

Appendix 3: Wildland and Fire Response, Planning, and Implementation Procedures

Specific procedures that the Branch of Fire Management follows regarding response, planning, and implementation of wildland fire projects in Yosemite National Park are variable. In an effort to preserve and protect the cultural and natural resources of the park, the following procedures are adhered to when executing the Appropriate Management Response to a wildland fire. The determination of how an agency will respond to a wildland fire will include an evaluation of such factors as risks to the safety and health of firefighters and the public, weather, fuel conditions, threats, and values to be protected.

One of the most important values to be protected is Wilderness; 95% of Yosemite National Park is designated Wilderness. The policy of the National Park Service (DO41) states that “Wilderness values must be adequately represented during all fire planning processes... Wilderness managers will assist in the selection of and implementation of appropriate responses to Wilderness fires.” All fire management operations will consider Wilderness as a value to be protected during their planning and implementation.

These constraints and the corresponding procedures are normally applied. In the event that an Incident Management Team is requested to suppress a wildland fire or a Fire Use Team is requested to manage a wildland fire, a delegation of authority will be prepared and signed by the park Superintendent. The delegation of authority will specify the Lead Resource Advisor and be accompanied by a list of constraints containing, but not limited to, the elements listed below. It would normally contain additional site-specific constraints that apply to the geographic area of the fire as well. The following procedures will also apply for actions not involving a management team.

Wildland Fire Operational Response Procedures

- Normally, a Resource Advisor(s) will be requested for any incident where outside crews are ordered. All fire locations are normally reported to the fire archaeologist as well.
- The Resource Advisor will identify all special-status species and their associated habitats, and will work with the line archaeologist to convey avoidance strategies to fireline crews.
- No heavy equipment is allowed for fireline construction without prior approval, in writing, by the Superintendent.
- No water bucket dipping is allowed in certain lakes determined to be significant habitat for wildlife. During drought conditions this constraint may be applied to other lakes as well so that they do not completely dry up. Lakes to be used for dipping will be determined by the Resource Advisor, incident by incident.
- Fire Retardant is not allowed within 300 feet of any water source. Fire retardant can permanently stain rock surfaces and is used with discretion when being applied near the

significant granite features, domes, and walls in the park. This discretion takes into account the location of the fire, the risk associated with the incident, and wind direction, which can cause the retardant to drift onto a rock face. This is particularly important near culturally significant features and scenic landscapes and any retardant on major features should be washed off using water bucket drops as soon as possible.

- A line qualified archaeologist will be assigned to all fires where organized crews are constructing fireline and will at their option check all work done on all fires.
- Only handtools will be used to construct fireline in the Yosemite Wilderness. Chainsaws are permitted; helicopters are permitted so long as excessive erosion from bucket work is avoided, especially if Type-I helicopters are used.
- Natural barriers will be used, to the greatest extent possible, to avoid fireline construction. All line construction will be kept to the minimum line standard required to do the job. Blacklining and burning out natural features will be used to maximum advantage when preparing fireline.
- Natural openings and clearings will be used whenever possible for helicopter landing zones, and in movement of crews. Landing zones should be constructed only when other alternatives are not possible, or safety concerns dictate and should be concurred with by the Resource Advisor.
- Resource protection measures will be implemented at spike camp locations. These will include proper food storage for wildlife protection, historic and prehistoric site survey and protection, and Wilderness sanitation measures.
- Fireline construction in and around riparian habitat will be done in a manner to least impact the values associated with these important habitat areas. No fireline construction will be done in meadows. Fireline construction that ties into or crosses streams will be done at points where the majority of line impacts upland vegetation rather than riparian vegetation.
- All wildland fire management activities within the boundaries of Yosemite National Park will adhere to Minimum Impact Management Techniques (MIMT; formerly known as “MIST”). MIMT requires that tactics are commensurate with the fire behavior, and do not require compromising firefighter and public safety.
- All wildland fire management activities within areas being managed as Wilderness inside the boundaries of Yosemite National Park will adhere to “minimum tool” requirements of the 1964 Wilderness Act (16 USC 1 1 21). Any question over the minimum tool qualification will be discussed by the Fire Management Committee and decided upon by the park Superintendent.
- Mitigation measures described in the Biological Opinion (Appendix Nine) issued by the U.S. Fish and Wildlife Service will be followed

Wildland Fire Planning Procedures

- All wildland fires occurring within Yosemite National Park will be managed under an Appropriate Management Response (AMR) strategy. AMR is defined as “ the response to a wildland fire is based on an evaluation of risks to firefighter and public safety, the circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities, and values to be protected. The evaluation must also include an analysis of the context of the specific fire within the overall local, geographic area, or national wildland fire situation.” (2001 Federal Fire Policy;

Appendix B Glossary). Appropriate Management Response allows for a full range of management actions, from full control through aggressive and costly suppression techniques, to a confine or contain strategy using existing barriers, predicted weather, or minimal suppression activities.

- All proposed fire management activity project plans not covered by the Yosemite Fire Management Plan/Environmental Impact Statement will undergo appropriate National Environmental Policy Act planning processes, either as a Categorical Exclusion, an Environmental Assessment, or an Environmental Impact Statement, depending on the significance of impacts.
- An internal and external technical review will be conducted before prescribed fire plans are submitted to the park Superintendent for approval. Signature lines indicating an internal review has been completed will be part of the cover page of each plan. Review and signature will be required from the Project Planner, Fire Management Officer, Chief Ranger, Chief of Resource Management, Research Scientist, and Fire Ecologist. External technical reviewers can be from another National Park Service unit, an adjacent cooperating agency, or a private contractor. External technical review will include a signature and comment page. Prescribed fires to be conducted in Wilderness will also be reviewed by the Wilderness Manager.
- A Fire Management Committee will provide oversight and direction to the Fire Management Program. Membership of the Fire Management Committee will be comprised of the Park Superintendent, Deputy Park Superintendent(s), Chief Ranger, Chief of Resource Management, Research Scientist, Fire Management Officer, Wilderness Manager, and Prescribed Fire Manager. The committee will meet each spring to perform an annual review of the Yosemite Fire Management Plan and approve any changes needed in the operational sections of the plan.
- A Prescribed Fire sub-group will work under the purview of the Fire Management Committee. This group will be comprised of the Prescribed Fire Managers staff and representatives of the Resource Management Division and Wilderness Manager. This group will be the interdisciplinary (ID) team that develops the operational prescribed fire plans and hazard fuel plans assuring that critical resource concerns are protected or mitigating measures are developed. This group will determine whether further consultation with USFWS or the SHPO is warranted.
- Fire, especially from natural ignitions on lands being managed as Wilderness, would be allowed to achieve resource management objectives to the fullest extent possible. It is recognized that extenuating circumstances (air quality concerns, cumulative impacts, visitor safety, aesthetics, national fire situation, seasonality, etc) will require some potentially beneficial fires to be suppressed. In this event, any suppressed fires that are candidates for managed wildland fire may be re-ignited when conditions that triggered the suppression action have abated or been mitigated.
- All decisions to engage in any actions permissible under the alternatives will be based on the best available science. The Fire Management Officer, Fire Ecologist, and Chief of Resource Management will be responsible for input on all fire management activities that affect the park's resources.
- Standard mitigations will be utilized in project planning (see Mitigation Measures).

National Park Service Implementation Procedures

Procedures and direction for implementation of fire management programs in the National Park Service is contained in Directors Order 18, and Reference Manual 18. This is a NPS policy and must be adhered to by all parks, and the most current version can be viewed on the NPS Firenet Site at: <http://www.nps.gov/fire/index.htm>, under Wildland Fire. Chapter 9 specifically deals with Wildland Fire Use and Suppression. Within the NPS policy are directions that allow the NPS to implement the National Fire Policy. The National Fire Policy is developed by representative members of all the wildland fire agencies and endorsed by the Secretaries of Interior, Agriculture, Energy, Defense, and Commerce; the Administrator of the Environmental Protection Agency (EPA); and the Director of the Federal Emergency Management Agency (FEMA).

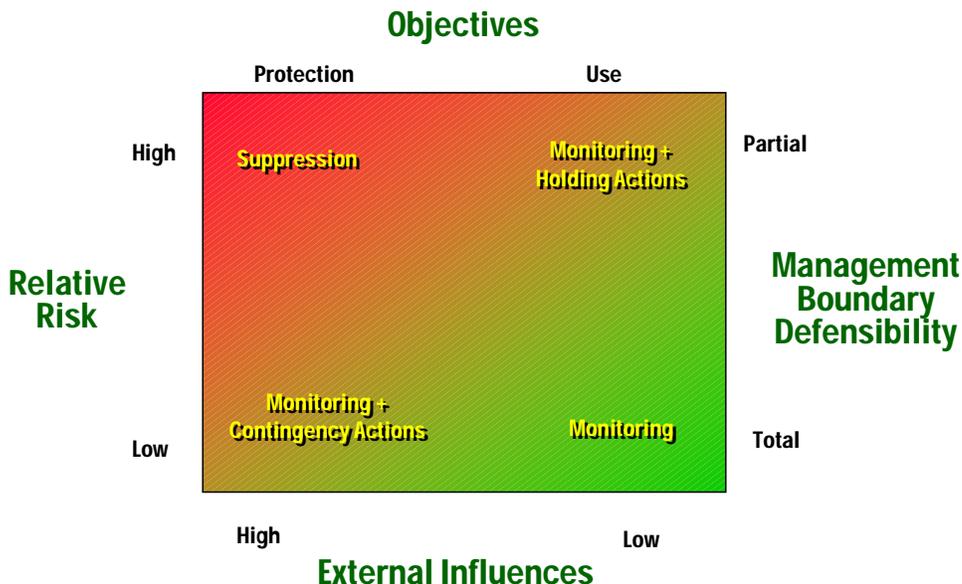
Policies are extremely dynamic, and seem to be in a constant state of change. The National Fire Policy was changed in 1989, 1995 and most recently 2001, followed by subsequent changes in each agency's policy. It is the intent of the final plan to provide for these changes through amendment to the text of the Yosemite Wildland Fire Management Plan as changes occur. These changes would not constitute the need for additional compliance or a complete rewrite of the Yosemite Fire Management Plan.

Wildland Fire Suppression Implementation

Appropriate Management Response

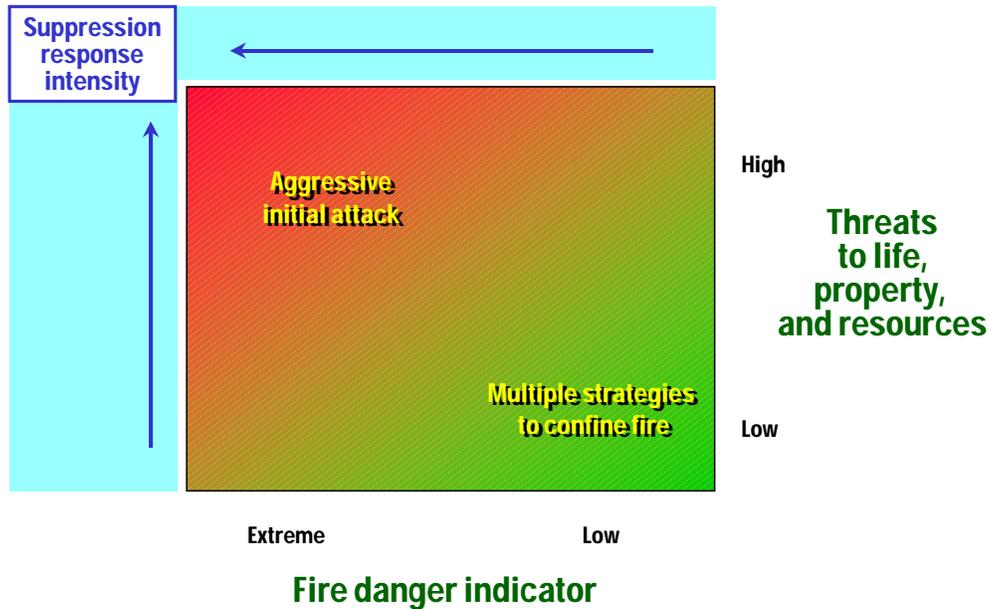
Suppression of wildland fires that are in fire management units where suppression is the required response would provide first for firefighter and public safety. The Appropriate Management Response concept as defined in the 2001 Federal Fire Policy was utilized in establishing Fire Management Units in Yosemite. There are areas in the Suppression Unit where safety, accessibility, and cost will result in a response that is as aggressive as practical. This would be pertinent to time of year, and proximity to the boundary between the FMU's. The attached chart shows the AMR concept and by crossing lines from top to bottom and side to side an indication of response is identified.

Appropriate Management Response



As Resources (engines, crews, aircraft) are assigned at the time of detection, an Incident Commander is assigned and additional resources are ordered and deployed as needed. At times when multiple ignitions take place, from lightning or other causes, prioritization takes place based on immediate threats to life, property and natural and cultural resources. Resources are deployed based on these priorities, which means that some ignitions may not receive an immediate initial attack if resources are not immediately available. The following chart displays how prioritization of ignitions can be tempered using the Appropriate Management Response when dealing with time of year and threats.

Appropriate Management Response



Additional resources (firefighting equipment, firefighters) are ordered through the national mobilization process that recognizes the *closest resources* concept. This allows a resource order to be filled from the closest available source, saving time and getting the resource quickly. Mobilization is done through agreements, operating plans, and mobilization guides that are developed before the wildland fire season and agreed to by participating federal and state agencies and local fire departments.

Wildland Fire Situation Analysis

If initial attack on a wildland fire is unsuccessful a Wildland Fire Situation Analysis (WFSA) is prepared. The WFSA is a decision making process in which the agency administrator (Superintendent) describes the situation, establishes objectives and constraints for the management of the fire, compares multiple strategic wildland fire management alternatives, evaluates the expected effects of the alternatives, selects the preferred alternative, and documents the decision. A Fire Complexity Analysis is completed concurrently to assist in making critical decisions concerning resource commitment and the need for or against using an Incident Management Team. The WFSA is approved by the Superintendent and is validated daily until the fire is controlled.

Burned Area Emergency Rehabilitation (BAER) Implementation

On April 27, 1998, the Department of the Interior approved new policies for Burned Area Emergency Rehabilitation (BAER). The new policies resulted from a 1½ year long effort by an interdepartmental team to revise BAER policies in support of current fire and resource management practices. These policies supersede and expand upon the interim policies contained

in the draft Department of the Interior BAER Handbook, and establish consistent BAER guidelines among the NPS, BLM, BIA, USFWS, and the USFS. The new policies are a major step forward because they allow parks to expand the use of BAER funding to mitigate a broad range of threats to natural and cultural resources critical to our mission and protection mandates. Since BAER projects can have a major impact on many aspects of park management, the successful implementation of these policies requires a coordinated interdisciplinary effort among natural and cultural resource managers, fire managers, and visitor services.

Specific guidelines for filing BAER requests and for understanding what BAER funding can be used for are outlined within each agency's policy documents. For the National Park Service this is Chapter 12 of NPS Reference Manual 18.

Prescribed Fire Implementation

Prescribed Fire Planning

The Prescribed Fire Plan is the site-specific implementation document that defines the strategic purpose, goals, and objectives for a prescribed fire project. It also provides guidance for developing the Incident Action Plans (IAP) that defines tactical activities for each operational period needed to execute the prescribed fire project. A prescribed fire plan is required for each prescribed fire project. All prescribed fire plans must be reviewed and recommended by a burn boss qualified at or above the complexity level of the project. The plan receives further review by the interdisciplinary team composed of the Prescribed Fire Managers staff and representatives of the Resource Management Division.

While the National Park Service has no specific position designated as a prescribed fire planner it is recognized that a burn boss must possess the skill and technical knowledge to perform this function. The minimum qualifications for the principal person preparing the plan are that the person (1) is a burn boss trainee (RXB2-t), (2) is knowledgeable about the local area, and (3) possesses skills necessary to write the plan. The park Superintendent has final authority to approve the prescribed fire plan and shall ensure the plan receives sufficient oversight, guidance, and support. As part of the responsibility for approval of the prescribed fire plan, the Superintendent is responsible for ensuring that the prescribed fire plan is closely linked to and consistent with the fire management plan and agency direction and policy. The burn boss has the responsibility to make the on-site, operational, "go/no-go" decision and approval authority for the Incident Action Plan. The burn boss ensures that all prescription elements are met before, during, and after the burn. Deviations from the approved plan, which cause an escape, injury, property damage or other consequence, may result in personal liability. Any amendment that presents major changes to the outcome, size, fire effects, or potential impacts on the management organization of the burn shall go through the same review, approval, and notification process as the original plan. The burn boss can approve amendments addressing minor changes to specific implementation actions, defined in the Incident Action Plan (IAP), on the day of the burn.

The prescribed fire planning process is explained in detail in Chapter 10 of NPS Reference Manual 18 and requires the completion of the following steps:

Technical Review: The technical review is **REQUIRED** to help ensure that a prescribed fire plan is written in a manner that the stated goals and objectives can be safely and successfully achieved when properly implemented.

- 1) **Seasonal Severity:** Effects of long-term drought are a component of the prescribed fire planning process and shall be factored into the prescription of each prescribed fire. When preparing the prescribed fire plan, consideration shall be given to long-term drought effects and climatological probabilities for weather events important to the success of the prescribed fire. When and where available national, geographic area, and specific long-term assessments will be evaluated. Consideration should be given to using long-range fire assessment teams, research, and agency meteorologists to support climatological assessments.
- 2) **Collaborative Planning and Review:** During the planning process all National Park Service units should solicit comments from all cooperating agencies and adjacent landowners, and attempt to incorporate those comments into the prescribed fire plan. However, mandatory approval from these agencies and landowners should not be required because it would curtail meaningful progress in accomplishing fuels management objectives.
- 3) **Prescribed Fire Plan Contents:** A standard prescribed fire plan form has been developed for use in the National Park Service. However, due to the variety of information required by an individual park unit the plan may be supplemented with additional content provided the minimum elements listed in the standard form are addressed. Each plan shall include as a minimum, the following elements:
 - a) **Signature Page:** The approved prescribed fire plan constitutes a delegation of authority to burn. No one has the authority to burn without an approved plan or in a manner not in compliance with the approved plan. Actions taken in compliance with the approved prescribed fire plan will be fully supported. Personnel will be held accountable for actions taken that are not in compliance with elements of the approved plan regarding execution in a safe and cost-effective manner.
 - b) **Executive Summary:** A brief discussion describing the purpose and justification of the project, connection with the overall management of the unit, and description of how it implements the fire management plan.
 - c) **Description of Prescribed Fire Area:**
 - i) General Area Description (narrative)
 - ii) Location (County, Legal, Lat/Long and/or UTM, Fire Management Zone)
 - iii) Geographic Attributes (Project Size, Elevation Range, Slope Range, Aspect Range)
 - iv) Description of Project Boundaries (Define geographic, natural and human features to be used as the project boundary.)
 - v) **Vegetation Types:** Describe the structure and composition of the vegetation type(s) within the project area, the percent of the area composed of this type and the fuel model that corresponds to it. Include plant community class, as available.
 - vi) **Fuels Characteristics:** Describe fuels as applicable by fuel type. Describe:
 1. Fuel type, natural or activity; Fuel Loadings by size class, live and dead, and total;
 2. Fuel bed depth;
 3. Arrangement; and
 4. Discussion of past environmental effects on the land and how they have impacted the fuel characteristics as appropriate.

- vii) Vicinity Maps – attached as appendices
- viii) Project Maps – attached as appendices (include vegetation/fuel maps)
- d) Goals and Objectives: Include purpose and goals of the prescribed fire, as stated in park management and supporting management plans (i.e. Resource Management Plan, Cultural Landscape Plan, Endangered Species Recovery Plan, etc.) Specific objectives of the prescribed fire and protection objectives shall be stated in quantifiable and measurable terms.
- e) Risk Management: The process of identifying and controlling hazards to protect resources and property. This includes implementing a risk management process, which is an analysis of proposed actions, the environment (fuels, topography, weather, etc.) where the project takes place, assessment of hazards, potential consequences, and mitigation to reduce risk (several worksheets are included in RM-18 Chapter 10). The mitigations described are then addressed in the later sections of the prescribed fire plan dealing with project complexity, organization, pre-burn considerations, ignition and holding actions, public and firefighter safety, and monitoring. A Job Hazard Analysis is part of this procedure and helps to integrate acceptable safety and health principles into the operation.
- f) Project Complexity: A prescribed fire complexity rating shall be completed as part of each prescribed fire plan following the process in RM-18 Chapter 10. This process determines the level of organizational structure and support needed to implement the project based on operational, logistical, safety and management needs. The complexity value breakpoints for requiring a Prescribed Fire Burn Boss Type 1 shall be 4 or more Complexity Values rated “High” OR 2 or more of the Primary Factor Complexity Values rated “High” OR when deemed appropriate by the Superintendent or unit Fire Management Officer.
- g) Organization: List required project organization to complete all phases of the project execution. The prescribed fire organization should be developed based on the objectives, risk assessment and project complexity. Specify minimum number and type of resources needed. Consider long duration, day/night, and multi-operational period projects where exchange of resources will need to occur.
- h) Cost: Estimated total costs for all phases of the project.
- i) Scheduling: Include proposed ignition date, projected duration. Note any dates when project may not be conducted.
- j) Preburn Considerations: List key on and offsite preburn activities and special precautions and regulations including responsibilities and timeframes. Specify on-site: line to be built, snags to be felled or protected, equipment to be pre-positioned, special features to be protected, warning signs to be placed, weather recording and monitoring needs, etc. Specify off-site: burn permits, notifications, media releases, closures, etc. Notifications will show whom we want to contact, who was contacted, who made the contact and when the contact was made. Specify special precautions and regulations: air quality, endangered species, cultural clearances, etc.
- k) Prescription: A prescribed fire prescription contains key weather and fire behavior parameters needed to achieve desired results. Identify ranges of acceptable prescription parameters to obtain desired fire behavior and effects. General prescriptions for burning

- in Yosemite National Park were developed through research in the mid 1970's and refined with correction factors in 1984. See tables A-3.1, 2, and 3.
- l) Ignition and Holding Actions: Identify methods, roles and responsibilities, coordination and special considerations needed. Attach modeling outputs or worksheets (i.e. Fireline Handbook, BEHAVE, etc.) to justify minimum holding resources required. An Incident Action Plan (IAP) is developed for each operational period that defines tactical activities and assignments.
 - i) Test Fire: The test fire is intended to evaluate fire behavior characteristics that are necessary to meet the prescribed fire plan objectives. A test fire is completed prior to making the decision to execute the project. It shall be ignited at a location within the prescribed fire area that is representative of the site and in an area that can be easily controlled if fire behavior is unacceptable.
 - ii) Firing and Ignition: Describe ignition operations including firing techniques and patterns. (attach a map where applicable.) Firing and ignition patterns should address potential changes to weather, topography and fuels. Specific firing and ignition tactics will be documented in the IAP showing necessary resources, safety considerations, equipment, and supplies. These tactics shall be further clarified in the briefing.
 - iii) Holding Actions: Operations to safely maintain the prescribed fire within prescription, within project boundaries and control all slopovers and spot fires within a predetermined time and size. Consider long duration, day/night, multi-operational period projects where exchange of resources will need to occur.
 - iv) Critical Holding Areas: Identify those areas where there is a higher likelihood of holding problems along the boundary or outside the burn unit (anticipated locations of numerous spot fires and/or slopovers, changes in fuel type, high value resource near the project boundary, etc.).
 - v) Divide the Project Area into subunits such as Branches, Divisions, and Groups, based upon complexity, size, assignments, access, topography, etc. Clearly delineate these on the project map using Incident Command System (ICS) symbols.
 - vi) Mop-up Operations: Identify proposed actions to secure and patrol project area until the prescribed fire is declared out.
 - m) Wildland Fire Transition Plan: Identify actions and notifications needed when the prescribed fire exceeds project boundaries and cannot be controlled within one burning period using on-site holding resources. All further actions will be determined through a new strategy developed in the Wildland Fire Situation Analysis (WFSA) process. Identify who the initial incident commander will be and what notifications will be needed.
 - n) Protection of Sensitive Features: Identify treatment and mitigations needed to protect cultural sites, threatened and endangered species, or other sensitive features. Include compliance with all applicable NEPA and NHPA requirements.
 - o) Public and Firefighter Safety: Describe public and personnel safety and emergency procedures. Identify safety hazards in and outside the project area, measures taken to reduce or mitigate those hazards, and Emergency Medical Service personnel assigned. The IAP should address communications, medical plan, and incident safety analysis.
 - p) Smoke Management: Describe how the project will comply with County, State, Tribal, and Federal air quality regulations. Include modeling outputs and mitigation measures to

- reduce potential impacts of smoke production and smoke related safety and health issues, if required.
- q) Interagency Coordination and Public Information: Identify actions, timelines and responsibilities for interagency and intra-agency pre-burn coordination and public involvement.
 - i) Media Releases and Public Notice Postings.
 - ii) Notifications: List of appropriate individuals, agencies and the public to receive notifications.
 - r) Monitoring: Describe how the following two elements will be met:
 - i) Fire Behavior Monitoring: Specify how monitoring of prescription elements will take place pre-ignition and during the burn, including weather, smoke/air quality, and fire behavior observations. Specify on-site weather, smoke, and fire behavior observations required during all phases of the project. Include procedures and responsibilities for acquiring weather and smoke forecasts. May reference park Fire Monitoring Plan, or recommended standards for Level 1 and/or Level 2 fire monitoring guidelines in the NPS Fire Monitoring Handbook.
 - ii) Fire Effects Monitoring: Specify how long and short-term fire effects (vegetation and fuels) monitoring will take place pre-burn and post-burn to evaluate if project objectives have been met. May reference park Fire Monitoring Plan, or recommended standards for Level 3 and/or Level 4 fire monitoring guidelines in the NPS Fire Monitoring Handbook. If plots exist on the unit, include a map of plot locations. Chapter 11 contains an outline for completing a Fire Monitoring Plan.
 - s) Post Fire Rehabilitation: Describe any necessary rehabilitation of disturbances that will be undertaken resulting from management activities of the project. These typically include fireline restoration, minor fence repairs and other mitigation actions that are pre-identified in the prescribed fire plan.
 - t) Post Fire Reports: Identify who, what, and when various reports associated with this project will be completed.
 - u) Appendices: Items to be attached to the prescribed fire plan:
 - i) Reviewer Comments - Provides a space for each reviewer to document comments pertaining to the development of the prescribed fire plan.
 - v) Technical Reviewer Checklist and Comments
 - i) Maps
 - i) Prescribed Fire Complexity Rating Worksheet
 - ii) Fire Modeling Outputs
 - iii) Agency Administrator Go/No-Go Pre-Ignition Approval
 - iv) Prescribed Fire Operations Go/No-Go Checklist

Tables A3-1, 2

General Park Guidelines, Prescribed Fire Prescriptions, Yosemite National Park. Based on Fire Behavior Prediction System (van Wagtenonk, J. W. 1974, van Wagtenonk and. Botti. 1984)

Head Fires					
Fuel Model	5	8	1	9	2
Vegetation	Manzanita Ceanothus Huckleberry Oak	Incense Cedar White Fir Red Fir Sugar Pine Giant Sequoia	Perennial Grass	Ponderosa Pine Mixed Conifer	Ponderosa Pine Bear Clover
Air Temp	30-75	30-80	30-80	30-75	40-75
RH	30-50	20-65	30-65	30-65	20-65
Mid-Flame Wind Speed	1-5	1-5	1-6	0-6	0-5
1hr TL FM	5-7	4-8	5-8	6-8	5-10
10 hr TL FM	9-13	6-13		9-15	7-16
100 hr TL FM (2)		7-20		10-20	8-20
1000 hr TL FM (2)		10-20 (1)		10-20 (1)	
Live Fuel Moist (3)	80-130				65-170
Rate of Spread (chains/hour)	7-20 (11-32)	0.3-1.7 (0.5-2.7)	4-143	2-7 (1.8-6.4)	3-23 (3.2-24.2)
Heat/Unit Area BTU/ft²	230-700	170-210	84-92	340-400	400-500
Fireline Intensity BTU/ft/sec	30-250	1-6	6-242	11-45	23-170
Flame Length	2-6 (12.3-36.8)	0.5-1 (0.9-1.9)	1-6	1.4-2.6 (1.0-1.9)	1.9-5.0 (1.5-3.5)

Backing Fires				
Fuel Model	5	8	9	2
Vegetation	Manzanita Ceanothus Huckleberry Oak	Incense Cedar White Fir Red Fir Sugar Pine Giant Sequoia	Ponderosa Pine Mixed Conifer	Ponderosa Pine Bear Clover
Air Temperature	40-90	40-90	40-85	40-85
RH	20-40	20-40	20-50	20-60
Mid-Flame Wind Speed	0-6	0-6	0-6	0-6
1hr TL FM	4-6	3-8	4-8	4-8
10 hr TL FM	20-40	20-40	20-50	20-60
100 hr TL FM (2)		7-12	8-15	7-15
1000 hr TL FM (2)		10-20 (1)	10-20 (1)	
Live Fuel Moisture (3)	65-120			65-170
Rate of Spread (chains/hour)	1.0-1.7 (1.6-2.7)	0.2-0.3 (0.3-0.5)	0.7-1.1 (0.5-0.7)	1.9-3.0 (2.0-3.2)
Heat/Unit Area BTU/ft²	550-750	180-250	350-450	450-525
Fireline Intensity BTU/ft/sec	10-23	0.8-1.3	5-8	16-29
Flame Length (ft)	1.3-1.9 (8.0-11.7)	0.4-0.5 (0.7-0.9)	0.9-1.2 (0.6-0.9)	1.6-2.1 (1.1-1.5)

- (1) The NFFL fuel model contains no fuels in this size class; thus recorded values do not affect calculated Rate of Spread, Heat/Unit Area, Flame Length, and Fireline Intensity. The 1000 hour time lag fuel moisture is important to assess because such fuels may be abundant in these vegetation types and may affect control, intensity, and tree scorch.
- (2) The 100 and 1000 hour time lag fuel moistures must be calculated under the NFD RS or derived from oven dried samples. These moistures also relate to the moisture content of the lower layers of duff, however NFD RS calculated values relate poorly to actual duff moistures after fall rains have begun. Oven drying of duff samples should be carried out if duff reduction needs to be assessed.
- (3) Live fuel moisture must be estimated from Fire Behavior prediction System tables, calculated from an NFD RS station using Woody Fuel Moisture, or derived from oven-dried samples.

Table A3-3
Correction factors for calculated flame lengths and rates of spread using the Fire Behavior Prediction System (van Wagtenonk, J. W. 1974, van Wagtenonk and. Botti. 1984)

Fuel Type (FM)	Flame Lengths Multiply calculated value by:	Rates of Spread Multiply calculated value by:
Bear Clover (2)	0.69	1.05
Ponderosa Pine (9)	0.83	0.91
Ponderosa Pine/Mixed Conifer	0.72	0.67
White Fir/Mixed Conifer (8)	1.87	1.56
White Fir/Red Fir (8)	1.69	1.90
Montane Chaparral (5)	6.14	1.59

Prescribed Fire Unit Preparation

Preparation of the prescribed fire unit for burning involves standard procedures that each burn boss does as the prescribed fire plan is developed. Normally the notice is given well in advance that certain units will be burned in an upcoming season. This information is passed onto the various resource specialists so that the burn boss can address concerns in the prescribed fire plan. In most cases a walk through is done with the Archaeologist (Fire), and other resource specialists so that any place line work is done is known and evaluated. The lines and features are flagged so that specialists will know where fireline will be constructed, what snags may be taken down, where water sources may be used or pumps set up, and where thinning will take place as the unit is prepared. This advance notice allows resource specialists to have time to inventory the unit if needed and bring up concerns prior to the development of the prescribed fire plan. It also ensures that work is performed on site. Procedures identified within this section and within the Mitigations Common to all Alternatives section will be followed. Several of the prescribed fire projects are done in phases where some thinning is required during the year the plan is developed. Jackpot and pile burning may precede the actual prescribed burning by a year or so. Fireline installation and snagging will normally be done the year the burn is planned as part of the final preparation.

Managed Wildland Fire Implementation

The decision to allow a wildland fire to burn so that it can accomplish resource benefits requires a Wildland Fire Implementation Plan (WFIP). Specific guidelines are contained in Chapter 9 of NPS Reference Manual 18. As these managed wildland fires cannot be planned for, except by designation of a Fire Management Unit where they may be allowed, these plans must be written when the ignition occurs. All naturally ignited wildland fires may be managed to accomplish resource management goals once an appropriate fire management plan is approved. Human caused wildland fires may receive a suppression response commensurate with values-to-be-protected, firefighter and public safety, and cost efficiency and can be managed or monitored in the Fire Use Unit. Management of wildland fires in the National Park system offers substantial flexibility in how land and resource management objectives can be accomplished. There are no pre-planned Maximum Manageable Areas (MMA) in Yosemite National Park but there are MMA's that have been developed and re-used through adaptive management. Yosemite currently has an agreement with Stanislaus National Forest to allow fire to cross the boundary between the Yosemite Wilderness and the Emigrant Wilderness.

The random pattern of wildland fire occurrence, combined with the possibility that the fire may last for several weeks or even months, requires more intensive planning and evaluation than for

prescribed fires and wildland fire suppression actions, especially at the initial decision point when the fire is detected.

The complete implementation process is described, with example forms provided, in the Wildland and Prescribed Fire Policy Implementation Procedures Reference Guide. The reference guide is a dynamic document that is periodically updated based on “lessons learned” or because policy changes as a result of some external or internal influence. The reference guide is a standard agreed to by all fire management agencies. This guide is in the process of being updated and the following description of the WFIP process may look somewhat different in the final Yosemite Fire Management Plan.

Wildland Fire Implementation Plan—WFIP

The Wildland Fire Implementation Plan is a three-stage process and is completed based on the level of risk that is associated with the fire. A wildland fire may be managed under any of the stages and need not have all stages completed.

Stage I – Initial Fire Assessment. Stage I is a decision-making process to evaluate new fire starts and assess ongoing wildland fires in the park. It establishes the foundation information critical to manage the fire, and provides the information for the initial Go/No-Go decision. Stage I consists of two distinct components: *Fire Situation Information*, and *the Initial Go/No Go Decision*.

Stage I considers the following elements:

- Fire origin and cause
- Affected fire management zone
- Immediate and projected threats to life and property
- Smoke and health concerns
- Availability of necessary qualified personnel and fire management resources
- Availability of qualified wildland fire manager
- Immediate and potential impacts to visitors, users, and local communities
- Projected fire growth under normal and drought conditions

Once the fire is authorized to burn it must be periodically re-assessed to confirm the continued capability to manage the fire. This must be completed irregardless of whether the fire is in Stage I, II or III of the planning process. This is done based on a set time schedule not to exceed at least once every 7 days. During periods of active growth this process is done daily. This revalidation consists of completing a revalidation checklist and assessing the need to perform additional planning by moving to Stage II or Stage III. The re-validation process requires a signature by the agency administrator (Superintendent).

Stage II – Short-Term Implementation Actions. Stage II represents the initiation of management for resource benefits. During this stage, the potential fire behavior is calculated; uncertainty is reduced by assessing risk of the fire, how quickly it could spread, and how intense the fire may

burn; fire complexity; necessary immediate and short-term management actions and resources; and evaluation of the need to move directly to Stage III.

Stage II consists of four distinct components: Fire Behavior Predictions and Risk Assessment, Short-term implementation actions, Complexity Rating Worksheet, and Stage III Needs Assessment

Fire Behavior Predictions and Risk Assessment: Short-term fire behavior predictions are vital to initial implementation actions because they provide:

- Estimates of fire size and shape at a given time
- Models of management alternatives
- Determinations of resource needs, production rates, and requirements
- Placement of resources
- Estimates of behavior under differential weather patterns
- Estimates of ignition patterns, including spotting
- Modeling for contingency action planning
- Developing prescriptions through historical weather records
- Verifying prediction outputs

The Short-Term Implementation Actions: Stage II also describes what the initial or immediate implementation actions will be. These actions can vary significantly, depending upon specific circumstances of the particular fire. In cases where the fire may be fuel-limited, surrounded by sparse fuels or natural barriers with only limited spread potential, monitoring may be specified as the necessary implementation action. In other cases, monitoring plus some form of limited mitigation actions may be necessary. In still other cases, fuel types in which the fire is burning may require immediate actions to delay, check, or direct the spread of fire.

- Objectives and Desired Effects
- Safety Considerations
- External Concerns
- Environmental Concerns
- Threats
- Short-Term Implementation Actions
- Estimated Costs
- Signatures

Complexity Analysis: Stage II requires that a Complexity Analysis be completed which is normally an agency agreed to process involving worksheets that address issues related to safety, threats and potential for escape. Where risks are identified from this analysis, they are specifically

addressed regarding the possibility to mitigate that risk. This is an evolving process but will include rating complexity elements including but not limited to:

- Fire Treatment Objectives
- Potential for Escape
- Life and Safety
- Values at Risk
- Fuels and Fire Behavior
- Management Organization
- Ecological and Environmental Considerations
- Social and Cultural Values
- Smoke and Air Quality Management
- Project Duration and Logistics
- Magnitude of oversight/political activities
- Ignition and Tactical Operations.
- Interagency Coordination

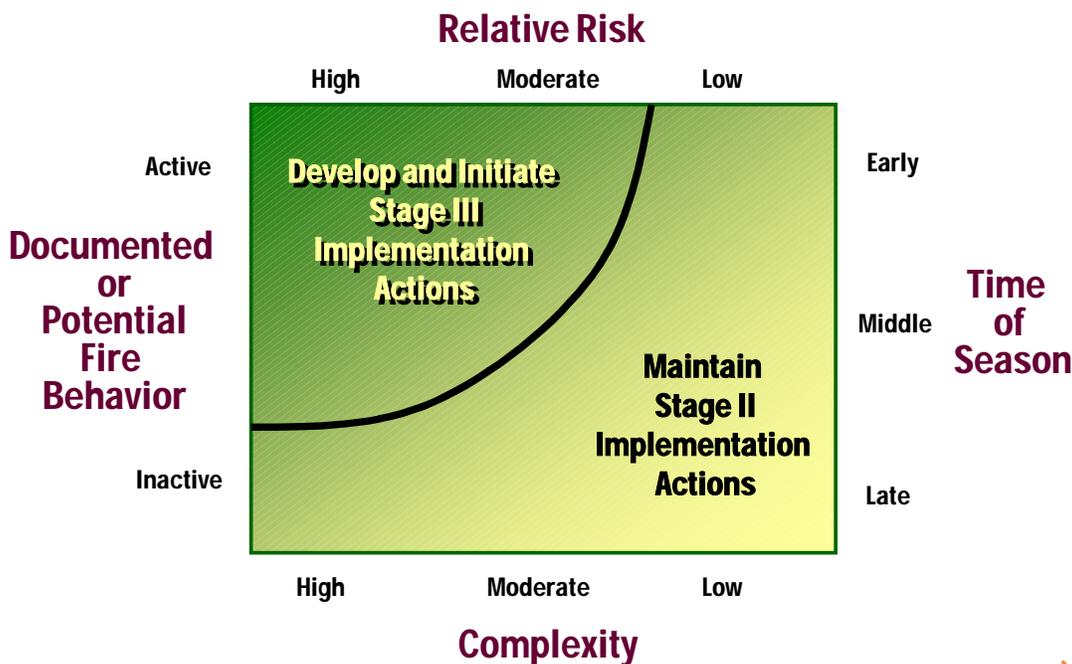
Stage III Needs Assessment: This process is a chart that provides the decision maker a visual aid to determine whether planning needs to proceed to the final level or whether management can continue at the Stage II level. It is currently based on comparing four elements to generate a visual indicator of where the fire is in relation to Stage III needs. The four elements are:

- Time of Season
- Documented or Potential Fire Behavior
- Complexity
- Relative Risk

All four of the above elements are known from completing the first two Stages of planning and are evaluated together to yield a visual aid which can help decide whether planning should proceed to Stage III. By matching indexes top and bottom and side to side the crossing point indicate the need to move to Stage III. This element is in the process of being upgraded and also applied to the decision making process for moving from Stage I to Stage II. For the current time however it is only applicable to the change from Stage II to Stage III.

Once the fire is authorized to burn it must be periodically re-assessed to confirm the continued capability to manage the fire. This is done based on a set time schedule not to exceed at least once every 7 days. During periods of active growth this process is done daily. This revalidation consists of completing a revalidation checklist and assessing the need to perform additional planning. At Stage II the periodic re-assessment and re-validation requirement also requires that the chart described above be evaluated each time the re-assessment is done. The re-validation process requires a signature by the agency administrator (Superintendent).

Stage III Need Assessment Chart



Stage III – Long Term Assessment and Implementation Actions. This is the final stage of the WFIP and its need is determined by the Stage III Needs Assessment Chart or it can be ordered completed by the Agency Administrator (Superintendent). Stage III is normally completed on all fires that display potential for significant growth, have potential to threaten significant values, or have significant holding actions or resource commitment associated with their management. This stage is also normally always completed if a Fire Use Management Team is activated to manage the fire.

Stage III details operational activities and documents the planning completed to ensure adequate mitigation actions have been developed. These actions will provide the best protection against fire activity exceeding acceptable limits. Mitigation actions are those on-the-ground activities that will serve to increase the defensibility of the Maximum Manageable Area (MMA), check, direct, or delay the spread of fire, and minimize threats to life, property, and resources. Mitigation actions may include mechanical and physical non-fire tasks and specific fire applications. Their purpose is to construct firelines, reduce excessive fuel concentrations, reduce vertical fuel continuity, create fuel breaks or barriers around critical or sensitive sites or resources, create "blacklines" through controlled burnouts, and limited suppression actions to limit fire spread and behavior. There are 15 major components to Stage III of the WFIP:

- Objectives and Risk Assessment Considerations
 - Natural and Cultural resource objectives and constraints/considerations

- Maximum Manageable Area Definition and Maps
- Fire Projections and Maps
- Weather season/drought discussion and prognosis
- Long-Term Risk Assessment (describe techniques and outputs, include maps as appropriate)
- Probability of Success
- Threats
 - Threats to MMA
 - Threats to Public Use and Firefighter Safety
 - Smoke dispersion and effects
 - Other
- Monitoring Actions (actions, frequency, and duration)
- Holding Actions (describe holding actions, management action points that initiate these actions, and key to map if necessary)
- Resources needed to manage the fire
- Estimated costs of long-term implementation actions
- Contingency Actions (describe contingency actions, management action points that initiate them, and resources needed)
- Information Plan
- Post-burn evaluation
- Signatures and Date

Once again the decision to manage a fire at Stage I, II, or III must be periodically re-assessed and validated by the agency administrator (Superintendent). This step provides a process to evaluate the continued capability of the local unit to manage the fire for resource benefits, and to determine if the fire is escalating in complexity and operational needs.

Wildland Fire Implementation Plan Application and Constraints

A fire that is burning in the middle of a Wilderness that has virtually no chance of reaching any valued resources will normally be managed at Stage I of the WFIP process unless it has potential to become a large fire. If a fire has some potential to reach a boundary, facility, or improvement of any type or cause smoke problems it would likely be managed at Stage II so that additional information is collected early into the management of the fire. Fires that are expected to require significant holding actions or mitigations to be successful will likely be managed at Stage III, which requires the most rigorous planning and analysis. These fires normally require a management structure to be set up and must be monitored intensively at the ground level and normally until the onset of fall when conditions moderate.

There are no conditions when Wildland Fires would not be managed in Yosemite except under periods of national moratorium (2000) or when the initial decision elements of the Go/No Go Decision are not acceptable to the agency administrator (Superintendent). Drought periods have long been thought to be times when these fires should not be managed. They are however the

only time when the high elevation communities experience fire naturally and are a significant force in Wilderness management. To suppress fire in a system with a 200+ year fire return interval can have long lasting effects and is much the reason why American Forests are in the condition they are. Science has shown us that we cannot continue to do this without possible irreversible impacts. What has been learned over years of management of wildland fire is that you can't manage them all because that also can have detrimental effects when they start exhibiting stand replacement behavior. Because certain parts of the ecosystem are in an unhealthy state, work needs to be done up front before management can be done using natural ignitions (the west side of Yosemite).

Issues that may preclude allowing a wildland fire to burn to accomplish resource benefits include:

- Extreme drought
- No qualified manager available
- Preparedness Levels
- Smoke
- Proximity to Unit boundaries
- No Resources available
- Too many fires already
- Unmitigatable Risk to high values

Wildland Fire Implementation Plan Application

Non-Fire Hazard Fuel Projects

Hazard fuel projects will also have an operational implementation plan. Format for this plan is new in 2001 and is outlined in RM-18 Ch 10. If no prescribed fire is proposed, then a Hazard Fuel Plan will outline the alternative treatments that will be used. If fire is to be applied at a later date to remove duff and forest floor litter, then the entire project would be written up as a Prescribed Fire Plan.