

Afterburn: A Look into Post-Fire Rehabilitation

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ABSTRACT: An evaluation on post-fire rehabilitation, this paper focuses on the fire that occurred on the Royal Gorge Park in Canon City, Colorado, June, 2013. Using information gathered from Richard Romano, the District Conservationist in Canon City's division of the Natural Resources Conservation Service as the main source, this paper explores the various steps in post-fire rehabilitation as it was accomplished regarding the Royal Gorge Park as well as the benefits and challenges faced and seen before, during, and after the ultimately successful and worthwhile rehabilitation effort.

Throughout history, fire has posed a significant threat to human development. Whether raging through the densely packed food source that is the forest or the spread out, easily burned food source that is range~~land~~, fire has and will continue to cause the destruction of human and animal habitat as well as impede plant development. In 2013 several fires ravaged Colorado.

Among them, however, was the fire that tore through the Royal Gorge Park in June and endangered, but spared, the famous Royal Gorge Bridge. The actions taken after this fire however provide an excellent example of post-fire rehabilitation. From the procedure taken to the financial obligations to the results observed and expected, range~~land~~ and forest rehabilitation efforts focused on the burned areas of the Royal Gorge Park exemplify how post-fire rehabilitation can improve, both short term and long term, the health of the land affected.

Fire is a natural force that ~~effects~~affects, both negatively and positively, many types of land. This potentially destructive process controls encroaching forests, quickly clears excess waste plant litter and overgrowth, and redeposits minerals into the soil. Concurrently, fire possesses the potential to risk life and property and to cause crippling damage to wildlife habitats and range health. The government had even set forward specifications on the type of fires that firefighters are allowed to combat, both on the range and in forests. Man-caused fires are to be dealt with, but naturally started fires are to be left to burn unless they pose a significant threat to life and property. While fighting the initially destructive forces of a raging fire is chiefly important, an enduring concern come into play after the fire has subsided. Managing fire-ravaged land is crucial post-fire, especially when the area is liable to flood or be subject to subsequent fires. But just as an action almost never occurs without a matching consequence, a fire never burns without the subsequent need for management.

As demonstrated during the rehabilitation of the Royal Gorge Fire, the process for post-fire rehabilitation is not something to be accomplished by one person. Richard Romano, the Natural Resources Conservation Service (NRCS) representative in the rehabilitation team, explained the process of post-fire rehabilitation and how it was implemented on the Royal Gorge Forest's burned land. The rest of the team, he explained, was made up of many important individuals concerned with managing the rehabilitation for different reasons, such as concern for the Canon City water supply, improvement of the land's health, and preservation of sites with anthropological significance, and the preservation of animal habitat. The individuals in this main rehabilitation team were: John Grieve, Colorado States Forest Service, District Forester; John Smeins, Bureau of Land Management (BLM), Hydrologist; Rick Romano, NRCS District Conservationist; Bob Hartzman, City of Canon City Water Superintendent; Steve Morrisey,

Fremont County Emergency Manager; Rex Brady, City of Canon City, Director of Parks and Open Spaces; and Rob Fontaine, NRCS, Civil Engineering Technician.

Managing land after a fire is somewhat of a step-by-step process. Firstly, the intensity of a fire must be rated in order to determine later actions. As rated by John Smiens, the fire on the Royal Gorge Park land burned at a medium intensity. Next, the amount of land burned must be determined. The Royal Gorge fire covered 2165 acres of parkland, 501 acres of BLM land, and 561 acres of privately owned land. Each category of land has to be considered because, especially in the case of private land, the cost of treatment may deter private land owners from opting for post-fire rehabilitation. In fact, due to cost, none of the privately owned burn area was treated. The amount of burn area and type of land burned as well as the grade (steepness) of said land also affects the seed spreading method chosen. Because of the hilly nature of most of the burnt land, the majority of the treated land, 853 acres, was seeded aerially with use of a helicopter that could easily maneuver the rough topography. Volunteers seeded an additional 70 acres by hand. Nine days following the spreading of the seed, which occurred on February 11th, 2014, Hydro-axe machinery arrived to masticate the burned trees and scatter the mulch, which varied in size from chunks the size of twigs to larger branches and logs. These machines worked across the seeded and unseeded land in a period stretching from the 20th of February to the 6th of May. Additionally, not only did the Hydro-axe machines perform their primary purpose, the large deep tread on their tires, combined with tire chains and their heavy weight stirring the soil, also served to push the seed under the soil, similarly to how one might cover the seeds in one's garden. From there, the rehabilitation team kept a watchful eye on the progress of the Royal Gorge burn area.

But post-fire rehabilitation is not all about the process. There are real costs and challenges that officials must face and work around in order to heal land that has been damaged by fire. Some of these challenges are theoretical and do not always threaten successful rehabilitation. When choosing the species to reseed burned rangeland, officials must be careful to choose species native to the area that are also going to thrive in the new nearly tree free range. This comes from the concern that an invasive or aggressive species might be introduced and not only prevent native species from eventually reclaiming the land, but also spread and choke out the native plant species in the area unaffected by the fire. Composition of the broadcast seed is very important as well. It must be composed of an adequate portion of grasses, shrubs, and forbs, all of which are necessary for a balanced and diversified rangeland. Additionally, about 5% of the seed mixture should be a nurse crop to protect the land while native slower growing seedlings have a chance to develop. A nurse crop is an annual sterile plant with a high germination rate. In the case of the Royal Gorge, triticale, a sterile hybrid of wheat and rye, was the chosen nurse crop. Not only are the purposely-introduced plants a concern when rehabilitating vulnerable burn land, but accidentally introduced species can also cause havoc in the fragile post-burn ecosystem. Many invasive species seeds are specially built to latch onto clothing, tires, or other means of transportation and have the potential to completely overwhelm beneficial plants. On the Royal Gorge Park, a plant called Mullein was a particular concern, though various types of knapweeds and thistles were of concern. At one point, a specifically designed herbicide was sprayed along the roadside to help limit the burn site's threat from the invasion of noxious weeds.

Some challenges can be predicted; some must be dealt with as they come. This was definitely the case during the rehabilitation at the Royal Gorge. As well as one might plan, it is sometimes difficult for everything to come together as hoped. In the case of the Royal Gorge

rehabilitation, timing was a challenge, especially surrounding the hydro-axing. The machines arrived a few days later than planned, though this had little effect on the overall success of the project, and took longer to process the land than expected. While not necessarily a direct mark against the success of the land rehabilitation, there was a lower successful rate of ground cover in the areas hydro-axed later than those hydro-axed at the beginning of the time period. Another challenge presented to the Royal Gorge rehabilitation team was the unpredictability of the weather. Days before the scheduled day to aerially drop the seed, snow blanketed the park. Little to no knowledge exists on the risks or benefits of seeding atop snow. Possible concerns included the seeds not sticking to the snow as they might on soil, the seeds bouncing to make measuring per square feet coverage difficult, as well as anything unforeseen. To quote Richard Romano, “I contacted several people, but their responses were pretty consistent. They told me they didn’t know if it would work, but if it did, to let them know!” In reality, the snow made, at least, the measuring of the seeds per square foot perhaps easier than normal because, instead of having to leave the square sampling plot at every measurement point, they simply had to indent the snow with the square and move on to the next point. Additionally, the white background of the snow made counting the seeds in the square considerably easy. Perhaps the most challenging aspect of the unexpected snow was the uncertainty that it would ruin months of planning.

Available resources, funds, contacts and willing participants, often come in the way of accomplishing a needed project. Post-fire rehabilitation is an expensive project, especially for private owners. Even when presented with a discounted rate on the rehabilitation efforts, none of the private owners approached accepted the rehabilitation efforts. The monetary cost was simply too high. In fact, according to meticulously recorded cost sheet from the City of Canon City, the entire rehabilitation effort on the Royal Gorge burn site cost \$635,140.75, including the hydro-

axing, the aerial seeding and seed, and seedling trees. Spread over an area of 1,368.8 acres of treated land, that is approximately \$464 per acre, a price out of many individual's affordable range. Even for a city or governmental organization, funds can be an important consideration when planning and executing a post-fire rehabilitation project. Funds can limit the type or amount of seed chosen for an area, mechanical practices to be applied, and sometimes the occurrence of the project itself.

But costs should not be the only thing considered for any project, and certainly not when evaluating the value of post-fire rehabilitation. Healing burned land holds many benefits short term and long term. Bare, untreated land is at a high risk of erosion while the land lacks the plant growth to slow normally harmless amounts of precipitation. After the fire at the Royal Gorge, a moderate rain sent massive amounts of muddy water into the surrounding catchments, waterways, the scenic Arkansas River and other routes on its way to the City of Cañon City's water processing plant. This was a sizable concern for the rehabilitation team's member, Bob Hartzman, the City of Canon City Water Superintendent. Several months after the fire, untreated land, found on privately owned property just outside the park, had much less ground cover than treated land. Additionally, many of the plants that had grown on the untreated land were undesirable. Bare land is also considerably more vulnerable to the invasion of unwanted species of plants, some of which can be very difficult to eradicate once they are established.

Safety and aesthetics must also be considered when weighing the value of post-fire rehabilitation. These are especially important at a site such as the Royal Gorge Park where thousands of people pass through every year. Burned trees pose a risk to everyone traversing around them and the process of rehabilitation eliminates most of that risk when most of the potentially hazardous trees are removed. They also serve as standing firewood, raising the risk

for future fires in the burn area. It is also true that dead, blackened trees are much less pleasing to the average eye than a healthy tree, as is bare or weed-covered ground to healthily diverse plant life. Both for safety and for aesthetics, post-fire rehabilitation holds the potential for great improvement on fire-ravaged land.

Fire can sweep land clean of life without warning. It is a swift remover of encroaching forests and an efficient eliminator of excess plant litter. It is a force capable of massive amounts of destruction. But fire is also inevitable, and it is our duty as responsible land managers to assist the land's recovery after a fire. Post-fire rehabilitation is one way to do this. As can be seen when observing the rehabilitation efforts employed on the Royal Gorge Park, post-fire rehabilitation not only addresses plant regrowth, but also diminishes the threat of erosion and excessive runoff, both by wind and by water, and corrects the aesthetic and safety concerns presented by burned land. Simply, post-fire rehabilitation is definitely a beneficial practice.

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