



Rehabilitation Following Wilderness Fire Suppression Activities

The major goal of wildfire rehabilitation is: To mitigate or eliminate environmental resource impacts caused by the fire suppression effort and rehab the area to as natural conditions as possible. Agency policy emphasizes the need to rehabilitate areas disturbed during the fire suppression effort to as natural an appearance as possible.

This goal coincides with the intentions of the Wilderness Act, which states: “...wilderness is an area effected primarily by nature, with human activity substantially unnoticeable...” In the case of wild-fire suppression, it is the human involvement that has the potential to be the damaging effect on the wilderness resource, even more so than the effects of the fire.

Rehabilitation Suggestion

Before starting rehabilitation task, walk through adjacent untouched area and observe appearance, arrangement and color scheme of a naturally evolved forest. Let your imagination be your guide—notice the variety/diversity of a natural landscape. The Resource Advisor should be available for advice and support with the crew(s) as well as quality control.

Major areas of concern to address in a fire suppression rehab plan are firelines, helispots, camps, staging areas, and any actions taken related to the the fire suppression effort. For instance, the repair of trails or bridges damaged during pack-in/pack-out trips, or the collection of plastic flagging used to direct crews to the fire or location of spot fires.

Fireline Rehabilitation:

- After fire spread is secured, replace dug-out soil/duff; obliterate any berms and leave as natural appearing.
- Provide some means for drainage to prevent erosion on firelines or trails created on sloped areas, i.e., shadow-depth water bars, or natural material to act as sediment dams.
- Scatter some cut brush/limbs onto fireline or impacted areas so it blends with the natural appearing landscape.
- Scatter obvious, excess accumulations of cut limbs/seedlings/saplings into a more natural arrangement.
- Flush cut stumps of felled trees and snags with the ground surface; scatter cut portion out of sight.
- Camouflage cut stumps in a manner that blends with surrounding natural landscape.
- Use a variety of means to camouflage cut faces of stumps and bolewood (rocks, dead woody material, fragments of stumps, bolewood and/or limbs, soil, and fallen/broken green branches)
- If need be, bring in some of the natural material you will use to camouflage cut faces of stumps and boles from adjacent untouched areas. (However, excessive movement of such material as dead down woody debris, partially decomposed stumps/bolewood, fragments of stumps/bolewood, etc. within the constructed helispot area could cause additional unnatural appearances)
- Piece together cut sections of down logs to appear natural, if possible. Place soil or some existing debris over where the cut was made.
- Position cut logs where they will be least noticeable to wilderness/park visitors.
- If bolewood can be moved, place cut end adjacent to or underneath existing down material.
- For large size bolewood that cannot be moved, place a slant cut (45-60 degree angle) on the

bottom side.

- Do not lop and scatter tops of cut trees. (Lop and scatter could create a harvest/precommercial thin appearance instead of a natural landscape)
- Selectively place a few of the cut seedlings or saplings in an upright position (wedged between down logs, old root wads, etc.).
- If there has been an excessive amount of bucking, limbing and topping, consider slinging rounds and tops from the site.
- Consider using explosives on some stumps and cut face of the bolewood. (End-result appearance will resemble that of a wind-fallen tree)
- Remove all plastic flagging and trash along the fireline.

Constructed Fireline

Firelines are frequently constructed heading straight down steep slopes creating extreme erosion potential. When lines are built across slopes or down slopes of moderate grade, a trench cleared to mineral soil will create a long-lasting scar unless repaired. While preventing erosion is the most important goal in rehabilitating firelines, a fireline that recovers at a slower rate than the fire area itself is considered equally unacceptable.

Many factors need to be considered when deciding the extent of rehabilitation. Most standards apply to all circumstances, with a few differences necessary as canopy cover, elevation, and moisture content of the areas vary. General standards which apply to all constructed firelines are followed by three site-specific standards that address the differences in rehab due to canopy cover, vegetation type, and moisture content. Standards for exposed sites, for example, call for greater transplant density and greater mulch cover.

General Rehabilitation Standards:

1. Replace recoverable rocks, mineral soil and duff which were removed during fireline construction. Mix well.
2. The above materials must be mounded in the fireline 4-6" higher than original contour to compensate for settling.
3. Add supplemental organic matter, if necessary, to accomplish the above. See Appendix B for site-specific supplements to be used.
4. Place check dams and drainage ditches as needed using the suggested guidelines given in the table below:

SLOPE (degrees)	CHECK DAMS	DRAINAGE DITCHES
<10	None	None
10-20	None	Every 30 feet
20-35	None	Every 15 feet
>35	Every 10-15 feet	Between every other check dam

5. Layer all suitable plants that are available along the fireline edges.
6. Plants need to be restored to the fireline at a frequency which is $\leq 25\%$ of the original cover unless the area fits one of the following circumstances: (1) high elevation (above 3500 ft) and non-forested (veg < 3 ft tall); or (2) high elevation and forested (veg > 3 ft) with canopy cover $\leq 50\%$. In this case, plants need to be restored at a frequency which is 50% of the original cover. If these plant cover densities cannot be met by layering (Step #5) plants must be added by transplanting. See Appendix B for specifics on suitable individuals to transplant and how to transplant properly.
7. Replace dead and downed material that was previously in fireline, i.e. logs.
8. Lay cut brush over the fireline, one layer thick only!
If the area is forested with at least 20% canopy cover or 50% shrub cover, 80% of the damaged area needs to be covered with mulch.
9. Retrieve flagging and remove all litter, tools, etc.
10. Flush cut conspicuous stumps; camouflage the ends with soil and vegetation.

Rehab Success Evaluation:

At Project's Completion: The minimum "Rehabilitation Standards" have been accomplished.

1 year: No significant erosion is visible - no rills over 2" in depth are present and erosion control mats and/or brush is still in place. 50% of the transplants survived.

2-3 years: No evidence of erosion is observed. Evidence of suitable new plant invasion is observed.

> 5 years: No evidence of erosion

Suitable vegetation covers the fireline at a frequency of 80% of what was there pre-fire.

Natural Barrier Firelines

Natural or man-made breaks in vegetation, such as water ways, hiking trails, rocky outcrops, talus and scree slopes, and roads, are often used as barriers to contain a fire. These barriers may be effective as is (unimproved) or they may need "improvement". It is the "improved" barriers that need rehabilitation due to the activities required to widen the barrier. The degree of improvement determines the amount of rehab.

Water Ways

Limbs and logs thrown into a stream during line construction can alter the water flow and possibly cause flooding. Any alteration in water flow should be corrected and the stream restored to pre-fire condition as best determined by the crew leader.

Rehabilitation Standard:

1. Remove all woody material (brush, branches & logs) that were thrown into the water during the fire. Duplicate pre-fire arrangement where possible.
2. Return stream bed to pre-fire condition. Remove dams, sumps and other human interventions.
3. Retrieve flagging and remove all litter, tools, etc.

Rehab success Evaluation:

At Project's Completion: Streambed is restored to prefire condition.

1 year: No differences visible in the watershed. No flooding or retardent flow observed.

Hiking Trails

“Improvements” to hiking trails may include cutting or limbing trees that line the trail in order to widen the fire break. This opening of canopy can cause unacceptable erosion.

Rehabilitation Standard:

1. Flush cut conspicuous stumps and camouflage the ends with soil and vegetation.
2. Place all cut limbs & seedlings alongside trail, near their source if possible, with the cut ends facing away from the trail.
3. Camouflage or block entrances to access trails and switchback short cuts. Switchback shortcuts need to be rehabilitated according to their level of impact, and may require following the guidelines for firelines.
4. Retrieve flagging and remove all litter, tools, etc.
5. The park trail crew may be assigned responsibility for correction of actual trail maintenance problems.

Rehab Success Evaluation:

At Project’s Completion: The hiking trail is restored to its pre-fire condition. No access trails or switchback shortcuts are visible from the hiking trail.

1 year: Trail is pre-fire width and condition. No use of switchback cuts or access trails are evidenced. No rills over 2" deep have occurred.

2-3 years: Still no erosion present. Width is pre-fire size. No use of access trails or shortcuts evidenced.

Rocky Outcrops, Talus or Scree Slopes

These natural firebreaks are rarely improved upon. If vegetation existed, it was probably very sparse. If vegetation was removed, no rehab to replace the vegetation is necessary. Most of the impact seen in these areas will be in the form of trenches for fire access trails.

Rehabilitation Standard:

1. If necessary, restore slope contour by raking slope material back into fireline until flush.
2. Retrieve flagging and remove all litter, tools, etc.

Rehab Success Evaluation:

At Project’s Completion: The minimum standards have been accomplished.

1 year: No evidence of fireline is observed.

<2 year: Same.

Fire Access Trails

Trails created by foot traffic along hoselines and firelines accessing pumpsites and the fire are of concern as they may become paths of erosion or may be used again by visitors due to their trail-like quality. This can cause impact in sensitive backcountry areas as well as endanger visitors who might wander into unmaintained and unstable fire areas. Treatments differ for access trails in burned areas versus vegetated areas.

Through Fire

Access trails that travel through the fire usually need attention in preventing further erosion and further use, but because they pass through the burned area, do not require transplanting or soil amendments.

Rehabilitation Standards:

1. Restore slope contour by raking in nearby fill to a level equal to adjacent soil level.
2. Drag available burned logs and brush across the “trail” every 50 ft.
3. If slope is >25 degrees, drainage dips should be added every 20 ft, or where natural features on the land dictate them most useful i.e. where they provide the most drainage, (where the trail changes direction).
4. Camouflage beginning of access trail so visitors will not be tempted to travel on it.

Rehab Success Evaluation:

At Project’s Completion: Access trail is not visible and/or not usable.

1 year: No erosion observed that is greater than that in adjacent fire areas. No evidence of further trail use.

2-3 years: Same as above.

>5 years: Same.

Through Vegetation

An access trail through vegetation is rehabilitated as if it were a fireline, but because the level of impact is not normally as serious, the amount of work required is less intensive. Usually, slope and soil loss are observed, as well as compaction of the soil. The degree of rehabilitation required is determined by the amount of impact observed.

Rehabilitation standards:

If trail path is less than 4 inches deep:

1. If soil is compacted, scarify the area lightly without killing any vegetation.
2. Replace recoverable soil and rocks that were displaced during use of access trail, trying to keep soil horizons correct.
3. Restore slope contour, compensating for settling.
4. Scrape back litter.
5. Drag available burned logs. Drag available burned logs and brush across the “trail”. Do this according to time and availability of materials every 50 ft.

If access trail is deeper than 4 inches and slope is very steep: rehabilitation standards and evaluation for constructed fireline must be followed.

Rehab Success Evaluation:

At Project’s Completion: The minimum “Rehab Standards” have been accomplished. Access trail is not visible and/or not usable.

1 year: No significant evidence of erosion is observed. No evidence of further trail use.

2-3 years: No new evidence of erosion is observed. Evidence of suitable new plant invasion is observed.

>5 years: No evidence of erosion is observed. Suitable vegetation covers the trail at a frequency of 80% of what was there pre-fire. No evidence trail use.

Special Areas

Special areas receive unusual, intermittent, unregulated, and/or extreme use. These special areas include; air drop points, base camps, “coyote” camps, helispots, pump sites, spike camps, and staging areas. Although the extent of impact to these areas may vary, the same type of impact often occur throughout.

This section of the manual is laid out a little differently. First, each area is described with the impacts commonly found there. Then, the individual impacts themselves are listed with the minimum standards for rehabilitation. Special areas need to be evaluated for possible impacts first and then rehabilitated for the impacts found there. Lastly, criteria for evaluation of success are given.

Helispots

Helispot construction (especially in Wilderness & National Parks) can cause a double impact—the impact of abrupt or unnatural appearing openings in a timber vegetative covered landscape, and the impact resulting from cut-faces of tree boles and stumps.

Many of the same type of impacts associated with fireline construction can occur during helispot construction and operation, therefore many of the techniques listed above can be used. Some other items to consider:

- If excessive amounts exist, pile and arrange to be burned at later date, or consider slinging cut material from the site.
- Obliterate landing pad and leave in as natural condition as possible: bury painted helispot markers, remove litter, clean up any area where oil or fuel spills occur, break up compacted soil.

Camp Situations and Personal Conduct

- Scatter campfire site rocks and charcoal, cover charred fire ring rocks with soil if necessary.
- Scatter any cut limbs or saplings that may have occurred.
- Cover latrine sites.
- Remove camp/tent poles and stakes and scatter in nearby timbered area.
- Pick up litter and pack out as garbage.

Finally just before leaving the site, walk through once again to eliminate any remaining evidence of human presence. A successful camp is one that leaves no trace of human activity.

Staging Areas, Etc.

In some wildfire situations, the fire camp, helibase, staging areas, drop-off points, and other miscellaneous constructed facilities are within the Wilderness or Park. These all need to be assessed for possible rehab needs, and measures taken accordingly to ensure the area is left in as natural appearing condition as possible.

Through application of appropriate suppression response and minimum impact suppression tactics, evidence of wildfire suppression damage on the wilderness resource can be greatly reduced. Appropriate suppression response (strategies and tactics) is a management practice that we as professional land managers must manage and make it happen. Ideally, this occurs as a result of up-front direction and on-going monitoring throughout implementation. The consequence will be a lessening in

the need for extensive and costly rehabilitation actions.

Base and Spike Camps

Groups of firefighters can stress the resource as they live and work out of base and spike camps for an extended period of time. Areas of possible impact include sleeping sites, mess area, first aid station, sanitation sites, equipment caches, and vehicle parking. At these specific spots and throughout the area look for: compacted soil, bare ground, litter, oil/fuel spills, disturbed slope as in leveled sleeping areas, human refuse/toilet paper, kitchen refuse (sump holes), campfire pits, cut seedlings and limbs, social trails between various living areas, and primitive constructions such as nails in trees, hooches, etc.

Coyote Camps

Coyote camps are temporary firefighter bivy camps located throughout the fire. Although these camps are not used for any length of time, they do exhibit impacts which may need rehab work. The main impacts to look for are: litter, compacted soil, bare ground, leveled sleeping sites, human refuse/toilet paper, campfire pits, cut seedlings and limbed trees.

Pumpsites

The operation of a portable firepump can result in impacts to both the ground on which the pump is resting and to the required water supply. Impacts to look for include: oil/fuel spills, water pollution, compacted soil, bare ground, dammed and altered streambeds, erosion from overflowing portable water tanks, and litter.

Staging Areas

If not managed well, staging areas can receive large amounts of impact due mainly to intensity of use and poor demarcation. Look for compacted soil, bare ground, litter, oil spills, leveled sleeping areas, sanitation spots, cut seedlings and trees.

Land Stewardship With Fire Suppression

The concept of “light hand on the land” or “minimum impact suppression tactics” involves a change in thinking and attitude. Previous portrayals of fire as an enemy of the forest or wildlands has indirectly created an acceptance that some land impacts or resource damage is necessary in order to halt the fire. However, after observing recent wildfire suppression activities and wildfire sites, it is apparent that this “level of acceptance” has far superseded what is necessary and often practical to halt fire spread.

This is a challenge for everyone. The concept of “light hand on the land” suppression tactics involves not just the firefighter, but all levels of management as well. Besides being included in fire training programs/sessions, it is very important that the concept be included in management-type workshops, conferences, symposiums and one-to-one contacts. Accomplishment of these less impacting tactics originates with instructions that are understandable, stated in measurable terms, and communicated both verbally and in writing. Ongoing monitoring and evaluation of these tactics both during and after implementation will further the understanding and achievement of good land stewardship ethics during fire suppression activities. However, without strong management direction at the beginning, the emphasis for and implementation of no/less adverse impacting suppression activities will not happen.