Appendix B

Supplemental Information

B-1: Burn Intensity and Severity Definitions

B-2: Vegetation Cover Types

B-3: Beshta Report: Response to Concerns

Appendix B-1: Burn Intensity and Burn Severity[1]

Burn Intensity: This is the effect of fire on vegetation. The degree of burn intensity depends on litter and duff depth, slope, burning conditions, and fuels. It generally relates to the proportion of vegetation blackened or consumed. Intensity affects residual ground cover, hydrologic calculations, hydrophobicity of the ash layer, regrowth of surface-seeded grasses, and regrowth of trees dependent on cone-based seeds.

- High burn intensity: Wildfire produced intense heat that blackened greater than 90% of all trees and consumed all ground vegetation; some black needles occur in the ash; remnants of cones, needles and grass crowns occur in the ash layer. many crowns have brown needles; small fuels (branches, needles, shrub stems) remain, but are blackened. All surface plants are dead. Standing burned trees are blackened and snags are charcoaled. In areas burned in 1988 (in the Brewer Fire) most medium fuels on the ground have been consumed.

- Medium burn intensity: This is a mosaic of canopy burn, surface burn, and unburned area. On the average 10% to 90% of the tree canopy has burned. There is a patchwork of unburned and surface-burned forest floor vegetation. Standing trees are blackened partway up the trunk, but not charcoaled.

- Low burn intensity: This is a mosaic of unburned and burned vegetation in forested areas.

Burn Severity: This is an effect of fire on the ecosystem, primarily concerned with soils. It is only loosely correlated to burn intensity, since some highly intense fires may be of such a duration that soil is largely un-heated, whereas some surface burns may severely affect soils because of extended heating by burning litter and duff. Litter and duff depth, antecedent soil moisture, soil texture, and slope can also affect soil heating. Severity affects hydrophobicity (water repellency) as well as the regrowth of shrubs and grasses dependent on sub-surface sprouting.

- High Burn Severity: Deep ground char occurs where the duff is completely consumed and the top of the mineral soil is visibly reddish or orange. Color below 1 cm is darker or charred from organic material. Downed logs are consumed or deeply charred. All shrub stems are consumed. Hydrophobicity can extend up to 5 cm in depth. Lethal temperatures can extend to 10 cm. Infiltration potential can be lessened, and erosion potential can be significantly increased. Roots and rhizomes may be killed and revegetation is delayed.

- Moderate Burn Severity: Litter is consumed and the duff is deeply charred. The underlying mineral soil surface is altered only in terms of darkening. Lethal temperatures occur down to depths of 5 cm. Hydrophobicity is limited to the surface 2.5 cm of soil. Roots and rhizomes will resprout within 3 years. Infiltration is reduced and erosion potential may be increased in the short run.

- Low Burn Severity: Litter is partially consumed. Soil is normal color. Lethal temperatures occur down to depths of 1 cm. Hydrophobicity occurs to 1 cm. Root crowns and surface roots will resprout quickly (within two years). Infiltration and erosion potential is not significantly changed.

[1] Source: Kraft Springs BAER Report, pg. 6-7

Appendix B-2: Vegetation Cover Types

Project Area Pre-Existing Condition

TSMRS Classification Label	Cover Type	Tentative Suitability	Tree Size DBH	Canopy Closure %	Acres	Percent Project Area	Percent Ponderosa Pine Area
111	Ponderosa Pine	Suitable	0 – 4.9”	<10	6274	9	17
112	Ponderosa Pine	Suitable	0 – 4.9”	10 - 39	895	1	2
113	Ponderosa Pine	Suitable	0 – 4.9”	40 - 69	162	<1	<1
114	Ponderosa Pine	Suitable	0 – 4.9”	70+	21	<1	<1
211	Ponderosa Pine	Unsuitable	0 – 4.9”	<10	6692	10	18
212	Ponderosa Pine	Unsuitable	0 – 4.9”	10 - 39	9	<1	<1
213	Ponderosa Pine	Unsuitable	0 – 4.9”	40 - 69	45	<1	<1
121	Ponderosa Pine	Suitable	5.0 – 8.9”	<10	378	<1	1
122	Ponderosa Pine	Suitable	5.0 – 8.9”	10 - 39	235	<1	<1
123	Ponderosa Pine	Suitable	5.0 – 8.9”	40 - 69	144	<1	<1
124	Ponderosa Pine	Suitable	5.0 – 8.9”	70+	31	<1	<1
221	Ponderosa Pine	Unsuitable	5.0 – 8.9”	<10	237	<1	<1
222	Ponderosa Pine	Unsuitable	5.0 – 8.9”	10 - 39	105	<1	<1
223	Ponderosa Pine	Unsuitable	5.0 – 8.9”	40 - 69	132	<1	<1
131	Ponderosa Pine	Suitable	9.0 “ +	<10	1520	2	4
132	Ponderosa Pine	Suitable	9.0 “ +	10 - 39	4210	6	11
133	Ponderosa Pine	Suitable	9.0 “ +	40 - 69	5836	9	16
134	Ponderosa Pine	Suitable	9.0 “ +	70+	1172	2	3
231	Ponderosa Pine	Unsuitable	9.0 “ +	<10	1504	2	4
232	Ponderosa Pine	Unsuitable	9.0 “ +	10 - 39	3624	5	10
233	Ponderosa Pine	Unsuitable	9.0 “ +	40 - 69	1763	3	5
234	Ponderosa Pine	Unsuitable	9.0 “ +	70+	48	<1	<1
141	Ponderosa Pine	Suitable	0 – 4.9” 9.0”+	<10	363	<1	1
142	Ponderosa Pine	Suitable	0 – 4.9” 9.0”+	10 - 39	466	<1	1
143	Ponderosa Pine	Suitable	0 – 4.9” 9.0”+	40 - 69	845	1	2
144	Ponderosa Pine	Suitable	0 – 4.9” 9.0”+	70+	102	<1	<1
241	Ponderosa Pine	Unsuitable	0 – 4.9” 9.0”+	<10	148	<1	<1
242	Ponderosa Pine	Unsuitable	0 – 4.9” 9.0”+	10 - 39	145	<1	<1
300	Aspen				331	<1	
310	Juniper				76	<1	
320	Cottonwood				4	<1	
330	Green Ash				779	1	
900	Water				9	<1	
910	Scoria/Sandstone				2523	4	
920	Dry Grassland				25237	38	
930	Wet Grassland				935	1	
Totals					**67,000**	**100.00**	**100.00**

Appendix B-3 Beshta Report: Response to Concerns

How The Kraft Springs Project Addresses the Recommendations of Beschta et al. (1995)

Introduction

One of the main issues the Kraft Springs Interdisciplinary considered in evaluating management of the Kraft Springs Fire Area is the management of fire-killed trees in the recovering forest. The focus of this deliberation was on the reduction of future fuels hazard and the recovery of the economic value of the fire killed timber while still maintaining the productivity and health of the forest and range. In 1998, the Brewer Fire burned much of the Long Pines administrative unit. Fire killed trees were left on the Brewer Fire and many on the Sioux Ranger District who were present on the Kraft Springs fire believe that the standing snags and downed fuel load contributed substantially to the intensity and spread of the fire. Recent studies (Brown, In Press) describe that:

"Large woody fuels have little influence on spread and intensity of the initiating surface fire in current fire behavior models; however, they can contribute to development of large fires and high fire severity. Fire persistence, resistance-to-control, and burnout time (which affects soil heating) are significantly influenced by loading, size, and decay state of large woody fuel."

Brown continues with:

"Torching, crowning and spotting, which contribute to large fire growth, are greater where large woody fuels have accumulated under a forest canopy and can contribute to surface fire heat release."

However, as the IDT worked to develop plans to reduce future fire hazard and recover the economic value of the fire killed trees, there was considerable discussion and planning to develop project design criteria to ensure that the project would not severely impact the burned landscape.

Several authors, and Beschta (1995) in particular, have noted that post fire salvage activities can have detrimental impacts to a recovering fire area. Based on considerable academic experience, the authors of Beschta et al (1995) provide their opinions on this issue in the form of general principles and recommendations. The authors present their suggested policy principles and land management recommendations as generally applicable to federal lands throughout the western United States, or at least the Upper Little Missouri Watershed. They are not focused on the specific ecological, social, and economic characteristics of the post-fire conditions of the Kraft Springs Fire. Moreover, the authors do not consider the multiple-use goals, objectives and standards of the Custer National Forest Land Management Plan. Thus, the Kraft Springs IDT must consider the authors' suggested principles and recommendations in the context of the specific post-fire conditions and Forest Plan management direction of the Custer National Forest Land Management Plan.

To address the issues raised in Beschta et al. (1995) and by others, the Sioux Ranger District on the Custer National Forest convened an interdisciplinary team with a wide variety of resource expertise in soils science, wildlife biology, hydrology, botany, silviculture, fire behavior, economics, engineering, and others.

The interdisciplinary team's task was to identify and evaluate ecological, social, and economic issues, including those raised by the authors of Beschta et al. (1995), associated with management needs addressed in the environmental analysis. Unlike the authors of Beschta et al. (1995), the team's task was to evaluate these issues in the specific context of the post-fire conditions on the Kraft Springs Fire area and the multiple-use goals and objectives of the Custer National Forest Land Management Plan. The results of their work are documented in the Kraft Springs Environmental Analysis and the project file.

This paper summarizes how their work addresses the issues raised by Beschta et al (1995). It focuses on the Beschta et al (1995) recommendations pertaining to post-fire practices since that is the subject of the actions proposed with the Post Fire Vegetation and Fuels Management Project.

In the remainder of this summary, all quotes from Beschta et al. (1995) are presented in ***bold italicized font*** to distinguish statements by the authors of Beschta et al. (1995) from other portions of this discussion.

Recommendations on Post Fire Practices

Salvage logging should be prohibited in sensitive areas.

> ***Logging of sensitive areas is often associated with accelerated erosion and soil compaction (Marston and Haire 1990), and inherently involves the removal of large wood that in itself has multiple roles in recovery. Salvage logging may decrease plant regeneration, by mechanical damage and change in microclimate. Finally, logging is likely to have unanticipated consequences concerning microhabitat for species that are associated with recovery, e.g., soil microbes. Salvage logging by any method must be prohibited on sensitive sites, including:***
>
> - ***In severely burned areas (areas with litter destruction),***
> - ***On erosive sites,***
> - ***On fragile soils,***
> - ***In roadless areas,***
> - ***In riparian areas,***
> - ***On steep slopes,***
> - ***On any site where accelerated erosion is possible.***

The potential impacts of management activities on these sensitive sites are important considerations in this environmental analysis. Federal laws and regulations, the Administrative Rules of Montana, and the Custer National Forest Land Management Plan provide authoritative direction to ensure that management activities on these sites do not result in unacceptable impacts to soil and water resources.

It is well understood that the harvest and yarding of trees may lead to increased erosion, soil compaction, loss of down wood, and soil fauna. However, the extent to which these effects occur depends upon a variety of factors such as specific site conditions, the methods used, the timing of these activities, and their duration. In other words, not all harvest and yarding methods have the same impacts, and the potential impacts of particular harvest and yarding methods depend upon where and under what conditions they are used. Land management agencies and logging contractors continue to develop and implement innovative methods for minimizing and avoiding these and other potential effects of post-fire logging. Depending on local site conditions, some harvest and yarding methods can be conducted at particular times of the year and for limited duration, resulting in very little impact to erosion rates, soil compaction, soil fauna, and sediment production. In addition, land managers can prescribe the amount of large wood left on site to achieve various objectives including erosion control, soil productivity, nonsymbiotic nitrogen fixation, mycorrhizal fungi functions, and wildlife habitat.

All of the action alternatives are designed to avoid or mitigate potential impacts of timber harvest on sensitive areas. The following characteristics of the action alternatives are responsive to the recommendations from Beschta et al. (1995):

- All stream channels will utilize at least a 50-foot streamside buffer zone. Activity areas adjacent to stream channels where slopes are steep would have wider buffers applied as follows:

Table 1: Recommended stream buffer widths by slope.

Slope of Mechanical Activity Unit Adjacent to Stream Channel	Buffer Distance (feet)
Less than 15%	50
Between 15% and 30%	50 on Mixed Commercial, 100 on Black Commercial
Greater than 30%	100

- Coarse woody debris would be left in amounts consistent with recommendations for dry pine type forests (Graham et al, 1994)

- Best Management Practices will be used on all timber harvest and road management activities, and monitored.

The design of all of the action alternatives is based upon a thorough consideration of the recommendations provided by Beschta et al. (1995) regarding salvage logging in sensitive areas. The environmental analysis addresses the potential impacts of timber harvest and yarding on soils. The environmental analysis also describes the effects of post-fire logging on erosion and watershed functions. All action alternatives utilize streamside buffers in riparian areas.

The environmental analysis evaluates the potential for action alternatives to accelerate erosion and increase sediment delivery to streams. On a watershed scale, the effects to stream channels and aquatic habitats are largely a function of the amount of the watershed's area that is disturbed. For concerns such as water yield/peak flow increases and sediment inputs to the next largest watershed, it is appropriate to analyze at a watershed scale.

Proposed harvest will only impact approximately 5% of the affected watersheds. Since the amount of disturbance is so small, the action alternatives will not have an appreciable affect on water or sediment yield at the watershed scale.

High percentages of burned area can produce water and sediment yield increases and make watersheds sensitive to further increases. Published literature indicates that watersheds with more than 25% vegetation removal begin to show increases in water and sediment yield (Bosch and Hewlett 1982; Troendle and Kaufmann 1987). The burned area will no doubt increase fine sediments entering stream channels. On a watershed scale, however, the effect will be proportionate to the area disturbed.

At a local scale, sediment can enter streams and have an adverse effect on aquatic resources. The likelihood of sediment entering streams at this scale is a function of the proximity to the stream of the activity, the type of activity being conducted, and the level of successful mitigation applied.

McIver and Star (2000) have reviewed available published literature on the effects of post-fire logging operations. The few complete studies on watershed response suggest that effects depend on specific features of burned stands and the harvest methods used. The next three paragraphs summarize their findings.

Stand characteristics that influence watershed response to logging include intensity of the burn, slope, and soil texture and composition. Erosion tended to be accelerated by increases in both burn intensity and slope angle. An important contributor to erosion was the combination of intense fire and coarse soils, because soil hydrophobic layers form most easily under these conditions. In general, erosion rates on logged areas were higher than un-logged control areas, although in some studies the woody residue from logging provided a mitigating effect.

A main determinant of post-fire erosion rates was logging method. Tractor skidding over bare ground created the highest percentage of soil disturbance (36%), followed by cable skidding (32%), tractor skidding over snow

(9.9%), skyline (2.8%), and helicopter (0.7%). In general, disturbance from various logging systems in burned areas parallels that seen in unburned stands. Sediment yield from post-fire logging were relatively short term in several studies (3 to 4 years to return to pre-treatment levels), but elevated sediment levels were apparent for longer terms on some sites.

McIver and Star (2000) felt literature on post-fire logging effects was very limited. Many studies have not been replicated, discouraging the application of results beyond specific sites and conditions. Whether local operations produce the effects seen in published studies depends on site and fire characteristics, manner of implementation, and mitigation effectiveness.

Harvest effects of the proposed alternatives are expected to follow those seen in various published studies of burned and green area logging. Tractor logging can be expected to result in a low level of erosion, tapering off to pre-disturbance levels in 5 to 10 years after partial-cut treatments. If the major fire and post-fire logging effects are limited to increases in sediment and water temperatures, available literature suggests that recovery of biotic communities to a pre-disturbance status would evolve as sedimentation from fires and harvest decrease, and as shade increases. Project design features described in chapters 2 and 3 are intended to limit harvest effects to the lowest intensity and shortest duration possible, and therefore offer the least possible contribution to overall effects, and the least hindrance to biotic and stream systems recovery. Past watershed improvements have also aided in long-term recovery by reducing chronic inputs of fine sediments to these same systems. Confounding factors that could increase effects or slow watershed recovery after fire and logging are likely limited to improperly applied harvest methods, debris flow events, landslides, or severe drought.

For all the action alternatives, the design of the activity, and the application of Best Management Practices (BMPs) would reduce or eliminate threats to decreases in watershed conditions that might occur from proposed activities. Implementation of an action alternative complies with the National Forest Management Act requirement to "insure that timber will be harvested from National Forest System lands only where soil, slope, or other watershed conditions will not be irreversibly damaged." The action alternatives are consistent with Custer National Forest Land Management Plan standards for soil and watershed protection, and will not irreversibly damage soil, slope or watershed conditions. It also complies with Forest Service Manual guidelines to limit detrimental soil compaction to less than 15 percent of an activity area.

In sum, while the action alternatives may not completely comport with the broad, rather absolutist recommendation suggested by the authors of Beschta et al. (1995), they will minimize potential short-term impacts resulting from vegetation management activities.

On portions of the post-fire landscape determined to be suitable for salvage logging, limitations aimed at maintaining species and natural recovery processes should apply.

> ***Dead trees (particularly large dead trees) generally have multiple ecological roles in the recovering landscape including providing habitat for a variety of species, and functioning as an important element in biological and physical processes (Thomas 1979). In view of these roles, salvage logging must:***
>
> - ***Leave at least 50% of standing dead trees in each diameter class.***
> - ***Leave all trees greater than 20 inches dbh or older than 150 years.***
> - ***Generally, leave all live trees.***

Alternative 2 proposes the most tree removal. Approximately 2 - 6 snags per acre will be left in harvest units, and all live trees will remain unless they interfere with the safety of the logging operation. All of the other action alternatives remove less than this amount. All harvest units will leave a minimum of 10 – 15 tons per acre of coarse woody debris on the ground.

The interdisciplinary team explored the ecological roles of snags such as habitat for some bird species and mammals, variable microclimates, and forest insect population dynamics. The fish and wildlife habitat value of snags and coarse woody debris, and the effects of alternatives on snag and coarse woody debris habitat are discussed the environmental analysis sections addressing soils and wildlife.

The authors of Beschta et al (1995) provide no rationale for their specific quantitative recommendations for leaving at least 50% of standing dead trees in each diameter class, and leaving all trees greater than 20 inches dbh or older than 150 years. The action alternatives provide for the retention of snags and coarse woody debris within harvest units based upon a consideration of the biophysical environments of the Kraft Springs Fire area and the ecological context of the forest conditions after the fire.

After the timber harvest activities from any one of the action alternatives are completed, there will still be more standing dead trees, distributed over a greater area, than has been historically known within the Long Pines administrative unit. As a result, it seems reasonable to conclude that the amount and pattern of dead trees on the Kraft Springs Fire area will be sufficient to provide for their **"multiple ecological roles in the recovering landscape including providing habitat for a variety of species, and functioning as an important element in biological and physical processes,"(Thomas 1979), and (Beschta et al. 1995).**

Because of soil compaction and erosion concerns, conventional types of ground-based yarding systems (tractors and skidders) should be generally prohibited. New equipment or techniques may be suitable where it can be demonstrated that soil integrity will be protected, that is, where acceleration of soil erosion and increased soil compaction can be demonstrated not to occur, and where there is no impairment of hydrologic and biological soil integrity. Helicopter logging and cable systems (particularly those that provide partial or full suspension) using existing roads and landings may be appropriate as may be horse logging; however, even these methods are not without potential problems and could locally increase runoff and sediment. Therefore, they must be actively monitored and avoided where sedimentation is already a major problem for salmonids or other sensitive aquatic species. Any activity that disturbs litter layers or soil surface horizons, either pre- or post-fire, can accelerate soil erosion and sediment delivery to aquatic systems.

The Kraft Springs Project environmental analysis specifies site design measures for local ground conditions rather than only by logging technique Site conditions will require minimal soil disturbance in accordance with requirements specified in the Custer National Forest Land Management Plan. Woody debris will be reduced to no less than 10-15 tons per acre of residual wood to provide organic matter recycling, and protection for regeneration and small game habitat.

Ground-based harvest and yarding equipment is limited to areas outside of riparian areas for all units. To further reduce the potential of sediment reaching streams and impacting aquatic systems, a 50-foot buffer will be implemented along all stream in areas treated for hazardous fuels reduction.

Because of the wide range of chronic ecological effects associated with roadbuilding, the building of new roads in the burned landscape should be prohibited.

> ***Roads are associated with a variety of negative effects on aquatic resources, including disruption of basin hydrology and increased chronic and acute sedimentation. Under no circumstances should new roads be introduced into sensitive areas, including roadless or riparian areas. Outside of these areas, road building should be avoided except where new road construction may be necessary to complete a larger program of partial or complete road obliteration. In such instances, offsetting benefits must be demonstrated. These may include cases in which a new road segment has been demonstrated to be necessary to enable obliteration of other roads that cause significant potential or existing adverse environmental effects.***

None of the action alternatives include any permanent road construction. Alternative 2 would result in the construction of temporary roads; Alternative 3 would not construct any new roads- specified or temporary. Once project activities are completed, these temporary roads would be re-contoured and re-vegetated. Temporary roads will avoid riparian areas and only enter where absolutely necessary to cross a stream channel or where local conditions require short distances of construction parallel to the stream channel.

Active reseeding and replanting should be conducted only under limited conditions.

> ***In general, active planting and seeding has been shown to advance regeneration and most often creates an entirely new, exotic flora. In addition, reseeding is associated with additional problems and costs. Therefore, such practices should be employed only where there are several years of evidence that natural regeneration is not occurring. For example, native species from regional stocks that may enhance fire resistance of a site may be planted if the effect is not to homogenize the landscape, (e.g., alder in southwestern Oregon and Northern California).***
>
> ***Introduction of non-native species or exotic genotypes of native species should be prohibited from all reseeding/replanting programs. Seeding grasses into burned forests has been shown to disrupt recovery of native plants and is likely to create more problems than it solves. (Amaranthus et al 1993). The use of pesticides, herbicides, and fertilizers should generally be prohibited. Spot-specific hand application of herbicides only for the removal of exotics may occasionally be considered if these is evidence that such action is likely to lead to long term reclamation of the site.***

Tree planting would only occur if natural regeneration does not occur for all of the action alternatives. The alternatives considered in the Kraft Springs Burned Area Emergency Rehabilitation report do not recommend the application of any pesticides or herbicides. Kraft Springs project will comply with the Forest's Noxious Weed Control Program existing at the time of project implementation.

Noxious weed infestations are known to occur throughout the burned area. These sites have had past annual monitoring and herbicide treatment. No aerial spraying is proposed in the burn area. It is anticipated that noxious weed monitoring and treatments will occur into the foreseeable future. Landings created for the project will likely be seeded and treated for noxious weeds. Continued weed monitoring and control is considered in all alternatives.

Structural post-fire restoration is generally to be discouraged.

> ***Frequently, post-fire restoration efforts involve the installation of hard structures including sediment traps, fish habitat alterations, bank stabilization, hay bales, weirs, check dams, and gabions. Such hard structures are not generally modeled or sited on the basis of natural processes, and their ability to function predictably may be particularly low in dynamic post-fire landscapes. Hard structures have high rates both of failure and of unanticipated side effects. Therefore, structures are generally an undesirable and unsuccessful method for controlling adverse environmental impacts.***
>
> ***Sediment management should focus on reducing or eliminating anthropogenic sources prior to their initiation (e.g., improve stream crossings to prevent culvert failure), and protecting and maintaining natural sediment control mechanisms in burned landscapes, particularly the natural recruitment of large woody debris on hillslopes and in streams. The goal should be to reestablish the natural post-fire background quality, quantity, and timing of sediment, including the presence of large woody debris, and this level should be considered the baseline.***

None of the alternatives considered in the environmental analysis include the installation of "hard structures including sediment traps, fish habitat alterations, bank stabilization, hay bales, weirs, check dams, and gabions." None of the alternatives include other fish habitat structures or sediment control structures of the types listed by the authors of Beschta et al. (1995).

Approximately 186 miles of existing roads are located within the fire area. Poor road construction techniques, poor location or placement of roads and inappropriate road design contributed to past sediment entry into area streams. Road restoration projects are being proposed for the road system. These include gravel surfacing and road template adjustments where roads are judged to be contributing to sediment to streams. Post fire rehabilitation included adding water bars, adding ditch lining materials, adding culverts, and conducting road maintenance to reduce sediment reaching streams from existing roads.

Suppression efforts on the Kraft Springs Fire included 149 miles of fire line, most of which was constructed using dozers. During the implementation of these methods, local resource advisors worked closely with division supervisors to ensure that placement of the lines did not increase the likelihood of sediment transport and erosion. All fireline construction was followed up with rehabilitation following suppression of the fire and prior to snowfall. Fireline rehabilitation included pulling debris and sod back into the line. The logs, stumps, and rock brought back into the fireline has ensured that firelines will not become new travel ways for humans, livestock, or motorized vehicles.

Post-fire management will generally require reassessment of existing management.

> ***For example, the condition of a transportation system (i.e., pre-existing roads and landings) should be reassessed after a fire. By increasing runoff, erosion, and sedimentation, fires may increase the risks posed by existing roads. Therefore, post-fire analysis is recommended to determine the need for undertaking road maintenance, improvement, or obliteration. There is some urgency to this reassessment as the longer appropriate treatments are put off; the more likely it is that failure will be triggered by a large runoff event.***
>
> ***Additionally, post-fire livestock grazing should be altered or eliminated to allow natural recovery processes to occur.***

Immediately after containment of the fires, the Custer National Forest prepared the Burned Area Emergency Rehabilitation report which assessed significant short-term threats to resources to from the Kraft Springs Fire, and where necessary, recommended treatments for mitigation (BAER, Sept. 2000). This interdisciplinary effort addressed various aspects of resource management such as soil and watershed integrity, wildlife, weed management, infrastructure, and recreation. The BAER report identified several measures to reduce erosion including:

In addition, the Forest completed a Long Term Rehabilitation Plan, which included assessments of range and the transportation system. Findings and recommendations from resource assessments included the following:

Transportation system facilities needed for the short and long term should be upgraded to appropriate standards to reduce sediment. Road template restoration, road sign replacement, hazard tree removal, unclassified road assessment, culvert and ditch cleaning, additional culverts, and upgrades to other road drainage features are all slated to receive project funding and implementation. Timely maintenance on the remainder of roads is needed to ensure existing drainage structures are operating efficiently. Monitoring is needed to ensure livestock grazing does not impede recovery potential of vegetation and watershed function.

Responsive to the assessments described above, approximately 95 miles of boundary fence are being installed/constructed in the project area in cooperation with adjacent private landowners, Livestock were not grazed on burned portions of National Forest grazing allotments within the Kraft Springs fire during the remainder of the 2001 grazing season. At this time, grazing is scheduled tentatively to be deferred for two growing seasons and would resume on the rangeland when ground conditions will support grazing activities without damage to the vegetation and soils resources. Riparian and upland rangeland sites showed some regrowth, re-establishment of native vegetation, and soil stabilization during 2002 when these sites were rested from livestock grazing. Inspections will occur during the spring of 2003, prior to livestock entry, to evaluate soil, streambank and vegetation conditions. If recovery appears to be proceeding at the established rate and livestock control fences are rebuilt, grazing will be authorized under a prescription that includes late season entry after forage plant maturation and a utilization level that is lighter than that prescribed normally.

The Long Term Rehabilitation Plan indicated that a comprehensive inventory of transportation facilities is needed. A transportation inventory is outside the scope of this project. However, the Forest will be evaluating road obliteration as a separate project.

The authors of Beschta et al. (1995) state that ***"we are aware of no evidence supporting the contention that leaving large dead woody material significantly increases the probability of reburn."***

We agree with the authors of Beschta et al. (1995) that the amount of large, woody fuel does not affect the probability of reburn or wildland fire ignitions in general. The probability of ignition is determined by the meteorological and physical processes that generate lightning, and the human behavior that leads to human-caused fires.

There is abundant scientific evidence that increased fuel loads can result in increased fire intensity and severity, and large continuous areas of relatively high fuel loads are more likely to result in larger fires than areas where the spatial arrangement of high fuel loads is discontinuous. The purpose and need of the fuel reduction portions of this project is not to reduce the probability of ignition or the occurrence of future fires. Rather it is to break up fuel continuity and reduce fuel loads in strategic locations and along the forest boundary in order to decrease risks that future fires will pose to human health and safety, property, improvements, and resources. The scientific evidence, literature, and reasoning underlying this aspect of the purpose and need of the Kraft Springs Project is discussed in the environmental analysis.

Additional information must be provided to the public regarding natural fires and post-burn landscapes to provide balance to the 'Smokey Bear" perspectives of fires and forests.

> ***Although post-fire landscapes are often portrayed as "disaster" in human terms, from an ecological perspective, fire is part of the normal disturbance regime and renewal of natural forest ecosystems. An increased appreciation and understanding of natural disturbance regimes in the ecology of forest ecosystems is needed by the public, and the public's land managers.***

Several meetings with local officials and other publics were held in 2002 prior to the Kraft Springs Fire. Fuels reduction and the need to work with fire in the ecosystem was extensively discussed. During and after the Kraft Springs Fire, the public was often updated and included in discussions about the future management of the North Long Pines area. These discussions have included the recognition that fire needs to play a part in future land management practices.