RESTORATION OF RIPARIAN AREAS WITHIN THE MEGRAM FIRE

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Leskiw, T. 2002. Restoration of Riparian Areas Within the Me gram Fire. In: Dumroese, R.K.; Riley, L.E.; Landis, T.D., technical coordinators. National Proceedings: Forest and Conservation Nursery Associations-1999, 2000, and 2001. Proceedings RMRS-P-24. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station: 277-280. Available at:
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Abstract

A variety of treatments have been employed to restore riparian areas affected by wildland fire on the Six Rivers National Forest in northwestern California. The Megram Fire began as a series of lightning strikes on August 23, 1999, eventually burning 125,040 acres. Specific treatments have included contour felling of dead trees, straw mulching, placement of straw wattles, helicopter seeding of non-native, non-persistent barley, planting trees and shrubs, and introducing and/or reconfiguring woody debris designed to enhance stream channel stability. In addition, lessons learned from several riparian restoration projects implemented in non fire-affected areas can be applied to fire rehabilitation efforts.

Key Words

Fire rehabilitation, anadromous fish, aerial seeding, contour felling, planting, mycorrhizae

Large-scale wildland fire events have the potential to impair water quality, especially in those areas where precipitation comes mainly in the form of rain, rather than snow. Declining salmon and steelhead populations in the Pacific Northwest have prompted land managers to hasten the postfire recovery process by employing a variety of rehabilitation methods.

What came to be known as the Megram Fire began as a series of lightning strikes on August 23, 1999. Then, two separate fires-Megram and Fawn-joined together during the second week of September.

The fire began in the Trinity Alps Wilderness of Shasta-Trinity National Forest in northwestern California and entered Six Rivers National Forest (SRNF) on September 18, 1999. The fire was declared controlled on November 4, 1999-after burning 125,040 acres. As luck-or lack thereof-would have it, portions of the fire burned into extensive blowdown created by a windstorm that occurred nearly four years earlier. This event uprooted several thousand acres, creating a fuel load and fire hazard of 300 to 400 tons per acre.

OBJECTIVES

The objective of fieldwork conducted during the spring following the fire was to ground-truth fire severity rankings derived from aerial photographs and, if necessary, to prescribe appropriate treatments. Fieldwork indicated that widespread tree mortality had created an increase in water yield, initiating surface flow at many sites where, previously, only subsurface flow had occurred. At this time (spring 2000) neither widespread stump sprouting of brush or tree species nor the establishment of understory (orbs had occurred. As a result, a moderate amount of erosion was taking place at certain sites in non-cohesive, decomposed granite soils.

METHODS

During the Burned Area Emergency Rehabilitation efforts immediately following the fire, several straw bale check dams were built to trap sediment. Prior to prescribing additional similar treatments, we conducted a field review of these structures the following spring with a team of earth scientists from the USFS Pacific Southwest Research Laboratory. It was their opinion that the amount of sediment saved per structure did not warrant the effort.

Treatments

So, within riparian areas, three specific treatment measures were employed to keep soil in place.

1. Aerial seeding: 2,490 acres were seeded with barley (at an application rate of 100 lbs/acre). Topographical slopes within the fire area averaged between 50% to 60%. Although riparian areas weren't specifically targeted, germination was excellent in riparian areas, due to seed "bounce and roll." As expected, about 20% of the barley re-seeded one year after the seeding project.
2. Contour felling: Much of the fire occurred in areas dominated by large, old-growth Douglas-fir and white fir. Some of these logs already on the ground were re-positioned along topographical contours to serve as "catches" for sediment and seeds. Many of the fallen dead trees were hung up on one or both ends, remaining above the ground, both in riparian and upslope areas. These "spanners" were "bucked out"-cut in lengths from 10 to 20' and re-positioned on the ground. Other seeding projects have shown that the presence of flat areas for seeds to "catch" on greatly enhances results, especially in areas with greater than 50% slope.
3. Tree and shrub planting: Because of the increase in water yield the first spring following the fire, some of the draws in the fire area were planted with phreatophytes-species not previously present there. It is our belief that these seedlings will become established before the water yield returns to normal.

Species

Specific plant species used were:

Sitka alder: Forest assistant Botanist John McRae collected 0.25 lbs. of Sitka alder *(Alnus viridis* ssp. *sinuata)* seed from riparian areas within the Megam fire during April 2000. This would have produced 10,000 plants at the expected germination rate of 30% to 40%. The seed was given to Tsemeta Nursery (operated by the Hoopa tribe), located in northwestern California. Seeds were sown May 2000; a germination rate of 30% to 40% was achieved. However, the presence of root maggots reduced the number of plants suitable for delivery to 4,000. Seven acres of riparian areas were planted (at a spacing of 8 to 9 feet).

American dogwood: Cuttings from *Cornus sericea* were collected within the fire area, albeit prior to the fire, as part of a road decommissioning project. Cutting survival was 82%, rivaling the success rate of willow from the same project, at 91% survival. McRae collected 10 lbs. of seeds of this species during the spring following the Megram fire. After one year of freezer storage, the germination rate was 30% to 40%. Therefore, for those species , capable of rooting, the question arises: would it be best to grow out from seed or merely collect cuttings? Personally, I'm in favor of going with cuttings, if sufficient personnel can be mobilized at the appropriate times. It's been my experience that the Forest Service procurement process often proves too cumbersome for the complicated "dance" of seed collection, storage, stratification, scarification, grow out, and transport back to the site for-finally-planting.

Deerbrush: During spring 2000, 10,000 deerbrush *(Ceanothus integerrimus)* seedlings were planted within the fire area (headwaters of East Fork Horse Linto and Cedar Creek), albeit not restricted to riparian corridors.

Another erosion control treatment that we employed in the Megram fire area was mulching of 1,186 acres with 19,000 bales of rice straw, although this activity was limited to upslope areas. Concern over the potential importation of noxious weeds has prompted SRNF to specify certified weed-free or rice straw on its mulching projects.

We also used a limited number of straw wattles: "straw sausages" encased in a plastic mesh covering. This product accomplishes the same thing as contour-fallen trees. Advantages are that they conform to irregular topography better than trees and are easily carried by two people. However, in areas where an adequate supply of dead timber already exists, it's difficult to justify their use given their cost and the logistics involved in hiking them into the project site. In addition, if portions of the wattle are allowed to drag on the ground during their transportation to the site, the mesh can break, greatly reducing their life expectancy.

RESULTS AND DISCUSSION

In those streams draining the fire area, turbidity showed little increase above pre-fire levels during the first two winters following the fire. In addition, the placement of several sediment fences revealed a lack of soil displacement. The lack of soil loss was due to precipitation (100% and 50% of normal, respectively) and treatments that included aerial seeding, the placement of straw mulch, contour felling and bucking of trees, and the planting of trees and shrubs.

We've been using commercially available mycorrhizal fungi for two years on several landslide revegetation projects. Unfortunately, on one project, the monitoring plot was located within a landslide planting area that has since moved downslope. However, the Chico Tree Improvement Center has used Bio-grow, a product available from Mycorrhizal Applications located in Grant's Pass, Oregon. The control group of seedlings (no mycorrhizal fungi applied) had 95% mortality from a damping-off from *Fusarium* root rot. Meanwhile, the plants that were inoculated with the product experienced a 95% survival rate while in the nursery.

This product comes in two forms: tablet and liquid. The tablet is buried in the ground near the roots. It contains 5 kinds of mycorrhizal fungi, IBA (a rooting hormone) and folic acid, etc. The tablet is the size of a Bayer aspirin. Cost: $39.95/1,000, minimum order is 2,000 tablets. The product is for conifers. For field plantings, this method is recommended rather than the liquid.

The liquid form, termed "Bio-grow," comes as a 1 liter liquid. It contains essentially the same ingredients as the tablets. Prior to application, the liquid is diluted at a rate of 1:100. The 1 liter container treats 15,000 square feet. It is important to get the ingredients to the roots, so it shouldn't be applied during dry season. The product is basically for conifers. Cost: $69.95/liter, minimum order of 2 liters.

Several lessons that we've learned from riparian restoration projects conducted outside of fire affected areas can also be applied to fire rehab efforts.

RIPARIAN PROJECTS

General Notes

Other riparian plant species that have performed well in SRNF restoration projects include bigleaf maple, red and white alder, black cottonwood, and various species of willows.

For those species that are capable of rooting from cuttings-mainly willow and cottonwood-the debate continues on whether to use cuttings or previously rooted stock. On Six Rivers, we've used both, with a mixed bag of results. Two case studies follow.

Todd Ranch Riparian Revegetation Project

The restoration site is along the South Fork, an undammed tributary to the Trinity River. Approximately 600 cuttings (300 each willow and cottonwood) were collected and planted during February 1998. Survival following 3 growing seasons is 55%. We were able to tap into a domestic water system to drip irrigate the cuttings, the tallest of which are now greater than 25'.

Herbaceous plants, grass, or brush can outcompete recently planted seedlings and cuttings. In addition, browsing by deer, rabbits, or wood rats can be a problem. The following summarizes our experience.

During Phase II of a riparian revegetation project, we purchased VisPore Tree mats (3' x 3' polyethylene fabric mats) from Treessentials of St. Paul, Minnesota. Their literature stressed that not all mats are created alike. Namely, their product contains 400 Microfunnels per square inch: four times the number of any other mat-or so they claimed. These holes are small enough to suppress weeds, yet sufficiently porous to admit water. Despite considerable grass at the restoration site, we were quite pleased with the mat's performance. However, with any new product, when evaluating product literature, it's often difficult to separate hyperbole from actual on-the-ground performance.

In this case, the company spoke the truth. For the previous year, when funding was tight, our silviculture department loaned us their mats. They were pleased with the performance of the mats they'd used the previous year. However, while soliciting bids for future work, our procurement department got involved, insisting-yes, you knew this was coming-on going with the low bidder. Several dozen dead trees later, we confirmed that the mats were essentially impermeable. Therefore, especially on the steeper sites, both drip irrigation and rainwater flowed off, not through, the mat. Although water never reached developing cutting roots-boy, did it enhance grass growth at the margins of the mats.

Treesentials also sells Supertube treeshelters: thin-walled, translucent fiberglass tubes designed to thwart browsing deer, rabbits, or rodents. This 4inch-diameter product comes in 1-foot increments, from 2 to 5' long. We used a control group of plants to monitor the performance of the tubes. Our experience was much like that of those customers mentioned in their brochure: considerably faster growth rates. However, prodigious growth rates from all our cottonwood cuttings required the removal of all tubes by midMay of the first year. This product may prove valuable for those tree species with slower growth rates and/or the presence of more browsers, but we discontinued their use.

Horse Linto Creek Revegetation Project

This project employed the use of 6-month-old rooted cuttings, grown in super cells. This method of culture had a major shortcoming: the meager amount of rooting medium fell away from the fragile roots. In the end, it was impossible to justify the amount of time and energy and money spent to have the cuttings grown out.

Planting unrooted cuttings is justified if the following conditions can be met: the site is no more than 3 to 10' above the water table or the site can be irrigated. Timing is key. In our area, we have a relatively narrow window to collect cuttings from dormant plants, say January and February, which may or may not dovetail with the Ranger's plans for the fire crew.

We have a project now in the planning stages where we expect to borrow techniques employed by our colleagues who restore gravel pits in the foothills of the Sierras. At such sites, they collect cottonwood poles 2 to 4" in diameter, 4 to 12' long. Holes are dug by backhoe; the depth of the planted poles ensures access to groundwater without the need for irrigation.

SUMMARY

Not all land managers agree that fire rehabilitation efforts should be attempted following large wildland fires. Nor is there consensus among those in favor of such activities as to the appropriate scope of rehabilitation efforts. Given the potential for soil loss following catastrophic fires, there is an increasing interest in protecting habitats for fish populations listed as threatened under the Endangered Species Act-or otherwise declining.

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