Table 1 - Fire Regimes

Fire Regime Group	***Frequency (Fire Return Interval)***	***Severity***
I	0-35 years	low severity
II	0-35 years	stand replacement severity
III	35-100+ year	mixed severity
IV	35-100+ year	stand replacement severity
V	>200 years	stand replacement severity

Table 2 - Condition Class Descriptions

Condition Class[1] Descriptions	
Condition Class	***Fire Regime***
Condition Class 1	Fire regimes are within an historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within an historical range.
Condition Class 2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range.
Condition Class 3	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

5. Control Problems & Dominate Topographic Features

Wildland-urban interface is perhaps the most critical issue in managing the fire program at the C&O Canal. A comprehensive description of neighboring landowners and agencies can be found in the 2003 Land Protection Plan. While most areas have good access for suppression resources, they also increase the values at risk and the probability of an ignition.

Control problems generally range from low to moderate depending on site specifics and burning conditions. Under normal fire seasons, control problems are expected to be low.

The topography is highly dependent on the geology of the park. **(See geology, page 22)** The park stretches from Georgetown DC to Cumberland Maryland, 184.5 miles along the Potomac River. Most of the park is in the 50 year flood plain. There are some heights within the park where upland piedmont forests will be located. The canal and towpath were engineered to traverse about 650 feet rise in elevation over the 184.5 miles and the historic structures create a significant component of the cultural landscape.

6. Other Management Considerations

Because the purpose of C&O Canal NHP is to preserve and interpret the historic and scenic features, all wildfire management actions will emphasis the preservation of the historic structures. Other considerations are the wildland urban interface, as well as developing and maintaining good relations with assisting agencies, the community and with Park neighbors.

Wildfire Management Program Components

A. General Implementation Procedures

Implementation of the components of the wildfire management program at C&O Canal is consistent with the park's fire management capabilities and will consider the current and predicted conditions affecting fire behavior. When possible, preplanned decisions, based on historical fire behavior indices will be considered in *Stage I Wildfire Implementation Plan* development to select an appropriate management response.

A Wildfire Implementation Plan (WFIP) will be initiated for all wildfires. This plan will provide the framework for determining the appropriate management response. The WFIP Stage I: Initial Fire Assessment will be the responsibility of the Incident Commander or C&O Canal's Park Fire Management Officer. Since the Fire Management Plan requires suppression of all wildfires, the requirement for a decision checklist as a part of the Stage I analysis can be considered met. Subsequently, Stage I analysis may be satisfied at the programmatic level in the Fire Management Plan through determinations made by combinations of values to be protected and/or fire behavior thresholds..

B. Wildfire Suppression

Range of potential behavior

1) Timber Fuels

In Fire Behavior Fuel Model 9 (leaf-off hardwoods), fires run through the surface litter faster than Model 8 (Leaf-on hardwoods) at a rate of spread of 7.5 chains/hour as opposed to 1.6 chains per hour and have longer flame lengths, averaging 2.6 feet as opposed to 1.0 feet. Fires within the hardwood forests of C&O Canal are generally restricted to surface fuels, consume leaf litter and branch wood, and reduce reproduction. Under most conditions, such fires are of low intensity and short duration. Flame lengths of 2 feet or less are common. Primarily wind and topography influence fire spread. Fire effects include the removal of surface fuels, occasional scorching of trees, and the reduction of young woody reproduction.

Larger mature trees (greater than 6" diameter at breast height (dbh) are susceptible to basal fire injury, which generally does not reduce diameter growth unless the crowns are appreciably damaged by fire. Damage to the cambium of larger trees is directly related to season of fire occurrence, intensity, duration of heat, bark thickness, and frequency of burning. Trees are generally less susceptible to fire injury during the dormant season. Seedlings and saplings of tree species other than oak-hickory are readily killed by fire.

According to studies conducted by Pennsylvania State University (Abrams, 1992), fire plays a significant role in development of oak forests. Relative to other hardwoods, fire should favor oaks because of their thin bark, sprouting ability, resistance to the rotting after scarring, and the suitability of fire-created seedbeds for acorn germination. Periodic fire should also check succession in oak forests because most successional species, such as maple, exhibit low resistance to fire. The clearing of successional species will also benefit the oak forest since oak species generally have low or intermediate tolerance to shade, and therefore their seedlings do not exhibit long-term survival or growth in the condition of a closed understory.

Under extreme conditions surface fires may torch out and occasionally crown where ladder fuels exist. The extent of such fire behavior is rather limited. Under these conditions, fire intensity may be sufficient enough to consume organic matter of mineral soil. Such conditions occur only during periods of severe and infrequent drought.

Monitoring programs should be established to evaluate and document the vegetative response to wildland and prescribed fires. Studies need to be conducted to learn the historical role that fire played in the ecosystem.

2) Grass Fuels

Fires within the grass fuel models of C&O Canal are of low to moderate intensity and of short duration. Fires within this fuel type spread very rapidly under the influence of wind and topography. Flame lengths of 3 to 6 feet are common depending on fine fuel moisture content, height of the grass, and wind intensity. Fire intensity is generally sufficient to consume all herbaceous surface fuels, and kill shrubs and scorch trees where present. Herbaceous vegetation usually increases in both density and vigor following fires.

Preparedness Actions

Preparedness" refers to activities that lead to a safe, efficient, and cost-effective fire management program in support of land and resource management objectives through appropriate planning and coordination. Preparedness includes planned activities for the development and implementation of the wildfire management program. These activities include staffing, training, fire prevention activities, education, provision and maintenance of support facilities, purchase of and contracting for equipment, supplies, support, planning and coordination, policy development and oversight, research, and interagency coordination."

Departmental policy requires that all personnel engaged in wildfire suppression and prescribed fire duties meet the standards set by the National Wildfire Coordinating Group (NWCG, *PMS-310-1*). C&O Canal will conform strictly to the requirements of the NPS wildfire management qualification and certification system.

Although C&O Canal has no specific wildfire fighter positions, employees will be encouraged to become qualified as wildfire fighters in order to support the Park's fire management program. The Park FMO will be responsible for obtaining the training required to meet Park needs for qualified wildfire fighters. When advanced or specialized training is necessary, the Park FMO will work through the Area Fire Management Officer to obtain funding and enrollment. The Park FMO will coordinate the Park's fire training needs with those of other nearby parks, cooperating agencies, and the region. Park wildfire fighters will attend an annual wildfire fighter safety refresher.

1) Fire Prevention, Education, and Community Assistance

C&O Canal's fire prevention and education program may be implemented in conjunction with other fire management and public safety agencies to increase awareness of fire prevention, develop understanding of the dangers and benefits of fire, protect human life and property, and prevent damage to cultural resources, real property, and natural resources.

The program of public education regarding wildfire prevention, potential fire benefits and dangers will be conducted as appropriate to help support Plan goals. Visitor contacts,

bulletin board materials, handouts, and interpretive programs may be used to increase visitor, leases and park neighbor awareness of fire hazards and benefits. The Area fire prevention and education specialist may provide assistance to the park for its fire prevention, education and community assistance programs.

Park employees will be provided with information about fire prevention, the wildland/urban interface, the objectives of the fire management program, and the dangers and benefits of prescribed fire and wildfire. Employees will be kept informed about changes in the fire situation throughout the fire season.
Park staff will work with the local fire departments and other agencies with fire management and public safety responsibilities to establish common protocols and procedures identify training needs, conduct joint training, and develop strategies for safer and more efficient fire management operations.

2) Fire Danger

A specific daily fire danger rating is not generated for the Park. The park will utilize the fire danger rating generated by the State of Maryland and at the Antietam National Battlefield when it comes on line. This rating will also be available through the NCRCC.

3) Fire Weather

C&O Canal does not maintain a fire weather station. Current fire weather information is available through the National Weather Service Forecast Office in Sterling, VA. Access to this information is available at www.erh.noaa.gov/er/box. The closest National Weather Service recording station is in Sterling, VA. Access to specific weather data covering the areas around the park can be found at: http://iwin.nws.noaa.gov/iwin/ct/zone.html

4) Step-Up Staffing Plan

The following actions will be taken to ensure adequate fire preparedness based upon the daily fire danger rating for the general area surrounding the Park.

Fire Danger "Low" or "Moderate": (Staffing Level 1 and 2) No activity necessary. Normal eight (8) hour tours of duty. Wildfire qualified personnel are available to respond and take necessary action on any fire reported.

Fire Danger "High": (Staffing Level 3) Normal eight (8) hour tours of duty. Fire equipment and supplies serviced and prepared for use.

Fire Danger "Very High" or "Extreme": (Staffing Level 4 and 5) Normal eight (8) hour tours of duty. The Park is totally prepared to respond to a fire. Location of wildfire qualified personnel is known to all relevant personnel. Wildfire qualified personnel have fire tools and personal protective equipment immediately available

in their work vehicles or at their work site. Emergency FIREPRO funding is available through the Regional Fire Management Officer to extend duty hours of wildfire qualified personnel.

Pre-Attack Plan

No written or formal pre-attack plan exists for C&O Canal. Volunteer fire departments have developed their own protocols and procedures for initial attack of fires within the Park. Historic structures receive the highest priority in regard to any suppression action. The measures currently being taken to prevent the damage or destruction of these structures by fire include keeping the grass mowed in at least a four-foot radius around each of these structures. The highest priority structures should be considered for retrofitted fire alarm systems.

Initial Attack

1) Priority setting during multiple fire occurrences

a. Public and firefighter safety.

b. Protection of improvements and private property.

c. Protection of cultural, historic, and natural resources with emphasis on T&E.

d. Utility rights of way

2) Criteria for appropriate initial attack response consistent with GP/RMP objectives

a. Public and firefighter safety.

b. Protection of improvements and private property.

c. Protection of cultural, historic, and natural resources. As part of the planning for initial attack the appropriate natural and cultural resource specialists will be contacted to be on site to provide assistance regarding park resources.

d. Minimum fire-line construction and use of Minimum Impact Suppression Tactics (MIST).

e. Available suppression resources and response times.

f. Fire behavior as determined by fuels, weather, and topography.

g. Use aircraft and mechanized equipment only where necessary to support above-listed criteria.

3) Confinement as a Strategy

a. Confinement may be used to minimize resource damage and to provide for firefighter safety.

b. A confinement strategy may be selected for initial attack as long as it is not being used solely to meet resource management objectives.

c. Resource benefits may be a by-product, but the strategy must be based upon the criteria listed above.

d. A confinement strategy may also be selected in the WFSA process when initial attack has failed to contain a wildfire. This strategy may also be used to minimize resource damage and to provide for firefighter safety.

4) Response Times

a. Response time for initial attack ground resources is approximately one hour or less depending on proximity, accessibility, and other such variables. Extended attack resources should be able to respond in two to six hours, again depending on proximity and availability.

5) Restrictions and Special Concerns

a. The constraints on these strategies affect the manner in which the wildfire will be suppressed, or the prescribed fire will be managed. A resource advisor will be assigned to all significant fires.

b. Fire retardant can stain or corrode historic structures and will not be used in the vicinity of these structures. If wooden structure protection is necessary, Class "A" foams may be used. Any fire suppression activity in the vicinity of a known historic site will receive guidance from a designated resource advisor.

c. Use of heavy equipment, mechanical or ground disturbing equipment will be used only as a last resort.

6) Local Issues

a. C&O Canal depends on local volunteer fire departments for initial and extended attack. This close alliance requires that C&O Canal work closely with these agencies in planning, training, preparedness, and other fire management issues.

7) Extended attack and large fire suppression

a. **Extended Attack Needs**:

b. Extended attack needs will be determined by considering the following:

c. Threats to life, property, and park resources

d. Availability of suppression forces

8) Implementation plan requirements – Wildfire Situation Analysis (WFSA) development:

a. When a fire escapes initial attack, a new strategy must be developed to suppress the fire. This selection process is accomplished through the development of a WFSA.

b. The WFSA is a decision process that employs a systematic and reasonable approach to determine the most appropriate management strategy for a particular situation. Reasonable management alternatives are identified, analyzed, and evaluated, and is consistent with the expected probability of success /consequences of failure. The Superintendent shall approve the WFSA and any revisions. Evaluation criteria include firefighter safety, anticipated costs, resource impacts, and social, political, and environmental considerations. The evaluation of alternatives becomes the triggering mechanism for re-evaluation of the WFSA.

c. An electronic version of a WFSA can be found at the U. S. Forest Service website at http://www.fs.fed.us/fire/wfsa/.

9) Incident Management Transition:

Transition to an incident management team requires a briefing by the Superintendent and a limited delegation of authority for the suppression of the fire(s). The briefing should address agency specific concerns, priorities, firefighter and public safety, economic and resource concerns, and other topics or issues of importance and relevance to the suppression effort.

10) Exceeding WFIP and New Strategy Selection

A WFIP has been exceeded when a fire cannot be suppressed during initial attack suppression actions, or when a prescribed fire becomes an escaped fire. Then, a Wildfire Situation Analysis must be developed. When completed, the WFSA will develop a new strategy by which the fire should be managed.

11) Minimum Impact Suppression Tactics (MIST)

a. All fire management activities in C&O Canal will rely on tactics, which do a minimum amount of resource damage while maintaining the safety of firefighters, personnel, and the public as the highest priority.

b. Fire line construction will be minimized by taking advantage of natural barriers, rock outcrops, trails, roads, streams, and other existing fuel breaks.

c. Limbing along the fire line will be done only as essential for the suppression effort and for safety.

d. Unburned material may be left within the final line.

e. Clearing and scraping will be minimized.

f. Snags or trees will be felled only when essential for control of the fire or for safety of personnel.

12) Rehabilitation Guidelines

a. When a suppression action is taken, rehabilitation may be necessary. The most effective rehabilitation measure is prevention of impacts through careful planning and the use of minimum impact suppression tactics. The Incident Commander will initiate immediate rehabilitation actions. Rehabilitation will be directed toward minimizing or eliminating the effects of the suppression effort and reducing the potential damage and hazards caused by the fire.

b. These actions may include:

c. Construct water bars to prevent erosion.

d. Place "bone yards" of cut vegetation in a natural or random arrangement.

e. Position cut ends of logs so as to be inconspicuous to visitors and camouflage where possible.

f. Flush cut stumps, camouflage with soil and moss.
g. Remove hand line berms.

h. If re-vegetation or seeding is necessary, only native plant species will be utilized, unless an approved Cultural Landscape Report treatment plan specifies otherwise, and the Natural Resource Specialist will be consulted for approval of the species chosen. Rehabilitation efforts should be initiated as soon as they can be safely implemented, which may be before the fire is declared controlled.

i. If extensive emergency rehabilitation is needed or if rehabilitation is needed to reduce the effects of a wildfire then the Park can request appropriate funding through the Burned Area Emergency Rehabilitation (BAER) fund. The BAER fund is administered through the NPS Branch of Fire and Aviation Management at the National Interagency Fire Center. The specifics of the policy can be found in 620 DM 3 DOI BAER Policy (2001). BAER project requests totaling $300,000 or less can be approved by the Regional BAER Coordinator. Submissions over this amount are reviewed at the regional level, and forwarded to the Fire Management Program Center for approval. Requests for BAER funding must be made to the Area Fire Management Officer within 72 hours of control of the fire.

13) Records and Reports

The Park FMO is responsible for all fire related records and reports except the WFIP. This responsibility may be delegated to an incoming Incident Commander for any fire escaping initial attack.

C. Wildfire Use

This option was rejected at this time due to the lack of fire management staff, the adjacent wildland/urban interface considerations and the lack of knowledge concerning the role that fire has historically had on the Park's natural resources. All unscheduled wildfires in C&O Canal will be suppressed using the most appropriate management action.

D. Prescribed Fire

Though a program of using prescribed fire at C&O Canal is not considered in this Plan, individual burns may be used for protection of cultural resources, especially historic scene restoration and maintenance, hazard fuel reduction, and natural resource objectives. If a

determination is made that a specific prescribed fire is required, that prescribed fire will be are subject to the requirements of NEPA, the NHPA and other applicable regulations. All prescribed fire operations will adhere to NPS prescribed fire policies and procedures found in RM-18.

1. Planning and Documentation

An approved burn plan will identify need resources, individual responsibilities, and timelines. These activities include scheduling of resources, coordination with neighboring agencies and communities, and obtaining necessary permits.

Long-Term Prescribed Fire Strategy

a. The purpose of prescribed burning at C&O Canal would be to protect and preserve the cultural resources of the Park, manage vegetation (specifically invasive plant species), and reduce fuel loading. Prescribed fire objectives will be to:

   i. Manage vegetation to maintain vistas, cultural landscapes and to promote the growth of native grasses and control woody vegetation on earthworks

   ii. Assist with the establishment and maintenance of the historic scene

Funding

b. FIREPRO funding requests for individual projects may be submitted to the Area Fire Management Officer. Documentation of individual project costs will be submitted to the Area Fire Management Officer for review. Expenditures will not exceed the authorized project amount.

Annual Planned Project List

c. Proposed projects may be submitted to the Park Fire Coordinator by any division chief. The Park Fire Coordinator will compile a list of these projects and submit them to the Superintendent for approval and prioritization.

Compliance Review/Approval

d. Prescribed fires will be processed through the NEPA/NHPA compliance review process. Compliance approval will be obtained before any physical actions associated with a prescribed burn is undertaken

2. **Needed Personnel**

C&O Canal does not have sufficient personnel trained to manage a prescribed fire. Personnel needed for a specific burn will be identified in the projects burn plan. The Park will participate in a coordinated approach to mutual prescribed fire programs with partners to be determined at the time of the burn.

3. **Fire Weather, Effects, and Behavior Monitoring**

Monitoring of prescribed fires at C&O Canal is intended to provide information for quantifying and predicting fire behavior and its ecological effects on Park resources while building a historical record. Monitoring measures the parameters common to all fires: fuels, topography, weather, and fire behavior. In addition, ecological changes such as species composition and structural changes will be monitored for several years after a fire. This information will be very useful in adjusting the prescribed fire program to better meet short and long-term resource objectives.

During prescribed burning, monitoring will include mapping, weather, site and fuel measurements, and direct observation of fire characteristics such as flame length, rate of spread, and fire intensity. Operational monitoring provides a check to insure that the fire remains in prescription, and serves as a basis for evaluation and comparison of management actions in response to measured, changing fire conditions, and changes such as fuel conditions and species composition.

All prescribed fires will be monitored regardless of size. The Park FMO will establish specific fire information guidelines for each fire to update intelligence about the fire.

The Park FMO will assure that assigned qualified personnel are used to monitor the behavior of prescribed fires. By being able to assess fire's potential, characterize and quantify its effects, and determine if it is within prescription, an efficient and flexible monitoring program will result.

C&O Canal will use the fire monitoring protocols with adaptations described in NPS Fire Effects Monitoring. Fire monitoring support will be coordinated with the Area Fire Management Officer.

4. **Prescribed Fire Project Critique**

A Fire Management Committee will critique each prescribed fire. A report detailing the actual burn will accompany any recommendations or changes deemed necessary in the program. This report will be submitted to the Superintendent. A critique of the fire management program, including the prescribed fire program, will be held by the Fire Management Committee each year prescribed burns are conducted at the conclusion of the fall fire season.

5. Reporting and Documentation Requirements

All prescribed fire forms will be completed as outlined by the Park FMO. A fire monitor will be assigned to collect all predetermined information and complete all necessary forms prior to, during, and after the fire. All records will be archived in C&O Canal's fire records for future use and reference.

The Park FMO will prepare a final report on the prescribed fire. Information will include a narrative of the fire operation, a determination of whether objectives were met, weather and fire behavior data, map of the burn area, photographs of the burn, number of work hours, and final cost of the burn.

The forms necessary for documenting prescribed fire activities are outlined in RM-18. The Individual Fire Report, DI-1202, and the Incident Record, is the responsibility of the Park FMO and documents all personnel and equipment costs involved in the burn.

6. Historic Fuel Treatment Map

Because prescribed fires have not been used at C&O Canal in the past, no historic fuel treatment map exists.

7. Local Prescribed Burn Plan Requirements

Park prescribed fire burn plans identify preplanned requirements (prescriptions) for initiating and continuing prescribed burn ignitions and operations. These prescriptions are found in RM 18 Ch 10 and include:

- Maximum Manageable Area (MMA) for the fire
- Minimum number of fire crew
- Specific skill certification requirements for the fire crew
- Other fire-related staff requirements
- Range of possible ignition dates
- Pre-ignition site preparation requirements
- Equipment needed on-site
- Fuel model(s) used
- Acceptable temperature, humidity, wind direction, wind speed, and fuel moisture ranges
- Predicted fire behavior

8. Exceeding Prescribed Fire Burn Plan

If the prescribed fire escapes the burn unit and immediate efforts at control are not successful, it will be declared a wildfire and suppressed. A Wildfire Situation Analysis

(WFSA) will be completed and additional personnel and resources ordered as determined by the Incident Commander. If the fire continues to burn out of control, additional resources will be called from the local and volunteer fire departments. An incident management team or other non-local resources may be requested to assume command of the fire.

9. Air Quality and Smoke Management

Air Quality Issues:

The park is located in a Class II Air shed and throughout its 184.5 miles, the park passes through two 1-hour non-attainment zones (Montgomery and Frederick County), and one 8 hour non-attainment zone (Washington County). Allegany County is the only attainment area the park is in. The Fire Management Plan will be in compliance with the Clean Air Act and all local State Department of the Environment laws regulating air quality.

The objectives for smoke management and compliance with air quality laws are similar to those for fire management: to encourage a natural process so long as it does not endanger public health and safety. Smoke levels become unacceptable when they impair visibility to such a degree that they detract from visitor enjoyment of the primary Park resource with emphasis on the vistas of C&O Canal. Dense smoke within C&O Canal is generally unacceptable; however, it may be tolerated for short periods if the winds assure good mixing. C&O Canal will also evaluate the forecasted impact of smoke on local communities and visitor safety. All of these considerations are difficult to quantify, monitor, and evaluate, and there will exist considerable room for discretion.

It may be necessary to aggressively control fires when smoke affects a sensitive area or creates a significant public response. All fire activities may have to be curtailed when an extended inversion or air pollution episode is in effect. Traffic control measures will be undertaken in conjunction with local law enforcement agencies when such episodes occur. Complaints regarding smoke will be documented and communicated to the Superintendent.

10. Smoke Mitigation:

C&O Canal will notify the surrounding assisting agencies, prior to any fire ignition. Thereafter, smoke characteristics will be evaluated regularly. A process will be developed for implementation to determine if adverse impacts to air quality and visibility are occurring from management decisions.

To minimize the effects of smoke the following guidelines will be considered when planning a prescribed fire:

Burning will be conducted only when visibility exceeds 5 miles or when the fire weather forecast indicates the presence of an unstable air mass, afternoon mixing heights are 500 meters or greater, and ventilation rates (mixing height in meters X transport wind speed in meters per second) is 2000 or greater.

11. Debris Burning

Fire is occasionally used to dispose of natural vegetative debris deemed infeasible or impractical to remove mechanically in a non-wildland fuel environment (parking lot, storage yard, gravel pit, etc.). The debris may be generated from routine maintenance activities, piled debris generated from flood debris, construction activities, removal of hazard trees, discarded building and administrative materials. Any material being burned for debris disposal must be classified as permissible to burn under applicable Federal, State, Tribal, and Local regulations including environmental compliance.

Debris burned in non-wildland environments do not require a prescribed burn plan. Debris burned in a wildland environment, including snow-covered ground, requires a prescribed fire plan.

The Park follows all applicable guidance and regulation when using fire for debris disposal.
Parameters for debris burning are:

- Temperature: Less than or equal to normal average high temperature for the month.
- Wind Speed: Less than 10 mph.
- Relative Humidity: Greater than 40%.
- Fine Fuel Moisture: Surrounding fuels greater than 20%.
- Smoke Dispersal: Mixing heights equal to or greater than 500 meters.

E. Non-Fire Fuel Treatment Applications

1. Mechanical treatments

Annual Activities

Hazard fuels at C&O Canal are typically managed through mowing (grasses and other herbaceous vegetation), raking or vacuuming (fallen leaves), cutting and chipping (woody vegetation), or other mechanical or cultural means.

Fuels around buildings, boundaries, roads, trails, picnic areas and other sites occasionally accumulate sufficient fuel density to create a hazard to real property, historic resources, or human health and safety. These fuels are usually managed by mechanical removal. These fuels should be removed from these areas at least twice annually.

Firebreaks are maintained around most structures in the Park. These firebreaks are typically re-mowed every two to four weeks during the growing season depending on the importance of the resource, the amount of visitation in the area, and the availability of staff and equipment.

Heavy equipment including industrial mowers, large trucks, and trailer-mounted wood chippers are often used in mechanical fuel removal. Heavy equipment except mowers should usually be confined to existing roads and trails. In all cases, tracked and wheeled vehicles should only be used off roads and on trails under conditions where they will not significantly disturb soils, compact soils, or break up vegetative cover.

F. Emergency Rehabilitation and Restoration

On January 19, 2001, the Department of the Interior issued new policy on burned area emergency stabilization and rehabilitation. The specifics of the policy can be found in 620 DM 3 DOI BAER Policy (2001). The Park FMO and the Natural Resource Specialist, subject to review by the Park Fire Committee, will jointly formulate a rehabilitation plan for each fire. The BAER plan will be submitted to the Regional BAER Coordinator (Regional Prescribed Fire Specialist) through the Area Fire Management Officer for approval within 72 hours of the date the fire is declared controlled. BAER project requests totaling $300,000 or less can be approved by the Regional Baer Coordinator. Submissions over this amount are reviewed at the regional level and forwarded to the NPS Fire Management Program Center for approval.

ORGANIZATIONAL AND BUDGETARY PARAMETERS

A. Organizational Structure of the Fire Management Program

This section discusses areas of responsibility for implementation of the fire management program by specific Park position. There may be instances that the same person functions in two areas of responsibility, e.g., the Natural Resource Specialist and the Park FMO may be the same person. The purpose of this section is to clearly define areas of responsibility, provide clear

direction and accountability, and further the development of a responsive fire management program.

1. Superintendent

a) Fire management at C&O Canal is the responsibility of the Superintendent, with technical duties and accompanying responsibilities delegated to staff members. The Superintendent will be responsible for management of the program within Departmental and National Park Service policy, Director's Order 18; Wildfire Management (DO-18), and all relevant laws and regulations.

b) Ensures that a comprehensive fire management program is adequately planned, staffed, implemented, and that the Fire Management Plan is reviewed annually and revised as necessary.

c) Maintains and facilitates public and media relations pertaining to both suppression and prescribed fire.

d) Approves prescribed fire plans.

e) Signs delegation of authority to I.C. if incident exceeds capabilities of park staff.

2. Acting Superintendent

a) Is delegated all decision making responsibility when the Superintendent is absent from the Park.

3. Natural Resource Specialist

a) Coordinates fire research efforts, and serves as the primary resource advisor for project fires or prescribed fires.

b) Serves as a member of the Fire Management Committee.

c) Develops natural resource objectives for prescribed fire.

d) Plans and coordinates prescribed fires and non-fire hazard fuels and wildland/urban interface treatment projects.

4. Park Fire Management Officer

a) Responsible for implementation and execution of all aspects of the Park fire management program except research.

b) Responsible for overall coordination, direction, and supervision of wildfire prevention, preparedness, and suppression and coordinates all wildfire emergencies.

c) Briefs the Superintendent on current and planned fire management activity.

d) Coordinates with park compliance officer for all post wildland fire actions and prescribed burn compliance reviews.

e) Responsible for coordination with the Cultural Resource Specialist on cultural resource issues during suppression activities and prescribed burn planning.

f) Develops and recommends approval of the Fire Management Plan to the Superintendent.

g) Serves as chair of the Fire Management Committee. Presents approved committee recommendations to the Superintendent.

h) Responsible for overseeing all Park fire management program activities. Prepares and administers the Fire Management Plan and the annual FIREPRO budget. Revises the plan annually and incorporates any necessary changes.

i) Responsible for completing the prevention analysis to determine the level and type of prevention effort required by the Park. Ensures implementation of the approved fire prevention program.

j) Responsible for initial attack and implementation of appropriate suppression response as recommended by the Fire Management Committee.

k) Responsible for the overseeing of safe suppression of all wildfires, demobilizations, and rehabilitation of the burned area.

l) Responsible for submission of fire situation reports to NPS Branch of Fire Management through the Area Fire Management Officer.

m) Responsible for providing fire-training opportunities to Park personnel to maintain predetermined fire qualification skills in critical positions. Reviews, updates, and maintains fire training and fire experience records. Submits updated records to the Area Fire Management Officer.

n) Ensures adequate inventory of equipment and supplies to efficiently implement the fire management program.

o) Coordinates the development of specific prescribed fire plans and execution of approved prescribed fires in accordance with RM-18. Submits each prescribed fire plan to the Superintendent for approval.

p) Ensures that both a briefing statement and delegation of authority, approved by the Superintendent, are prepared for incoming Incident Management Teams.

q) Coordinates dispatch of Park personnel for in-Park fire assignments and to provide assistance to other Parks and agencies. Requisitions fire crews, or fire resources and supplies for use within the Park.

r) Prepares, reviews, and revises cooperative agreements with interagency cooperators. Maintains liaison with interagency cooperators through annual meetings to review agreements.

s) Maintains technical references, maps, and aerial photos for the fire program.

t) Responsible for completion of all fire reports (DI-1202s), and coordinates the timely entry of reports into the NPS Fire Management Computer System through the Area Fire Management Officer within 10 days of a fire.

u) Coordinates initial attack of wildfires.

5. Regional Fire Management Officer

a) The Regional Fire Management Officer is the FIREPRO funded Fire Management Officer for the Regional Fire Management Office.

b) The Regional FMO provides the first level of technical assistance to the park for all fire management planning, and implementation activities. This includes assistance for managing the Park's use of fire management programs such as the National Fire Danger Rating System, the Weather Information Management System (WIMS), the NPS Wildfire Computer System (SACS), the resource ordering system (ROSS), the Incident Qualification and Certification System (IQCS), Fire Program Analysis (FPA), FIREPRO budgeting, etc.

c) The Regional FMO assists with the Park's wildfire qualification and certification program, fire monitoring, fire training and mobilizations, development of preparedness, suppression, wildland/urban interface, fuels management and prescribed fire operational plans, development of cooperative agreements with local and state agencies, and administration of Rural Fire Assistance Program grants to local fire departments. The Regional FMO coordinates fire management needs.

d) The Regional Fire Management Officer has delegated authority for the management of the region's fire management program. The Regional FMO is responsible for planning, training, technical assistance, budget prioritization, coordination, and interagency issues for units of the National Park Service in the Region. The Regional FMO assures that the

regional fire management program is conducted accordance to established policy and procedures and that FIREPRO funds are used appropriately.

e) The Regional FMO represents the parks in the region to the NPS Fire Management Program Center, VICC, and other regional and national fire management organizations.

f) Park requests for assistance from the Regional FMO will be coordinated through the Park FMO. Requests should be made as far in advance as is practical.

g) The Regional FMO will assist the Park in acquiring needed resources and equipment, and in preparing FIREPRO funding requests.

h) The Regional FMO may be requested to serve on an incident management team as an agency representative regarding fire management operations.

6. Area Fire Prevention and Education Specialist

a) The Area Fire Prevention, Education and Wildland/Urban Interface Specialist (Area PEWS) is the FIREPRO funded FEPIS position. The position is located in the NER at Charlottesville, Virginia and assists NCR and can be contacted through VICC.
b) The Area FEPIS provides assistance to the Park in conducting fire prevention and education programs. The Area FEPIS can also assist the park in evaluating park structures for wildland/urban interface issues and with an outreach interface program to park neighbors and local governmental bodies and agencies.

7. NPS Fire Management Program Center

The NPS Fire Management Program Center (FMPC) is located in Boise, Idaho and provides national leadership, direction, coordination and support for NPS fire, aviation and incident management. The primary purposes of the FMPC are:

- Achieving national mandates for firefighters, NPS employee and visitor safety.
- Protecting natural and cultural resources.
- Maximizing partnerships with federal, state, local and tribal entities, in order to achieve the greatest benefit for park resources.
- Achieving and maintaining the highest standard of professionalism using state-of-art concepts, technologies and practices.

B. FIREPRO Funding

Annual wildfire management appropriation provides FIREPRO funding for necessary expenses for fire planning and oversight functions, along with budgeted activities necessary to prepare for the normal fire season, and for the development and implementation of the

wildfire emergency suppression, emergency rehabilitation, and hazard fuels reduction program.

The Park is not a base funded FIREPRO park and does not have FIREPRO funded positions. FIREPRO funding is available for approved fire training, prevention, preparedness, suppression, prescribed fire, wildland/urban interface, fuels treatment, and burned area emergency stabilization and rehabilitation projects. Related equipment, personal protective equipment and supplies may be acquired with FIREPRO funding. Financial grants may be provided to qualifying local fire departments through the Rural Fire Assistance Grant Program (RFA).

All FIREPRO funding requests are made through the Area Fire Management Officer.

C. Fire Management Organization

The Fire Management Committee will be comprised of the Park Assistant Superintendent, Fire Management Officer, Cultural/Natural Resource Specialist, Chief of Visitor Services, Safety Officer, Chief of Interpretation/Public Affairs and Facility Manager. The Fire Management Officer will chair the Committee. The Committee will request technical expertise from other individuals at any time. Natural and Cultural Resource Specialists will be consulted to protect park resources during fire planning activities due to the important role that resources play in the park both from the mission statement to the infrastructure of the park. The Compliance Officer will also be consulted to insure that all actions meet the compliance regulations of the NPS and the federal government. Each committee member will designate an alternate to serve in the event that the normal representative is unavailable.

In an effort to coordinate the Park's fire management program with those of other nearby NCR parks, representatives of the Area Fire Management Officer and those parks may meet to organize equipment and personnel needs relating to fire programs at each park.

The Fire Management Committee will convene at the request of the Park FMO or Superintendent. The primary purpose of the Committee is to coordinate preparedness, suppression, and prescribed fire activities between the Park's division's, and between the Park and cooperating agencies.

1. Committee Actions During Prescribed Burns

During any active prescribed burn, the FMO, representing the Committee, will brief the Superintendent at least once daily, and as often as necessary, on the current fire situation. Alternatives and recommendations for any change in the management strategy for the fire will be presented. During the progress of any prescribed burn, the Prescribed Burn Boss will ensure that a contingency plan is prepared should the burn exceed prescription. The Superintendent has final and complete authority for all fire management decisions.

2. Committee Actions During Suppression Fires

Any wildfire that threatens to exceed the initial attack capabilities will have a qualified Incident Commander assigned to manage the fire. If a fire extends beyond one operational period, the Incident Commander will ensure that a Wildfire Situation Analysis (WFSA) is prepared.

3. Committee Actions During Non-Fire Periods

The Committee may be convened during periods of elevated fire danger to coordinate preparedness activities. The Committee will also be convened at other times to coordinate the Park's prevention, wildland/urban interface, prescribed fire and fuels treatment activities. As mentioned above, the Committee will coordinate equipment and personnel needs with those of other nearby parks with fire programs.

D. Wildfire Use Certification

The Park has rejected the strategy of wildfire use. The Park's use of wildfire will not be used at this time due to the lack of fire management staff, the adjacent wildland/urban interface considerations and the lack of knowledge concerning the role that fire has historically had on the Park's natural resources.

E. Interagency Coordination

Interagency cooperation is vital to the full realization of NPS fire management program objectives. The ability of a single agency to implement a fire management program of any complexity is limited without coordination with and assistance from other organizations. Interagency cooperation and the coordination of shared resources and common activities are critical to the success of the Park's fire management program.

1. Local Coordination

The NCR has a written cooperative agreement with the State of Maryland Department of Natural Resources for wildfire suppression within the park and surrounding areas. The park also has verbal agreements for wildfire suppression with the fire departments of the local communities. The Park plans to develop written cooperative agreements with these communities in the near future. These fire departments offer significant support to the Park fire management program.

2. Regional Coordination

Through an inter-agency agreement, NCR is a member of the Virginia Multi-agency Coordinating Group. This group is comprised of 3 NPS units including the NCR, SHEN

and BLRI as well as VADOF, GWNF and F&WS. The Regional FMO coordinates fire management needs between the Area parks, MACG and with the SACC in Atlanta, GA.

Mobilization and dispatch of fire resources (staff, equipment, and supplies) is through the NCRCC via the Regional FMO. A list of available resources and detailed procedures for requesting assistance are documented in the NCRCC Fire Mobilization Plan. The mobilization plan is updated annually.

3. National Coordination

The National Park Service is a member of the Interagency Cooperative Fire Agreement and the National Wildfire Coordinating Group (NWCG). Participating members of the agreement include the U.S. Forest Service of the Department of Agriculture, the Bureau of Indian Affairs, Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service of the Department of the Interior. Through additional agreements, state forestry and wildfire agencies, private forestry companies, the Association of State Foresters, and many states participate in this agreement.

The principle objective of the Interagency Cooperative Fire Agreement is the cooperative and cost effective sharing of fire resources during national and regional emergencies. Through this agreement, a wide variety of fire resources and support services can be made available to units of the National Park Service. All requests for assistance through this agreement are directed to the SACC through the Regional FMO.

MONITORING AND EVALUATION

1. Monitoring Programs

The park will implement long and short term monitoring to access accomplishments, and determine the effects of fire management activities on cultural and natural resources.

The Park will work closely with the Area FMO and Regional Prescribed Fire Specialist in developing and implementing a fire monitoring program. Assistance in conducting fire monitoring activities, including the establishment and sampling of monitoring plots, will be coordinated through the Area FMO.

2. NPS Fire Monitoring Handbook

This handbook will serve as the source document providing monitoring needs with minor adaptations made for local situations and conditions. An electronic copy can be found at http://www.nps.gov/fire/fmh/FEMHandbook.pdf

3. Fire Monitoring Plan

A Fire Monitoring Plan, based upon the protocols found in the *NPS Fire Monitoring Handbook* will be developed as part of the implementation of this Fire Management Plan.

FIRE RESEARCH

Research is a necessary element in the fire management program at C&O Canal. The primary objective of fire research is to provide information for making fire management decisions. Fire research will be coordinated through the Natural Resource Specialist of the park.
As the park's Fire Management Plan is implemented and tested, additional research will inevitably be needed. Research will be identified for such purposes as refining prescriptions, improving the understanding of fire behavior and fire effects, refining monitoring protocols, defining fire return cycles, describing fuels dynamics, describing the impacts on cultural resources, and other information needed for operational fire and resource management.

Currently there are two PMIS statements calling for fire research at C&O Canal. PMIS 106934, *Determine Role of Fire in Eastern Bottomland Forest* and PMIS 106955, *Research Fire History.*

Monitoring will be a part of all prescribed fires conducted in the park. Monitoring will help to define the effectiveness of the fire management program by assessing the vegetative effects of fire. The monitoring protocols found in the *NPS Fire Monitoring Handbook* will be adapted and used by the park.

PUBLIC SAFETY

1. Public Safety Issues and Concerns

The Park is dedicated to ensuring the safety of each visitor and to all residents and property adjacent to the Park's boundary with regards to its fire management program. The Superintendent may close all or a portion of the Park (including roads and trails) when elevated fire danger, wildfire or a prescribed fire pose an imminent threat to public safety.

2. Mitigation Safety Procedures

The Park will implement a notification system to inform visitors, neighbors, and political audiences of all fire activity through normal communication channels. A fire activity report will be updated, as significant changes occur to inform Park personnel of potential fire threats. Areas of fire activity will be clearly signed at the visitor center. Residents

adjacent to the Park will be notified in advance of any prescribed fire. If any fire poses a threat outside the Park's boundaries, law enforcement agencies will be notified.

PUBLIC INFORMATION AND EDUCATION

1. Public Information Capabilities and Needs

The Park is committed to keeping the public informed of its fire management program and activities. The Area Fire Prevention, Education and Wildland/Urban Interface Specialist (Area FEPIS) is an available resource to the Park for consultation, support and assistance.

2. Step-Up Public Information Activities

a. Information and education are important processes in public acceptance of the managed fire program at Park. The Park FMO will provide the Superintendent with accurate information regarding current fire situations and management activities. The public information program will be developed as follows:

b. The public information outlets of neighboring and cooperating agencies, the area fire management office and the regional office will be provided with all fire management information.
c. The fire management program will be discussed in informal talks with employees of all divisions, contractors, volunteers, residents, IBP's, SUP's, Agriculture leases, and park neighbors.
d. The role of the fire management program will be developed and discussed, as appropriate, in off site programs and talks.
e. The fire management program will be incorporated into visitor contacts, interpretive talks, walks, and tour programs. Particular attention will be given when fires are conspicuous from roads or visitor use areas.
f. Concepts of the prescribed fire program will be incorporated, as appropriate, in publications, brochures and handouts.
g. This plan will be posted to the NPS website "*Planning, Environment, and Public Comment (PEPC).*" Any future compliance reviews will also be posted to PEPC for public information.

Emergency closures or restrictions may become necessary during periods of elevated or extended fire danger. Such closures will necessitate additional coordination and communication with the public and the media.

PROTECTION OF SENSITIVE RESOURCES

1. Cultural and Historic Resources Protection

The greatest cultural resource concern are the historic buildings and the archeological resources located in the Park. Protection of these resources is focused on prohibiting any activity that causes damage to the structures or to the artifacts that are housed by these structures and any unnecessary ground disturbance. It is extremely important that coordination with the Cultural Resource Specialist be done during suppression activities and during prescribed burn planning.

a. Historic Structures

There are a total of 1,365 historic structures within the park, most of which are deemed to be "contributing" elements to the Chesapeake and Ohio Canal National Historical Park historic district, listed in the National Register of Historic Places. This district is nationally significant for several reasons, including areas of architecture and engineering, commerce and transportation, military events, and conservation.

The most sensitive historic structures include 120 buildings (22 lock houses, 5 canal-operation buildings such as the Great Falls Tavern and section houses, 47 other historic buildings such as farm houses and their dependencies, 6 commercial structures such as stores and mills, and 4 governmental structures such as Washington Aqueduct features).

The canal-related structures include engineering works such as lift locks, culverts, bridges, waste weirs, and dams, primarily composed of fire-resistant materials such as stone, brick, and earth.

b. Museum Collections

Museum collections are exhibited at several locations throughout the park. These locations should be considered high-priority to protect sensitive property (Georgetown Visitor Center, Abner Cloud House, Great Falls Tavern, Riley's Lock, Ferry Hill, Williamsport Visitor Center, Hancock Visitor Center, and Cumberland Visitor Center).

c. Cultural Landscapes

There are 15 formally recognized cultural landscapes within the park, including the 184.5 miles of canal and prism. Specific landscapes have also been identified at Abner Cloud/Potowmack Canal, Antietam Village, Carrollton Manor Farms,

Cumberland, Ferry Hill, Fort Duncan/Christian Smith Homestead, Four Locks, Great Falls Tavern, Hancock, Old Town, Point of Rocks, Two Locks/Opequon Crossing, Williamsport, and Western Maryland Railway.

2. Natural Resources Protection

a. Diversity

The C&O Canal is one of the most biologically diverse parks, especially for plant species, in the National Park system. The park has recorded over 1,200 species of vascular plants, over 100 rare, threatened or endangered species of plants in Maryland and The District of Columbia, and 1 federally endangered plant species. The number of rare plants represents one of the highest concentrations of state-listed rare plants in the eastern US. Several species are globally rare, and some occur here because they are dependent upon special habitats and ecological conditions present along the Potomac River. 192 birds, 64 fish, 62 reptiles and amphibians, and 47 species of mammals are also documented. Ptilimnium nodosum (harperella), the one federally endangered plant species in the National Capital Region, is currently being reintroduced into the park. Several rare aquatic biotas have either been found or are suspected to exist in the seeps, springs and cave communities of the park. Several bald eagle nests are monitored year round for activity.

b. Geology

The rich geological, ecological and biological diversity preserved inside the boundaries of the park include a wealth of communities such as riparian, terrace, upland forest, seeps and springs, cave and wetlands. More than 40 state and nationally significant natural areas, including Appalachian shale barren communities (areas that harbor globally rare plants, rare limestone outcrops and scoured bedrock floodplain, are found in the park. The park also protects the largest extant block of upland forest in Maryland's Piedmont, the Goldmine tract, and the highest quality limestone and calcareous shale habitats remaining in the state, Ferry Hill bluffs and Chilton Woods. The largest significant natural area is the Potomac Gorge in Montgomery County and in the District of Columbia.

c. Habitats

Aquatic environments in the park include wetlands, streams, rivers, springs and seeps, and open water habitat in the sections of watered canal. These habitats support animals such as frogs, toads, salamanders, fish, freshwater mussels, beaver, and muskrat. Terrestrial habitats such as forests, open fields, rocky outcrops, developed, and transition habitats support many common Eastern Deciduous woodland species: deer, song birds,

red and gray fox, raccoon, gray and fox squirrels, and a few uncommon species, like the black bear and bobcat. Bald eagle, a federally threatened species, nests here.

d. Birds

The park is home for numerous year round bird species and neo-tropical migratory travel through the park from South and Central America, the Caribbean and southern US to North American nesting habitats. The Potomac River floodplain provides habitat for many migrating and breeding birds and is becoming increasingly important as natural areas are lost or fragmented in Maryland and all over the U.S. The American Bird Conservancy and National Audubon Society have designated C&O Canal as an Important Bird Area (IBA) in the U.S., small sites critical to rare species or that support large concentrations of a species.

e. Mollusks

The park contains a diverse native mussel community, including several species that are state and federally endangered. Native mollusks, or mussels, are the most imperiled aquatic fauna in North America and continue to decline primarily due to habitat loss and invasion of non-indigenous species. Of nearly 300 species of mussels in North America, 13 are considered extinct and 57 are designated federally endangered or threatened species. Of the 20 species of freshwater mussels in Maryland, 10 are in C&O Canal NHP.

3. Developments, Infrastructure, and Improvements Needing Protection

As funding allows, defensible space will be maintained around buildings, structures, and other improvements in the Park.

FIRE CRITIQUES AND ANNUAL PLAN REVIEW

The Incident Commander or the Burn Boss will initially critique wildland and prescribed fires. This critique should take place with those directly involved in the management of the fire.

The Park Fire Management Committee should review prescribed and wildfires of significant size, cost, or where minor safety issues or minimal levels of public concern occur. These findings should be forwarded to the Area Fire Management Officer.

Prescribed or wildfires involving an Incident Management Team or significant political, safety, or public issues should be reviewed by the Regional Fire Management Officer. If a fire

generates a major political or public concern, involves multiple serious injuries or a fatality, the Regional Fire Management Officer and the NPS Fire Management Program Center should participate in the review.

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The Park FMO will review the Fire Management Plan annually for currency and incorporate changes into the appendix. Changes to the appendices require approval of the Fire Management Committee. The fire management plan is subject to formal review every five years.

CONSULTATION AND COORDINATION

The following people were involved in the formulation and preparation of this fire management plan:

C&O Canal National Historical Park

Martin Gallery, Fire Management Officer
Chris Stubbs, Chief, Resource Management Division
Scott Bell, Natural Resource Program Manager
Brad Clawson, Chief Ranger
Sam Tamburro, Cultural Resource Program manager
Lynne Wigfield, Compliance Officer
John Hitchcock, Park Ranger

Antietam National Battlefield

Ed Weneschof, Chief Ranger

Regional Staff

Jeffery Seabright, Assistant Regional Fire management Officer