FIRE TREATMENT MEASURES FOR ARCHEOLOGICAL RESOURCE PROTECTION

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This discussion lists series of treatment measures from which parks can choose for their CRCs as standard measures for cultural resource protection. These treatment measures may also be modified or supplemented in order to meet agency or individual preferences. As such, the following list of treatment measures may be used selectively or in their entirety, as appropriate to agency unit needs and procedures.

The following list of treatment measures is by no means exhaustive. Some of these measures (e.g., hand lines surrounding resources) are designed to provide complete, short-term protection of cultural resources (e.g., avoidance). There are many circumstances where total avoidance is necessary and appropriate. However, total avoidance may have consequences such as the creation of "islands of unburned vegetation that signals unauthorized artifact collecting or vandalism. Additionally, avoidance may do little more than defer a wildland fire that eventually damages or destroys the resource.

Exclusionary tactics involve preventing fire from burning on or in close proximity to a cultural resource through the use of some predetermined fire management action such as a fire line, sprinkler system, or intentionally burning out the perimeter of a resource. Exclusionary tactics are often employed when it is anticipated, given expected fire behavior, that the fire will burn at an intensity that exceeds the threshold above which a particular resource or resource attribute is impacted (e.g., ~100° C for obsidian hydration rinds). Other examples of exclusionary techniques that have been employed with success include fire shelters, fire retardants, hand and mechanical fuel removal, and fuel burial.

Non-exclusionary tactics make no attempt to exclude fire from a resource of interest, but instead seek to produce fire intensities below that expected to cause resource damage and/or that will not lead to future indirect effects. Common non-exclusionary approaches to resource protection include hand and mechanical fuel load reduction, burning under favorable prescriptions, and removal of vulnerable resources.

Some of the treatment measures in the following pages are designed to minimize the risk of substantial damage to resources while allowing fire or fire management activities at cultural resource locations. Treatment measures that allow fire management activities to take place at cultural resource locations may pose greater short-term risk than total avoidance. However, facilitating certain fire management objectives such as fuels reduction may facilitate long-term preservation of cultural resources.

The use of treatment measures briefly described below should be accompanied by specific methods or parameter for their application that maximize cultural resource protection. Agencies and SHPOs/THPOs should reach agreement on how each of these treatment measures will be applied.

Flagging. Flagging, in and of itself, is not a protective measure. The actions that are prompted by the flagging constitute the treatment. The most common use of flagging is to identify an area within which ground-disturbing activities and fire should be excluded.

Buffer Zones. Buffer zones surrounding cultural resources may be employed as a means to lessen the likelihood of inadvertent effects from fire management activities. Buffer zones may also ensure that the settings of cultural resources are preserved, although such protection may require a definitive study to

determine the contributing elements of landscapes to those resources.

Redesign. Fuel management projects may be redesigned to exclude the area containing and surrounding the cultural resource(s). Redesign is obviously more appropriate to fuel reduction projects than it is for wildland fire suppression.

Fire Lines or Firebreaks. Cultural resources may be protected by creating firebreaks that eliminate and break the chain of fuels to resources. There are several types of fire lines, each with their own advantages and disadvantages. These include: natural fire lines; wet and retardant lines; scratch lines; undercut lines; hand lines; and cat lines. The advantages of one particular method over another will depend upon the type of fire management activity (e.g., fuels reduction versus fire suppression), fire behavior, and cultural resource characteristics.

Sprinklers. Sprinklers are used as a preventative measure. The sprinkler is attached to the building (or other cultural resource) and water from a nearby source is pumped through the system until the threat of fire is past, providing a constant shower over the property to be protected. Possible effects of using the sprinkler include water saturation and collapse, and water damage.

Foam wetting agents (suppressants) and fire retardants. Foam wetting agents, such as Silv-Ex Wildfire Foam Concentrate, and other Class A foaming agents, are considered fire suppressants applied either to fuels or the base of a flame. Foams may be applied to cultural resources and/or areas surrounding cultural resources to protect them from fire damage. Fire retardants are defined by Teie (1994:167) as "…a substance that, by chemical or physical action, reduces or slows combustion, thus slowing or retarding the rate of spread of the flame front. Most retardants are produced by combining water, several chemicals, and a coloring agent. The main chemical ingredient is a fertilizer."

Back Burning and Ring Firing. Back burning (i.e., purposely burning outside a main fire application) may be used to reduce fuels, thereby buffering cultural resources in order to protect them from either prescribed fires or wildland fires. Ring firing is a related method described by Teie (1994:478) as follows:

This type of firing is used when you are trying to save a valuable resource like a structure, or a historic or archeological site. This method of firing isn't anchored by the fireline. It is designed to create an unburned island.

Fire Fabric or Wraps. Fire resistant fabric may be placed over combustible cultural resources to protect them from burning. Sometimes called "cabin wrap," this is a metallic material is attached to the structure with staples to create a nonflammable barrier. Potential effects of fire fabric include inadvertent damage to the cultural resource when attaching and/or removing the wrap.

Burial. The heat effects of fire are generally minimal for even the most severe surface fires when objects are buried 10 cm or more. The burial of woody fuels or archaeological materials is best suited to spot locations, such as stumps, or well-defined features, such as outcrops, where soils can be easily and totally remove without damage to underlying deposits.

Thinning. Thinning reduces stand density by removing fuels. Thinning actions may vary between firebreaks and areas surrounding firebreaks. Pre-commercial thinning involves hand thinning of smaller diameter materials. Commercial thinning, accomplished through timber sales, involves larger materials. Small fuels can be removed from a cultural resource, either to lower the intensity of fire as it crosses the

resource, or exclude fire from all or parts of a resource. This removal may involve carrying or dragging dead and downed branches away from the site or fire sensitive resources, or using rakes or leaf blowers to remove smaller debris.

Once thinning is accomplished, the slash must be treated or disposed in some way, including piling the material so that it can be burned. The actual piling of the material may be accomplished by hand or machine, where equipment such as dozers and small tractors will haul the material to piles. Slash is also pushed or dragged into windrows. Some slash may be "rough-piled" or "jackpot piled" where heavier concentrations of fuel are left where they fall and are burned on site. Disposal activities should ensure that cultural resources are not situated within the disposal areas. Several additional methods of fuel disposal are listed below.

Lopping And Scattering - Thinned areas may be "lopped" to reduce fuel slash heights and then broadcast burned. Lopping consists of cutting smaller branches off the main stem so that the height of the slash layer is reduced, which in turn allows for a less intense fire if the are is broadcast burned.

Crushing - Crushing involves dragging a large drum with protruding spokes or spikes over the vegetation, effectively breaking the fuel into smaller pieces. Another form of crushing uses a "brush crusher" in which a piece of equipment similar to a "weed-whacker" is attached to a tractor. The "brush crusher" is able to reduce the height of vegetation from 4 to 6 down to 6" in height. Both of these pieces of equipment are pulled or transported by either rubber tire tractors, or rubber or metal track dozers. The "brush crusher" may operate on up to a 60% slope.

Chipping - In the chipping process, slash is forced through a chipping machine, reducing the larger pieces of slash to small chips that are spread over the site to be burned at a later date, or left on site to naturally decompose.

Hydro-Ax And Agra-Ax - The Hydro-ax and Agra-ax are large cutting tools attached to a "Bobcat" type tractor (see also Low-impact Logging Equipment, below). They are used in the pinyon/juniper type, cutting trees off at the ground level. The trees are usually left to lay where they fall, assisting in soil retention.

Broadcast Burning - Broadcast burning uses fire over a designated area to consume natural or activity slash that has not been piled or windrowed. Broadcast burning may be used separately or in conjunction with mechanical methods such as thinning. Broadcast burns may be ignited by hand, by "terra-torches", torches mounted on 4-wheelers or on a flatbed truck, or with aerial ignition. Preparation for the burn may include line building, both by hand and machine.

Pile Burning - Pile burning disposes of hand or machine-piled slash. Piling the slash and burning during cooler, wetter, or winter conditions reduces the chance of escape and lessens the potential for damage to the remaining vegetation on site. Piles are normally ignited by hand using fuses or drip torches.

Directional Felling. Large, heavy fuels that create a fire ladder or carry crown fires can be manipulated both within and surrounding cultural resources to reduce the danger of fire damage. Experienced professional loggers can fell large trees with high precision to avoid sensitive cultural resources (e.g., historic structures, prehistoric archeological surface features).

Helicopter Yarding or Logging. Trees may be lifted from the ground by helicopter with little ground disturbance. This yarding technique is common for roadless areas and areas with sensitive resource concerns where traditional terrestrial yarding cannot be used. Helicopter yarding usually creates a small amount of ground disturbance where the trailing end of the log is dragged vertically before lifted off the ground. This dragging typically disturbs an area no more than one square meter and disturbs the ground to depths less than 20 cm.

Full-suspension yarding. Various full-suspension yarding techniques may be applied to remove trees with little or no damage to archaeological deposits. Logging equipment such as front end loaders and skidders with steel tracks or rubber tires may be used to carefully and fully lift logs and remove them from the site. Special care and monitoring is necessary to ensure that tracks or tires do not disturb surface soils.

Low-impact Logging Equipment. Other types of low-impact logging equipment may also be available for use on and surrounding cultural resources. One type of machine is the feller-buncher, which uses a hydraulic arm and grapple to grab trees, cut them below the grapple, lift and suspend them directly from the stump, and rotate to gently lay the tree in stacks (bunches). There are also cut-to-length logging machines that lays down a bed of protective slash in advance of the machine, which is designed for minimum ground impact. Care must be exercised to ensure that the vehicle, either tracked or tired, does not disturb the ground surface when they enter or exit archaeological sites.

Over-the-Snow Logging. Fuels may be safely reduced on archeological sites in areas that receive relatively deep snowfall by removing trees over the snow. Typically, minimum snow depths and maximum temperatures are specified to ensure that the ground surface will not be impacted by logging equipment.

Burn Prescriptions. Non-exclusionary treatment measures may involve the use and manipulation of fire or fuels to attain certain temperatures, fire residence times, or other conditions (e.g., smoke limitations). Burn prescriptions may involve scheduling considerations to ensure certain fuel or air moisture; the reduction, if not elimination, of heavy fuels; application of water or other materials to keep fire temperatures within specified parameters; or applying certain firing techniques to manipulate fire residence time. Burn prescriptions should be designed and implemented by fire management specialists.

Surface Collection. Even severe fires rarely impart extensive damage to materials that are buried more than a few inches below the ground surface. Treatment of archaeological site surfaces may include the removal of cultural materials from the ground surface. Removal may involve mapping the location of artifacts, and could include temporarily collecting large artifacts prior to a fire and returning them once fire danger has passed. Alternatively, more extensive collection of fire-sensitive archaeological material (e.g., obsidian debitage) may be curated for future study, since returning such material to correct proveniences on site surfaces is impractical.

Scheduling. Scheduling a fire management activity during a season when certain critical cultural resources are less likely to be harmed is another potential treatment measure. For example, fuel management projects might be scheduled to avoid burning Native American plant resources during their productive periods. In other instances, fires may be scheduled to enhance Native American plant productivity.