Wallow Fire 2011

Large Scale Event Recovery

Rapid Assessment Team

Forest Vegetation Salvage Insects and Disease Report

Apache-Sitgreaves National Forests

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Forest Vegetation

The Wallow fire has impacted over 504,500 acres of Apache-Sitgreaves N.F. land and resources. As shown below, much of the fire area (approximately 290,430 acres, 58%) burned at moderate-high and high severity (loss of >50% of BA), resulting in considerable losses of forest vegetation. As RAVG models are refined, it is likely that moderate-high and high severity burn acreage will increase. Additional tree mortality can be expected in the next 1-6 years as remaining trees die of cambium/root damage from heat, insects and disease infestations and other post-fire conditions.

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Table 1. RAVG Mortality estimates for the Wallow fire as of 07/20/2011

Wallow Fire RAVG Overstory Mortality Estimates on ASNF Lands	
Burn Severity (BA Loss)	**Acres**
0-25%	78,689
25 – 50%	120,206
50 - 75%	97,328
75 – 100%	193,101
No Data	15,194
TOTAL	**504,518**

On non-reserved timberlands, forest conditions were extremely unregulated. According to permanent Forest Inventory and Analysis (FIA) plot data for the Apache-Sitgreaves, forest-wide average net annual growth of growing-stock trees has far exceeded the rates of total annual mortality and cutting levels combined. (Rogers, 2003.) This imbalance across most non-WUI acres within the Wallow Fire boundary was verified by local Foresters, and undoubtedly contributed to wildfire behavior.

The following table shows the acreage burned by the existing forest type across the Wallow fire area. Not represented on the table are small amounts of various types of non-vegetated, grass, shrub, and other hardwood categories. Mixed conifer forests are comprised of Douglas-Fir, blue spruce, and white fir types that total nearly 94,500 acres across the fire area. Mixed conifer and ponderosa pine types total approximately 317,705 acres or 71% of the forested area burned by the wallow fire.

Table 2. Burn severity in dominant cover types across the Wallow fire area (based on RAVG data 07/20/11)

Basal Area Loss	Ponderosa Pine	Douglas-Fir	White Fir	Aspen	Pinyon Juniper	Spruce/Fir	Blue Spruce	Engelmann Spruce	Juniper Woodland	Oak Woodland	Gambel Oak	Southwestern White Pine	Tree (undetermined)	Cottonwood	Willows	Unknown	Grand Total
0 - 25%	26,096	9,964	1,967	4,401	6,902	1,470	856	1,003	1,516	1,677	446	77	131	74	21	15,347	**71,949**
25 - 50 %	68,666	15,007	3,368	3,402	3,762	1,707	1,391	1,179	1,119	928	190	136	143	105	14	12,159	**113,277**
50 - 75%	54,584	9,334	2,684	2,308	2,347	1,381	1,149	776	538	439	105	108	89	64	24	10,560	**86,489**
75 - 100%	66,913	30,018	13,295	9,115	4,575	5,590	3,039	3,063	1,006	562	72	328	91	20	62	26,071	**163,821**
No Data	6,959	1,767	524	1,424	420	145	164	308		27	17	14	65	0	7	917	**12,758**
Grand Total	**223,219**	**66,090**	**21,837**	**20,649**	**18,006**	**10,293**	**6,599**	**6,328**	**4,179**	**3,634**	**830**	**664**	**519**	**263**	**128**	**65,054**	**448,293**

Natural Regeneration/Reforestation

As noted in the Fire/Fuels report, the post-fire vegetative response and composition depends on several factors including fire severity, pre-fire vegetation, and species adaptations to fire (Brown et al 2003). Post-burn soil and weather conditions will also influence vegetation response. Due to the sheer size of the Wallow Fire, numerous species, vegetation types and ecosystems were affected. The discussion below describes typical post-fire response of the most dominant cover types in the Wallow fire area.

Ponderosa Pine

Ponderosa pine is adapted to frequent, low intensity surface fires, however a combination of crown consumption and crown scorch in moderate to high intensity fires can cause mortality in all size classes (Sieg et al 2006). Several species of bark beetles tend to attack pines weakened by drought and fire, which can add to tree mortality rates in subsequent years following the fire. Savage and Mast (2005) investigated trajectories of ponderosa pine stands following crown fire. At most sites they studied, ponderosa pine (PIPO) was the most abundant of any tree species following fire. They found a higher proportion of mixed conifer forest species, such as white fir and aspen occurring at higher elevation sites that regenerated to forest, while more Douglas-fir occurred at mid-elevation burn sites. Two general pathways of recovery emerged at their study sites in the decades after crown fire occurrence: 1—recovery to a PIPO forest, with densities exceeding the historic range of variation or 2) a deflection of forest recovery toward another vegetative state.

Douglas-Fir

From seedling to pole-sized, Douglas-fir (Pseudotsuga menziesii) has a low-branching habit and thin bark that make it very susceptible to fire damage. Crown scorch can kill Douglas-fir. The low branching habit encourages damage to the crown, which can outweigh the insulative nature of the bark. However, as they mature, the bark thickens, and survival of moderately severe fires is possible (FEIS 2011).

The ability of Douglas-fir to reestablish following the Wallow Fire will depend on a viable seed source and desirable growing conditions. There is some concern about the pre-burn presence of Douglas-fir beetle and Douglas-fir dwarf mistletoe that may now impact remaining seed trees (please refer to Insect and Disease discussion below). Douglas-fir seed germinates and establishes best on bare mineral soils, conditions provided by fire disturbance. Douglas-fir seedlings need partial shade while they are very young, but once established, require full sunlight (FEIS 2011). Regeneration success of Douglas-fir on the Wallow Fire will depend on available and surviving seed trees, good seed crops and accessible bare mineral seedbeds.

White Fir

White fir (Abies concolor var. concolor) is highly susceptible to fire damage as a young tree due to its thin bark, resin blisters on the bole and drooping lower branches. As a result, young trees are easily killed by even low intensity surface fires. As trees mature, the bark thickens and the older trees develop some degree of fire tolerance. Following fire, white fir reestablishes via wind- dispersed seed (FEIS 2011). White fir is an aggressive shade-tolerant tree that is able to reproduce successfully in the understory of ponderosa pine, Douglas-fir, and aspen stands. Silvicultural considerations for blue spruce (Picea pungens) are similar to those of white fir.

Southwestern White Pine

This species (Pinus strobiformus) commonly occurs as a mid-seral co-dominant in mixed species stands. Its large seed size makes it an important food source for many species of wildlife and local bears have been known to supplement their diets with the cambium layer after peeling off the bark. All age classes are susceptible to fire scorch, given this tree's low branching habit. Older trees can withstand low-moderate burn severity due to their thick bark. It is not yet clear how white pine blister rust disease found within the Wallow boundary will affect post-burn recovery success, except that several diverse populations of SW white pine needed to develop a genetic rust-resistance program were likely impacted by the fire which would reduce the availability of quality seed trees.

Aspen

Quaking aspen (Populus tremuloides) is very competitive on burned sites. It often dominates a site after fire even where it was barely noticeable as a component of the pre-fire vegetation. Aspen has adapted to fire in many ways, including easy top-kill by fire so root systems can send up a profusion of sprouts, and rapidly growing sprouts that extract the needed water, nutrients and photosynthate from the post-fire extant root system (FEIS 2011). Sudden Aspen Decline had been noted within the boundaries of the Wallow Fire prior to the burn. Although aspen decline is not expected to affect aspen sprouting following the fire, browsing by ungulates is expected to limit sprouting success in some areas and the situation warrants assessment and monitoring (see detailed aspen discussion below).

Pinyon-Juniper

Pinyon pine and juniper trees are easily killed by fire, although one species of juniper, alligator juniper (Juniperus deppeana), sprouts prolifically after fire. ASNF personnel observed that the Wallow Fire did not spread in the pinyon-juniper type unless there was heavy dead and down fuels. Both pinyon and many species of juniper have low fire resistance from seedling to maturity based on bark thickness and inability to regenerate easily after disturbance (Brown et al 2000). A possible pathway of re-establishment from a post crown-fire pinyon-juniper stand to pinyon-juniper woodland may take up to 300 years (Brown et al. 2000) following a severe fire.

Natural regeneration of conifer species can be expected in areas that burned at light or light-moderate severity (where < 50% of the existing basal area was lost), and also in smaller blocks of higher severity that are surrounded by or still may contain live trees (for example, areas up to 100 acres in size for ponderosa pine stands). Potential Natural Vegetation Type (PNVT) mapping combined with slope conditions in the fire area can shed some light on where natural regeneration may occur. The table below summarizes the acreage in the fire by burn severity, and PNVT.

Table 3. Acreage of Burn Severity for Ponderosa Pine, Mixed Conifer and Spruce/Fir PNVT in the Wallow Fire

PNVT COVER TYPE	Burn Severity (BA Loss)			
	0 – 25%	**25 – 50%**	**50 – 75%**	**75 – 100%**
Ponderosa Pine	8,624	47,807	35,445	32,860
Mixed Conifer	26,805	49,386	28,190	100,107
Spruce/Fir	1,810	2,211	1615	6,155

Artificial reforestation efforts (planting) will be desirable in many of the mixed-conifer and ponderosa pine stands that burned at moderate-high and high severity (where >50% of the existing basal area was lost). There will, however, be limitations to how much of the area can actually be planted. Currently, seed available to sow for the correct seed zones, species mixes and elevation ranges within the fire area (and across the ASNF) are minimal. Collection of additional seed in the near future will depend on a sufficient seed crop being produced by residual trees, which could take 3-7 years; and further, preparing and awarding a seed procurement contract prior to next year's cone crop will be critical to take advantage of sufficient crops when they become available. Generally, the Forest has had most success with containerized seedlings and therefore the planting of seedlings from seed collected from the burn area would follow up to two growing seasons after the seed has been sewn at the nursery. As the need for fuels reduction activities (burning) increases over time (as standing trees fall to the ground), it will be important to coordinate those activities with the objective of protecting areas of regeneration (natural and artificial).

The Forest's tree planting IDIQ (Indefinite Delivery, Indefinite Quantity) contract has recently expired. In order to prepare for planting projects, this contract will have to be updated, advertised and awarded prior to the first planting season (i.e. prior to seedlings being available). Given an adequate supply of appropriate seed and seedlings from the nursery and considering planting windows (seasonality) and logistics, it is estimated that up to 2,500 acres of planting in the fire area could be accomplished annually. This is a notable increase over the forest's current planting program, even considering planting needs in the Rodeo-Chedeski fire area which has been hindered by limits in budget and available personnel. This estimate assumes that there is a Forester/Culturist position filled as part of the recovery team (see actions) to be dedicated to reforestation projects, there is available seed and nursery area to produce the seedlings needed

and an adequate and efficient contractor base is available to implement contracts. Actual acreage of reforestation capability may be lower (for example, recent planting in the Rodeo-Chedeski and Warm fire areas in the region ranged from approximately 200 – 1,600 acres per year). A review of soil conditions and productivity will also inform the prioritization of reforestation efforts.

Site preparation will be required in some areas prior to planting; much of this will focus on removing overhead hazard trees prior to planting activities. The forest has had success with using heavy equipment to push or chain over standing snags and following this with a crushing machine to break-up resulting fuels. These activities also help prevent loss of the plantation to fires in the future.

Aspen

Aspen is an important feature on the landscape as it serves as an early seral species in conifer stand development, adds diversity to forest ecosystems and watersheds while providing valuable wildlife habitat and scenic qualities. As shown in the table above (burn severity in dominant cover types), there were approximately 20,600 acres of aspen stands (or clones) within the fire perimeter prior to the burn, representing 80 % of the aspen found on the ASNF. However, many of these stands were in noted decline or totally lost in recent years as a result of Aspen Decline. There were 60 aspen decline monitoring plots previously established within the fire area to further study aspen conditions on the ASNF. The plot information collected prior to the fire will serve as valuable baseline data for evaluating response of aspen stands (especially those documented in decline). As shown in the table below, aspen burned at varying degrees of severity in the Wallow Fire, which will influence aspen's recovery in the years to come.

Nearly 52% of the aspen stands within the Wallow fire area burned at high severity (75 – 100% mortality). This is not unexpected fire behavior for aspen, and, in fact, high severity fire may result in increased suckering response compared to lower severity classes. However, if areas of high severity fire burned with such intensity that aspen root systems were damaged or destroyed, aspen regeneration potential in these areas may be lost; the potential for complete loss of a stand may be exacerbated if these stands were showing signs of decline. Given expected loss of some stands, the short-term availability of this key habitat component has been drastically reduced, affecting wildlife species (bear, elk, deer, migratory birds, etc.) until sufficient regeneration has replaced these stands. In areas of lower burn severity and associated aspen mortality, regeneration can be expected with the likelihood that it will be heaviest where consumption of aspen over-story and reduction of litter and duff layers was highest (given high stand health and vigor prior to the fire). Overall, aspen regeneration can be expected to thrive over much of the burn area as this species is well adapted to reproduce in disturbed areas.

One of the most important factors affecting aspen's return to the landscape will be the protection of aspen seedlings and saplings from damage caused by animal browsing, especially in the lower slopes and flat-lands. Animal browsing has been shown to have significant impacts on the

successful regeneration of aspen as it can kill small seedlings/suckers while barking (removal of bark from stem) creates pathways for disease and decay into trees of all sizes. Given that much of the vegetation across the fire area has been lost and that aspen regeneration will likely emerge prior to other browse species, increased browse pressure on early regeneration can be expected. Forests across northern Arizona have had success with creating barriers (fences or jackstraw piles) around emerging aspen stands. While expensive, fences tall enough to exclude elk provide the greatest level of protection from browse, though they have to be maintained on a regular basis at additional costs. Jackstraw piles are less effective overall, but require no maintenance once in place; the appropriate use of this method should include considerations given to the amount of standing dead/dying trees available around the aspen stand and the fire/fuels risk that large concentrations of fuel will pose to the stand and surrounding forest. Given limited funds, monitoring aspen regeneration and implementing appropriate protection measures on priority sites will aid the recovery of this key forest and habitat component.

Ongoing Vegetation Management Projects

The fire has impacted a number of past, current and future vegetation management projects including the Greer WUI, Eagar-South, Nutrioso, Beaver Creek WUI and Campbell-Blue project areas (as well as others). Eagar-South and the Nutrioso projects (1 and 2) were important parts of the White Mountain Stewardship (WMS) project. In total, the fire impacted over 3,000 acres of active task orders in the Nutrioso projects (a total obligation of approximately $1.4 million) and a 1,450 acre task order in the Eagar South project that was scheduled for award in fiscal year 2011. These projects cannot move forward until it is determined if the original environmental analyses prepared for these projects are still valid. Field inspection/verification of burn severity conditions within each project area will be needed to inform project documentation review. Using remote sensing data (i.e. RAVG) mapping alone may yield inaccurate representations of post-fire conditions within these project areas (e.g. overestimation of moderate-high and high severity burn acreage).

Should it be determined that the fire has significantly changed the conditions in these project areas such that the original decisions are no longer valid, future offerings for the White Mountain Stewardship project will be need to be shifted. Without the ability to award task orders in Nutrioso or Eagar-South, the acreage for these projects would have to be substituted with acreage from projects on the Lakeside and Black Mesa Ranger Districts (Los Burros and Nagel projects). The use of these projects is anticipated to meet the majority of acreage commitments for the WMS through 2014, use of acreage in the Greens Peak and/or Show-South projects may need to be used. The fire did not impact current projects associated with the 4 Forest Restoration Initiative (Rim Lakes, Mineral C –Thompson, Mineral C- Whiting, Timber Mesa) and prep work continues in these areas to meet the initial commitments from the ASNF. However, if the Forest focuses all its current planning, prep and administration resources on restoration within the fire area, the ability to meet commitments to the 4FRI project may be jeopardized.

At the outset of the fire, the Forest was working on the revision of its Forest Plan; specialist reports and the Draft Environmental Impact Statement were nearing completion. Given that the Wallow fire altered existing conditions across much of the Apache side of the Forest, effects analyses may need to be reexamined to consider such a change in forest density and stand characteristics (age class/size distribution) and the possible departure from the range of natural variability for each Potential Natural Vegetation Type in the higher severity burn areas. Timber Suitability designations may also need review for reduced soil productivity due to excessive soil heating and subsequent erosion.

Roadside Hazard Tree Removal

As part of the BAER activities in the fire area, 266 miles of high use roads are currently being cleared of hazard trees to protect the safety of forest employees and contractors and the general public once areas are re-opened for use. Following or concurrent with these efforts, the Forest has been and will continue to offer salvage sale contracts for removal of this material. Sales ranging from 400 to 3,000 ccf (hundred-cubic-feet) of material have been offered and contracts have been awarded with bid rates ranging from $1.00 (the regional minimum) to $6.50 per ccf. Additional contracts for roadside hazard tree material will be offered in the fall of 2011.

Included in the recommendations for roads and public safety (see Engineering section), is the continuation of immediate hazard tree removal operations for up to a total of 1,000 miles of roads within the fire area. Given an average corridor of 150 feet from either side of the road, this work would treat hazard trees and remove material from up to 36,364 acres (this includes some of the acreage already being treated). There is approximately 700 miles of additional roads in the burned area (low to moderate severity) that could add an additional 25,500 acres beyond what is already being recommended for treatment.

Prior to the start of the Wallow fire, the Alpine and Springerville Ranger Districts were actively planning and implementing vegetation management projects to improve forest health and treat hazardous fuels near the Wildland Urban Interface. Though much of these areas were burned over (see discussion above), project areas which lost less than 75% of the existing basal area may still warrant continuation of treatments to meet forest health and fuels reduction objectives. Utilizing previous analyses and survey work in these areas can expedite project planning and implementation timeframes.

Salvage

Salvaging timber from the forest interior (i.e. material not associated with hazard tree removal along roads or included in previous project areas) may be desirable to meet resource needs and capture economic value before it's lost. Salvage operations can be an important first-step in preparing sites for reforestation efforts to protect planting crews as well as the growing trees from mechanical damage from falling trees and re-burn potential. Generally, salvage timber can

still hold value for up to 3 years before the wood fiber deteriorates, though this may be longer depending on site conditions.

The table below shows the amount of mixed conifer and ponderosa pine forest burned at the ranges of severity in the Wallow Fire (based on RAVG data); slope data is presented to give an idea of operational considerations to be made. Highly erosive soils unsuitable for logging operations (under the Forest Plan) and other sensitive areas (wilderness, wildlife habitat) are not included in acreage totals given below. Nearly 90% of the mixed conifer and ponderosa pine available for salvage operations are on slopes less than 40% and offer salvage opportunities accessible to traditional ground-based logging systems.

Table 4. Wallow Fire Burn Severity in Mixed Conifer and Ponderosa Pine stands on slopes less than and greater than 40% (with Wilderness, Sensitive Soils and Wildlife Habitat Removed)

Cover Type and Slope Class	Acreage per RAVG Burn Severity Class				
	0 - 25%	25 - 50%	50 - 75%	75 - 100%	Grand Total
Mixed Conifer	**12,702**	**14,567**	**9,098**	**32,431**	**68,798**
0-40%	11,512	12,871	7,858	27,893	60,135
> 40%	1,190	1,696	1,240	4,538	8,664
Ponderosa Pine	**18,325**	**52,991**	**40,443**	**39,220**	**150,980**
0-40%	15,535	49,399	38,687	37,969	141,590
> 40%	2,790	3,593	1,756	1,251	9,390
Grand Total	**31,027**	**67,559**	**49,541**	**71,651**	**219,778**

Using Forest Inventory data from the 2009 FIA survey (from Forest Inventory Data Online; http://apps.fed.us/fido), initial volume estimates show that more than 850,000 ccf (approximately 425 million board-feet) of material may be available for salvage within the fire area. The assumptions made for these estimates are summarized below. Refining these assumptions and the data available to more closely reflect on-the-ground conditions will occur throughout the recovery process and produce more accurate estimations.

1) **Volume per acre before the fire** – This analysis only includes volume from trees greater than 9 inches in diameter (DBH) as material smaller than this has little to no market value and tends to rot quickly. The estimated volume per acre for ponderosa pine and mixed conifer forests across the burn area are shown below

- ***Net Volume Per Acre Averages (> 9 inches DBH) prior to Wallow Fire (using Forest Inventory Data 2009)*:**
  - **Ponderosa Pine – 16.71 ccf/acre**
  - **Mixed Conifer – 18.73 ccf/acre –** (this volume is strictly for Douglas-fir, as other species in mixed conifer were not easily separated from FIDO data).

(Volume per acre estimates are based on the NET volume of wood in the central stem from trees at least 9 inches in diameter to minimum 4-inch top diameter).

2) **Volume loss percentage given RAVG burn severity classes** – As RAVG modeling presents basal area loss as a range (e.g. 0-25%) applying standard basal area loss percentage for each severity class is necessary; these estimates are shown in the Table below (Assumed % Volume Loss).

Table 5. Assumptions made for the percent of volume lost for each burn severity class used in salvage volume estimate.

Burn Severity Class	Assumed % Volume Lost
0 - 25%	15
25 - 50%	40
50 - 75%	60
75 - 100%	90

3) **Availability of lost volume for salvage** – In order to account for volume (trees) that were completely or nearly completely consumed in the fire and for material that will be left on-site to address other needs (soils, watershed and/or wildlife), an assumption of the percentage of volume available for salvage was made (shown in Table 5, below).

Table 6. Assumed volume consumed by fire and estimates of volume to remain on-site to meet other resource needs used for salvage volume availability estimates.

Burn Severity	Volume Consumed*		Volume to remain on-site *	% of Volume Available for Salvage
0 - 25%	5%	+	0%	**= 95%**
25 - 50%	15%	+	5%	**= 80%**
50 - 75%	30%	+	10%	**= 60%**
75 - 100%	60%	+	25%	**= 15%**

*Volume consumed is a visual estimation by Forest Silviculturist after multiple flights over the fire area. Volume to remain on-site is an assumed value.

The calculation used to estimate the salvage volume potential for each species group and each severity class is as follows:

Avg. Vol/Acre (1) **X** *Assumed % Vol Lost (2)* **X** *% Vol Available for Salvage* **X** *Acreage* = **Total Volume Available**

The table below summarizes the acreage and salvage volume available within the Wallow Fire area across RAVG burn severity classes using data and assumptions given above. The values

given reflect only the acreage and volume available on slopes less than 40% which are most feasible with traditional ground-based harvesting methods.

Table 7. Potential salvage acreage and volume in Ponderosa Pine and Mixed Conifer stands across burn severity classes within the Wallow Fire. Acreage given reflects only slopes less than 40%.

	Ponderosa Pine		Mixed Conifer		
Burn Severity	Acres	Total Volume (ccf)	Acres	Total Volume (ccf)	GRAND TOTAL (ccf)
0 - 25%	15,535	36,992	11,512	30,726	**67,718**
25 - 50%	49,399	264,146	12,871	77,144	**341,290**
50 - 75%	38,687	232,726	7,858	52,985	**285,711**
75 - 100%	37,969	85,652	27,893	70,529	**156,181**
TOTAL	**150,979**	**619,516**	**68,797**	**231,384**	***850,900***

***Sampling Errors for Volume Estimates from FIDO are 13.9% for PP and 25.6% for MC**

As shown above, the vast majority of salvage material available (Nearly 75%) is within low-moderate and moderate-high (25 – 50% and 50 -75%) burn severity classes. Focusing salvage/restoration treatments in these areas may offer the greatest gain in recovering economic values while protecting residual live trees from insect and disease attacks though volume yield per acre will greatly influence the operational and economic feasibility in these areas. Additional material from oak, aspen and other softwoods (such as spruce ,fir and white pine) will also be available, however estimations of those volumes are difficult due to limitations of inventory data at the time of this report; Spruce, fir and southwestern white pine may contribute an additional 25-30% in mixed conifer volume. Aspen and oak trees offer additional volume that can be salvaged and used for firewood and/or biomass and have been included in recent roadside hazard tree removal sales. The estimates only consider the merchantable portion of trees >9 inches in diameter; significant biomass volume from small trees and tree tops and limbs would be available if markets become available.

It can be expected that additional mortality will be observed in the fire area over the next 1 to 6 years; volume estimates for this eventual mortality were not included in the totals above because 1) it is difficult to estimate at such a large scale, and 2) it is assumed that the eventual mortality can make-up for the loss of current volume estimates due to future loss of value (rot).

The Wallow Fire area has an extensive existing road system with nearly 495 miles of roads to access the available salvage acreage summarized above. Utilizing the existing road system to the greatest extent possible will expedite project planning and improve overall economics by limiting the amount of temporary road construction required to remove salvage products though considerations must be made for existing road conditions and maintenance requirements given the expected increase in runoff levels.

The removal of fire killed trees prior to the loss of useable material to protect public safety, address forest health and reforestation concerns and recover economic value will be a necessary part of the recovery effort. Given the large scale of the Wallow fire, opportunities exist in each of these areas though prioritization will be necessary to address project specific objectives and maximize return on investment.

Insects and Disease

Prior to the Wallow fire, the fire area showed a variety of insects and disease agents including Ips, western, roundheaded and mountain pine beetles, Douglas-fir and spruce beetles, fir engravers, defoliators, dwarf mistletoe, blister rusts and root rots. Additionally, Aspen Decline had been documented in the area and recent surveys suggested that up to 25,000 acres of aspen had been impacted or completely lost across the forest (primarily on the Apache side). Insect and disease levels were monitored with yearly surveys by Forest Health Protection staff as well as documented by Forest personnel during routine project work.

Some of these agents likely played a role in fire behavior and effects, though further analysis of the pre and post fire conditions would be needed to quantify these effects. The post-fire response of insects and diseases within the fire area will vary between species and depend on a variety of environmental factors including: burn severity, residual live tree density, climate, location and other environmental conditions. Immediate actions can be taken to minimize the impacts of existing I&D agents, while future actions must be responsive to monitoring results to reduce further damage to and loss of forest vegetation.

Below are considerations for important insects and diseases that are likely to be active following the fire:

Bark Beetles

Beetle activity will likely increase following the fire, especially in the *Dendroctonus* and *Ips* species (ponderosa pine beetles generally do not show large-scale outbreaks following fire, though fire perimeters and areas near existing populations will be at risk of further infestation from these species). Trees severely damaged (but not killed) by the fire will serve as ready hosts to beetle populations which could multiply and begin to attack residual green trees. For this reason, proactive management of dense stands within the fire perimeter (or near known populations) should be emphasized. Perhaps most important will be the protection of residual live trees in high value sites such as developed recreation areas and key wildlife habitat such as MSO PACS (with an emphasis on the largest trees in the area). Further damage or loss of trees in this area could pose a threat to life and safety and further degrade important wildlife habitat. Beetles may also impact the success of natural regeneration in areas if they attack and subsequently kill potential seed trees.

Mistletoe

Mistletoe was present in much of the conifer forest stands within the fire area prior to the Wallow fire. Though further assessment of pre and post fire data will determine exactly how much mistletoe remains, it is very likely that mistletoe persists in areas that were not completely consumed by fire. The most important consideration for mistletoe is how it will influence (impact) natural and artificial regeneration efforts.

Root Rot

High levels of root rot in mature mixed-conifer and spruce/fir stands were documented in the fire area prior to the burn, including in and around developed recreation sites. It is likely that root rot pockets will expand and increase after the fire as it will spread through the roots of the dead trees. Additional live trees within and adjacent to these pockets will also likely be infected. A primary concern for areas infected with root rot diseases is the likelihood of root failure and wind-throw of trees that, without careful inspection, appear healthy.

White Pine Blister Rust

White pine blister rust, a non-native disease, was only recently discovered in Arizona, including within the Wallow fire perimeter in 2009. The disease was observed mostly in moist canyon bottoms, and less frequently on upper slopes. There were 12 WPBR monitoring plots within the fire area that were part of a study being conducted by FHP and NAU. It is likely that a flush of *Ribes* shrubs (the alternate host species) will follow the burn in higher elevation moderate to high severity areas which could spread the disease to residual live white pines and future regeneration. High infection hazard sites include very moist sites such as drainage bottoms.

Defoliators

Populations of defoliators in the spruce/fir forest types were active in the fire area prior to the burn. It is likely that moderate to high severity burn areas killed individuals but defoliating insects will persist within the burn area. Consideration to these insects should be given when replanting areas of the fire (using the appropriate species mix) and managing stands in the future to reduce interlocking crowns and multiple canopy layers.

Aspen Decline

The high mortality of mature aspen stands observed over the past decade is no longer expected to be an issue within the fire perimeter, due to mortality from fire. Aspen reproduction through suckering and/or seedling establishment is expected to be prolific immediately following fire, however, in some areas regeneration is threatened by severe browsing of wild and domestic ungulates. A monitoring plan is necessary to determine where aspen reproduction is threatened and what if anything can be done about it. For more information on aspen response in the Wallow fire, refer to the aspen discussion above.

Literature Cited / Reviewed

Brown, J.K., and J.K. Kapler Smith, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, forest Service, Rocky Mountain Research Station. 257 p.

Brown, J.K., E.D. Reinhardt, and K.A. Kramer. 2003. Coarse woody debris: managing benefits and fire hazard in the recovering forest. Gen. Tech. Rep. RMRS-105. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 16 p.

FEIS. 2011. Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis, accessed July 2011.

Forest Inventory Data Online (http://apps.fs.fed.us/fido). Accessed 8/17/2011.

Higgins, Bruce. 2008. A Comparative Analysis of Forest Recovery. unpublished.

Rogers, Paul. Sept. 2003. Forest Resources of the Apache-Sitgreaves National Forest. USDA-FS Rocky Mountain Research Station, Ogden, UT.

Savage, M., and J.N. Mast. 2005. How resilient are southwestern ponderosa pine forests after crown fires? Can J. Forest Research 35: 967-977.

Sieg, C.H., J.D. McMillin, J.F. Fowler, K.K. Allen, J.F. Negron, L.L. Wadleigh, J.A. Anhold, K.E. Gibson. 2006. Best predictors for post-fire mortality of ponderosa pine trees in the Intermountain West. Forest Science 52(6) 718-728.

Additionally, critical site and program specific data and information for this report was provided by:

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Recommended Actions

Immediate Need: Roadside Removal of Dead and Dying timber

Action Description:

Initiate immediate removal of hazard trees along roads within the fire perimeter. Considering all Maintenance Level 2, 3, 4 and 5 roads within the burn area on ASNF lands (totaling 1,000 miles), up to 36,364 acres of timber could be salvaged from within 150 feet of each side of the road; treatment along roads not currently recommended by the engineering group would add an additional 700 miles and 25,500 acres of immediate salvage availability. This work has already begun on nearly 266 miles of roads (totaling up to 9,672 acres) in the burn area. Project planning for this effort would be expedited as it is an immediate need to protect health and safety (per 1909.15 Chapter 30 – 32.12 Category 1 – Decision Memo and Case File NOT required), though cursory review from specialists could help identify any special protection needs. Considerations for easements and right-of-ways would have to be made in preparing the project which may reduce overall acres and timber volume availability. Projects would be implemented within 3 years following the fire to ensure material recovery. As the majority of the roads (1,000 miles) are being contract fell through engineering to immediately abate hazards, layout, mark and cruise costs would be minimized along these roads, though adding additional roads would require this work. All sales would require administration of the contracts.

***Which resource or issue area(s) does it address*?**

Trees are currently being felled to address the immediate need to protect the life and safety of forest visitors and workers as recreational use and project work in the fire area gradually increases. Following the hazard tree removal activities with timber sales to remove downed trees would provide forest products to local markets and help create fuelbreaks across the burn area as material would be removed from the roadside that could otherwise create high fuel loading adjacent to roads.

***How does the action relate to damage or changes caused by the event*?**

Fire killed trees along roadway pose a safety hazard to forest visitors and workers; this action is proposed in order to address these concerns. Additionally it will provide products to local markets and help prevent hazardous fuel conditions along roadways in the future.

***What are the consequence(s) of not implementing the action*?**

Allowing standing dead trees to remain adjacent to roads poses a serious safety issue. These trees will eventually fall and could possible injure or kill people recreating or working near roads. Falling trees will block roads, possibly stranding visitors or workers. Fallen, jackstrawed trees could present fuels issues next to roads creating challenges for fire management in the future as well as create unsightly conditions along frequently travelled roadways.

***What is the cost of the action*?**

Planning:

GS 11 Archaeologist (project review, recommendation for avoidance/mitigations): 20 days @ $300/day: $6,000

GS 11 Resource Specialists Review (range, wildlife, fish, soils, hydro, fuels, lands, recreation, silviculture) 10 days each @ $300/day: $27,000

Implementation:

GS 12 Contracting Officer (contract review, award, administration) 40 days @ $360/day: $14,400

GS 11 Timber Management Officer (project review, coordination, implementation) 40 days @ $300/day: $12,000

GS 9 PreSale Forester (Contract Prep, field prep coordination) 60 days @ $260/day $15,600

Administration (including supplies) $30/acre X 36,364 acres $1,090,920

Additional ML 1 roads added:

Layout/Mark/Cruise/Admin – 25,500 acres @ $140/acre $3,570,000

TOTAL: $1,198,920 ($32.06/acre – this total increases to $4,735,920 when adding additional mileage/acreage from ML 1)

Acreage: 36,364 (61,864 with additional ML1)

Immediate Need: Section 18 reviews on Nutrioso 2, Eagar South-Phoneline projects Greer WUI Environmental Assessment and Campbell-Blue CE documentation.

***Action Description*:**

Complete Section 18 reviews on Nutrioso 2, Eagar South-Phoneline, Greer WUI and Campbell-Blue projects to determine if the original analysis and decision are still valid or if changed conditions resulting from the fire are outside the scope and range of the effects considered in the original analyses. If projects are within the scope and range, document the findings (FSH 1909.15 – Section 18.4) and move forward with implementation (some marking will likely be necessary). Based on review of existing environmental conditions and analysis, reanalyze these projects using appropriate NEPA compliance documents using as much of the previous effects analyses as are still valid. It will be critical to obtain quality field data to verify post fire information (such as RAVG) prior to assessing the changed conditions in each of these projects and ID Team should help determine what information needs will be priority for review.

***Which resource or issue area(s) does it address*?**

This action will assess whether the continuation of vegetation management activities authorized under previous decisions are appropriate and will help the forest determine how to meet obligations for important forest programs (i.e. the White Mountain Stewardship Contract). Additionally, the original intent and objectives of these projects will be met (fire/fuels, watershed protection, forest health, etc.) should they be determined to move forward with implementation.

***How does the action relate to damage or changes caused by the event*?**

Fire over such a large area may have changed conditions enough that either 1) the original desired conditions for these projects are no longer applicable or achievable, and/or 2) the effects analyses in the original Environmental Assessments are no longer accurate.

Assessing whether or not these projects can move forward after the fire will determine how the forest will meet its priority targets for WMS through 2014.

***What are the consequence(s) of not implementing the action*?**

Continuation of project implementation without a review of the original analyses and decisions may put the forest at risk for lawsuits based on changed conditions.

***What is the cost of the action*?**

Field Data Gathering – Prepare Changed Condition Report for ID Team

GS-11 Forester/Silv. (Project oversight, field verification) - 10 days @ $300/day $3,000

GS 7 Forestry Technicians (GPS and plot data collection) – 2 techs, 10 days each @ $220/day $4,400

ID Team Review and Assessment of Original Documentation

GS 13 District Ranger (Project direction and review) – 5 days @ 450 $9,000

GS 11 Forester/Silv. (ID Team Leader) – 15 days @ $300/day $4,500

GS 11 Specialist Review (range, wildlife, archaeology, fire/fuels, hydro/soils, lands, fish, recreation, timber) 10 days each @ $300/day $30,000

Remark of burned areas that are cleared for implementation following Chapter 18 Review (remarking in Nutrioso 2 and Eagar South-Phoneline).

Marking 2,225 acres @ $75/acre - $166,875 (Nutrioso 2 and Eagar South-Phoneline; estimate that only ½ of the acreage may need remarking)

Supplies, Materials and Vehicles

2 Trucks FOR and Mileage (2 months use) - $325/month and $0.35/mile (300 miles each) $1,510

Misc. - $1,000

TOTAL: $220,285 Treatment Acres = 4,450 + any remaining acres available from Greer WUI.

Prepare Forest Restoration Strategy – FY 12

***Action Description*:**

Standing dead timber within stands that have only burned at low to low-moderate severity presents a problem for maintaining forest health and minimizing future hazardous fuels conditions in the long term. Fire killed trees remaining amongst unburned or lightly burned stands could act as suitable breeding material for *Ips, Dendroctonus* and other beetles known to already exist in the fire area (see insects and disease discussion in this report). As standing dead trees begin to fall in the next 3-5 years and regeneration emerges, fuel conditions may pose the threat of fire once again spreading into the canopy.

Compile various recovery projects and review with appropriate NEPA analysis. This could include re-visitation on the Beaver Creek WUI project, other previously analyzed project areas that are no longer able to move forward due to changed conditions (see above), addressing forest health by thinning and removing mortality in high priority areas (e.g. WUIs), prescribed fire treatments in the fire area, reforestation projects, sediment cleanout of lakes, culvert replacements and others. Consider using previous NEPA analysis areas to expedite survey and analysis as well as placing vegetation management activities between previously implemented WUI projects to enhance community protection. Various decision documents can be tiered to this single analysis and Decision Memos can be issued where appropriate.

Recommend filling a dedicated planning team for this effort (this is reflected in the skills need assessment and organizational structure described in the report).

Which resource or issue area(s) does it address?

This action will address many of the needs for forest health protection (thinning, prescribed fire, etc.) and the rehabilitation actions that require NEPA analysis (sediment cleanout, culvert replacement).

How does the action relate to damage or changes caused by the event?

The fire has burned over existing project areas, damaged or degraded infrastructure such as culverts and has put Hulsey, Sierra Blanca and Acre lakes at risk of filling with sediment. Restoration activities will require NEPA analysis prior to implementation and developing a strategy to effectively conduct analysis and implementation is important.

What are the consequence(s) of not implementing the action?

Individual project planning efforts may become burdensome and difficult to handle for a single team and projects may get tied up in the planning process and unable to capitalize on available rehabilitation funding during the limited time it is available.

What is the cost of the action?

Estimate a vegetation management project area resulting from this NEPA analysis at approximately 40,000 acres. Of course, the costs can be scaled to final project acreage determined by Forest and Planning team. Costs for planning team are captured in summary tables as the individual line item for the NEPA team. (Planning Team Costs: $2,200,000 for FYs 12 and 13)

Implementation costs of the various projects are shown individually as well; reduced prep costs given could possibly be reduced if it is determined that the use of DxD/DxP will meet silviculutral objectives, though higher sale administration costs will be realized to ensure cutting is meeting project objectives.

Implementation:

GS 11 Silviculture (RXs/Contract Specs) -80 days @ $300/day = $24,000

Heritage Resource / Biological Surveys - $75/acre = $3,000,000

Layout, Mark, Cruise and Administration - $140 / acre x 40,000 acres = $5,600,000

Overhead – GS 12 CO 180 days @ $360/day = $64,800

TOTAL: $8,690,000 Treatment Acres: 40,000 (estimate)

These costs were spread over 3 years

Plan/Implement additional timber salvage project for interior forest areas – FY12/13/14

Action Description

Should markets become available for salvage material from the burned area, preparation of an EA/EIS for salvage sales and implementation activities will be required (layout, mark, cruise, administration, etc.). NEPA planning could be handled by the dedicated NEPA team suggested in the RAT final report and costs for such analysis are incorporated as a separate line item. Consider salvaging from areas most easily accessible from existing roads to minimize analysis and temporary road construction needs. As shown above, over 100,000 acres of the wallow fire are within 600 feet of existing forest roads (ML 2-5). Analysis of burn severity and cover type within this area has yet to be done to help inform desired conditions and initial volume estimates. Some of this area is being treated already for hazard tree removal, but even so, abundant salvage opportunity exists beyond those activities.

Which resource or issue area(s) does it address?

Recovery of forest products/economic value of lands within the fire boundary. This project could also be used to prep reforestation sites by clearing overhead and eventual fuel loading hazards in areas identified for planting.

How does the action relate to damage or changes caused by the event*?*

The Wallow fire burned across a large area of a forest that has traditionally produced significant timber resources to support the local and regional economy.

What are the consequence(s) of not implementing the action?

Un-salvaged timber will eventually deteriorate and become unusable by most of the current industry. Falling trees may damage natural regeneration and reforested areas and could pose a threat of spreading fires to these areas before trees are large enough to withstand burning.

What is the cost of the action?

Acreage given is an estimate and fully within the lands available for salvage harvest. Exact project scope and costs will be determined by Forest and planning team.

Planning Team (for FY 14 to finish any work started by recommended planning team under the comprehensive restoration project):

GS 11 NEPA Planner/Team Leader – 120 days @ $300/day $36,000

GS 11 Specialists (range, wildlife, archaeology, fire/fuels, hydro/soils, lands, fish, recreation, timber, silviculture) 120 days @ $300/day $360,000

Implementation:

Heritage Resource Surveys - $30/acre $1,500,000

Wildlife Surveys - $15/acre $750,000

Layout, Mark ,Cruise and Administration - $150 / acre x 50,000 acres = $7,500,000

TOTAL: $~10,150,000 Treatment Acres: 50,000

Planning and 30% of prep/admin costs put in FY 12

40% prep/admin cost put in FY 13

30% prep/admin costs in FY 14

Prepare Comprehensive Reforestation Plan – Immediate Need

***Action Description*:**

It is recommended that the ASNF silviculture group meet for a dedicated period of time to discuss the reforestation needs for the Wallow fire (and rest of the forest) and compile a comprehensive reforestation plan for the burned area. Considerations should be given to natural regeneration areas and PNVT as well as seed zones, elevation ranges, proper species mix and priorities for anticipated planting efforts. GIS assistance will be required for this effort. Additionally, the group should review and finalized the 10-year Seed Procurement Plan for the forest and begin preparing specifics for new cone collecting and planting IDIQ contracts. A final Seed Procurement Plan must be in place prior to cone collection and sewing (nursery work). It is recommended that the forest consider using categorical exclusion authority (see FSH 1909.15 Chapter 30 – 31.2 #5) where no extraordinary circumstances exist and conduct suitable NEPA compliance where the use of CEs is not appropriate.

***Which resource or issue area(s) does it address*?**

This is critical for the successful reforestation efforts in the Wallow fire area. Reforestation will address soil/watershed and watershed concerns identified in the RAT report.

How does the action relate to damage or changes caused by the event?

Reforestation (planting) will be required in many areas of the Wallow fire to expedite recovery to a forested condition and improve hydrologic function and wildlife habitats.

***What are the consequence(s) of not implementing the action*?**

Without developing a reforestation plan and assessing reforestation and seed collection, storage and sowing needs, planting efforts could stall or become cumbersome resulting in fewer acres being planted.

***What is the cost of the action*?**

Request to Fund Digital Imagery Flight for FY 11

$260,000 (listed in FY 11 in cost summary tables)

Reforestation Plan

GS 11 Silviculturists (4) : 15 days each @ $300/day $18,000

GS 9 GIS Specialist: 10 days @ $260/day $2,600

Resource Specialist Review and Input: (range, wildlife, archaeology, fire/fuels, hydro/soils, lands, fish, recreation, timber)

5 days each @ $300/day $13,500

Total: $34,100 Project Accomplishment: Comprehensive Reforestation Plan, Seed Procurement Plan and strategy, NEPA document authorizing planting activities.

Reforestation in high priority areas

Action Description:

Fill Forester/Culturist (position reflected in the suggested organizational structure under Silviculture) , to take direction from reforestation plan (above) and begin managing a reforestation program including cone collecting, seed storage, sowing seed (borrowed or stock seeds). This position will prepare IDIQ contracts for collection and planting and oversee survival exams and can prepare and evaluate grant opportunities to help support program. This position will also contribute to the assessment/planning team for the comprehensive restoration project and coordinate planting with other activities in the burn area.

Begin site preparation activities (where necessary) and planting in 2013/2014 at the rate of 2,500 acres per year (estimated maximum capacity). Continue survival and stocking exams on standard schedule (1, 3, 5, 10 years) on both natural regeneration and reforested areas within the fire. Request digital imagery flight in year 2014 or 2015 to assess natural regeneration and inform other restoration activities.

***Which resource or issue area(s) does it address*?**

A dedicated position for this effort will improve program efficiency and effectiveness.

***How does the action relate to damage or changes caused by the event*?**

The Wallow fire has burned at high severity over more than 50% of its area, much of these areas will not regenerate naturally due to a lack of available seed trees.

***What are the consequence(s) of not implementing the action*?**

Large areas of the fire will take many years or decades to regenerate on their own.

***What is the cost of the action*?**

Seedling Costs:

$200/ acre @$2,500 $500,000

Planting:

2,500 acres/yr @ $600/acre = $1,500,000 / year for 10 years.

Forester/Culturist Position (planting prep, administration and survival exams):

GS 9 – 260 days @ $260/day $67,600
GS 7 Forestry Tech Assistance: - 120 days @ $220/day $26,400
GS 11 Silviculture (Planting RXs, contract prep) – 80 days @ $300/day $24,000
Site Preparation:
1,000 acres/year @ $90/acre $90,000/year
Digital Imagery Flight to determine natural regeneration success at year 3 or 4 post fire
$350,000

Cost/year ~$2,155,800 - Cost in FY 2014 = ~$2,505,800

Accomplishment: Collect seed, sow/lift seed, planting contract and site prep to reforest approximately 2500 acres/year.

Apply MCH Bark Beetle Repellent Caps in High Value Areas – FY12, FY13

Action Description:

Distribute MCH pheromone caps across 2,400 acres of high priority sites throughout the fire area including MSO PACs with large diameter Douglas-fir remaining after the fire and developed recreation sites.

Which resource or issue area(s) does it address?

It will protect key habitat and recreational site features from insect attack.

How does the action relate to damage or changes caused by the event?

Bark beetle activity is expected to increase after the fire and large Douglas-fir are at risk of attack and mortality. The pheromone packets will be effective at repelling beetles from these high value sites (including some success for spruce trees as well).

***What are the consequence(s) of not implementing the action*?**

Loss of large Douglas-fir within developed recreation sites will change the character of these sites and create a hazard to the safety of visitors. Loss of these trees in MSO PACs will remove key habitat components from the few PACs have not been burned at higher severities in the project area.

***What is the cost of the action*?**

Purchasing MCH Packets
2,400 acres (1,400 PACS – 1,000 ac. developed rec) @ 30/acre X $2 each $144,000
Placing Packets:
500 person-days to place all packets in 4 week period (125 person-days per week)
6 placement crews x 4 GS 4/5 per crew @$150/day per person X 4 weeks $72,000
Supplies, Materials and Vehicles
Safety Supplies - $800/crew X 6 crews $4,800
Materials (staples, staple guns etc.) $1,000
Cold Storage for Packets $1,000
4 Vehicles @ $325/month X 1 month + $0.35/mile X 500 mi each = $2,000

Total: ~$224,800 Project Accomplishment: Doug-Fir beetle mitigation on approximately 2,400 acres/year in high value sites.

Hazard Tree Recognition Training for Forest and Cooperating Agencies – Immediate Need

***Action Description*:**

Hold hazard tree recognition training for Forest employees and cooperating agencies and partners to increase situational awareness and safety as post fire projects begin.

***Which resource or issue area(s) does it address*?**

Health and safety of forest personnel and cooperating agencies.

***How does the action relate to damage or changes caused by the event*?**

There are many trees that are structurally compromised due to fire and insect and disease activity.

***What are the consequence(s) of not implementing the action*?**

Possible hazards to people working in the fire area.

***What is the cost of the action*?**

Hazard Tree Specialist Time	
GS 12 Hazard Tree Specialist (Fairweather) – 5 days @ $360/day	$1,800
Travel	$650
Supplies and Materials	$500

Total: ~$2,500 Project Accomplishment: 2 or 3 training sessions on Hazard Tree Identification

Survey Developed Recreational Areas for Hazard Trees, Insects and Diseases. FY12-13

Action Description:

Use FHP assistance to identify trees in developed recreation sites that are structurally damaged due to fire or insects and disease to reduce the risk to forest visitors.

Which resource or issue area(s) does it address?

Public health and safety.

***How does the action relate to damage or changes caused by the event*?**

Insect and disease activity may increase following the fire.

***What are the consequence(s) of not implementing the action*?**

Safety hazards in developed recreation sites would remain and could seriously injure visitors.

***What is the cost of the action*?**

GS 7 Forestry Tech Assistance – 4 @ $220/day each 120 days	$4,400
Felling Costs	$10,000
Travel	$2,500
Supplies and Materials	$500

Total: ~$19,000 Project Accomplishment: Hazard Tree Assessments in Developed Rec Sites for 2 years.

Assign or Detail GS 9 Forester to reevaluate and correct timber stand delineations in required databases. – Immediate Need

***Action Description*:**

A forestry technician is needed to re-delineate stand boundaries within the fire area due to changes in vegetation types and boundaries. This effort will feed the assessment of post fire conditions, and will be needed for NEPA analysis of various restoration activities (reforestation, salvage cutting) and accomplishment reporting in the FSVeg and FSVegSpatial databases.

***Which resource or issue area(s) does it address*?**

This will assist in condition assessment and monitoring as well as inform future planning efforts.

How does the action relate to damage or changes caused by the event?

Drastic changes in stand conditions over much of the fire area require new stand boundaries be draw so that project activities can be accurately recorded through time.

***What is the cost of the action*?**

GS 9 Forester (oversight) – 60 days @ $260/day	$15,500
GS 7 Forestry Tech – 120 days @ 220/day	$26,400

Total: $~32,000