4. ENVIRONMENTAL CONSEQUENCES

The nature of wildland fires and their unpredictability makes it difficult to assess the potential impacts of the fires themselves or the emergency responses to those fires before they occur. For instance, the impacts of a proposed new road are easily determined by evaluating the disturbance of flora, fauna or cultural resources along the route of the proposed road. Direct impacts occur from a simple cause and effect relationship such as loss of small mammals that could not escape a wildland fire or the loss of a historical structure from wildland fire. Indirect impacts occur from secondary or higher-order relationships that act through intermediate sets of cause and effect relationships such as the loss of wildlife following the loss of habitat from a wildland fire. However, a wildland fire does not have a predetermined origin or path, that is, fires often occur as random acts of nature. In fact, the level of impact may differ depending on the intensity of the wildland fires and the level of emergency response. Therefore, this document relies on the evaluation of relative impacts more than on absolute impacts. Finally, DOE may take emergency actions to the extent necessary to contain, control, and extinguish wildland fires.[1]

At semiarid sites, such as the INEEL, wind and water erosion can contribute to surface water and groundwater pollution. Wind and water erodes soil and transports the sediment and ash to where it may be washed by subsequent rains into groundwater via deep injection wells or into surface water. Naturally occurring and manmade pollutants, such as trace metals, nutrients, pesticides, and radionuclides, may be associated with this soil potentially altering water quality. If water quality is sufficiently affected, the INEEL could exceed the standards for discharges to deep injection wells and surface water. Water quality has not been studied to document the effects of fire and fire-related activities at the INEEL. However, fire directly increases erosion by reducing vegetative cover and several fire-related activities directly increase erosion by disturbing soil. An altered fire frequency and recovery cycle increases the rate of erosion and decreases watershed stability.

Table 4-1 (see page 39) describes the potential environmental consequences of the alternative approaches to wildland fire management discussed in Section 2 on the air, water, wildlife/habitat, and cultural resources of the INEEL. The following sections compare the impact of each alternative approach on the management objectives and goals (see Section 1.4 and Appendix B) for each discipline, including whether it meets the management objectives of the INEEL Infrastructure Organization. Table 4-2 (page 46) summarizes the effect of each alternative on the management objectives of each discipline.

4.1. Alternative 1 – Maximum Fire Protection Approach

4.1.1. Air Resources

Alternative 1 would mostly meet the air resource management goals, since fire suppression and post-fire activities would meet most air quality objectives (Table 4-2 and Appendix B). However, pre-fire activities may not meet air quality objectives. Fugitive dust from these activities would likely be high relative to other alternatives because of the greater amount of activity, such as blading non-paved roads. Planning and direction from the wildland fire management committee would help mitigate some of this increased impact. Fugitive dust from fire suppression activities would likely be greater than for Alternatives 2 and 3, because of the aggressive fire suppression tactics used. However, smoke emissions from fires and subsequent dust emissions from burned areas would be smaller than for Alternatives 3 and

[1] 10 CFR 1021 states: "DOE shall consult with CEQ as soon as possible regarding alternative arrangements for emergency actions having significant environmental impacts. DOE-ID uses an environmental checklist process to determine if an activity (planned or emergency) constitutes a significant environmental impact. If there is a potential for significant impact, DOE-ID would prepare an Environmental Assessment.

4, because fires would likely be smaller. Protecting SCAs would reduce or eliminate potential for spread of radiological contamination. However, contamination levels would be unlikely to cause human health or ecological concerns (see Table 3-1). Site restoration would continue to reduce long-term fugitive dust generation from burned areas.

4.1.2. Water Resources

Alternative 1 would likely meet water resource management objectives by using aggressive fire fuel management and fire suppression, dust suppression, and site restoration with implementation of recommendations from the Wildland Fire Management Committee (Table 4-2 and Appendix B). However, Alternative 1 would likely ~~has~~ create the largest acreage of bare soil and would that be detrimental to water resources due to increased erosion from frequent soil disturbance and from invasive annual plant species that provide inferior soil stabilization when compared to native perennial vegetation. In addition, 32-ft wide unimproved roads would become increasingly deep and function as channels altering flow paths, increasing erosion, and flooding. Alternative 1 ~~would~~ could result in few unwanted fires due to aggressive fuel management.

4.1.3. Wildlife/Habitat Resources

Alternative 1 would not meet all natural resource management objectives because of pre-fire, fire suppression, and post-fire and their associated activities (Table 4-2 and Appendix B). Although wildland fire management under this alternative may protect ecological resources from wildland fire, it will not protect the unique large, ecologically continuous sagebrush ecosystem from destruction because of the direct loss of habitat and fragmentation of habitat by pre-fire activities.

Fuel Management Zones – Although it causes a direct loss of some sagebrush habitat, creating fuel management zones along improved roads and gun ranges will limit the loss of sagebrush habitat to fire. Proper fuel management in these areas can reduce the risk of a large fire by limiting access to coarse woody fuels (shrubs). The method selected to reduce fuel loads will be important to defining the extent of the direct impacts. Methods that remove all of the native perennial vegetation (blading or soil sterilization) will increase the likelihood of weed invasion. Preventing weed invasions on these fuel management zones will require expensive maintenance on an annual basis. The maintenance activities required to support these fuel management zones will also likely result in additional risks to the remaining habitat by increasing the likelihood of ignitions and also by potential for weed management to damage non-target plant species. These fuel management zones will also be at risk to soil erosion. These effects will be minimized if mowing is used to remove only the coarse woody fuels leaving the remaining native perennial plants intact.

Creating fuel management zones by blading unimproved roads to a width of 32 feet will have significant impacts to ecological resources. This activity will result in substantial habitat fragmentation in addition to the direct loss of sagebrush habitat (see Appendix C). This activity will also likely result in widespread invasion of weeds into areas where this is currently not a major concern. Preventing weed invasions on these fuel management zones will require expensive maintenance on an annual basis. The maintenance activities required to support these fuel management zones will also likely result in additional risks to the remaining habitat by increasing the likelihood of ignitions and also by potential for weed management to damage non-target plant species. These fuel management zones will also be at risk to soil erosion.

Upgrading Unimproved Roads – Upgrading unimproved roads will have both direct and indirect effects on ecological resources. Many of the listed roads are presently two-track roads. Grading them will result in direct loss of sagebrush habitat. It will also lead to habitat fragmentation (see Appendix C). Improving roads will also likely lead to increased access and use for reasons other than fire suppression. Heavier human uses of these areas will likely lead to a reduction in habitat quality and increased fragmentation effects. Improving roads will likely increase soil erosion and weed invasion.

Defensible Space – Creating defensible space around facilities will result in direct loss of habitat. These areas will also be prone to weed invasion and soil erosion as described above (see Appendix A). Mowing rather than blading firebreaks ~~will have~~ has fewer effects on ecological resources. This would be the preferred approach to providing protection near facilities and the primary paved roads.

Prescribed burning, if conducted properly, can have little impact to ecological resources. However, prescribed burning can put large areas of sagebrush steppe habitat at risk. This risk should be assessed separately for each prescribed fire.

Fire Suppression Activities – Fire suppression activities can also have direct and indirect impacts to ecological resources. The primary direct effects are caused by construction of containment lines. These effects are by direct loss of the vegetation on those sites and the increased likelihood of invasion by weeds (see Appendix A). Prominent among the weeds likely to invade is cheatgrass. Cheatgrass invasion increases the probability of fire ignition, because of the increase in fine fuels, and also increases the rate of fire spread. Containment lines can also result in habitat fragmentation (see Appendix C). However, it must be noted that construction of containment lines and firebreaks are important tools for controlling fire. The alternative to using these tools is an increased risk of larger fires that remove more sagebrush habitat.

Using backfires and burning large pockets of unburned vegetation will result in substantial loss of additional habitat.

Use of foam from the wildland heavy units and aerial fire retardant drops likely have little negative impact on ecological resources. Larson et al (1999) concluded that neither Phos-Check nor Silv-Ex had any disruptive effect on Great Basin shrub steppe vegetation communities. They cautioned, however, that their results did not address potential long-term impacts not seen in their one-year long study.

The use of water cannons to protect facilities will likely have little direct effect on ecological resources. However, care should be taken to minimize the potential for erosion. Use of the water cannons should be discontinued immediately after the fire danger has ended. Extended use can result in increased soil erosion and/or weed invasion. Application of soil tackifiers for post-fire dust control will likely have lesser ecological impacts than continued irrigation.

Fire suppression and pre-fire activities can have long-term impacts on ecological resources. Fuel management zones and containment lines create corridors that would have direct and indirect impacts to the ecosystem by changing the habitat characteristics from a continuous shrubland to a shrublands interspersed by grasslands. Construction of these corridors could also lead to soil degradation, edge effects, erosion, and invasion of undesirable species including non-native or exotic animals and plants (see Appendix C).

Direct and Indirect Impacts – Habitat fragmentation leads to increasing edge effects, loss of species diversity, alterations in natural disturbance regimes, and alterations in ecosystem functioning (Caling and Adams 1999). Increased edges can result in microclimatic changes in light, temperature, wind, humidity, and incidence of fire. Each of these effects can have a significant impact upon the number and kind of species associated with the edge.

Habitat fragments differ from original habitat in two important ways: 1) fragments have a greater amount of edge for the area of habitat, and 2) the center of each fragment is closer to the edge (Primack 1998). These changes are not beneficial to sagebrush obligates.

Changes in the microenvironment at the fragment edge can result from habitat fragmentation. Some of the more important edge effects include microclimate changes in light, temperature, wind, humidity, decreased soil moisture, and incidence of fire (Shelhas and Greenberg 1996; Laurance and Bierregaard 1997; Reed et al. 1996). Each of these edge effects can have a significant impact upon the vitality and composition of species in the fragment and increased wind, lower humidity, and higher temperatures make fires more likely (Primack 1998). Edges produced by roads and fire lines can also increase nest parasitism by brown-headed cowbirds. Brown-headed cowbirds, the only obligate brood parasite in North America, feed primarily in open areas, but use perches to watch for nest building activities. Edge habitats are perfect for their needs (Brittingham and Temple 1983) and brood parasitism increases on edges and in fragmented habitats (Belthoff and Rideout 2000).

In shrub-steppe ecosystems, invading weeds, which were usually non-mycorrhizal, disrupted succession of native species, 99% of which were mycorrhizal –dependent. Also, fires have become more common and extensive in sagebrush ecosystems invaded by cheatgrass (Natural Resources Defense Council 2001). Presence of cheatgrass along edges (fire lines and roads) may allow it to invade burned patches, increasing the likelihood of fire spread into adjacent sagebrush patches, further fragmenting the ecosystem (Knick and Rotenberry 1997).

Disturbances such as fire and roads can increase the distance between remaining shrub patches that provide seed sources (Knick and Rotenberry 1997). The dominant shrub on the INEEL, big sagebrush, does not resprout from crown or roots following fire (Young and Evans 1978). Thus, natural regeneration of these shrublands could be severely limited by availability and dispersion of seed sources. Dispersal of sagebrush is primarily wind driven and occurs largely within 30-m of the seed source (Young and Evans 1989).

The direct impacts to wildlife and habitat resources that would result from the implementation of this alternative include habitat loss and habitat fragmentation. Direct impacts would include the immediate death of individual plants and animals that reside in the areas where fuel management zones and containment lines would be placed. Disturbance of soil will also increase erosion and invasion by non-native vegetation. Additional edges resulting from present fire suppression activities could increase nest parasitism from brown-headed cowbirds and increase nest predation from predators that commonly use corridors, such as coyotes.

Indirect impacts would be those that reduce a population over time due to the change in ecological resources. The loss of resources impacts populations by increasing competition for resources and predation or parasitism. Creating corridors impacts the area by reducing the resource that provides nesting, foraging, and protection cover as well as potentially enhance the habitat for undesired species. Corridors also could result in the separation of populations by creating corridors with pre-fire and fire suppression activities, resulting in potential isolation and weakening of the gene pool.

This alternative may also cause the reduction or elimination of some species. Pre-fire and fire suppression activities would result in increased habitat and resource reduction over time due to the relatively slow recovery time of the sagebrush steppe ecosystem from disturbance. This will result in increased fragmentation impacts such as reduction in habitat, edge effects, fire suppression of plant and animal dispersal, increased erosion, increased invasion by non-native or more competitive species (resulting in the elimination or reduction of native but less competitive species), and potential reduction in genetic diversity.

Threatened and Endangered Species – Several species listed as species of concern by the FWS could be impacted severely or eliminated if long-term destruction of habitat results from pre-fire and fire suppression activities. These species include the sage grouse, pygmy rabbit, Merriam's shrew, long-

billed curlew, northern sagebrush lizard, ferruginous hawk, loggerhead shrike, and painted milkvetch. There is potential that any of these species could be listed by the FWS as Threatened or Endangered ~~on~~ under the ESA, which would require habitat recovery. As pre-fire and fire suppression fragmentation and habitat destruction increases over time, it will be much more difficult and costly to restore viable habitat.

The FWS has indicated[1] concerns about several plants and animals that may occur on the INEEL (see Table 3-2). Although these species have no status under the ESA, FWS is concerned about their population status and threats to their long-term viability. In context with ecosystem-level management, the FWS suggests that these species and their habitats be considered in project planning and review.

~~Due to the large number of "species of concern" on the INEEL (see Table 3-2) and the FWS suggestion that these species and their habitats be considered in project planning and review (see Section 3.4), it is recommended that the U. S. FWS be asked for consultation regarding the management of these species and their habitat on the INEEL if Alternative 1 is selected. Such a consultation will provide insight on species and habitat management, which will be critical if any of these species become listed under the ESA. This consultation will also minimize impacts to these species and their habitats during wildfire pre-fire, fire suppression, post-fire and rehabilitation.~~

Wildland Fire Management Committee – The impact of many of the effects described above could be reduced through appropriate planning by the Wildland Fire Management Committee. This would include consideration of these impacts when designing the pre-fire activities and proper rehabilitation of areas impacted by fire suppression activities (post-fire).

4.1.4. Cultural/Historical Resources

Alternative 1 would not meet all cultural resource objectives (Table 4-2 and Appendix B). Activities described in Section 2.1 (see Table 2-1), such as blading, sterilizing, mowing and prescribed burning are more extensive under this alternative than Alternatives 2, 3, or 4, and would thus disturb more surface area. Unimproved road mileage identified for vegetation removal (16 ft from the middle of the road to each side) totals 126 miles under Alternative 1, while Alternatives 2, 3 and 4 have no vegetation removal planned along any non-paved roads. In addition, firebreak construction as described under Alternatives 1 and 4 (Table 2-1, "Indirect Tactic") have the potential to adversely affect the contextual information of cultural resources by bisecting sites, churning under or damaging cultural resources. Application of MISTs under Alternative 2 would reduce the potential of adverse affects to cultural resources by limiting soil disturbance, with Alternative 3 identified as the most benign alternative with no firebreaks proposed.

However, under Alternative 1 advanced planning and coordination by a Wildland Fire Management Committee would allow for the development of mitigation and management plans that would contribute to the identification, evaluation and protection of cultural resources as required by federal law. Conducting cultural resource surveys before creating firebreaks and mowing, minimizing disturbance of soil from heavy equipment operation and vehicular travel in general, and cultural resource site avoidance as a form of preferred mitigation could be practiced under this alternative. A Wildland Fire Management Committee is not proposed for either Alternative 3 or 4, but is included under Alternative 2.

4.2. Alternative 2 – Balanced Fire Protection Approach

4.2.1. Air Resources

[1] Letter from Snake River Basin Office, USFWS to Roger Blew, September 1, 2001; Department of Energy, Idaho National Engineering and Environmental Laboratory Species List Update; 1-4-01-SP-1118/Updates #1-4-01-SP-826/506.0000

Alternative 2 would mostly meet the air resource management goals since pre-fire and post-fire activities would meet all air quality objectives, and fire suppression activities would meet most air quality objectives (Table 4-2 and Appendix B). Planning and direction from the wildland fire management committee would help minimize impact from pre-fire actions. Smoke and post-fire dust emissions could exceed those of Alternative 1, since fires would be fought with less aggressive tactics, such as using MIST. Site restoration would reduce long-term fugitive dust, including post-fire radiologically contaminated dust, should the SCA burn. Even if that occurs, downwind spread of the very low-level radiological contamination is unlikely to cause human health or ecological concerns (see Table 3-1).

4.2.2. Water Resources

Alternative 2 would most effectively meet water resource management objectives by using aggressive fuel management, soil stabilization, MIST, dust suppression, and site restoration (Table 4-2 and Appendix B). Alternative 2 likely has the least pollutant exposure from soil sterilants, herbicides, and fire-inhibiting chemicals. Alternative 2 would result in few unwanted fires due to aggressive fuel management. In addition, Alternative 2 would protect water quality because of stable soil condition.

4.2.3. Wildlife/Habitat Resources

Alternative 2 would meet most natural resource management objectives (Table 4-2 and Appendix B). Wildland fire management under this alternative should protect ecological resources from pre-fire, fire suppression, and post-fire activities through mitigation strategies and MIST.

Fuel Management Zones – The impacts from creating fuel management zones is the same as Alternative 1, except there would be no impacts along unimproved roads since Alternative 2 would not create fuel management zones along unimproved roads (see Section 4.13). This difference means that there would be fewer acres of direct habitat loss and less habitat fragmentation.

Upgrading Unimproved Roads – Upgrading unimproved roads so that they are passable, at a minimum, by 4X4 vehicles will have lesser impacts than those described for Alternative 1. Many of the listed roads are presently two-track roads and for the most part are passable by 4X4 vehicles. Further improvement of these roads will also likely lead to increased access and use for reasons other than fire suppression. Heavier human uses of these areas will likely lead to a reduction in habitat quality and increased fragmentation effects.

Defensible Space – The impacts from creating defensible space is the same as Alternative 1, except there would be no impacts from prescribed burning since Alternative 2 would not use prescribed burning as a method to create defensible space. In addition, there would be little impact associated with creating defensible space around SCAs, since this alternative would protect only two SCAs (see Section 4.1.3).

Fire Suppression Activities – The impacts associated with fire suppression activities are the same as Alternative 1 (see Section 4.1.3) with the exception of the addition of MIST.

Direct and Indirect Impacts – The direct and indirect impacts are the same as Alternative 1, except Alternative 2 includes the use of MISTs (see Section 4.1.3). The incorporation of MIST into the fire suppression activities would lessen the impacts of the emergency response to some fires. For example, the use of cold trailing rather than blading containment lines results in less soil disturbance, decreased likelihood of weed invasion, reduced habitat fragmentation and edge effects. It also greatly decreases the need for site restoration.

Threatened and Endangered Species – The impacts to T&E species is the same as Alternative 1 (see Section 4.1.3) except for the use of MIST and the impacts related to the pre-suppression construction of

the firebreaks. Construction of the firebreaks ~~will~~ would result in a direct loss and fragmentation of sagebrush steppe habitat.

Wildland Fire Management Committee – The benefits of ~~putting together~~establishing a Wildland Fire Management Committee are the same as Alternative 1 (see Section 4.1.3).

4.2.4. Cultural/Historical Resources

Alternative 2 would not meet all of the cultural resource objectives (Table 4-2 and Appendix B). However, following MIST would reduce damage to cultural resources and minimize contextual loss by limiting the amount of soil to be disturbed. No vegetation removal along unimproved roads is proposed under Alternative 2, 3 or 4, but is extensive under Alternative 1 (126 miles). In addition, Alternative 1 proposes conducting prescribed burns to eliminate excessive fuel loads, an activity that may adversely affect cultural resources if off-road vehicular travel occurs, while Alternatives 2, 3 and 4 do not propose prescribed burning. During fire suppression activities under Alternative 2, tactics such as minimization of width and depth of containment lines, cold-trail tactics, and most importantly, the use of existing roads as containment lines, greatly reduces the potential to damage cultural resources (MIST).

Alternative 2, as in Alternative 1, allows for advanced planning and coordination by a Wildland Fire Management Committee for the development of mitigation and management plans that would contribute to the identification, evaluation and protection of cultural resources as required by federal law. As in Alternative 1, conducting cultural resource surveys before creating firebreaks and mowing, minimizing disturbance of soil from heavy equipment operation and vehicular traffic in general, limiting the width and depth of containment lines, integrating containment lines into existing natural breaks (such as lava outcrops, ridges) and cultural resources site avoidance as a preferred form of mitigation could be practiced under this alternative.

4.3. Alternative 3 – Protect Infrastructure and Personnel Safety Approach

4.3.1. Air Resources

Alternative 3 would not meet most air resource management goals, since fire suppression and post-fire activities would not meet air quality objectives (Table 4-2 and Appendix B). Only pre-fire activities would meet air quality objectives because they can be planned and carried out under controlled conditions to minimize impacts to air quality.

Emissions from fires and subsequent dust emissions from burned areas would likely be larger and longer in duration than for the other alternatives. Fugitive dust from equipment operations during fire suppression activities would likely be the lowest relative to the other alternatives, since ground disturbance occurs only at threatened facilities. Under Alternative 3, SCAs would not be protected. Therefore, the potential for downwind spread of radiological contamination during and after a fire through an SCA would be larger than for Alternatives 1 and 2. However, contamination levels would be unlikely to cause human health or ecological concerns (see Table 3-1).

4.3.2. Water Resources

Alternative 3 would not meet water resource management objectives because fire suppression activities would allow for frequent, and large wildland fires leading to increased soil erosion, weed infestation, and loss of watershed stability (Table 4-2 and Appendix B). Therefore, Alternative 3 would have the greatest impact to water resources of all the alternatives.

4.3.3. Wildlife/Habitat Resources

Alternative 3 would not meet all natural resource management objectives because of fire suppression activities. Wildland fire management under this alternative ~~will~~ would not protect ecological resources from unwanted fire and could result in large areas of sagebrush habitat burned. In addition, pre-fire activities are limited to areas immediately surrounding threatened facilities; therefore, short-term impacts would be less. However, long-term impacts from the loss of habitat site-wide could result in long-term impacts to the vegetation and wildlife.

Fuel Management Zones – Creating fuel management zones around facilities will result in direct loss of habitat. These areas ~~will~~ would also be prone to weed invasion and soil erosion as described above (see Appendix A). Mowing rather than blading firebreaks ~~will have~~has fewer effects on ecological resources. This would be the preferred approach to providing protection near facilities and the primary paved roads.

Upgrading Unimproved Roads – Upgrading unimproved roads is not part of this alternative.

Defensible Space – The impacts associated with creating defensible space are the same as Alternative 1, except, there would be not impacts from protecting SCAs.

Fire Suppression Activities/Direct and Indirect Impacts – The greatest difference between this alternative and the others is that there is no goal of containing the fire. As such, creating containment lines is not part of this alternative. Because no containment lines are created, many of the concerns over habitat fragmentation, creation of new corridors, and edge effects are not important considerations in this alternative. Not creating containment lines also means that the potential for invasion by non-native plants is greatly reduced, as is the need for restoration. However, the direct loss of sagebrush habitat due to uncontained wildland fire could be a significant impact of this alternative.

Threatened and Endangered Species – The impacts to T&E species is the same as Alternative 1 (see Section 4.1.3).

Wildland Fire Management Committee – This alternative does not consider using a Wildland Fire Management Committee, thus there would be no benefits as described in previous alternatives.

4.3.4. Cultural/Historical Resources

Alternative 3 in many ways meets all of the cultural resources objectives (Table 4-2 and Appendix B). Damage caused by pre-fire management and fire suppression activities, such as containment line and firebreaks, grading, blading, mowing, grubbing, and re-seeding or off-road travel is greatly reduced or eliminated; thus Alternative 3 would result in the least disturbance to soil and cultural resources. While this alternative does not utilize MIST in conjunction with fire suppression activities, these suppression activities would be restricted to gun range and facility perimeters only, as opposed to the 890 square miles of INEEL acreage that could be affected by activities proposed under Alternatives 1, 2 and 4.

4.4. Alternative 4 – No Action or Traditional Fire Protection Approach

4.4.1. Air Resources

Alternative 4 would not meet most air resource management goals (Table 4-2 and Appendix B). Fire suppression and post-fire activities would not meet air quality objectives, because MIST would not be used for suppression, and no restoration of burned sites would be conducted. Only pre-fire activities would meet most air quality objectives. Fugitive dust from pre-fire activities would likely be less than for Alternative 1, but some practices, such as improving unimproved roads, would result in increased dust emissions over Alternatives 2 and 3. ~~Fugitive dust would likely be greatest for this alternative.~~ Additionally, SCAs would not be protected under Alternative 4. Therefore, the potential for downwind

spread of radiological contamination during a fire would be greater than that for Alternatives 1 and 2; and similar to Alternative 3. H~~h~~owever, contamination levels would be unlikely to cause human health or ecological concerns (see Table 3-1).

4.4.2. Water Resources

Alternative 4 would not meet water resource management objectives due to poor fuel management and lack of site restoration (Table 4-2 and Appendix B). The following impacts would contribute to the overall impact to water resources: (1) loss of watershed stability due to soil erosion and invasive plants; (2) increasing difficulty achieving soil stabilization with vegetation; (3) degradation of water quality due to soil sedimentation; (4) reduced capacity of wastewater facilities due to soil sedimentation; (5) degradation of groundwater due to increased sediment and ash concentrations in storm water discharges to deep injection wells; and (6) clogged ditches, culverts, and channels due to soil sedimentation increasing the potential for ice dam formation, causing flooding and contact between water and sources of pollution such as outdoor material and equipment storage areas.

4.4.3. Wildlife/Habitat Resources

Alternative 4 would not meet all natural resource management objectives because of fire suppression and its associated activities (Table 4-2 and Appendix B). Wildland fire management under this alternative may protect ecological resources from wildland fire, but will not protect resources from pre-fire and fire suppression activities.

Fuel Management Zones – The impacts from creating fuel management zones is the same as Alternative 1, except it should be noted that compared to Alternatives 1 and 2, the fuel management zones along the paved roads would only extend to 10 ft. rather than up to 300 ft. and are, therefore less likely to be as effective at confining a fire to the area adjacent to the road.

Upgrading Unimproved Roads – Upgrading unimproved roads is not part of this alternative.

Defensible Space – The impacts associated with creating defensible space are the same as Alternative 1, except, there would be not impacts from protecting SCAs and there would be no impacts from prescribed burning ~~would~~ since this alternative would not use prescribed burning as a method to create defensible space.

Fire suppression Activities – The impacts associated with fire suppression activities are the same as Alternative 1, except there would be no impacts from backfires since backfires would not be part of this alternative (see Section 4.1.3).

Direct and Indirect Impacts – The direct and indirect impacts are the same as Alternative 1 (see Section 4.1.3).

Threatened and Endangered Species – The impacts to T&E species is the same as Alternative 1 (see Section 4.1.3).

Wildland Fire Management Committee – This alternative does not consider using a Wildland Fire Management Committee, thus there would be no benefits as described in ~~previous a~~Alternatives 1 and 2.

4.4.4. Cultural/Historical Resources

Alternative 4 would most likely result in the most damage to cultural resources because of the lack of opportunity for planned mitigation before fire suppression activities (that is, no Wildland Fire Management Committee); thus, it does not meet cultural resource goals (Table 4-2 and Appendix B). Impacts from pre-fire, fire suppression, and post-fire activities, such as firebreak and containment lines and off-road travel, would be greater than for all other alternatives, and no damage assessments or site restoration activities are proposed under this alternative.

Table 4-1. Summary of environmental impacts comparing alternatives for wildland fire management activities on air, water, wildlife/habitat, and cultural/historical resources of the INEEL.

Wildland Fire Management Strategies			
Maximum Fire Protection Approach Alternative 1	**Balanced Fire Protection Approach Alternative 2**	**Protect Infrastructure and Personnel Safety Approach Alternative 3**	**No Action – Traditional Fire Protection Approach Alternative 4**
Air Resources			
Pre-Fire Activities • Fugitive dust from mowing vegetation, blading unimproved roads, fuel management along unpaved roads, firebreaks around facilities and SCAs, and smoke emissions from prescribed burning.	**Pre-Fire Activities** • Fugitive dust from mowing vegetation or blading around facilities to create defensible space and to manage fuel around buildings and along roadways. Less impact than Alternative 1.	**Pre-Fire Activities** • Fugitive dust from mowing vegetation or blading around facilities to create defensible space. Less impact than Alternatives 1, 2, and 4.	**Pre-Fire Activities** • Fugitive dust from mowing or blading around facilities, and maintaining unimproved roads. Less impact than Alternatives 1 and 2.
Fire Suppression Activities • Fugitive dust from double-blade containment lines and road blading activities. • Small and/or short-duration smoke plume from wildland fires. • Small risk of downwind radioactive contamination.	**Fire Suppression Activities** • Fugitive dust from containment lines; less impact than Alternative 1. • Small and/or short-duration smoke plume from wildland fires; greater impact than Alternative 1. • Small risk of downwind radioactive contamination, but greater than for Alternative 1.	**Fire Suppression Activities** • Fugitive dust would likely be small because soil-disturbing activities restricted to just around facilities. • Large and/or long-duration smoke plume from wildland fire, thus likely degrading air quality. • Downwind spread of radioactive contaminants may occur.	**Fire Suppression Activities** • Same as Alternative 1.
Post-Fire Activities • Fugitive dust from wildland fires and restoration activities. • Small risk of downwind radioactive contamination.	**Post-Fire Activities** • Fugitive dust from fire scars and restoration could be greater than for Alternative 1 because fires may be larger due to less aggressive fire suppression. Larger risk than Alternative 1 of spread of radioactive contamination.	**Post-Fire Activities** • Dust from larger burned areas, and risk of spread of radioactive contamination highest of all alternatives.	**Post-Fire Activities** • Dust from unrestored burned areas greater than alternatives 1 and 2. • Risk of spread of radioactive contamination similar to Alternative 2.
Water Resources			
Pre-Fire Activities • ~~Exposure~~ Release ~~of pollutants from~~ of chemicals to the environment during soil sterilization and weed treatment ~~for~~ of defensible space. • Water use during irrigation. • Ongoing soil erosion from bare soil for defensible space and separation of fuel zones. • Ongoing soil erosion from 32-ft wide unimproved roads. • Ongoing soil erosion from upgrading 84 miles of unimproved roads. • Soil erosion following prescribed burns from firebreaks, containment lines, and burned acreage.	**Pre-Fire Activities** • ~~Exposure~~ Release of chemicals to the environment ~~pollutants~~ during soil sterilization and weed treatment for defensible space. • Water use during irrigation. • Temporary soil erosion from establishing stabilized defensible space. • Temporary soil erosion from upgrading and stabilizing impassable segments of unimproved roads. • Soil erosion following prescribed burns from firebreaks, containment lines, and burned acreage.	**Pre-Fire Activities** • ~~Exposure~~ Release of chemicals to the environment ~~pollutants~~ during soil sterilization and weed treatment for defensible space. • Water use during irrigation. • Ongoing soil erosion from bare soil for defensible space and separation of facilities from fuel zones. • Soil erosion following prescribed burns from firebreaks, containment lines, and burned acreage.	**Pre-Fire Activities** • ~~Exposure~~ Release of chemicals to the environment ~~pollutants~~ during soil sterilization and weed treatment for defensible space. • Water use during irrigation. • Ongoing soil erosion from bare soil for defensible space, separation of fuel zones, and emergency access. • Soil erosion following prescribed burns from firebreaks, containment lines, and burned acreage.
Fire Suppression Activities • ~~Exposure~~ Release of chemicals to the environment ~~pollutants~~ during use of fire-inhibiting chemicals. Foams can interfere with the ability of	**Fire Suppression Activities** • ~~Exposure~~ Release of chemicals to the environment ~~pollutants~~ during use of fire-inhibiting chemicals; however, avoidance of use within 300	**Fire Suppression Activities** • ~~Exposure~~ Release of chemicals to the environment ~~pollutants~~ during use of fire-inhibiting chemicals near facilities only.	**Fire Suppression Activities** • ~~Exposure~~ Release of chemicals to the environment ~~pollutants~~ during use of fire-inhibiting chemicals.

Table 4-1. Summary of environmental impacts comparing alternatives for wildland fire management activities on air, water, wildlife/habitat, and cultural/historical resources of the INEEL.

Wildland Fire Management Strategies			
Maximum Fire Protection Approach Alternative 1	**Balanced Fire Protection Approach Alternative 2**	**Protect Infrastructure and Personnel Safety Approach Alternative 3**	**No Action – Traditional Fire Protection Approach Alternative 4**
gills to absorb oxygen, causing fish to die. Retardants can cause sufficient ammonia concentration to be lethal to fish and aquatic organisms. • Potential ~~exposure~~ release of chemicals to the environment ~~pollutants~~ during emergency response on unstable roads, fueling, and equipment failure. • Water use to suppress fire. • Disturbance of waterway by response vehicles and from loading water tankers. • Soil erosion from 24-ft wide deep containment lines and firebreaks potentially in waterways, draws, and steep terrain.	ft of waterways. • Potential ~~exposure~~ release of chemicals to the environment ~~pollutants~~ during fueling and equipment failure. • Water use to suppress fire. • Soil erosion from narrow shallow containment lines and firebreaks with avoidance of waterways, draws, and steep terrain.	• Potential ~~exposure~~ release of chemicals to the environment ~~pollutants~~ during fueling and equipment failure. • Water use to suppress fire near facilities only. • Soil erosion from 24-ft wide deep containment lines and firebreaks near facilities only.	• Potential ~~exposure~~ release of chemicals to the environment ~~pollutants~~ during emergency response on unmarked unstable roads, fueling, and equipment failure. • Water use to suppress fire. • Disturbance of waterway by response vehicles and from loading water tankers. • Soil erosion from 24-ft wide deep containment lines and firebreaks potentially in waterways, draws, and steep terrain.
Post-fire Activities • ~~Exposure~~ Release of chemicals to the environment ~~pollutants~~ for ~~minimal~~ weed treatment during restoration. • Water use to suppress dust. • Soil erosion from wide deep containment lines and firebreaks until restoration is successful. • Erosion if grazing is not curtailed.	**Post-fire Activities** • ~~Exposure~~ Release of chemicals to the environment ~~pollutants~~ for weed treatment during restoration. • Water use to suppress dust. • Temporary soil erosion from narrow shallow containment lines and firebreaks until restoration is successful. • Short-term soil erosion due to traffic from replacing power poles. • Erosion if grazing is not curtailed. • Short-term soil erosion due to installation of erosion and sediment controls such as mulch, check dams, and snow fences.	**Post-fire Activities** • Water use to suppress dust. • Long-term soil erosion from containment lines and firebreaks near facilities only. • Short-term soil erosion due to traffic from replacing power poles. • Erosion if grazing is not curtailed.	**Post-fire Activities** • Water use to suppress dust. • Long-term soil erosion from containment lines and firebreaks that are not restored and become trails. • Short-term soil erosion due to traffic from replacing power poles. • Erosion if grazing is not curtailed.
Wildlife/Habitat Resources			
Pre-Fire Activities • Blading unimproved roads to a width of 32 ft would have significant impacts to ecological resources, such as: o Habitat fragmentation o Direct loss of habitat o Increase in weed invasion o Increase in maintenance of unimproved roads; thus, increasing potential impact on wildlife. • Blading firebreaks and creating disc lines around facilities would result in (see Appendix A): o Direct loss of habitat	**Pre-Fire Activities** • Creation of fuel management zones would result in some direct loss of some sagebrush habitat. • Prescribed burning, if not properly controlled, can lead to additional habitat loss. • Converting the fuel management zones to more fire resistant vegetation could have additional impacts due to soil disturbance increasing the risk of weed invasion and putting the sagebrush habitat nearby at risk to encroachment by non-native vegetation~~Creating greenstrips by converting the fuel management zones to more~~	**Pre-Fire Activities** • No fuel management along improved roadways means there is no reduction in the risk of fires burning large areas adjacent to roads. • Creating defensible space around facilities results in a direct loss of habitat. Using paving or gravelling would require that annual weed control and other maintenance be performed. Blading firebreaks around facilities would result in direct loss of habitat, weed invasions, and indirect impacts that reduce a native plant population over time due to the change in ecological resources.	**Pre-Fire Activities** • Mowing a 5 to 10-ft wide strip along paved roadways would have little affect on reducing the risk of fires burning large areas adjacent to roads. • Creating defensible space around facilities results in a direct loss of habitat. Using paving or gravelling would require that annual weed control and other maintenance be performed. Blading firebreaks around facilities would result in direct loss of habitat, weed invasions, and indirect impacts that reduce a population over time due to the change in ecological resources.

Table 4-1. Summary of environmental impacts comparing alternatives for wildland fire management activities on air, water, wildlife/habitat, and cultural/historical resources of the INEEL.

Wildland Fire Management Strategies			
Maximum Fire Protection Approach Alternative 1	**Balanced Fire Protection Approach Alternative 2**	**Protect Infrastructure and Personnel Safety Approach Alternative 3**	**No Action – Traditional Fire Protection Approach Alternative 4**
o Weed invasion o Indirect impacts that reduce a population over time due to the change in ecological resources. • Mowing vegetation in remote areas of site such as along unimproved roads would result in substantial habitat loss and fragmentation. • Prescribed burning, if not properly controlled could lead to additional habitat loss. • Improving unimproved roads by blading to a width of 32 ft would have both direct and indirect effects on ecological resources such as (see Appendix C): o Direct loss of sagebrush habitat o Fragmentation of habitat o Increased access and use for reasons other than fire suppression, likely leading to heavier human use of these areas and the potential to reduce habitat quality and increased fragmentation effects. • Creating defensible space around facilities results in a direct loss of habitat. Using paving or gravelling would require that annual weed control and other maintenance be performed. Blading firebreaks around facilities would result in direct loss of habitat, weed invasions, and indirect impacts that reduce a population over time due to the change in ecological resources. • Species of concern could be impacted severely or eliminated if long-term destruction of habitat continued. • Sterilization of bare soil and other weed control actions may leave these areas prone to increased erosion, and weed invasion if sterilization program is discontinued.	~~fire resistant vegetation (such as crested wheatgrass) could have additional impacts due to soil disturbance increasing the risk of weed invasion and putting the sagebrush habitat nearby at risk to encroachment by crested wheatgrass~~. • Creating defensible space around facilities results in a direct loss of habitat. However, defensible space would only be used around two SCAs, ARA-23 and BORAX-02. • Maintenance of unimproved roads would result in direct impacts, but would be limited to small areas.		• Species of concern could be impacted severely or eliminated ~~if~~ with the long-term destruction of habitat. • Sterilization of bare soil and other weed control actions may leave these areas prone to increased erosion, and weed invasion if sterilization program is discontinued.
Fire Suppression Activities • Construction of containment lines and emergency firebreaks would result in the direct loss of the vegetation on those sites and the increased likelihood of invasion by weeds, such as cheatgrass (see Appendix A). • Indirect impacts of suppression may reduce	**Fire Suppression Activities** • Same kinds of impacts as Alternative 1; however, using MIST would decrease the level of impact.	**Fire Suppression Activities** • Construction~~s~~ of emergency firebreaks around threatened structures would result in some loss of vegetation on those sites. • Long-term wildlife and habitat loss from not fighting wildland fires; thus, potentially resulting in large losses of sagebrush habitat (see	**Fire Suppression Activities** • Same as Alternative 1.

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Wildland Fire Management Strategies			
Maximum Fire Protection Approach Alternative 1	**Balanced Fire Protection Approach Alternative 2**	**Protect Infrastructure and Personnel Safety Approach Alternative 3**	**No Action – Traditional Fire Protection Approach Alternative 4**
populations over time, due to the change in ecological resource. • Cheatgrass invasion on unrestored containment lines increase the probability of fire ignition. • Fragmentation of habitat (see Appendix C). • Burnouts may result in substantial loss of additional habitat. • Species of concern could be impacted severely or eliminated by long-term destruction of habitat (see Table 3-2).		Appendix C).	
Post-fire Activities • The actions that could be implemented by the Wildland Fire Management Committee ~~would~~ could reduce the long-term impacts due to the wildland fire and fire suppression activities.	**Post-fire Activities** • Same as Alternative 1.	**Post-fire Activities** • Little or none, since restoration activities would be limited to immediately around threatened facilities.	**Post-fire Activities** • Long-term wildlife and habitat loss from not restoring firebreaks, containment lines and other soil disturbing activities.
Cultural/Historical Resources			
Pre-fire Activities • Roadside mowing of 10- to 300-ft along improved roadways, including approach roads to facilities, and around all INEEL gun ranges in undisturbed and unsurveyed terrain has the potential to adversely affect cultural resources, especially features such as fire rings, hunting blinds, cairns, or historic structural remains. • Mowing vegetation, creating disc lines, and the blading of firebreaks along unimproved roads and facility perimeters could result in: o Destruction of prehistoric and historic sites, trails, and landscape features o Increased access to prehistoric and historic sites and other cultural features, resulting in the potential for increased looting or unauthorized visitation to cultural resource sites o Alteration of landscape features, such as, but not limited to, traditional cultural places. • Prescribed fires have the potential to adversely affect cultural resources if off-road vehicular travel occurs, or if firebreaks are built to contain the burn. In addition, a prescribed burn could damage or destroy combustible material found in	**Pre-fire Activities** • Roadside mowing of 10- to 300-ft along improved roadways, including approach roads to facilities, and around all INEEL gun ranges in undisturbed and unsurveyed terrain has the potential to adversely affect cultural resources, especially features such as fire rings, hunting blinds, cairns, or historic structural remains. • Installation of new irrigation systems could have an adverse impact on cultural resources. • Paving, graveling, mowing or blading previously undisturbed areas in order to provide defensible space has the potential to adversely affect cultural resources and could result in: o Loss of contextual site information o Destruction or degradation of prehistoric and historic sites, trails and landscape features. • Disturbing unimproved roads may impact a road or trail that has historic origins such as T-1, a portion of the Oregon Trail (Goodale's Cut Off), which is considered historic and is nominated to the National Register of Historic Places. • Creating firebreaks around SCAs has a high potential to adversely affect cultural resources and could result in:	**Pre-fire Activities** • Mowing and sterilization of established facility perimeter areas to maintain a 30-ft defoliated zone on previously undisturbed soil. • In areas without an established perimeter, blading to clear the ground of all vegetation has the potential to adversely affect cultural resources through: o Loss of contextual site information during ground disturbing activities o Destruction or degradation of prehistoric and historic sites, trails and landscape features. • Construction of firebreaks around vulnerable structures using dozers, graders and discs has a high potential to adversely affect cultural resources through: o Destruction or degradation of prehistoric and historic sites, trails and other features, resulting in a loss of contextual information o Increased access resulting in the potential for looting or unauthorized visitation to cultural resource sites o Alteration of landscape features, such as, but not limited to, traditional cultural places.	**Pre-fire Activities** • Mowing a greater than 5-ft strip along both sides of highways and other major improved roads would have the potential to adversely affect cultural resources, especially features such as fire rings, hunting blinds, cairns, or historic structural remains. • Weed removal by mechanical means, such as blading or chaining, has the potential to adversely affect cultural resources and could result in: o Loss of contextual site information o Destruction or degradation of prehistoric and historic sites, trails and landscape features. • Prescribed fires have the potential to adversely affect cultural resources if off-road vehicular travel occurs, or if firebreaks are built to contain the burn. In addition, a prescribed burn could damage or destroy combustible material found in historic-era archaeological sites and adversely alter the results of protein residue, radiocarbon, or obsidian hydration testing. Other effects of fire could include erosion of archaeological deposits on slopes destabilized by the loss of vegetation. • Creating firebreaks around SCAs and along unimproved roads have a high potential to

Table 4-1. Summary of environmental impacts comparing alternatives for wildland fire management activities on air, water, wildlife/habitat, and cultural/historical resources of the INEEL.

Wildland Fire Management Strategies			
Maximum Fire Protection Approach Alternative 1	**Balanced Fire Protection Approach Alternative 2**	**Protect Infrastructure and Personnel Safety Approach Alternative 3**	**No Action – Traditional Fire Protection Approach Alternative 4**
historic-era archaeological sites and adversely alter the results of protein residue, radiocarbon, or obsidian hydration testing. Other effects of fire could include erosion of archaeological deposits on slopes destabilized by the loss of vegetation. • Use of grazing animals to control vegetation could have the potential to adversely impact cultural resource sites. Trampling and churning of fragile desert soils can cause destruction or degradation of prehistoric and historic sites, trails and landscape features and result in a loss of contextual site information. • Installation of new irrigation systems could have an adverse impact on cultural resources. • Paving, graveling, mowing or blading previously undisturbed areas in order to provide defensible space has the potential to adversely affect cultural resources and could result in: o Loss of contextual site information o Destruction or degradation of prehistoric and historic sites, trails and landscape features. • Maintenance of unimproved roads may include ground-disturbing activities, such as blading, which could adversely affect cultural resources. In addition, disturbing unimproved roads may impact a road or trail that has historic origins such as T-1, a portion of the Oregon Trail (Goodale's Cut Off), which is considered historic and is nominated to the National Register of Historic Places. • Creating firebreaks around SCAs and along unimproved roads have a high potential to adversely affect cultural resources and could result in: o Destruction or degradation of prehistoric and historic sites, trails and other features, resulting in a loss of contextual information o Increased access resulting in the potential for looting or unauthorized visitation to cultural resource sites o Alteration of landscape features, such as, but not limited to, traditional cultural places.	o Destruction or degradation of prehistoric and historic sites, trails and other features, resulting in a loss of contextual information o Increased access resulting in the potential for looting or unauthorized visitation to cultural resource sites o Alteration of landscape features, such as, but not limited to, traditional cultural places.		adversely affect cultural resources and could result in: o Destruction or degradation of prehistoric and historic sites, trails and other features, resulting in a loss of contextual information o Increased access resulting in the potential for looting or unauthorized visitation to cultural resource sites o Alteration of landscape features, such as, but not limited to, traditional cultural places

Table 4-1. Summary of environmental impacts comparing alternatives for wildland fire management activities on air, water, wildlife/habitat, and cultural/historical resources of the INEEL.

Wildland Fire Management Strategies			
Maximum Fire Protection Approach Alternative 1	**Balanced Fire Protection Approach Alternative 2**	**Protect Infrastructure and Personnel Safety Approach Alternative 3**	**No Action – Traditional Fire Protection Approach Alternative 4**
Fire Suppression Activities • Construction of containment lines (by indirect, direct or parallel attack) and off-road travel of fire-fighting equipment could result in: o Destruction of prehistoric and historic sites, trails, and landscape features o Increased access to prehistoric and historic sites and other cultural features, resulting in the potential for increased looting or unauthorized visitation to cultural resource sites o Alteration of landscape features, such as, but not limited to, traditional cultural places o Loss of contextual site information due to vegetation rehabilitation. • Backfires could potentially adversely affect cultural resources by: o Using off-road vehicular travel to start these fires o Damaging or destroying combustible material found in historic-era archaeological sites and adversely alter the results of protein residue, radiocarbon, or obsidian hydration testing o Increasing erosion of archaeological deposits on slopes destabilized by the loss of vegetation. • Off-road travel, which is considered to be a ground disturbing activity, for hose line application of water has the potential to adversely affect cultural resources by degrading or destroying prehistoric and historic sites, trails and other landscape features, resulting in a loss of contextual information.	**Fire Suppression Activities** • Same as Alternative 1.	**Fire Suppression Activities** • Construction of firebreaks (up to 24 ft by blade) and off-road travel by fire-fighting equipment around vulnerable structures and equipment could result in: o Destruction of prehistoric and historic sites, trails, and landscape features o Increased access to prehistoric and historic sites and other cultural features, resulting in the potential for increased looting or unauthorized visitation to cultural resource sites o Alteration of landscape features, such as, but not limited to, traditional cultural places o Loss of contextual site information due to vegetation rehabilitation. • Off road travel, which is considered to be a ground disturbing activity, for hose line application of water has the potential to adversely affect cultural resources by degrading or destroying prehistoric and historic sites, trails and other landscape features, resulting in a loss of contextual information.	**Fire Suppression Activities** • Same as Alternative 1.
Post-fire Activities • Fire restoration activities, such as soil stabilization and revegetation, have the potential to adversely affect cultural resources, Adverse impacts to cultural resources could result in: o Destruction of prehistoric and historic sites, trails, and landscape features o Increased access to prehistoric and historic sites and other cultural features, resulting in	**Post-fire Activities** • Same as Alternative 1.	**Post-fire Activities** • None.	**Post-fire Activities** • When no restoration actions are planned, cultural resources could be adversely impacted by wind and water erosion, especially when construction of firebreaks, containment lines, and off-road vehicular traffic are the initial impacting agents. These adverse impacts could result in: o Destruction of prehistoric and historic sites, trails, and landscape features

Table 4-1. Summary of environmental impacts comparing alternatives for wildland fire management activities on air, water, wildlife/habitat, and cultural/historical resources of the INEEL.

Wildland Fire Management Strategies			
Maximum Fire Protection Approach Alternative 1	**Balanced Fire Protection Approach Alternative 2**	**Protect Infrastructure and Personnel Safety Approach Alternative 3**	**No Action – Traditional Fire Protection Approach Alternative 4**
the potential for increased looting or unauthorized visitation to cultural resource sites o Alteration of landscape features, such as, but not limited to, traditional cultural places o Loss of contextual site information due to vegetation rehabilitation.			o Increased access to prehistoric and historic sites and other cultural features, resulting in the potential for increased looting or unauthorized visitation to cultural resource sites o Alteration of landscape features, such as, but not limited to, traditional cultural places o Loss of contextual site information due to vegetation rehabilitation.

ARA **Auxiliary Reactor Area**
BORAX **Boiling Water Reactor Experiment**
INEEL **Idaho National Engineering and Environmental Laboratory**
SCA **Soil Contamination Areas**

Table 4-2. Evaluation matrix for natural resource objectives across alternatives – a relative comparison (see Appendix C).

Natural Resources Objectives / Alternatives	Maximum Fire Protection Approach Alternative 1	Balanced Fire Protection Approach Alternative 2	Protect Infrastructure and Personnel Safety Approach Alternative 3	No Action – Traditional Fire Protection Approach Alternative 4
Air Resources				
Minimize pre-fire dust generation	1	2	2	2
Minimize dust generation during fire suppression activities	1	2	2	1
Minimize smoke from fires	3	2	0	2
Minimize post-fire windstorm-generated dust	3	2	0	2
Minimize potential for burning SCAs and releasing contamination to air	3	2	0	2
If SCAs burn, minimize spread of contamination post-fire.	3	3	0	3
Air Resource Total	**14**	**13**	**4**	**12**
Water Resources				
Reduce risk of large frequent fire	3	2	0	0
Minimize pollutant exposure	1	3	1	0
Minimize erosion	1	3	1	0
Protect water utilities	3	2	0	0
Comply with standards and regulations	2	3	0	0
Use fiscal resources efficiently	1	3	1	0
Water Resource Total	**11**	**16**	**3**	**0**
Wildlife / Habitat Resource				
Limit the size of wildland fires	3	2	0	0
Promote a return to natural fire cycle and landscape-scale ecosystem diversity	2	2	0	0
Eliminate the need for rehabilitation following fire suppression	1	2	3	0
Protect threatened, endangered, and sensitive species and their habitat	1	2	1	2
Protect sage grouse and other sagebrush-obligate species and their habitat	0	1	0	1
Prevent habitat loss and habitat fragmentation	1	2	2	0
Maintain a large undeveloped sagebrush steppe ecosystem	0	2	0	0
Maintain plant genetic diversity	~~2~~1	~~2~~3	~~2~~1	2
Protect unique ecological research opportunities	0	3	2	1
Prevent invasion of non-native species including noxious weeds	~~2~~0	2	~~2~~1	1
Wildlife / Habitat Resource Total	**~~12~~9**	**~~20~~21**	**~~12~~10**	**7**

Table 4-2. Evaluation matrix for natural resource objectives across alternatives – a relative comparison (see Appendix C).

Natural Resources Objectives / Alternatives	**Maximum Fire Protection Approach Alternative 1**	**Balanced Fire Protection Approach Alternative 2**	**Protect Infrastructure and Personnel Safety Approach Alternative 3**	**No Action – Traditional Fire Protection Approach Alternative 4**
Cultural Resources				
Reduce disturbance of cultural resources	2	2	2	2
Demonstrate an effective balance between ongoing DOE missions and programs and cultural resource preservation and enhancement	2	3	1	2
Respond to existing executive orders, federal, state, and DOE mandates for historic preservation	2	3	1	2
Provide guidance on regulatory compliance to decision makers early in the fire suppression planning process	2	3	1	2
Cultural Resource Total	**8**	**11**	**5**	**8**
Grand Total	**~~45~~42**	**~~60~~61**	**~~24~~22**	**27**

These evaluations are based on the ability to meet the management goals and objectives presented in Table B-1. The higher the value, the better the alternatives meet the management objective.
3 Fully meets the natural resource management objectives
2 May meet natural resource management objectives with implementation of objective-specific recommendations.
1 May meet natural resource management objects, but may cause other impacts (e.g., firebreaks reduce fire size but increase fragmentation).
0 Does not meet the natural resource management objectives.