

Kella Romero

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Dr. Grant

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Is active reforestation more effective than natural regeneration post severe wildfire?

Forests are facing new challenges in the United States. Severe wildfires are burning hotter, spreading farther and faster, and leave behind burn sites where almost no mature trees survive. Climate change has created hotter and drier conditions not only sparking severe wildfires but also making it even harder for seedlings to return on their own post-fire. There are burn sites that once regenerated naturally after a fire and are now struggling to recover. Some of these post-burn areas show no sign of trees coming back at all and that number keeps growing at an alarming rate. This noticeable change has sparked debate that natural regeneration is no longer enough. Some argue that human intervention is required now more than ever to help forests recover long term.

This issue affects forests in New Mexico and across the West, sparking additional debate about land management, climate instability, future growth and management protocol.

Understanding how forests heal post fire reinforces learning through research, asking questions, substantial findings and referring to data that concurs with my thesis. After researching different studies, reading long-term data, and comparing successful and failed burn sites, it is clear active

reforestation is more effective than natural regeneration post severe wildfire. Reforestation ensures seed availability, considers climate issues and solutions, and supports resilient forest growth long term. Emphasis on long term.

To elaborate, one major problem relying on natural recovering forests is the loss of seed sources. Severe fires burn so intensely that they kill nearly all mature trees in select areas. With no surviving trees dropping seeds, natural regeneration becomes almost impossible. That generation of trees is eliminated. Rother and Veblen's study on six Colorado front range wildfires found that "59% of sampled plots contained zero seedlings". This was still true even more than a decade after the fires (Rother and Veblen 8). This finding shows that natural regeneration alone cannot fix the problem. Without seeds, the forest simply cannot return to a normal state. North et al. describe that modern fires often create burn sites "beyond natural seed-dispersal limits". This essentially means burn sites are too far from any surviving trees to recover on their own (North et al. 210). Active reforestation directly solves this issue by planting seedlings where nature cannot sustain. Rodman et al. found that human intervened, specific-planted areas recovered "about 25.7% faster" than places left to regenerate naturally (Rodman et al. 4). Factors like soil moisture and heat tolerance can vary widely across different regions and elevations and though not every burn area responds the same, research consistently shows that planting gives forests a much better chance of coming back and thriving long term. This is especially true in severely burned or isolated burn sites.

Another reason natural regeneration is not a long-term solution is climate change. Higher temperatures, warmer nights, unpredictable weather, native species fallout and extended drought make it hard for seedlings to survive. Even if seeds are available and begin growth, their lifespan

is often cut short. Kemp et al. found that summer temperatures were the biggest factor shaping whether seedlings survived. Kemp et al. also noted that once temperatures pass a certain threshold, seedling establishment is minimal “regardless of seed-source proximity” (ecologist Kemp et al., *Ecosphere*, 2019). This means if seeds are nearby, the climate itself can prevent a forest from thriving.

The book *Living with Fire: Fire Ecology and Policy for the Twenty-First Century* reinforces this idea. Jensen and McPherson explain that warming temperatures and drying soils have “pushed many western forests beyond their historical regenerative capacity” (Jensen and McPherson 121). Their work shows what challenges forests face today. They explain that these challenges are different from those of the past and are constantly changing. What used to be classified as a healthy recovery protocol no longer works. Active reforestation allows land managers to plant drought-tolerant and climate-appropriate species. This improves the odds that young trees will survive in harsher conditions emphasizing that successful future planting practices require an adaptive strategy focused on climate resilience.

Active reforestation helps shape forests that are more resilient long-term. Even though natural regeneration has been part of forest recovery for thousands of years, the conditions shaping modern burn sites post-fire are so different. Larger burn scars, reduced snowpack, and overlapping drought years all reduce the chances that forests will return without human help. Additionally, natural regeneration often leads to inconsistent regeneration patterns. Some sites end up with dense clusters of seedlings while other parts of the site remain bare. Dense clusters can lead to competition for resources, resulting in widespread failure to establish a healthy forest cover. Furthermore, this unevenness can make forests more vulnerable to future fires, drought,

and threatening insects. North et al. recommends reforestation strategies that can create healthier spacing, encourage species diversity, and build forests that can handle future ever changing stress (North et al. 215). This kind of planning requires immense human intervention.

Tortorelli et al. also note that early seedling patterns can predict long-term outcomes. This means that if natural regeneration is low at the start, it will likely stay low for decades (Tortorelli et al. 2024). The USGS reports that future climate conditions may prevent forests from recovering naturally, especially if seed production drops or drought intensifies (USGS). All the evidence strongly supports the idea that active reforestation is necessary for long-term resilience. As Jensen and McPherson explain, the environmental realities of today “demand more intentional and adaptive forest management” (143).

Another issue that strengthens the case for active reforestation is the increasing size of severe burn sites. The USGS reports that modern wildfires, especially in the West, are producing larger treeless areas that significantly exceed historic burn patterns (USGS). As these burn areas and size continue to expand, there is more noticeable extreme fire behavior, and the number of burn sites that can naturally regenerate decline. Active planting is one of the only reliable ways to prevent these areas from remaining dead indefinitely. When forests fail to return, the consequences spread beyond the burn site. Without tree cover, soils erode more easily, water quality declines, and wildlife habitat becomes fragmented. The USGS emphasizes that regeneration failure can disrupt entire watershed systems, which shows that successful reforestation affects more than trees but can help stabilize whole ecosystems.

Overall, the research shows that natural regeneration is no longer something we can rely on to regenerate forests post severe wildfire. Climate change is becoming more unpredictable

and larger burn sites are happening, both contributing to how western forests are shaped today. Many wildfire areas simply do not have the seed sources, moisture, or climate conditions needed for regrowth without human intervention. The studies I reviewed make it clear that active reforestation gives forests a fighting chance, focusing on solutions for conditions that are much harsher. Human intervention allows forests to overcome seed shortages, plant tree species that can tolerate future climates, and create healthier forest structures. As fires become more severe and the environment continues to warm, active reforestation is necessary one to ensure that forests can recover for generations to come.

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