Cape State Park. The better drained upland habitats lie along

the Pungo side of Back Bay. They decline gradually to a low elevation of approximately 5' msl along the edges of Back Bay. This lower elevation is the upper edge of the flood plain, where most of the marshes and swamps of western Back Bay are found. Along the higher elevations, where the soils are well drained, the land is crop farmed. Because of the flatness and low elevation of the lands around Back Bay, flooding from sustained southern winds during the spring and summer is a problem for most farmers; especially if the farmland is below the 3' - 4' contour level.

The U.S. Department of Agriculture's Soil Conservation Service has mapped the soils within the City of Virginia Beach in its Soil Survey of City of Virginia Beach, Virginia. The major soil associations found within the Refuge include Acredale silt loam-Tomotley loam-Nimmo loam, Back Bay mucky peat-Nawney silt loam, and Newhan-Duckston-Corolla fine sands (USDA, SCS. 1985) .

The Refuge roughly includes the northern two-thirds of the 39 square mile Back Bay complex. This complex is divided by its natural configuration of islands, into five "sub-Bays": North, Shippis, Redhead, Sand and Back Bays. Numerous channels, narrows, and guts link these sub-Bays together, as does sheet-flow across wetlands during high-water events. The surrounding uplands and wetlands cover an additional 64 - 65 square miles. Major drainages into the Bay include (from northwest to southwest) Hell Point, Muddy, Beggar's Bridge, Nawney and Devil Creeks. The surrounding lands drain into these five creeks and/or the Bay, via numerous, connected drainage ditches.

Most of the Bay is shallow with an average depth of <5'. The Bay maintains fresh to slightly brackish (1-3 ppt salinity, currently) water, with salinity increasing slightly as one proceeds southward. There is no lunar tidal influence since the nearest Atlantic Ocean inlet is 50 miles south of the North Carolina border. Water level fluctuations are principally wind-generated ("wind tide"); with sustained southerly winds (generally during summer) moving Bay waters to the north and raising the northern Bay levels, and sustained northerly winds (generally during winter) moving Bay waters to the south and drawing-down the northern Bay levels. Bay water level fluctuations of 3' - 4' have been observed in the northern Bay vicinity, resulting in occasional flooding of low-lying lands and roadways around the Bay complex.

The 880 acre Refuge impoundment complex is located on the barrier island portion of the Refuge, south of the headquarters. This ten impoundment complex consists principally of eight moist soil management units, that are seasonally flooded (fall and winter) and drawn-down (spring and summer). Two additional impoundments serve as water reservoirs that hold water as needed, regardless of the season. Water is supplied to this complex by a pair of 15,000 gallons/minute pumps, that transport water from the bay adjacent to the West Dike, into the C-storage Pool reservoir; from where it is distributed into the desired impoundment via interconnecting water control structures.

F. Structures and Facilities

Existing Refuge structures requiring consideration in a fire situation (as listed in the Refuge Real Property Inventory) include the following. Every effort should be made to insure that these structures and facilities are not negatively impacted by Refuge prescribed burning operations.

- Boardwalks, four, wooden:
 1. Bay Trail, 800' long
 2. Dune Trail, 1200' long

- 3. Seaside Trail, 500' long
- 4. Kuralt Trail, with elevated wooden, observation blind
- Bridge, wooden “Boy Scout Bridge” - Long Island, north.
- Building, flammable storage, cinder block - Maintenance compound
- Building, metal storage, “Tram Building” - Maintenance compound
- Building, Refuge office & Visitor Contact Station with wooden deck and handicapped accessible ramp
- Building, Shop/Storage, brick with 4 bays - Maintenance compound
- Building, Shop & Office, YACC Building - Maintenance compound
- Building, Environmental Education Center, Ashville Bridge Creek, Tract 151, 3022 New Bridge Road with wooden deck and handicapped accessible ramp
- Bulkhead, wooden, 180', headquarters area Back Bay shoreline
- Dock, canoe, on wooden pilings, Ashville Bridge Creek Environmental Education Center
- Dock, wooden, with boat ramp - Headquarters area
- House, 1 story, 1150 Horn Point Road, residence
- House, 1 story, “Banworth House,” vacant, Tract 207, 4224 Muddy Creek Road, with attached 2 car garage and 2 wooden outbuildings
- House, 1 story, Tract 157, 3149 Colechester Road, residence
- House, 1 story, “Grimstead House,” vacant, Tract 223, 1633 Nawney/Nanney’s Creek Rd.
- House, Bloodworth, 1 story brick with wooden shed, Tract 131, 1464 Lotus Drive - Life Use Reservation
- House, Henley, 2 story wooden, Tract 205, 4188 Muddy Creek Road - Life Use Reservation
- House, Whitehurst, 3 story wooden, Tract 171, 1176 Horn Point Road - Life Use Reservation
- Kiosks:
 1. Interpretive, wood with fiber embedment panels, Parking lot - Headquarters area
 2. Interpretive, wood with fiber embedment panels, Bay Trail at Staff parking lot - Headquarters area
- Metal Buildings:
 1. Hog farrowing & Nursery (RP#138), Knight, Tract 242, Mill Landing Road
 2. Hog farrowing & Nursery with 2 attached lean-to sheds, & feed room (RP#139), Knight, Tract 242, Mill Landing Road
 3. Hog rearing (RP#140), Knight, Tract 242, Mill Landing Road
 4. Hog rearing (RP#141), Knight, Tract 242, north of lagoon, Mill Landing Road
 5. Hog rearing (RP#142), Knight, Tract 242, south of lagoon, Mill Landing Road
- Metal & Concrete Buildings, three:
 1. Hog raising parlor (RP#144), Meiggs, Tract 191, south of lagoon
 2. Hog raising parlor (RP#145), Meiggs, Tract 191, north of lagoon

- 3. Hog raising parlor (RP#146), Meiggs, Tract 191, larger building north of lagoon
- Platform, wooden, on wooden pilings, Outdoor Classroom Pond - Headquarters area
- Platform, fishing, wooden on wooden pilings, with wooden shaded rest area - D-Pool
- Signs, wooden, five:
 1. Entrance, large, headquarters parking lot
 2. Interpretive, large, at Fee Booth entrance
 3. Entrance, large, at corner of New Bridge and Sandbridge Roads
 4. Refuge, large, roadside, north of Sandbridge Road, Tract 106 (Riggs)
 5. Interpretive sign, large, Reforestation site, south side of Sandbridge Road
- Storage buildings, four:
 1. Metal frame, 96 sq.ft. - Maintenance compound
 2. Wood frame, 64 sq.ft. - Headquarters area
 3. Wood frame, 96 sq.ft. - Horn Point House
 4. Wood frame, Tract 174, 1007 Horn Point Road, former Hunt Club
- Tanks, two, fuel storage, 1000 gal. each - Maintenance compound
- Weather station, fire, electronic - at Headquarters area

V. WILDLAND FIRE MANAGEMENT SITUATION

A. Historic Role of Fire

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

A combination of fire types, including naturally-occurring (lightning-caused) fires (Kirwan and Shugart 2000), and fires associated with the activities of Native Americans and European colonists (Patterson and Sassman 1988) have historically influenced vegetation in the eastern U.S. Naturally occurring fire is infrequent in the mid-Atlantic, however, human-set fire has historically, dramatically impacted the ecology of the region, including coastal Virginia (Brown 2000). At the time of European contact, the forest landscape in much of the East contained open stands of trees and some grasslands (Davis 1981), shaped by short-interval, low-intensity fires. Many open areas had been created by slash-and-burn agricultural practices of Native Americans, and as a result of gathering and clearing for firewood (Brown 2000).

Bratton and Davison (1986) found historical evidence of fire in maritime forests of Cape Hatteras, North Carolina. The authors concluded that fire suppression, in combination with other disturbances, had increased pine species, decreased oak species, and shifted fire regimes from small, frequent, low-intensity fires, to infrequent, larger, high-intensity fires. The authors concluded that fuels management would be necessary to restore the site to oak-dominance, its pre-settlement condition. Back Bay NWR may need to evaluate fuel loads, and pine invasion, in its “maritime woodlands”, and potentially use prescribed fire to preserve and perpetuate its stands of live oak.

1. Fire Weather

The climate of Southeast Virginia is humid subtropical. This climate is determined by latitude, topography, prevailing westerly winds, and the influence of the Atlantic Ocean (Commonwealth of Virginia 1988). Average winter temperatures is 49°F and the average summer temperature is 71°F. Average annual precipitation is approximately 51.4 inches, with similar average monthly rainfall throughout the year. Prevailing winds are westerly with highest wind speeds in the spring.

Back Bay's wildfire season is normally in the Spring (March & April) and then again in the Fall (October & November). During these times the relative humidities are usually lower, winds tend to be higher, and the fuels are cured to the point where they readily ignite.

Precipitation is fairly uniform throughout the year (Table 1, Virginia State Climatology office). During early spring, snow cover is uncommon, fine fuels are cured, and windy conditions are frequent; during this time period fires can be fast spreading, short-lived, and mainly confined to surface fuels. Relatively low fire hazards exist between May and September due to the abundance of green vegetation. Fall fires are possible once deciduous vegetation has cured and leaves are on the ground, especially if precipitation is below normal. In drought years, fire occurrence can increase in the spring, may taper off through June, July, and August then increases again in October and November.

Table 1. Climatological Normals (1961-90)

BACK_BAY_WILDLIFE_REFUGE , VA (440385) Percent Missing: 7.01

	MinTemp (F)	MaxTemp (F)	AvgTemp (F)	AvgPrcp (in)	AvgSnow (in)
Jan	31.8	49.1	40.4	4.04	1.4
Feb	32.8	50.7	41.7	3.51	1.9
Mar	39.9	58.2	49.0	3.67	0.4
Apr	47.7	66.6	57.1	2.81	0.0
May	56.7	74.1	65.4	3.97	0.0
Jun	65.6	82.2	73.9	3.57	0.0
Jul	70.2	86.0	78.1	4.71	0.0
Aug	69.8	85.1	77.5	5.58	0.0
Sep	65.4	80.3	72.9	4.44	0.0
Oct	55.4	71.4	63.4	3.18	0.0
Nov	45.3	63.0	54.2	3.03	0.0
Dec	36.5	54.0	45.2	3.10	0.3
Ann	51.4	68.4	59.9	45.61	4.0

Records show fires within the acquisition boundary to be human/unknown caused and usually in the winter months around the hunting seasons. Tables #1- 3 in Appendix G, shows number of fires by size class and occurrence. Although most fires are outside the normal fire seasons they are thought to be caused by human actions, as there are very few lightning caused fires.

Control problems can be expected on fires burning in the peak fire season (Spring and Fall). When continuous fuels and warm, dry, windy environmental conditions are encountered, high fire intensities and rapid spread rates can be achieved within a short time. In these situations, firefighter

safety may dictate use of indirect attack suppression methods. Potential fire behavior by fuel models found at Back Bay are found below.

Wildland fire may start near refuge boundary lines or where public access is permitted. Fire Behavior Fuel Model 3 or N is the most probable starting fuel model and the high rate of spread associated with cured grasses are typically the problem. An extremely fast moving fire front exceeding 100 chain/hr with flame lengths greater than 3.7 m (12.0 ft) can be expected. A fire in this fuel type will normally be controlled only at the change in fuel type near the edge of the marsh or the fire break.

Although a wildland fire exhibiting extreme fire behavior should be a rare event at Back Bay NWR this does not remove the threat to human health and welfare. Wildland fire and prescribed fire remain a hazard and prescribed safety measures are to be followed.

2. Major Refuge Fuel Types

The Fire Management Units (FMUs) on Back Bay NWR contain several fuel types. The following fuel types, fire behavior, and fire effects relate to all FMUs.

a. Fire Behavior Fuel Model 1 (National Fire Danger Rating System [NFDRS] Model L)
This model represents grassland fields found within all five Refuge FMUs. These fields are characterized by short and medium cool season grasses with some broadleaf herbaceous vegetation and few encroaching woody plants. Fuel loading is generally under 2.0 ton/acre. Fields which fall under this model are mowed periodically. Thus, the fuel bed is under 0.6m (2.0 ft) for much of the year.

Fire spread is governed by the fine and continuous herbaceous fuels that have been completely or partially cured. Surface fires that move rapidly through the cured vegetation are typical. High spread rates can be expected, but fire intensities remain low and are short in duration. Flame lengths may approach 1.2 m (4.0 ft). Significant wind events may yield a rate of spread greater than 50 chain/hr. A fire in this fuel type will usually do little permanent damage to resources.

b. Fire Behavior Fuel Model 3 (NFDRS Model N)
The vegetation which characterizes this fuel model includes emergent wetland plants (e.g., cattail and *Phragmites*) and tall grasses (e.g., switchgrass, big bluestem, and reed canary grass). This fuel type typically exceeds 0.9 m (3.0 ft) in height and the total fuel loading present exceeds 3.0 ton/acre.

Fires in this fuel model are the most intense of the grass group and display high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the vegetation and across standing water. Windy spring or fall days with high temperature and low relative humidity make this fuel type hazardous. An extremely fast moving fire front exceeding 100 chain/hr with flame lengths greater than 3.7 m (12.0 ft) can be expected. A fire in this fuel type will normally be controlled only at the change in fuel type near the edge of the marsh or the fire break.

c. Fire Behavior Fuel Model 6 (NFDRS Model F and Q)
A broad range of shrub conditions is covered by this model, fuel situations to be considered include chapparel, oak brush, low pocosin and shrub tundra. Cured hardwood slash can also be considered. Shrubs are older, but not as tall as fuel model 4. Total fuel < 3inch dead and live is 6.0 tons/acre. Dead fuel load, 1/4 inch tons/acre is 1.5, with a fuel bed depth of 2.5 inches.

Fires carry through the shrub layer where foilage is more flammable, but requires moderate

winds, greater than 8 mi/h at mid flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrub group has a wide range of fire intensities and rates of spread. With winds of 5mi/h, fuel moisture content of 8 percent, fuel model 6 has a rate of spread of 32 ch/hr and 6 ft/fl. Depending on conditions this type of fire can be unpredictable, could carry on the ground as a slower moving surface fire or through the shrub layer when wind speeds are higher and humidities lower.

d. Fire Behavior Fuel Model 8 (NFDRS Model H and R)

Fuel model 8 consists of mainly deciduous woodlands with closed to semi-closed canopies. The litter layer is compact, composed of leaves and twigs, and has little undergrowth.

Slow-burning surface fire can generally be expected with low rates of spread (< 5 chain/hr) and flame lengths less than 0.6 m (2.0 ft), except when an occasional fuel concentration is encountered. Fires will normally remain on the surface, except under dry conditions when fire may burn down through the duff layer and into underlying peat deposits. Only under severe weather conditions that involve high temperature, low relative humidity, and high wind speed do these fuels pose fire hazards. Occasional flare-ups are possible when fire encounters larger fuel concentrations.

e. Fire Behavior Fuel Model 9 (NFDRS Model E)

Model 9 consists of open or closed deciduous stands and mixed stands during leaf-off, otherwise similar to fuel model 8. The litter layer is fluffy and leaves are subject to movement under windy conditions. Scattered concentrations of dead or downed woody material are greater than in Fuel Model 8.

Fires in this fuel type will have a higher rate of spread due to the deciduous leaf litter layer. Under windy conditions, expect spotting problems from rolling and blowing leaves. Fires will generally remain on the surface and can be problematic in spring before green-up. This fuel type can also be problematic in fall if precipitation is below normal and an unwanted ignition source is present. Flame lengths may exceed 0.6 m (2.0 ft) with a rate of spread of 5 to 10 chain/hr. Containment problems can be expected under windy conditions.

Table 2 summarizes potential fire behavior for fuel models present on the Refuge. Local weather information was obtained from the Refuge's automated weather station, and above archive precipitation data from Back Bay National Weather Service site.

Table 2. Index break point by Fuel Model (FM) present on Back Bay National Wildlife Refuge

INDEX	FM L		FM N *		FM R		FM E		FM F	
	90	97	90	97	90	97	90	97	90	97
IC	8	18	19	26	16	21	14	20	21	30
SC	16	65	60	91	1	3	5	8	10	19
ERC	1	2	25	28	9	13	13	16	13	16
BI	10	28	82	99	10	15	19	26	26	34
KBDI	375	480	375	480	375	480	375	480	375	480

where: IC = Ignition Component
 SC = Spread Component
 ERC = Energy Release Component
 BI = Burning Index
 KBDI = Keetch-Bvram Drought Index

*Primary Fuel Model for day to day tracking and Step-up planning actions.

Fuel Model Key

- L Open Grass Field
- N Marsh, course grass habitat, less than 25% woody shrub component
- R Deciduous Forest Leaf Litter, summer months
- E Deciduous Forest Leaf Litter, spring and fall
- D Shrub stands between 2 and 6 feet high, some live fuel moisture.

To better understand some of the values in Table 2 above, flame length can be approximated by dividing BI by 10. On a VERY HIGH fire danger day (90th percentile), predicted flame lengths could range from 1.2 to 8 feet depending on the fuel type. On an EXTREME day (97th percentile), advise initial attack forces to expect flame lengths ranging from 1.8 to 10.6 feet. Any flame length over 4 feet is too intense for direct attack and other suppression tactics, such as cooling with water, dozers, and indirect suppression response is necessary. Since grass is the primary fuel contributing to fire spread in all Refuge habitats, fast moving fires will happen, potentially moving at 2 miles per hour in cured marsh habitat. Expect to catch a fire occurring in marsh vegetation at existing fuel breaks or change to a different fuel type. Fire Family Plus was used to generate outputs. Five years of fire weather data were available. As the database grows, output values will be adjusted so that the refuge can keep informed on high fire danger days and the greatest fire behavior potential. Additionally, the refuge can monitor predicted fire danger as prepared on a daily basis through the Back Bay FTS weather station and WIMS. Figures 2 and 3 for BI and KBDI below are displayed 5 day periods for fuel model N from 1996 to 2000, indices for fuel models L,R, F and E are found in Appendix H.

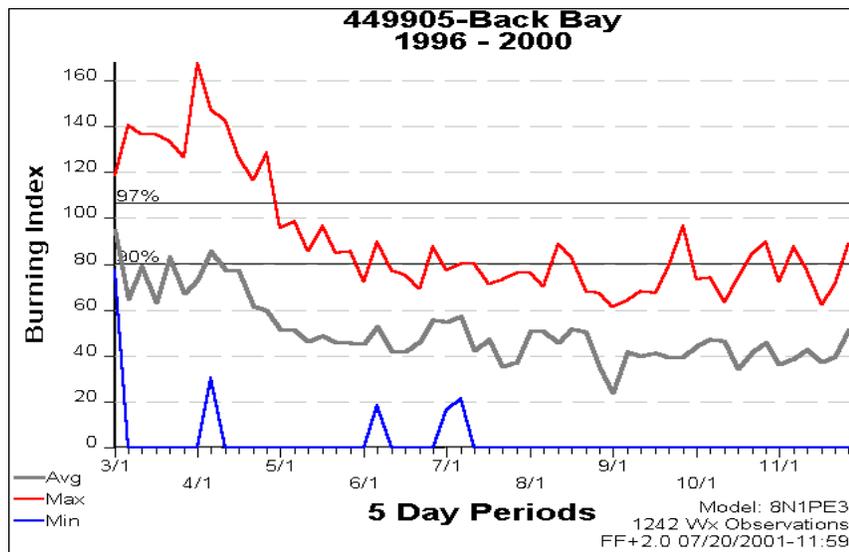


Figure 3 - BI average for fuel model N using 1995 through 2000 data from the Back Bay NWR automated weather station.

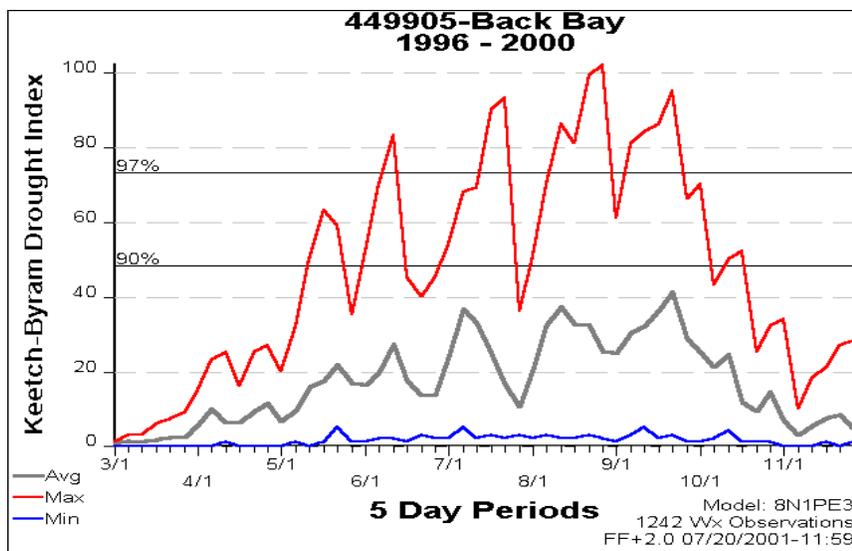


Figure 4- KBDI average for fuel model N using 1995 through 2000 data from the Back Bay NWR automated weather station.

The District FMO or RFMC monitors fire potential throughout the year for the Refuge. Based on current and forecasted conditions, the District FMO will evaluate the need for additional planning actions and advise the RFMC of such actions or conditions. The RFMC will also be advised and consulted for any long-term fire season severity needs beyond the more short-term, pre-approved Refuge Step-Up Plan.

3. Pre-settlement fires

Frost (1995) estimates that Pre-settlement fires on irregular plains and tablelands in southeastern

Virginia were approximately every 4-6 years, due to natural lightning and Native American burning activities. This regime varied by specific landscape factors. Frost concludes that before modern fire suppression methods, emergent wetlands burned fairly frequently, probably igniting as fire moved from adjacent uplands. Peatlands (canebrakes, pocosins) in the southeastern U.S. were also influenced by natural and anthropogenic fire, and vegetation was controlled primarily by two factors: fire frequency and organic matter depth (Frost 1995). The wooded swamps and lowland forests of the Back Bay area were therefore historically influenced by fire, as evidenced in some forests by the presence of cane (*Arundinaria gigantea*) - an indicator of frequent-fire. In modern times, these fires have been suppressed, likely resulting in fewer peatlands successional types, and overall lower peatlands diversity, in the Back Bay region. Frost's fire frequency/organic soil type categories correspond to wetlands habitats found at Back Bay NWR (Frost 1995):

- a. Southeastern Brackish Marshes (correspond to "natural and impounded emergent wetlands") - fire removes heavy thatch that builds up every 2-5 years; fire opens up habitat for colonization, temporarily increasing community richness; fire suppression at higher salinities in the brackish range tends to lead to dominance by *Juncus* sp.
- b. Peatlands /mineral soils (correspond to "mid-successional lowland forests"): On wet mineral soils with 26 to 50 yr. fire frequency; woody stems dense, dominant subcanopy and shrub layers; canopy trees of red maple, loblolly pine, slash pine, white oak and other hardwoods, cane, gallberry (*Ilex coriacea*), other shrubs as dominants. On wet mineral soils with 51 to 100 year fire frequency; dominated by overstory loblolly pine, red maple, and bottomland oaks; shading reduces flammable understory; principle effect of fire is to reduce small size classes of understory stems.
- c. Peatlands/organic soils (correspond to "wooded/forested swamps"): On thin organic soils with 51 to 100 year fire frequency; mature forest of mixtures of loblolly pine, sweetgum, and bottomland hardwoods; subcanopy with scattered stems of cane, and shrubs such as *Ilex* sp. , *Myrica* sp.; herb layer of tall ferns (*Osmunda* sp.). On thin organic soils with 100 to 300 year fire frequency; baldcypress, *Nyssa* sp., green ash; subcanopy of red maple and green ash; sparse shrubs; swamp herb layer

4. Post-settlement Fire History

FIRE FACTS: Five year average for Virginia Beach (from <http://www.dof.state.va.us/R1/virginia.htm#fire>)

Total number of wildfires = 12
Total acres burned = 32
Average size fire, acres = 2.7

Tables 1, 2 and 3 in Appendix G show numbers of fires by size, class and occurrence at Back Bay NWR over the past ten years. See also the above Fire History discussions.

5. Prescribed fire history

The typical Refuge burning season occurs during the fall. In cases where prescribed burning attempts have failed or been prevented, prescribed burning has also occurred during the early spring. Burning any later than March in this area, risks negatively impacting early nesting birds. Therefore, the Refuge prescribed fire season normally runs from September through November and/or March of each year. The below table summarizes Refuge prescribed burning events from 1987 through 2000.

Table 3 - Refuge Prescribed Burning Summary (1987-2000)

Unit : 51510 BACK BAY NWR - VIRGINIA BEACH, VA Years: 1987 Thru 2000

Fire Types: PRESCRIBED FIRE						Total Agency	
Year	# Fires	1	2	3	4	5	Acres
1987	2***						31.0
1988	1*****						160.0
1989	1*****						75.0
1990	3*****						480.0
1991	2*****						200.0
1992	2*****						300.0
1993	5*****						145.0
1994	0						.0
1995	0						.0
1996	0						.0
1997	3*****						84.0
1998	4*****						70.0
1999	1**						25.0
2000	0						.0
	(* = 9 ACRES)					TOTAL=	1849.0

B. Responsibilities

1. Refuge Manager (RM): The Refuge Manager will have final responsibility for the development and implementation of the fire management program, and will annually review the fire management program. The Refuge Manager will have final approval of cooperative and interagency agreements, and approval of all prescribed fire plans. The Refuge Manager may delegate certain fire management duties to various members of the Refuge staff.

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

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

5. Outdoor Recreation Planner (ORP): The Outdoor Recreation Planner, or someone on the public use staff, will serve as public information officer for the Refuge, addressing public and media inquiries regarding the fire program, and coordinating outreach and educational activities related to fire program.

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

7. Regional Fire Ecologist

The Regional Fire Ecologist advises the refuge staff on matters related to specific ecological effects of prescribed fires or wildland fires. Reviews and evaluates refuge fire management plans and annual burn plans for ecological soundness and technical adequacy. Assists refuge biological staff in planning field inspections/data collections before and after prescribed or wildland fires. Assists biological staff in determining if habitat management objectives of fire actions were achieved. Provides up-to-date scientific information to refuge staff concerning the role of prescribed fire in habitat management in the northeastern U.S. Serves as a liaison between the refuge and research institutions, establishing cooperative studies to evaluate a full range of effects of prescribed fire on refuge lands.

8. Regional Fire Management Coordinator (RFMC):

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

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

C. Fire Analysis Committee

Consists of the Refuge Manager, Deputy Manager, Refuge Biologist and District Fire Management Officer. Other staff personnel may be designated as being on the Fire Management Committee at the discretion of the Refuge Manager.

The committee shall meet prior to and following the fire season to: 1) Determine objectives and needs for fire management for the ensuing year; 2) Coordinate and critique the committee's operation and function; and 3) Review the Fire Management Plan and revise as necessary.

The team may be convened whenever fire and weather conditions indicate that fire presents a serious

problem to Refuge resources. When convened, the committee shall evaluate fire potential, weather, and management concerns; and determine an appropriate course of action, using the Fire Management, CCP, and/or Station Management Plans, as guidelines, together with any prepared Wildland Fire Situation Analysis for ongoing fires (Ref. Appendix D).

D. Initial Attack Teams

Initial attack teams will consist of experienced, fully-qualified firefighters, those on their first fire, and well-qualified leadership. Teams will be prepared and equipped with hand and power tools as needed and will be dispatched with a day's supply of food and water, so they can continue work for 24 hours without additional support.

Employees participating in any wildland fire activities on Fish and Wildlife Service or cooperators' lands will meet fitness requirements established in PMS 310-1, except where Service-specific fitness requirements apply. Exceptions to fitness requirements on initial attack activity are available from the Regional Fire Management Coordinator per guidelines in Chapter 1.5 of the Fire Management Handbook (USFWS 2000).

E. Interagency Operations

Cooperative agreements with various federal, state and local agencies generally provide the means by which the resources of each agency are available to assist in initial attack efforts. These agreements have detail regarding payment among cooperators, list of response areas, communications frequencies, and have been reviewed by a contract specialist and/or solicitor.

Back Bay NWR, along with other Virginia refuges, currently has a cooperative agreement for fire control with the Virginia Department of Forestry. Refuge wildfire management is also carried out in cooperation with the Sandbridge Volunteer Fire Department, on an informal communications and report-sharing basis. However, no written agreement exists.

Back Bay NWR will use the Incident Command System (ICS) as a guide for fireline organization. Qualifications for individuals is per the Wildland and Prescribed Fire Qualifications System Guide (PMS 310-1, January 2000). Depending on fire complexity, some positions may be filled by the same person.

F. Protection of Sensitive Resources

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

Fire inhibiting chemicals (e.g., aerially applied retardants and Class A foam solutions) may be used with the concurrence of the Refuge Manager and then only beyond 300 feet of waterways. Direct application of these chemicals into waterways and wetlands, such as impoundments, inflows, stream channels, marshes or drainage ditches must be avoided.

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

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

VI. WILDLAND FIRE ACTIVITIES

Fire program management describes the operational procedures necessary to implement fire management at Back Bay NWR. Program management includes: fire prevention, preparedness, emergency preparedness, fire behavior predictions, step-up staffing plan, fire detection, fire suppression, minimum impact suppression, minimum impact rehabilitation, and documentation. All fires not classified as prescribed fires are wildland fires and will be appropriately suppressed.

A major goal of the Refuge fire management program is to reduce the threat and occurrence of human caused wildland fires. The Wildland Fire Prevention Analysis and Plan should be done and focus on risk of human caused ignitions within an area; hazards within that area; and values of resources found within that area. Prevention activities developed for specific areas include education aimed at park visitors, employees, and adjacent landowners; engineering (or the use of appropriate equipment, methods, and projects); and enforcement of regulations aimed at preventing human caused fires.

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

Engineering activities will provide and maintain fire prevention devices (e.g., spark arrestor) on appropriate field equipment, monitor power lines or other potential sources of ignition on a yearly basis, and evaluate Refuge structures for flammable construction materials and the need for hazard fuel reduction work.

Enforcement staff will conduct routine patrols and enforce regulations regarding campfires, smoking, etc., as appropriate.

Virginia's wildfire season is normally in the Spring (March and April) and again in the Fall (October & November). During these times the relative humidities are usually lower, winds tend to be higher, and the fuels are cured to the point where they readily ignite. Hardwood leaves are on the ground providing more fuel, and sunlight directly reaches the forest floor, warming and drying the surface fuels.

As fire activity fluctuates during the year from month to month it also varies from year to year. Some years Virginia gets adequate rain and snow keeping fire occurrence low. Other years the weather does not cooperate as well and we have extended periods of warm, dry, windy, days and therefore increased fire activity.

A. Fire Management Strategies

All unplanned wildland fires will be suppressed in a prompt, safe, aggressive, and cost-effective manner to produce fast, efficient action with minimum damage to resources using appropriate management strategies.

1. Wildland Fire Suppression

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

Although resource impacts of suppression alternatives must always be considered in selecting a fire management strategy, resource benefits will not be the primary consideration. Appropriate suppression action will be taken to ensure firefighter safety, public safety, and protection of the resources.

Critical protection areas include:

- a) the North Bay Marshes Bald Eagle nest (FMU#3)
- b) the Refuge Structures and Facilities listed in Section IV.F. of this Plan (FMU #1 & #3)
- c) the Sandbridge Wildland Urban Interface (FMU#1)
- d) the “moist-soil units” within the impoundment complex (the eastern sides of A, B and C Pools, and most of G, H and J Pools) - (FMU#3)
- e) Adjacent private properties along Refuge boundaries and Sandbridge, Muddy Creek, Nawney Creek, Colechester, New Bridge and Horn Point Roads (FMU#2).

These five categories will receive priority consideration in fire control planning efforts. In all cases, the primary concerns of fire suppression personnel shall be personal and public safety. If necessary, all persons not involved in the suppression effort may be evacuated, and affected portions of the Refuge may be closed to the public.

Suppression strategies should be applied so that the equipment and tools used to meet the desired objectives are those that inflict the least impacts upon natural and cultural resources. Minimum impact suppression strategies will be employed to protect all resources. Natural and artificial barriers will be used as much as possible for containment. Fireline construction will be conducted to minimize long-term impacts to Refuge resources.

Vehicle access to normally closed areas of the refuge will be permitted, using existing roads and trails when possible. When such off-road travel is necessary, vehicle access will be allowed with the approval of the Refuge Project Leader or Delegate.

Should fire threaten the moist soil units within the Refuge impoundment complex, short-term flooding of those units can be carried out to protect their important wintering waterfowl food-plants. Such flooding should be carried out with water provided by the C-Storage Pool's Pump Station and redistributed into A, B, C, G, H & J Pools through the water control structures connecting these impoundments. Once the fire threat has passed, these impoundments should be returned to the water level objective for that time of year.

Fire equipment (pumpers, other vehicles, etc.) access to wildfires on marshes and other wetland habitats may not be possible due to soft, water-saturated soils. In such cases, other alternatives should be used, including: containment and permitting the fire to burn itself out; aerial water drops; foot access by line crew(s) with backpack pumps and hand tools; ATV access with water sprayer unit; boat access from adjacent waterways; etc.

Sites impacted by fire suppression activities or by the fire will be rehabilitated as necessary, based on an approved course of action for each incident.

2. Prescribed Fire

Prescribed fires are intentionally ignited under predetermined weather and fuel moisture conditions that permit managers to exert substantial influence over the spread and intensity levels that the fire can achieve. These fires are ignited for purposes of accomplishing resource management objectives. All prescription parameters, ranges, and objectives are clearly stated in an individual project plan for each prescribed fire.

Prescribed fire will be utilized to modify vegetative communities for improved wildlife habitat, hazard fuel reduction and ecosystem function.

B. Preparedness

Preparedness is the work accomplished prior to fire occurrence to ensure that the appropriate response, as directed by the Fire Management Plan, can be carried out. Preparedness activities include: budget planning, equipment acquisition, equipment maintenance, dispatch (initial attack, extended, and expanded), equipment inventory, personnel qualifications, and training. The preparedness objective is to have a well trained and equipped fire management organization to manage all fire situations within the Refuge. Preparedness efforts are to be accomplished in the time frames outside the normal fire season dates.

Most local fires are outside the normal fire seasons and are thought to be caused by human actions. There are very few lightning-caused fires (see historical weather data table, "Climatological Normals 1961-90" on page 22 of this Plan). Records show fires within the Refuge acquisition boundary to be human/unknown caused, usually during the winter hunting seasons. Table 1-3 in Appendix G, shows the number of fires by size, class and occurrence.

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

1. Wildland Fire Preparedness

Preparedness includes activities conducted before a fire occurrence to ensure the ability of the refuge's fire management organization to initiate effective action. The objective of preparedness is to have a well-trained and equipped fire management organization in place to manage all fire situations that confront Back Bay managers. A copy of the Refuge's Normal Strength Inventory is included as Appendix J of this Plan..

Prior to and during the fire season, the Refuge Manager and District FMO will take the following measures to ensure adequate fire preparedness:

January 1 – March 30: Update and maintain accurate employee training and qualification records. Review Cooperative Agreements with surrounding fire management agencies. Prepare plans for any prescribed burn projects for hazard fuel reduction and resource management projects. Order fire cache supplies and replacement equipment as needed. Perform annual maintenance on fire weather station. Obtain necessary physical fitness evaluations. Provide updates or changes to cooperators for local and regional mobilization plans. The Refuge Manager, with input from the Refuge FMO and Biologist, shall review fuel break needs. This includes scheduling maintenance of existing or construction of new fuelbreaks, based upon the resource values at risk.

April 1 - June 15: Inventory fire supplies and equipment and update list. Inspect fire cache to ensure equipment is ready. Check operation of all slip-on and portable pumps.

Outfit field vehicles, all initial attack personnel, and interagency crew participants. Review fire weather station observation, recording, and weather station equipment maintenance procedures. Review established procedures for utilizing suppression and emergency preparedness accounts. Evaluate the need for basic firefighter training and conduct if necessary.

June 16 - November 15: Maintain state of readiness as identified in the Step-Up Plan (see Table 5). Operate all slip-on units and portable pumps at least monthly.

November 16 - December 31: Critique fire season. Evaluate individual performance ratings of fire personnel and correct deficiencies and recommend training as needed. Review and revise Fire Management Plan as needed.

2. Fire Prevention

An active fire prevention program will be conducted in conjunction with other agencies to protect human life and property, and prevent damage to cultural resources or physical facilities.

A program of internal and external education regarding potential fire danger will be implemented. Visitor contacts, bulletin board materials, handouts and interpretive programs may be utilized to increase visitor and neighbor awareness of fire hazards. Trained employees need to relate to the public the beneficial effects of prescribed fires as opposed to unwanted human-caused fires, with emphasis on information essential to understanding the potential severity of human-caused wildland fires and how to prevent them.

It is essential that employees be well informed about fire prevention and the objectives of the refuge's fire management program. Further, employees must be kept informed about changes in existing conditions throughout the fire season.

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

3. Staffing Priority Levels

Emergency preparedness describes actions to provide extra capability during times of extreme or unusual fire danger caused by meteorological influences on the refuge's fuel complexes. Unusual occurrences will be addressed by planned use of emergency preparedness funds linked to the national Fire Danger Rating System (NFDRS) burning index, and as described in the "Step-up Staffing Classes" of Appendix F. The Refuge's authority to expend emergency preparedness funds is detailed in FWS Fire Management Handbook. Appropriate actions for use of emergency preparedness funds include: hiring of temporary emergency firefighters; placing existing staff on extended tours of duty; increasing or initiating special detection operations; pre-positioning additional resources in the Refuge (engines, crews, etc.); and hiring fixed-wing or rotary aircraft to accomplish necessary preparation. These are planned to ensure the capability of prompt response with adequate forces to whatever specific fire situation develops.

Authorization to expend emergency preparedness funds will be obtained from the Regional Fire Management coordinator who will evaluate the justification presented and reply to the refuge within 24 hours.

Fire Management involves prevention, detection, preparedness, and suppression activities. The scope of activities associated with each type of fire management action

varies with changes in the risk of fires igniting and with the predicted fire behavior. This Plan uses the Burning Index (BI), derived from the National Fire Danger Rating System (NFDRS) (Deeming et al. 1977), and the Keetch-Byram Drought Index (KBDI) (Keetch and Byram 1988) as an important measure for basing determinations regarding the scope and extent of fire management activities. Depending on the BI and KBDI derived from the daily NFDRS/WIMS data, predicted fire danger is classified as low, moderate, high, very high, or extreme. A set of staffing classes, which have a corresponding set of actions that the refuge will initiate to meet potential fire danger, has been developed and is presented in Appendix F.

Burning indexes and Keetch-Byram Drought Index utilized in development of BBNWR staffing classes were taken from an historical analysis of fire weather observations archived for the Back Bay weather station (Station Number 449905). NFDRS fuel model N was used as the primary fuel model for fire danger calculation purposes. For these observations, the low fire danger rating equates with BI's ranging from 0 to 20; moderate equates with BI's ranging from 21 to 40; high ranging from 41 to 81; very high ranging from 82 to 98; and extreme with BI's of 99 and greater.

Actions taken under staffing classes I - III are funded through the normal refuge budget. Additional actions detailed under staffing classes IV - V can be supplemented by emergency preparedness funding requested through the Regional Fire Management Coordinator. Burning index, associated staffing classes, and designated prevention, detection, and preparedness actions to be taken with each level are discussed in Table 4 below. Using the Keetch-Byram Drought Index (KBDI), modify staffing as follows:

Table 4 - Staffing Adjustments in Response to KBDI Changes

<u>KBDI Range</u>	<u>Staffing Adjustment</u>
0 - 200	Reduce 1 Class (Normal 11/15-5/15)
201- 329	No Change (Normal 5/16-7/14 and 10/16-11/14)
330 - 375	Increase 1 Class (Normal 7/15-10/15)
>375	Increase 2 Classes (Rare event)

4. Training

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

Basic wildland fire training refreshers are offered annually for red-carded firefighters and records kept in a centralized database. Additional training is available from surrounding agencies in pump and engine operation, power saws, firefighter safety, fire weather and fire behavior, helicopter safety and prescribed fire objectives and activities. 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 FMO will coordinate fire training needs with those of other nearby refuges, cooperating agencies, and the RO.

The refuge supports the development of individual Incident Command System (ICS) overhead personnel from among qualified and experienced refuge staff for assignment to overhead teams at the local, regional, and national level.

Fire suppression is an arduous duty. On prescribed fires, personnel may be required to shift from implementation/monitoring activities to suppression. Poor physical condition of crew members can endanger safety and lives during critical situations.

Personnel performing fire management duties will maintain a high level of physical fitness. This requires successful completion of a fitness pack test. Personnel must complete a three mile hike with a 45 pound pack in less than 45 minutes.

5. Supplies and Equipment

Back Bay NWR maintains a small cache of equipment needed for prescribed burning operations. With the exception of the electronic Fire Weather Station, this "Back Bay NWR fire equipment cache" is stored and maintained at the Refuge maintenance compound. The Weather Station is located to the immediate west of the Refuge Headquarters and Visitor Center building. The contents of the cache are listed in Appendix J. Back Bay NWR staff (Prescribed Burn Boss and Maintenance Staff) are responsible for maintaining and issuing equipment. Additional equipment and project needs are requested through the Normal Unit Strength (NUS) funds provided by the Regional Fire Management Coordinator, and through the Annual FireBase budget process.

When additional items are needed on an emergency or otherwise short-notice basis, the Refuge has contacted cooperators, such as the District Fire Management Officer at Great Dismal Swamp NWR, and requested those items from their Refuge fire equipment cache. However, the proper procedures should involve planning well ahead, and ordering the materials through a GSA fire equipment contractor.

In accordance with the Back Bay NWR Dispatch Plan, the Back Bay Refuge Dispatcher will contact the servicing Dispatcher for the area, at Great Dismal Swamp NWR, at the request of the Back Bay NWR Burn Boss. Requests for additional personnel and equipment to combat the fire, are made through this servicing Dispatcher. A listing of other possible contacts can be found in Appendix K - Back Bay NWR Dispatch Plan.

6. Detection

Back Bay relies on ground based fire detection and location systems using confirmation of visitor reports with refuge personnel. All smoke and fire reports will be made to the refuge headquarters. The Refuge Manager will be notified of all fire or smoke reports as soon as possible. To enhance communication with cooperators and the public, notification of cooperators fire management offices can also be made.

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

7. Communication

The Refuge has maintained its own low-band radio system for decades. This system is on the same frequency (163.150/164 Mhz) as other National Wildlife Refuges in this vicinity. The Base Station (FCC call sign: KIE-622), and several hand-held and portable vehicle radios are in use as part of that system. Of these, two hand-held and one portable were purchased with fire funds. This old radio system is scheduled for upgrading during 2002, to a new digital, high-band system, with a repeater on the City-owned tower on Sandbridge Road. No repairs are being done on these low-band radios because of the expected upgrade. The upgrade is intended to provide much more reliable reception, anywhere on the Refuge, along with new base station, hand-helds and portable vehicle radios.

Maintenance and upkeep of all Refuge radios, including the three fire radios, has been the responsibility of the Refuge Ranger/Law Enforcement Officer. Use of Refuge hand-held radios is documented through a sign-out form in the same area that the radios occupy.

The Refuge has historically used other frequencies (False Cape State Park, local Police and Fire Departments, etc.) on the Refuge Base Station, and communication with those other agencies does periodically occur. Communication and cooperation are very good between the Refuge and those agencies. No memorandums of understanding are known to exist.

The Refuge Burn Boss is responsible for receiving and passing on current records of qualifications, to individual Refuge fire personnel. The Refuge Burn Boss is also responsible for recommending them for the necessary fire-related training, to insure that a viable Refuge Fire Team exists that is capable of carrying out Refuge prescribed burning programs. A list of the current Refuge Fire Team can be found in the Fire Dispatch Plan of Appendix K.

8. Pre-Attack Plan

Upon discovery of a fire, all subsequent actions will be based on the following:

- 1) The Incident Commander (IC) will locate, size-up, and coordinate suppression actions.
- 2) Provide for public safety.
- 3) Considering the current and predicted fire conditions, the Incident Commander will assess the need for additional suppression resources and estimate the final size of the fire. The potential for spread outside the refuge should be predicted, as well as the total suppression force required to initiate effective containment action at the beginning of each burning period.
- 4) The Incident Commander will assess the need for law enforcement personnel for traffic control, investigations, evacuations, etc. and make the request to the Refuge Manager.
- 5) Document decisions and complete the fire report (DI-1202).
- 6) Should a wildland fire move into an extended attack a Delegation of Authority will be invoked. Once a Delegation of Authority has been authorized the Incident Commander will make the final decisions pertaining to the fire. A copy of Delegation of Authority is in Appendix C.

9. Fire Management Units

The Back Bay National Wildlife Refuge is subdivided into three separate Fire Management Units (Ref. Figure 5 & Appendix M). Proximity to human developments, geographic boundaries (waterways, roads, property lines, etc.), ease of access for fire suppression, and woody fuel complexes, were the primary criteria used in determining fire unit boundaries. Road and/or water access dictates suppression resource response times. Proximity to human developments indicates a higher probability that fire may create a wildland-urban interface incident; and are areas where wildland fire management responses with increased suppression resources are warranted. Woody fuel complexes largely dictate the rate-of-spread and wildland fire intensity that fire management resources will face.

In the event of multiple fire starts that exceed the capability of local suppression resources, fire(s) on Refuge lands within Fire Management Unit (FMU) #1 will generally receive top priority in assignment of available resources. Refuge lands in FMU#2 will receive medium priority, and Refuge lands in FMU#3 the lowest priority.

Back Bay NWR currently consists of approximately 8,700 acres. Many blocks of property within the Refuge acquisition boundary have not yet been acquired. The estimated total acreage when all property within the acquisition boundary is acquired will

be 11,007 acres. Most of this future land acquisition will occur in FMU#3. Acreage estimates for the following Fire Management Units are only for lands currently owned by the Fish & Wildlife Service.

a) *Fire Management Unit #1 - Wildland Urban Interfaces (WUI)* - FMU #1 consists of

Figure 5 - BBNWR Fire Management Units



Refuge lands along the Refuge's exterior perimeter, and adjacent to private lands and high value properties/houses. It includes the following four WUI subunits and habitats:

- (1) Barrier island woodlands and wetlands adjacent to the western side of Town of Sandbridge.
- (2) Woodlands south of Sandbridge Road.
- (3) Woodlands and wetlands adjacent to New Bridge Road.
- (4) Woodlands and old fields adjacent to Nawney/Nanney Creek Road.

WUI boundaries follow existing waterways, roads and/or Refuge boundaries. The estimated total acreage of FMU#1 currently owned by Back Bay NWR is 520 acres, broken down as follows:

- (1) WUI#1 = 200 acres
 - (2) WUI#2 = 62 acres
 - (3) WUI#3 = 177 acres
 - (4) WUI#4 = 81 acres
- Total FMU = 520 acres

FMU #1 possesses the greatest likelihood that human-caused fire could burn onto the Refuge; and conversely, that wildland fire could exit the Refuge and become an urban-interface fire. Smoke sensitive areas (Figure 6) are most dense in this same vicinity. WUI #1 is the highest priority WUI area within FMU #1. The Refuge Horn Point residence is located in WUI#3 of FMU#1 and merits special consideration and protection during prescribed burning and wildfire protection efforts.

Fuel types found in FMU#1 include:

- 1) Short and medium cool season grasses, with some broadleaf herbaceous vegetation and a few woody plants; equivalent to Fire Behavior Fuel Model (NFFL) 1 (National Fire Danger Rating System [NFDRS] Model L).
- 2) Emergent wetland plants (needlerush, Phragmites and cattail) and tall grasses with a few woody plants; equivalent to NFFL 3 (NFDRS Model N).
- 3) Predominantly shrubs with small pine-oak-gum mixes; equivalent to NFFL 6 (NFDRS Models F & Q).
- 4) Mixed stands of pine and deciduous trees with scattered concentrations of dead or downed woody material; equivalent to NFFL 9 (NFDRS Model E).

The only known indicator species in this FMU that benefits from fire is Pond pine (*Pinus serotina*). However, the extent of this species presence in WMU#1 is not known. No known important indicator species are harmed by fire.

b) **Fire Management Unit #2 - Forest and Wooded Wetlands** - This FMU consists of Refuge woodlands and old fields north of Sandbridge Road, west of WUI#1 and south of Lake Tecumseh; together with both sides of Asheville Bridge Creek; and extending south along Refuge woodlands adjacent to the eastern side of Muddy Creek Road and both sides of Horn Point Road. The estimated total acreage of FMU#2 currently owned by Back Bay NWR is 859 acres.

Fuel types found in FMU#2 include:

- 1) Principally deciduous woodlands with closed to semi-closed canopies with little undergrowth; equivalent to NFFL 8 (NFDRS Model H & R).
- 2) Open or closed deciduous stands and mixed coniferous-deciduous stands, with scattered concentrations of dead or downed wood material; equivalent to NFFL 9 (NFDRS Model E).

The only known indicator species that benefits from fire in FMU#2 is Pond Pine; although it has not yet been confirmed in this part of Back Bay NWR.

c) **Fire Management Unit #3 - Refuge Palustrine Emergent Wetlands** - Marshes, moist soil units, impoundments, old fields, shrub-scrub, and wooded wetlands in the following areas: (1) The barrier island; (2) All Back Bay Islands; (3) all of the North Bay Marshes west of FMU#1's WUI#1; and (4) All western, mainland marshes. The Refuge headquarters, Visitor Center, Nature Trails and Maintenance Compound are in this Unit, on the barrier island portion of the Refuge immediately south of the Town of Sandbridge. This FMU includes Refuge lands that receive the highest public use. Wetlands properties along the western side of Back Bay have the poorest vehicular access (both external and internal) on the Refuge, and therefore they also have the longest response times for Refuge wildland fire management staff. Staff from the Sandbridge Fire Company normally reach those areas more quickly than the Refuge's.

Fuel types for WMU#3 include:

- 1) "Old Fields" with short and medium cool season grasses, with some broadleaf herbaceous vegetation and a few encroaching woody plants; equivalent to NFFL 1 (NFDRS Model L).
- 2) Marshes supporting emergent wetland plants (Needlerush, cattail and Phragmites) and tall grasses (switchgrass, Big bluestem and Reed canary grass); equivalent to NFFL 3 (NFDRS Model N).
- 3) Mostly shrubs, with scattered Live oak; equivalent to NFFL 6 (NFDRS Model 6).
- 4) Open or closed deciduous tree stands, and mixed pine-deciduous stands; equivalent to NFFL 9 (NFDRS Model E).

The only known indicator species that benefit from fire in FMU#3 are Black needlerush (*Juncus roemerianus*) and Pond pine. Scattered Pond pines have been observed in the remnant maritime forest ("Green Hills") area along the western side of A-Pool. The Back Bay area is reported to be the northern extent of its geographic range. However, it appears that most of the Pond pine was logged out earlier in the 20th Century; leaving only a few trees. That area is now mostly occupied by Loblolly pine, Red maple, Sweetgum, a few Black-gum/tupelo, scrubby Live oaks (*Quercus virginiana*) and Waxmyrtle shrubs. Back Bay is also reported to be the northern extent of the geographic range for Live oak.

Prescribed burning of extensive Refuge Black needlerush marshes in and around Back Bay has not been encouraged in the past. However, discussions with long-time residents reveal that the local populace has historically "burned off" these marshes in late fall and winter; in the belief that it "improves" the marshes for wintering waterfowl use. After careful consideration of this concept, we have concluded that prescribed burning of these needlerush and saltmeadow hay (*Spartina patens*) marshes should be encouraged in the future. When carried out wisely, in 3-4 year cycles, the following habitat and wildlife benefits are realized:

- 1) Reduction of fuel loading (matted needlerush stems among live plants and on marsh floor), that also stifles germination of other beneficial species.
- 2) Increased use by wintering and migrating waterfowl (ducks, geese and Tundra swans) of areas after the long, needle-tipped stems are removed/burned off.
- 3) Increased germination of desirable waterbird food-plants already in seed-bank.
- 4) Rapid recycling of nutrients into soil and remaining needlerush rootstocks.

The only known exception to this needlerush prescribed burning recommendation, is in FMU#3's western North Bay Marshes vicinity, where "mixed Black needlerush-Phragmites marshes" support a significant breeding population of the Least Bittern (*Ixobrychus exilis*). The Least bittern is a "Species of Special Concern" in the State of Virginia. Canoe surveys conducted along "Black Gut Ditch," to the south of Sandbridge Road by Refuge Biologist John Gallegos and expert birder Robert Ake, recorded consistently high numbers of Least Bitterns during 1997-2001. This area supports a unique "low canopy" about 3-4 feet above the marsh surface, that is created by broken

Phragmites stems resting atop lower needlerush stems. This canopy creates a "shelf" that the bitterns appear to use for nesting/resting. Removal of this unique habitat-type may lead to a loss of this breeding population of Least bitterns.

FMU#3 also harbors the only known Bald eagle nest on Back Bay NWR. The nest is located in the woods/marsh edge, atop a 40' tall Loblolly pine, among dense Phragmites, Greenbrier and Multiflora rose. Habitat is scattered Loblolly pine-Sweetgum-Red maple wet (bottomland) woods. GPS UTM coordinates are 0414111E and 4066415N (+/-30'). This is an active eagle nest, that relocated to this location from further southeast, in 1999. Burning activity should be restricted in this vicinity during the nesting season (late December through mid-May). This nest site is a priority protection area during a North Bay Marshes wildfire in FMU#3.

The eastern one-third of A, B and C Pools and most of G, H and J Pools, within the Refuge impoundment complex, is also a critical, fall/winter protection area. Those areas should not be burned over during prescribed fire projects in the fall or winter. They comprise the Refuge moist-soil units, and provide a significant food source (seed) for wintering waterfowl. Feeding wintering and migrating waterbirds is a primary goal of Back Bay NWR. This food source is also a priority protection area during a wildfire in FMU#3.

Fire behavior for all FMUs, by fuel types, in each of the "normal" and "extreme" fire years (as defined by 100 or 1,000-hour time lag fuel moisture, Burning Index (BI), Keetch-Byram Drought Index, (KBDI) etc.), are covered under Section V.A.2. (Major Refuge Fuel Types) of this Plan.

More specific descriptions of the three Refuge FMUs' fuel types and related fire behaviors are found in Section V.A.2. (Major Refuge Fuel Types) of this Plan. Specific plant species compositions of referenced habitats are found in Section IV.D. (Vegetation) of this Plan. Information relating to the annual fire weather cycle, including extremes, is found in Section V.A.1. (Fire Weather). Graphs for NFDRS Fuel Models discussed herein are within Appendix H of this Plan.

A detailed breakdown of FMU acreage estimates is contained in Appendix L. A map of each fire management unit is contained in Appendix M.

As indicated in Section V.A.F. (Protection of Sensitive Resources) of this Plan, use of fire retardants and foams and heavy equipment is prohibited within 30 meters of any waterway in Refuge FMUs. Direct application of these chemicals into waterways and wetlands, especially impoundments, inflows, stream channels, marshes or drainage ditches, must be avoided.

Due to staff limitations, relatively small land management parcels, long response times, valuable resources, and values at risk on neighboring lands, this plan does not recommend wildland fire managed for resource benefit as an option for any of the units. Wildland fires will be suppressed using the appropriate suppression response. Prescribed fires will be used to reduce hazardous fuels and to meet resource management objectives.

10. Vegetation Types

Detailed information on Refuge plant species and plant communities/habitats are found in Section IV. (Description of Refuge), Part A. (Vegetation). According to information obtained from the U.S. Fish and Wildlife Service's endangered species program, there are currently no federally listed threatened or endangered plant species on Back Bay NWR. The State of Virginia's Department of Conservation & Recreation lists 21 rare (principally wetlands) plants in its *Natural Heritage Inventory of Back Bay National Wildlife Refuge* (Walton, et al. Feb.2001).

11. Fuel Types and Fire Behavior

The various fuel types and related fire behaviors for Refuge habitats are found under Sections VI. B.9. (Fire Management Units) and V.A.2. - (Major Refuge Fuel Types) of this Plan.

12. Suppression Tactics

Wildland fires will be suppressed in a prompt, safe, aggressive, and cost-effective manner to produce fast, efficient action with minimum damage to resources. Suppression involves a range of possible actions from initial attack to final suppression. All wildland fires will be suppressed.

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

There will be only one Incident Commander responsible to the Refuge Manager. The Incident Commander will designate all overhead positions on fires requiring extended attack. The proper form for delegating authority to an incoming Incident Commander is contained in Appendix C (Delegation of Authority) of this Plan. The "Project Fire Transition Guide" details guidelines for the orderly transition of fire management responsibilities to incoming Incident Management Teams; it is found in Appendix E of this Plan.

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

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

13. Suppression Conditions

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

1. Report of the fire to the Back Bay NWR Headquarters, and subsequently to the District FMO or RFMC.
2. Dispatcher or other Refuge staff makes determination of location, legal description, and land ownership at the occurrence site.
3. Two or more Refuge staff will be dispatched to the fire location. Personnel dispatched will be qualified and equipped to undertake initial attack action.
4. Immediately upon arrival at the fire location, an initial fire size-up (report of the fire size, behavior, environmental conditions, fuels, terrain features, existence of special hazards or threats to persons or improvements, and any other factors observed which could affect fire behavior and suppression efforts etc.) will be completed. This information will be reported to Refuge dispatch. These fire size-up observations will be immediately forwarded to the Fire Management Officer.
5. Upon determination of actual fire location and based on the information reported following the initial fire size-up, the Incident Commander will develop the appropriate suppression response, giving consideration to applicable resource management objectives and constraints, together with considerations of personnel

safety and economics. Data gathered in the size-up will be utilized by the Incident Commander to determine an appropriate strategy for managing the fire.

Specific daily dispatch guidelines to be utilized by the Refuge Dispatcher will be developed by the Refuge staff and FMO at the beginning of each fire season. These specific guidelines will be continually updated, as needed, to reflect the changes in available resources, environmental conditions and predicted fire danger as reflected in the daily Burning Index (BI) and Keetch-Byram Drought Index (KBDDI) value.

The Fire Management Officer or Refuge Dispatcher will monitor the Burning Index (BI) daily. The Fire Management Officer or Regional Fire Management Officer is responsible for the daily collection of fire weather observations from February 15 to November 15, and to ensure that the fire weather station equipment is operable during those times. Whenever a fire is reported on Refuge lands, forces and equipment dispatched for initial attack will be based on daily Burning Index, fire location, existing and predicted environmental conditions and any other factors pertinent to making sound fire management decisions.

All wildfires will receive an immediate and aggressive initial attack response. The Fire Management Officer or Refuge Manager will assign an Incident Commander and determine the appropriate suppression strategy to be utilized. The Fire Management Officer will keep the Project Leader updated of the fire situation. The Fire Management Officer will coordinate all suppression activity within the refuge and may request that cooperators initial attack a fire. The goal in initial attack actions is to limit damage to threatened values, while minimizing the area burned and preventing escape of the fire.

An Initial Attack Incident Commander (ICT4 or ICT5) as determined by refuge needs will be responsible for all actions taken on the fire. The IC will inform the Fire Management Officer and Refuge Manager of the fire situation as soon as possible after arrival in the scene. If the fire behavior and complexity continue to increase, the IC may be replaced by an ICT3 along with additional support personnel and equipment. The Refuge Manager, in consultation with the Fire Management Officer, is responsible for the selection of a replacement Incident Commander.

Extended attack actions occur when fires have not been contained or controlled by initial attack forces. Extended attack continues until either the transition to a higher level incident management team is completed or the fire has been contained or controlled. The Wildland Fire Situation Analysis (WFSA) must be completed by Refuge staff when a fire escapes initial attack, and if the action escalates to incident management team levels, the incoming team will be briefed by the Refuge Manager (Agency Administrator's Briefing) and current Incident Commander. The team will be given a written delegation of authority and will have an Agency Administrator's Representative assigned as a staff member to the incoming Incident Commander. The delegation of authority will provide the Refuge Manager's priorities, constraints, and other guidelines prerequisite to effective suppression of the fire. When the team has accomplished its assigned tasks, the fire will be transferred back to the Refuge. A local Incident Commander will be assigned, and a debriefing will be held by the departing team to provide for an orderly transition of command. The Project Leader will conduct a closeout session that will include a performance evaluation of the departing team. The transition Incident Commander will assume command at the agreed upon time. The departing team will then be demobilized. Occasions in which two or more fires are ignited can be generally associated with days when high to extreme fire intensity conditions exist. Suppression actions taken on multiple fires can quickly deplete fire suppression resources; therefore, initial attack dispatching for multiple fire starts will be prioritized. If personnel are available, at least two individuals will be dispatched to each fire reported on days experiencing multiple starts. However, if sufficient personnel are not immediately available, the priority order established in the FMU discussion will determine which fires receive the first available personnel resources.

Priority of initial attack on days of multiple fire starts will be:

- Fires threatening life or property within Refuge boundaries
- Fires starting within the Refuge which are within one mile of Refuge boundaries and which have a likely potential to burn across the boundary and onto non-Refuge lands, particularly within Wildland Urban Interface units of FMU#1.
- Fires starting outside the Refuge which are within one mile of Refuge boundaries and which are on State lands administered by the Virginia Department of Forestry.

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

14. Wildland Fire Situation Analysis (WFSA) For fires that cannot be contained in one burning period, a WFSA must be prepared. In the case of a wildland fire, the Incident Commander, in conjunction with the FMO, will prepare the WFSA. Approval of the WFSA resides with the Refuge Project Leader. A WFSA is found in Appendix D.

The purpose of the WFSA is to allow for a consideration of alternatives by which a fire may be controlled. Damages from the fire, suppression costs, safety, and the probable character of suppression actions are all important considerations.

Public safety will require coordination between all refuge staff and the IC. Notices should be posted to warn visitors, trails may be closed, traffic control will be necessary where smoke crosses roads, etc. Where wildland fires cross roads, the burned area adjacent to the road should be mopped up and dangerous snags felled. Every attempt will be made to utilize natural and constructed barriers, including changing fuel complexes, in the control of wildland fire. Rehabilitation efforts will concentrate on the damages done by suppression activities rather than on the burned area itself.

15. Aircraft Operations

Aircraft may be used in all phases of fire management operations. All aircraft must be Office of Aircraft Services (OAS) or Forest Service approved.

Helicopters may be used for reconnaissance, bucket drops and transportation of personnel and equipment. Natural helispots and parking lots are readily available in most cases. Clearing for new helispots should be avoided where possible. Improved helispots will be rehabilitated following the fire.

As in all fire management activities, safety is a primary consideration. Qualified aviation personnel will be assigned to all flight operations.

16. Rehabilitation and Restoration

Departmental Manual 620 DM 3 Burned Area Emergency Stabilization and Rehabilitation (January 2001) describes recent Interior policies regarding post-fire stabilization and rehabilitation. Emergency stabilization is planned action taken during and

soon after a wildland fire to stabilize and prevent unacceptable degradation to natural and cultural resources, to minimize threats to life or property resulting from the effects of the fire, or to repair/replace/construct physical improvements necessary to prevent degradation of land or resources. Repair of damages caused by fire suppression activity should be charged to the suppression account (9261) and completed prior to incident demobilization. Repair of damages caused by the fire should be charged against the rehabilitation account (9262).

Emergency rehabilitation is long-term post-fire efforts to repair or improve lands unlikely to recover naturally from wildland fire damage, or to repair or replace fire-damaged facilities consistent with approved land management plans. The purpose of rehabilitation is either to emulate historical or pre-fire ecosystem structure, function, diversity, and dynamics, or if that is infeasible, then to restore or establish a healthy, stable ecosystem in which native species are well represented. Any area in the fire perimeter or the downstream impact area of a wildland fire is eligible for Emergency Rehabilitation (9262) funding.

All post-fire activities must follow an approved Emergency Stabilization and Rehabilitation (ESR) Plan. The ESR Plan contains two sections, emergency stabilization and rehabilitation. The two sections can be developed separately or concurrently. For multi-agency fires the stabilization section has to be completed within 10 days following control of the fire and review and approval/disapproval has to occur within 7 days following Plan completion. For fires, which occur only on Service lands, the stabilization section must be completed within 30 days following control of the fire and review and approval/disapproval within 14 days following Plan completion. The rehabilitation section must be completed within 6 months following control of the fire and review and approval/disapproval within 2 months of Plan completion. If the two parts are submitted together, the timeframe for the stabilization section applies.

The Regional Fire Management Coordinator (RFMC) is responsible for reviewing and concurring with the Plan, and the Refuge Manager and Regional Director must approve the Plan as meeting resource management objectives. If the total obligation of the Plan is expected to exceed \$500,000 in 9262 funding, the National Wildlife Refuge System Chief must also approve or disapprove the Plan. An electronic copy of the approved ESR including the cost estimate will be forwarded to the Service Fire Management Coordinator in Boise, Idaho within ten days following final approval for budgeting/tracking purposes.

The ESR Plan covers 3 years following control of the fire. Stabilization activities can be funded for 2 full growing seasons following control and rehabilitation activities can be funded for 3 years. Treatment monitoring is funded for 2 years following control with a third year contingent on submitting a report of initial accomplishments. The RFMC monitors expenditure of rehabilitation funds for all Service incidents within his or her Region.

Further guidance on emergency stabilization and rehabilitation can be found in Chapter 5 of the Service Fire Management Handbook. Section 5.3 addresses ESR Plan development.

Rehabilitation, when necessary, will occur according to the following standards and techniques:

- Remove all trash and debris from firelines, staging areas, ICPs, and other locations.
- Attempt to return such areas back to their original condition.

- Flush cut all stumps that were created or disturbed on the incident.
- Mechanically constructed firelines should be built with water bars, when necessary, to prevent erosion. Consideration should be given to moving woody debris back into firelines and re-seeding with native grasses to simulate natural processes and accelerate healing of the disturbed area.
- Disturbed natural water channels will be restored to pre-burn conditions by removing and rehabilitating all constructed dams, water drafting sites, and equipment and personnel access points.

17. Required Reporting.

The following reports, records, and documentation are required as part of the Back Bay NWR Fire Management Program.

Each wildland fire suppression fire documentation package will include the following:

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

Annual reports: The Fire Management Officer is responsible for preparation of any annual reports dealing with fire activity. Such reports will be submitted to the Project Leader for approval and will remain on file.

18. Fire Investigation

Fire management personnel will attempt to locate and protect the probable point of origin and record pertinent information required to determine fire cause. They will be alert for possible evidence, protect the scene and report findings to the fireline supervisor.

Prompt and efficient investigation of all suspicious fires will be carried out. However, fire management personnel should not question suspects or pursue the fire investigation unless they are currently law enforcement commission qualified.

Personnel and services of other agencies may be utilized to investigate wildland fire arson or fire incidents involving structures. All fire investigations should follow the guidelines outlined in 4.1-2 of the Fire Management Handbook (2000). Should a fire investigation be necessary, the Back Bay NWR contact person is Forester/Arson Investigator Bryan Poovey of Great Dismal Swamp NWR, or his successor.

VII. PRESCRIBED FIRE ACTIVITIES

A. Long-term prescribed burn program

The Refuge will continue to use prescribed fire to meet its resource management objectives. Prescribed fire at Back Bay NWR will be carefully guided to meet the overall Refuge Management objective to ensure biological diversity. The Plan will support resource management objectives as defined in the Refuge Master Plan, Marsh and Water Management Plan, Public Use Management Plan, and Safety Management Plan.

There is ample information in the literature to assist Refuge staff in developing fire prescriptions for upland grasslands and marshes. As the fire program develops, burn prescriptions may be developed for other habitats. A thorough literature search, an inventory of evidence such as fire scars, an inventory of soils distributions, and consultation with regional forest ecologists, is needed to develop ecological “targets” for shrublands or forest restoration and management with prescribed fire for the Refuge. Periodic, on-the-ground inventories of forest fuels, and assessment of hazards at the urban interface, are needed to determine where hazard fuel reduction burns may be necessary.

1. Grassland and Emergent Marsh Habitats

The Refuge biological staff uses prescribed fire to maintain grasslands (fields) on the Refuge. Prescribed fire will be used to reduce woody invasion (e.g. sweetgum, loblolly pine), recycle nutrients, reduce litter layers, increase native, warm season grasses, and reduce non-native, cool season grasses. The Refuge will use fire as part of a program to eliminate tall fescue and other non-native plants, and to establish native grasses on the Refuge. Prescribed fire can be a cost-effective alternative to mowing and herbicide applications in grasslands. Fire has been shown to be more effective at reducing litter layers than mowing (Rudnický et al. 1997), and is recommended for maintaining grassland habitats for grassland birds such as grasshopper sparrow and vesper sparrow (Jones and Vickery 1997).

Section VI.B.9. (Fire Management Units) details specifics for improved fire management of WMU#3's Black needlerush marshes.

2. Forest Habitats

Prescribed fire may be introduced into forest habitats. This may be done on the edges of grassland burns, in the interest of lessening impacts of line construction, enhancing firefighter safety, and providing a more efficient and cost-effective means of carrying out Rx fire operations. It will also create “soft edge” habitat between grassland and forested areas.

As the fire program develops, the Refuge may begin using prescribed fire in this habitat independently, to restore a natural fire regime to forest habitats. Burns may be used to reduce hazard fuels and to protect Refuge resources from intense wildfires. In addition, prescribed fire may be used to enhance forest habitats for wildlife. Prescribed fire, mimicking a natural fire regime, may be important to forest ecological processes such as maintaining understory species richness and productivity, or in regeneration of oaks.

Fires in Virginia and Delmarva forests have been found to be associated with oak and hickory dominance in upland forests (Orwig and Abrams 1994). Upland hardwoods are an important habitat type for a variety of wildlife in Virginia. Prescribed burning should be precluded from hardwood stands unless they are very young (<5-10 years) or very old (>65 years). In seedling stage hardwoods, fire can be helpful in encouraging oaks and hickory

germination and dominance. However, as the trees get into the sapling and pole stages fire can cause serious damage to these species due to thin bark (VDOF).

Burning on a periodic basis also can improve the value of grass and brushland understories for certain wildlife species. Fires can remove accumulated dead plant material and litter that may impede wildlife movement, and encourage the growth of seed-producing forbs, succulent, broadleaf forbs and also can stimulate legume germination. Fire may release nutrients that create dense herbaceous growth necessary for high insect production.

While the role of fire in small game management has become accepted and well used in the southern coastal plains and prairie states, in Virginia the use of fire for habitat manipulation is rare and not well understood. Small controlled burns, with appropriate monitoring and evaluation of primary and secondary effects are recommended as the Refuge begins to implement prescribed fire in wooded habitats.

B. Annual activities for prescribed burn program

Planning will start several months to one year in advance of implementing the burn program. In the case of some fields densely populated with non-native, invasive plants, fields may be pre-treated with herbicide, such as Roundup© or Plateau©, before burns. These herbicides will kill non-natives, and leave dead above-ground fuels. Prescribed fire may then be used to remove litter and prepare seed beds for native plantings.

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

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

Mowing and other site prep will be accomplished for necessary firebreaks. Baseline vegetation and fuel information will be collected and compiled. Annual Prescribed Burn Plan will be prepared and submitted by March 1 for necessary approvals. The Annual Prescribed Burn Program will be implemented as approved by the RFMC.

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

Prescribed burning qualifications will be reviewed in the fall, matching available training courses to agency and personnel needs. Training requests are submitted to the RFMC for further consideration and scheduling. At the Refuge level, most of the burning is of low complexity requiring at a minimum qualifications of Firefighter 2 rating. At least one individual, who meets the qualifications for Prescribed Fire Burn Boss (RXB3), is required as the Burn Boss. In general, three to six individuals (minimally fire qualified) will be required to carry out the prescribed burn program at Back Bay NWR. Considerable assistance can be provided by the District Fire Management Officer and fire crew stationed at Great Dismal Swamp NWR.

C. Correlation with Strategy and Objectives/Burn Season

The prescribed fire program described in this Plan is consistent with the resource management and wildlife research objectives enumerated above. In addition, the Refuge wildfire strategy is

enhanced through the treatment of natural and management generated fuel loads, which might pose a threat to resource values.

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

D. Fire Effects/Fire Behavior Monitoring

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

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

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

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

E. Complexity Analysis

The Complexity Analysis from FIREBASE will be utilized for any burn plans written for BBNWR. This analysis will address factors such as risk of escape, values at risk, fuels, duration of the burn, air quality, type of ignition, burn team size, and treatment objectives.

F. Potential Impacts

Back Bay NWR's Prescribed Fire Program is sensitive to potential adverse impacts. Visitors and neighbors will be notified prior to a planned burn. Most of the planned grassland burn blocks are well within the Refuge boundary, easily accessible, away from public roads, and present few control problems. Threats to human life and property are minimal. Back Bay is bounded by a mixture of suburban and rural landscape. Local hunt clubs often used prescribed fires to manage private emergent marshes for wildlife use. Significant public opposition to prescribed fire for fuels

reduction and wildlife habitat enhancement is not likely, although adverse impacts to the air quality of Virginia Beach, and nearby airfields, are a significant concern..

Smoke management is a critical element of prescribed fire planning at Back Bay. Several roads present concerns for smoke management at each FMU. Wind direction and ignition patterns will be carefully prescribed to carry smoke away from all potentially impacted roadways and airfields. As a further precaution, warning signs or guards will be used on public roads to advise motorists of a burn in progress, if smoke could reduce visibility. Refuge roads adjacent to burn sites will be closed to the public during prescribed burn activities.

Listed below are 13 principles that will guide smoke management planning at Back Bay NWR.

- Have clear objectives. Be sure to have clear resource objectives and consider the impact on the total environment, both on and off-site.
- Obtain and use weather forecasts. Weather information is needed to determine what will happen to smoke, as well as to determine the behavior of fire.
- Do not burn during pollution alerts or temperature inversions. Smoke tends to stay near the ground and not disperse readily.
- Comply with air pollution control regulations. Check with the appropriate agency prior to burning.
- Burn when conditions are good for rapid smoke dispersion. The atmosphere should be slightly unstable so smoke will rise and dissipate rapidly.
- Determine the direction and volume of smoke and use caution when near or upwind of smoke sensitive areas. Burning should be done when wind will carry smoke away from heavily traveled roads, airports, and populated areas.
- Use test fires to confirm smoke behavior. Set test fires in the area proposed for burning, away from roads and other "edge" effects.
- Notify local fire control office and adjacent landowners. Notification will inform potentially impacted residents that it is not a wildfire.
- Use backing fires where possible. Assuming resource management objectives can be met, backing fires produce more complete consumption of fuels and produce less smoke. If other firing methods are used, ensure that fire is hot enough and the weather conditions are suitable to vent smoke into the upper atmosphere.
- Burn in small blocks. The larger the area being burned, the more visibility is reduced downwind and the higher the concentration of particulates put into the air. However, it may be better to burn all of an area when weather conditions are ideal for smoke dispersion.
- Mop-up along roads. Burn out and mop-up operations should be started as soon as possible along roads to reduce smoke impact on visibility.
- Have an emergency plan. Be prepared to control traffic on nearby roads if the wind direction changes. Be prepared to stop a prescribed fire if it is not burning according to plan or if weather conditions change.
- Follow the prescription and burn smart. Burn when duff and soil moisture levels are high enough to prevent smoldering ground fires. Burn under conditions of low relative

humidity and fuel moistures to prevent smoke particles from combining with moisture to produce smog and poor visibility. Avoid days with low transport windspeed (< 2 mph) or low morning mixing heights (< 1500 ft).

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

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

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

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

G. Documentation Requirements

To implement prescribed fire on the Refuge, an Annual Prescribed Fire Plan will be prepared, which addresses the required elements as outlined within the Fire Management Handbook. Guidelines and format for preparing this annual Plan are detailed in Exhibit 1-4-2 of the Fire Management Handbook (June 8, 2001). A copy is included as Appendix N of this FMP. The Plan will be prepared and submitted by the Refuge Biologist, in coordination with the District Fire Management Officer. The Plan is then reviewed by the RFMC and Burn Boss and given final approval by the Refuge Manager.

Prior to burn implementation, a checklist of burn-day actions, as specified within the burn plan and the Fire Management Handbook (2.2-3), is completed and becomes part of the final burn report. Additional documentation includes burn day notifications and contacts, documentation of current, expected, and extended forecasted weather conditions for a 3 to 5 day period beyond the day of the burn. The Burn Boss is responsible for gathering and documenting the above information prior to burn implementation.

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

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

Each individual burn will have a DI-1202 and narrative prepared and entered into the FMIS. The Refuge Biologist is responsible for preparing the DI-1202. A hard copy, along with the documentation listed above, will be kept on file at the Refuge office. A copy will also be sent to the RFMC or District FMO for input into the FMIS.

Critiques will follow the format specified within the Fire Management Handbook (2.2-3). This will be the minimum standard. Additional critique documentation, such as prescribed burn summaries and cost documentation, will be prepared as necessary based on Refuge or Regional needs.

VIII. AIR QUALITY / SMOKE MANAGEMENT GUIDELINES

US Fish and Wildlife Service fire management activities which result in the discharge of air pollutants, (e.g., smoke, carbon monoxide, and other pollutants from fires) are subject to, and must comply with, all applicable federal, state, interstate, and local air pollution control requirements. These requirements are specified by Section 118 of the Clean Air Act, as amended (42 USC 7418). It is not the primary intent of the Clean Air Act to manage the impacts from natural sources of impairment (i.e., wildland fire use for resource objectives and wildfires). Smoke from these fires is an inevitable by-product. Fires are not considered point sources of emissions, but tend to be spatially distributed singular events, and temporary impacts to visibility and visitor enjoyment must be recognized, expected, and managed. This may include temporary closures or warnings during the progress of management approved prescribed fires. Pertinent areas that will demand attention include any of the heavily traveled highway corridors within the acquisition boundary, the city of Virginia Beach, and any other populated areas adjacent to refuge lands. Back Bay NWR will comply with Air Quality-Smoke Management Guidelines listed in the Fire Management Handbook. The fire management program will be in compliance with interstate, state, and local air pollution control regulations, as required by the Clean Air Act. The Refuge Manager or Burn Boss will contact local and state authorities to ascertain all procedures prerequisite to compliance with regulations or permits, or ensure in writing that regulatory requirements will be met. A copy of the Fire Management Plan will be forwarded to the appropriate authorities, if necessary. Personnel from permitting agency will be allowed on-site during prescribed fires and wildland fires used for resource objectives for observational purposes if necessary for their agency needs.

Prescribed burning will be conducted only on days that are acceptable to the permitting agency. Any monitoring activities will be coordinated with the permitting agency and information collected will be made available to them as requested. All burn plans will have clear objectives and will monitor impacts of smoke on the human and natural environments. Current and predicted weather forecasts will be utilized along with test fires to determine smoke dispersal.

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

Considerations useful in managing smoke from longer duration fires include:

Develop contingency plans to limit smoke production if the need arises (may involve suppression on portions of the line).

Establish and maintain close communication with state and local air regulatory agencies regarding status of such fires.

IX. FIRE RESEARCH

Research may be performed to support the fire management program by providing information that is useful or necessary in decision making. Currently, principal research needs in Back Bay national Wildlife Refuge relate to:

A. Assessing the role of fire as a natural process:

- fire history

B. Assessing the effects of fire:

- effects on individual plants
- effects on plant communities
- effects on ungulates
- effects on air
- correlation of fire effects with fire behavior

C. Assessing suitable fire prescriptions for prescribed burning:

- treatment objectives
- fire behavior parameters
- fire types (heading, backing, flank, etc.)
- season of year

X. PUBLIC SAFETY

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

- Limited opportunities to find safety zones for escaping from a fast moving wildfire on the Refuge trail and road system. Refuge visitors will likely not be able to recognize a safe area so emphasis will be to sweep potentially effected areas as quickly as possible.
- Certain areas will be closed to use when the risks to visitors is too high or there are not enough personnel to handle the situation any other way.
- Information concerning fire danger will be disseminated through the Visitor Center contacts, trailhead and bulletin board signing. Any time human life may be endangered, all necessary means will be taken to warn or evacuate visitors and neighboring landowners and other users.
- Smoke on roadways may create a vehicle visibility hazard, from a fire burning nearby or at night under light wind conditions. It could also occur on roadways outside the refuge.

The Refuge Manager or Fire Management Officer will inform the staff of potentially hazardous conditions on the refuge. The Project Leader or appointee will coordinate public and interagency notifications and implement them if a fire should occur. Suppression actions will be taken to mitigate the fire's impact within and outside the refuge. The extent of public notice will depend on the specific fire situation. The following actions should be considered:

- When fire affects travel along any roads in Back Bay NWR, law enforcement or refuge staff will be dispatched to stop or control traffic. The State Patrol and Sheriffs office will be informed and assistance requested as needed.
- When evacuation of an area is recommended, the Project Leader, Refuge Manager, and Regional Fire Management Coordinator will be informed immediately.
- When heavy smoke impacts the Refuge, personnel will be sent to inform people of the situation, assess the area, and clear out if necessary.
- When fire is projected to rapidly spread and threaten sites or trails where visitors are known or strongly suspected to be, an employee will be dispatched to the area by best possible means to notify visitors of the danger. Such individuals will be knowledgeable of fire behavior and fire safety principles to be able to stay with visitors as long as needed to assist them to safety.
- As part of initial and continuing size-up, the Incident Commander will determine the proximity to the fire of any visitors or other land users, inform them of potential hazards, and aid in evacuation if needed. If life is threatened, and the parties do not cooperate, law enforcement assistance may be requested through dispatch.
- When needed, information on location, behavior, expected dangers, areas to avoid, and other precautions will be posted on refuge bulletin boards, and local post offices and businesses.
- When the risks from a wildland fire are high, precautionary signs will be posted on trails and bulliten boards The Prescribed Fire Burn Boss will ensure that closure and/or informational signs

on prescribed burns are properly posted.

A Status Summary (ICS 209) for all fires burning over 24 hours will be provided to the Virginia Interagency Coordination Center. The status summary will be distributed to all divisions on a daily basis.

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

The Fire Information Officer will notify and make media releases on local TV and newspapers, and through electronic mail if needed. The Fire Information Officer will be updated whenever new fire information is available. Additional notification will be made to cooperating agencies, as appropriate.

Ensuring and maintaining firefighter safety is of the utmost importance and takes precedence over rapid suppression targets or goals. The South Canyon Fire in Colorado in 1994 serves to reinforce the need to ensure and maintain firefighter safety. On all actions on wildland fires in Back Bay NWR, the **10 Standard Firefighting Orders** and **18 Situations That Shout Watch Out** will represent **Refuge Policy** and will be strictly adhered to. Failure to maintain communications and to obtain fire behavior predictions and weather forecasts constitute grounds for suppression forces to withdraw from firelines and re-establish tactics. It will be the responsibility of the Fire Safety Officer to ensure that all safety measures are implemented and anyone failing to adhere to fireline safety will be removed from the fire.

The Incident Commander or Burn Boss will ensure that:

- All firefighters will wear proper personal protective equipment.
- All firefighters have completed basic wildland fire training S-130/190. All firefighters on wildfires must have successfully passed the Pack Test within the past year. All firefighters on prescribed burns must have successfully passed the Field Test within the past year.
- Communications is possible with all people involved with the fire.
- Fire weather will be taken at minimum every hour during on going fires.
- Any significant change in fire behavior or weather will be communicated immediately to everyone on the fireline.

XI. PUBLIC INFORMATION AND EDUCATION

Good public relations can engender public support and is prerequisite to a successful fire management program. Failure to provide good public information can be responsible for collapse of the program. Fires can spread very quickly and visibly, necessitating that timely, accurate information concerning both prescribed fire and wildfires be provided to refuge visitors and adjacent landowners.

The Refuge will issue all press releases regarding fire danger levels, closures, special precautions, and prescribed fires to newspapers, radio and television stations. The Project Leader or designee, when necessary, will function as Information Officer, and provide for effective communication between personnel, the public, and the media. The fire management program will be incorporated into the refuge's overall interpretive program and explained when possible and appropriate. At higher staffing classes and/or during periods of high fire activity, an Information Officer will be ordered from outside the refuge.

Prior to prescribed fires, the Refuge Office will inform landowners or agencies located near the

prescribed burn. The Project Leader will initiate a press release as needed. On the day of the burn, all staff should be notified as to the burn's location and any special safety warnings to pass on to visitors, i.e., caution to watch for smoke on the road, or advice not to hike in the area. Key visitor use or access sites where visitors could likely observe or approach the burn area should have temporary signs indicating a prescribed fire is occurring. This provides for public safety and education, and decreases the likelihood that visitors will report or attempt to put out a prescribed fire.

Post-season activities will include those tasks necessary to adequately assess how the local public and cooperators received the efforts. This will be accomplished through coordination meetings with neighbors, contacts with local groups, media, and the State Air Pollution Control Bureau. The purpose of this feedback is to revise plans, procedures and educational efforts regarding overall fire management at Back Bay NWR. The refuge should maintain a file of public comments received concerning prescribed burns, and use them to improve communication efforts targeted at increasing support for the fire management program.

XII. FIRE CRITIQUES AND ANNUAL PLAN REVIEW

This Fire Management Plan will be reviewed and evaluated annually to determine if the objectives have been met and to make necessary revisions. The Refuge Fire Management Staff will conduct this evaluation. Any problems associated with the guidelines or standards set for fire management, cost effectiveness and suppression will be addressed through revision or addendum and made a part of this plan. The Project Leader and Regional Fire Management Coordinator will approve all revisions, with concurrence of the Regional Director.

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

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

All entrapment and fire shelter deployments will be reviewed in accordance with the Fire Management Handbook 3.6.2 Fire Reviews.

XIII. CONSULTATION AND COORDINATION

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

The Refuge Manager and District Fire Management Officer are responsible for coordination and consultation with cooperators regarding fire management activities. This includes involvement with the Region 5 Fire Management Coordinator; Region 5 Fire Ecologist; Region 5 South District FMO; Virginia Interagency Coordination Center; U.S. Forest Service, U.S. Fish and Wildlife Service; Virginia State Department of Forestry; City of Virginia Beach, City of Poquoson and local cooperators.

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

John Gallegos, Refuge Biologist & Prescribed Burn Boss, Back Bay NWR

Allen Carter, Region 5 Fire Management Coordinator, Great Dismal Swamp NWR

Laura Mitchell, Region 5 Fire Ecologist, Prime Hook NWR

Gary Kemp, Region 5 South District Fire Management Officer, Great Dismal Swamp NWR

XIV. APPENDICES

APPENDIX A: REFERENCES CITED

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APPENDIX B: DEFINITIONS

Agency Administrator. The appropriate level manager having organizational responsibility for management of an administrative unit. May include Director, State Director, District Manager or Field Manager (BLM); Director, Regional Director, Complex Manager or Project Leader (FWS); Director, Regional Director, Park Superintendent, or Unit Manager (NPS), or Director, Office of Trust Responsibility, Area Director, or Superintendent (BIA).

Appropriate Management Action. Specific actions taken to implement a management strategy.

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

Appropriate Management Strategy. A plan or direction selected by an agency administrator which guide wildland fire management actions intended to meet protection and fire use objectives.

Appropriate Suppression. Selecting and implementing a prudent suppression option to avoid unacceptable impacts and provide for cost-effective action.

Bureau. Bureaus, offices or services of the Department.

Class of Fire (as to size of wildland fires):

Class A - ¼ acre or less.

Class B - more than ¼ but less than 10 acres.

Class C - 10 acres to 100 acres.

Class D - 100 to 300 acres.

Class E - 300 to 1,000 acres.

Class F - 1,000 to 5,000 acres.

Class G - 5,000 acres or more.

Emergency Fire Rehabilitation/Burned Area Emergency Rehabilitation (EFR/BAER). Emergency actions taken during or after wildland fire to stabilize and prevent unacceptable resource degradation or to minimize threats to life or property resulting from the fire. The scope of EFR/BAER projects are unplanned and unpredictable requiring funding on short notice.

Energy Release Component (ERC). A number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. It is generated by the National Fire Danger Rating System, a computer model of fire weather and its effect on fuels. The ERC incorporates thousand hour dead fuel moistures and live fuel moistures; day to day variations are caused by changes in the moisture content of the various fuel classes. The ERC is derived from predictions of (1) the rate of heat release per unit area during flaming combustion and (2) the duration of flaming.

Extended attack. A fire on which initial attack forces are reinforced by additional forces.

Fire Suppression Activity Damage. The damage to lands, resources and facilities directly attributable to the fire suppression effort or activities, including: dozer lines, camps and staging areas, facilities (fences, buildings, bridges, etc.), handlines, and roads.

Fire effects. Any consequences to the vegetation or the environment resulting from fire, whether neutral, detrimental, or beneficial.

Fire intensity. The amount of heat produced by a fire. Usually compared by reference to the length of the flames.

Fire management. All activities related to the prudent management of people and equipment to prevent or suppress wildland fire and to use fire under prescribed conditions to achieve land and resource management objectives.

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

Fire prescription. A written direction for the use of fire to treat a specific piece of land, including limits and conditions of temperature, humidity, wind direction and speed, fuel moisture, soil moisture, etc., under which a fire will be allowed to burn, generally expressed as acceptable range of the various fire-related indices, and the limit of the area to be burned.

Fuels. Materials that are burned in a fire; primarily grass, surface litter, duff, logs, stumps, brush, foliage, and live trees.

Fuel loadings. Amount of burnable fuel on a site, usually given as tons/acre.

Hazard fuels. Those vegetative fuels which, when ignited, threaten public safety, structures and facilities, cultural resources, natural resources, natural processes, or to permit the spread of wildland fires across administrative boundaries except as authorized by agreement.

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

Maintenance burn. A fire set by agency personnel to remove debris; i.e., leaves from drainage ditches or cuttings from tree pruning. Such a fire does not have a resource management objective.

Natural fire. A fire of natural origin, caused by lightning or volcanic activity.

NFDRS Fuel Model. One of 20 mathematical models used by the National Fire Danger Rating System to predict fire danger. The models were developed by the US Forest Service and are general in nature rather than site specific.

NFFL Fuel Model. One of 13 mathematical models used to predict fire behavior within the conditions of their validity. The models were developed by US Forest Service personnel at the Northern Forest Fire Laboratory, Missoula, Montana.

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

Prescribed Fire. A fire ignited by agency personnel in accord with an approved plan and under prescribed conditions, designed to achieve measurable resource management objectives. Such a fire is designed to produce the intensities and rates of spread needed to achieve one or more planned benefits to natural resources as defined in objectives. Its purpose is to employ fire scientifically to realize maximize net benefits at minimum impact and acceptable cost. A written, approved prescribed fire plan must exist and NEPA requirements must be met prior to ignition. NEPA requirements can be met at the land use or fire management planning level.

Preparedness. Actions taken seasonally in preparation to suppress wildland fires, consisting of hiring and training personnel, making ready vehicles, equipment, and facilities, acquiring supplies, and updating agreements and contracts.

Prevention Activities directed at reducing the number or the intensity of fires that occur, primarily by reducing the risk of human-caused fires.

Rehabilitation (1) Actions to limit the adverse effects of suppression on soils, watershed, or other values, or (2) actions to mitigate adverse effects of a wildland fire on the vegetation-soil complex, watershed, and other damages.

Suppression. A management action intended to protect identified values from a fire, extinguish a fire, or alter a fire's direction of spread.

Unplanned ignition. A natural fire that is permitted to burn under specific conditions, in certain locations, to achieve defined resource objectives.

Wildfire. An unwanted wildland fire.

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

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

Wildland/urban interface fire A wildland fire that threatens or involves structures.

APPENDIX C: DELEGATION OF AUTHORITY

_____ is assigned as Incident Commander on the _____ Fire. You have full authority and responsibility for managing the fire suppression activities within the framework of law, agency policy, and direction provided in the Overhead Briefing and/or Wildland Fire Situation Analysis.

Your primary responsibility is to organize and direct your assigned and ordered resources for efficient and effective suppression of the fire. You are accountable to the Refuge Manager or his designated representative listed below. Financial limitations will be consistent with the best approach to the values at risk.

Specific direction for the _____ Fire covering management and environmental concerns are as follows:

_____ will represent me on any occasion that I am not immediately available. This

authority is effective as of _____.

Refuge Manager

Date/Time

WILDLAND FIRE SITUATION ANALYSIS

Incident Name: _____

Jurisdiction: _____

Date and Time Completed: _____

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

Section I, WFSA Information Page

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

items used.

I. Wildland Fire Situation Analysis	
To be completed by the Agency Administrator(s)	
A. Jurisdiction(s)	B. Geographic Area
C. Unit(s)	D. WFSA #
E. Fire Name	F. Incident #
G. Accounting Code:	
H. Date/Time Prepared _____ @ _____	
I. Attachments	
- Complexity Matrix/Analysis *	_____
- Risk Assessment/Analysis *	_____
Probability of Success *	_____
Consequences of Failure *	_____
- Maps *	_____
- Decision Tree **	_____
- Fire Behavior Projections *	_____
- Calculations of Resource Requirements *	_____

- Other (specify) _____

* Required

** Required by FWS

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

Section II. Objectives and Constraints

- A. Objectives: Specify objectives that must be considered in the development of alternatives. Safety objectives for firefighter, aviation, and public must receive the highest priority. Suppression objectives must relate to resource management objectives in the unit resource management plan.

Economic objectives could include closure of all or portions of an area, thus impacting the public, or impacts to transportation, communication, and resource values.

Environmental objectives could include management objectives for airshed, water quality, wildlife, etc.

Social objectives could include any local attitudes toward fire or smoke that might affect decisions on the fire.

Other objectives might include legal or administrative constraints which would have to be considered in the analysis of the fire situation, such as the need to keep the fire off other agency lands, etc.

- B. Constraints: List constraints on wildland fire action. These could include constraints to designated wilderness, wilderness study areas, environmentally or culturally sensitive areas, irreparable damage to resources or smoke management/air quality concerns. Economic constraints, such as public and agency cost, could be considered here.

II.

Objectives and Constraints

To be Completed by the Agency Administrator(s)

A. Objectives (Must be specific and measurable)

1. *Safety*

- Public

- Firefighter

2. *Economic*

3. *Environmental*

4. *Social*

5. *Other*

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

Section III. Alternatives

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

III. Alternatives (To be completed by FMO / IC)
--

	A	B	C
A. Wildland Fire Strategy			
B. Narrative			
C. Resources needed			
Handcrews	_____	_____	_____
Engines	_____	_____	_____
Dozers	_____	_____	_____
Airtankers	_____	_____	_____
Helicopters	_____	_____	_____
D. Final Size			
E. Est. Contain/ Control Date			
F. Costs			

G. Risk Assessment - Probability of success - Consequence of failure	<hr/> <hr/>	<hr/> <hr/>	<hr/> <hr/>
H. Complexity			

I. Attach maps for each alternative

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

Section IV. Evaluation of Alternatives

- A. Evaluation Process: Conduct an analysis for each element of each objective and each alternative. Objectives shall match those identified in Section II.A. Use the best estimates available and quantify whenever possible. Provide ratings for each alternative and corresponding objective element. Fire effects may be negative, cause no change, or may be positive. Examples are: 1) a system which employs a "-" for negative effect, a "0" for no change, and a "+" for positive effect; 2) a system which uses a numeric factor for importance of the consideration (soils, watershed, political, etc.) and assigns values (such as -1 to +1, - 100 to +100, etc.) to each consideration, then arrives at a weighted average. If you have the ability to estimate dollar amounts for natural resource and cultural values, this data is preferred. Use those methods which are most useful to managers and most appropriate for the situation and agency. To be able to evaluate positive fire effects, the area must be included in the resource management plan and consistent with prescriptions and objectives of the fire management plan.

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

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

IV.

Evaluation of Alternatives

To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander

A. Evaluation Process	A	B	C
<p>Safety</p> <p>Firefighter</p> <p>Aviation</p> <p>Public</p>			
<p><i>Sum of Safety Values</i></p>			
<p>Economic</p> <p>Forage</p> <p>Improvements</p> <p>Recreation</p> <p>Timber</p> <p>Water</p> <p>Wilderness</p> <p>Wildlife</p> <p>Other (specify)</p>			
<p><i>Sum of Economic Values</i></p>			

<p>Environmental</p> <p>Air</p> <p>Visual</p> <p>Fuels</p> <p>T & E Species</p> <p>Other (specify)</p>			
<p><i>Sum of Environmental Values</i></p>			
<p>Social</p> <p>Employment</p> <p>Public Concern</p> <p>Cultural</p> <p>Other (Specify)</p>			
<p><i>Sum of Social Values</i></p>			
<p>Other</p>			

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

Section V. Analysis Summary

- A. Compliance with Objectives: Prepare narratives that summarize each alternative's effectiveness in meeting each objective. Alternatives that do not comply with objectives are not acceptable. Narrative could be based on effectiveness and efficiency. For example: "most effective and least efficient," "least effective and most efficient," or "effective and efficient." Or answers could be based on a two-tiered rating system such as "complies with objective" and "fully complies with or exceeds objective." Use a system that best fits the manager's needs.
- B. Pertinent Data: Data for this Section has already been presented, and is duplicated here to help the Agency Administrator(s) confirm their selection of an alternative. Final Fire Size is displayed in Section III.D. Complexity is calculated in the attachments and displayed in Section III.H. Costs are displayed on page 4. Probability of Success/Consequences of Failure is calculated in the attachments and displayed in Section III.G.
- C. External and Internal Influences: Assign information and data occurring at the time the WFSA is signed. Identify the Preparedness Index (1 through 5) for the National and Geographic levels. If available, indicate the Incident Priority assigned by the MAC Group. Designate the Resource Availability status. This information is available at the Geographic Coordination Center, and is needed to select a viable alternative. Designate "yes," indicating an up-to-date weather forecast has been provided to, and used by, the Agency Administrator(s) to evaluate each alternative. Assign information to the "Other" category as needed by the Agency Administrator(s).

Section IV. Decision

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

V.

Analysis Summary

To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander

Alternatives	A	B	C
A. Compliance with Objectives Safety Economic Environmental Social Other			
B. Pertinent Data Final Fire Size Complexity Suppression Cost Resource Values Probability of Success Consequences of Failure			

C. External / Internal Influences

National & Geographic

Preparedness Level _____

Incident Priority _____

Resource Availability _____

Weather Forecast

(long-range) _____

Fire Behavior Projections _____

VI.

Decision

The Selected Alternative is: _____

Rationale:

Agency Administrator's Signature

Date/Time

This Section is completed by the Agency Administrator(s) or designate.

Section VII. Daily Review

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

Section VIII. Final Review

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

VIII.

Daily Review

To be completed by the Agency Administrator(s) or Designate

Selected to be reviewed daily to determine if still valid until containment or control

	P R E P A R E D N E S S L E V E L	I N C I D E N T P R I O R I T Y	R E S O U R C E A V A I L A B I L I T Y	W E A T H E R F O R E C A S T	F I R E B E H A V I O R P R O J E C T I O N S	W F S A V A L I D
--	---	--	--	---	---	---

Date	Time	By	
------	------	----	--

If WFSA is no longer valid, a new WFSA will be completed!	
VIII. Objectives	Final Review
The elements of the selected alternative were met on: _____ <div style="display: flex; justify-content: space-around; width: 100%;"> Date Time </div>	
By: _____ (Agency Administrator(s))	

A GUIDE FOR ASSESSING FIRE COMPLEXITY

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

Use of the Guide:

1. Analyze each element and check the response "yes" or "no."
2. If positive responses exceed, or are equal to, negative responses within any primary factor (A through G), the primary factor should be considered as a positive response.

3. If any three of the primary factors (A through G) are positive responses, this indicates the fire situation is, or is predicted to be, Type I.
4. Factor H should be considered after all the above steps. If more than two of these items are answered "yes," and three or more of the other primary factors are positive responses, a Type I team should be considered. If the composites of H are negative, and there are fewer than three positive responses in the primary factors (A-G), a Type II team should be considered. If the answers to all questions in H are negative, it may be advisable to allow the existing overhead to continue action on the fire.

GLOSSARY OF TERMS

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

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

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

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

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

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

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

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

FIRE COMPLEXITY ANALYSIS

		Yes/No
A.	FIRE BEHAVIOR: Observed or Predicted	
	1. Burning Index (from on-site measurement of weather conditions). Predicted to be above the 90% level using the major fuel model in which the fire is burning.	_____
	2. Potential exists for "blowup" conditions (fuel moisture, winds, etc.)	___ ___
	3. Crowning, profuse or long-range spotting.	___ ___
	4. Weather forecast indicating no significant relief or worsening conditions.	___ ___
	Total	___ ___
B.	RESOURCES COMMITTED	
	1. 200 or more personnel assigned.	___ ___
	2. Three or more divisions.	___ ___
	3. Wide variety of special support personnel.	___ ___
	4. Substantial air operation which is not properly staffed.	___ ___
	5. Majority of initial attack resources committed.	___ ___
	Total	___ ___
C.	RESOURCES THREATENED	
	1. Urban interface.	___ ___
	2. Developments and facilities.	___ ___
	3. Restricted, threatened or endangered species habitat.	___ ___
	4. Cultural sites.	___ ___
	5. Unique natural resources, special designation Districts or wilderness.	___ ___
	6. Other special resources.	___ ___
	Total	___ ___
D.	SAFETY	

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

- E. OWNERSHIP **Yes/No**
- 1. Fire burning or threatening more than one jurisdiction. _____
 - 2. Potential for claims (damages). _____
 - 3. Conflicting management objectives. _____
 - 4. Disputes over fire management responsibility. _____
 - 5. Potential for unified command. _____
- Total** _____

- F. EXTERNAL INFLUENCES
- 1. Controversial wildland fire management policy. _____
 - 2. Pre-existing controversies/relationships. _____
 - 3. Sensitive media relationships. _____
 - 4. Smoke management problems. _____
 - 5. Sensitive political interests. _____
 - 6. Other external influences. _____
- Total** _____

- G. CHANGE IN STRATEGY
- 1. Change in strategy to control from confine or contain. _____

- 2. Large amount of unburned fuel within planned perimeter. ___ ___
- 3. WFSA invalid or requires updating. ___ ___
- Total** ___ ___

H. EXISTING OVERHEAD

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

Signature _____

Date _____ **Time** _____

APPENDIX E: PROJECT FIRE TRANSITION GUIDE

The following guidelines are for the orderly transition of fire management responsibilities to incoming Incident Management Teams. Some information will need to be in writing and some may be given verbally.

Assumption of Responsibilities

1. The assumption of an incident by a team must be as smooth and orderly as possible. The local Incident Commander (IC) already in place is in charge until officially released. Release should not occur until all incoming team members are fully briefed.
2. The ordering unit should specify the expected time of arrival and expected time of transition by the incoming team.
3. The ordering unit should accomplish the following prior to the arrival of the incoming team:
 - a) Determine Incident Command Post (ICP)/Base location.
 - b) Order support equipment, supplies, and initial basic support organization for the incident.
 - c) Secure an ample supply of appropriate maps.
 - d) Determine transportation needs of the team and obtain needed vehicles.
 - e) Schedule agency administrator briefing time and location.
 - f) Obtain necessary communications equipment and support for the incident.

Agency Administrator Briefing

This briefing should take place as soon as the incoming team is completely assembled. The Administrator (or designated representative) should provide the following information to the team:

Overview

1. Name and number of the incident
2. Name of the current IC
3. Approximate size of fire, location, and land status
4. General weather conditions at the incident site
5. Experienced fire behavior
6. Fuel types
7. Current tactics
8. ICP and Base locations
9. Other factors impacting strategy and resources
10. Written delegation of authority to the incoming IC

11. Recommended local participation in the team organization
12. Information about existing or anticipated Unified Command organization (if any)
13. Presence of agency evaluation team (if assigned)
14. Names and skills of technical specialists assigned to the incident
15. Local fire policy
16. Concerns relating to resource values, improvements, wilderness and roadless areas, cultural resources, rare and endangered species, etc.
17. Priorities for control
18. News media procedures
19. Political considerations
20. Agreements in effect
21. Agency position on trainee assignments
22. Other agencies already on the incident and agency representatives
23. Desired date and time when team transition will occur
24. Safety issues
 - a) Accidents to date
 - b) Status of accident reports
 - c) Areas with existing or potential hazardous materials Operations (Considered in I.C. briefing)

1. Strategy
2. Tactics

Planning

1. Local unusual fire behavior and fire history in the vicinity of the incident
2. Legal considerations (current investigations in progress)
3. Pre-attack or resource protection plans available to the team
4. Local agency needs for release of in-place resources
5. Incident Status Summary (ICS-209) reporting requirements
6. Copy of the current Incident Status Summary
7. Training Specialist assigned or ordered

8. Status of current team
9. Status of local agency personnel
10. Agency capabilities for team operations support
11. Agency rest and rotation policies
12. Agency rehabilitation policies
13. Agency demobilization concerns

Logistics

1. Transportation routes
2. Ordering system to be used
3. Procurement Unit in place or ordered
4. Procedures for feeding incident personnel
5. Available sleeping facilities
6. Local medical facilities
7. Nearest burn/trauma center
8. Contacts with local law enforcement agencies

Finance

1. Fiscal limitations and constraints
2. Cost-sharing arrangements affecting the incident
3. Contracting Officer assigned
4. Potential for claims

APPENDIX F: STAFFING CLASS

Table 3 - Step-up staffing classes for Back Bay NWR

Step-up Staffing class (fuel model N)		
Staffing Class	Burning Index	Actions
I (Low)	0–2.0	<p>Prevention - Prevention activities can be grouped into two categories: Refuge activities; and coordination with other agencies. During low fire danger situations, Refuge activities will represent the major prevention activities. Visitors, should use public use areas only; no open fires and to totally refrain from the use of any fireworks or explosives.</p> <p>Detection - Refuge personnel will carry out normally assigned duties.</p> <p>Preparedness - Refuge personnel will carry out normally assigned duties.</p>
II (Moderate)	21-40	<p>Prevention - Refuge actions described above under conditions of low fire danger will be sufficient for conditions of moderate fire danger. No additional Refuge actions or coordination with other agencies are necessary.</p> <p>Detection - Personnel to carry out normally assigned duties.</p> <p>Preparedness - A minimum of one slip-on pump unit for the Refuge will be prepared for operation. Fire suppression tools will be added to Refuge vehicles involved in field operations.</p>
III (High)	41-81	<p>Prevention - In addition to the steps to be taken during periods of low and moderate fire danger, visitors will be warned of the level of fire danger and restrictions will be implemented against any smoking in the Refuge's back country. Refuge activities may include notification of local cooperators of increasing fire danger.</p> <p>Detection - Personnel to carry out normally assigned field duties with special emphasis on fire detection.</p> <p>Preparedness - Fire suppression tools will be added to all Refuge vehicles. A minimum of one slip-on pump unit will be installed and made operable in pick-up truck. Each equipped vehicle will carry sufficient tools and supplies to sustain initial attack until first reinforcements can arrive on a fire.</p>
IV (Very High)	82-98	<p>Prevention - All previously mentioned prevention activities would be conducted. In addition, Refuge activities will be stepped-up to include notification of local and regional cooperators. Coordination with other agencies will increase in terms of both short and long range planning, public notification, coordinated prevention activities, and increased cooperation.</p> <p>Detection - Refuge personnel will carry on normally assigned detection duties. FMO may designate one or more personnel to part or fulltime road patrol. Patrols may be increased at the discretion of the FMO or RFMC.</p> <p>Preparedness - All available slip-on pumps will be placed on appropriate Refuge vehicles and made fire-suppression ready; i.e., in working condition, water tanks full, etc. All appropriate Refuge vehicles will be stocked with initial attack fire-tools and supplies. All Refuge personnel qualified and assigned fire suppression duties will be placed on one-hour call-up notice. Notice will be forwarded to the neighboring offices and Regional Office of the very high fire danger condition. Daily availability of additional local, regional, and national resources will be monitored.</p>
V (Extreme)	99+	<p>Prevention - In addition to all steps detailed above, visitors to the Refuge will be orally warned of the fire danger conditions, and no open fires will be permitted. Refuge activities will be continually ongoing through Refuge personnel or cooperators' efforts. Daily notification of Regional Office FMO will be completed to enable public notification from that office. Cooperators will be continually updated in regard to conditions and opportunities for bans on open burning or related activities.</p> <p>Detection - Fire patrols will be increased in the number of personnel patrolling, in the frequency and in the extent of these patrols. Specially placed lookouts may be ordered as the conditions warrant, at the discretion of the FMO.</p> <p>Preparedness - In addition to preparedness steps taken for low-moderate-high-very high fire danger conditions, The Regional Office will be kept informed of current conditions. The locations of all work crews will be monitored and all fire suppression personnel will be kept on a 15-minute call-up notice. Daily situation reports will reflect the fire danger situation. Neighboring FMOs, cooperators, and other organizations will be updated periodically regarding the situation. Consideration will be given to pre-positioning additional local or regional suppression resources to supplement suppression capabilities. Fire information will be provided daily to visitors, cooperators, Regional Office, and local media. Refuge fire staff will be on standby and Project Leader or Acting will be available.</p>

APPENDIX G: FIRE HISTORY TABLES

Records of fires on refuge lands were initiated in 1990. Fire history is illustrated in tables 1, 2, and 3.

Table 1: Number of fires recorded (1990-2000)

Cause	Number	Percent	Acres
Human	1	14	3.0
Lightning	0	0	
Unknown	6	86	124.5
Total	7	100	127.5

Table 2: Number of fires by size class (fires)

	Size Class (acres)				
Number and percent of fires	A	B	C	D	E
	0 - .25	.25 - 9	10 - 99	100 - 299	300 +
Number	1	1	5		
Percent	14.5	14.5	71		

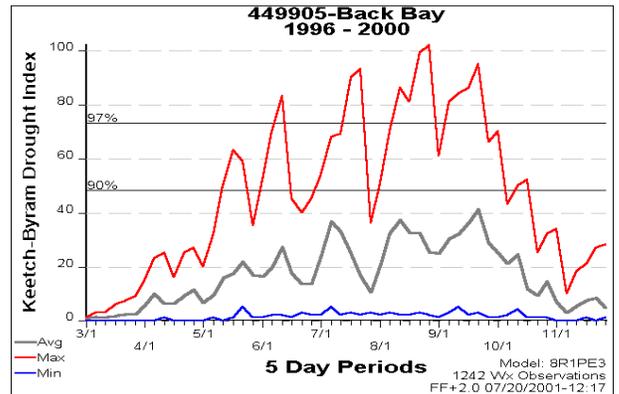
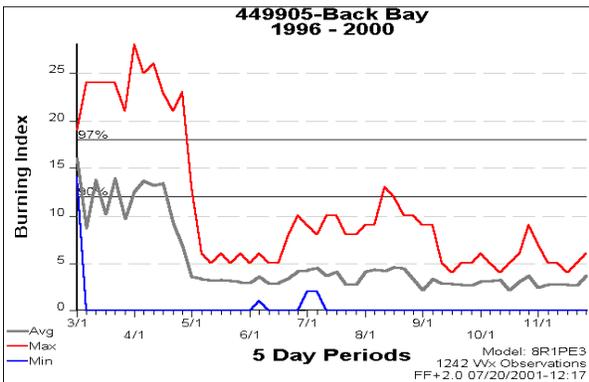
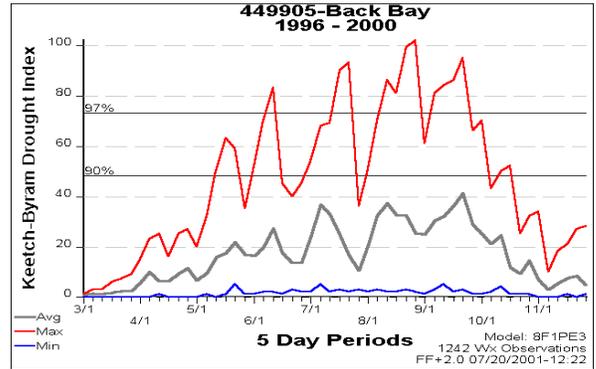
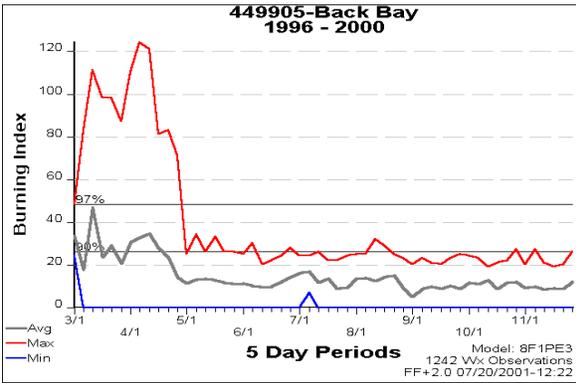
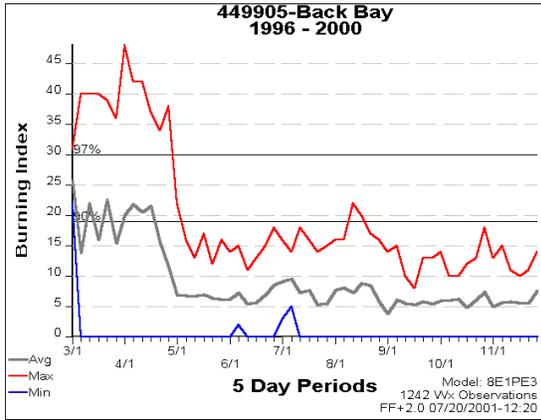
Table 3: Fire by period of occurrence (7 fires)

	Months											
	J a n u a r y	F e b r u a r y	M a r c h	A p r i l	M a y	J u n e	J u l y	A u g u s t	S e p t e m b e r	O c t o b e r	N o v e m b e r	D e c e m b e r
Number of fires	0	3	2	0	1	0	0	0	0	0	0	1

The 7 recorded fires (1990-2000) reflect only those fires on which some suppression action was taken. From

refuge personnel observations, there is evidence that a number of unrecorded fires occur on refuge lands. These unrecorded fires apparently are extinguished by rain or simply burn themselves out before being seen and recorded. There is no reasonable estimate available for the numbers or frequency of unrecorded fires that have occurred. The size of such fires has remained small and the fires are obviously of short duration. Of the 7 recorded fires between 1995 and 2000, 6 were believed to be arson caused and one may have been accidental or an electrical fire.

APPENDIX H: NFDRS FUEL MODELS AND INDICES USED IN STAFFING PLANS



APPENDIX I - REQUEST FOR CULTURAL RESOURCE COMPLIANCE (RCRC)

REQUEST FOR CULTURAL RESOURCE COMPLIANCE

U.S. Fish and Wildlife Service, Region 5

Appendix Determination _____	Date rec'd by CRT: _____
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PROJECT NAME:					PROGRAM: <small>(PARTNERS, REFUGES, JITW, WSECP, ETC.)</small>	
STATE:		ECOREGION:			FWS UNIT: ORG CODE:	
PROJECT LOCATION:	COUNTY	TOWNSHIP	RANGE	SECTION	FWS CONTACT: NAME, TEL#, ADDRESS	
USGS QUAD:					DATE OF REQUEST:	
TOTAL PROJECT ACRES/LINEAR FT/M:		APE ACRES / LINEAR FT/M (IF DIFFERENT)			PROPOSED PROJECT START DATE:	
MAPS ATTACHED		CHECK BELOW				
COPY OF PORTION OF USGS QUAD WITH PROJECT AREA MARKED CLEARLY (REQUIRED)				PROJECT (SKETCH) MAP SHOWING AREA OF POTENTIAL EFFECT WITH LOCATIONS OF SPECIFIC GROUND ALTERING ACTIVITIES (REQUIRED)		
PHOTOCOPY OF AERIAL PHOTO SHOWING LOCATION (IF AVAILABLE)				ANY OTHER PROJECT PLANS, PHOTOGRAPHS, OR DRAWINGS THAT MAY HELP CRT IN MAKING DETERMINATION (IF AVAILABLE)		
DIRECTIONS TO PROJECT: <small>(IF NOT OBVIOUS)</small>						

<p>DESCRIPTION OF UNDERTAKING:</p>	<p>DESCRIBE PROPOSED PROJECT AND MEANS TO FACILITATE (E.G., PROVIDE FUNDS TO REVEGETATE 1 MILE OF RIPARIAN HABITAT, RESTORE 250 ACRES OF SEASONAL WETLANDS, AND CONSTRUCT A 5-ACRE PERMANENT POND). HOW IS THE PROJECT DESIGNED (E.G., INSTALL 2 MILES OF FENCE AND CREATE APPROXIMATELY 25' OF 3' HIGH CHECK DAM)?</p>
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<p>AREA OF POTENTIAL EFFECTS (APE):</p>	<p>DESCRIBE WHERE DISTURBANCE OF THE GROUND WILL OCCUR. WHAT ARE THE DIMENSIONS OF THE AREA TO BE DISTURBED? HOW DEEP WILL YOU EXCAVATE? HOW FAR APART ARE FENCEPOSTS? WHAT METHOD ARE YOU USING TO PLANT VEGETATION? WHERE WILL FILL BE OBTAINED? WHERE WILL SOIL BE DUMPED? WHAT TOOLS OR EQUIPMENT WILL BE USED? ARE YOU REPLACING OR REPAIRING A STRUCTURE? WILL YOU BE MOVING DIRT IN A RELATIVELY UNDISTURBED AREA? WILL THE PROJECT REACH BELOW OR BEYOND THE LIMITS OF PRIOR LAND DISTURBANCE? DIFFERENTIATE BETWEEN AREAS SLATED FOR EARTH MOVEMENT VS. AREAS TO BE INUNDATED ONLY. IS THE AREA TO BE INUNDATED DIFFERENT FROM THE AREA INUNDATED TODAY, IN THE RECENT PAST, OR UNDER NATURAL CONDITIONS? PROVIDE ACRES AND/OR LINEAR FT/M FOR ALL ELEMENTS OF THE PROJECT.</p>
<hr/>	
<p>ENVIRONMENTAL AND CULTURAL SETTING:</p>	<p>BRIEFLY DESCRIBE THE ENVIRONMENTAL SETTING OF THE APE. A) WHAT WAS THE NATURAL HABITAT PRIOR TO MODIFICATIONS, RECLAMATION, AGRICULTURE, SETTLEMENT? B) WHAT IS LAND-USE HISTORY? WHEN WAS IT FIRST SETTLED, MODIFIED? HOW DEEP HAS IT BEEN CULTIVATED, GRAZED, ETC.? C) WHAT IS LAND USE AND HABITAT TODAY? WHAT NATURAL AGENTS (E.G., SEDIMENTATION, VEGETATION, INUNDATION) OR CULTURAL AGENTS (E.G., CULTIVATION) MIGHT AFFECT THE ABILITY TO DISCOVER CULTURAL RESOURCES? D) DO YOU (OR DOES ANYBODY ELSE) KNOW OF CULTURAL RESOURCES IN OR NEAR THE PROJECT AREA?</p>
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APPENDIX J - NORMAL BACK BAY NWR STRENGTH INVENTORY

ONE **1994 CHEVROLET CHEYENNE, 1 TON PICK-UP TRUCK** WITH DUAL REAR WHEELS - USED TO CARRY REFUGE SLIP-ON PUMPER UNIT, AND TOW TRAILER PUMPER UNIT.

ONE **SLIP-ON PUMPER UNIT**, WAJAX-PACIFIC 100 GALLON FIBERGLASS TANK WITH ½" HOSE REEL AND B1-11 BRIGGS & STRATTON PUMP, WITH 2 00' OF 1½" HOSE, NOZZLES AND ACCESSORIES.

ONE **TRAILER PUMPER UNIT**, WITH SIMS 200 GALLON FIBERGLASS TANK ;WITH ½" HOSE REEL AND B1-11 BRIGGS & STRATTON PUMP. MOUNTED ON FOUR WHEELS WITH HEAVY DUTY BALL-TOW HITCH, WITH THREE TOOL AND ACCESSORIES COMPARTMENTS. CARRIES 200' OF 1 ½" HOSE, NOZZLES & ACCESSORIES.

TWO **MARK 3 PORTABLE PUMPS**, WAJAX-PACIFIC, WITH 150' OF 1" HOSES , FUEL CAN, AND ACCESSORIES.

ONE **FIRE WEATHER STATION**, FORESTRY TECHNOLOGY SERVICES, WITH DATALOGGER, MODEM, COMPUTER DATABASE, AND THE FOLLOWING ELECTRONIC SENSORS: WIND DIRECTION, WIND SPEED, HUMIDITY, AIR TEMPERATURE, FUEL MOISTURE, FUEL TEMPERATURE AND RAIN GAUGE.

ONE **FIRE PLOW**, THAT PROVIDES A 4' WIDE DITCH WITH AN ADDITIONAL 2' OF FILL PUSHED TO EITHER SIDE.

THREE **DRIP-TORCHES**, WAJAX-PACIFIC WITH DIESEL-GASOLINE FUEL MIX.

THE FOLLOWING **HAND TOOLS**:

PULASKIS - 3

FIRE RAKES - 3

GRASS RAKES (IRON) - 3

FIRE SHOVELS (SPADES) - 6

“FLAPPERS/BEATERS” - 3

ONE **ALL-TERRAIN-VEHICLE WITH 15 GALLON WATER SPRAYING UNIT**, WITH ELECTRIC PUMP

THREE **BACK-PACK WATER PUMPS**, 10 GALLON “YELLOW BAGS” WITH TROMBONE PUMPS & NOZZLES

THREE **FIRE RADIOS**: 2 WALKIE-TALKIES & 1 MOBILE VEHICLE UNIT (IN CHEYENNE FIRE TRUCK)

THE FOLLOWING **BACK BAY NWR PRESCRIBED BURN TEAM**:

PRESCRIBED BURN BOSS -1

PUMPER OPERATOR - 1-2

IGNITION SPECIALIST - 1-2

DISPATCHER - 1

OBSERVER/WEATHER SPECIALIST - 1

ALL FIVE REFUGE FIRE PERSONNEL ARE PROPERLY EQUIPPED WITH THE FOLLOWING SAFETY GEAR:

FIRE HELMET & GOGGLES

NOMEX FIRE SHIRTS AND PANTS

HEAVY-DUTY, LEATHER "RED-WING" FIRE BOOTS

FIRE SHELTER

"RED-BAG" FOR TRANSPORTING FIRE GEAR

WEB-GEAR, PISTOL-BELT, "YELLOW-BAG" AND "FANNY-PACK" FOR CARRYING PERSONAL GEAR TO FIRE

TWO WATER BOTTLES

ASSORTED MISCELLANEOUS SUPPLIES, SUCH AS EAR-PLUGS, EAR-PROTECTORS, FIRST-AID KITS, NIGHT-LAMPS, "GLO-STICKS," ETC.

APPENDIX K - BACK BAY NWR FIRE DISPATCH PLAN

I. WHEN A REPORT OF SMOKE OR FIRE IS RECEIVED, GET AS MUCH INFORMATION FROM THE CALLER AS POSSIBLE. THE FOLLOWING INFORMATION SHOULD BE FILLED IN:

----LOCATION OF SMOKE OR FIRE?

----NAME, PHONE NUMBER, AND LOCATION OF CALLER?

----COLOR OF SMOKE?

----SIZE AND TYPE OF FIRE?

----CHARACTER OF FIRE (RUNNING, CREEPING, SMOLDERING, ETC.)?

----IS ANYONE FIGHTING THE FIRE?

----DID THEY SEE ANYONE IN THE VICINITY, OR A VEHICLE LEAVING THE FIRE AREA?

----WEATHER AT THE FIRE LOCATION?

II DISPATCH CHECK-LIST

A. CHECK MAP LOCATION OF FIRE AND OWNERSHIP/PROTECTION STATUS (IS RESPONSE NECESSARY?).

B. IF FIRE IS ON, OR THREATENING REFUGE, CONTACT REFUGE PRESCRIBED BURN BOSS. ASK IF WE SHOULD DISPATCH REFUGE 200 GALLON PUMPER AND THREE QUALIFIED STAFF, AND/OR NOTIFY REGIONAL FIRE MANAGEMENT OFFICER AT GREAT DISMAL SWAMP NWR..

C. IF FIRE IS NOT ON REFUGE, NOR THREATENING REFUGE, AND ADDITIONAL RESPONSE IS NEEDED, NOTIFY VIRGINIA BEACH FIRE DEPARTMENT (911).

D. NOTIFY PROJECT LEADER, OR ACTING PROJECT LEADER.

E. NOTIFY FIRE WARDEN (TELEPHONE 757-426-7832) AND STATE FORESTRY DEPARTMENT (PORTSMOUTH - 757-465-6840).

F. IF FIRE DANGER IS VERY HIGH OR EXTREME CONTACT REGIONAL FIRE MANAGEMENT OFFICER AT GREAT DISMAL SWAMP NWR, FOR TECHNICAL SUPPORT (IE. DETERMINATION ON WHETHER AIRCRAFT OR OTHER SPECIAL EQUIPMENT IS NEEDED, AND/OR OTHER LOGISTICAL SUPPORT.)

G. MAINTAIN LOG OF ALL RADIO AND TELEPHONE COMMUNICATIONS.

H. REMAIN ON DUTY TO PROVIDE FURTHER ASSISTANCE AS NEEDED.

III. LOCAL SUPPORT ITEMS

A. ADJACENT LAND OWNERS:

1. FALSE CAPE STATE PARK

MANAGER

KYLE BARBER

426-5395 (H)

ASST. MANAGER	ROBERT M. PARK	426-2685
CHIEF RANGER	CHUCK BUTLER	426-2246
OFFICE	JEANNE HELLSTROM	426-7128
2. DISTRICT STATE PARK MANAGER	FRED HAZELWOOD	481-3537 (H) 481-2131 (W)
3. CITY OF VIRGINIA BEACH (LITTLE ISLAND CITY PARK)		THRU 911

B. BACK BAY REFUGE FIRE PERSONNEL (WITH AT LEAST S-130 AND S-190 TRAINING):

<u>NAME</u>	<u>ASSIGNED ROLE</u>	<u>HOME PHONE</u>
JOHN STASKO*	FIRE FIGHTER, VISITOR EVACUATION	426-0728
PAUL CALDWELL**	FIRE FIGHTER, COORDINATION	430-9680
JOHN GALLEGOS**	FIRE FIGHTER, REFUGE BURN BOSS	468-0358
DEAN WERNER**	FIRE FIGHTER, LAW ENFORCEMENT	425-6247
GINA SWOPE*	PUMPER OPERATOR	491-4891
CESAR FREYTES	FIRE FIGHTER, PUMPER OPERATOR	422-2621
WALTER TEGGE	FIREFIGHTER, VISITOR EVACUATION	427-6214
RACHEL CLICHE	FIREFIGHTER	426-1631

(* = NON-ARDUOUS DUTY ONLY ** = RED-CARDED)

C. FISH & WILDLIFE SERVICE (FWS) DIRECTORY:

1. REGIONAL OFFICE - CHIEF, NATIONAL WILDLIFE REFUGE SYSTEM (413) 253-8550
- 2.. BOISE INTERAGENCY FIRE COMMAND - FWS FIRE MANAGEMENT COORDINATOR
(208) 387-5596
3. REGIONAL FIRE MANAGEMENT COORDINATOR (AT GREAT DISMAL SWAMP NWR VA)
ALLEN CARTER (W) 1-757-986-3706
(H) 1-757-468-4769

D. OTHER SERVICES:

1. LOCAL FIRE DEPARTMENT 427-5943
EMERGENCY 911
2. VIRGINIA STATE FORESTRY DEPARTMENT
REGIONAL OFFICE - WAVERLY 834-2300
PORTSMOUTH OFFICE 465-6840
LOCAL FIRE WARDEN (JIM BRIGHT) (H)426-7832
3. TIDEWATER DEPT. OF ENVIR. QUALITY, AIR, WATER, & WASTE 424-6707
4. OCEANA NAVAL AIR STATION
FIRE DEPARTMENT 433-2841
EMERGENCY 433-3333
5. FALSE CAPE STATE PARK 426-7128

E. AVAILABLE REFUGE FIRE EQUIPMENT (REF. APPENDIX J OF THIS FIRE MANAGEMENT PLAN)

APPENDIX L - BACK BAY NWR FIRE MANAGEMENT UNITS ACREAGE ESTIMATES

(ESTIMATES ARE ONLY FOR LAND OWNED AS OF JANUARY 2002)

VIII. FIRE MANAGEMENT UNIT #1

- C WILDLAND URBAN INTERFACE #1 (WEST OF TOWN OF SANDBRIDGE)
 - 1. NORTHEASTERN PORTION OF TRACT 104B (NORTH BAY MARSHES) = 15% OF 980A. = 147A., ROUNDED OFF TO 150 A.
 - 2. EASTERN PORTION OF TRACT 104A (BLACK GUT) = 34% OF 142A. = 48.3A. ROUNDED OFF TO 50 ACRES.
 - 3. **TOTAL ACREAGE FOR WUI#1 = APPROXIMATELY 200 ACRES**
- C WILDLAND URBAN INTERFACE #2 (SOUTH OF SANDBRIDGE ROAD)
 - 1. TRACTS 112, 113 & 115 RESPECTIVELY (ALONG SANDBRIDGE ROAD) = 3A., 1A. & 2A. = TOTAL OF 6 ACRES
 - 2. SMALL PORTION OF NW CORNER OF TRACT 104B = APPROX. 30 ACRES IMMEDIATELY EAST OF COMMERCIAL LOTS, AND ALONG SANDBRIDGE ROAD, AND WEST OF "BLACK GUT DITCH" SOUTH.
 - 3. TRACT 108A EAST OF SANDBRIDGE ROAD AND WEST OF THE DENNIS CHANDLER PROPERTY = 26 ACRES.
 - 4. **TOTAL ACREAGE FOR WUI#2 = APPROXIMATELY 62 ACRES.**
- C WILDLAND URBAN INTERFACE #3 (BOTH SIDES OF COLECHESTER ROAD; AND EAST OF NEW BRIDGE ROAD & WEST OF HELL POINT CK.)
 - 1. TRACT 141 = 147 ACRES
 - 2. TRACT 143 = 5 ACRES
 - 3. TRACT 159 = 25 ACRES
 - 4. **TOTAL ACREAGE FOR WUI#3 = APPROXIMATELY 177 ACRES.**
- C WILDLAND URBAN INTERFACE #4 (SOUTH OF NAWNEY/NANNEY'S CREEK ROAD & NORTH OF NAWNEY CREEK)
 - 1. TRACT 223 = 35 ACRES
 - 2. TRACT 225 = 20 ACRES
 - 3. TRACT 227 = 26 ACRES
 - 4. **TOTAL ACREAGE FOR WUI#4 = APPROXIMATELY 81 ACRES**
- C **TOTAL FMU #1 ACREAGE ESTIMATE = 520 ACRES**

IX. FIRE MANAGEMENT UNIT #2 - EASTERN SHORELINE OF BLACK GUT, WESTWARD AND NORTH OF SANDBRIDGE ROAD. INCLUDES BOTH SIDES OF ASHEVILLE BRIDGE CREEK AND EXTENDING SOUTH ALONG MUDDY CREEK & HORN POINT ROADS.

- C TRACT 101 (GARCIA, WEST OF ASHEVILLE BRIDGE CREEK) = 173 A.
- C TRACT 101A (GARCIA, EAST OF ASHEVILLE BRIDGE CREEK) = 25 A.
- C TRACT 102 = 10 A.
- C TRACT 103 = 80% OF 190 A. = 152 A. + 56 A. (PARCEL A) = 208 A.
- C TRACT 104 (BLACK GUT AND WESTWARD) = 198 ACRES

- C TRACT 106 = 40 A.
- C TRACT 108B = 9 A.
- C TRACT 110 = 3 A.
- C TRACT 163 (25% OF) = 66 A. X .25 = 16 A.
- C TRACT 166 (25% OF) = 44 A. X .25 = 11 A.
- C TRACT 167 = 5 A.
- C TRACT 171 = 7 A.
- C TRACT 183 = 6 A.
- C TRACT 194 = 75 A.
- C TRACT 197 (25% OF) = 66 X .25 = 16 A.
- C TRACT 201 = 10 A.
- C TRACT 205 = 47 A.
- C **WMU #2 TOTAL ACREAGE = APPROXIMATELY 859 ACRES**

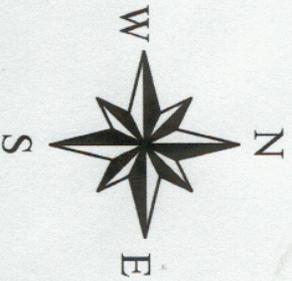
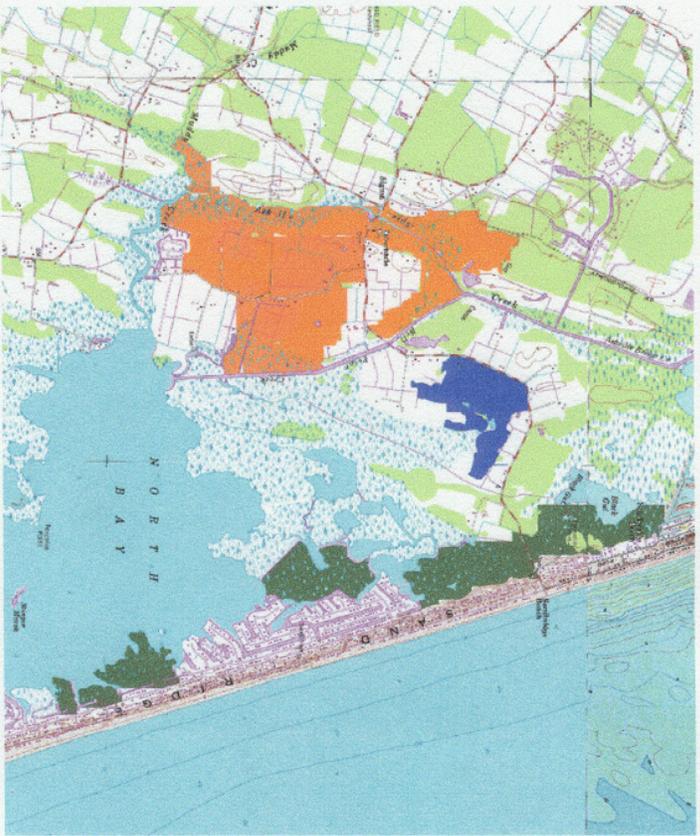
X. **FIRE MANAGEMENT UNIT #3 - REFUGE INTERIORS AND BARRIER ISLAND - PRINCIPALLY SHRUB-SCRUB, EMERGENT MARSH, WOODED SWAMP AND IMPOUNDED WETLANDS HABITATS.**

- C ORIGINAL REFUGE = APPROXIMATELY 4,600 ACRES
- C TRACT 104B (NORTH BAY MARSHES WEST OF WUI #2) = 950 A.
- C TRACT 127 = 35 A.
- C TRACT 157A, B & C = 45 A.
- C TRACT 159 = 26 A.
- C TRACT 163 (75% OF) = 51 A.
- C TRACT 166 (75% OF) = 33 A.
- C TRACT 174 = 7 A.
- C TRACT 187 = 5 A.
- C TRACT 191 = 66 A.
- C TRACT 196 (NE CORNER MOUTH OF BEGGAR'S BRIDGE CREEK) = 80 A.
- C TRACT 197 (75% OF) = 50 A.
- C TRACT 200, A = 65 A.
- C TRACT 201 = 10 A.
- C TRACT 207 = 33 A.
- C TRACT 216, A, B, & D = 78 A.(216) + 115 A.(A & B) = 193 A.
- C TRACT 217 = 25 A.
- C TRACT 228 = 8 A.
- C TRACT 229 = 32 A.
- C TRACT 233 = 3 A.
- C **TOTAL ACREAGE FOR FMU #3 = APPROXIMATELY 6,317 ACRES**

XI. **TOTAL ACREAGE OF ALL THREE FMUS = APPROXIMATELY 7,696 ACRES**

APPENDIX M - BACK BAY NWR FIRE MANAGEMENT UNITS' MAPS

Fire Management Unit # 1



SCALE: 1" equals approx. 1.8 miles

LEGEND	
Green:	WUI #1
Blue:	WUI #2
Orange:	WUI #3
Gray:	WUI #4



Rachel Cliche, Wildlife Biologist
 USFWS - Back Bay NWR
 February 4, 2002

Fire Management Unit #2



SCALE: 1" equals approx. 1.8 miles

Rachel Cliche, Wildlife Biologist
USFWS - Back Bay NWR
February 4, 2002

Fire Management Unit # 3



SCALE: 1" equals approx. 1.8 miles

Rachel Cliche, Wildlife Biologist
USFWS - Back Bay NWR
February 4, 2002

APPENDIX N - PRESCRIBED FIRE PLAN FORMAT

NOTE: AVAILABLE UPON REQUEST AT BACK BAY NATIONAL WILDLIFE REFUGE HEADQUARTERS

APPENDIX O: COOPERATIVE AGREEMENTS

COOPERATIVE FIRE CONTROL AGREEMENT BETWEEN
COMMONWEALTH OF VIRGINIA, DEPARTMENT OF FORESTRY
AND THE
USDI, FISH AND WILDLIFE SERVICE

FIRE MANAGEMENT COOPERATIVE AGREEMENT BETWEEN
U.S. FISH AND WILDLIFE SERVICE NORTHEAST REGION
AND
THE NATURE CONSERVANCY
EASTERN AND NEW YORK REGIONS

NOTE: AVAILABLE UPON REQUEST AT BACK BAY NATIONAL WILDLIFE REFUGE HEADQUARTERS

APPENDIX P: MEMORANDUM OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING BETWEEN
U.S. FISH AND WILDLIFE SERVICE
AND THE
COMMONWEALTH OF VIRGINIA
(RE: FALSE CAPE STATE PARK)

NOTE: AVAILABLE UPON REQUEST AT BACK BAY NATIONAL WILDLIFE REFUGE HEADQUARTERS