Alternative A – No Action

Biological Environment

Vegetation and Fire Ecology

Potential for Impacts from Catastrophic Fire

Subalpine Forests. Vegetation in this group shows no departure from the normal fire return interval (table 2.1). This indicates that stand structure, composition, and fuel loads are within the natural range of variability and potential for catastrophic fire is low. Since 1930, the largest fire in this vegetation zone was only 773 acres. Fire behavior and fire effects would be expected to closely track historical norms with minimal potential for non-native plant establishment. Thus, the No Action Alternative would not reduce the risk of catastrophic fires and the effect on subalpine forests would be adverse, short-term, and negligible.

Upper Montane Forests. Vegetation in this group would continue to show moderate to high departures from the median fire return intervals (table 2.1). About 25% of the acreages of upper montane forests are within one return interval of normal. Of the red fir forest and montane chaparral, about 75% would continue to have moderate departures (2-3 intervals). About 70% of western white pine/Jeffery pine forest are and would continue to be four or more return intervals from normal. The structure and composition of all upper montane forests would continue to change to include higher densities of small, shade-tolerant species, contributing to the potential for catastrophic fire. Chaparral would be reduced in size and extent. Large areas would be converted to vegetation types that would not have historically occurred in the area. Fuel loads would remain higher than the natural range, also contributing to significantly increased chance of catastrophic fire in these areas. While large, stand-replacing fire occasionally occurred in these areas naturally, the existing trend toward high fuel loading would cause a gradual increase in the size and extent of these types of fires. This would be an adverse effect. The relatively small annual average acreage of managed wildland fire in this alternative would increase the chances of stand-replacing fires and associated encroachment into these sites by non-native plant species. The risk of catastrophic fire under Alternative A on upper montane forests would increase, thus effects would be adverse, long-term, and major.

Lower Montane Forests. About 50% of these forests are within two median fire return intervals of natural due to an active prescribed fire program. At the same time, about 50% of these areas are three or more return intervals from normal and some have extremely high departures from the median fire return interval, consequently the chance of catastrophic fire has significantly increased under the existing program. Under Alternative A, vegetation in this group would continue to show moderate to high departures from the median fire return intervals (table 2.1). Of the ponderosa pine/bear clover forest, 36% has missed 17 median return intervals. Fire exclusion has changed these relatively open forests to forests with dense thickets of shade-tolerant tree species at the higher elevations, and dense shrub at lower elevations. Thus, both structure and composition of ponderosa pine/bear clover forest is significantly outside the natural range of variability. Both ponderosa pine/mixed conifer and ponderosa pine/bear clover are undergoing a vegetative type change—becoming white fir/mixed-conifer forest. Fuel loads are significantly higher than they were historically. While large stand-replacing fires occasionally occurred in these forests; fires burning in existing conditions would have a much greater intensity than under the natural fire regime.

Under this alternative, wildland fire in much of the lower montane forest type would be larger in size and extent than expected under the natural range of variability. Such fires would alter gap distribution and the vegetative mosaic. High-intensity, catastrophic fire would convert large areas to vegetation types that would not have historically occurred in the area and would increase the likelihood for invasion of non-native plant species. The Mariposa Grove of Giant Sequoias occurs in lower montane forest and could be one of the areas converted by catastrophic fire. These effects would be outside the range of natural variability, and adverse. The relatively small annual average acreage treated with prescribed fire would increase the potential of stand-replacing fires, thus the effects of the No Action Alternative on lower montane forests would be adverse, long-term, and major.

Montane Meadow. Vegetation in lower montane meadows shows high departures from the mean fire return interval (table 2.1). Almost 80% of the meadows are four or more return intervals from normal. Hydrologic regimes have been altered in many meadows in Yosemite Valley and intensive ecological restoration is ongoing. However, fire exclusion has significantly increased the potential for catastrophic fires in the forests surrounding these meadows. Under this alternative, severe encroachment by conifers would continue and meadows would continue to contain large amounts of Kentucky bluegrass and other non-native, cool season grasses. Fuel loads would be higher because of the number of years between fires and because of conifer encroachment. The relatively small annual average for acreage treated with prescribed fire in this alternative would increase the chances of having stand replacing fires in the forests surrounding meadows. High-intensity fire would likely have more of an effect upon encroaching conifers than on the montane meadow native and non-native species. The effects of the No Action Alternative on meadows would be adverse, short-term, and minor.

Foothill Woodlands. Vegetation in the foothill woodlands would continue to show low to moderate departures from mean fire return interval (table 2.1). Most of the areas in this vegetation type were burned in the large wildland fires that occurred in and around the park during the 1990s. Cheatgrass and other non-native annual grasses have invaded the foothill woodlands. High-severity fires are normal for this group, and the effects from them are within the natural range of variability, although in many areas native species have been replaced with non-native species favored by and/or facilitating unnatural fire frequencies. The relatively small annual average number of acres that would be treated with prescribed fire under this alternative would increase the chances of catastrophic fires due to the potential of fire to spread from the lower montane forests, as happened during the 1990 A-Rock fire. The effects of Alternative A on foothill woodlands would be adverse, long-term, and minor, due to the gradual shift in dominance from native to non-native species that have unnatural fire regimes.

Fire Management Treatments

The No Action Alternative would utilize managed wildland and prescribed fire and a limited array of site preparation, including fuel reduction, techniques. Site preparation for prescribed burns include fire line construction, hand thinning, and some snagging. Fuels may be piled for burning. Fuel reduction is performed in advance of prescribed burning to reduce the potential for an escaped burn and to reduce impacts to air quality from smoldering material following the prescribed burn. Some material is moved to wood yards and chips have been given away or used in the park or El Portal.

Managed Wildland Fire

Subalpine Forests. Of the subalpine forest, 99% would occur within the Fire Use and Conditional Units. There is no departure from normal fire return interval for this group. The structure, composition, and fuel loading are within the natural range of variability. Fire behavior and fire effects would be expected to closely track historical norms. However, the small annual average number of acres burned with managed wildland fire would limit the beneficial impacts to these areas. Overall, the effect of managed wildland fire on subalpine forest would be beneficial, long-term, and minor.

Upper Montane Forests. Of upper montane forest, 95% would occur in the Fire Use and Conditional Units. Fire behavior and fire effects would be expected to be normal to slightly outside the natural range of variability due to changes in the structure, composition, and fuel loads. It is expected that managed wildland fire would have a beneficial, long-term, major effect in areas that burn. However, under this alternative, the small annual amount of managed wildland fire, on average, would likely result in changes that would significantly increase the chance of catastrophic fire in upper montane forests. This is because a large number of fires would be suppressed in the Conditional Unit, which would lead to increased fuel loads. Many areas in red fir and western white/Jeffery pine forests would move outside the natural range of variability during the life of this plan. The effects of Alternative A in upper montane forests would be adverse, long-term, and moderate to major.

Lower Montane Forests. About 40% of lower montane forests occur in the Fire Use and Conditional Units. Half of that acreage is in the Conditional Unit—where wildland fires are likely to have been suppressed. Because the structure and composition of these forests would continue to be significantly outside the natural range of variability, particularly in the Conditional Unit, fire behavior and fire effects also would be expected to be at or outside the natural range of variability. It is expected that managed wildland fire would have a beneficial, long-term, and major effect in the areas that burn. But, the small annual average of acres treated with managed wildland fire would result in overall increases in the potential for catastrophic fire in this type. Additionally, a large number of fires would be suppressed in the Conditional Unit, leading to increased fuel loads. Many areas of lower montane forest would move outside the natural range of variability during the life of this plan. The effects of Alternative A on lower montane forests would be adverse, long-term, and major.

Meadows. About 60% of dry montane meadows would occur in the Fire Use and Conditional Units. Fuel loads are higher than normal due to the accumulation of grass and woody fuels (small conifers) in the years between fires, which would be greater than under historic conditions. Fire behavior and fire effects would be expected to be slightly to moderately outside the natural range due to these changes. The small number of acres to be burned annually by managed wildland fire would be expected to significantly increase the potential for catastrophic fire in the forests surrounding these meadows, but not in the meadows themselves. The effects of managed wildland fire on meadows, under this alternative, would be beneficial, long-term, and minor to moderate, due to the limited size of burns and lack of appropriate timing and frequency.

Foothill Woodlands. About one quarter of foothill woodlands would occur in the Fire Use and Conditional Units. Most of that acreage would be in the Fire Use Unit where fires are less likely to be suppressed than in the Conditional Unit so most fires in this vegetation group would be managed for resource benefit. High severity or catastrophic fires are now normal in the foothills woodland vegetation types, due in part to the establishment of non-native, annual grasses and

forbs encouraged by these fire events. The effects of Alternative A for managed wildland fire on foothill woodlands would be beneficial, long-term, and minor.

Re-ignition clause. The re-ignition clause would not be used under this alternative.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). The effects of holding actions and monitoring would be similar for all vegetation types so all vegetation will be grouped for this analysis.

Water and retardant drops release liquids onto burning or unburned areas. Vegetation can be physically damaged from the impact of the liquid, but the areas tend to be small and the effects relatively local. Most fire retardant contains fertilizer type compounds, including ammonia, nitrogen, and phosphorous that can change pristine vegetation, especially in areas low in nitrate/ammonia type nutrients. Added nutrients can lead to a decrease in growth of native vegetation and a proportionate increase in the establishment of non-native species that favor higher nutrient levels. However, the chemical components of retardant only remain for a few months at most, and long-term, chemical alteration of the soil would not occur. Impacts in high elevation, low nitrogen areas would be mitigated if needed by avoiding use of retardant or by using "clear" retardant that minimizes active nutrients within the mix. Physical damage to vegetation can be avoided by requesting that pilots fly aircraft quickly enough to dissipate water and retardant over larger, more linear areas. Overall, the effect of water and retardant drops on vegetation is adverse, short-term, and minor.

Fire monitoring activities would potentially require the development, use, and management of helispots and spike camps, which could disturb vegetation and soils. In forested areas, trees and/or snags would be removed under some situations, to open areas for safe operation of aircraft or to make camps safe for fire personnel. The effects generally are local. Common practice is to use, when available, previously used sites and open areas that require little disturbance. Aircraft skids or wheels, boots, equipment, and camp and base supplies could be contaminated with non-native seed, providing vectors for non-native species that would not otherwise disperse to these sites. Mitigation measures would include: (1) avoiding known populations of special-status species; (2) cleaning vehicles and equipment prior to actions to make them weed-seed free; (3) rehabilitating sites (return to natural grade) as quickly as possible to restore natural drainage and prevent unnatural runoff patterns; and (4) replacing litter and duff, to make these sites less susceptible to invasion by non-native species. Overall, the effects of helispots and spike camps on vegetation would be adverse, short-term, and negligible.

Prescribed Fire

Prescribed burns are carried out for two primary reasons—to restore or maintain vegetation within target conditions and to reduce fuels to protect buildings or achieve other administrative objectives (e.g. maintenance of cultural landscapes or view sheds). At times, the two reasons contradict each other because their effects differ on various components in a burn unit (Kauffman, 1990). For example, unnaturally frequent burns or burns done outside of the natural fire season would favor some species and target others, shifting vegetation away from natural conditions. On the other hand, fires conducted solely to restore fire to the ecosystem or to maintain fire's role may lead to unacceptable fuel loading or species composition. For example, the natural fire regime in ponderosa pine/bear clover favors a continuous cover of bear clover. This highly flammable and fire-adapted species poses threats to buildings. Therefore, unnaturally frequent burns would be conducted to reduce or eliminate bear clover near developed areas.

Subalpine Forests. Less than 1% of subalpine forests occur within prescribed fire units under the No Action Alternative. These forests are within the normal fire return interval and structure, composition, and fuel loading are within the natural range of variability. Fire behavior and fire effects would be expected to closely track the historical norms, if prescribed burns were conducted during the normal fire season. Although effects of burning during the *shoulder season* (outside of the normal fire season) are yet to be studied, the potential of adverse effects exists. The very small acreage involved makes this potential effect local. Overall, the effect of prescribed fire on subalpine forest would be beneficial, short-term, and minor.

Upper Montane Forests. Less than 10% of upper montane forests occur within prescribed fire units under the No Action Alternative. Vegetation in this group shows moderate to high departures from the median fire return intervals (table 2.1). Fire behavior and fire effects would be expected to be normal to slightly outside the natural range of variability due to changes in structure, composition, and fuel loads. First entry burns have been conducted during the shoulder season and while the overall effect of these burns has been beneficial, potential for adverse effects on some plant species exists. For example, spring burning has shown high mortality in mature sugar pines. The small annual average number of acres treated with prescribed fire would allow the potential for catastrophic fire to increase in these areas. The effects of Alternative A on prescribed fire in upper montane forests would be beneficial, long-term, and minor.

Lower Montane Forests. Most of the prescribed burn units in the park occur in lower montane forests, and about 40% of lower montane forests are in prescribed burn units. Under Alternative A, vegetation in this group would continue to show moderate to high departure from median fire return intervals (table 2.1). Prescribed fire could effectively reverse the undesirable increase in dense thickets of shade-tolerant tree species at the higher elevations and shrubs at lower elevations, and could return these forests to relatively open stands. However, the amount of prescribed fire treatment proposed annually is limited. At the current rate of burning, departure from normal return interval is increasing and larger areas are at risk for high-intensity fire. Because the structure and composition of these forests is significantly outside their natural range of variability, fire behavior and fire effects would be expected to be from normal to outside the natural range of variability. First entry burns would often be conducted during the shoulder seasons to aid in control. While the overall effect of these burns would be beneficial, there would be the potential for adverse effects on some plant species. For example, the mortality rate for large sugar pines is often higher during spring burns than in fall burns. The small annual average number of acres burned would not significantly decrease the potential for catastrophic fire in these areas. It would not be possible to realize restoration targets, except in small areas. The effects of continuing the current level of prescribed fire under Alternative A on lower montane forests would be adverse, long-term, and moderate.

Meadows. Less than one third of dry montane meadows occur in prescribed fire units. Vegetation in the dry montane meadows would continue to show high departures from the mean fire return interval (table 2.1). Fuel loads would be higher than normal because of conifer encroachment and the long interval between fires. Fire behavior and effects would be expected to be outside the normal range of variability due to these changes. The small annual average for acres treated with prescribed fire is resulting in a loss of dry montane meadow habitats at a rate greater than what would normally occur. At the current rate of prescribed fire, restoration and maintenance targets would not be met, except on a local basis. Overall, the effects of the No Action Alternative from prescribed fire on meadows would be adverse, long-term, and moderate.

Foothill Woodlands. Less than 20% of foothill woodlands occur in prescribed fire units under the existing program. Vegetation in foothill woodlands would continue to show low to moderate departures from the mean fire return interval (table 2.1). High-severity fires are now normal in these types of vegetation, due to the presence of a mix of native and non-native species. Through the removal of numerous non-native plant species, restoration of the native suite of grasses and forbs within the foothill woodlands would continue. Prescribed fires to reduce non-native species would be conducted outside of the normal fire season for this type, which would potentially have adverse fire effects on some native vegetation. However, if highly invasive non-native species are not removed, the structure, composition, and fuel loads in foothill woodlands would be significantly altered and remain outside the normal range of variability. Overall, the effects of the current level of prescribed fire on foothill woodlands would be adverse, long-term, and minor to moderate.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

The effects of holding actions and monitoring would be expected to be the same for all vegetation types, so they will be grouped for this analysis. Hand line would disturb surface vegetation and soils, potentially opening micro-sites for invasion by non-native species. Snagging could lead to unnaturally high concentrations of fuels. Mop-up activities would create soil disturbance and open sites that non-native species could invade. The effects of these activities would be generally local, and would rarely have landscape scale implications, unless unmitigated. All of these activities would be mitigated through avoidance and/or rehabilitation measures. Overall, the effect of site preparation on vegetation would be adverse, short-term, and minor.

Fuel Reduction by Hand or Machine

Aggressive Reduction Techniques. These treatments would not be used in Alternative A.

Passive Reduction and Lower Profile Techniques.

Low-Impact Skidding. Would not be used in this alternative.

Hand Cutting. These activities would continue to be used in the Conditional and Suppression Unit, in Special Management Areas, and in the wildland/urban interface. Impacts that would not change by vegetation type include the potential for trampling and burial of sensitive plants and communities (e.g. wetlands); the appearance of cut stumps; and the loss of fuel ladders. Most of these impacts would be mitigated through project planning and coordination with the Resource Management Division. Hand cutting would not occur in subalpine forests, upper montane forests, and meadows in this alternative.

Current prescriptions for hand thinning have been developed for lower montane forests where most of the thinning activity would be done. Cutting small diameter trees in the past has actually increased the smallest time-lag fuels, which are the most flammable (Yosemite Fire Management File Data). Removing small diameter trees amounts to removing some of the ladder fuels which are needed for fire to kill some of the larger trees that have come into the area since fire exclusion. Additionally, because of the small number of acres treated annually with hand thinning, the potential for large, high-severity fires would remain high. Thus, unless prescribed fire is used on hand-thinned fuels, the effects of hand thinning on lower montane forests would be adverse, short-term, and minor. If these fuels are also treated with prescribed fire, under controlled conditions, the effects of hand thinning would be beneficial, long-term, and minor to moderate.

Hand thinning has been used in very small areas in foothill woodlands, all within the El Portal Administrative Site. Thinning would continue to be used for removing small diameter trees and

brush, to reduce the fire hazard to structures. Due to the intensive nature of this work, some ground disturbance would take place and there would be a potential for additional non-native species establishment. Mitigation would include minimizing soil disturbance and performing post-treatment surveys for non-native plants and implementation of control measures as needed. Overall, the effects of hand thinning on foothill woodlands would be beneficial, short-term, and negligible.

Pile burning. The effects of pile burning would be essentially the same for all vegetation types, so they will be grouped for this analysis. Piles generally are burned following hand thinning, and would precede the use of prescribed fire. Impacts associated with pile burning would potentially include surface and soil disturbance associated with dragging materials to each pile; the very localized, intense burn effects upon surface fuels, litter and duff, and soil layers; and the long lasting effects upon soil chemistry and structure due to extreme heating over long time periods. Because of these effects, piles would be kept small, to the size of a small car. This would minimize the extent of soil damage. The small size would also allow for the recolonization of sterilized patches by mycorrhizal fungi and other soil organisms. These locations are potential micro-sites for colonization by invasive non-native species. Mitigation would include minimizing soil disturbance and performing post-treatment surveys for non-native plants and implementation of control measures as needed. Overall, the impacts of pile burning on vegetation would be adverse, short-term, and negligible.

Chipping. Chipping would only be used occasionally in this alternative. Chipping cut material and then distributing it over a site could occur where air quality, visitor use, or other management concerns prohibit burning. Such impact, however, would be adverse, short-term, and negligible.

Cumulative Impacts

Vegetation within Yosemite National Park and the El Portal Administrative Site has been affected by a variety of actions, including past fire suppression activities, logging, development, construction of O'Shaughnessy Dam (and the creation of the Hetch Hetchy Reservoir), and agricultural and other activities below the park. The effect of 100 years of fire exclusion cannot be overstated. With the exception of subalpine forests, all other vegetation groups have moderate to high departures from normal fire return intervals. The large areas of moderate and high departure vegetation indicate the high potential for catastrophic wildland fires and the potential for type conversion from one vegetation type to another. The overall effect of these activities on forest structure, composition, and fuel loading has been adverse, long-term, and major.

Other actions expected to occur within Yosemite that would affect vegetation would be implementation of the *Merced Wild and Scenic River Comprehensive Management Plan/EIS* (NPS 2000) and the *Yosemite Valley Plan/SEIS* (2000c). The first identifies a protection zone along the Merced River that will allow for enhanced protection of native plant communities that occur in drainages and areas adjacent to the river. Implementation of the *Yosemite Valley Plan* would substantially increase the human population in the El Portal Administrative Site, which would increase the potential for human caused fires and the potential for catastrophic fire, as well as the introduction, establishment, and spread of non-native plant species. Smaller increases in human population would also occur in Wawona, Hazel Green, and Foresta with similar effect. Mitigation measures identified in the *Yosemite Valley Plan* would reduce the potential level of impact to adverse, long-term, and minor.

Actions taken in Yosemite Valley associated with the *Yosemite Valley Plan* would reduce fragmentation. Meadows and California black oak woodland would be increased. However, due

to the small areas treated, the overall effect is negligible to minor when looking at park vegetation as a whole. Overall, the effect would be beneficial, long-term and negligible to minor.

Past, present, and reasonably foreseeable actions include fire management and fuel treatment activities outside the park, many of which would be on national forest lands. These would include A-Rock Reforestation, Aspen Fuels Reduction, Orange Crush Fuels Program, Rogge-Ackerson Fire Reforestation, and the Fire Management Plan for Wilderness in Stanislaus National Forest. These projects would include reductions in the spread of noxious weeds, management of fuels and fire in a manner more in line with current federal wildland fire management policies, and protection of riparian resources. These efforts, if successful, would improve habitat conditions for vegetation by controlling weeds and managing fire as part of the ecosystem. These actions would have net beneficial impacts on vegetation by either reducing the potential for high severity fire or restoring vegetation to more ecologically stable targets.

Overall, the effects of these projects on vegetation would be beneficial, long-term, and minor to moderate. These present and reasonably foreseeable future actions would contribute to reversing the adverse impacts of past actions in the region. These effects, in combination with the impacts of Alternative A, would result in beneficial, long-term, and minor cumulative impacts.

Conclusion

Fire management activities would effect vegetation in generally beneficial ways, through actions that would maintain plant communities within their natural range of variability. Continuing an active managed wildland fire program will keep the subalpine forests in the Fire Use Unit within the normal range of variability. Effects in the Conditional and Suppression Units would be limited by the amount of forests treated annually. Because of the likelihood of increasing the risk of large, high intensity fires that would cause type conversion in foothill woodlands and lower and upper montane forests in the Conditional Unit, this alternative would continue to have a high potential for adverse, long-term, and major effects of the type that resulted from the A-Rock Fire. Because over 62% of the park has departed little from the natural range of variability, overall, these effects would be adverse, long-term, and minor to moderate.

The Mariposa Grove of Giant Sequoias is one of the resources specifically identified in the enabling legislation for Yosemite National Park. If catastrophic fire were to eliminate or severely damage this grove, the impact would be impairment.

Wetlands

Potential for Impacts from Catastrophic Fire

Fires of high intensity or large size could have moderate, adverse impacts on wetlands. However, depending on the specific activities associated with individual fires and considering effects at multiple scales, impact levels could vary from negligible to major. Because of the limited scope of work under Alternative A, there would be little reduction in the potential for catastrophic fire. Large, high-intensity fires could cause ecosystem fragmentation, which could impose unnatural barriers on plant and wildlife movements and affect seed sources, nutrients, and plant distribution patterns in wetland communities. These effects would be magnified for spatially limited or isolated wetlands. Fires that consumed all or the majority of available habitat within an area could have major effects on organisms dependent on that habitat type as well. High-intensity fire could initiate a process of type conversion to a less desirable plant assemblage in a wetland, which could

result in short-term alterations in occupation by certain species. These effects could occur at multiple spatial scales and result in long-term impacts to wetland ecosystems.

Some additional adverse ecological impacts would be expected following extreme fire events in wetland communities. Most fires spread through the combustion of organic matter that is in contact with the soil, making fire and soil interactions significant (Agee 1993). Fire creates physical, chemical, and biological changes that may be either beneficial or detrimental to long-term soil productivity. Fire events typically involve a transfer of nitrogen from the litter to both air and soil, a transformation of nitrogen from organic to inorganic forms, and a conversion from nitrogen-consuming to nitrogen-fixing plants (Woodmansee and Wallach 1981). These chemical changes associated with fire may impact water quality and quantity as well.

General observations suggest that fire accelerates erosion rates in areas normally subject to erosion but creates little erosion in areas of normally stable soils (Pyne et al. 1996). Wetlands described here are likely to represent communities with low potential for erosion, however, they may also represent areas of deposition for material eroding from upland sites. In regard to catastrophic fire, the effects of Alternative A on wetlands would continue to be adverse, long-term, and minor, due to potential habitat fragmentation and deposition with drying effects on wetland sites caused by catastrophic fire.

Fire Management Treatments

Managed Wildland Fire

In most burning conditions, low- and moderate-intensity fires would burn near or around wetlands—in dry years fires could burn into wetlands. In the short-term, the loss of isolated or spatially limited wetlands habitat would have adverse effects, but over the long-term, these effects would be beneficial as fire is part of the dynamic disturbance cycle of these landscapes. Effects would thus be beneficial, long-term, and moderate.

Re-ignition clause. Re-ignition of wildland fires is not permitted under this alternative.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). Wetland habitats would be avoided to the greatest extent possible during holding actions or fire monitoring. While meadows might be used as temporary helispots, this would only be done at dryer sites. Impacts associated with holding actions on wetlands would be adverse, short-term, and negligible.

Prescribed Fire

Fire management activities would likely result in significant ecological benefits for wetlands throughout the park. Although some of these communities have a history of repeated burning and exhibit strong response mechanisms, it is likely that these events occurred at a lower periodicity and severity than has been documented in the contemporary Sierra Nevada (Skinner 2001).

Fires near wetlands would be ignited when wetlands are moist enough not to sustain fire spread, therefore prescribed fire impacts to wetlands would be minimized. Mechanical pre-treatments would be designed to avoid impacts to designated wetlands. The landscape impacts of these combined treatments would benefit wetlands by reducing the likelihood of catastrophic fires of greater intensity to which wetlands are adapted. Appropriately timed and structured prescribed fire events would help significantly with the control of woody tree invasion, as well as the loss of species diversity and structural complexity (Miller et al. 1998).

Risks associated with prescribed fires would include vegetation type conversion (wetland sites to undesirable vegetation types) and adverse impacts to some wetlands species. Prescribed fire activities would only be implemented in designated wetlands when ecologically defensible objectives were presented for habitat, vegetation response, or soil management. Unit arrangement, firing strategies, and prescription parameters would all be designed to minimize the direct effects of prescribed fire. Under this alternative, benefits of prescribed fire would include burning and possibly cutting small trees to achieve more natural structural conditions for specific habitats and well-timed burning to enhance wetland species. These impacts would be beneficial, typically short-term, and minor to moderate.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Site preparation for managed wildland fires and prescribed burns would include the use of wetlands as natural barriers and water sources where water is available. When a wetland area is being used for a boundary, line construction and some snagging would occur in the adjacent uplands. Burns would be allowed to back into and burn around wetlands and meadows or through them if the vegetation were dry enough to carry fire. Wetland habitats would be avoided to the greatest extent possible during implementation of confinement and containment strategies. If the objectives of a prescribed burn were to reduce conifer invasion of meadow, some cutting of already established trees might be performed. Since no actual disturbance to the wetland characteristics would be realized, the impacts would be beneficial, short-term, and minor to moderate.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Hand cutting would not typically occur in wetlands. In some meadows small invading conifers would be cut, in which case the effects would be beneficial, short-term, and minor to moderate.

Pile burning. Piles are sited to avoid wetland areas wherever possible. When fuel reduction work is done on the edge of a meadow wetland, piles might be put on the upland areas adjacent to the wetland, where they would be burned. Some movement of ash particles may subsequently wash into the wetland area resulting in an increase of nutrient levels. The impact of pile burning on wetlands would be beneficial, short-term, and minor to moderate.

Chipping. No wetlands plant material would be chipped under this alternative and chip application would avoid riparian and meadow areas.

Cumulative Impacts

Cumulative effects to wetland and aquatic resources discussed herein are based on analysis of other wetlands activities in the Yosemite region and the potential effects of this alternative. The projects identified below include those projects that have the potential to affect local wetland patterns and processes as well as large-scale or regional wetland patterns and processes.

Aquatic and riparian systems are the most altered and impaired habitats of the Sierra Nevada and, as a small proportion of the landscape, are relatively rare. Wetlands in the Sierra Nevada have been drained since the earliest settlers attempted to improve forage and permit agriculture (Hughes 1934; University of California, Davis 1996e). Development and activity in Yosemite has reduced meadow acreage by 60-65%. Dams, roads, and diversions throughout most of the Sierra have profoundly altered stream-flow patterns and water temperatures. Within the mountains, broad

valleys with wide riparian areas were often reservoir sites, and much of the former riparian habitat in the Sierra Nevada is now under water. The extent of the inundation across the range becomes apparent when one realizes that virtually all flatwater on the western slope of the Sierra Nevada below 5,000 feet is artificial (University of California, Davis 1996e). These past actions have had long-term, adverse effects on regional wetland and aquatic habitats.

Regional and park wide planning efforts such as the Sierra Nevada Framework for Conservation and Collaboration (USFS); U.S. Forest Service management plans for adjacent Wilderness; and the Wilderness Management Plan Update (NPS) would provide benefits to the size, integrity, and connectivity of wetlands. Cooperation among land management agencies would increase the opportunity to share common objectives and improve resource protection. These plans also could increase knowledge of resources and recreational use. These plans have the potential to have long-term, moderate, beneficial impacts on wetlands, though the proposed management direction has not been finalized.

Other projects approved or planned for construction that could have beneficial effects on wetlands include campground rehabilitation projects in Tamarack, Yosemite Creek, Bridalveil and Hodgdon Meadows Campgrounds, and the Merced River Eagle Creek Ecological Restoration Project (Yosemite Valley). Erosion control and mitigation from these projects would enhance and strengthen palustrine forest and palustrine scrub/shrub wetlands. The Eagle Creek project would revegetate currently denuded riverbanks that were formerly palustrine forest and palustrine scrub/shrub wetlands. The erosion control and restoration projects would have long-term, localized, beneficial impacts on wetlands.

Regional and park plans that would have positive cumulative impacts on wetlands are tempered by adverse impacts that include an extensive infrastructure that diverts water away from wetlands in Yosemite Valley, continued unnatural widening of the Merced River in the east Valley, the potential direct loss of wetland habitat at the Yosemite View Parcel Land Exchange, and other projects outside of the park.

Considered in combination with these beneficial, long-term, and moderate effects, the cumulative impacts of the Alternative A would be adverse on wetlands because of the potential for large, high-intensity fires, with subsequent short-term changes in nutrients, water quality, and vegetation connectivity. Some of these impacts could be long-term, but most would be short-term and negligible. The potential for beneficial or adverse impacts to wetlands would be greater from projects occurring within the cumulative impact assessment area of the Sierra Nevada bioregion than from this alternative.

Conclusion

The effects of the No Action Alternative would be adverse, short-term, and minor to moderate, and would include the continued alteration of forest types surrounding wetlands and the increased likelihood of fire intensities outside the range of tolerance for wetland species. Although most fire management activities would have little or no impact on wetland resources, this alternative would do little to minimize the adverse effects of large, high-intensity fires, and would result in an increase in fire threat through time. These effects would not represent impairment.

Wildlife

Potential for Impacts from Catastrophic Fire

Under Alternative A, park personnel would follow existing fire management practices. The primary threat to wildlife and their habitat would be intense, stand-replacing fires over large areas of the park, especially at lower elevations. Such fires would greatly change the diversity and abundance of wildlife species in the park, through wide-scale and radical changes in habitat (e.g., Finch et al. 1997). Under this alternative, achieving target conditions, and thus more natural vegetation assemblages, for many habitat types would be unlikely. Therefore, the threat of large, catastrophic fires in much of the park would continue or increase indefinitely. Because of the higher risk of catastrophic fire, impacts from fire suppression actions (e.g., fire line construction, helispots, spike camps) are most likely to occur under Alternative A as well.

The mixed-intensity fires that are typical under the natural fire regime for most forested habitats in the park create habitat *heterogeneity* (assorted patches of vegetation types inter-mixed across the landscape). For example, patches of stand-replacing fire within a larger fire create small gaps and openings in the forest canopy while leaving other areas hardly scorched. These processes sustain a wide diversity of wildlife species and promote ecosystem resilience. Sierra Nevada wildlife species have existed for thousands of years under the natural fire regime. They have developed behavioral and life-history adaptations that allow them to take advantage of the spatial and temporal changes in habitats through fire. Under current conditions of abnormally high fuel loading in many forest vegetation types, however, the large, high-intensity fires that are likely would lead to habitat homogeneity. As a consequence, the forest supports an unnatural assemblage and succession of wildlife species adapted to the altered, nearly uniform, habitat.

The A-Rock and Steamboat fires of 1990 provide examples of the adverse effects of stand-replacement fires. These fires burned in unnatural forest conditions and increased the homogeneity of the landscape. In the Foresta area, the fire burned a ponderosa pine/mixed-conifer forest in which years of fire exclusion had caused high fuel loads. The lightning-fire killed virtually all of the trees and understory vegetation during a dramatic crown run of approximately 3,000 acres. Now, over a decade later, the area is dominated by a shrub community interspersed with numerous large snags. While a shift in species composition and succession is natural after a stand-replacing fire, a 3,000 acre type conversion with no interspersed patches of the former habitat type is not characteristic of the fire regime for this type of forest.

This unnaturally large, homogenous habitat area presents several problems for park wildlife that will extend many years into the future. While the area is favorable to bird species such as lazuli bunting, fox sparrow, and numerous woodpecker species, virtually none of the forest-dependent species, such as black-headed grosbeak, white-breasted nuthatch, and western tanager have returned (NPS 2001c). Two California spotted owl territories were lost as well (Gould and Norton 1993). High-intensity fires create large numbers of snags that are normally of high value to many wildlife species (Lyon et al. 2000). Their value, however, is reduced for some species if the area of snags is too large and surrounding vegetation does not afford other necessities, for example, food and cover. Also, high-intensity fires result in fewer snags several years later as the fire created snags fall and growth of the single-age class forest to a snag-producing age takes many decades (Huff and Smith 2000).

Given the potential impact of unnaturally large, intense fires that are likely under current fuel conditions and the relatively long duration of this risk under Alternative A, the effect from the potential impact to wildlife in regard to catastrophic fire is adverse, long-term, and major.

Fire Management Treatments

Managed Wildland Fire

In Yosemite and in surrounding forests, many mid- to low-elevation forests are overgrown with dense shrubs and young trees because of a history of fire exclusion. At the same time, as explained above, some areas are at high risk of unnatural high-intensity fire events. These conditions affect the abundance and diversity of wildlife species directly by creating unfavorable habitat conditions for some species. For example, dense understory growth may adversely affect habitat quality for California spotted owls and northern goshawks by limiting their access to prey (Weatherspoon et al. 1992, Maurer 2000, respectively). Fires started by lightning strikes and managed in the Fire Use Unit and, under appropriate conditions, in the Conditional Fire Use Unit, are an important tool in working toward target vegetation conditions and, therefore, a return to more natural habitat diversity and structure. This allows a return to a more natural distribution, abundance, and diversity of wildlife species in areas that are currently severely altered by a long history of fire exclusion and at risk of catastrophic fire.

However, the rate of habitat restoration would be limited under this alternative. Over the last 30 years, an average of about 4,000 acres has burned annually; well short of the average 16,000 acres that is believed to have burned naturally each year. Therefore, the conditions of suppression-altered habitat and its effects on wildlife species abundance and diversity and the threat of catastrophic fire to wildlife and habitat are likely to continue indefinitely.

Because this alternative relies heavily on natural ignitions and they are somewhat random events, areas burned may not be those of highest management priority (i.e., high fuel loads from fire exclusion). Also, some areas are likely to burn at higher than natural intensities due to high levels of fuel accumulation, even when fire prescriptions are adhered to. As a result, forest gaps may be larger and consumption of large woody debris that provides habitat may be greater than in natural burning conditions. This may adversely affect species that favor dense, complex forests, such as hermit thrush, northern flying squirrel, and marten. Such impacts, however, must be weighed against the benefit of reduced risk of catastrophic fire that would cause greater detrimental change in wildlife habitat. Effects from Alternative A would be beneficial, long-term, and minor due to reductions in the threat of catastrophic fire, but such benefits would be limited by the relatively small number of acres that would be treated annually.

Re-ignition clause. Would not occur under Alternative A.

Prescribed Fire

The use of prescribed fire provides the greatest potential for focused work to restore wildlife habitat and reduce the threat of catastrophic fire. Areas furthest from the natural fire regime with identified threats to wildlife and habitat, can be targeted for treatment. Fire can be planned to occur under conditions that maximize benefit to resources, including wildlife and habitat, and minimize fire-related impacts to sensitive wildlife resources (e.g., spotted owl nesting sites).

Under this alternative, high levels of fuel loading in some areas may cause prescribed fires to burn at higher than natural intensities, even when fire prescriptions are designed to minimize this event. Creation of forest gaps and consumption of large woody debris may be greater than what would be expected under natural fire conditions in some areas of a burn. Thus, intense burning may adversely affect species that favor dense forest, such as hermit thrush, northern flying squirrel, and marten. Such impacts, however, must be weighed against the benefit of the reduced risk of catastrophic fire. Under Alternative A, such benefits would be minimized by the relatively small number of acres that would be treated with prescribed fire.

In habitats near developed areas, where protection of human-built structures and facilities is a concern, prescribed fire would be used to reduce fuel loads to the lower end of the natural variability. If forests became more open (less understory vegetation) and contained less down wood, the effect on animal species that depend on these features, such as salamanders, small mammals, and ground-nesting birds, would be adverse. However, overall a larger number of species would benefit from restoration of forests to a more natural condition.

Prescribed fires would be started when conditions are favorable for their control. This is often in the spring or fall, which is outside of the dry season when most natural fires occur. This would have an adverse effect on species of wildlife that are adapted to the natural timing of fires. For example, small mammals that hibernate in leaf litter could suffer higher mortality during prescribed fires.

Under Alternative A, impact of prescribed fire on wildlife would be beneficial, long-term, and minor, because this action provides habitat improvement in areas most severely altered by fire suppression and some reduction in the risk of catastrophic fire, but such benefits are limited by the relatively small number of acres that would be treated annually.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Maintaining control of managed wildland fires and prescribed fires would occasionally involve hand line construction, snagging, water drops, and other actions. Such efforts are necessary and likely to be less intense than they would be during fire suppression activity.

Water Drops. Dropping water on fires from helicopter buckets would carry inherent risks to wildlife. Water that is removed from small bodies of water may adversely affect aquatic organisms by depleting their habitat, or causing it to dry up prematurely in the same year. Some aquatic species, such as mountain yellow-legged frogs, have small, isolated populations that could be devastated by removal of water and/or frogs. In addition, Chitrid fungus has recently been identified as a factor in the disappearance of mountain yellow-legged frog populations. Helicopter buckets, mostly through dipping in separate water bodies, would potentially spread this fungus to non-infected populations of frogs. Non-native fish inhabit many park lakes and streams, and bullfrogs are present in several others. Water dipped from such areas could lead to the spread of non-native species to pristine waters. The physical impact of a water drop could adversely affect individual animals. On the positive side, water drops can, in some circumstances, be used instead of hand lines ("wet-lining") to control fire movement. This tactic would result in less impact to soil, forest litter, and vegetation than hand line construction and, therefore, would have less impact on wildlife, both in intensity and duration. Under Alternative A, the impact of water drops on wildlife would be adverse, long-term, and minor based upon possible impacts to aquatic ecosystems, especially in relation to amphibians. Mitigation: Avoid dipping from waters known to contain mountain yellow-legged frogs and bullfrogs; avoid dipping from small bodies of water, spread water when dropping. Water drops will only be done on land to avoid the spread of non-native fishes.

Retardant Use. Some terrestrial wildlife could be affected by retardant drops if they were struck by the chemicals, resulting in injury or contamination. Wildlife could also be disturbed by the low-flying aircraft. Under Alternative A, impact to wildlife from retardant drops is expected to be negligible, adverse, and short-term because of its limited application in the park, and protocols for its use designed to protect aquatic resources. Mitigation: Adhere to established protocols for retardant use; limit use in park.

Helispot Construction. Construction of helispots often results in the felling of trees and snags, which are potential wildlife habitat. Snags are especially important wildlife habitat. In addition, helicopter traffic would likely disturb wildlife, such as nesting raptors. Under Alternative A, impact of helispots on wildlife is expected to be adverse, long-term, and minor, based upon their likely limited use, although their use under this alternative is likely to be higher than under other alternatives, due to the greater chance of suppression activities. Mitigation: Limit helispot construction; site helispots away from sensitive resources; use natural clearings for helispots.

Spike Camps. Fire crews staying in spike camps can have an adverse effect on wildlife by allowing them access to human food. This would lead to individuals becoming conditioned to human foods and cause human-wildlife conflicts. In such cases, animals are often eventually killed to protect human safety. Presence of hand crews in remote areas would introduce an element of disturbance, which could affect sensitive species, such as nesting raptors. Under Alternative A, impact to wildlife from spike camps is expected to be adverse, short-term, and minor. Mitigation: Site spike camps away from sensitive resources. Provide strict control of availability of food to wildlife at camps.

Hand Line. Hand line construction would remove and disturb soil and forest litter, possibly affecting animals such as small mammals, amphibians, invertebrates, and ground-nesting birds. The presence of hand line crews in remote locations could cause direct disturbance of some wildlife species and introduce unnatural food sources (see spike camps above). Impacts could be minimized by on-site avoidance of valuable or sensitive wildlife resources (e.g., raptor nests). This would include sensitive habitats, such as meadows and riparian areas. Removal of forest litter and vegetation can also lead to soil erosion and increased siltation in adjacent lakes and streams. This could have an adverse effect on aquatic species, such as amphibians and invertebrates. Impact of hand line construction in association with managed wildland fire and prescribed fire under Alternative A would be adverse, short-term, and negligible given the present limited use of fire, the use of minimum impact management techniques (MIMT), and fire line rehabilitation. Mitigations: Continued use of MIMT; careful planning of fire line construction to avoid sensitive wildlife resources and habitats, avoidance of unnecessary line construction, and proper storage of food.

Snagging. Snags are probably the most valuable tree-form to wildlife (Brown and Bright 1997). They provide cavities and loose bark for nesting and roosting and food in the form of wood-boring insects. Any holding action that requires the felling of snags to protect human safety and the integrity of the fire line would potentially affect wildlife by reducing the availability of snags to species such as pileated woodpeckers, northern flying squirrel, and several bat species. Felling would likely kill some animals. The number of snags lost would vary, depending upon factors such as the type and age of tree stand, its history of fire and/or disease or insect infestation, and the intensity of the fire. Under Alternative A, snagging associated with holding actions would potentially have moderate, long-term, and adverse impacts because of the relatively small areas that would be affected. Mitigation: Use MIMT and limit snag removal to those snags identified as a clear threat to human safety and fire line integrity.

Mop-up. The churning of soil and forest litter to extinguish residual hot spots along the periphery of a fire would cause some mortality of buried organisms by exposing them to heat and flames. Such impact, however, would be along short sections of the lined perimeter and affect few species. Impact of mop-up would therefore be adverse, short-term, and negligible.

Holding Action Summary: Under Alternative A, actions associated with managing wildland fire would have adverse effects on wildlife, but such effects would be slight and localized. Holding

actions would facilitate the use of wildland fire to move forests toward natural conditions, which would provide beneficial, long-term, and minor effects on wildlife. Under Alternative A, these effects would be limited by the relatively small number of acres that would be treated each year.

Fuel Reduction by Hand or Machine

Aggressive Reduction Techniques. These treatments would not be used in Alternative A.

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Hand thinning of understory vegetation, down fuels, and small-diameter trees in the wildland/urban interface would have mixed effects on wildlife and habitat. Hand cutting trees and brush to attain target conditions provides a more natural habitat and helps reduce the threat of catastrophic fire; especially from human-caused ignitions that occur in developed areas. The resulting forest structure, however, tends to be less complex and more homogeneous, because protection of property and safety through fuel reduction is a major consideration in these areas. A few species, such as marten, hermit thrush, and some small rodents may be adversely affected by this reduced complexity, but many more species, such as Cooper's hawk, Hammond's flycatcher, and several bat species, would benefit from a more open forest. At the current rate of treatment (< 25 acres/year), restoration of habitat and mitigation of the risk of catastrophic fire to both wildlife and humans is inhibited.

During hand-thinning operations, wildlife in the area might be affected in two ways. Removal of trees and other vegetation would adversely affect wildlife, such as insects and nesting birds, currently using these habitat features. Secondly, human presence and use of chainsaws and other tools during thinning operations may disturb wildlife, although such disturbance would be short-lived. Impact to wildlife from hand-thinning would be beneficial, long-term, and minor, because habitat affected by fire suppression would be returned to a more natural condition, and threat of catastrophic fire would be reduced in these areas. Mitigation: Identify and avoid sensitive wildlife resources.

Pile Burning. Piling and burning of downed trees and shrubs may have an adverse effect on some wildlife. Some species, such as small rodents and reptiles, may take up residence in burn piles between the time they are stacked and the time they are burned; which can be at least several months. Many of these animals are likely to flee the flames once the piles are ignited, but some may perish.

Under Alternative A, effects on wildlife from hand thinning and piling and burning would be beneficial, long-term, and negligible because improvement of habitat adjacent to developed areas toward target conditions would proceed slowly. The area of habitat affected would be relatively small. Some wildlife species may be adversely affected by emphasis on fuel reduction, but more species are likely to benefit from achievement of target conditions, and reduction in the threat of catastrophic fire, small as it is under this alternative.

Chipping. When removed biomass cannot be burned on site or removed for logistical, administrative, or ecological reasons, it may be chipped and distributed over the site. When chips are spread deeply enough to affect the growth of native plants, wildlife would be affected. Such impacts, however, would be limited to areas adjacent to roads and developed areas, and standard mitigation for chipping calls for chips to be spread as thinly as possible on the site—usually to a depth of not more than 1 inch. The machinery used for chipping and shredding would be loud,

which would disturb wildlife, such as nesting birds, in the short-term. Impact to wildlife from chipping would therefore be negligible, adverse, and short-term.

Peregrine Falcon

The peregrine falcon, until recently, was an endangered species that the National Park Service considered a special-status species. It has, however, been removed from the endangered species list after a successful recovery program. The park continues to monitor peregrine falcons in Yosemite as part of its larger wildlife management program. Peregrine falcons occupy a broad range of habitats, but need suitable nesting cliffs, which would not be affected by fire management activities due to the vertical aspect of nesting habitat and its lack of vegetation. Some of the major species that peregrine falcon eat (e.g. cliff dwelling birds, such as white throated swift and violet green swallow), are not likely affected by fire management practices because they forage along cliff faces and in the airspace above the Valley floor. Peregrines tend to adjust to changes in the array of bird species available within a forest type, and thus would find suitable prey in a wide variety of forest conditions. Effects on the peregrine falcon would be adverse, short-term, and negligible. However, the park would continue to monitor the status of the peregrine, and if deleterious effects were detected, related to fire management operations, these operations would be adjusted or refined.

Cumulative Impacts

The past activities within the region that have had the greatest adverse impacts upon wildlife have included development, timber harvest, and fire suppression activities. The present and reasonably foreseeable future projects that would have an effect upon wildlife and habitat would include:

Yosemite Wilderness Management Plan Update: This plan could affect how fires are managed in Wilderness by modifying current minimum tool policies. It is likely, however, that the plan will recognize the value of fire in maintaining Wilderness values, and be compatible with fire management goals. On one hand, impacts from fire line construction, snagging, etc., could be reduced, but, on the other hand, policies that inhibit full and quick implementation of the fire program would potentially delay achievement of target conditions which would be beneficial to wildlife over wide areas of the park. Impact on wildlife is expected to be beneficial, long-term, and moderate.

Yosemite Valley Plan/SEIS (2000): Implementation of the preferred alternative would restore highly-valued habitats in Yosemite Valley and decrease the fragmentation of these habitats. This would help restore wildlife abundance and diversity in Yosemite Valley. The construction of facilities outside of Yosemite Valley would cause localized destruction of forest habitat, but the overall impact is expected to be major, beneficial, and long-term.

Merced Wild and Scenic River Comprehensive Management Plan/EIS (2000): Implementation of the preferred alternative would help protect river-related wildlife habitat and species. This is especially true in Yosemite Valley, where past development has encroached on river habitats. The *Merced River Plan* would provide the framework for reducing present development and limiting future development in these areas, with moderate, beneficial, long-term impacts on wildlife.

Yosemite West Re-zoning: This project would likely lead to an increase in the Yosemite West wildland/urban interface area, requiring intensive management of vegetation and fuels over a wider area. This would have an adverse effect on wildlife because an additional 55 acres would be

developed in mixed-conifer habitat near the park boundary. Impact on wildlife is expected to be moderate, adverse, and long-term.

Yosemite West, 31 Acre Bed and Breakfast: Like the above project, this project would have an adverse effect on park wildlife by reducing mixed-conifer habitat near the park boundary. No effect on wildland/urban interface treatment in the park is expected, since the affected property abuts national forest land. Impact on wildlife is expected to be moderate, adverse, and long-term.

Hazel Green Ranch: Potential for development in this area adjacent to the park would affect an area of mixed-conifer and meadow habitat. Impact on wildlife is expected to be adverse, long-term, and minor to moderate, due to likely consideration by the developer for preservation of sensitive habitats. However, plans for the site are uncertain.

Evergreen Lodge Expansion*:* This development would affect an area of mixed-conifer habitat near the park. Effect on wildlife is expected to be adverse, long-term, and minor because of the long-term human occupation of this area.

Rush Creek Guest Lodging and Conference Facilities: This project would affect an area of mixed conifer habitat. Effect on wildlife is expected to be adverse, long-term, and minor.

A-Rock Reforestation (USFS): This project would hasten the return of the area burned in the 1990 fire to a forested habitat of 5,000 acres. This would eventually benefit forest-dependent species such as spotted owls, but techniques used to achieve this condition (burning, mechanical thinning, herbicides), would have an adverse effect on wildlife, such as lazuli bunting, fox sparrow, and mule deer, that have occupied the post-fire, shrub-dominated community. Overall impact is expected to be adverse, long-term, and minor because of the artificial influence on the natural succession of habitats and associated wildlife.

Aspen Fuels Reduction (USFS): This project would enhance habitat quality for spotted owls over a 500 acre area near the park. This would have a beneficial, long-term, and minor impact.

Fire Management Plan for Wilderness (USFS): This plan would provide beneficial, long-term, and moderate impact on wildlife by allowing naturally-ignited fires that stay in prescription to cross boundaries between National Park Service and U.S. Forest Service lands. This could result in wider areas of wildlife habitat benefiting from habitat improvement from fire.

Orange Crush Fuels Program (USFS): This project would manage fuels through prescribed burning. This would have a beneficial, long-term, and minor effect on wildlife by working toward the return of a natural fire cycle for the area, and reduce the chance of catastrophic fire, which could carry into the park.

Rogge-Ackerson Fire Restoration (USFS): This would eventually benefit forest-dependent species such as spotted owls, but techniques used to achieve this condition (burning, tilling, shredding, herbicides), would have an adverse effect on wildlife that have occupied the post-fire, shrub-dominated community, such as lazuli bunting, fox sparrow, and mule deer. Overall impact is expected to be adverse, long-term, and minor because of the artificial influence on the natural succession of habitats and associated wildlife.

Sierra Nevada Forest Plan Amendment (USFS): Implementation of this plan would have a major, beneficial, long-term effect on wildlife by leading to more ecosystem-based management of national forests in the Sierra Nevada.

The impacts of these actions, considered in combination with the impacts of Alternative A, would result in beneficial, long-term, and minor cumulative effects on park wildlife and habitat. This is because past, present, and reasonably foreseeable projects inside and outside the park would beneficially affect large areas of wildlife habitat in the central Sierra Nevada. The Sierra Nevada Forest Plan Amendment would affect virtually all U.S. Forest Service land around the park by more ecosystem-based management. In comparison, projects with adverse impacts involve small areas and/or have minor impacts over larger areas.

Conclusion

Effect of Alternative A on wildlife would be adverse, long-term, and major because of the indefinite continuation of the direct effects of high-fuel loading on habitat structure and quality in some areas and the continued threat of catastrophic fire. High-intensity fire has the potential to cause wide-scale, long-term, changes in park habitats as well as large-scale changes in wildlife abundance and diversity in those areas affected. Impacts from actions to suppress fires would be most intense under this alternative, because of the prolonged period over which undesirable wildland fires are likely to occur. Large, high-intensity fires would potentially affect large areas of wildlife habitat, which would be considered key to the natural integrity of the park. The effect would potentially be that of impairment.

Special-Status Species – Plants

The four California rare plant species grow within the lower montane forest and foothill woodland vegetation zones, where fires frequently occur. These plants occur mainly within the El Portal Administrative Site, although isolated populations of the Yosemite onion are also found within the park. Threats to these species are from suppression-related impacts and establishment of non-native plant species in areas that have been severely burned (Hessl and Spackman 1995). As fire lines are tied into creek bottoms and moist areas, populations occurring in those sites may be affected. These impacts can be mitigated by avoidance of known populations and habitats of these species. Soil and substrate disturbance from line construction and trampling is especially harmful to perennial species—in this case, Yosemite onion, Tompkin's sedge, and Congdon's lewisia.

Non-native plants have become established throughout the lower elevations of Yosemite and are concentrated in areas that receive constant disturbance and/or a constant influx of seed and plant material—e.g. along transportation corridors and drainages (Gerlach et al. 2001). As fires burn they open up habitat that may be taken over by non-native plant species. These plants are more aggressive colonizers, have a phenology different than natives, and may be favored by fire-caused changes in the soil. Fires started in the shoulder seasons for hazard fuel reduction or other management reasons may actually exacerbate this problem, favoring non-native plants over the native suite of species. In addition, these fires may negatively affect the rare plants themselves, which are adapted to fires occurring during the normal fire season—May through October at these elevations. For example, Congdon's woolly-sunflower blooms into May and sometimes into June. Prescribed fires held earlier in the year will destroy mature plants and their potential to produce seed for the following season—thereby harming population size and viability.

Potential for Impacts from Catastrophic Fire

Due to fire exclusion and high fire return interval departures in most areas within the vegetation groups inhabited by these special-status plant species, fires tend to have unnaturally high intensity, with impacts to overstory as well as ground cover vegetation. In drainages (which act as chimneys by concentrating high-intensity fire) these fires cook vegetation and create hydrophobic soils.

Yosemite onion, Tompkin's sedge, and Congdon's lewisia all occur on moist slopes or in drainages, and are at most risk of direct impacts from unnaturally high intensity fires. Congdon's woolly-sunflower is an annual species that is in seed during the fire season. It grows on sparsely vegetated slopes with light fuels so fire intensity is generally within normal limits, and this plant thrives under post-burn conditions when competing plants have been burned off and woolly-sunflower seedlings can become established on very exposed slopes. Level of effect to any of these species would depend on the extent of the event (whether it affected the entire species or an isolated population) and the proximity of the disturbed area to non-native seed sources (whether other species became established within the habitat). Impacts from Alternative A to special-status species in regard to catastrophic fire would be adverse, long-term, and minor to moderate, due to the likelihood of extreme exposure of these sites to the sun and heating (due to loss of overstory cover and shade) following the fire.

Fire Management Treatments

Managed Wildland Fire

Under the No Action Alternative, all of the plant special-status species described in this document occur within either the Conditional or Suppression Units. During fire events, input from a Resource Advisor would continue to be used to minimize or eliminate impacts to these species (see Chapter II, Mitigation under Actions Common to All Alternatives and Appendix 3). Human-caused fires would be suppressed regardless of the potential for ecological benefits, and attempts would be made to protect known populations through direct suppression actions. Lightning fires in areas inhabited by these species would most often be suppressed; the only exception would be within the Conditional Unit where there could be isolated populations of the Yosemite onion. In this unit, lightning fires would be allowed to burn if conditions (including ecological, political, and administrative) permitted. These fires would occur within the natural fire season, when plants would be dormant and resistant to direct fire effects. The departure from natural fire return intervals in these areas would continue to increase over time, with increased potential for catastrophic fire as explained above. Therefore, impacts associated with managed wildland fire to special-status species under this alternative would be adverse, long-term, and moderate, because fire in some areas that would benefit from burning would continue to be suppressed.

Re-ignition clause. Not used under this alternative.

Holding Action and Monitoring Effects (water and retardant drops, helispots and spike camps). Water and retardant drops release liquids onto burning or unburned areas. The physical impact of hundreds of gallons of fluid can cause erosion of soils both from the direct impact and from runoff from the site (due to the nature of decomposed granite soils and sparsely vegetated metamorphic substrates). The woolly-sunflower could be washed from the slope, if soils containing seed for this species are dislodged and carried to lower, possibly less suitable slopes and gullies. Perennial species of onion, sedge, and lewisia, due to their below-ground bulb and root structures, could lose the above-ground portions of individual plants with minimal impact to the perennial portions. However, loss of above-ground biomass could eventually lead to reduced vigor in the season following a fire.

Retardant is high in phosphorous and nitrogen, both of which are generally found in very low concentrations within the habitats for these species. Increased levels of nutrients could increase the potential for the establishment of non-native species. However, the chemical components of retardant only remain for a few months at most, and long-term, chemical alteration of the soil does not occur. Impacts are mitigated through avoiding the use of retardants, or by using "clear"

retardants that minimize active nutrients within the mix. Direct impacts would be avoided by asking pilots to keep their aircraft moving so that water and retardant is dissipated over a larger, more linear area. In this way, less soil is disturbed, decreasing the amount of downslope erosion and topsoil lost.

Fire monitoring activities, including the development and management of helispots, spike camps, and fire camps can all lead to ground disturbance. There is an increased potential of spills and soil contamination from aircraft as well as chainsaws and fuel cans in these areas. Aircraft runners, boots, other equipment, and camp and base supplies contaminated with non-native seed, provide vectors for non-native species that otherwise would not have dispersed into these sites. Mitigation measures include avoiding known populations of special-status species, cleaning weed seeds from vehicles and equipment, and rehabilitating sites as quickly as possible (which restores natural drainages, prevents further unnatural runoff; and restores locally gathered litter and duff to the site). Mitigation measures as described in Chapter II would be adhered to. All of the special-status species occur in relatively steep, inaccessible areas that would not serve for staging areas or helispots. Therefore, impacts of these actions taken in conjunction with mitigation measures would be adverse, short-term, and negligible.

Prescribed Fire

Prescribed burns are carried out for two primary reasons—to restore or maintain vegetation within target conditions and to reduce fuels to protect buildings or achieve other administrative objectives (e.g. maintenance of cultural landscapes or view sheds). At times, the two reasons contradict each other because their effects differ on various components in a burn unit (Kauffman, 1990).

In the areas where the park's listed plant species occur, prescribed burns are done for both reasons. Efforts would continue to restore the native suite of grasses and forbs within the foothill pine/live oak/chaparral vegetation type, through the removal of numerous non-native plant species. Other areas adjacent to developments (particularly in the El Portal Administrative Site) would be burned during the shoulder season and at higher frequencies to create a defensible barrier around houses, businesses, and administrative facilities. Depending on the site and the species affected, impacts would vary. Overall, due to the highly limited and isolated habitat of special-status plant species and their overall resilience to fire, these actions would have a minor, adverse, and long-term effect.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Preparations for managed wildland fire can significantly disturb vegetated areas. Felling and moving snags can create large accumulations of fuel in sparsely covered areas not normally at risk of fire. Hand line construction could cause ground disturbance across slopes and drainages that might divert run-off and cause a loss of topsoil, thus drying out drainages and impinging on individual plants within a special-status population. Mop-up activities would churn up ash and soil, creating extensive disturbance within the upper soil layers, potentially establishing non-native species due to an increase in interstitial spaces in the soil. Mop-up can also lead directly to the loss of seed and below-ground plant structures by exposing them to heat and flames. All of these actions can negatively affect the park's special-status plant species. As much as possible, efforts would be made to identify known populations of these species during fire planning so that disturbance would not occur. In the event that a population were disturbed, fire rehabilitation (which includes restoring natural topography by replacing soil layers scraped aside and rocks that were moved while building hand lines) would mitigate the impacts. Mop-up would not be allowed

within a certain distance of a special-status species plant population so that soils and below-ground plant structures would be left intact and undisturbed. Snags would be felled away from sensitive sites to prevent damage from high-intensity burns. Under this alternative, with these mitigations, impacts would be negligible to adverse, short-term, and minor.

Fuel Reduction by Hand or Machine

Aggressive Reduction Techniques. These treatments would not be used in Alternative A.

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Hand cutting to reduce overall stand density, break up continuous areas of shrubs and trees, and/or remove ladder fuels under this alternative would be focused on removing smaller size classes of tree seedlings and saplings. Thinning prescriptions have been developed for most wildland/urban interface areas of the park, as well as undeveloped portions of Yosemite Valley and Wawona. Prescriptions include species to target, desired density of smaller age classes (so that some seedlings and saplings would remain on the site), and (if applicable) species to be avoided.

In the case of special-status plant species, hand thinning would only affect known populations in the El Portal Administrative Site. All thinning projects would go through review, with Resource Advisors providing input regarding the presence and necessary measures to protect and/or avoid these species. Yosemite onion and Congdon's lewisia generally are unaffected by thinning due to the locations of their populations. Both Tompkin's sedge and Congdon's woolly-sunflower potentially would be affected by thinning activities if ground disturbance such as foot traffic or dragging cut materials were to occur. Therefore, the impact of hand thinning in the No Action Alternative (with mitigations) would be adverse, short-term, and negligible to minor.

Pile burning. Pile burning would generally follow hand thinning and would precede broadcast burning (as site preparation). Impacts associated with pile burning would include surface and soil disturbance associated with dragging materials to each pile; very localized, intense burn effects on surface fuels, litter, and duff; and damage to soil layers (and thus subsurface plant structures such as seeds, roots, bulbs, rhizomes, and mycorrhizal mycelium). Longer-term impacts might include changes in soil chemistry and structure, from extreme, long duration heating. Piles would be kept rather small – about the size of small car – so they would be manageable when burned and so the effects would be localized and unlikely to impact larger, individual plants. The small size would allow re-colonization of sterilized patches by mycorrhizal fungi and other soil organisms.

These activities would have the potential to impact both Tompkin's sedge and Congdon's woolly-sunflower because of the location of some populations and individuals of these species. Yosemite onion and Congdon's lewisia generally would not be impacted by these activities, because of the location of their populations. Efforts would be made to avoid individual plants and populations, by identifying them during planning for the activity. Vegetation is often so thick that resource specialists would be unable to gain access to a burn site to accurately identify isolated individual plants. However, larger populations would be avoided, and piles would be placed in sites that are unlikely to support these species. Therefore, impacts of pile burning on plant special-status species would be negligible to adverse, short-term, and minor.

Chipping. Chipping activities would occur when biomass could not be burned on site or when it would need to remain on site for logistical, administrative, or ecological reasons. Chips can cause localized denudation by burying soils and seed banks and robbing soils of available nutrients during the decomposition process. Chips – due to their high cellulose content and the lack of moisture and nutrients in local soils to facilitate rapid breakdown – should only be applied up to 1

inch deep. However, chips would be spread more thickly in some areas (such as road shoulders in the El Portal Administrative Site) to deter non-native plant species such as yellow star-thistle. Impacts would occur to special-status species if chips were placed on top of populations and/or individuals, or on potential habitat for these species. Careful project planning and notification to resource specialists prior to the start of a project would help avoid covering special-status plants. Due to these mitigations, the impact of chipping on special-status species would be short-term, negligible to minor, and adverse.

Cumulative Impacts

Other actions expected to occur within Yosemite that would affect these special-status species would be implementation of the *Merced Wild and Scenic River Comprehensive Management Plan/EIS* (NPS 2000) and the *Yosemite Valley Plan/SEIS* (2000c). The first identifies a protection zone along the Merced River that will allow for enhanced habitat protection of Tompkin's sedge, some populations of Yosemite onion, and Congdon's lewisia, which occur in drainages and areas adjacent to the river. Implementation of the *Yosemite Valley Plan* would substantially increase the human population in the El Portal Administrative Site, which would increase the potential for impacts (from radiating use and the increased potential for the introduction, establishment, and spread of non-native plant species) to individuals and populations of all of these plant species. Mitigation measures identified in the *Yosemite Valley Plan* reduce the potential level of impact to adverse, long-term, and minor.

Beyond the park and administrative site boundaries, the only projects that would affect these plants, because of their habitat requirements, would be those that occur within the Merced River drainage immediately west of the park. The Sierra Nevada Forest Plan Amendment, which affects both Stanislaus and Sierra National Forests, would have potential effects in areas adjacent to the park. Under this plan, efforts would be made to reduce the spread of noxious weeds, protect riparian resources, and manage fuels and fire similarly to the National Park Service.

Thus, present and reasonably foreseeable projects in the region would potentially improve habitat conditions for these species (by controlling weeds and restoring fire as part of the ecosystem), with resultant long-term, minor, and beneficial impacts. These effects, in combination with the effects of Alternative A, would result in minor, adverse and long-term cumulative impacts.

Conclusion

Overall, the effect of Alternative A would be adverse, long-term, and minor for special-status plant species, primarily because of the potential for habitat modification from high-intensity fire, and because of the effects of some on-site treatments on populations. There would be no impairment from the effects of this alternative.

Special-Status Species – Animals

Sierra Nevada Bighorn Sheep (Ovis canadensis sierrae) - Federal Endangered

This species has an extremely limited distribution in Yosemite; a few individuals occasionally venture into the park near Mount Dana and Gaylor Basin. They come from a reintroduced population that is found primarily on Tioga and Warren Crests, east of the park. Bighorn sheep summer on high, open terrain above treeline, and winter on high, windswept ridges or descend to lower elevations on the east side of the Sierra. Critical habitat requirements include open terrain that has a low chance of concealing predators and steep, rocky escape terrain. Green vegetation

around water seeps is important in foraging areas (Moore 1993). Because of the limited distribution in Yosemite, no wildlife habitat relationships (Mayer and Laudenslayer 1988) evaluation was done for this species.

Potential for Impacts from Catastrophic Fire

Bighorns select high elevation, habitats that have sparse tree and shrub cover where fires rarely spread even though lightning strikes are frequent. The natural fire return interval is 200 to 400 years. Catastrophic fire would, therefore, be highly unlikely. The fires that do occur would help open up the landscape, making it more suitable for bighorns. For bighorn sheep, impact of Alternative A in regards to catastrophic fire, would be adverse, long-term, and negligible.

Fire Management Treatments

Managed Wildland Fire

All bighorn habitat in Yosemite is in the Fire Use Unit, where lightning-fires are the primary method of habitat management. Fires would be evaluated and allowed to burn when they would accomplish resource management objectives. The rarity, low intensity, and slow rate of spread of fires make their suppression, and possible re-ignition, unlikely. As such, managed wildland fire would have a negligible, beneficial, long-term effect on bighorn sheep under Alternative A.

Prescribed Fire

Prescribed burns in bighorn sheep habitat would be unlikely since these areas are well within the natural fire return interval of 200 to 400 years. The U.S. Forest Service has recently burned bighorn wintering areas outside the park in order to enhance habitat quality, reduce predator cover, and stimulate forage growth. Yosemite has no wintering habitat. Prescribed fire under Alternative A would therefore, have a negligible, beneficial, long-term effect on bighorn sheep.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Because management of wildland and prescribed fires would be unlikely in bighorn habitat, actions to manage such fires would also be unlikely. Any human presence would potentially disturb bighorns and affect their survival and reproduction (Papouchis et al. 2001). Therefore, fire crews in bighorn habitat would have an adverse effect. Helicopters dropping water and retardant would also distress bighorns. The improbability of these actions happening in bighorn habitat, however, limit their expected impact to adverse, short-term, and negligible.

Fuel Reduction by Hand or Machine

Passive Reduction Techniques. Would not occur in bighorn sheep habitat.

Cumulative Impacts

Two regional plans for adjacent U.S. Forest Service land would affect Sierra Nevada bighorn sheep. Implementation of the Sierra Nevada Forest Plan Amendment/FEIS (USFS) would potentially benefit bighorns by protecting resources of value to bighorns. The Management Direction for the Ansel Adams, John Muir, and Dinkey Lakes Wilderness Revised Draft/EIS would have a beneficial effect on bighorns by allowing habitat enhancement of wintering areas through prescribed burning.

The Inyo National Forest has implemented restrictions on dogs within all occupied bighorn habitat. Removal of three mountain lions over the last year from bighorn habitat outside the park has helped reduce predation. The cancellation of two domestic sheep grazing allotments (Bloody Canyon and Alger Lakes) on the Inyo National Forest, and the modification of two others, have

helped reduce the threat of disease transmission from domestic sheep to bighorn sheep. These actions are all designed as part of the interagency recovery efforts for this endangered species.

The resulting cumulative impacts from these actions on Sierra Nevada bighorn sheep are major, beneficial, and long-term because they will help the species recover to larger, more stable self-sustaining populations. In combination with the negligible impacts from Alternative A, cumulative impacts would remain major, beneficial, and long-term.

Conclusion

The impact of Alternative A on Sierra Nevada bighorn sheep would be beneficial, long-term, and negligible because of the continued, though rare, influence of fire on their habitat.

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) – Federal Threatened

Distribution of the valley elderberry longhorn beetle in the area administered by Yosemite National Park is restricted to the El Portal Administrative Site. The entire life cycle of the valley elderberry longhorn beetle is connected to the elderberry plant (*Sambucus sp.*). Adverse effects on elderberry plants would therefore, have an adverse effect on this beetle. Current management of vegetation in El Portal follows U.S. Fish and Wildlife Service guidelines for protection of valley elderberry longhorn beetle and their host plants (USFWS 1999).

Potential for Impacts from Catastrophic Fire

Valley elderberry longhorn beetle and elderberry plants have existed under natural fire regimes for thousands of years. Chaparral and oak woodland communities where elderberry plants are found are subject to large, high-intensity fires, which could result in high mortality of valley elderberry longhorn beetle and elderberry plants. Under present conditions, catastrophic fire presents the threat of moderate, adverse, long-term effects on valley elderberry longhorn beetles. Implementation of Alternative A would not reduce these impacts.

Fire Management Treatments

Managed Wildland Fire

The El Portal Administrative Site, where valley elderberry longhorn beetle habitat occurs, is entirely within the Suppression Unit where wildland fires would be suppressed.

Prescribed Fire

Use of prescribed fire would be beneficial to the valley elderberry longhorn beetle by reducing the chance of catastrophic fire in beetle habitat. All elderberry shrubs with evidence of valley elderberry longhorn beetle activity (exit holes) would be protected during prescribed fires by reducing fuels and/or applying water around shrubs. Fires that reach greater than 2-4 feet in height near valley elderberry longhorn beetle-occupied shrubs would be extinguished. Elderberry plants with no evidence of beetle occupation would not be protected during prescribed fire. Valley elderberry longhorn beetle and elderberry plants evolved with fire, and regular burns remove decadent wood and stimulate new growth in the shrubs. Thus, fire is important for maintaining the health of elderberry plants. In valley elderberry longhorn beetle habitat, prescribed fires would be lit when conditions would produce moderate intensity fires. Although shrubs burned in prescribed fires may not have valley elderberry longhorn beetle exit holes, it is possible some beetles may be present, and could be killed. Elderberry shrubs burned in prescribed fires would take several years to generate stems large enough to support the beetle (> 1 inch diameter). Under Alternative A, prescribed fire use in El Portal would be limited. Its effect on the valley elderberry

longhorn beetle would, be beneficial, long-term, and negligible, because long-term benefit to elderberry plants through regeneration and reduced fuel loads would offset the unintentional, short-term impacts from beetle mortality. Mitigation would include following U.S. Fish and Wildlife Service guidelines for protection of valley elderberry longhorn beetle and their host plants.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Standard procedures for these activities, in accordance with U.S. Fish and Wildlife Service guidelines, would limit damage to elderberry plants. The following fire management actions are unlikely in valley elderberry longhorn beetle habitat and, therefore, would not affect the species: water and retardant drops, helispot construction, and spike camps. Construction of hand lines before and during prescribed fires and mop-up would not affect the valley elderberry longhorn beetle because elderberry plants would be avoided. Snagging is unlikely in valley elderberry longhorn beetle habitat and, therefore, would not affect the species. Impact of actions taken to manage prescribed fire under Alternative A to the valley elderberry longhorn beetle would be adverse, short-term, and negligible.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Hand cutting to reduce fuels that threaten developed areas in El Portal would not likely adversely affect the valley elderberry longhorn beetle. Standard mitigation requires the mapping of all elderberry plants in a treatment area. All elderberry plants with stems greater than one inch in diameter at ground level would be left. This would protect the plants most likely to be inhabited by valley elderberry longhorn beetles. Hand cutting could affect the recruitment of small plants into the larger, valley elderberry longhorn beetle-suitable size class. However, the reduction of fuels by hand thinning would help reduce the threat of catastrophic fire, which would help protect the valley elderberry longhorn beetle and their host plants. The limited application of this technique in El Portal would limit such benefit. Impact on the valley elderberry longhorn beetle from hand thinning under Alternative A would be beneficial, long-term, and minor.

Pile Burning. Materials removed during hand-thinning operations may be piled on-site and burned. This could have an adverse effect on valley elderberry longhorn beetles if the piles were near enough to elderberry plants to damage them. Standard procedures designed to protect the beetle would limit such effects. Impact on the valley elderberry longhorn beetle from pile burning under Alternative A would be adverse, short-term, and negligible.

Chipping. In some cases, cut materials would be chipped, when logistical, administrative, or ecological reasons made on-site burning unsuitable. If chips were distributed over the treatment site, they would inhibit growth of elderberry plants by “mulching” and removing soil nutrients during decomposition. Current chipping guidelines, however, limit the depth at which chips can be spread on the soil, to minimize these adverse effects. Effect of chipping on the valley elderberry longhorn beetle under Alternative A would be negligible, adverse, and long-term.

Cumulative Impacts

Urbanization in California’s Central Valley and Sierra foothills is a primary factor affecting valley elderberry longhorn beetles and continued human population growth in the Sierra Nevada is likely to result in further destruction of habitat.

Specific foreseeable projects that could adversely affect valley elderberry longhorn beetle populations include the Yosemite View Parcel Land Exchange (NPS); Yosemite Motels expansion; University of California, Merced campus; the City of Merced General Plan; and the Merced River Canyon Trail Acquisition (BLM). Developments likely to affect the valley elderberry longhorn beetle would however, have to comply with U.S. Fish and Wildlife Service mitigation guidelines to protect the beetles.

The Sierra Nevada Forest Plan Amendment/FEIS (USFS) and the *Merced Wild and Scenic River Comprehensive Management Plan/FEIS* (NPS) would help protect valley elderberry longhorn beetles by providing more ecosystem-based management of potential habitat. The valley elderberry longhorn beetle and its habitat are biologic Outstandingly Remarkable Values under the *Merced River Plan* and, therefore, must be protected and enhanced under that plan.

Impacts to valley elderberry longhorn beetle from present and reasonably foreseeable actions would be minor, beneficial, and long-term. In combination with the effects of Alternative A, the cumulative effects would be adverse, long-term, and minor, based on the increased intrusion of human development into valley elderberry longhorn beetle habitat.

Conclusion

The impact of Alternative A on valley elderberry longhorn beetles is expected to be adverse, long-term, and minor due primarily to fire and fuels management techniques and the continued threat of catastrophic fire that may affect the beetles and their host plants.

California Red-Legged Frog (*Rana aurora draytonii*) - Federal Threatened

California red-legged frogs have disappeared from nearly the entire Sierra Nevada, including Yosemite National Park—only two populations are known to exist in the northern Sierra. The most significant cause of this decline is alteration and destruction of habitat from activities such as urban development, dams, sediment from roads and mines, grazing, and timber harvest (USFWS 1996). Pesticide contamination and non-native predators have also been implicated in the frog's demise. Predation by bullfrogs is thought to have caused the disappearance of red-legged frogs from Yosemite, where red-legged frogs were last seen in 1984. Recent surveys have found none (Knapp 2000). Red-legged frog habitat was identified through wildlife habitat relationships analysis (Mayer and Laudenslayer 1988).

Potential for Impacts from Catastrophic Fire

Under the median fire return interval, over 90% of the high-quality habitat has missed more than four intervals. Although red-legged frogs are no longer known to live in Yosemite, catastrophic fire could have an adverse effect on habitat that could be used by the frogs if they were reintroduced. The frog's main habitat, ponds and slow-moving streams with emergent vegetation, is unlikely to burn, but riparian areas that the species uses for foraging and shelter during dry periods could (Jennings and Hayes 1994). Some riparian habitats in the park have extraordinarily high accumulations of fuel, and this, coupled with the chimney effect of drainages, could result in high-intensity fires that would destroy riparian habitat and adversely affect aquatic habitats.

Alternative A would allow these risky conditions to continue indefinitely. Catastrophic fires would possibly affect red-legged frog habitat. No frogs would be directly affected, but the quality of habitat for potential reintroduction of the species to Yosemite would be degraded. Effects on California red-legged frogs from catastrophic fire under Alternative A would be minor (because no

frogs are present), adverse, and long-term. Mitigation: Identify potential red-legged frog habitat and reduce fuels in those areas.

Fire Management Treatments

Managed Wildland Fire

Because approximately 84% of high-quality red-legged frog habitat in the park is in the Fire Use Unit, managed wildland fire would the primary method of management in this habitat. Fuel loads and the risk of catastrophic fire could be reduced by allowing natural ignitions to burn within established prescriptions. However, this alternative would limit the number of these fires and re-ignitions of suppressed fires would not occur. Also, accumulations of fuel may cause managed wildland fires to burn at unnaturally high intensity in some areas, which could adversely affect riparian habitats. The impact of managed wildland fire on California red-legged frogs would be beneficial, long-term, and minor.

Prescribed Fire

Prescribed fire, because it is used to restore the natural vegetative structure of park habitats and reduce the risk of catastrophic fire, would benefit the riparian habitat of red-legged frogs. This benefit would be limited by the relatively small area that would be burned annually under Alternative A. At the same time, the threat of catastrophic fire would remain high. Only about 16% of high-quality, red-legged frog habitat is in the Suppression Unit, where prescribed fire would be the primary tool. However, prescribed fires are allowed in only a small part of this unit so benefits would be limited. High levels of fuel loading in some areas may cause prescribed fires to burn at higher than natural intensities, even when fire prescriptions were designed to minimize high-intensity fires. Such adverse effects, however, must be weighed against the overall reduction in the threat of catastrophic fire achieved through prescribed fires. Impact to California red-legged frogs from prescribed burning under Alternative A would be beneficial, long-term, and negligible, due to the small area of high-quality potential habitat that would be affected.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Water drops could have an adverse effect on potential red-legged frog habitat due to the possible introduction and spread of non-native species. The last waters in the park known to contain red-legged frogs are infested with bullfrogs, which were the likely cause for the disappearance of red-legged frogs. Bullfrog tadpoles and adults could be transported to new areas through water drops, further reducing habitat suitable for red-legged frogs. Current protocols prohibit retardant drops within 300 feet of any surface waters. Retardant could diminish water quality, but the effect on red-legged frogs would be negligible, since none are present. Hand line construction and spike camps could affect frog habitat if they were placed in riparian or wetland areas. Current fire management protocols, however, recognize the sensitivity of these areas and procedures are in place to protect riparian areas. Potential impacts would be limited by the relatively small number of acres that would be treated by prescribed and managed wildland fire. Helispots, snagging, and mop-up would be unlikely to have any effect on red-legged frogs because such activities are unlikely to occur in red-legged frog habitat, and no red-legged frogs are known to exist in the park. Impact of prescribed and wildland fire management activities on California red-legged frogs under Alternative A would be adverse, long-term, and negligible, primarily from the threat of the spread of bullfrogs from water drops. This could be mitigated by prohibitions against dipping water from waters known to contain bullfrogs.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Reduction in fuel loading by hand thinning would have a beneficial effect on red-legged frogs by reducing fuel loads and the threat of catastrophic fire. This treatment, however, would be used in very small areas of potential red-legged frog habitat near developed areas. Yosemite Valley, El Portal, Foresta, and Wawona appear to have suitable habitat. Pile burning, after thinning, could have an adverse effect on red-legged frogs if piles were located near occupied habitat (because frogs may shelter in the piles and be killed when they were burned). However, no known populations of red-legged frogs occur in areas likely to be treated with hand thinning. Impact of hand-thinning on red-legged frogs under Alternative A is expected to be beneficial, long-term, and negligible, due to the possible reduction in the threat of catastrophic fire near potential habitat.

Cumulative Impacts

The remaining small, isolated California red-legged frog populations makes them extremely vulnerable to impacts such as non-native species predation and chemicals. Critical habitat has been identified, but human population growth and urbanization is likely to impact potential habitat and affect the chances of red-legged frogs being reestablished into parts of their former range. Protection of critical habitat and compliance with the Draft Recovery Plan would be the best defense against these impacts. In addition, implementation of plans such as the Sierra Nevada Forest Plan Amendment, would help protect red-legged frogs by providing more ecosystem-based management of U.S. Forest Service lands.

Although no California red-legged frogs are known to currently exist in Yosemite, protection of aquatic and riparian habitats in Yosemite Valley called for in the *Merced Wild and Scenic River Comprehensive Management Plan* would be beneficial if reintroduction of the species were to occur. Protection and restoration of aquatic and riparian habitats from implementation of the *Yosemite Valley Plan* would cause minor to moderate beneficial impact on California red-legged frog habitat and would enhance the chances of its successful reintroduction. Overall, the impact of these projects considered in combination with the minor, adverse and long-term effects of Alternative A to California red-legged frogs would result in beneficial, long-term, and minor cumulative effects, due to implementation of land management plans that would protect habitat and species conservation plans that would protect the California red-legged frog.

Conclusion

No known populations exist in Yosemite or El Portal. Impact of Alternative A on potential habitat of California red-legged frogs would be adverse, long-term, and minor, due primarily to the continued threat of catastrophic fire and lack of fuel reduction.

Bald Eagle *(Haliaeetus leucocephalus)* - Federal Threatened

Bald eagles are rare and transient in the Yosemite area, and while they have been seen in many areas of the park, they are most frequently seen near large rivers and lakes. Nesting by bald eagles is not known to occur in the park or El Portal. Fish are the primary prey of bald eagles in these areas, and large trees and snags for perching are important habitat components. Bald eagle habitat was identified through wildlife habitat relationships analysis (Mayer and Laudenslayer 1988).

Potential for Impacts from Catastrophic Fire

Analysis of bald eagle habitat in Yosemite reveals that approximately 66% of high-quality eagle habitat has missed more that four median fire return intervals. This means a substantial portion of the park's bald eagle habitat is at risk from catastrophic fire. The relatively slow pace at which this risk would be reduced under Alternative A, through managed wildland and prescribed fire, means

it would continue indefinitely, or grow worse, as areas go unburned. Catastrophic fire would destroy the large trees and snags that are important bald eagle habitat components. Effects of Alternative A regarding catastrophic fire and bald eagles would be moderate, adverse, and long-term.

Fire Management Treatments

Managed Wildland Fire

Approximately half of the high-quality bald eagle habitat in the park is in the Fire Use Unit and would benefit from managed, low-intensity, lightning fires. Fire would help open the forest canopy, making it more navigable by bald eagles. It would also reduce the threat of catastrophic fire, which could destroy the large, old growth trees that are important habitat components. These benefits, however, would be limited by the relatively limited use of wildland fire and the lack of the possibility of re-ignition of suppressed wildland fire under Alternative A. Threat of catastrophic fire in some areas would continue indefinitely. Because of high levels of fuels, managed wildland fires may burn at unnaturally high intensities, which could result in the death of large trees in some areas. This must be weighed against the reduced threat of catastrophic fire that would result from managed wildland fire. Impact of managed wildland fire on bald eagles under Alternative A would be beneficial, long-term, and minor, due to the relative slow rate at which it would be implemented.

Prescribed Fire

Approximately half of the high-quality bald eagle habitat in the park is in the Suppression Unit. This means prescribed fire would be the primary tool for fuel reduction and restoration of natural forest structure in a substantial portion of the park's bald eagle habitat. Habitats in the Suppression Unit are also those that have most severely deviated from the natural fire return interval. Under Alternative A, however, the rate of prescribed fire use would remain relatively low, so the high risk of catastrophic fire would continue indefinitely. The current high levels of fuel accumulation may, in some areas, result in high intensity fires that would result in the death of some large trees. This adverse effect, however, must be weighed against the reduced threat of catastrophic fire over large areas that would result from prescribed fire use. Impact of prescribed fire on bald eagles under Alternative A would be beneficial, long-term, and minor, due to the relatively slow rate at which prescribed fire would be used.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Construction of hand lines could have an adverse effect on bald eagles if large trees or snags were cut in areas used by eagles. This would generally not occur, since the management goals of this plan are to retain old growth forest attributes, and hand lines would avoid, to the greatest extent feasible, these features. Water or retardant drops could have an adverse effect on eagles if a nest were struck or if nesting birds were disturbed by aircraft. However, no eagles currently nest in the park, and any future nests would be identified as a sensitive resource to avoid. Helispots would generally be constructed in open areas away from the tall trees favored by eagles. Snagging would have an adverse effect on eagles if important perching or roosting snags were cut. However, snags would only be cut if they presented a threat to life and safety, were a threat to the control of wildland fire, or represented a hazard to property or park resources. Some snags would be lost in fires, but new snags would be created from fire mortality of trees.

Overall, impact of fire management actions under Alternative A would be adverse, short-term, and negligible, since the relatively low level of application of wildland and prescribed fires in this alternative would limit potential effects.

Fuel Reduction by Hand or Machine

Aggressive Reduction Techniques. These treatments would not be used under Alternative A.

Passive Reduction or Lower Profile Techniques.

Hand Cutting. Hand cutting would have a negligible effect on bald eagles, since it would generally occur near developed areas that bald eagles avoid. Bald eagles are occasionally seen along the Merced River in Yosemite Valley and El Portal, but current management direction to protect riparian areas and other river-related resources would limit adverse effects from hand thinning. Hand thinning would have a negligible, adverse, short-term effect on bald eagles.

Pile Burning. Pile burning would have no effect on bald eagles

Cumulative Impacts

Bald eagles are recovering from a population crash that was caused by habitat destruction and pesticide contamination—they are reoccupying many places in the Sierra Nevada. The construction of numerous reservoirs on Sierra Nevada rivers have created large bodies of water suitable for bald eagles, but they have also interrupted the runs of anadromous fishes that eagles might feed on. Implementation of the Sierra Nevada Forest Plan Amendment/FEIS would benefit bald eagles by preserving old growth forests over broad areas of U.S. Forest Service land surrounding Yosemite. Implementation of the *Merced Wild and Scenic River Comprehensive Management Plan/FEIS* (NPS) would help protect riparian habitats.

The overall cumulative impact on bald eagles, considered in combination with the moderate, adverse, and long-term effects of Alternative A, would be beneficial, long-term, and minor, based on the continuing recovery of the species and implementation of broad-ranging plans that would benefit the species.

Conclusion

Alternative A would have a moderate, adverse, long-term effect on bald eagles, primarily from the continued threat of catastrophic fire, that could destroy the large trees and snags that are important habitat components.

Mountain Yellow-Legged Frog *(Rana muscosa*) - Under Review for Federal Listing

Precipitous declines in mountain yellow-legged frog populations have resulted in their disappearance from between 70% and 90% of their historical range in the Sierra Nevada (Jennings 1996). This includes Yosemite National Park, where mountain yellow-legged frogs have disappeared from over 80% of their former range (Fellers 1997). The most apparent cause for this decline is the introduction of non-native fishes that prey on the frogs and their larvae (Kapp and Matthews 2000). Other possible factors include disease and environmental toxins. Mountain yellow-legged frog habitat was identified through wildlife habitat relationships analysis (Mayer and Laudenslayer 1988).

Potential for Impacts from Catastrophic Fire

Mountain yellow-legged frogs would be little affected by catastrophic fire in Yosemite because the lake, pond, and wetland habitats where mountain yellow-legged frogs are found, are not flammable. Over 90% of mountain yellow-legged frog habitat is within a natural fire regime. Severe fire would potentially result in sediments entering these habitats, but such fires are not likely over most of the frog's range. Impact on mountain yellow-legged frogs under Alternative A

would be adverse, short-term, and negligible, primarily due to possible increase in sediments in aquatic habitats resulting from catastrophic fire.

Fire Management Treatments

Managed Wildland Fire

Over 98% of high-quality mountain yellow-legged frog habitat occurs in the Fire Use Unit, mainly in areas that have not suffered from fire exclusion. Managed wildland fire would have little effect on mountain yellow-legged frogs, other than maintaining the natural fire regime. Although use of wildland fire would be limited under Alternative A, some benefit to mountain yellow-legged frogs would be derived from reducing the risk of catastrophic fire in the small part of its habitat that has missed fire return intervals. Impact of managed wildland fire on mountain yellow-legged frogs under Alternative A would be beneficial, long-term, and negligible.

Prescribed Fire

With only 2% of mountain yellow-legged frog habitat occurring in the Fire Suppression Unit, and so little of its habitat in need of burning, prescribed fire would have a negligible effect on the species. Although use of prescribed fire would be limited under Alternative A, some benefit to mountain yellow-legged frogs would be derived from reducing the risk of catastrophic fire in the unit. Impact of prescribed fire on mountain yellow-legged frogs under Alternative A would be beneficial, long-term, and negligible.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Water dipping and water drops could have an adverse effect on mountain yellow-legged frogs in several ways. Non-native fish, which are already present in many park waters, could be transferred into waters containing frogs. Remnant populations of frogs composed of small numbers of individuals could be impacted if frogs or larvae were removed. Finally, infection by a Chytrid fungus has been identified as a possible factor in the decline of mountain yellow-legged frogs. Water buckets could transfer this disease from an infected population of frogs to a healthy population. The limited use of wildland fire and prescribed fire in mountain yellow-legged habitat limits the possibility of these events, and effects would be mitigated by avoiding dipping from waters containing mountain yellow-legged frogs, bullfrogs, or non-native fish (see Appendix 3).

Retardant drops could adversely affect mountain yellow-legged frogs through contamination of their aquatic habitat. Protocols for retardant use in Yosemite restrict its use within 300 feet of water and on bare rock, which limit the chances of the chemicals reaching water. These restrictions, coupled with the low probability of having prescribed and managed wildland fire in mountain yellow-legged frog habitat, would limit impact on the species.

Helispots, spike camps, and hand lines would have limited use in mountain yellow-legged frog habitat—they would be sited away from such sensitive habitats. Overall impact of prescribed and wildland fire management actions on mountain yellow-legged frogs under Alternative A would be adverse, long-term, and negligible, due to the risk to frog populations from water drops.
Mitigation: Comply with established protocols to protect resources, identify locations of sensitive resources to avoid impacts, use MIMT.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. No populations of mountain yellow-legged frogs are known to occur in areas where hand-cutting would be applied. Therefore, this action, along with pile burning, would have no effect on mountain yellow-legged frogs.

Cumulative Impacts

Two regional plans for adjacent U.S. Forest Service land could affect mountain yellow-legged frogs. The Sierra Nevada Forest Plan Amendment/FEIS and the Management Direction for the Ansel Adams, John Muir, and Dinkey Lakes Wilderness Revised Draft Environmental Impact Statement. The implementation of the former document would prohibit pesticide and herbicide application within 500 feet of known mountain yellow-legged frog sites, remove exotic fish from some sites, and prohibit livestock grazing in breeding sites. These measures would improve conditions for mountain yellow-legged frogs. Implementation of the latter document would reduce recreational impacts on mountain yellow-legged frogs and prohibit grazing in moist environments. In addition, a mountain yellow-legged frog conservation plan for the Sierra Nevada is being written (USFS), and a restoration program is underway in Sequoia and Kings Canyon National Parks (NPS).

Update of Yosemite's *Wilderness Management Plan*, and the *Merced Wild and Scenic River Comprehensive Management Plan* would beneficially affect mountain yellow-legged frogs by helping to reduce current impacts on the species related to human uses of habitat areas.

Fish stocking, acid rain, snowmelt, ultraviolet radiation, disease, and pesticide drift from agricultural areas could all be factors contributing to the decline of mountain yellow-legged frogs, and all are likely to continue.

The resulting impacts of these present and reasonably foreseeable future projects on mountain yellow-legged frogs would be beneficial, long-term, and moderate, because of active efforts to protect and restore the species, and the implementation of land management plans that would provide more ecosystem-based management. In combination with the effects of Alternative A, cumulative impacts would be beneficial, long-term, and moderate.

Conclusion

Impact to mountain yellow-legged frogs from Alternative A would be beneficial, long-term, and negligible due primarily to the return of the natural fire regime to the small area of habitat that has departed from a natural fire return interval.

Yosemite Toad (*Bufo canorus*) - Under Review for Federal Listing

The Yosemite toad is a high-elevation species found in the central Sierra between 8,000 and 10,000 feet. Suitable habitat for breeding includes open wet meadows, ponds, and lake margins, surrounded by lodgepole or whitebark pine forests. The toads find cover in thick meadow grass, low-lying willows, or other vegetation, as well as rodent burrows and damp logs and stones (Sherman and Morton 1984, 1993; Karlstrom 1962). Throughout its range, the Yosemite toad has experienced recent steep population declines and has disappeared from over 50% of historic sites (Jennings 1996). Surveys conducted in the park in 1999 found Yosemite toads in 14 sites, which reflected a modest recovery. Possible causes for the decline of Yosemite toads include livestock grazing, drought, chemical toxins, and increases in UV radiation. Non-native fish may also be a contributing factor. Yosemite toad habitat was identified through wildlife habitat relationships analysis (Mayer and Laudenslayer 1988).

Potential for Impacts from Catastrophic Fire

There is little potential for catastrophic fire affecting Yosemite toads or their habitat. Most of the lodgepole and whitebark pine forests that surround the meadows and pond habitat are within their natural fire regime as is 67% of suitable habitat and 79% of high-quality habitat. This, coupled with the preference of the species for moist habitats, makes it unlikely that catastrophic fire would have an appreciable effect on Yosemite toads. Conceivably, fires adjacent to occupied habitat could have an adverse effect if sedimentation increased, but such effects have not been demonstrated. Regarding effects of catastrophic fire, impact on Yosemite toads under Alternative A would be adverse, short-term, and negligible.

Fire Management Treatments

Managed Wildland Fire

Over 95% of Yosemite toad habitat is in the Fire Use Unit, but over 67% of this habitat has not deviated from median fire return interval. Managed wildland fire would have little effect on Yosemite toads, other than helping to maintain the natural fire regime. Although use of wildland fire would be limited under Alternative A, some benefit to Yosemite toads would be derived from reduction in the risk of catastrophic fire in the small proportion of habitat that has deviated from the natural fire return interval. Impact of managed wildland fire on Yosemite toads under Alternative A would be beneficial, long-term, and negligible.

Prescribed Fire

Only 5% of Yosemite toad habitat is in the Fire Suppression Unit and little of it is in need of burning. Prescribed fire would have a negligible effect on Yosemite toads, other than helping to maintain the natural fire regime. Although use of prescribed fire would be limited under Alternative A, some benefit to Yosemite toads would be derived from reduction in the risk of catastrophic fire in the small proportion of habitat out of natural fire return interval. Impact of prescribed fire on Yosemite toads under Alternative A would be beneficial, long-term, and negligible.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Water drops could have an adverse effect on the Yosemite toad in several ways. Non-native fish could be transferred into waters containing toads. Remnant populations of toads composed of small numbers of individuals could be affected if frogs or larvae were removed, although their usual breeding habitat (shallow wetlands and ponds) is usually too shallow for dipping. Finally, infections of a Chytrid fungus has been identified as a possible factor in the decline of amphibians. Water buckets could transfer this disease from an infected population to a healthy population. The source of such an infection could be mountain yellow-legged frogs that inhabit ponds and lakes that are deep enough to dip water out of. The limited use of wildland fire and prescribed fire in Yosemite toad habitat would limit the possibility of these events, but waters containing Yosemite toads and mountain yellow-legged frogs must be avoided as water sources for water drops.

Retardant drops could adversely affect Yosemite toads through contamination of their aquatic habitat. Protocols for retardant use in Yosemite restrict its use within 300 feet of water and on bare rock, which limits the chances of the chemicals reaching water. Some of the less conspicuous habitat of Yosemite toads (i.e., wet meadows) may be accidentally exposed to retardant. Restrictions, coupled with the low incidence of prescribed and managed wildland fire in Yosemite toad habitat, would limit impact on the species.

Helispots, spike camps, and hand lines would have limited use in Yosemite toad habitat, and would be sited away from such sensitive habitats.

Snagging and mop-up operations would have limited, if any, application in Yosemite toad habitat, and would be unlikely to have any impact on the species.

Overall impact of prescribed and wildland fire management actions on toads under Alternative A would be adverse, long-term, and negligible, due primarily to the risk to remaining populations from water drops and retardant contamination. Mitigation: Identify locations of Yosemite toad and mountain yellow-legged frog populations and avoid these areas when dipping water or making water or retardant drops.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Hand thinning would have no direct effect on Yosemite toads, since it would occur in forest habitats. The reduction of fuels would help prevent catastrophic fire, although such fires would be of little threat to Yosemite toads. Impact of hand cutting on Yosemite toads would be beneficial, long-term, and negligible.

Cumulative Impacts

The Sierra Nevada Forest Plan Amendment/FEIS and the Management Direction for the Ansel Adams, John Muir, and Dinkey Lakes Wilderness Revised Draft Environmental Impact Statement could affect Yosemite toads. The implementation of the former document would prohibit pesticide and herbicide application within 500 feet of known Yosemite toad habitat, remove exotic fish from some sites, and prohibit livestock grazing in breeding sites. These actions would improve conditions for mountain Yosemite toads. Implementation of the latter document would reduce recreational impacts on toads and prohibit grazing in moist environments.

Fish stocking, acid rain and snow, ultraviolet radiation, disease, and pesticide drift from agricultural areas could all be contributing to the decline of mountain yellow-legged frogs—these actions would be likely to continue.

The impacts of present and reasonably foreseeable projects on Yosemite toad would be beneficial, long-term, and moderate, based primarily on active efforts to protect and restore the species, and the implementation of land management plans that would provide more ecosystem-based habitat management. Considered in combination with the impacts of Alternative A, cumulative impacts would be beneficial, long-term, and moderate.

Conclusion

Impact to Yosemite toads from Alternative A would be beneficial, long-term, and negligible due primarily to the return of a natural fire regime to the small area of habitat that has departed from a natural fire return interval.

California Spotted Owl *(Strix occidentalis occidentalis)* - Under Review for Federal Listing

California spotted owls are found throughout the Sierra Nevada, from lower elevation oak and ponderosa pine forests up to 7,600 feet elevation red fir forests. Forested areas with greater that 70% canopy closure are potential spotted owl nesting and roosting while areas with greater than 40% canopy closure provide foraging. Old growth forests provide the best habitat. There are approximately 100 known and probable spotted owl sites in Yosemite National Park

(Weatherspoon et al. 1992). Comparison of the two most recent studies of spotted owls in Yosemite (Gould and Norton 1993; Steger 2000) suggests that the population of spotted owls in the park is relatively stable (Thompson 2000). The number of California spotted owls in the Sierra Nevada has declined steadily, prompting the current review by U.S. Fish and Wildlife Service for possible listing of the species. Likely cause for this decline is habitat destruction and fragmentation from logging and development. Severe wildland fire in mixed-conifer forests may represent the greatest threat to existing spotted owl habitat in Yosemite (Weatherspoon et al. 1992). California spotted owl habitat was identified through wildlife habitat relationships analysis (Mayer and Laudenslayer 1988).

Potential for Impacts from Catastrophic Fire

Under a natural fire regime, much of the spotted owl habitat in the Sierra was subject to frequent, low-intensity fires. Under existing conditions, approximately 49% of high-quality spotted owl habitat has missed over four median fire return intervals. About 54% of high-quality spotted owl habitat occurs in the Suppression Unit, where the greatest threat of catastrophic fire exists. High fuel loadings make it likely that large, stand-replacing fires would occur, which would destroy spotted owl habitat by reducing the canopy closure. In addition, the growth of dense understory vegetation may affect foraging habitat quality. Under Alternative A, the current relatively slow rate of forest fuel accumulations would result in the destruction of spotted owl habitat through catastrophic fires and prolong the degradation of habitat by allowing thick understory vegetation to remain. Impact of to California spotted owls would be adverse, long-term, and major.

Fire Management Treatments

Managed Wildland Fire

With approximately 47% of high-quality California spotted owl habitat occurring in the Fire Use Unit, the use of wildland fire can be an important tool in protecting and improving spotted owl habitat in the park, by helping to maintain the natural fire regime. Spotted owls can coexist with extensive fires of varying intensities within their habitats (Weatherspoon et al. 1992). Such a tool, however, must be carefully applied. Lightning fires are somewhat random events; they give little chance to prepare an area to protect resources and maximize fire benefit. Because of the existing high level of fuel loading in many areas, even fires that are burning within prescription are likely to burn small areas at intensities high enough to have an adverse effect on some spotted owls. This impact, however, must be weighed against the risk of catastrophic fire if an emphasis on fire suppression were to continue in much of the park. In the old growth stands favored by spotted owls, the dense canopies maintain a higher relative humidity, which reduces heating and drying of surface fuels—thus reducing flammability. Adverse effects from wildland fire would be minimized if fuel loads were reduced in and near spotted owl nesting and roosting areas. This could be done by application of spring prescribed fires that would disrupt fuel continuity and reduce the potential for stand-replacing fires (Weatherspoon et al. 1992).

Under Alternative A, use of wildland fire would be limited which would limit benefits to California spotted owls. The threat of catastrophic fire would remain a large threat to the species in some areas. The effect of managed wildland fire on California spotted owls would be beneficial, long-term, and minor, based on the likely mitigation of the threat of catastrophic fire, limited though it would be under this alternative.

Prescribed Fire

Prescribed fire provides the greatest potential for targeted treatment of forest habitats, with a focus on protecting spotted owls and improving their habitat. Fifty-four percent of high-quality spotted owl habitat exists in the Suppression Unit, where prescribed fire would be most heavily used, and

where areas have deviated most severely from the natural fire return interval. Adverse impacts on spotted owl territories located prior to ignition of a prescribed fire would be minimized through preparatory burns and mechanical fuel reduction in nesting and roosting habitat to control fire intensity in these immediate areas. Prescribed fire must also take into account other important habitat components, such as large, down, woody debris that provide a substrate for hypogeous fungi, which are an important food source for northern flying squirrels, an important prey of spotted owls (Verner et al. 1992). Fires of an intensity that would reduce the amount of large, woody debris would have an adverse effect on spotted owls.

Currently, no program elements exist for identification of spotted owl locations, or for the management of prescribed fires for the benefit of spotted owls. The use of prescribed fire under Alternative A, would, nonetheless, have a beneficial, long-term, and minor impact on California spotted owls, primarily through reduction in the threat of catastrophic fire in some areas.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Water and retardant drops would have an adverse effect on spotted owls if they occurred over nesting habitat and, especially, nests. Such events have a low probability of occurring, but would be mitigated if nest sites and probable nesting habitat could be avoided. Helispots and spike camps would potentially have an adverse effect on spotted owls if they were located close to nesting or roosting areas and the level of disturbance were high. Hand-line, if constructed through a spotted owl nesting or roosting area, would potentially cause adverse effects from disturbance and habitat alteration, especially if trees were felled. Snags are often used by spotted owls as nest sites (Verner et al. 1992). As such, snagging operations to protect human safety and the integrity of fire lines would potentially have an adverse effect on spotted owls.

Overall, actions taken to manage wildland and prescribed fire would have a minor adverse effect on spotted owls through possible disturbance and habitat alteration in roosting and nesting sites. Such impacts could be mitigated by locating all spotted owl sites and avoiding impacts to them.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Under Alternative A, hand thinning in the vicinity of development and roads could have an adverse effect on spotted owls if canopy closure were reduced enough to degrade. This is especially true where developed areas interface with dense forest that provides roosting and nesting habitat. Under Alternative A, cutting large trees would be limited because techniques would be confined to hand thinning and then piling and burning. In some areas, clearing understory vegetation could, in fact, improve foraging conditions for spotted owls. Under Alternative A, the impact on California spotted owls of hand thinning and burning would be beneficial, long-term, and negligible because of the possible return of treated areas to a more natural forest structure.

Chipping. Chipping has only been used occasionally in this alternative. Chipping cut material and then distributing it over a site could occur where air quality, visitor use, or other management concerns prohibit burning. The equipment used to chip material is extremely loud and, if operated nearby, may disturb spotted owls. Such impact, however, would be adverse, short-term, and negligible.

Cumulative Impacts

Past activities that have impacted spotted owls and their habitat include timber harvest, development and fire suppression activities. Their effects have been moderate to major, adverse and long-term. Present and reasonably foreseeable future projects would include:

Yosemite Valley Plan/SEIS (NPS 2000c): Implementation of the preferred alternative would restore highly-valued habitats in Yosemite Valley and decrease the fragmentation of these habitats. This would help restore foraging habitat for spotted owls in Yosemite Valley. The construction of facilities outside of Yosemite Valley would cause localized destruction of forest habitat, but the overall impact would be negligible to beneficial, long-term, and minor.

Merced Wild and Scenic River Comprehensive Management Plan/EIS (2000a): Implementation of the preferred alternative would help protect river-related wildlife habitat and species. This would be especially true in Yosemite Valley, where past development has encroached on river habitats. The *Merced Wild and Scenic River Comprehensive Management Plan* would provide the framework for reducing present development and limiting future development in these areas, with moderate, beneficial, long-term impacts on spotted owls.

Yosemite West Re-Zoning: This project would likely lead to an increase in the Yosemite West wildland/urban interface, requiring intensive management of vegetation and fuels over a wider area. This would have an adverse effect on spotted owls because an additional 55 acres would be developed in mixed conifer habitat near the park boundary. Impact on spotted owls would be moderate, adverse, and long-term.

Yosemite West, 31 Acre Bed and Breakfast: Like the above project, this project would have an adverse effect on spotted owls in the park, by further reducing mixed conifer habitat near the park boundary. No effect on wildland/urban interface treatment in the park is expected, since the affected property abuts USFS land. Impact on spotted owls would be moderate, adverse, and long-term.

Hazel Green Ranch: Development at this location adjacent to the park would affect an area of mixed conifer and meadow habitat. Impact on spotted owls would be adverse, long-term, and minor, due to likely consideration by the developer for preservation of sensitive habitats.

Evergreen Lodge Expansion: This development would affect an area of mixed conifer habitat near the park. Effect on spotted owls would be adverse, long-term, and minor.

Rush Creek Guest Lodging and Conference Facilities: This project would affect an area of mixed conifer habitat. Effect on spotted owls is expected to be adverse, long-term, and minor.

A-Rock Reforestation (USFS): This project would hasten the return of the area burned in the 1990 fire to a forested habitat of 5,000 acres. This would eventually benefit forest-dependent species such as spotted owls. Overall impact would be beneficial, long-term, and minor.

Aspen Fuels Reduction (USFS): This project would enhance habitat quality for spotted owls over a 500-acre area near the park. This would have beneficial, long-term, and minor effects.

Fire Management Plan for Wilderness (USFS): This plan would provide beneficial, long-term, and moderate impact on spotted owls by allowing naturally-ignited fires that say in prescription to cross boundaries between the park and the national forests. This could result in larger areas of habitat benefiting from fire, resulting in beneficial, long-term, and minor impacts.

Orange Crush Fuels Program (USFS): This project would manage fuels through prescribed burning. This would have a beneficial, long-term, and minor effect on spotted owls by working toward the return of a natural fire cycle for the area, and reduce the chance of catastrophic fire, which could carry into the park.

Rogge-Ackerson Fire Restoration (USFS): This would eventually benefit forest-dependent species such as spotted owls. Overall impact would be beneficial, long-term, and minor.

Sierra Nevada Forest Plan Amendment: Implementation of this plan would have a moderate, beneficial, long-term effect on spotted owls by leading to more ecosystem-based management of National Forests in the Sierra Nevada.

The resulting impacts from present, and reasonably foreseeable future projects on park spotted owls and their habitat would be beneficial, long-term, and minor, because some projects with a beneficial impact would affect large areas of habitat in the central Sierra Nevada. The Sierra Nevada Forest Plan Amendment would affect virtually all national forest land around the park by enabling more ecosystem-based management. Implementation of the *Yosemite Valley Plan* and the *Merced Wild and Scenic River Comprehensive Management Plan* would benefit high-value habitats, primarily in Yosemite Valley. The *Yosemite Fire Management Plan* under Alternative A would, however, have major, adverse, and long-term impacts associated with habitats continuing to be affected by fire suppression and continued risk of catastrophic fire in some areas. Other foreseeable projects with adverse impacts would affect small areas and/or have minor effects over larger areas. Effects in Yosemite would likely offset benefits realized elsewhere, and the cumulative impact would be adverse, long-term, and negligible.

Conclusion

Alternative A would have major, adverse, long-term impact on spotted owls from the prolonged threat of catastrophic fire that would occur at the current, relatively slow rate of treatment of accumulated fuels.

Pacific Fisher *(Martes pennanti)* - Under Review for Federal Listing

Fishers are among the most habitat-specific mammals in North America, living in landscape mosaics of conifer-dominated forest stands, and avoiding open areas that have no overstory or shrub cover (Buskirk and Powell 1994). Late successional mid- to low-elevation coniferous or mixed forests provide the most suitable habitat because they provide abundant potential den sites and prey (Allen 1987). The presence of large deciduous trees, such as oaks, also appears to be important. Forest type, however, is probably not as important to fishers as structural characteristics, such as dense canopies, and large trees, snags, and down logs. Riparian areas are also important (Seglund 1995). Fishers are apparently present in Yosemite in extremely low numbers (Chow unpublished data) and may be extirpated from much of their historical range in Washington, Oregon, and California (Aubry and Raqley 1999, Carroll et al. 1999, Zielinski et al. 1996). Trapping at the end of the 19th century severely reduced the number of fishers, but the reasons for the lack of recovery in the species in the absence of trapping are unclear. Factors may include loss of suitable habitat from logging and fire suppression, fragmentation of habitat, and disturbance and mortality from roads.

Potential for Impacts from Catastrophic Fire

Catastrophic fire has the potential for severely altering fisher habitat by reducing canopy closure and forest floor features that are important components of suitable fisher habitat. In the park, 35%

of all potential fisher habitat, and 32% of high-quality fisher habitat has missed more than four fire return intervals. This indicates that catastrophic fire would potentially have a substantial effect on fishers. Studies, observations, and roadkills of fishers in Yosemite indicate that the highest density of Pacific fishers in the park are found south of Yosemite Valley; especially along the Wawona Road and Glacier Point Road corridors. Much the area along Wawona Road has greater that four missed fire return intervals (map 1-3), making it among the areas highest at risk of catastrophic fire. As such, catastrophic fire in Yosemite has a high potential for adverse impacts on fishers.

Under Alternative A, actions to reduce fuel loading would proceed at a relatively slow pace, resulting in more catastrophic fires in fisher habitat and resultant adverse effects on fishers. Regarding catastrophic fire, the impact of Alternative A on fishers would be adverse, long-term, and major.

Fire Management Treatments

Managed Wildland Fire

Seventy-seven percent of all fisher habitat and 69% of high-quality habitat in the park occurs in the Fire Use Unit. Managed wildland fire, therefore, has the potential for achieving and maintaining reduced fuel loading and natural forest structure, as a benefit to fishers. Existing high levels of fuel loading in some areas, however, indicate that fire intensity may be great in some areas, reducing the large, woody debris, and large snags that are important habitat components. Also, over the short-term, short-term, shrub cover would be reduced. Overall, wildland fire would be beneficial to fishers. However, under Alternative A, wildland fire would be used at a relatively slow rate, and catastrophic fires are likely to occur. Under Alternative A, managed wildland fire would have a beneficial, long-term, and minor effect on fishers.

Prescribed Fire

Because prescribed fires can be targeted on habitats that are at the greatest risk of catastrophic fire, and are the most severely altered by a history of fire suppression, it has the potential for great resource benefit. This is especially true for fishers, because the area of the park believed to support the highest density of this species is in the Suppression Unit, and is among the most severely deviated from a natural fire return interval.

High fuel loading in some areas would potentially result in prescribed fires of high enough intensity to consume large woody debris, which is an important component of fisher habitat. Also, large snags, that are of high value to fishers, would potentially be consumed. Prescribed fires conducted with a concern for fishers should minimize these losses. On balance, reduction in the risk of catastrophic fire would yield the greatest, long-term benefit to fishers, but fire prescriptions should strive to conserve habitat elements that are important to fishers (e.g., large trees, snags, and large woody debris). The benefit of prescribed fire under Alternative A would be limited by the relatively slow rate of its use. Catastrophic fires would likely occur over time. Impact to fisher under Alternative A would be beneficial, long-term, and minor, based upon a modest reduction in the threat of catastrophic fire in some areas.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Water and retardant drops should have no effect on fishers, unless they were struck, which would be highly unlikely. Some short-term disturbance would occur from overflights. Hand line construction could have a localized, adverse effect on fishers through direct disturbance, and alteration of habitat. Such effects, however, would be limited in area and short-term. Helispot and spike camps could have an adverse effect if they were located near a fisher den, but, without

knowledge of every den site, this impact would be difficult to avoid. Snagging could have an adverse effect on fishers by removing an important habitat component, because snags are often used as den sites. Snags should only be cut when they present a clear threat to human safety or the integrity of a fire line. Prescribed and wildland fire would create new snags through the killing of trees, but most of these would be relatively small snags, and it would take time for the dead trees to become suitable snags through decay.

In total, actions taken to manage wildland and prescribed fire would a potential to have a minor, adverse, long-term effect on fishers, primarily due to possible reduction in the number of snags.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Reduction in fuel loading and stand density by hand thinning could adversely affect fishers by reducing understory vegetation and habitat complexity. These effects would, however, be balanced against the accompanying reduction of the threat of catastrophic fire from fuel reduction. Hand crews would also cause some short-term disturbance while on site. Hand thinning under Alternative A would be adverse, long-term, and negligible.

Chipping. The noise of chipping machines would cause short-term disturbance near developed areas. Chips spread too thickly could suppress understory vegetation, which could have an adverse effect on fishers, but the areas where this technique would be used are already marginal habitat for fishers due to existing levels of human disturbance and habitat fragmentation. Chipping under Alternative A would have a negligible, adverse, short-term effect on fishers.

Cumulative Impacts

Past and present actions that have affected fishers have included development, timber harvest and fire suppression. Their effects have been major, adverse and long-term. Reasonably foreseeable future actions that would affect fishers would include:

Yosemite Valley Plan/SEIS (2000c): Implementation of the preferred alternative would restore highly-valued habitats in Yosemite Valley and decrease the fragmentation of these habitats. The construction of facilities outside of Yosemite Valley, however, would cause localized destruction of forests, some of which are known fisher habitat. These impacts would be adverse, long-term, and minor.

Merced Wild and Scenic River Comprehensive Management Plan/EIS (2000): Implementation of the preferred alternative would help protect river-related wildlife habitat and species. This is especially true in Yosemite Valley, where past development has encroached on river habitats. The *Merced Wild and Scenic River Comprehensive Management Plan* would provide the framework for reducing present development and limiting future development in these areas, with moderate, beneficial, long-term effects on fishers.

Yosemite West Re-Zoning: This project would likely lead to an increase in the Yosemite West wildland/urban interface area, requiring intensive management of vegetation and fuels over a wider area. This would have an adverse effect on fishers because an additional 55 acres would be developed in mixed conifer habitat near the park boundary, in an area of known fisher occurrence. Impact on fishers is expected to be adverse, long-term, and moderate.

Yosemite West, 31 Acre Bed and Breakfast: Like the above project, this project would have an adverse effect on fishers in the park, by further reducing mixed conifer habitat near the park boundary. No effect on wildland/urban interface treatment in the park is expected, since the

affected property abuts U.S Forest Service land. Impact on fishers is expected to be adverse, long-term, and moderate.

Hazel Green Ranch: Development in this area adjacent to the park would affect an area of mixed conifer and meadow habitat. Impact on fishers is expected to be adverse, long-term, and minor, if consideration is give by the developer for preservation of sensitive habitats. However, there is some uncertainty about the future of this property.

Evergreen Lodge Expansion: This development would affect an area of mixed conifer habitat near the park. Effect on fishers is expected to be adverse, long-term, and minor.

Rush Creek Guest Lodging and Conference Facilities: This project would affect an area of mixed conifer habitat. Effect on fishers is expected to be adverse, long-term, and minor.

A-Rock Reforestation (USFS): This project would hasten the return of the area burned in the 1990 fire to a forested habitat in 5,000 acres. This would eventually benefit forest-dependent species such as fishers. Overall impact is expected to be beneficial, long-term, and minor.

Aspen Fuels Reduction (USFS): This project would enhance habitat quality for spotted owls over a 500 acre area near the park. Such improvement is also likely to benefit fishers. This would have a beneficial, long-term, and minor impact.

Fire Management Plan for Wilderness (USFS): This plan would benefit fishers by allowing naturally-ignited fires that stay in prescription to cross boundaries between the park and Forest Service lands. This could result in wider areas of habitat benefiting from habitat improvement from fire, resulting in beneficial, long-term, and minor impacts.

Orange Crush Fuels Program (USFS): This project would manage fuels through prescribed burning. This would have a beneficial, long-term, and minor effect on fishers by working toward the return of a natural fire regime for the area, and reduce the chance of catastrophic fire, which could carry into the park.

Rogge-Ackerson Fire Restoration (USFS): This would eventually benefit forest-dependent species such as fishers. Overall impact is expected to be beneficial, long-term, and minor.

Sierra Nevada Forest Plan Amendment: Implementation of this plan would have a moderate, beneficial, long-term effect on fishers by leading to more ecosystem-based management of National Forests in the Sierra Nevada.

The resulting impacts on Pacific fishers and their habitat would be moderate, beneficial, and long-term, because some foreseeable projects would benefit large areas of habitat in the central Sierra Nevada. The Sierra Nevada Forest Plan Amendment would affect virtually all U.S. Forest Service land around the park by enabling more ecosystem-based management. Implementation of the *Yosemite Valley Plan* and the *Merced Wild and Scenic River Comprehensive Management Plan* would beneficially affect high-value habitats, primarily in Yosemite Valley. The *Yosemite Fire Management Plan* under Alternative A would, however, have adverse impacts associated with habitats continuing to be affected by a history of fire suppression, and the continued risk of catastrophic fire in some areas. Other foreseeable projects with adverse impacts would affect small areas and/or have minor effects over larger areas. Benefits yielded elsewhere would likely be offset by effects of catastrophic fire in Yosemite. Considered in combination with the impacts of Alternative A, the cumulative impact would be beneficial, long-term, negligible.

Conclusion

Overall, Alternative A would have a major, adverse, long-term effect on fishers by allowing the threat of catastrophic fire to continue indefinitely, especially in the southwest part of the park where fisher densities are believed to be highest and fuel loading has reached critical levels.

Great Gray Owl *(Strix nebulosa)* – California Endangered

The Sierra Nevada population of great gray owls marks the most southerly extent of the species in the world, and the center of abundance of this population is in Yosemite National Park. Surveys in Yosemite National Park and adjacent national forests estimate the California population of great gray owls at 100 to 200 birds (Winter 1986). Breeding habitat occurs in pine and fir forests near montane meadows between approximately 2,460 and 7,380 feet in elevation (Winter 1980). In California, nearly all reported great gray owls nests have been in the tops of large-diameter broken snags that are within several hundred feet of a meadow, where most foraging takes place. High snag densities may be critical for nesting habitat, because not all snags form top depressions suitable for nests. Great gray owls descend to elevations as low as 2,000 feet during the winter. The small size of the California population of great gray owls may be due to habitat degradation from logging and grazing.

Potential for Impacts from Catastrophic Fire

Approximately 35% of all great gray owl habitat, and 19% of high-quality great gray owl habitat has missed more than four median fire intervals. This means, overall, catastrophic fire has the potential for substantial effects on the park population of great gray owls. Shading is an important factor in nest site selection and nesting success because here, at the furthest southern extent of the owl's range, overheating of incubating adults and nestlings can occur (Reid 1989). In a catastrophic fire, nesting snags could be destroyed and trees shading any surviving snags could be sparse. Snags would be created in a fire but they may not be suitable without shade, and long-term recruitment of snags would be reduced because there would be fewer living trees.

At lower elevations, on wintering areas, catastrophic fire would have little effect on great gray owls. The A-Rock fire that burned over Foresta in 1990 has had no detectable effect on the use of Big Meadow by wintering great gray owls, and may have actually opened up more foraging habitat.

The threat of catastrophic fire would be greatest under Alternative A, because the rate at which treatment of accumulated fuels and altered habitats would occur is relatively slow. Some areas would continue to deviate further from natural conditions and catastrophic fires would likely occur in time. The impact of Alternative A would be adverse, long-term, and minor, given the relatively small amount of great gray owl habitat that is at risk, the slow rate of treatment would expose more areas to risk of high-intensity fires.

Fire Management Treatments

Managed Wildland Fire

Approximately two-thirds of all great gray owl habitat and 80% of high-quality habitat occurs in the Fire Use Unit. As such, managed wildland fire has potential to affect great gray owl habitat quality, but a majority of the habitat in this unit is at or close to a natural maximum fire return interval, especially in higher-elevation breeding areas. Almost a quarter of all habitat has missed at least one fire return interval.

Lightning fires are somewhat random events and there would be little chance to protect owl habitat. Even fires that are burning within prescription are likely, in places, to burn at intensities

high enough to have an adverse effect on some great gray owls, due to the high fuel loading in some areas. Some nesting snags may be consumed. This impact must be weighed against the increased risk of catastrophic fire, if the emphasis on fire suppression were to continue in the Fire Use Unit. Some meadows, especially at lower elevations, are shrinking in size due to conifer encroachment, without fire, this would eventually have an adverse effect on great gray owls.

Benefit to great gray owls of managed wildland fire would be limited by its slow rate of use under Alternative A. Catastrophic fire would continue to be a threat to some areas. The effect of managed wildland fire on great gray owls under Alternative A would be beneficial, long-term, and minor, because of the small acreage of great gray owl habitat that has deviated from the maximum fire return interval and the limited amount of this habitat that would be treated with wildland fire under Alternative A.

Prescribed Fire

Although only about one-third of all great gray owl habitat occurs in the Fire Suppression Unit, these are the areas furthest from the natural fire regime (map 1-3), and, therefore, stand to benefit the most from prescribed fire. In some areas, high levels of fuel may result in high-intensity fires that would potentially consume nesting snags and other habitat components important to great gray owls. These threats, however, should be weighed against the continued risk of catastrophic fire to great gray owls. Under Alternative A, use of prescribed fire would be limited and the risk of catastrophic fire would continue in some areas. Surveys would be conducted to locate and protect active nest sites. Impact of prescribed fire on great gray owls under Alternative A would be beneficial, long-term, and minor, based upon the improvement of habitat and the reduction in the threat of catastrophic fire that would occur.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Water and retardant drops would have an adverse effect on great gray owls if owls or nest sites were struck. The chances of this are small, especially if nest sites can be located prior to the use of water or retardant drops. Helispots and spike camps would have an adverse effect on great gray owls if they were located near nest sites. Such effects, however, would be short-term. Hand lines would adversely affect great gray owls if they were constructed near nest sites, where ongoing human disturbance could affect nesting success. These impacts could be minimized if nest sites could be located prior to line construction. Snagging would have an adverse effect on great gray owls through reduction in the number of snags available for nest sites. Impact would be greater if active nest snags were removed. Mop-up would not have an adverse effect on great gray owls unless it entailed snag removal.

Overall, actions taken to manage wildland and prescribed fires would have a negligible, adverse, long-term effect on great gray owls under Alternative A. This is primarily based upon possible impacts associated with snag removal, although the limited use of wildland and prescribed fire under Alternative A would limit such impacts.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile techniques.

Hand Cutting/Pile Burning. Hand cutting and pile burning would have an adverse effect on great gray owls if it occurred near nesting or hunting areas, where the disturbance caused by hand crews could be disruptive. If thinning also included removal of snags it would have an adverse effect by reducing the density of potential nesting snags. Areas where hand thinning could occur near occupied great gray owl habitat include Crane Flat, Hodgdon Meadow, Wawona Meadow,

Foresta, and along Glacier Point Road. Impact of hand thinning on great gray owls under Alternative A would be adverse, short-term, and negligible, based upon potential disturbance of hunting and nesting owls.

Chipping. The noise caused by chipping machinery could adversely affect great gray owls' hunting success. Great gray owls hunt primarily by sound, and chipping machinery could be disruptive, especially near areas where great gray owls are known to occur such as Crane Flat, Hodgdon Meadow, Wawona Meadow, Foresta, and along Glacier Point Road. Chipping under this alternative would be infrequent, thus effects would be adverse, short-term, and minor.

Cumulative Impacts

Past and present actions that have affected great gray owls have included development, timber harvest and fire suppression. Their effects have been major, adverse and long-term. Reasonably foreseeable future actions that would affect great gray owls would include:

Yosemite Valley Plan/SEIS (2000): Implementation of the preferred alternative would restore highly-valued habitats in Yosemite Valley and decrease fragmentation, which could benefit great gray owls, although they are now rare in the Valley. The construction of facilities outside of Yosemite Valley, however, would cause localized destruction of habitat. If parking were constructed at Foresta, this would have an adverse effect on the great gray owls that use Big Meadow for wintering and staging. Such effects would be adverse, long-term, and moderate.

Merced Wild and Scenic River Comprehensive Management Plan/EIS (2000): Implementation of the preferred alternative would help protect river-related wildlife habitat and species. This is especially true in Yosemite Valley, where past development has encroached on river habitats. The *Merced Wild and Scenic River Comprehensive Management Plan* would provide the framework for reducing present development and limiting future development in these areas, with moderate, beneficial, long-term effects on great gray owls.

Hazel Green Ranch: Development in this area adjacent to the park would affect an area of mixed conifer and meadow habitat. Impact on great gray owls is expected to be adverse, long-term, and negligible if consideration is given by a developer to preservation of sensitive habitats. However, there is some uncertainty about the future of this property.

Evergreen Lodge Expansion: This development would affect an area of mixed conifer and meadow habitat near the park. Effect on great gray owls is expected to be adverse, long-term, and minor.

Fire Management Plan for Wilderness (USFS): This plan would benefit great gray owls by allowing naturally-ignited fires that say in prescription to cross agency boundaries. This could result in wider areas of habitat benefiting from fire, resulting in beneficial, long-term, and minor impacts

Orange Crush Fuels Program (USFS): This project would manage fuels through prescribed burning. This would have a beneficial, long-term, and minor effect on great gray owls by working toward the return of a natural fire cycle for the area which would reduce the chance of catastrophic fire that might spread into the park.

Sierra Nevada Forest Plan Amendment: Implementation of this plan would have a moderate, beneficial, long-term effect on great gray owls by leading to more ecosystem-based management of National Forests in the Sierra Nevada.

The effect of reasonably foreseeable projects in combination on park great gray owls and their habitat would be beneficial, long-term, and moderate, because some foreseeable projects with a beneficial impact would affect large areas of habitat in the central Sierra Nevada. The Sierra Nevada Forest Plan Amendment would affect virtually all U.S. Forest Service land around the park by enabling more ecosystem-based management. Implementation of the *Yosemite Valley Plan* and the *Merced Wild and Scenic River Comprehensive Management Plan* would beneficially affect high-value habitats, primarily in Yosemite Valley. The *Yosemite Fire Management Plan* under Alternative A would, however, have adverse impacts associated with habitats continuing to be affected by a history of fire suppression and continued risk of catastrophic fire in some areas. Other foreseeable projects with adverse impacts would affect small areas and/or have minor effects over larger areas. Considered in combination with the effects of Alternative A, cumulative impacts would be beneficial, long-term, and negligible.

Conclusion

The effects of Alternative A on great gray owls would be adverse, long-term, and moderate, based primarily on the threat of catastrophic fire that would continue indefinitely, due to the relatively slow rate of fuels treatment. Actions taken to manage wildland and prescribed fires could adversely affect great gray owls if they reduced snag density or caused disturbance of nesting or hunting owls.

Willow Flycatcher *(Empidonax trailii)* – California Endangered

In the past, willow flycatchers nested in California wherever willow thickets in wetlands, meadows, or riparian areas were found (Grinnell and Miller 1944). In recent decades, breeding populations have disappeared from low elevation habitats in the state. Alteration and destruction of riparian and meadow habitats is thought to be the principal cause for this decline (Remson 1978). Other contributing factors may include nest parasitism by brown-headed cowbirds, disturbance from grazing, and disturbance on wintering grounds. Nest predation is a major cause of nest failure in willow flycatchers in the Sierra Nevada (Morrison et al. 2000). The California population of willow flycatchers is thought to number around 200 pairs.

In Yosemite, willow flycatchers were once widespread; they have declined from a combination of internal and external factors. Recent records of willow flycatchers in the park include Wawona Meadow, Hodgdon Meadow, and Westfall Meadow.

Potential for Impacts from Catastrophic Fire

In the Sierra Nevada, the long-term response of willow flycatchers and their habitat to fire is not known. The natural role and extent of fire in Sierra Nevada meadows is unclear, but it is likely that under drought conditions, historic late summer and autumn fires may have occasionally influenced meadow vegetation. The rate of willow stand mortality in meadows from catastrophic fire is unknown, but re-sprouting and re-growth may take place (Agee 1994). If willows regenerate after a fire, the time between the fire and the re-growth of willows to the point where they could be reoccupied by willow flycatchers is unknown (Paxton et al. 1996).

With all of this uncertainty about the effects of fire on willow flycatchers, we must assume that burning willows reduces nesting habitat and thus has at least a short-term adverse effect on willow flycatchers. Wildland fire in riparian and meadow vegetation is typically low in intensity and frequency, except where concentrations of woody debris cause flare-ups (Skinner and Chang 1996). During a low-intensity burn, willow stands containing a minimal amount of dry wood and high moisture content are generally just singed and recover quickly.

Sixty-percent of all potential willow flycatcher habitat and 60% of high-quality habitat in the park have missed more than four median fire return intervals. This means a large proportion of Yosemite's willow flycatcher habitat is vulnerable to catastrophic fire, although local effects (i.e. meadow moisture levels) would likely influence the specific habitat impact that would most directly affect the flycatchers: the consumption of willows by fire.

Under Alternative A treatment of accumulated fuels would occur at a relatively slow pace, increasing potential for catastrophic fires over time. The impact on willow flycatchers would be adverse, long-term, and moderate, because of the gradual increase in the amount of habitat that has missed fire return intervals. This is moderated by the usually low fire frequency and intensity in meadow habitats.

Fire Management Treatments

Managed Wildland Fire

Only about 26% of potential willow flycatcher habitat and only one known flycatcher site (Westfall Meadow) are located in the Fire Use Unit. Habitat in this unit is at or near the median natural fire return interval. Nonetheless, fire would be used to restore and maintain habitat, and reduce the chance of catastrophic fire.

Low-intensity fires can cause new growth in willows by singeing the stems, which stimulates the plant to produce new sprouts. Over time, the willows become denser. Without low-intensity burns or floods, willows tend to contain more decayed and decadent growth, which increases the chance that they will be consumed in a fire (Fritzke 2001). Wildland fires that are likely to affect meadow habitats known to be occupied by willow flycatchers should be evaluated for potential adverse effects, based on fuel loading in the meadows and willows, and managed to minimize impacts. Surveys would be conducted to locate all willow flycatchers in the park so appropriate fire management actions can be taken.

Under Alternative A, no re-ignitions of suppressed wildland fires would occur. This would limit the amount of area that could be treated with managed wildland fire, thus catastrophic fire would remain a threat in some areas.

Use of wildland fire under Alternative A would result in beneficial, long-term, and negligible impact on willow flycatchers, because the natural fire regime existing in most wildland habitat areas would continue, but due to the limited use of wildland fire, some areas would continue to be threatened by catastrophic fire.

Prescribed Fire

Approximately 74% of all willow flycatcher habitat in the park and 73% of high-quality habitat occurs in the Fire Suppression Unit, and these areas tend to be the ones with the greatest number of missed fire return intervals. Two of the three known active nest sites are located in the Suppression Unit. Prescribed fire would be an important tool for restoring habitat and protecting it from catastrophic fire. Prescribed fires likely to affect meadow habitats known to be occupied by willow flycatchers should be evaluated for potential adverse effects and managed to minimize impacts. Burning at specific sites would not occur during the period of nesting and fledging (May – September), and willows would be protected from intense fires by clearing dead and decadent fuels from around and within willow shrubs. If possible, meadow habitats with recent flycatcher nests would be burned in stages, so not all potential nest shrubs would be damaged at once. Surveys would be conducted to locate willow flycatchers in the park, so appropriate fire management actions can be taken. The rate at which prescribed fire would be applied under

Alternative A would be limited. Degraded habitat and risk of catastrophic fire would continue indefinitely in some areas, with possible adverse effects on willow flycatchers.

Impact of prescribed fire on willow flycatchers under Alternative A would be beneficial, long-term, and minor, because of the modest reduction in the threat of catastrophic fire and regeneration of lightly-burned willows.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps) and Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Water and retardant drops are unlikely to affect willow flycatchers because the habitat flycatchers occupy is relatively wet, and does not in most years carry fire. Existing procedures for retardant prohibit its use within 300 feet of water and wetlands. Helispots could affect willow flycatchers if they were located near nesting areas, and the amount of helicopter traffic were enough to cause frequent disturbance. Such could be the case at Wawona Meadow, which is commonly used for helicopter operations. Spike camps are prescribed to be established outside of sensitive habitats, such as meadows, and therefore would not have an adverse effect on willow flycatchers. Hand lines would have an adverse effect on willow flycatchers if they were built through meadows, and willows were cut or removed. These habitats, however, usually contain enough moisture that they do not carry fire, making fire lines unnecessary. Also, fire line construction guidelines call for the avoidance of sensitive habitats, such as meadows. Snagging would have no effect on willow flycatchers because snags are not commonly found in meadows, and are not an important habitat component of this species. Mop-up would have an adverse effect on willow flycatchers if it involved the digging or disturbance of willow shrubs, but meadow habitats are very unlikely to harbor hot spots that would need mop-up actions.

Overall, actions taken to manage wildland and prescribed fires would have minor, adverse, short-term effects on willow flycatchers, mostly from potential impacts of conducting helicopter operations out of Wawona Meadow.

Fuel Reduction by Hand or Machine

Passive Reduction Techniques.

Hand Cutting. Hand cutting would have a negligible effect on willow flycatchers because it would not usually occur in meadow habitats where large fuels are sparse and the moist conditions would typically not carry fire.

Chipping. Chipping would occur infrequently and well away from willow flycatcher habitat.

Cumulative Impacts

Past and present actions that have impacted willow flycatcher include development, water projects, grazing, timber harvest. Their effects have been major, adverse, and long-term. Reasonably foreseeable future projects that would affect willow flycatcher would include:

Yosemite Valley Plan/SEIS (2000): Implementation of the preferred alternative would restore highly-valued habitats, including meadows, in Yosemite Valley and decrease the fragmentation of these habitats, which could benefit willow flycatchers, although they are no longer found in Yosemite Valley. Such effects would be beneficial, long-term, and minor to moderate.

Merced Wild and Scenic River Comprehensive Management Plan/EIS (2000): Implementation of the preferred alternative would help protect river-related wildlife habitat and species. This is especially true in Yosemite Valley, where past development has encroached on river habitats. The

plan would provide the framework for reducing present development and limiting future development, with moderate, beneficial, long-term effects on willow flycatchers.

Hazel Green Ranch: Development of this area adjacent to the park would affect an area of mixed conifer and meadow habitat. Impact on willow flycatchers is expected to be adverse, long-term, and negligible, if consideration is given by the developer to preservation of sensitive habitats. However, there is uncertainty about the future of this property.

Evergreen Lodge Expansion: This development would affect an area of mixed conifer and meadow habitat near the park. Effect on willow flycatchers is expected to be adverse, long-term, and minor.

Fire Management Plan for Wilderness (USFS): This plan would benefit willow flycatchers by allowing naturally-ignited fires that stay in prescription to cross boundaries into the park. This could result in wider areas of habitat benefiting from habitat improvement from fire, resulting in beneficial, long-term, and minor impacts

Orange Crush Fuels Program (USFS): This project would manage fuels through prescribed burning. This would have a beneficial, long-term, and minor effect on willow flycatchers by working toward the return of a natural fire cycle for the area, and reduce the chance of catastrophic fire, which could spread into the park.

Sierra Nevada Forest Plan Amendment (USFS): Implementation of this plan would have a moderate, beneficial, long-term effect on willow flycatchers by leading to more ecosystem-based management of National Forests in the Sierra Nevada.

Some current and foreseeable projects would benefit large areas of the central Sierra Nevada. The Sierra Nevada Forest Plan Amendment would affect virtually all U.S. Forest Service land around the park by enabling more ecosystem-based management. Implementation of the *Yosemite Valley Plan* and the *Merced Wild and Scenic River Comprehensive Management Plan* would beneficially affect high-value habitats, primarily in Yosemite Valley. In aggregate their effects would be minor, beneficial and long-term. Other foreseeable projects with adverse impacts would affect small areas and/or have minor effects over larger areas. The *Yosemite Fire Management Plan* under Alternative A would, however, adversely impact habitats affected by years of fire suppression by continuing the risk of catastrophic fire in some areas. Considered in combination with the effect of Alternative A, the cumulative impacts would be negligible to minor, beneficial, and long-term.

Conclusion

The impact of Alternative A on willow flycatchers would be adverse, long-term, and minor because of the continued threat of catastrophic fire in some areas, although such fires are likely to affect only a small portion of potential willow flycatcher habitat.

Summary Conclusion, Special-Status Species – Animals

In almost all cases, the greatest threat to special-status species would be catastrophic fire. Under Alternative A the potential of catastrophic fire would continue and increase during the life of the plan. Some effects of catastrophic fire could be considered impairment to special-status species.

Physical Environment

Watersheds, Soils, and Water Quality

Potential for Impacts from Catastrophic Fire

In the Suppression Unit, there are 64,268 acres of the Merced River watershed and 42,313 acres of the Tuolumne River watershed. Another 27,180 acres of the Merced and 32,316 acres of the Tuolumne are within the Conditional Unit. Because of the likelihood of forest fuels accumulating and plant community structure continuing to change, the potential for large, high-severity fires over the life of the plan (assumed 15-year timeframe) is large. Approximately 25% of the Merced River watershed and 19% of the Tuolumne River watershed show moderate to high departures from median fire return intervals. These areas, many of which are lower and upper montane forest, have the greatest potential for catastrophic fire.

High-severity fires in Yosemite are characterized by extensive burned areas that may be continuous from ridgeline to slope bottom and include riparian areas. Water yield and peak flows increase following high severity fire because soil infiltration rates decrease and there is little vegetation to intercept precipitation or organic litter (duff) to slow water runoff. Extensive and continuous areas of hydrophobic soils are created, further decreasing infiltration and increasing water yields.

This alternative would cause an increase in sediment and nutrient yields in the watershed and corresponding increased rates of erosion and sediment deposition in channels. This would affect both water quality and the physical characteristics of channels and their associated aquatic habitats. Channels would not reestablish their pre-fire character until the vegetation re-colonized and stabilized hill slopes and channel banks. However, because of burn severity in the riparian areas, reestablishment of vegetation would take decades or longer. During extreme weather events, debris torrents would potentially scour streams, delaying restoration of the riparian community for even longer. Thus, in regard to catastrophic fire, the effects of Alternative A on soils and watershed conditions in the Suppression Unit would include areas of adverse, potentially long-term, and major change.

Fire Management Treatments

Managed Wildland Fire

Approximately 255,208 acres of the Merced River watershed, and 386,166 acres of the Tuolumne River watershed are within Fire Use or Conditional Units. Vegetation and fuel loading are only slightly altered as most of this area is within two intervals of the natural range of variability. Fire in the duff layers would spread across the watershed under variable conditions so that burn severity would range from light to locally severe. Patches of extremely hydrophobic soils would be created in areas of high fuel loading where soils would be exposed to heating for a longer time and at a higher temperature than where fires burned in lighter fuels. Fire would help keep plant communities within their natural range of variability. The effects would not typically be on a watershed scale; fire would typically burn along ridge tops and upper slopes, with only partial intrusion into slope bottoms and riparian areas. Water yield and peak flows would increase only slightly and within a small range of variability, thus sediment and nutrient yield fluctuations would be short-term. As a result, there would be negligible channel response, and a short-term recovery of riparian systems. Overall, the soils and watershed effects within these areas would be beneficial, short-term, and moderate.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). Helispots would be located more than 150 feet away from any river, and generally much further. Because of the relatively small surface area of a helispot, they would typically have little effect upon water quality or other watershed attributes. Spike camps for monitoring and holding crews would have the potential to be larger, especially as crew-size increases, but even so, effects would be generally local. Both helispots and spike camps would contribute to areas of increased compaction and disturbance in the soils. Soil effects of these actions would be adverse, long-term, and negligible to minor. Watershed effects of these actions would be adverse, short-term, and minor.

Retardant and suppressant compounds would not typically move into ground water or into surface water from runoff as they would be used carefully around surface waters because of potential effects upon aquatic organisms. Most fire retardants contain fertilizer type compounds, including ammonia and nitrogen, which can cause changes in pristine terrestrial and aquatic ecosystems, especially those otherwise low in nitrate/ammonia type nutrients. Additionally, ammonia itself can be quite toxic in aquatic habitats. Some retardants contain preservatives that release cyanide. The half-lives for these compounds, in soil, are short. When retardants and suppressants are in use, pilots and engine crews would be directed to avoid dropping retardants within 300 feet of wetlands, streams, and lakes. Potentially adverse and moderate to major effects could be arrested through these wide buffer zones, making the effect of using retardant and suppressant adverse, short-term, and negligible to minor, for both soils and watersheds.

Prescribed Fire

Prescribed fire would typically be used in areas where the fire return interval is three or more fires out of cycle, or to maintain target conditions in areas within the Suppression Unit or along the margins of the Fire Use and Conditional Units. Where fire return intervals are out of cycle, such as around wildland/urban interface areas, fuel accumulations can be well outside their natural range of variability. Due to the controlled nature of prescribed fire, however, in terms of fuel moisture, weather conditions, time of day, spatial pattern of ignition and other factors, prescribed fire would not generally result in high severity fire that would alter watershed conditions. However, the soils would not be subjected to the natural range of variability present with natural fire. Prescribed fire would be used, however, as a means to reduce the severity of fire in these areas, and would limit the potential for catastrophic fire that could burn along the entire vertical gradient in the watershed. Burn blocks would continue to be limited in size. Burns would not be continuous up the vertical gradient of the watershed (meaning from ridge, through mid-slope, and into or through the slope bottom/riparian). Fire in the duff layers would spread under variable conditions, but not with enough severity to cause extensive areas of hydrophobic soil. With the unnaturally high fuel loads, the soils will be exposed to higher temperatures and longer resident times than in the normal range of variability. It should be noted that under this alternative, only 1,442 acres of prescribed burning and approximately 100 acres of wildland/urban interface treatment would occur over an average year. This would contribute to the high potential for catastrophic fire and diminish the landscape-scale effects of burning. The effects of prescribed fire on watershed conditions would be beneficial, long-term, and moderate.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

These activities would have the potential to increase soil erosion, because vegetation and organic litter would be removed to stop or hold a fire. Erosion would be greatest along stretches of line that run down slope. Soil compaction and disturbance would occur with both hand line and mop-up. Waterbars and check dams would continue to be used as mitigation, to reduce runoff and the

resulting erosion. The downed snags would create locally heavy areas of fuels that would affect the temperature and fire residence time on very small scales. Soil and watershed effects would be adverse, short-term, and minor.

Fuel Reduction by Hand or Machine

Aggressive Reduction Techniques. These treatments would not be used in this alternative.

Passive Reduction and Lower Profile Techniques.

Hand Cutting. These activities would continue to be used in the wildland/urban interface, and as needed in the Conditional and Suppression Units and in Special Management Areas. Because of the labor-intensive nature of the work, accomplishments would remain at approximately 100 acres treated per year. Hand cutting activities would lead to soil compaction on a localized scale, but would likely have a negligible effect on duff and topsoil layers, resulting in negligible direct impacts on watershed characteristics, including water yield, peak flows, sediment yield, nutrient yield, and stream system response. However, because of the small numbers of acres treated annually, the potential for large, high severity fires would remain high. Thus, the effects of hand cutting would be beneficial and potentially long-term, but only minor in intensity.

Pile burning. Piles would burn under variable conditions, ranging from light to locally severe, creating small patches of extremely hydrophobic soils. Biological and physical characteristics of these patches would be expected to change. However, because of the small areas, the biological function of these areas would return very quickly. The effects would not be on a watershed scale. Projects would be limited in scale, with boundaries typically associated with only one portion of the slope (top, mid-slope, or bottom). Water yield and peak flows would increase only slightly, and within a small range of variability, thus sediment and nutrient yield would only see short-term fluctuations. As a result, there would be negligible channel response, with short-term effects, if any, in riparian systems. The impact of pile burning on soils would be adverse, short-term, and minor. Overall, the watershed effects within these areas would be beneficial, short-term, and minor to moderate.

Chipping. Chipping would only be used occasionally in this alternative. Chipping cut material and then distributing it over a site could occur where air quality, visitor use, or other management concerns prohibit burning. Such impact, however, would be adverse, short-term, and negligible.

Cumulative Impacts

The Merced and Tuolumne River watersheds have been affected historically by a variety of actions. Past actions have included fire suppression activities that have contributed to fuel build-up and high-severity fires, logging, construction of O'Shaughnessy Dam and the creation of the Hetch Hetchy Reservoir on the Tuolumne, and multiple agricultural and land use activities below the park. Logging and fire exclusion would both be expected to have adverse effects on soils. It should be noted that activities in the upper watersheds have had relatively little effect on water quality, compared to the downstream sources of change.

Present and reasonably foreseeable actions within the watersheds include the Aspen fuels reduction, Orange Crush fuels program, and A-Rock reforestation on the Stanislaus National Forest; similar programs on other national forests; and the various fire, resource, and land management actions that would take place on the national forests in the watershed, as a result of implementing the Sierra Nevada Forest Plan Amendment. Most of these treatments include extensive use of tracked machinery. This will cause soil compaction and alter the biological and physical functions of these areas. While the actions would reduce the potential for high severity

fire, the impacts on soils would be adverse, potentially long-term, and minor. These actions would have net beneficial impacts on watershed values through either reducing the potential for high severity fire, or through the reduction of watershed effects through restoration.

When considered in combination with the minor to moderately beneficial impacts of projects on other lands in the upper watersheds, the cumulative impacts from Alternative A would be adverse, long-term, and minor.

Conclusion

In aggregate, actions implemented under this alternative would have adverse, long-term, and moderate effects. This conclusion is based on a combination of beneficial, long-term, moderate to major effects in the Fire Use and Conditional Units, and the potential for areas of adverse, long-term, and major, effects in the Suppression Unit, where large, high-severity fires would likely occur during the life of the plan. The effects of Alternative A on watersheds, soils, and water quality would not typically be considered impairment.

Air Quality

Emissions

Wildland and Prescribed Fire Emissions

Smoke from wildland fires and prescribed fire is a complex mixture of carbon, tars, liquids, and gases. The major pollutants are particulates (PM_{10} and $PM_{2.5}$), volatile organic compounds (VOC), and carbon oxides (CO and CO_2). Nitrogen oxides ($NO_{X)}$ are produced during a fire, but in a relatively small quantities compared to the other pollutants. Table 4.5 summarizes the annual emissions from various fire types that would occur under Alternative A. They are based on emissions that have occurred within the park over the 10-year period 1991 to 2000 (based on park records).

Mechanical Treatments Emissions

Air emissions would be generated by machines used in site preparation and fuel reduction activities. Motorized equipment would include chainsaws, chippers, and haul trucks. Emissions from the operation of this equipment have been estimated based on approximate historical operating hours by park personnel clearing approximately 100 acres per year, estimated horsepower ratings, estimated operating loads, and emission factors (see Methodology, Air Quality). Estimated air emissions are summarized in table 4.6. These emissions would be minor when compared to emissions from prescribed or wildland fire or broadcast burning. Chipping cut material and then distributing it over a site could occur when air quality is a concern. Such impact, however, would be beneficial, short-term, and negligible.

Table VI-5
Average Air Emissions Associated with Various Fire Types in Yosemite National Park—based on ten years of emissions data (1991-2000)

Alternative A—Average Emissions from Existing Program							
Fire Type		**Fire Emissions (tons/yr)** [a]					
	Acres [d]	**PM_{10}**	**$PM_{2.5}$**	**VOC**[b]	**CO**	**NO_x**	**CO_2**
Prescribed Burns[c]	1,495	1,087	917	719	12,945	370	58,557
Managed Wildland Fire[c]	2,152	1,564	1,321	1,034	18,637	532	84,305
Wildfire	5,759	6,920	5,864	3,529	76,930	2,198	387,446
Total	**9,406**	**9,571**	**8,103**	**5,282**	**108,512**	**3,100**	**530,308**

a PM_{10} = Suspended Particulate, $PM_{2.5}$ = Fine Particulate Matter, VOC = volatile organic compounds, CO = Carbon Monoxide, NOx = Nitrogen Oxides, CO_2 = Carbon Dioxide
b VOC (volatile organic compounds) as methane
c Based on composite emission factor for prescribed burning
d Average annual historical fire acres during 1991-2000

Table VI-6
Air Emissions Associated with Mechanical Thinning Activities In Alternative A

Alternative A							
Equipment	**Operating Hours**	**Motorized Equipment Emissions (tons/yr)**[a]					
		PM_{10}	**$PM_{2.5}$**	**VOC**	**CO**	**NO_x**	**CO_2** [b]
Chainsaws	1,400	0.04	0.04	0.74	2.40	0.01	ND
Chippers	267	0.06	0.06	0.02	3.57	0.00	ND
Haul Trucks	192	0.05	0.05	0.09	0.42	0.28	ND
Total		**0.15**	**0.15**	**0.85**	**5.39**	**0.29**	**ND**

a PM10 = Suspended Particulate, PM2.5 = Fine Particulate Matter, VOC = volatile organic compounds as methane, CH4, CO = Carbon Monoxide, NOx = Nitrogen Oxides, CO2 = Carbon Dioxide
b No data

Mitigation Measures

Various management techniques would be used to reduce air emissions produced by prescribed fires and wildland fires. Together with overall priorities, such as firefighter and public safety, prescribed and wildland fire and suppression actions would be conducted so that effects of smoke and other emissions on air quality and visibility would be lessened. Air emissions would be decreased by reducing the area burned, reducing fuel loading (e.g., chipping and hauling away), or managing fuel consumption.

Smoke Communications Strategy

The park also has developed a *Smoke Communication Strategy* (Appendix 4) that provides a blueprint for how to manage future smoke events from prescribed fires, managed wildland fires, suppression actions, and fires occurring outside the park. It provides information on health issues and concerns and, among others, it would be directed to visitors, employees, and residents in affected smoke sensitive areas. The park would also attempt to monitor particulate levels in the park during smoke events. Park air quality technicians would operate air quality monitors that measure particulate levels every hour. These levels are used to compute a 24-hour average that correlates with the Environmental Protection Agency Air Quality Index for particulates.

Agency Coordination

Prior to igniting a prescribed fire, Yosemite National Park must obtain permission through a permit from the appropriate County level Air Quality Management District. The park must also obtain meteorological approval to burn from the California Air Resources Board. It is the responsibility of these permitting agencies to coordinate the numbers of fires burning in one area. As an added measure to mitigate the potential cumulative impacts of prescribed fires, Yosemite fire management staff are members of the Mountain Counties Air Alliance, a Sierra Nevada-wide Fire Management network of National Parks, National Forests, BLM Units, California Department of Forestry, private timber companies, air pollution control districts, and State Parks. The goal of this group is to assure planned ignitions on federal and state lands in the Sierra Nevada do not adversely impact smoke sensitive areas in and around the burn area. The group meets twice a year to discuss issues and register burns for the coming year.

Cumulative Impacts

Other actions in the immediate area and greater San Joaquin Valley would have cumulative impacts when viewed in the context of Alternative A. These include the implementation of the public transportation recommendations included in the *Yosemite Valley Plan* (removal of some roads in the Valley and the implementation of an out-of-Valley shuttle bus system). The net affect of these actions would be to reduce vehicle related air emissions in the Valley and along the corridors leading to the Valley. A regional transit system, the Yosemite Area Regional Transportation Strategy (YARTS), provides some visitors and commuting employees with an alternative to driving into the Valley and would result in overall lower air emissions. A 2-year demonstration of YARTS began in the summer of 2000. The planned improvements for state highway 41 in both the short-term (1999-2000) and long-term (2014) are not likely to increase traffic to the Valley according to Madera County Transportation Commission officials, since the improvements are directed at relieving congestion and not increasing traffic volume.

There are expansion projects in the region that would affect air emissions in the region. These include construction of new housing developments, to accommodate, for example, population growth in the City of Merced which is expected to rise from 62,000 to 133,000 by the year 2015. Other new housing includes the Rio Mesa Area Plan on the east side of Highway 41 in Madera County with a planned 29,000 housing units over 100 years and a University of California Campus just outside Merced that would accommodate 31,500 residents and 31,600 students. There are also new lodging projects planned for the area that would increase guest rooms by about 725. Collectively, these developments would increase vehicles and associated air emissions in the region. The Merced expansion plans represent an approximate 30% increase in the estimated population of Merced County and a corresponding increase in vehicle numbers and related air emissions. Increases in Madera County are expected to be 25 %. An increase in population near the park has the potential to create larger areas of wildland/urban interface that would cause fire issues and smoke concerns and possibly complaints.

The park is surrounded by the Stanislaus, Sierra, Toiyabe, and Inyo National Forests, which experience wildland fires and planned burns. Park and U.S. Forest Service fire management staff would continue to coordinate their planned ignitions to minimize potential impacts on smoke sensitive areas.

Wildland fires that occur in surrounding National Forests are expected to generate smoke emissions similar to those quantified for wildland fires burning within Yosemite National Park. In the event that fires are burning in the park and in surrounding forests simultaneously, the impacts

to air quality would have the potential to be extreme. However, in these cases, park and forest staffs would coordinate closely on managing smoke emissions to minimize impacts to smoke sensitive areas. This would include suppressing wildland fire that might otherwise have been managed to achieve ecosystem management goals. Activities in the region have both short-term and long-term effects and would remain adverse.

Conclusion

Generally, Alternative A would continue the practices of recent years, which would not meet the park's natural resources management objective of returning the park to its natural background conditions for air quality. The continuing risk of wildland fires consuming areas of high fuel loadings would have the attendant effect of continuing adverse, long-term, and major impacts on air quality. These effects would not represent impairment.

Cultural Environment

Archeological Resources

Potential for Impacts from Catastrophic Fire

Impacts of catastrophic fire and fire suppression are discussed in several reports (NPS 1991b; DOI 1996; Hull 1991, Keefe et al. 1999). These reports document major, adverse impacts to archeological resources both from fire related activities and from high-impact fire suppression actions. In general, catastrophic fires in the vegetation types found in Yosemite result in soil and below-soil heating that damages archeological materials (see e.g., Andrews and Rothermel 1982; Agee 1973; Sackett and Haase 1992). Significant archeological resources exist in areas that are at risk from catastrophic fire and high-impact fire suppression actions. Therefore, implementation of this alternative has the potential to result in adverse, long-term, and major impacts to archeological resources from catastrophic fire. These impacts would be mitigated to the extent possible (see Methodology, Mitigation of Impacts to the Cultural Environment, above).

Fire Management Treatments

Managed Wildland Fire

Under this alternative, wildland fire would be used in Fire Use and Conditional Units, map 2-12. Approximately 28,878 acres, or 4.5%, of the total 641,375 acres in these units have been inventoried for archeological resources. The 850 sites in the area range in significance from low to exceptional. Based on a comparison of the missed fire return intervals in maps 2.5 and the units, 226,590 acres, or 35%, of these units probably contain significant fuel accumulation (FRID values of three and greater). As noted above, soil and below-soil temperatures can be regulated to thresholds that minimize damage to archeological materials, when vegetation is burned under certain prescriptions. However, in areas where significant fuels have accumulated, it is unlikely that wildland fire can be managed to avoid damage to archeological resources. In these areas, managed wildland fire would have direct and indirect adverse impacts to archeological resources. The intensity of these impacts would depend upon the nature and significance of the resources as well as the intensity of burning and the post-burn landscape condition, but would be potentially adverse, long-term, and minor to moderate. These impacts would be reduced to the extent possible by implementing mitigations (see Methodology, Mitigation Measures).

In areas where the FRID analysis indicates from zero to two missed fire return intervals, it is likely that managed wildland fire could be managed to avoid soil and below-soil temperatures that damage archeological materials. In these areas managed wildland fire would probably not adversely impact archeological resources. However, post-fire survey and fire-effects research would be necessary to verify this assumption. It is likely that minor to moderate, long-term, beneficial impacts would result from maintaining natural fuel loading on archeological sites.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). Holding and monitoring actions have the potential to adversely impact archeological resources through soil disruption and compaction. The intensity of these impacts would depend on the nature and significance of the resources as well as the extent of disturbance, but effects would be potentially, adverse, long-term, and minor to moderate. These impacts would be mitigated as much as possible.

Prescribed Fire

Under this alternative, prescribed fire would be used in the Conditional and Suppression Units (map 2-12). Approximately 27,573 acres, or 17% of the total 166,078 acres in these units have been inventoried for archeological resources. Eight hundred and fifty known sites are within this area, ranging in significance from low to high. Based on a comparison of the missed fire return intervals in map 2.5 with the units, 75,351 acres, or 45% of these units contain significant fuel accumulation. As noted above, soil and below-soil temperatures can be regulated to thresholds that minimize damage to archeological materials, when burns are accomplished under certain prescriptions.

Prescribed fires are lit under specific conditions to burn in a certain way. Thus, the potential for prescribed fire to have adverse impacts to archeological resources would be less than catastrophic fire or even managed wildland fire. However, in areas where significant fuels have accumulated (areas that have missed three or more fires) it might not be possible to manage fire so that damage to archeological resources would be avoided. In these areas, prescribed fire would have direct and indirect adverse impacts to archeological resources. The intensity and duration of these impacts would depend upon the nature and significance of the resources as well as the intensity of burning and the post-burn landscape condition. These impacts would be mitigated to the extent feasible by implementing mitigating measures. Maintaining lighter fuel loads on archeological sites would likely result in long-term, beneficial impacts to archeological resources.

In areas where the FRID analysis indicates from zero to two missed fire return intervals, it would be likely that prescribed fire could be managed to avoid soil and below-soil temperatures that damage archeological materials. In these areas, prescribed fire would probably not adversely impact archeological resources. However, post-fire survey and fire-effects research is necessary to verify this assumption. It is likely that minor to moderate, long-term, beneficial impacts would result from maintaining more natural fuel loading on archeological sites.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Construction of hand lines, removal of snags, and conducting fire mop-up would cause soil disruption and compaction and can therefore adversely impact archeological resources. These activities can also expose archeological sites. The intensity of these impacts would depend upon the nature and significance of the resources as well as the extent of disturbance. Effects would potentially be adverse, long-term, and minor to moderate. These impacts would be avoided or reduced as much as possible through mitigating measures.

Fuel Reduction by Hand or Machine

Aggressive Reduction Techniques. These treatments would not be used in this alternative.

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Hand cutting would reduce unnatural fuel loads in and around archeological resources, and thereby reduce the potential for intense fires that generate soil and below-soil temperatures that damage archeological materials. Cutting would also reduce root encroachment and make sites more visible, making it easier to record them. Therefore, hand cutting would generally result in minor to moderate, long-term, beneficial impacts to archeological resources.

Pile burning. Pile burning, if conducted on archeological sites, would generate intense, localized soil and below-soil temperatures that would potentially damage archeological materials. Therefore, pile burning on sites would result in adverse impacts to archeological resources. The intensity of impact would depend upon the significance of the resources and the types of materials present, but would be potentially adverse, long-term, and minor to moderate. These impacts would be mitigated by avoiding archeological sites during pile burning.

Chipping. The process of creating chips does not involve ground disturbance, therefore impact on archeological resources would be negligible. There are no study data indicating the impacts of distributing chips on archeological sites. However, in order to mitigate any potential impacts, chips would not be distributed on known archeological sites.

Cumulative Impacts

Archeological resources are subject to damage from development, vandalism, visitor access, and natural processes (including fire). For example, tens of sites in Yosemite are considered at risk from existing facility development. At least 12 past, present, and reasonably foreseeable design and construction projects in Yosemite (consisting of facility redesign, road realignments, and utility and bridge replacements) could disturb additional archeological resources.

Several projects under the control of surrounding state or federal agencies or communities include the construction of resort lodging (e.g., the Hazel Green Ranch development, the Rush Creek Guest Lodging project), improvement of transportation facilities (i.e. Evergreen Road Improvement), management of fuels, or management planning for fire and Wilderness. Even though any or all of these could disturb archeological resources by the extensive grading and ground disturbance required to upgrade facilities in archeologically sensitive areas, the impacts on archeological resources cannot be evaluated until resource inventory and design information is available.

This alternative would contribute to the damage and/or loss of some regional archeological resources through burning and post-burn landscape processes, as well as emergency actions associated with catastrophic fire response. Since the most frequent and intense adverse impacts would usually be associated with catastrophic fire and emergency actions, and this alternative would not significantly reduce the potential for catastrophic fire, there is a greater potential for fire-related impacts to archeological resources. Adverse impacts would be mitigated to the extent possible through measures described above. The adverse impacts associated with other past, present, and reasonably foreseeable future projects would be minor to moderate. Considered in combination with impacts to archeological resources from Alternative A, cumulative impacts would be adverse, long-term, and moderate to major.

Conclusion

Implementation of this alternative could result in adverse, long-term, and major impacts to archeological resources mainly due to the high likelihood of future catastrophic fire. Of all fire management situations and treatments, catastrophic fire and high-impact suppression actions result in the most frequent and severe impacts to archeological resources. Depending upon the intensity of burning, the related soil and below-soil temperature, and the post-burn landscape condition, managed wildland fire and prescribed fire would also result in direct and indirect adverse impacts to archeological resources. These impacts would be mitigated to the extent possible (see Methodology, Mitigation Measures). In the areas where a more natural fire regime could be restored and maintained, and buildup of heavy fuels could be avoided, there would be the potential for long-term, beneficial impacts.

Large, high intensity catastrophic fire would potentially affect archeological districts, which would be considered key to the cultural integrity of the park or to opportunities for enjoyment of the park. The effect would potentially be that of impairment.

Ethnographic Resources

Potential for Impacts from Catastrophic Fire

Significant ethnographic resources exist in areas that are at risk from catastrophic fire and emergency fire suppression actions. Therefore, implementation of this alternative would have the potential to result in major, adverse, and short to long-term impacts to ethnographic resources from catastrophic fire.

These impacts would be reduced to the extent possible using measures described under Methodology (Chapter IV). However, consultation with American Indian tribal leaders, traditional practitioners, and elders is critical to identifying these resources and determining the most appropriate treatment. Such consultation is difficult or impossible to achieve in emergencies, and the potential for damage to or loss of significant resources is greater.

Fire Management Treatments

Managed Wildland Fire

Neither the Fire Use Unit or the Conditional Unit, where wildland fire would be allowed to burn, have been inventoried for ethnographic resources and few data exists regarding traditional use by American Indian people. Therefore, the potential for impacts to ethnographic resources is unknown, but the potential for adverse impacts would be low. Continuing a natural fire regime for ecosystem maintenance would likely result in minor to moderate, long-term, beneficial effects, especially in the areas of the Fire Use and Conditional Units, in which there are fewer missed fires. The park is consulting with all park-associated American Indian tribes and groups in order to determine the potential for impacts and the most appropriate mitigating measures. The park would continue to consult with tribal groups as part of the ongoing government-to-government relationship, and would factor new information into fire management planning as it becomes available.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). Holding and monitoring actions would have the potential to adversely impact ethnographic resources, typically traditionally used plants. The intensity and duration of these impacts would depend upon the nature and significance of the resources as well as the extent of

disturbance, and would potentially be minor to moderate, adverse, and short- to long-term. These impacts would be avoided or reduced as much as possible, through mitigating measures.

Prescribed Fire

The majority of the prescribed fire units have not been inventoried for ethnographic resources. However, since prescribed fires are planned actions, the potential for adverse impacts would be reduced compared to the potential for adverse impacts through either catastrophic fire or managed wildland fire. Reducing heavy fuel loads and reintroducing fire's natural role in ecosystem maintenance would more likely result in minor to moderate, long-term, beneficial effects upon ethnographic resources. However, since prescribed burns would potentially occur outside of natural fire season, the effects could be adverse. As part of the ongoing government-to-government relationship with American Indian tribes, Yosemite National Park would continue to consult with all park-associated American Indian tribes in order to determine the potential for impacts and the most appropriate mitigating measures. The park would factor new information into fire management planning as it becomes available.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Construction of hand lines, removal of snags, and conducting mop-up would impact ethnographic resources. The intensity and duration of these impacts would depend upon the nature and significance of the resources as well as the extent of disturbance. These effects would be potentially minor to moderate, adverse, and short- to long-term. These impacts would be avoided or reduced as much as possible through mitigating measures and through ongoing consultation with park-associated tribal groups.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Hand cutting would have the potential to adversely impact ethnographic resources, mainly through damage to traditionally used plants. The intensity and duration of these impacts would depend upon the nature and significance of the resource as well as the extent of disturbance. These impacts would be avoided by either avoiding traditionally used plants, or only thinning during seasons when this action would promote culturally-desired plant characteristics. In areas where inventory data are not available, plants typically used for traditional purposes would be treated the same as known ethnographic resources. As with other aspects of the fire management program, the park would continue to consult with park-associated tribal groups in order to identify and address concerns regarding ethnographic resources. Thus, minor to moderate, beneficial, and short-term impacts would be achieved where possible and the potential for adverse impacts would be reduced or avoided.

Pile burning. Pile burning could be beneficial if the burning was planned as part of the management of a traditional resource. Otherwise, pile burning could damage plants if burning was unintentional or out of season. Therefore, pile burning would result in adverse impacts to ethnographic resources. The intensity and duration of impact would depend on the significance of the resources and the types of materials present. Effects would be potentially negligible to adverse, short-term, and moderate. These impacts would be mitigated by avoiding unintentional pile burns on, or adjacent to, traditionally used plants.

Chipping. There are no study data showing the impacts of distributing chips on or near ethnographic resources. However, in order to mitigate any potential impacts, chips would not be distributed on known ethnographic resources. The effect would therefore, be negligible.

Cumulative Impacts

Ethnographic resources and their traditional cultural associations have been lost or damaged in Yosemite through disruption of cultural traditions and disenfranchisement through government policies and actions, larger societal trends, and past development, visitor use, and natural events. Ethnographic resources have also been lost because of fire and suppression of fire. Nevertheless, Yosemite retains many sites and resources of significance to local and culturally-affiliated American Indians. Five past, present, or reasonably foreseeable management plans and design/construction projects in Yosemite (e.g., facility redesign, utility replacement, and road realignment) have the potential for effect.

Additional projects under the control of surrounding state and federal agencies or communities include construction or expansion of resort facilities such as Hazel Green Ranch and Rush Creek Resort, improvement of transportation facilities, and reforestation and fuels reduction projects. While any or all of these projects could impact ethnographic resources by damaging gathering sites and historic villages or by restricting access to traditional use places, it is not possible to accurately evaluate the nature of impacts without detailed project information which is not now available. However, the trend for potential resource disturbance by these types of undertakings can be expected to continue.

This alternative would contribute to minor to moderate damage and/or loss of some regional ethnographic resources from burning and post-burn landscape processes, as well as emergency actions associated with catastrophic fire response. Since this alternative would not significantly reduce the potential for catastrophic fire, there would be a greater potential for fire-related impacts to ethnographic resources. Adverse impacts would be mitigated to the extent possible. Considered in combination with the adverse, long-term, and minor to moderate effects of present, and reasonably foreseeable future projects, cumulative effects of implementing Alternative A would be adverse, long-term, and minor to moderate.

Conclusion

Implementation of this alternative would potentially result in adverse, short-term, and minor to moderate impacts to ethnographic resources, mainly due to the increasing likelihood of catastrophic fire. Managed wildland fire and prescribed fire could also result in indirect adverse impacts to ethnographic resources, depending upon the timing and intensity of burning. Effects would be minor to moderate, adverse, and typically short-term. These impacts would be mitigated to the extent possible through standard mitigating measures as well as through ongoing consultation with park-associated American Indian tribal groups.

Large, high intensity catastrophic fire would potentially affect ethnographic resources, which would be considered key to the cultural integrity of the park or to opportunities for enjoyment of the park. The effect would potentially be that of impairment.

Cultural Landscape Resources, Including Individually Significant Historic Structures

Potential for Impacts from Catastrophic Fire

Significant cultural landscape resources exist in areas that are at risk from catastrophic fire and emergency fire suppression actions. Vegetation density has increased in some cultural landscapes, affecting their character; efforts to reverse this trend would not be increased under this alternative. Therefore, implementation of this alternative would have the potential to result in major, adverse

and long-term effects upon cultural landscape resources from catastrophic fire. These impacts would be mitigated to the extent possible.

Fire Management Treatments

Managed Wildland Fire

Significant cultural landscape resources exist in areas proposed for managed wildland fire. For the most part, they consist of backcountry cabins, camps, historic trails and roads (and their associated features), and other historic structures. Many historic resources were either constructed with wood or contain features of flammable materials. In areas where heavy fuels have accumulated, it is unlikely wildland fire could be managed at a level necessary to avoid damage to cultural landscape resources unless mitigating measures are implemented either before or early in the wildland fire event. In these areas, managed wildland fire would have direct and indirect adverse impacts to these resources. The intensity and duration of these impacts would depend on the nature and significance of the resources, as well as the intensity of burning and the post-burn landscape condition. Effects would be adverse, long-term, and major, if national register properties were lost during fire. However, fire would also contribute to maintaining cultural landscapes, and impacts would be mitigated to the extent possible.

Where the FRID analysis shows from zero to two missed fire return intervals, it would be likely that wildland fire could be managed to avoid adverse impacts to cultural landscape resources. Maintaining a natural fire regime would likely result in minor to moderate, long-term, beneficial impacts to cultural landscape resources by reducing the potential for high-intensity fires.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). Holding and monitoring actions would have little potential to adversely impact cultural landscape resources. The intensity of any such impacts would depend upon the nature and significance of the resources as well as the extent of disturbance, but would be potentially minor to moderate, adverse and long-term. These impacts would be avoided or mitigated as much as possible.

Prescribed Fire

Prescribed fire would be lit under specific conditions in pre-determined areas. Thus, the potential for adverse impacts to cultural landscape resources from prescribed fire would be less than with catastrophic fire or even managed wildland fire. However, in areas where fuels have accumulated (areas of three or more missed fires) it might not be possible to manage fire to avoid damage to cultural landscape resources, unless mitigations were implemented prior to burning. Prescribed fire would have direct and indirect adverse impacts to resources. The intensity and duration of these impacts would depend on the nature and significance of the resources as well as the intensity of burning, but would be potentially negligible to adverse, long-term, and minor. These impacts would be mitigated as much as possible.

In areas where the FRID analysis indicates from zero to two missed fire return intervals, it would be likely that prescribed fire could be managed to avoid impacts to cultural landscape resources. Any potential impacts would be avoided by prescribing a target condition for these areas that would protect and enhance cultural resources. Maintaining a natural fire regime would likely result in beneficial, long-term, and minor to moderate impacts to cultural landscape resources by reducing the potential for high-intensity fires.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Construction of hand lines, removal of snags, and conducting fire mop-up would have little potential to adversely impact cultural landscape resources. Any such impacts would be adverse, short-term, and negligible, and would be avoided or reduced through mitigation.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Hand cutting would have the potential to adversely impact cultural landscape resources, mainly through inappropriate vegetation removal in cultural landscape or historic site settings. The intensity of these impacts would depend on the nature and significance of the resource, as well as the extent of disturbance. Potentially moderate, adverse, and long-term impacts would be avoided by prescribing a target condition for these areas that would protect and enhance the cultural resource.

Pile burning. Pile burning would have little or no potential to impact cultural landscape resources. Any potential impacts would be avoided by implementing mitigating measures.

Chipping. Distributing chipped material would result in minor, short-term, adverse impact to cultural landscape resources, if the chips were distributed in places where such materials were not compatible with a historic site or setting. This potential impact would be avoided by prescribing chipped-material distribution in a manner compatible with a cultural landscape or historic setting.

Cumulative Impacts

Historic resources at Yosemite have been lost or damaged through past development of facilities and park infrastructure, visitor use, natural deterioration, and natural events such as floods and fires. Rapidly disappearing structures in the region include homestead cabins, barns, road and trail segments, bridges, mining complexes, railroad and logging facilities, blazes, and campsites. These resources are tangible remains of the area's ranching, grazing, logging, and mining history. However, despite past losses and disturbances, Yosemite contains many significant historic structures and cultural landscape resources.

Five past, present, or reasonably foreseeable design and construction projects within Yosemite would potentially affect historic resources. For example, removal of the Cascades Diversion Dam and Happy Isles Bridge would result in the loss of historic resources. Reconstruction of the Mariposa Grove Road would impact the historic landscape resources at the Mariposa Grove of Giant Sequoias and the South Entrance Station. Several projects under the control of surrounding state and federal agencies or communities involve constructing facilities in the vicinity (e.g., new development at Hazel Green adjacent to the historic Coulterville Road). Any or all of these actions would impact historic resources; however, it is not possible to accurately evaluate the nature of impacts without more detailed, site specific project information which is not now available. The trend for potential disturbance of resources by these types of undertakings can be expected to continue.

This alternative would contribute to the damage and/or loss of cultural landscape resources from burning and post-burn landscape processes, as well as emergency actions associated with catastrophic fire response. Since this alternative would not significantly reduce the potential for catastrophic fire, there would be a greater potential for fire-related impacts to cultural landscape resources. Adverse impacts would be mitigated to the extent possible. The adverse impacts associated with past, present, and reasonably foreseeable future projects would be minor to

moderate and long-term. Considered in combination with the impacts to cultural landscape resources from Alternative A, cumulative effects would be adverse, long-term, and moderate to major.

Conclusion

Implementation of this alternative would potentially result in adverse impacts to cultural landscape resources, mainly due to the increasing likelihood of catastrophic fire. Of all fire management situations and treatments, catastrophic fire and associated emergency response would result in the most frequent and severe impacts to cultural landscape resources. Managed wildland fire and prescribed fire would also result in adverse impacts to cultural landscape resources. These impacts would be reduced to the extent possible through mitigation (see page 4-11). Because the potential for catastrophic or other high-intensity fires would remain high, this alternative would result in moderate to major, long-term, and adverse impacts to cultural landscape resources.

Large, high intensity catastrophic fire would potentially affect large areas of the cultural landscape, which would be considered key to the cultural integrity of the park or to opportunities for enjoyment of the park. The effect would potentially be that of impairment.

Section 106 Summary

Under regulations of the Advisory Council on Historic Preservation (36 CFR 800.9) addressing the criteria of effect and adverse effect, implementation of this alternative would have the potential to adversely affect significant historic properties. Archeological sites, ethnographic resources, and cultural landscape resources (including historic sites and structures) would likely be adversely affected by high-intensity fires and emergency response actions associated with catastrophic fire. The number and significance of resources that potentially would be affected cannot be projected since inventory and evaluation data are lacking for much of the park. These impacts would be mitigated to the extent possible by some pre-burn inventory for resources of concern, avoiding known resources when feasible, reducing hazardous fuels at significant resources, documentation and protection of significant resources, post-burn inventory and stabilization, and fire-effects research.

Social Environment

Recreation

Potential for Impacts from Catastrophic Fire

Large catastrophic fires would most likely occur in the Suppression Unit and possibly the Conditional Unit, where fires have been and would continue to be suppressed. The relatively small number of acres treated annually with prescribed fire would contribute to the high potential for large and catastrophic fires in these units. This would be especially true in the wildland/urban interface, in which homes and communities, visitor facilities, and park operations buildings are located, and where the most aggressive suppression activities have historically taken place. Several large, catastrophic fires have occurred in the park since 1990, including the A-Rock fire. The park was closed for several days until the A-Rock fire was controlled—thus visitors were affected by being denied access to the park. Under this alternative, the potential for large, catastrophic fire would continue to increase, likely resulting in future park closures and impacts upon all park visitors. Although closures of limited areas would be possible, many closures potentially would be

park-wide, thus affecting all park visitors. During closures, the effects will be adverse, short-term, and major. These events would likely occur during peak visitation periods, and over a limited timeframe.

Fire Management Treatments

Managed Wildland Fire

Managed wildland fire would affect recreation in the Fire Use and Conditional Units, most of which is Wilderness. Mainly Wilderness visitors would be affected as local closures and restrictions would affect some trip itineraries and possibly trip quality for some people. Because of this and perceived risks, managed wildland fire would enhance the Wilderness experience for some users, while it would negatively affect the visit for others. Some visitors would be redirected to other parts of the park during closures. However, because visitation is high during peak periods and because of the trailhead quotas that are in place for park Wilderness, some visitors might not be able to take a Wilderness trip or would not be able to access a preferred area. This would be an adverse, short-term, and major effect on a small proportion of park visitors.

The majority of park visitors affected would be affected only by the smoke from managed wildland fires, and this would typically occur when down slope and down-valley winds carry smoke into the basins, generally during night-time and early morning hours. Those affected would mainly be overnight visitors, which would represent over one-third of the visitors to Yosemite Valley, for example. However, smoke would potentially remain in the area throughout the day, affecting visibility of scenic areas (see Scenic Resources, below). These effects on all park visitors would be potentially adverse, short-term, and moderate. Managed wildland fire would be common during the peak season thus smoke effects would potentially impact a large number of visitors.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). Many Wilderness users would be sensitive to these actions, particularly when they are used in Wilderness. Helicopter use can be quite intrusive in Wilderness because of noise, visual aspects, and the need to clear spots for safe landings and operations. The adverse and moderate effects of noise and activity would be short-term, while the fire was staffed and/or monitored.

Prescribed Fire

Prescribed fires would continue to be scheduled and managed in ways that limit their effects on visitors. The amount of prescribed fire activity in the No Action Alternative would be the least among the alternatives (approximately 1200 acres treated per year). Effects on visitor activities, including hiking, nature study, and scenic touring, would generally be limited to small-scale closures and restrictions, although visitors would have to recreate outside of the prescribed fire project boundary. Very few people would be unable to partake in their chosen activity, although some would have to go to another part of the park. Smoke would affect a wider area, and thus more visitors, than closures and restrictions. However, because prescribed fires would be ignited only under certain atmospheric conditions, the effects of concentrated smoke would generally be localized. Effects would be adverse, short-term, and minor.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Site preparation would rarely influence visitor movements or activities. If chainsaws were in use, areas would be closed off, but visitors would likely avoid the immediate area or stay at some distance because of noise (see Noise, below). Under this alternative, most site preparation would have only negligible to minor, short-term, and adverse effects.

Fuel Reduction by Hand or Machine

Aggressive Reduction Techniques. These treatments would not be used under Alternative A.

Passive Reduction and Lower Profile Techniques.

Hand Cutting. If chainsaws were in use, areas would be closed off and visitors would likely stay at some distance because of noise levels (see Noise, below). Most hand cutting activities would have negligible to minor, short-term, and adverse effects on recreation. Piles of fuels would have the potential to effect scenic quality, but generally, piles would be placed to limit visibility and other effects.

Pile burning. Effects upon activities would generally be limited to small, local scale closures and site restrictions, with most visitors being able to recreate elsewhere, outside of the prescribed fire boundary. Very few people would be unable to partake in their chosen activity, although some would have to go another part of the park. Smoke would affect more visitors than closures, but because the piles would be burned under atmospheric conditions specified by the counties, the smoke effects would generally be minimized. Effects would be adverse, short-term, and minor.

Cumulative Impacts

Past actions that affect recreation would include the development of visitor use facilities in and around the park. These facilities have provided support to visitors in beneficial and long-term ways. Several reasonably foreseeable projects have the potential to provide increases in visitor services and facilities, including Hazel Green Ranch, Rush Creek Guest Lodging and Conference facilities, Evergreen Lodge Expansion, and others. These projects have the potential to provide long-term, and moderate to major benefits to the visitor seeking these services. The effects of past, present and reasonably foreseeable actions upon recreation have been beneficial, long-term, and major. However, the *Draft Yosemite Fire Management Plan/EIS* does not propose to remove, increase or modify visitor facilities, and its major influence would be that of local effects upon recreational experiences, including hiking, nature study, and scenic touring. These impacts of other projects in the region, in combination with the impacts of this alternative, would result in beneficial, long-term, and major cumulative impacts.

Conclusion

In aggregate, the actions of this alternative would have adverse, short-term, and minor effects on recreation, except during large, catastrophic fire events, when closures and other needed actions would result in major, short-term, and adverse effects. There would be no impairment from the effects of this alternative.

Scenic Resources

Potential for Impacts from Catastrophic Fire

Important scenic views in Yosemite Valley and the giant sequoia groves are also Special Management Areas and have been high priority for receiving fire management treatments over the past 30 years. As a result, these are not areas with the highest potential for catastrophic fire. The areas where there is the greatest potential for catastrophic fire would be in suppression areas along the western boundary. Three of the four entrance roads come into the park through the Suppression Unit, and catastrophic fire in this area in recent years has had major impact on scenic quality. The A-Rock and Steamboat fires burned large stretches along both the Big Oak Flat Road and the South Entrance Road, leaving extensive areas of standing dead trees in an open landscape

that was formerly forest. The impact of this fire, on scenic quality along these roads, was adverse, long-term, and major. Under this alternative, the potential for more fires of this size and intensity would remain high. If along major road corridors, or near major scenic vistas, on the margins of or in Special Management Areas, the effects would be adverse, major, and potentially long-term.

Fire Management Treatments

Managed Wildland Fire

Wildland Fires would continue to burn approximately 2,567 acres per year, mostly in Wilderness. To some, the effect of managed wildland fire on scenic resources would be seen as adverse, but extreme fire behavior and effects are not common in these areas, so most Wilderness visitors would be see the effects as beneficial and natural. Fire in plant communities that are within their natural range of variability rarely result in extreme events with major effects on scenic quality. The typical effects of fire include blackened bark, caftans on some trees, opening of the understory, cleaning (through burning) of the litter and duff layer, and the scorching of some trees, resulting in scattered kill and opening of the canopy. It is likely that Wilderness users would see these natural effects as beneficial, long-term, and major on a landscape scale.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). These actions have the potential to have short-term effects on scenic resources, in the form of evidence of helispots and spike camps. These effects would be local in scale and probably not encountered by most Wilderness visitors. Effects would be adverse, short-term, and minor.

Prescribed Fire

Prescribed fire can be used as a tool to maintain scenic resources, such as in Yosemite Valley and in the giant sequoia groves, and it can also have effects that would be considered potentially adverse to the visitor who infrequently visits parks and natural areas. Fire would continue to be infrequently prescribed as a tool for maintaining open scenic views. This acreage would only be a portion of the 1,442 acres treated per year on average, and most would be in either Yosemite Valley or in the sequoia groves. Some visitors would see the local effects of burning as adverse, but public acceptance of the prescribed fire program has increased to the point that local effects would not typically be seen as adverse. Effects of prescribed burning on scenic resources would be generally beneficial and long-term, but minor, because of the limited number of acres treated.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

These actions would be visible to visitors within the immediate area of the work, but would not typically be seen within scenic views, when viewed on a landscape scale. Effects would be adverse, short-term, and minor.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. These actions would be visible to visitors within the immediate area, but would not typically be seen within scenic views, when viewed on a landscape scale. Effects would be adverse, short-term, and minor. Hand cutting is not currently used as a tool to restore and maintain open vistas in places like Yosemite Valley.

Pile burning. This activity has two potential effects on scenic resources. First, piles of stacked fuels would be visible, potentially within major scenic views. Second, piles once burned

would leave a pattern of burned area that would appear unnatural. Both effects would be adverse, short-term, and minor.

Cumulative Impacts

The effects of past and present actions on scenic resources can be seen in Yosemite Valley, which includes visitor and support facilities. Major viewpoints, like Tunnel View, have no visible intrusions, while visitors, traffic, and facilities can be seen from places like Lower Yosemite Falls. These effects are adverse, long-term, and moderate.

Past, present, and reasonably foreseeable actions include timber harvest, fire management and fuels treatment activities outside the park, many of which are on national forest lands. These would include reasonably foreseeable future projects like A-Rock Reforestation, Aspen Fuels Reduction, Orange Crush Fuels Program, Rogge-Ackerson Fire Reforestation, and the Fire Management Plan for Wilderness in Stanislaus National Forest. These actions would cause effects similar to those from fire management actions in the park. Effects would include burned areas, cut stumps, evidence of holding lines, burned area fire rehabilitation work, and others. Some of these effects potentially would be visible from roads. The effects would be adverse to beneficial, long-term, and minor. Considered in combination with the impact of Alternative A on scenic resources, cumulative impact would remain beneficial, long-term, and minor.

Conclusion

Fire management activities would affect scenic resources in generally beneficial ways, through actions that would maintain open vistas and natural forest structure. Effects in the Suppression Unit would be limited by the amount of annual burning and thinning. Overall, these effects would be beneficial, long-term, and minor. This is because of the likelihood of having large, high intensity, catastrophic fires remains high. This alternative would continue to have a high potential for adverse, long-term, and major effects of the type that resulted from the A-Rock Fire. Yosemite Valley is one of the resources specifically identified in the designating legislation for Yosemite. If catastrophic fire were to cause major intrusions into the Valley or into the Mariposa Grove of Giant Sequoia, the effect would potentially be impairment.

Noise

Potential for Impacts from Catastrophic Fire

During catastrophic fires, large fire organizations would be employed to control the fire, as needed. When this occurs, a larger amount of equipment, including helicopters and fire engines, would be used to accomplish fire control objectives. Complex fire operations can extend their activities over large areas, sometimes tens of thousands of acres. Helicopters and chainsaws in close proximity would be the loudest typical equipment, with sounds as loud as 100 dB. These sounds would be uncomfortably loud if nearby. In terms of relative loudness, these sounds would be 128 times as loud as a lower limit, urban daytime ambient noise level of 40 dB (reference loudness). During suppression actions that are brought about because of large, high severity fires, noise effects would be adverse, short-term, and major.

Fire Management Treatments

Managed Wildland Fire

During managed wildland fire incidents, helicopters would be used as needed for reconnaissance, monitoring, and moving people and supplies. At least one flight per day would normally be flown over fires, many of which would be in Wilderness. As fires grew, the reconnaissance area and flight duration would increase as well. Helicopters 100 feet from a person would be as loud as 100 dB, a sound that would be uncomfortably loud. In relative loudness, this would be 128 times as loud as a urban, daytime ambient noise level of 40 dB (reference loudness). This effect would be adverse, short-term, and major. However, the noise would generally affect only a small number of Wilderness visitors, unless operations occurred near populated areas and Wilderness corridors.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). The effects of helicopter use, as in water and retardant drops, would be the same as described under managed wildland fire. In the event of a holding action, chainsaws, water pumps and other equipment would be used. Chainsaws have sound levels of approximately 100 dB, or 128 times as loud as the reference loudness of 40 dB. The effect, especially at close range, would be adverse, short-term, and moderate to major

Prescribed Fire

Prescribed fire operations typically occur within a defined project area but do entail noise. Noise would be generated in many of the 25 days it would take each year on an average to complete projects. Fire engines would commonly be used along roads and, in some cases, along burn boundaries. A diesel truck traveling at 40 miles per hour at 50 feet can have sound levels of 80 dB (16 times as loud as reference loudness). Effects would be adverse, short-term, and moderate.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

The equipment used in building control lines, snagging, and mop-up during these operations would include chainsaws, water pumps, and other equipment. The effect would be adverse, short-term, and moderate.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Chainsaws would be the major piece of equipment used during these operations, which are generally conducted in defined project areas. The effect would be adverse, short-term, and moderate.

Pile burning. The equipment used during these operations would include engines and water pumps. The effects would be similar to that found under prescribed fire above.

Cumulative Impacts

The noise effects of past and present actions are manifest in the soundscapes in places like Yosemite Valley and along major roadways. Vehicular traffic in these areas typically results in sounds that exceed 60 dB at 50 feet. In some locations in Yosemite Valley, such as along Northside Drive and Southside Drive, about 15 noticeable sound events can occur each hour. These effects would continue to be adverse, long-term, and moderate. Past, present, and reasonably foreseeable actions would include fire management and fuels treatment activities outside the park, many of which are on national forest lands. The types of equipment that would be used would be similar to those used in the national park, including helicopters, chainsaws, and water pumps. The noise

effects would be adverse, short-term, and moderate to major. Considered in combination with the noise effects of Alternative A, cumulative effects would remain adverse, short-term, and moderate to major.

Conclusion

Fire management activities would continue to introduce noises that have a short-term, adverse, and moderate to major effects on ambient noise levels, especially in wildland/urban interface areas and during large, catastrophic fire events. In Wilderness, helicopter and chainsaw noises would continue to introduce short-term intrusions, with adverse and major effects.

There would be no impairment of the park's resources or values.

Local Communities

Alternative A, as well as the other alternatives considered, has risks and a degree of uncertainty associated with it. The threat of loss from wildland fires is the most important consideration, even though we cannot predict when and where wildland fires will occur. The risk associated with implementing prescribed fire and fuel treatment activity is lower than the threat of wildland fire, even when one considers potential smoke emissions and escaped prescribed fires. Most of the uncertainty in implementing a successful fire management strategy is associated with doing enough fuels treatment in enough places to influence wildland fire in the intended ways.

Potential for Impacts from Catastrophic Fire

The greatest potential for catastrophic fires would be in the Suppression Unit and along the margins of the Fire Use Unit. Aspen Valley, Hodgdon Meadow, El Portal, Foresta, Wawona, Yosemite Village, and Yosemite West are all within or along the Suppression Unit. Forest conditions around each of these communities are among the most altered from fire suppression in the park. In this alternative, catastrophic fire would continue to have the potential to affect these communities through both direct impact (i.e. property loss and damage from fire) and the indirect effects of closures and other actions (i.e. loss of business and associated economic impacts). The 1990 A-Rock fire, which closed the park for 11 days and burned the majority of the homes and buildings in Foresta, is illustrative of the potential impact of an extreme-behavior, wildland fire.

Potential Direct Effects: Under this alternative, the potential for large, catastrophic fire would remain high in and near Aspen Valley, Hodgdon Meadow, El Portal, Foresta, Wawona, Yosemite Village, and Yosemite West. There would be less than 100 acres of fuel treatment accomplishment per year, split among all the communities. At this level of accomplishment, it would not be possible to accomplish restoration objectives, thus the risk of catastrophic fire would remain high. In the event of a wildland fire exhibiting extreme behavior in these communities, the impact could be great. During the A-Rock Fire in 1990, 70 homes and other buildings and 14 vehicles in Foresta were destroyed by fire; only 18 buildings and five vehicles were left intact. This impact was adverse, long-term, and major. Similar effects would be expected in any of the other communities in the event of an extreme fire event. Potential direct effects from catastrophic fire in wildland/urban interface would include adverse, long-term, and major impacts.

Potential Indirect Effects. Potential Indirect effects would include loss of revenue in both local and regional communities, because of the closures associated with catastrophic fire. This would include loss of business activity in the gateway communities and in the park. Lost would be business at lodging, restaurants, gift shops, and various services in gateway communities and in the

park. Because of the potential for catastrophic fire in the Suppression Unit, the likelihood of having fire-related closures during the life of the plan would be high. During and following the Yosemite flood of January 1997 when the park was closed, economic impacts were estimated at an average of about $32 of lost expenditures per visitor, per day of closure. Assuming a worst case scenario of an 11 day total park closure during the peak season month of August, the economic impact would be in excess of $13 million in lost visitor expenditures in the five county area. The estimate of impact, by county is included in table 4.7. Part of these lost expenditures would be losses to county tax receipts. The greatest impact would be in Mariposa County where the loss of motel tax alone could be greater than $200,000 for an 11 day period.

Table VI.7
Estimated Distribution of Impacts upon Visitor Expenditures, by County

Worse case scenario of an 11 Day Total-Park Closure, as a Result of Large, Catastrophic Fire

County	Expenditures
Madera County (11.3% of expenditures)	$ 1,619,519
Mariposa County (56.2% of expenditures)	$ 7,613,028
Merced County (5.2% of expenditures)	$ 745,266
Mono County (18.6% of expenditures)	$ 2,665,757
Tuolumne County (8.7% of expenditures	$ 1,246,886
Total for the five counties	$ 13,890,456

Notes: Based on 37% park overnight stays, 40% local overnight stays, and 23% day use, and $45.5 per day for park overnighters, $28, 32 per day/per person for local overnighters, and $11.02 per day/per person for day users, and using 1997 dollars. Analysis based on information in: Duffield, et al 1997.

Although severe impacts would result under this scenario, a closure of this length would not likely bring about a change in social and economic environments in the five counties. Major effects would likely include short-term job loss (or reductions in hours worked) and reductions in personal income, the impact of which would be highly variable. Overall, a closure of this duration would have adverse, short-term, and moderate effects. (Note that some fire personnel would use hotels and other local services, lessening these potential effects.)

Fire Management Treatments

Managed Wildland Fire

Wildland fires would be managed in the Fire Use Unit to accomplish resource management objectives of restoring fire to ecosystems while protecting a variety of resource values. There would be risk associated with these fires, including possible escape and extreme fire behavior. However, managed wildland fire in plant communities that are within their natural range of variability would rarely present a threat of escape and property damage or loss. The effects of managed wildland fire that would more typically occur would be smoke-related impacts on local and regional communities. Smoke can affect health, visibility, or both. Because particulates in smoke can have health effects, the park would use a communication strategy to inform communities of smoke events (Appendix 4). Second, smoke can affect scenic views and the quality of the visitor experience. It is possible that some visitors would decide not to visit Yosemite because of a fire, but the numbers would not likely be large. The effects of managed wildland fire on communities would be adverse, short-term, and negligible.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). Holding actions and monitoring do not typically affect local communities. However, there is always risk associated with fire management actions, and in the event of a failed holding action, the worst case effects would be the same as described under catastrophic fire, above.

Prescribed Fire

Prescribed fire would be one of the tools used to reduce risks associated with fire in and near the wildland/urban interface (Aspen Valley, Hodgdon Meadow, El Portal, Foresta, Wawona, Yosemite Village, Yosemite West, and others). Under this alternative, approximately 1,442 acres would be burned in the park in an average year. Some of this would be to reduce risks in wildland/urban interface areas, but much of the work would be to accomplish restoration objectives and to maintain Special Management Areas, including giant sequoia groves. With the small amount of wildland/urban interface treatment that would be done annually, risk of fire to communities would not be reduced during the life of the plan.

Only about 100 acres or less of thinning would occur in this alternative. Because of this, it is doubtful that prescribed fire would effectively reduce risks in some areas. Prescribed fire in some areas (such as around Yosemite West), when applied under controlled conditions but not in combination with mechanical treatments, would not be effective at restoring forest community structure. The likelihood of being able to suppress all fires in wildland/urban interface areas would decrease further over time as forests continue to accumulate fuel. Considering the impacts of catastrophic fire to wildland/urban interface areas, the effects of prescribed fire would be locally beneficial, but overall, the risk of wildland fire would remain high. The effects of prescribed fire would be beneficial, long-term, and minor to moderate.

Prescribed fire use in wildland/urban interface areas would impact residents through smoke and site closures. During prescribed fire activities, residents and visitors would be affected through localized safety closures and equipment noise. Smoke would effect all down-wind locations in the area but most areas of the park would be unaffected. Some residents would have concerns about the smoke, while others would want the work to move forward, to provide the fire protection and ecosystem restoration benefits. Overall, these effects upon local communities would be adverse, short-term, and minor.

There are risks and uncertainty associated with implementing a successful fire management strategy that includes prescribed fire. The program attempts to do enough fuels treatment in enough places to influence wildland fire in the intended ways. The risks associated with prescribed fire and fuel treatment activity is lower than risks from wildland fire, even when one considers potential smoke emissions and escaped prescribed fires.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

These actions would not have socio-economic effects upon communities.

Fuel Reduction by Hand or Machine

Passive Reduction and Lower Profile Techniques.

Hand Cutting. Less than 100 acres of thinning would occur in wildland/urban interface areas. Though locally effective, the small number of acres treated would limit the overall effectiveness of reducing the risk of catastrophic fire. It would not be possible to bring wildland/urban interface areas back to within target conditions during the life of the plan, except on a limited, local basis. The potential for large, high-intensity wildland fires would continue to increase. Effects would be beneficial, long-term, and minor.

Pile burning. The effects of pile burning would be similar to prescribed fire effects.

Cumulative Impacts

Many projects, proposed or on-going, in the five county area would affect local communities. These projects include new lodging and visitor service projects, utility and infrastructure projects, and other projects dealing with fire, fuels, and vegetation management. Examples of reasonably foreseeable future projects that could have an effect upon visitation within the local communities include Evergreen Lodge expansion in Tuolumne County, Hazel Green Ranch in Mariposa County, Rush Creek Guest Lodging and Conference Facilities in Tuolumne County, Yosemite West Thirty-One Acre Bed and Breakfast in Mariposa County, and Yosemite Motel's proposed development in Mariposa County. These projects would provide additional facilities for visitors.

The Yosemite Motels project, for example, would add 141 new motel units, creating new hotel tax revenues and potential spending impacts from increased visitation. An additional 141 new lodging units would allow for approximately 98,000 additional visitor overnight stays per year. These additional stays would generate a net gain of approximately 5.3 million dollars per year in total (direct and secondary) visitor spending—a beneficial, long-term, and minor impact on the local economy. If new visitors are attracted to the region by the increase in lodging capacity, visitor-spending growth would be higher and the impact would be greater.

Whereas these projects would potentially bring about increases in visitation and spending growth, closures during periods of catastrophic fire would bring about short-term decreases in both visitation and spending. Considered in combination with the long-term, minor, and beneficial economic impacts of new development in the communities, the impacts of infrequent closures under Alternative A would remain adverse, short-term, and moderate.

Fire management-related projects would include A-Rock Reforestation, Aspen Fuels Reduction, Orange Crush Fuels Program, Rogge-Ackerson Fire Reforestation, the Fire Management Plan for Wilderness in Stanislaus National Forest, and others. These actions would result in effects similar to fire management activities in Yosemite, with the same types of risks. These actions would potentially reduce risks of catastrophic fire and restore resources on and near the boundaries of Yosemite. The long-term, beneficial, and moderate effects of these actions, considered in combination with the impacts of Alternative A, would result in cumulative effects in Yosemite's wildland/urban interface areas that would potentially be adverse, long-term, and moderate to major.

Conclusion

Because the potential for catastrophic fire remains high in this alternative, the risk in Alternative A for direct effects (loss of property during fires) and indirect effects (loss of business during fire-related closures) is highest among the alternatives. This is because the amount of prescribed fire and fuel treatment is not adequate to restore park forests to target conditions, especially in the Suppression Unit. As a result, the overall effect of this alternative is beneficial, long-term, and minor.

Environmental Justice

Yosemite Village, El Portal, and Hodgdon Meadows have high proportions of federal and/or concession employees. Foresta, Wawona, and Yosemite West also have residents who work for these employers, but like Aspen Valley, also have a high proportion of residents who do not work in the park—many have other residences as well. The property values vary between areas.

These communities, like the Sierra Nevada region as a whole, have a larger proportion population of Caucasians than both the state on the whole and the communities just outside the region in the San Joaquin Valley. The proportion of American Indians for the five county region is higher than the statewide population proportion.

Although the average property values vary among these wildland/urban interface areas, fire management activities have not targeted one or more of the wildland/urban interface areas as more important than others. Any differences in activity time and effort are reflective of the complexity of the work required in each area. Prescribed fire and thinning activities have historically been conducted in Aspen Valley, El Portal, Hodgdon Meadows, Foresta, Wawona and Yosemite Valley. In the last 2 years, cooperative, interagency prescribed fire activities have also been conducted Yosemite West. Under this alternative, the work would continue to focus on the most immediate risks associated with each of the wildland/urban interface areas. In that risks in each of the communities would be targeted, the effects upon minority and low-income populations in those communities would be beneficial, long-term, and minor, as are effects described under Local Communities above.

Cumulative Impacts

Cumulative effects would be the same as described under Local Communities above.

Conclusion

Prescribed fire and fuel treatment would be focused on the immediate risks associated with each of the wildland/urban interface areas. The effects upon minority and low-income populations in those communities would be beneficial, long-term, and minor.

Special Designations

Wild and Scenic Rivers

The Wild and Scenic River Act of 1968 requires agencies to protect and enhance the outstandingly remarkable values (ORV) of Wild and Scenic Rivers in Yosemite National Park and the El Portal Administrative Site. Chapter V discusses the potential for achieving this end, in light of the actions proposed in the *Yosemite Fire Management Plan*. Impacts of this alternative on river related attributes are discussed in the representative sections (for example, in watersheds, water quality and soils; plant communities and fire ecology; etc.).

Wilderness

Potential for Impacts from Catastrophic Fire

Catastrophic fire is most likely to occur in the western portion of the park, in areas that are within the Suppression Unit, and along the western margins of the Fire Use and Conditional Unit. Much of this area is not Wilderness, but fires in this area have the potential to spread into Wilderness, and affect Wilderness values. Catastrophic fires like the A-Rock Fire potentially would burn extensive areas, affecting natural resources, and possibly moving them beyond the lower limits of their natural range of variability, for plant composition/diversity, community structure, and fuel loading. The effect of these operations on wildness could be adverse, long-term, and moderate, but the

effect of catastrophic fire on naturalness would have the potential to be adverse, long-term, and major.

Fire suppression operations used to control these fires would typically include helicopters, chainsaws, and other equipment. These would be used as determined by a minimum tool analysis documented in the Fire Management Plan. Prescribed fire and wildland fire used for resource benefits would also affect Wilderness values and users, although on a much smaller scale than the effects resulting from suppression operations on catastrophic fire. In the long-term, the increased naturalness of the area due to the restoration and maintenance of a more natural role of fire would be a major benefit.

Fire Management Treatments

Managed Wildland Fire

Wildland fires would continue to burn approximately 2,567 acres per year, mostly in Wilderness. Fire in Yosemite plant communities that are within their natural range of variability would rarely result in extreme events with major effects. The typical effects of fire include blackened bark, catfaces on some trees, opening of the understory, clearing the forest floor, and the scorching of some trees—resulting in scattered kill and opening of the canopy.

As with all alternatives in the EIS for the FMP, helicopters would be used for reconnaissance, monitoring, and movement of people and supplies. Chainsaws would be used during holding actions; these would affect Wilderness character on in the short-term. Holding actions would generally be limited to instances in which fire policy or air quality regulations require such actions.

Holding actions may include water and retardant drops, construction of handline, spike camps, and helispots. Such actions will be guided by the minimum tool and minimum impact management technique philosophies. While the visual effects of the constructed handline are often in remote areas, the rare visitor to these areas have a high expectation of pristine conditions.

It is likely that Wilderness users would see the natural effects of fire as beneficial, long-term, and major on a landscape scale, and the effects of equipment use on the Wilderness experience as adverse, short-term, and minor to moderate.

Re-ignition clause. Re-ignition would not be used on this alternative.

Holding Action and Monitoring Effects (water and retardant drops, helispots, and spike camps). These actions have the potential to have short-term effects on Wilderness quality. These effects would include evidence of helispots and spike camps, and would be generally local in scale and encountered by few visitors to the backcountry. Effects would be adverse, short-term, and minor.

Prescribed Fire

Prescribed fire can be used as a tool to restore Wilderness resources. Approximately 1,442 acres would be treated with prescribed fire each year. Most of this would occur outside of Wilderness, as needed to accomplish other objectives (for wildland/urban interface and Special Management Areas, for example). Targets related to maintenance would be used in most of the Wilderness. Where prescribed fire is needed to achieve restoration targets, the effect would be beneficial, long-term, and moderate to major.

As with all the alternatives in the FMP/EIS, past fire suppression and logging have compromised both the Wilderness and naturalness of the western forests of the Yosemite Wilderness. The beneficial effects of restoring natural conditions and natural fire to an area that is otherwise at risk for unnatural, large scale catastrophic fire are long-term and major. The effects on Wilderness experience are largely the same as for wildland fire used for resource benefits, although the expanded burning season associated with prescribed fire means that the short-term effects, such as smoke, will be present for more of the year.

Site Preparation Associated with Managed Wildland Fire and Prescribed Fire (hand line, snagging, mop-up)

Minimum impact management techniques (MIMT) are used in Wilderness. However, impacts from site preparation would be visible to visitors within the immediate area. This would diminish the Wilderness character of the area, through the evidence of human activities. Other than stumps cut flush with the ground and other visible saw cuts, which would be apparent, most effects would be adverse, short-term, and minor. Debris would be scattered to reduce visual effects in Wilderness, and handlines would be obliterated.

Fuel Reduction by Hand or Machine

Aggressive Reduction Techniques. Would not occur under this alternative.

Passive Reduction Techniques.

Hand Cutting. These actions would be visible to visitors within the immediate area, but would not typically affect views on a landscape scale. Effects would be adverse, short-term, and minor.

Pile burning. This activity would have two potential effects on Wilderness resources. First, piles of stacked fuels would be visible, and would potentially diminish the Wilderness character of the area. Second, piles once burned would leave a patch of burned area that would appear unnatural. Both effects would be adverse, short-term, and minor.

With regard to Wilderness areas within Yosemite, these activities would be limited to the Wilderness area in the Wawona WUI in which prescribed fire is determined to be unsafe to use because of the proximity of private structures. Tools used in this area would be determined via the minimum tool analysis documented in the FMP. It is expected that following the mechanical removal of hazardous fuels, prescribed fire will be used to the extent practical to maintain fuel loads within target conditions.

Cumulative Impacts

Notable ecological manipulation has occurred in the Yosemite Wilderness, resulting in a significant effect on both wildness and naturalness. In addition to Native American burning and historic fire suppression already noted, large areas of the western part of the park, including part of the Wilderness, were logged in the early part of the 20th century. The Civilian Conservation Corps burned much of the slash from this logging, which reduced fuel loads, but species composition and structure were changed considerably.

Other manipulation included 19th century grazing and burning by euro-americans, fish stocking, killing of predators such as the California Grizzly, spraying of insects such as needle-miner moth, and attempted eradication of plant species such as gooseberries and poison oak. Recently, managed wildland fire and prescribed fire have had a significant effect. Ecological changes caused by fire suppression are not realized by most visitors, although the effects of major wildfires are noticed by many visitors.

The effects of past and present recreational actions on Wilderness are seen in trails, bridges, primitive structures, and campsites. These facilities have the potential to diminish the Wilderness quality to some visitors, but most depend on many of these features and tolerate their presence. Overall, their effects are adverse, long-term, and minor.

Past, present, and reasonably foreseeable actions include fire management and fuel treatment activities outside the park, many of which are national forest lands. These would include A-Rock Reforestation, Aspen Fuels Reduction, Orange Crush Fuels Program, Rogge-Ackerson Fire Reforestation, and the Fire Management Plan for Wilderness in Stanislaus National Forest. These actions would result in evidence similar to that left by fire management activities in the park—burned areas, cut stumps, rehabilitated holding lines, burned area rehabilitation work, and others. Some of these impacts would be within Wilderness. The effects would be beneficial, long-term, and moderate to major on Wilderness values.

These effects, considered in combination with the effects of Alternative A, would result in the cumulative effects on Wilderness would be beneficial, long-term, and moderate.

Conclusion

Fire management activities would affect Wilderness character in generally beneficial ways, through actions that would maintain plant communities within their natural range of variability, and thus maintain Wilderness values, especially in the Fire Use and Conditional Units. Effects in the Suppression Unit would be limited by the amount of annual fuel treatment accomplishment. Because of the likelihood of having large, high intensity, catastrophic fires that could spread into Wilderness, this alternative would continue to have a high potential for adverse, long-term, and major effects of the type that resulted from the A-Rock fire. In Wilderness, helicopter and chainsaw noises would continue to introduce short-term, intrusions, with adverse and minor to major effects.

Adverse effects on Wilderness due to the restoration of prescribed and wildland fire are outweighed by the greater benefit of returning ecosystems to a more natural condition. Overall, these effects would be beneficial, long-term, and minor to moderate. Large, high intensity catastrophic fire would effect large areas of Congressionally designated Wilderness, which is key to the natural integrity of the park and to opportunities for enjoyment of the park. This would result in adverse, long-term, major effects. The effect would potentially be that of impairment.

Energy Consumption

The energy consumption associated with fire management activities is difficult to calculate, because of the great number of variables involved, including the size and complexity of projects. Fire management activities, including monitoring managed wildland fire, prescribed fire, and hand thinning are considered in the analysis; emergency fire suppression and administrative activities are not.

Engine fuel is consumed by equipment during managed wildland fire. Aircraft, generally a helicopter, is used to monitor the fire on a daily basis, and to provide reconnaissance to anticipate fire movements. During prescribed fire operations, fuel is consumed by drip torches, engines, water tenders, and chainsaws (the latter during site preparation work). Occasionally, aerial ignition devices are used, which require the use of a helicopter. During these kinds of projects, engine crews, water tenders, ground crews with drip torches, and site preparation are still

involved. Estimates of fuel consumption are shown in table 4.8. For this analysis, it was estimated that prescribed fire would burn an average of 1,442 acres per year, generally ignited by drip torch.

Cumulative Impacts

Energy is used in many park operations. For the proposed action for the *Yosemite Valley Plan* alone, projections included an estimated reduction of 1,341,800 gallons of gasoline consumption per year, and an increase of 335,500 gallons of diesel fuel consumption (a total of 549,300 gallons of diesel fuel consumption per year by year 2015). Combined, these values represent a decrease of 1,006,300 gallons of fuel consumption per year. After this reduction, the total level of fuel consumption would be approximately 1,688,300 gallons per year, a moderate, long-term, beneficial impact. The impact of the amount of fuel consumed during fire management activities at Yosemite National Park would be adverse, long-term and negligible. The cumulative effects would remain beneficial, long-term, and moderate.

Conclusion

Energy would be consumed during fire monitoring and reconnaissance, prescribed fire operations, and fuel reduction activity. Typically, more than 9,000 gallons of various fuels would be consumed per year. The effects of the program's energy demand would continue to be adverse, long-term, and negligible.

Table IV-8
Projected Energy Consumption Under Alternative A

Fire Management Treatment	Acres Treated per year	Equipment Used	Treatment Rate or Equipment Use	Fuel Use Rate	Fuel Use
Managed Wildland Fire	2,567 in 19 fires per year	Aircraft (helicopter used in recon flights)	1 hour per recon flight; 96 recon hours per year (3 year average).	60 gallons of fuel per hour	5,760 gallons of fuel
Prescribed Fire [a]	1,442 acres, in 10 prescribed fires.	a) Drip Torches; and [OR Aerial ignition device (ignition balls and helicopter time)]	Approx. 1 acre per hour per torch, 8 acres per day in an 8 hour shift. [OR in aerial ignition, approx. 150 acres per day by aerial ignition; 2 hours flight time per day.]	Approx. 2 gallons per acre burned. [OR approx. one box (1000 balls) per 150 acres, plus 60 gallons of fuel per hour of flight time, plus ground crews.]	2,884 gallons of drip torch fuel [OR 7000 ignition balls, with approx. 840 gallons of aviation fuel; plus approx. 200 gallons drip torch fuel for ground crews.]
		b) engines	2 to 4 engines plus 1 water tender per day (3 on average), for an average of 25 days per year; 12 hour shifts.	8 miles per gallon diesel fuel, at least 50 miles out and back to station per vehicle per day.	469 gallons of diesel fuel.
		c) Chainsaws (used in prep work, on approx. 85 project acres).	Crew of saws can treat 5 acres per day.	2 gallons per day per saw; 10 gallons per crew per day.	170 gallons
		d) Chipper	Crews can treat 5 acres per day	10 gallons per day. (20 days max.)	200 gallons
Hand Cutting	100	Chainsaws	Crew with 5 saws can treat 5 acres per day.	2 gallons per day per saw; 10 gallons per crew per day	200 gallons
Total: 9683 gallons of various fuels					

a Total fuel includes drip torches, chainsaws, and trucks, not aerial ignition technique

Sustainability and Long-Term Management

Relationship of Short-Term Uses and the Maintenance and Enhancement of Long-term Productivity

This alternative would not result in new development, thus it would not take lands out of productivity as natural ecosystems. However, fires would continue to be suppressed, mostly in the Suppression Unit and to a lesser extent in the Conditional Unit. This would allow forest structure to continue to change and fuel load conditions to increase. This would be particularly true in upper and lower montane forests. This would not likely reverse under this alternative, because of the limited amount of prescribed fire project work that would be completed annually (1,442 acres per year, on average). The effects, as described under Vegetation, would include type conversion (change over time to a different vegetation type and fire regime) and other ecosystem effects. Over the long-term, there is great potential for extensive areas to be taken by catastrophic fire into early seral stages, a long-term and adverse effect. Evidence of this potential effect is the impact of the A-Rock Fire.

Irreversible or Irretrievable Commitments of Resources

This Alternative would have the highest potential of large, catastrophic fire. The trend has shown that in Yosemite and surrounding areas high-intensity fires are more frequent than they were in the past. The fire history of the park indicates that, until recently, Yosemite National Park did not sustain fires of the size of the A-Rock. In the 1990's, the park had three large, high-intensity fires: A-Rock, Steamboat, and Rogge-Ackerson.

The effects of the A-Rock Fire were long-term, adverse, and major, and represent, in a relative sense, an irretrievable commitment of resources. Under Alternative A exists the highest potential for having more fires of this intensity, because of the limited amount of fuel treatment and prescribed fire, particularly in the Suppression Unit. Future fires of this size and intensity would likely have irretrievable effects.

The giant sequoia groves would continue to be focus of fuel treatments and prescribed fire, as they have in the past. This has assisted in protecting them, but they have remained at risk, and, allowing surrounding areas to continue to degrade would increase this risk over time. The loss of the Mariposa Grove of Giant Sequoia would be considered an irretrievable loss of resources, and represent impairment, under the definition in National Park Service Management Policies 1.4.5

If burned during catastrophic fire, historic resources would be irreversibly and irretrievably lost since one cannot be reconstructed, only replaced by a similar structure which would lack the significance and integrity of the original.

Effects of managed wildland fire in the Fire Use and Conditional Units upon wildlife and other park values would not generally be considered irreversible or irretrievable, in that their effects would typically be within the natural range of variability for park ecosystems and wildlife habitat, and would be short-term. Habitat would typically become suitable to wildlife relatively quickly.

Under Alternative A, no irreversible and irretrievable commitments of resources would be associated with air quality.

Adverse Impacts that Could Not be Avoided if the Action Were Implemented

As discussed above, it would be likely that the effects of large, high intensity catastrophic fire could not be avoided, considering the amount of prescribed fire and fuel treatment work that would occur under this alternative. Treatments would attempt to restore plant community structure and reduce the risk of catastrophic fire. Implementation of this alternative would reduce the potential for adverse effects, but only in areas receiving treatment. The amount of work proposed would not be enough to restore park ecosystems. The potential for adverse effects would be greatest in upper and lower montane forests.

Generally, Alternative A would continue the practices of recent years, which would not meet the park's natural resources management objective of returning the park to its natural background conditions for air quality. The continuing risk of wildland fires consuming areas of high fuel loadings would have the attendant effect of continuing major, adverse impacts on air quality.