

Western Ecological Research Center

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Ecological Impacts of Wheat Seeding After a Sierra Nevada Wildfire

Wildfires are a natural process in many western U.S. ecosystems, but they often have undesirable impacts. In addition to the immediate destruction of natural and human resources, postfire environments have the potential for increased soil erosion and hazardous flooding. To mitigate these postfire problems, early in the 20th century, agencies initiated programs designed to “rehabilitate” burned watersheds through seeding of alien forbs and grasses. In recent years the federal government has formalized this process into the Burned Area Emergency Rehabilitation (BAER) program, and it has been reviewed for its effectiveness at attaining the desired goals of slope stabilization and reduced soil erosion. A recent publication by USGS scientist Dr. Jon Keeley in the *International Journal of Wildland Fire* illustrates the need for post-treatment monitoring of BAER projects, not only to determine effectiveness of treatment but to also evaluate negative ecosystem impacts.



In spring 2002, wheat dominated the ponderosa pine forest in Giant Sequoia National Monument, California. This and adjacent burned area in Sequoia National Forest were reseeded with non-persistent wheat after the 2001 Highway Fire. Photo: Jon Keeley, USGS.

Management Implications:

- BAER project seeding with wheat has the potential to reduce native biodiversity, increase fire hazard, and inhibit recruitment of pines.
- Potential positive impacts of wheat seeding on reducing first year alien plant invasion need to be evaluated in the context of the potential ecological vacuum in subsequent years.
- There is a need to monitor impacts as well as effectiveness of postfire seeding treatments.

Following the 2001 Highway Fire, which burned 1,680 hectares of mixed ponderosa pine-oak-chaparral in the newly created Giant Sequoia National Monument and the adjacent Sequoia National Forest of Fresno County, California, Keeley initiated studies to investigate the impact of seeding with non-persistent wheat. In the first postfire growing season, the natural regeneration of unseeded control sites averaged about 55 percent ground surface covered. Wheat seeding enhanced the ground cover, averaging 95 percent ground surface cover. Wheat was the dominant species on the seeded sites, comprising 67 percent of the total cover. Dominance diversity curves were markedly affected by the seeding and indicated a disruption in the natural ecological structure of these communities. On seeded sites, wheat dominated and all other species were poorly represented, whereas on unseeded control sites there was a more equitable distribution of species.

Correlated with the wheat cover was a significant decrease in species richness at all scales examined. Total species richness was reduced from 152 species across

all unseeded sites to 104 species on all seeded sites. Average species richness, at scales from 1–1000 m², was 30–40 percent lower on seeded sites. Species most strongly inhibited were postfire endemics whose life cycle is restricted to immediate postfire environments. Seeded sites had fewer alien species than unseeded sites; however, this may not have any lasting effect since other studies show the primary alien threat is not in the first postfire year. Seeding was also associated with an order of magnitude drop in ponderosa pine seedling recruitment and, coupled with the massive thatch still remaining on the site, it is likely that recruitment will be inhibited in subsequent years.

It is expected that as the concept of adaptive management becomes more instilled in resource management agencies, this sort of monitoring will become routine. Monitoring is crucial because adaptive management is a philosophy that essentially treats land management actions as hypotheses, and this philosophy requires controlled studies to objectively evaluate treatment effectiveness and impacts.

Keeley, J. E. 2003. Ecological impacts of wheat seeding after a Sierra Nevada wildfire. International Journal of Wildland Fire 13:73–78.