Chapter 1. Purpose of and Need for Action

Document Structure

The Forest Service has prepared this final environmental impact statement (FEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This final environmental impact statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters and other sections:

- *Chapter 1. Purpose of and Need for Action:* The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the Agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2. Alternatives, Including the Proposed Action:* This chapter provides a more detailed description of the Agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the environmental effects of implementing the proposed action and other alternatives.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during development of the environmental impact statement.
- *Glossary*
- *References Cited*
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental impact statement such as the record index, public comments and responses, etc. This is contained in a separate document for this FEIS.
- *Index:* The index provides page numbers by document topic.

Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record available by contacting the Kaibab National Forest supervisor's office in Williams, Arizona.

The project record references all scientific information considered: papers, reports, literature reviews, review citations, academic peer reviews, science consistency reviews, and results of ground-based observations to validate best available science. This FEIS incorporates by reference (as per 40 CFR 1502.21) the "Kaibab National Forest Land and Resource Management Plan" (forest plan), as amended (USDA Forest Service 2004a), as well as the project record, including specialist reports and other technical documentation used to support the analyses and conclusions of this EIS. Analysis was completed for forest vegetation, botany, wildlife, hydrology and soils, visuals, recreation, range, heritage and cost effectiveness. Information from these reports has been summarized in chapter 3.

Summary of Changes from the Draft Environmental Impact Statement

Based on comments from the public and other agencies (appendix D) on the draft environmental impact statement (DEIS) changes were made for the final environmental impact statement (FEIS). Many of the changes are editorial for clarity. More substantive changes include the following:

- Clarification of the desired coarse woody debris for the dry mixed conifer and ponderosa pine types found on the Kaibab Plateau as per Brown et al. (2003) is 5 to 20 tons per acre. The DEIS used a range appropriate for cooler and wetter habitat types that do not occur in the Warm Fire area.
- Clarification of specific actions included in salvage logging activities. Logging operations include felling trees then skidding them to a landing site where nonmerchantable tops would be cut off, and the remaining tree boles loaded onto trucks to be hauled to processing mills. The trucks would use the existing road system in place, which would require maintenance work such as blading of the road surface.
- Clarification of project design features including where ground-based equipment access may occur, noting which items are applicable to the designated Mexican spotted owl (MSO) habitat areas (chapter 2),and inclusion of expanded California condor protection measures in the event one is sighted within the project area during activities.
- One change in the project design features was the removal of slash mats. This item was dropped from the project design features since it would not be operationally feasible because it requires a cut-to-length system, not locally available.
- Incorporation of additional fire modeling information to show how future estimated fuels within the project area could affect fire events.
- Updated commercial volume and economic information to reflect updated defect percentages provided by the Region 3 measurement specialist and currently in use.
- Addition of the literature review and response to comments submitted for the DEIS added as appendices D and E.
- Correction of typos.

Note: Corrections to the “Kaibab National Forest Land and Resource Management Plan,” as amended (USDA Forest Service 2004a) were issued in 2008 which corrected mapping of geographic areas and ecosystem management areas. This information has been updated in this FEIS. Figures and mapping displayed in this document are approximate and based on existing databases.

Location

The proposed Warm Fire Recovery (WFR) project area includes the Warm Fire suppression area located 4 miles south of Jacob Lake and 14 miles north of the Grand Canyon National Park boundary on the North Kaibab Ranger District of the Kaibab National Forest, Coconino County, Arizona. The legal description for the project area is all or portions of Sections 28, 29, 31-36, T38N, R2E; Sections 31, 32 T38N, R3E; Sections 10-15, 23-25, 35, 36 T37N, R1E; Sections 1-36 T37N, R2E; Sections 5-9, 17-21, 29-31 T37N, R3E; Sections 1, 2, 11, 12 T36N, R1E; Sections 1-10 T36N, R2E; and Section 6 T36N, R3E; Gila and Salt River Meridian (see figure 1).

Management Direction

This EIS process and documentation has been prepared according to direction contained in the following:

- National Forest Management Act (NFMA)
- National Environmental Policy Act (NEPA)
- Council on Environmental Quality (CEQ) regulations
- Endangered Species Act (ESA)
- Clean Water Act of 1977
- Forest Service Handbook (FSH) 1909.15

An EIS is a disclosure rather than a decision document. Its primary purpose is to document environmental analysis to support a Forest Service decision, documented in a Record of Decision (ROD), regarding a proposed action or alternatives to it. Specific decisions to be made by the Forest Service in consideration of this analysis are described later in this chapter.

The best available science is considered in preparation of this EIS. However, what constitutes best available science might vary over time and across scientific disciplines. As a general matter, we show consideration of the best available science when we insure the scientific integrity of the discussions and analyses in the project NEPA document.

Specifically, this EIS and the accompanying project record identify methods used, reference reliable scientific sources, discuss responsible opposing views, and disclose incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR, 1502.9 (b), 1502.22, 1502.24).

Forest Plan

The “Kaibab National Forest Land and Resource Management Plan,” (hereafter referred to as the forest plan) as amended (USDA Forest Service 2004a), establishes multiple-use goals and objectives, and assigns a management area to each portion of the forest. A recent correction to the forest plan clarifies the geographic areas (GA) and ecosystem management areas (EMA) on the forest. In addition, the project area lies within the Grand Canyon National Game Preserve and overlaps a portion of the Red Point Roadless Area. There are 2 geographic areas in the WFR project area; and these GAs overlap all or portions of 10 landscape areas (or ecosystem management areas) (see figure 2):

GA 13 (36,041 acres, 92 percent of project area; all or portions of nine EMAs/landscape areas): This area is located in the middle of the North Kaibab Ranger District. Ponderosa pine predominates in most of this management area, except at higher elevations and on cooler sites, where mixed conifer and spruce-fir vegetation cover a major portion of the area. Understory vegetation includes mutton bluegrass, blue grama, squirreltail, junegrass, sedges and mountain muhly. Aspen is scattered throughout in pure stands and as a component of both the overstory and understory vegetation. In openings and thinned stands important forage producers are pine dropseed, mountain muhly, tall oatgrass, weeping brome, and smooth brome. The forb component includes yarrow, ragweed, columbine, sandwort and cinquefoil. In dense conifer stands, sedges and the forb component are essentially the only understory vegetation. All of this management area is in the Grand Canyon National Game Preserve.

GA 16 (3,069 acres, 8 percent of project area; a portion of Little East EMA/landscape area): This area is located on the eastern side of the North Kaibab Ranger District. The majority of this area is dominated by woodland vegetation consisting largely of pinyon pine and Utah juniper (pinyon-juniper). At higher elevations there are ponderosa pine stringers. The understory typically includes big sagebrush, snakeweed and rubber rabbitbrush. Cliffrose is also common on rocky slopes. Impacted range sites are dominated by blue grama although squirreltail, junegrass, Indian ricegrass and mutton bluegrass are present on the better sites. Paradine plains cactus is known to occur in this management area with other sensitive species occurrences possible. A portion of this management area is in the Grand Canyon National Game Preserve.

The WFR project focuses on management actions within GA 13. A small portion of GA 16 and the roadless area have been identified for reforestation planting activities. The northeast portion of the project area also includes a portion of the Red Point Roadless Area (5,726 acres), which overlaps both GAs. No salvage harvest activities would occur within the roadless area; however, reforestation (planting) is proposed within the roadless area.

Background

The Warm Fire was started by lightning on June 8, 2006, south of Jacob Lake Campground on the North Kaibab Ranger District, Coconino County, Arizona. The fire met the criteria for wildland fire use, and was consistent with the forest plan, Kaibab fire management plan, and the Federal Wildland Fire Management Policy. The Warm Fire was managed as wildland fire use for approximately 2 ½ weeks, during which time approximately 19,000 acres burned, many acres with the desired results of burning mainly in the understory of stands, while some portions burned with undesired high overstory mortality. On June 25, winds pushed the fire south, outside the maximum manageable area (MMA), at which time management of the fire was changed to a suppression strategy.

Between June 25 and July 4, while the fire was managed under a wildfire suppression strategy, approximately 39,110 acres burned. Much of this area burned at high intensity in the crowns as well as on the ground and resulted in severe fire effects (USDA Forest Service 2007c). Sites that were disturbed during fire suppression were rehabilitated immediately following fire containment. Both hand and dozer fire lines were water barred and seeded as part of this rehabilitation work. No other sites were mechanically disturbed during the fire suppression (such as constructing safety zones or staging areas).

The project area for this EIS is the wildfire suppression portion of the Warm Fire. No activities in this project will occur in the wildland fire use area or any areas outside the wildfire suppression area**.**

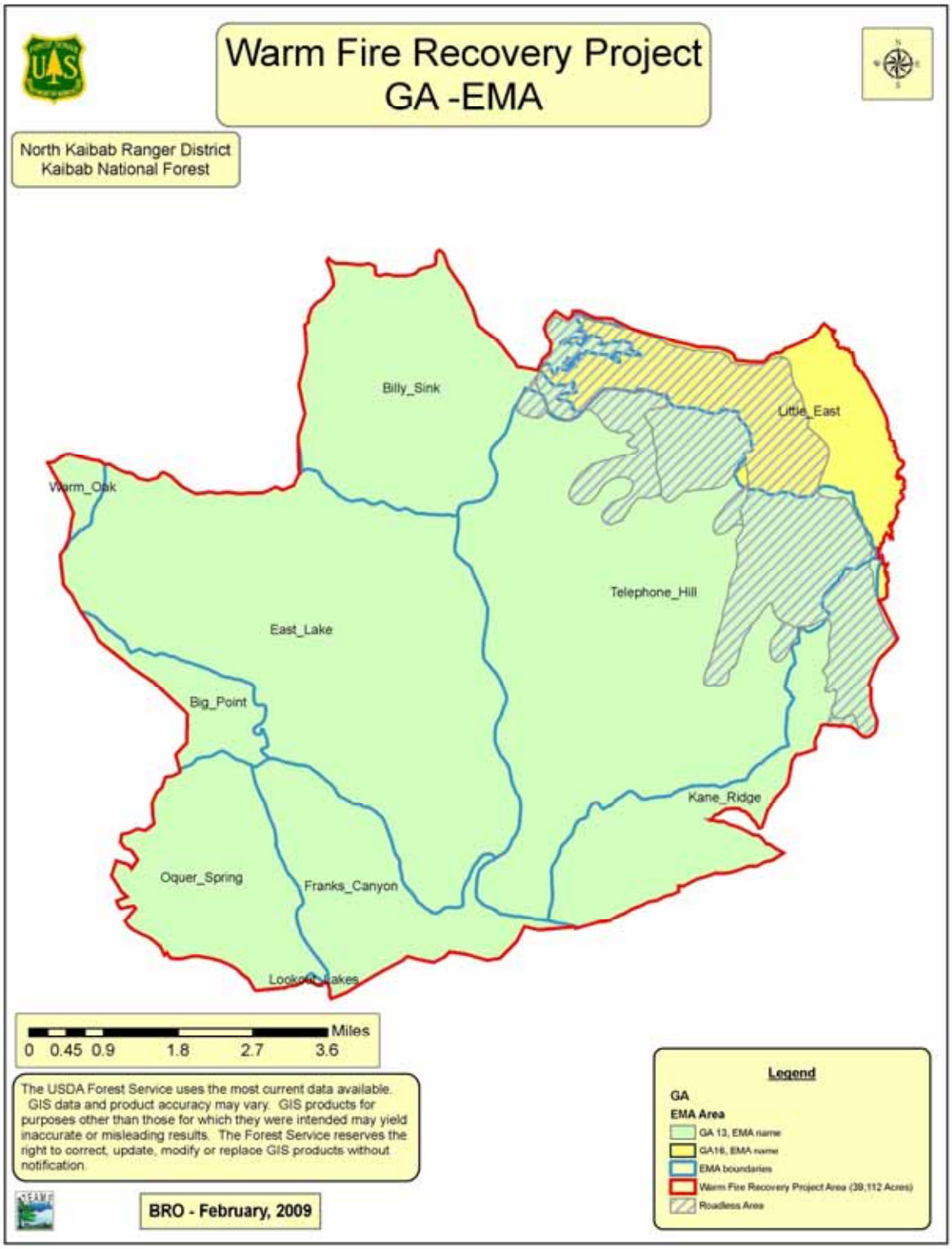

Figure 1. Geographic areas – ecosystem management areas map

Burned Area Emergency Response

On July 1, 2006, a Burned Area Emergency Response (BAER) team was assembled to conduct a soil and hydrologic assessment, and to initiate rehabilitation to minimize the loss of soil productivity, downstream water quality, and threats to human life and property.

The rehabilitation work included repair of storm damaged roads, installing warning signs along roads to alert travelers to hazardous snags and potential road washouts from flash flooding, and seeding approximately 10,000 acres to prevent erosion on the areas most severely burned. In addition, 1,700 acres of high burn severity acres within the Pediocactus Conservation Area were seeded with a sterile hybrid seed to establish effective vegetative ground cover to reduce the risk of flooding and control excessive soil erosion. Another objective for seeding in the conservation area was to reduce the establishment of invasive plants that could threaten the Paradine plains cactus (Pediocactus, also known as the Kaibab plains cactus) population (USDA Forest Service 2006b). This area was aerially re-seeded in February 2008. Monitoring has shown that seeding efforts have been effective. Native grasses and forbs within the seeded areas and elsewhere within the burned area are also responding favorably and are expected to continue to improve.

Warm Fire Assessment – Post-fire Conditions and Management Considerations

On August 1, 2006, a Forest Service interdisciplinary team was assembled to assess the status of the post-fire resources, identify recovery needs, and recommend a program of recovery work beyond BAER in the fire suppression area. The results of this post-fire assessment are documented in the “Warm Fire Assessment Post-Fire Conditions and Management Considerations” (referred to as the Warm Fire Assessment) (USDA Forest Service 2007c) and incorporated by reference into this analysis. It provides technical reports for soils, forested vegetation, wildlife resources, fire ecology, predicting post-fire tree mortality, wildlife, plants, invasive plants, heritage resources, recreation, scenery and range resources which describe impacts from the fire and provide recommendations for recovery. The key current conditions and desired conditions for the approximate 39,100 acres relevant to this proposed project and analysis are described below.

Burn Severity

The Warm Post-fire Assessment Team classified the burn severity within the Warm Fire suppression area (USDA Forest Service 2007c). Burn severity is a term that describes the effects of heat on soil and watershed conditions that are important for their influence on soil productivity and the potential for destructive flooding.

Site indicators used to assess burn severity include the degree of water repellent soils, degree of litter and duff consumed, the amount and kind of live vegetation consumed, degree of downed woody material consumed and charred, and post-fire vegetative ground cover. Using these indicators, burn severity was described and summarized in three burn severity classes: high, moderate, and low (DeBano et al. 1998).

Approximately 41 percent (16,026 acres) of the area was classified as low burn severity. Low burn severity is defined as "there is light ground char where the litter was scorched, charred, or partially consumed (see figure 3). The duff is largely intact, though it may be charred on the surface. Woody debris is partially scorched or charred. Vegetative ground cover remains intact and is adequate to protect soils from accelerated soil erosion" (USDA Forest Service 2007c).

Figure 2. Example of a low burn severity area within the project area

Figure 3. Example of high burn severity within the project area

The moderate and high burn severity areas lost critical soil and hydrologic function. In some areas, natural soil recovery has already begun. Vegetative ground cover and coarse woody debris are necessary for the recovery of forest and grassland ecosystems. In forested ecosystems, a minimum of 10 to 15 tons per acre of down, coarse woody debris should be managed for in the moderate to high burn severity areas, and 5 to 10 tons per acre in the low burn severity areas. In woodland ecosystems (pinyon-juniper), a minimum of 5 tons per acre should be managed for (USDA Forest Service 2007c).

Low burn severity was observed in forested areas where much of the tree overstory is green with some scorch at the base of the trees and in the lower branches. Most of the trees survived; however, there are pockets of seedlings and saplings that were killed or consumed. Many of the shrubs, forbs and grasses were burned under conditions that could be described as a "cool" burn.

In these cases, much of this vegetation survived (USDA Forest Service 2007c). Approximately 19 percent (7,290 acres) was classified as moderate/high burn severity, and 40 percent (15,780 acres) was classified as high burn severity.

The moderate and high burn severity areas lost critical soil and hydrologic function. In some areas, natural soil recovery has begun. Vegetative ground cover and sufficient coarse woody debris (as described above) are necessary for the recovery of forest and grassland ecosystems.

The post-fire assessment (USDA Forest Service 2007c) noted high burn severity (see figure 4) where “a large majority of the trees were killed with entire tree canopies totally consumed by intense heat and fire. Foliage, litter, and duff were completely consumed, and coarse downed woody debris was deeply charred or totally consumed.” Moderate burn severity is defined as “the surface litter layer was consumed and the duff layer was deeply charred by the fire. Much of this ash has moved offsite due to wind and water. Small woody debris is mostly consumed; larger logs remain but are charred. Vegetative ground cover is patchy and not continuous. Much of the tree canopy remains; however, it was scorched, turning the needles brown. These needles will eventually fall to the soil’s surface, providing immediate mulch and initiating the slow recovery process of re-establishing vegetative ground cover.”

The majority of burned areas within the forested cover types resulted in high mortality (100 percent scorching of the subcanopy and upper canopy trees and 100 percent mortality of upper canopy trees) and mixed-high mortality (100 percent scorching of the subcanopy, 40 percent scorching of upper canopy trees, and 70 percent mortality of upper canopy trees). The fire consumed the surface litter layer and the duff layer was deeply charred. Some water repellency existed below the soil surface with strong water repellency in isolated areas (USDA Forest Service 2007c).

The forest plan, as amended (pages 22-34), notes desired conditions for ponderosa pine and mixed conifer types are emphasized and managed for uneven-aged stand conditions to provide various age classes within forested stands (USDA Forest Service 2004a). The areas that burned with high and moderate to high severity, which resulted in high mortality, will regenerate essentially as even-aged stands since most of the previous age classes were killed by the fire. Some areas lack adequate seed sources of desired tree species. For instance, where ponderosa pine stands burned through the crowns of the trees, cones were consumed in the fire and seed sources are lacking to disperse seeds to reforest those areas to ponderosa pine. In areas where seed sources are lacking, it may take decades to centuries for the areas to become forested and to attain uneven-aged stand structure in ponderosa pine and mixed conifer types.

Future fire behavior, fire intensity, and fire severity are dependent on the amount of fuels consumed by the Warm Fire, the amount of mortality, and the type of vegetation that re-establishes on each site. Severity is a combination of heat release and duration of heating, therefore, both fine and large fuels play a role. Brown et al. (2003) developed a potential timeline for post-fire fuel structures and their contribution to possible fire behavior that estimates fire severity would be reduced for approximately 10 years due to the lack of fine fuels and lower ignitability of the larger fuels. From 10 to 30 years most snags would be anticipated to fall and down, coarse woody debris would experience some decay which equates to a longer burning and smoldering time. High severity effect and soil heating would occur where down material lies on the soil surface. After 30 to 60 years, considerable decay would occur in the coarse woody debris. At that time, a higher severity burn would be possible when compared to conditions before the Warm Fire based on the amount of anticipated coarse woody debris and soil heating effects (Monsanto and Agee 2008). If a conifer overstory has become established, the possibility of a crown fire coupled with burnout of coarse woody debris from the Warm Fire could result in high burn severity across the affected areas if the majority of the material remains in place across the affected landscape (USDA Forest Service 2007c).

The vegetation mortality map (see figure 6) was created by modifying a Landsat Burned Area Reflectance Classification (BARC) image provided by the Forest Service Remote Sensing Applications Center. As described previously, high tree mortality was noted throughout the areas that burned with moderate to high and high burn severity resulting in high mortality (USDA Forest Service 2007c).

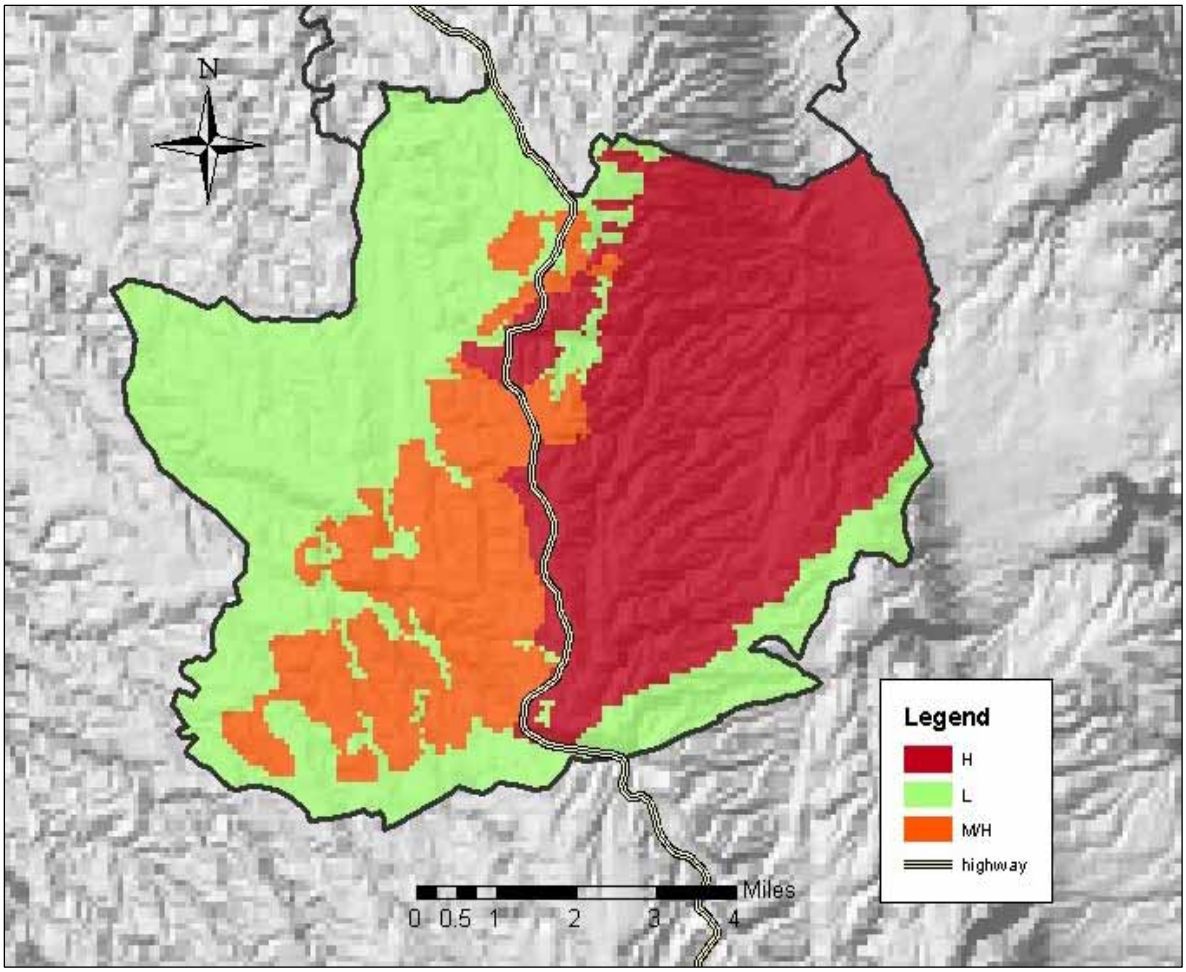

Figure 4. Burn severity map

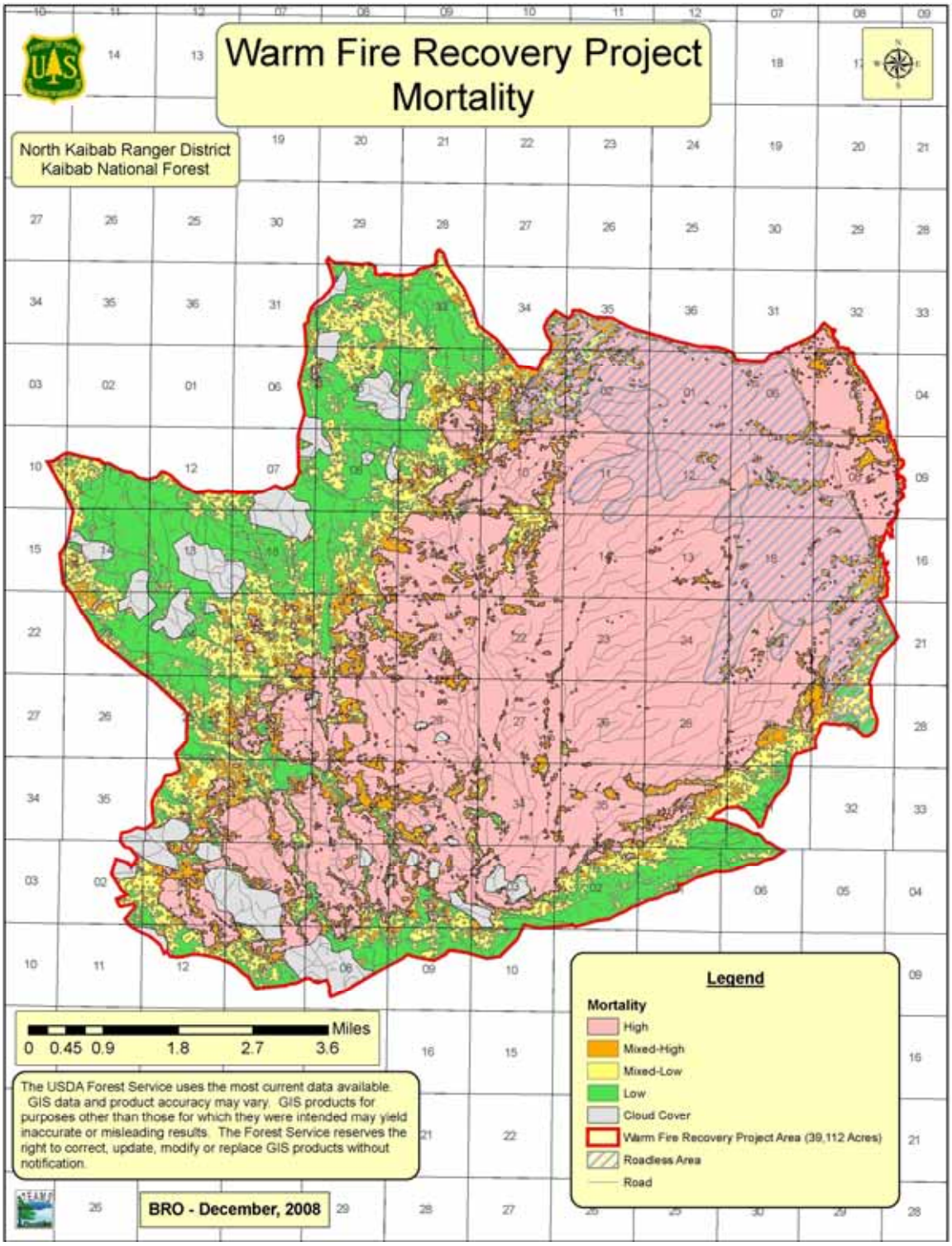

Figure 6. Vegetation mortality map

The post-fire assessment recommended the following primary recovery needs and possible management actions to address those needs (USDA Forest Service 2007c):

- Provide for public safety:
  - Hazard tree removal along highways and major forest system roads.
- Road and trail maintenance to roads, inside ditches and culverts to address increased erosion:
  - Prevent further fire-related resource damage.
- Heritage site protection to prevent them from being damaged during precipitation events.
- Restore the structure and function of the forest:
  - Reforestation of the large conifer areas killed by the fire and currently with few and poorly distributed seed sources to promote the desired forest structure and accelerate the recovery of habitat conditions for native wildlife species.
  - Opportunity to actively manage areas for aspen regeneration for continued aspen presence on the Kaibab Plateau.
  - Planting browse species for mule deer in the mule deer winter and transitional range on the east side of the fire.
- Support the local community and economy:
  - Salvage of some of the approximately 200 million board feet (MMBF) of timber that was killed by the fire.
  - Make firewood available to reduce fuels in certain areas in order to increase the likelihood of safe and successful fire protection efforts in the future.
- Learn through monitoring and research to improve management over time:
  - Opportunities exist to learn about fire effects and post-fire recovery under various management scenarios. The forest and forest management in general could benefit if research is encouraged and supported in the Warm Fire area.

Warm Fire Rehabilitation and Recovery Plan and Status Summary

The forest reviewed the management considerations identified in the post-fire assessment and developed an overall “Warm Fire Rehabilitation and Recovery Plan and Status Summary” to provide an overview of the rehabilitation and recovery needs for lands burned in the June 2006 Warm Fire and the current status of that work. This plan is periodically updated and posted on the Kaibab National Forest Web site to provide followup on the management actions recommended in the post-fire assessment. For more detailed information, please refer to http://www.fs.fed.us/r3/kai/projects/warm/documents/warmfire_recovery_plan_summary_Dec2008.pdf

Following is a summary of actions considered or implemented under separate environmental reviews within the Warm Fire area:

- BAER emergency rehabilitation activities include: aerial seeding of 10,040 acres in the fall of 2006; fire line water-barred and seeded in the fall of 2006; aerial re-seeding of 1,710 acres in spring of 2008; erosion stabilization structures in the spring of 2008

(additional soil stabilization treatments planned for 2009); rebuilding 3 miles of fence in 2007 (4 miles are planned in 2009); repairing 8 stock tanks in 2009; repairing 3 headcut areas in 2009.

- Providing for public safety was addressed in a separate project to reduce risks posed by hazard trees along roads and trails ("Hazard Tree Removal Along Highways and Forest System Roads and Trails in the 2006 Warm Fire" decision signed July 19, 2007, USDA Forest Service 2007a). This project is ongoing. Warning signs have been installed on roads entering the burned area advising users of hazardous conditions from falling trees and possible road washouts.
- Preventing further fire-related resource damage is being addressed through: (1) ongoing road and trail maintenance that will be necessary until erosion in the burned area stabilizes; (2) managing weeds in accordance with the "Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds" and subsequent ROD (USDA Forest Service 2004); and (3) protection of heritage sites that have been impacted by the fire and subsequent runoff events. Road repair work has been performed within the fire area since the fall of 2006 and will continue in 2009. Five miles of trails will be repaired in 2009. Weed treatments on 90 acres occurred in the fall of 2008 (100 acres of treatment are planned in 2009). Stabilization of 120 heritage sites was completed in 2007 and 2008.
- Restoring structure and function of the forest is partially being addressed through the Warm Fire reforestation project approved in September 2007 (USDA Forest Service 2007d) for previously planted areas that were burned. This project was designed to take advantage of the natural site preparation created by fire that allows for quick establishment of trees before competitive exclusion from other species makes establishment and survival more difficult. Conifer seedlings were planted on 1,589 acres during the spring of 2008 (900 acres of conifer planting is planned for 2010).
- Planting browse species (e.g., cliffrose) to benefit deer in areas where browse species were consumed by the fire is being considered.
- Various research projects from universities, the Rocky Mountain Research Station and the Grand Canyon Trust have been proposed or discussed to learn more about the effects from the fire, including studies to look at understory plant responses and a comparison of potential effects of salvage logging in the Southwest.

Purpose and Need for Action

The difference between desired conditions identified in the forest plan and existing post-fire conditions was assessed by the interdisciplinary team. The responsible official identified three items based on the recovery needs that were most time sensitive to focus on for this effort. There are needs to:

1. Recover economic value from burned timber
2. Reforest burned conifer stands to move toward desired conditions
3. Break up fuel continuity in the project area

These three components of the purpose and need items are discussed below detailing the desired conditions, existing conditions, and needs for change.

1. Recover economic value from burned timber.

Desired Condition: The forest plan includes the goal to "manage suitable timberland to provide a sustained level of timber outputs to support local dependent industries." The plan also includes a guideline for Geographic Area (GA) 13 to "salvage stands, or parts thereof, that are severely damaged by dwarf mistletoe, insects, fires, or windthrow." The Forest Service has a memorandum of understanding (MOU) with the State of Utah to jointly identify priority restoration needs, build capacity to accomplish needed restoration projects, and to expand the use of stewardship contracting or other tools that encourage local employment in order to benefit management of the national forests and communities of the Central Colorado Plateau.

Existing Condition: The Warm Fire (the suppression area with the wildland fire use area), burned 12,000 acres of ponderosa pine as a stand-replacing fire with 100 percent mortality. Much of the mixed conifer habitat mapped across the Kaibab Plateau historically had a plurality of ponderosa pine (Lang and Stewart 1910). The dry mixed conifer forest type on the Kaibab Plateau is, in terms of fire ecology and historic fire return intervals, nearly identical to ponderosa pine. The Warm Fire burned 4,300 acres (or 76 percent) of the mixed conifer habitat as a stand-replacing fire with 100 percent mortality. Both of these are outside the historic range of variability (Fulé et al. 2003b). Aspen, which has been declining across the Southwest for years, will respond favorably to the disturbance event and increase in distribution (USDA Forest Service 2007c).

The forested stands that burned in the Warm Fire resulted in a varying amount of vegetation mortality. The following four levels of vegetation mortality were determined within the Warm Fire Recovery (WFR) project area (USDA Forest Service 2007c):

- **Low Vegetation Mortality:** The low vegetation mortality class was characterized by areas that were either unburned or burned in small patches resulting in less than 15 percent mortality of vegetation in the less than 16-foot height classes and little to no scorching of subcanopy and upper canopy trees, and less than 5 percent of upper canopy trees were killed by fire effects.
- **Mixed-Low Vegetation Mortality:** This class was characterized by fire effects slightly higher and with more variability than low. The mixed-low class was characterized by approximately 10 percent mortality of upper canopy trees and 50 percent subcanopy scorch.
- **Mixed-High Vegetation Mortality:** This class was characterized by fire effects less lethal and with more variability than high. The mixed-high mortality class was characterized by approximately 70 percent mortality of upper canopy trees and median values of 100 percent subcanopy scorch and 40 percent upper canopy scorch.
- **High Vegetation Mortality:** This class was characterized by complete mortality of vegetation in the less than 16-foot height classes, 100 percent scorching of the subcanopy and upper canopy trees, and 100 percent mortality of upper canopy trees.

The post-fire Landsat image from which the vegetation mortality map was created was taken July 9, 2006, 5 days after the fire was declared fully contained. Table 2 displays the percent of each cover type in each mortality class. The percentages indicate all cover types experienced much higher mortality than would be expected based on historic fire regimes (USDA Forest Service 2007c).

Table 2. Percent of cover type within each mortality class

Cover Type	Mortality Class			
	Low	Mixed-Low	Mixed-High	High
Pinyon-Juniper	3%	4%	12%	81%
Ponderosa Pine	23%	18%	12%	47%
Mixed Conifer	8%	7%	7%	78%
Aspen	15%	18%	15%	52%

Source – Warm Fire Assessment

There is a need for recovering the economic value of some of the approximately 200 million board feet of timber killed by the Warm Fire before all commercial value of the wood is lost to deterioration. This would meet the forest plan guideline to salvage stands or portions that are severely damaged by fire. Jobs created from the sale of salvage material could provide positive benefits to the local community in support of the MOU with the State of Utah. Salvage harvest would also help reduce costs associated with meeting desired fuel conditions in portions of the burned area by removing some of the large material that would add to future fuel loading if left onsite. Revenues from the sale of wood products could also be applied to defray some of the costs of needed fire restoration work, such as reforestation.

2. Reforest burned conifer stands to move toward desired conditions.

Desired Condition: The forest plan includes a standard for GA 13 to "formulate, design, and propose operations or improvements that contribute, over time, to the achievement of desired resource or ecological conditions in landscapes." Desired conditions based on forest plan direction and supported by reference conditions (Fulé et al. 2003b; Gildar and Fulé 2004; White and Vankat 1993, and other sources) include:

- Forest stands dominated by the appropriate species, which includes both conifers and quaking aspen as determined at the site level.
- Uneven-aged stand conditions.
- Relatively low stand densities in ponderosa pine dominated stands, with higher densities in mixed conifer stands.
- Surface fuel levels are such that reflect the historic fire regime (relatively frequent and low fire severity) and the associated ecological processes are maintained.
- Collectively, these conditions provide suitable habitat for native wildlife species, including northern goshawks, Mexican spotted owls, and their prey species.

Existing Condition: The post-fire assessment of cover types indicates that 50 percent of the potentially forested (were forested prior to the Warm Fire) acres in the project area are in a completely non-stocked condition with an additional 18 percent considered non-stocked (1 to 9 percent live tree canopy cover) (USDA Forest Service 2007c). Of the remaining 32 percent, approximately 27 percent are in the ponderosa pine cover type, 3 percent aspen, 2 percent mixed conifer, and less than 1 percent pinyon-juniper. Table 3 lists the acres and percent of potentially forested acres by cover type.

Table 3. Current acres of cover type and percent of potentially forested acres

Cover Type in Project Area	Current Acres	Percent of Potentially Forested Acres*
Pinyon-Juniper (PJ)	281	<1%
Ponderosa Pine (PP)	10,268	27%
Mixed Conifer (MC)	657	2%
Aspen (QA)	986	3%
Non-stocked w/0% tree canopy cover (NS)	18,799	50%
Non-stocked w/1-9% tree canopy cover (NS_S)	6,781	18%

* Potentially forested acres are those that had a forested cover type prior to the Warm Fire.

Large areas of conifer stands were killed by the fire and large portions of stands that were occupied by conifer trees now have few and poorly distributed seed sources. Natural conifer regeneration may take decades to centuries (Savage and Mast 2005).

There is a need to establish conifer trees in areas where conifer seed sources are now lacking and the desired condition is for conifer cover types. The early establishment of conifers (e.g., by planting seedlings) and removal of large tree boles to reduce future large fuel hazards would provide the greatest assurance that conifers would be a significant component of the next generation of forest vegetation in the burned area. Widely spaced planting of conifers would allow for future ingrowth, or planting, developing uneven-aged stand structures. In order to protect the reforested stands from future wildland fires, they would need to be managed to become resilient to low and moderate intensity fires. There is a need to protect and accelerate the recovery of habitat conditions that would provide for the needs of native wildlife.

3. Break up fuel continuity in the burned area.

Desired Condition: Surface fuel levels are such that effects from future fires are acceptable and the benefits to soil productivity and wildlife habitat can be realized. The future forest can be sustained with fire functioning as a key ecological process. The Kaibab forest plan includes guidelines for woody debris retention levels of 10 to 15 tons per acre in mixed conifer forest types (Forest Plan, pp. 29-30) and 5 to 7 tons per acres in ponderosa pine forest types (Forest Plan, p. 30). These levels are appropriate for forests that have not been impacted by severe wildfires. Brown et al. (2003) recommend optimal ranges of fuel levels in areas impacted by wildfires in the Western United States. That is 5 to 20 tons per acre of fuel loads be retained on warm, dry, burned forest habitats, such as the ponderosa pine sites and dry mixed conifer sites in the Warm Fire. Based on this recommendation, the interdisciplinary team identified a desired coarse woody debris level of 15 to 20 tons per acre in the project activity units. This level represents a conservative approach by adopting the high end of the range recommended by Brown, et al. This level will provide more material for the development of soil organic matter, much of which was consumed by the fire. Reducing fuel loads to these levels over extensive areas of the Warm Fire is not realistic, however, given the scale of the fire, the high cost of non-salvage fuel treatments, and the impacts and difficulties associated with reducing large, heavy fuel loads with prescribed burning (refer to chapter 2, “Alternatives Considered but Eliminated from Detailed Study.” Nevertheless, it is desirable to make substantial progress toward these levels in stands that were lethally scorched.

Desired conditions based on forest plan direction and supported by reference conditions (Fulé et al. 2003b; Gildar and Fulé 2004; White and Vankat 1993) include: Surface fuel levels are such that the historic fire regime (relatively frequent and low fire severity) and the associated ecological processes can be maintained.

Existing Condition: Approximately 39,000 acres have fire-killed trees. Of these, approximately 23,000 acres experienced moderate/high to high burn severity leaving few or no live conifer trees. These fire-killed trees will eventually fall to the ground and will result in large amounts of large diameter fuels over extensive areas. The values of coarse woody debris calculated for the post Warm Fire sites were for trees still standing that will fall over time. The coarse woody debris ranged from 1 to 148 tons per acre (USDA Forest Service 2007c).

The duff layer was consumed on many acres so the large material that falls over the next 10 years is not anticipated to burn readily due to lack of fine fuels to carry a fire. Future burn severity and adverse soil heating effects are expected to be high after 30 years due to accumulations of duff and decay of downed material fuels (Monsanto and Agee 2008; USDA Forest Service 2007).

There is a general lack of research specifically addressing high volumes of coarse woody debris and subsequent fire threat to soils, developing forests, and future fire control efforts. However, monitoring observations suggest fuels management can be effective in supporting forest recovery in fire-dependent ecosystems (USDA Forest Service 2008a). Based on 30 years of fire occurrence data on the North Kaibab Ranger District, there has been an average annual fire occurrence of 66 fires per year. Future fire events in this fire-adapted ecosystem are anticipated.

There is a need to make progress toward breaking up continuity of potential large fuels in areas that experienced moderate/high and high burn severity in order to increase the likelihood of safe and successful fire management efforts of future fires (both wildland and prescribed) and to reduce the severity of fire effects. The objective in these areas is to promote, over the longer term, fuel conditions with low surface fire intensity and fire severity as well as low resistance to fire line construction; collectively helping to reduce the likelihood of future large, high intensity fires, protect reforestation efforts, and reduce the fire effects to soils and other resources.

Proposed Action

In response to the previously described components of the purpose and need, the Forest Service proposes to salvage harvest fire-killed trees; conduct fuels reduction treatments, and plant conifer seedlings. The proposed salvage operations and related activities would occur within high and mixed-high fire mortality areas of the project area. Only trees without green needles will be salvaged. Salvage harvest activities would involve the following mechanized equipment:

> Feller-buncher equipment (either rubber tired or tracked) cuts the trees and moves them from the stump to a designated skid trail, placing several trees in a “bunch” for transport to the landing.
>
> Skidding equipment (typically rubber tired with a grapple) lifts one end of a bunch of trees and drags them along a skid trail to the landing. Skid trails are predesignated routes where multiple passes of skidding equipment occur.

Trees are delimbed, cut into log lengths, and skidded to a landing area where the unmerchantable tops would likely be cut and piled. Some trees may have tops cut where the tree is felled. The cut logs would be loaded onto trucks to be hauled away for forest product processing. Planting would

entail site preparation by hand clearing a small area of competing vegetation, and then planting conifer seedlings also by hand. Certain existing closed roads would be temporarily opened to allow access for salvage activities and then closed again at the end of the project. Early comments and suggestions received from the public generated from the October 11, 2006, Warm Fire public meeting and from the October 12, 2006, public stakeholder field trip were considered when determining where salvage logging may be appropriate.

The transportation system required to access salvage operations is in place. No new roads would be constructed with this project; however, approximately 95 miles of older, existing closed system roads would need to be temporarily opened for salvage activities, and then closed at completion of the project. Closure would be done through a timber sale contract clause (T811) and includes native grass seeding where mineral soil is exposed, ensuring proper drainage structures are in place along the length of the road, and scarification and placing slash on the road prism for the first 200 feet. Other open Forest System roads would be maintained as needed.

The majority of salvage activities would occur on areas previously dominated by ponderosa pine on slopes under 20 percent, with short spans (less than 100 feet) of activities on adjacent slopes over 20 percent where material could be directionally felled or end lined to restrict use of ground-based equipment to slopes below 20 percent.

The following criteria were used to determine whether an area would be appropriate for treatment:

- **Wildlife:** Ensure large blocks of snags and habitat corridors for certain birds and other wildlife species to provide snag habitat and connectivity. These areas were combined with 100-foot buffers along the ephemeral drainages identified in the USGS National Hydrography Dataset stream layer for soil and water resource protection, and would retain habitat with no ground disturbance or snag removal within the project area.
- **Economics:** Stands considered for salvage include those with at least 3 MBF of gross volume per acre in trees greater than 14 inches in diameter. Smaller diameter material is anticipated to lose value quickly, so areas with only smaller material were not proposed for salvage activities.
- **Soils:** Forest plan direction allows harvest on slopes under 40 percent. In order to protect soils in this project, skid trails will not exceed 20 percent slope for distances greater than 100 feet and will not occur at all on slopes greater than 30 percent. On treatment units with soil categorized as “severely erodible,” ground-based yarding and fuels treatment equipment would be restricted to slopes less than 20 percent. Reaching with feller-buncher type equipment or end lining (using cable to pull logs to the skidder) to access material within 100 feet of ground-based units would be allowed on slopes up to 30 percent.
- **Fire Severity:** Areas with mixed-high and high mortality were considered for salvage logging. Low severity burn areas stocked with green trees were removed from salvage consideration. Only conifer trees with no green needles are proposed to be salvaged. A frequent debate related to salvage harvest is “when does a fire damaged tree become a fire-killed tree,” e.g. will a damaged tree be dead in 1 year, 2 years, 10 years, or longer? Trees will not be considered “fire-killed” if green needles remain. The result of this conservative clarification is that it maximizes the chance of retaining isolated seed sources across the mixed-high and high severity burn areas. In addition, future snags will be created as trees with green needles subsequently die. The remaining live trees,

standing dead to meet forest plan direction, and logs on the ground, would be maintained to enrich the regenerated forest (Franklin and Agee 2003). Salvage will be concentrated in trees 14 inches d.b.h and larger. Trees less than 14 inches d.b.h will not be designated as timber in harvest contracts. These trees, along with larger snags retained for wildlife, and tops and limbs left onsite following harvest, would contribute to the amount of coarse woody debris (CWD) left onsite; the objective being: retain an average of at least 15 to 20 tons per acre of CWD on all salvage units. The Kaibab forest plan calls for retaining two or more snags per acre in ponderosa pine and greater than three snags per acre in mixed conifer forest types. Five to seven snags per acre would be retained within Warm Fire harvest units that were previously designated MSO critical habitat, and three to five snags per acre would be retained in stands that were previously ponderosa pine areas. Retained snags would target the largest diameter trees left in groups. The majority of salvage activities would occur on slopes under 20 percent, with short spans (less than 100 feet) of activities on slopes over 20 percent where material could be directionally felled or end lined to restrict use of ground-based yarding equipment to slopes below 20 percent.

- **Reforestation Needs:** Approximately 4,800 acres of previously conifer dominated forest types are determined to have enough aspen present to restock the stand through sprouting and would be managed for aspen. Areas with adequate aspen regeneration will provide for relatively fast tree canopy and restoration opportunities. Planting conifer seedlings was identified for areas with mixed-high and high mortality that do not have a significant aspen response, are lacking a seed source, and where suitable soil conditions exist to ensure a reasonable chance of reforestation success. All acres of MSO habitat were initially considered for planting. However, aspen is likely to become established on approximately 30 percent of the mixed-high and high mortality habitat (based on pre-fire aspen stocking) and it was decided not to plant those sites due to vegetative competition. Other considerations for planting included the probability of natural regeneration by assessing adjacency to live stands and seed sources. Probability of survival was considered for mixed conifer species that need moister microclimates and soils. Planting is proposed to establish mixed conifer species composition for some of the areas that are designated Mexican spotted owl habitat. Planting is proposed for approximately 240 acres in GA 16 on the cooler, moister aspects with deeper soils that were dominated by ponderosa pine prior to the fire.
- **Recreation/Roadless Area:** The Red Point Roadless Area was excluded from consideration for salvage activity to maintain roadless characteristics. However, hand planting conifers in the Red Point Roadless Area where seed sources were lost in the fire was included to help move this area toward desired forested conditions. Planting is proposed for approximately 1,095 acres in the Red Point Roadless Area on the cooler, moister aspects with deeper soils that were dominated by ponderosa pine prior to the fire.

The activities in the proposed action developed to address the needs are as follows (see chapter 2 for more details):

- Ground-based salvage logging of fire-killed trees on approximately 9,114 acres removing approximately 73.4 million board feet (MMBF), gross volume, of timber material from the project area. However, it is expected that the timber has lost some economic value due to deterioration of the wood (e.g., insect holes and blue stain affecting the outer layers of each tree bole) and may result in approximately 35.7 MMBF of commercial volume.

- The transportation system required to access salvage operations is in place. No new roads would be constructed with this project; however, approximately 95 miles of existing closed spur roads would need to be re-opened for salvage activities, and then closed at completion of the project. Other open Forest System roads would be maintained as needed.
- Planting ponderosa pine on 7,625 acres and mixed conifers (ponderosa pine and Douglas-fir) on 2,353 acres within high and mixed-high fire mortality areas where limited and poorly distributed seed sources currently exist, and where there is a moderate to high potential for planting success. These areas include salvage units and other areas where the soil inventory indicates a moderate to high potential for planting success. Preplanting surveys will occur at the stand level and a regeneration prescription will be developed based on current and desired stand conditions; including re-establishing mixed conifer habitat for Mexican spotted owls. Seedlings would be planted in groups with irregular spacing between each group with desired stocking levels ranging from 30 trees per acre to 160 trees per acre. Some sites may need to have more seedlings planted per acre initially, based on anticipated seedling survival rates. The reforestation effort within designated MSO stands will promote the establishment of Douglas-fir seedlings to the greatest extent possible based on current site conditions. The planting pattern would be based on the prefire stand structure with groups being concentrated adjacent to where legacy trees existed before the fire.
- Removing some of the large fuels by means of salvage harvest and followup slash treatments such as “lop and scatter to 18-inch depth” to break up fuel continuity would occur on all salvage logged areas. Additional fuels treatments would be conducted on approximately 283 acres of the salvaged logged areas along main roads where fuel loads are in excess of 15 to 20 tons per acre. These treatments may include a combination of lop and scatter of tops and limbs, chipping, mastication, and/or hand pile or jackpot burning of 50 percent of the 3- to 12-inch material. A minimum of 15 to 20 tons per acre will be retained onsite post harvest to address soil resource concerns. Treatments along Highway 67 are designed to meet scenic integrity objectives while other treatments along Forest System roads or trails (i.e. Forest Road 212 and Trail 101) are designed to meet recreation objectives.

Scope of the Project, Analysis, and Decision Framework

The scope of the project and the decision to be made are limited to salvage of fire-killed timber, reforestation, and hazardous fuel reduction work in portions of the 2006 Warm Fire suppression area.

Invasive plant prevention measures are included in the proposed project design, but direct control of invasive plants is not proposed in this project. Invasive plant control and management in the Warm Fire area is addressed by the Record of Decision and “Final Environmental Impact Statement for Integrated Treatment of Noxious and Invasive Weeds on the Coconino, Kaibab, and Prescott National Forests” (USDA Forest Service 2005).

The proposed action does not represent a comprehensive travel management plan. Certain closed roads would need to be opened for salvage operations and following use would be re-closed. A roads analysis for temporarily opening certain closed roads has been completed for this project. District-wide roads analysis, NEPA analysis, and a decision that would designate routes for

motorized access on the North Kaibab Ranger District under the Travel Management Rule, including the Warm Fire area, are currently scheduled for 2009 and 2010.

The responsible official for this proposal is the forest supervisor. Based on the analysis in the final EIS, the responsible official will make the following decisions and document them in a record of decision:

- Whether to salvage fire-killed timber from the Warm Fire Suppression area as proposed, as described or modified in an alternative, or not at all.
- What level of reforestation planting, if any, should occur.
- What level of fuels reduction, if any, should occur.
- What project design features should be applied.

Public Involvement

The Forest Service hosted a public meeting on October 11, 2006, in Kanab, Utah, to discuss the Warm Fire Use event and after action review. During that meeting, the public was invited to submit suggestions for future management of the area burned in the suppression portion (project area). The next day (October 12, 2006), a field trip to the burned area with local, State, and Federal agency personnel as well as other interested parties allowed discussion of future management considerations and recovery needs for the project area. Individuals continued to express concerns and suggestions for restoration actions, which the Forest Service considered while determining the existing conditions and formulating a proposed action to address the identified purpose and need.

In addition, as part of the public involvement process, the following occurred:

- As part of the public collaboration process, the Forest Service made information available on its Web site (http://www.fs.fed.us/r3/kai/projects/warm/) and sent newsletters to notify interested individuals of an open house in Kanab, Utah.
- On December 6, 2006, the Forest Service met with Kaibab Paiute Tribe representatives to review the collaborative input received and the preliminary proposed actions. Consultation with other tribes has been initiated and will be ongoing throughout analysis and implementation.
- On December 6, 2006, the Forest Service held an open house in Kanab, Utah, to review the collaborative input received and preliminary proposed action.
- On December 19, 2006, the Forest Service sent letters informing interested and affected individuals, groups and agencies of the proposed action and soliciting scoping comments.
- The Notice of Intent (NOI) to publish an environmental impact statement was published in the Federal Register on December 28, 2006. The NOI asked for public comment on the proposal from December 28, 2006, through January 26, 2007.
- On February 8, 2007, the Forest Service held an open house in Flagstaff, Arizona, to relay a summary of the issues identified from project scoping, describe tentative alternatives, and solicit input on other alternative concepts.
- On February 9, 2007, the Forest Service held another open house in Kanab, Utah. That event had the same objectives as the February 8 event in Flagstaff described above.

- The Warm Fire Recovery project has been listed on the forest's schedule of proposed actions since March 1, 2007.
- The forest has updated its Web site to keep interested parties informed of actions within the Warm Fire area at: http://www.fs.fed.us/r3/kai/projects/warm/
- The availability of the draft EIS and opportunity for comments were publicized widely via notification of parties on the project mailing list and notices in newspapers and the Federal Register.
- Comments received during the draft EIS comment period led to: updates to the potential salvage volume, clarification of the project design features and applicable best management practices, additional fuels modeling to display anticipated effects more clearly, additional literature reviews which have been included in appendix B to the final EIS and correction of minor typos. Comments on the DEIS and responses to them are provided in appendix D.

Issues

The forest received over 2,000 responses to scoping, mostly electronic form letters. The comments were reviewed and a list of comments and documentation explaining their categorization may be found in the project record. Some comments were outside the scope of the purpose and need for this project. Many commenters disagree with the stated purpose and need identified for the project, wanting instead analysis of restoration management options without active management.

Using the comments from the public, tribes and other agencies, individuals, and groups, the ID team developed a list of issues to address in this EIS. The ID team identified and separated the issues into two groups: significant and nonsignificant issues. Significant issues are defined as those directly or indirectly caused by implementing the proposed action. Nonsignificant issues were identified as those: (1) outside the scope of the proposed action; (2) already decided by law, regulation, forest plan, or other higher level decision; (3) irrelevant to the decision to be made; or (4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7: "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review" (Sec. 1506.3).

Some comments were considered for alternative development, but were eliminated from detailed analysis because the recommendations would not meet the identified purpose and need for the project. These are discussed further in chapter 2.

Using the external and internal comments and concerns, the following significant issues are carried forward for analysis:

1. **Effects on Soils and Water Quality:** Concern that salvage logging, as proposed under this project, would adversely affect long-term soil productivity, damage soil structure, and increase erosion and sediment delivery. They also state that removing logs would permanently remove valuable organic matter from the site. These commenters cited the Beschta Report (Beschta et al. 1995) and other literature in support of their arguments. Some commenters suggested that alternative technologies (helicopter) could be used to minimize ground disturbance. Others suggested that construction of new roads and landings should not occur to protect the fire impacted soils. Indicator values are: (1) acres

of soil disturbance; and (2) percent of area with effective ground cover, including coarse woody debris levels retained (tons per acre). This issue was used to develop alternative 3, as described in chapter 2. The no action alternative is also responsive to this issue.

2. **Effects to Wildlife and Wildlife Habitat:** Concern that removal of dead trees would adversely impact habitat for Mexican spotted owl (MSO), management indicator species (MIS) including the northern goshawk, and certain bird species and other wildlife associated with snags. Concern was also expressed that the proposed action would be inconsistent with the intent of the Grand Canyon Game Preserve Act. Several commenters believe that the proposed action would not leave enough dead trees for some wildlife. Indicator values are: (1) number of snags per acre retained; (2) number of down logs per acre retained; and (3) years to regenerate forested areas. This issue was used to develop alternative 4, as described in chapter 2. The no action alternative is also responsive to this issue.
3. **Spread of Nonnative Invasive Plants**: Concern that salvage logging would increase the spread of nonnative invasive plants; especially cheatgrass, in the project area from seed introduction potential and soil disturbance. Indicator values are acres of salvage disturbance. This issue was used to develop alternative 3, as described in chapter 2. The no action alternative is also responsive to this issue.
4. **Fire Risk and Fuels Reduction**: Concern was expressed regarding the need to reduce fuels. Some commenters believe that no fuels reduction is necessary and that the risk of future fires is low in severely burned areas. Other commenters believe that current standing dead trees could be fuel for a future fire once they fall to the ground. They state that fuels reduction should be a restoration goal to help prevent a future catastrophic fire. Still others felt that removal of large diameter trees would increase the risk of fire. Many expressed a desire to know what size and quantity of fuels would be left on treatment sites. Indicator values are tons per acre of residual fuels and resistance to control.

Many commenters expressed concern for the effects of salvage logging, citing reports such as Beschta et al. (1995) and Donato et al. (2006). In general, those reports conclude that fire salvage delays recovery, removes the elements of recovery, or accentuates the damage caused by the fire. These concerns are expressed more specifically in significant issues 1 through 4, above. Appendix B and elsewhere in chapter 3 provide reviews of the scientific reports and position papers related to salvage logging and address their relevance to this project.

In addition to the significant issues identified above, the effects of the proposed action and alternatives on other resources and factors are described in chapter 3, including:

- **Reforestation of Conifer in Areas Lacking Seed Sources**: Currently, there is a lack of seed source in some of the ponderosa pine and mixed conifer areas to reforest parts of the fire because numerous trees that provided seed to the area were killed or mortally injured. A component of the desired condition of the project area is to reforest some of the ponderosa pine and mixed conifer areas to maintain them as conifer stands into the future. Quaking aspen is naturally reforesting some areas and would be allowed to restock stands. Project design features are incorporated to plant stock from the appropriate seed zone and to plant in clumps near legacy or historic stumps or snags to address concerns raised with stocking density and visuals. Protection of seedlings was identified as a concern for seedling survival and would be addressed through microsite selection. Anticipated effects of salvage operations on regeneration will be disclosed.

- **Effects to Visual Quality:** Salvage harvest activities may impact the visual quality along the North Rim Scenic Byway. The scenic byway is traveled heavily in the summer as people visit the North Rim of the Grand Canyon. Salvage operations may further degrade the scenery of the area by creating unnatural openings and leaving slash. This potential impact is addressed through implementation of project-specific mitigation. Project design features that minimize slash piling along the scenic byway address this concern. Scenery management system guidelines will be followed for the North Rim Scenic Byway and along other well traveled roads identified in the forest plan as level 1 concern areas.
- **Effects to Heritage Resources:** Activities related to the proposed action could cause disturbance to heritage resource sites. However, heritage surveys to identify sites will be conducted prior to completion of the final EIS. All sites eligible or listed on the National Register of Historic Places, as well as any unevaluated sites will be marked for avoidance prior to project implementation. In the event that an undocumented site is discovered during implementation, activities will cease and appropriate mitigation measures will be taken to ensure that the site is not impacted.
- **Effects to Other Resources:** Activities related to range, recreation, and transportation systems will also be disclosed in chapter 3.