3G: Fire Management

Management Measure for Fire Management

Prescribe fire for hazardous fuel reduction and control or suppression of wildfire in a manner that reduces potential nonpoint source pollution of surface waters:

(1) Prescribed fire should not cause excessive sedimentation due to the combined effect of partial or full removal of canopy and removal of ground fuels, litter layer and duff.

(2) Prescriptions for wildland fire use should protect against excessive erosion or sedimentation to the extent practicable.

(3) All bladed firelines, for prescribed fire and wildfire, should be stabilized with water bars and/or other appropriate techniques if needed to control excessive sedimentation or erosion of the fireline.

(4) Wildfire suppression and rehabilitation should consider possible NPS pollution of watercourses, while recognizing the safety and operational priorities of fighting wildfires.

Management Measure Description

The goal of this management measure is to minimize nonpoint source pollution and erosion resulting from prescribed fire used for site preparation, fuel hazard reduction, and activities associated with wildfire control or suppression. Studies have shown that prescribed burning, if carefully planned and done using appropriate BMPs, has no significant effect on water quality (South Carolina Forestry Commission, 2000).

Prescribed burning reduces hazardous fuels. Where tree species are ecologically dependent on fire for regeneration or maintenance of healthy stands, fire is an essential forest management tool. Particularly in the interior west and much of the south, ecosystems developed in the presence of frequently-occurring, low-intensity ground fires. Returning these stands to a structure that more closely resembles that which occurred under these frequent fire regimes requires the use of prescribed fire. Because fire suppression has contributed to increased levels of fuels, wildland fires occurring in these areas burn quite hot and consume a lot of material (live and dead).

The severity of burning and the proportion of the watershed burned are the major factors that affect the influence of prescribed burning on streamflow and water quality. Fires that burn severely on steep slopes close to streams and that remove most of the forest floor and litter down to the mineral soil are most likely to adversely affect water quality. The amount of erosion following a fire depends on

- The amount of ground cover remaining on the soil
- The steepness of the slope
- The time, amount, and intensity of subsequent rainfall
- The severity of fire
- The erodibility of the soil and soil type

- How rapidly a site revegetates
- The type of vegetation

Periodic, low-intensity prescribed fires usually have little effect on water quality, and revegetation of burned areas reduces sediment yield from prescribed burning and wildfires.

Cost of Prescribed Burning

Costs associated with prescribed fire depend on the size of the fire crew, the amount of heavy equipment needed at the site to control the burn, the areal extent and intensity of the burn, and the topography of the area being burned. Table 3-33 provides a range of costs associated with prescribed burning (Hansit, personal communication, 2000; Holburg, personal communication, 2000).

Table 3-33. Range of Prescribed Fire Costs

Topography	Crew Cost[a]	Heavy Equipment Cost[a]
Mountainous	$50 to $100 per acre	$200 to $400 per acre
Flat land	$3 to $60 per acre	$75 to $300 per acre

[a] Hansit, personal communication, 2000; Holburg, personal communication, 2000.

Best Management Practices

Prescribed Fire Practices

- *Plan burning to take into account weather, time of year, and fuel conditions so that these help achieve the desired results and minimize effects on water quality.*

Evaluate ground conditions to control the pattern and timing of the burn.

- *Execute the prescribed burn with an agency-qualified crew and burn boss.*
- *Do not conduct intense prescribed fire for site preparation in the SMA.*
- *Do not pile and burn for slash removal purposes in the SMA.*
- *Avoid construction of fire lines in the SMA.*
- *Avoid conditions that require extensive blading of fire lines by heavy equipment when planning burns.*
- *Use handlines, firebreaks, and hose lays to minimize blading of fire lines.*
- *Avoid burning on steep slopes in high-erosion-hazard areas or areas that have highly erodible soils.*

Prescribed Fire in Wetlands

- *Whenever possible, conduct burns in wetlands in a manner that does not completely remove the organic layer of the forest floor.*

Prescribed burns conducted in wetlands have the potential to be the most severe due to the increased fuels available. Conduct the fire to minimize the potential to increase surface runoff and soil erosion.

- *When conducting prescribed fire to regenerate fire-dependent species, such as aspen, minimize consumption of the organic layer and openings in the vegetation to that which is necessary to obtain adequate regeneration.*
- *Do not construct firelines that could drain wetlands.*
- *Avoid intense burning.*

Intense burning can accelerate erosion by consuming more organic cover than desired.

Wildfire Practices

Wildfire can change erosion rates on the burned area in two ways. First, fire eliminates vegetative soil cover. Second, chemical changes in the soil following fire may create an increased resistance to water infiltration in the upper soil layer, and this can increase surface runoff and sheet erosion (Elliot et al., 1998). The magnitude of these effects depends on how hot a fire burns, slope, vegetation type, and soil resistance to erosion. Erosion following fire is greatest where a fire has burned most severely and the fire is followed by a strong storm, a year of moderately high rainfall, or a spring with a large volume of snowmelt.

- *Whenever possible leave a 300-foot buffer on both sides of a waterway when using aerially applied fire retardants. If necessary to apply retardant within the 300-foot zone, used the application method that will most accurately keep the retardant from entering the stream.*

The U.S. Forest Service will stop purchasing fire retardant chemicals that contain sodium ferrocyanide. A recent study revealed that mixtures with the chemical can decompose to produce amounts of cyanide that exceed EPA water quality guidelines for freshwater organisms.

- *Do not clean application equipment in watercourses or locations that drain into watercourses.*
- *Close water wells and temporary water catchments excavated for wildfire-suppression activities as soon as practical following fire control.*
- *During wildfire emergencies, firelines, road construction, and stream crossings are unrestricted by BMPs when necessary for health and safety of firefighters and the public and protection of resources from greater damage due to wildfire. However, use BMPs whenever possible and begin remediation as soon as possible after the emergency is controlled.*

Fireline Practices

Fireline construction is an integral part of both wildfire suppression and preparation for prescribed burning. Because of the possibility of water quality degradation following fireline construction, however, precautions are necessary to ensure that water quality is not impaired when firelines are constructed (Florida Department of Agriculture and Consumer Services, 1993). Fireline construction involves removing all organic material to expose mineral soil, and this can result in excessive erosion and water quality degradation. In wetland systems, firelines can function as drainage corridors, resulting in excessive drainage and converting a wetland to a non-wetland system. Implementation of one or more of the following practices can minimize water quality effects from fireline construction.

- *Use natural or in-place barriers (e.g., roads, streams, and lakes) to minimize the need for fireline construction in situations where artificial construction of firelines could result in excessive erosion and sedimentation.*
- *Avoid placing firelines through sensitive areas such as wetlands, marshes, prairies, and savannas unless absolutely necessary.*
- *When crossing water bodies with plowing equipment, raise the plow to prevent connecting the fireline directly to the water body. Water bodies can be used as firelines to avoid unnecessarily disturbing riparian zones.*
- *Construct firelines with the minimum disturbance possible that still allows for safe and effective firefighting, for instance handline rather than cat line when possible.*
- *Construct firelines in a manner that minimizes erosion and sedimentation and prevents runoff from directly entering watercourses.*
- *Avoid constructing firelines in SMAs. When necessary to construct line in SMAs, use appropriate strategies following direction in Land Management Plans for protection of resources*
- *Minimize construction of fireline straight up and down hill. Balance location of fireline with potential for larger fire consuming greater amounts of material.*

The following minimum impact suppression techniques (MIST) for firelines are recommended to minimize water quality impacts (http://www.nps.gov/crmo/firemp/crmofmp_aj.htm).

- Minimize fireline construction by taking advantage of natural barriers, rock outcrops, trails, roads, streams, and other existing fuel breaks.
- Construct firelines to be as narrow as necessary to halt the spread of the fire and place then to avoid impacts to water resources.
- Leave unburned material within the final line.
- Minimize clearing and scraping.
- Flag the route to the fire from the nearest trail or road to minimize off-road travel and soil disturbance.

Fireline Rehabilitation

- *Where possible, use alternatives to plowed lines such as harrowing, foam lines, wet lines, or permanent grass.*
- *Get cover on the site as soon as possible after the fire is out to maintain erosion control measures on firelines.*
- *Revegetate firelines with native species.*
- *Install grades, ditches, and water bars as soon as it is safe to begin rehabilitation work.*
- *Install water bars on any fireline running up and down the slope, and direct runoff onto a filter strip or sideslope, not into a drainage.*