



# Impacts of Fire on Invasive Species

part 4

Following the 2002 Hayman Fire, understory vegetation recovered rapidly, and understory cover met or exceeded pre-fire levels by the second post-fire year. In this repeat photograph series, the recovery of mountain mahogany (*Cercocarpus montanus*) and soapweed yucca (*Yucca glauca*) is particularly apparent. These species primarily re-established following the fire by sprouting.

## The 2002 Hayman Fire – Ecological Benefit or Catastrophe?

### An understory plant community perspective

By Paula Fornwalt, Research Ecologist, USDA Forest Service, Rocky Mountain Research Station, Fort Collins

#### THE HISTORIC AND CURRENT ROLE OF FIRE

Fire has long been a keystone ecological process in Western forests. In ponderosa pine (*Pinus ponderosa*)/Douglas-fir (*Pseudotsuga menziesii*) forests of the Colorado Front Range, historical fires are believed to have been “mixed severity” in nature. That means that these fires are believed to have typically burned within a range of severities from low severity surface fire where few trees were killed to high severity crown fire where all trees died. As a result, these historical fires created and sustained a heterogeneous mosaic of forest conditions. These fires are also believed to have played a critical role in sustaining diverse, lush understory plant communities.

However, today’s fires in these forests are widely viewed to be burning more severely than historical ones, due to a century of fire suppression and other factors. Though historical fires did have a high severity component, the large size of many of the high severity patches created by today’s fires appears to be unprecedented. There are concerns that understory plant communities will not recover without intervention. There are also concerns that these

fires will facilitate the establishment and spread of exotic plants. It is important that we develop a more thorough understanding of how understory plant communities will develop following today’s fires so that these concerns can be addressed.

#### MAKING HAY OUT OF THE 2002 HAYMAN FIRE

One such opportunity was provided by the 2002 Hayman Fire. The Hayman Fire burned more than 138,000 acres (55,800 ha) of a ponderosa pine/Douglas-fir forest west of Colorado Springs, making it the largest fire known to burn in Colorado to date. This fire also burned 20 pre-existing upland 0.25 acre (0.1 ha) plots that had been surveyed for understory plant composition and cover in 1997. The plots burned with a range of severities. My colleagues and I seized this opportunity to examine the influence of fire severity and time-since-fire on understory plant communities by remeasuring the plots annually from 2003 to 2007, one to five years post-fire, and again in 2012, ten years post-fire.

We found that the understory plant communities in our plots were quite dynamic over the decade following the Hayman Fire. For all fire severities, total post-fire richness (that is, the number

of species in a 0.25 acre plot) was comparable to total pre-fire richness during early post-fire years, and then increased. This increase was primarily driven by an increase in forb richness, particularly native early-successional species such as ragleaf bahia (*Bahia dissecta*) and varileaf phacelia (*Phacelia heterophylla*). In contrast, total cover declined in the first post-fire year for all fire severities, as one might expect. However this decline was rapidly reversed in following years as the post-fire cover of forbs and graminoids met or exceeded pre-fire levels.

Shrub cover was slower to recover, and was still below pre-fire levels a decade later for all fire severities. The relatively slow recovery of shrubs is likely due to the fact that even species that vigorously sprout after fire, like mountain mahogany (*Cercocarpus montanus*), can take many years to regain their large pre-fire size, and some species, like common juniper (*Juniperus communis*), do not sprout at all.

A few interesting findings arose with respect to exotic plants. First, we documented more than 20 exotic species in our plots, five of which are Colorado noxious weeds: cheatgrass (*Bromus tectorum*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), butter-and-eggs (*Linaria vulgaris*), and mullein (*Verbascum thapsus*). The table below lists 10 of the most common exotics we found, and the percent of plots they were found in for each year of the study.

While the post-fire response of individual species was variable, most responded positively to both fire severity and time-since-fire. This means that most species became increasingly more abundant both as time passed (generally peaking in abundance a few years post-fire and maintaining that abundance for the duration of the study) and as fire severity increased (gen-

erally being more abundant in areas that burned with high severity than in areas that burned with low severity).

The most common exotic species in our study, mullein, responded in this manner. Cheatgrass also warrants special mention, as it was not found in any of the plots until 2007, five years post-fire. Cheatgrass cover



in invaded plots remains quite low, but nonetheless it does appear to be on the increase, especially in severely burned areas. Cheatgrass is now known to have been a contaminant of the straw used during post-fire rehabilitation activities. Other species, such as prickly lettuce (*Lactuca serriola*) and the seeded annual grass triticale (*Triticosecale rimpaii*), exhibited an initial increase post-fire, followed by a decline.

Second, we found that total exotic richness and cover also responded positively to time-since-fire and fire severity. Given that this finding parallels the pattern we observed for most individual exotic species, it should not be surprising. However, it is critical to point out that exotic richness and cover do remain low. Even ten years after the Hayman Fire, total exotic richness in severely burned plots averaged less than six species (accounting for about 10% of total plant richness), and exotic cover averaged less than 3% (accounting for about 8% of total plant cover).

Lastly, we found that exotic plants do not appear to be interfering with native plant development in the Hayman Fire. We examined this by looking at correlations between native and exotic cover. The theory is that if exotics are negatively impacting natives through competition for resources such as light or water, then we would expect to see a negative correlation between native and exotic cover – that is, we would expect native cover to decrease when exotic cover increases. However, analyses of our data did not reveal such a correlation for any burn severity or year.

#### THINKING BEYOND THE HAYMAN FIRE

While the Hayman Fire may be viewed as catastrophic by some measures, for example, by resulting in the loss of a forest cover type over extensive areas, our findings suggest that it may not be a catastrophe from an understory plant perspective. These findings hold true not only for lightly burned areas, but for severely burned areas as well. But how applicable are our findings to other recent Colorado Front Range fires, such as the High Park Fire which burned more than 87,000 acres west of Fort Collins in 2012? I always respond with an answer typical of an ecologist – “it depends.” With regard to exotics, it is noteworthy that our Hayman plots were relatively free of exotics prior to the fire. Post-fire exotic response elsewhere may be quite different than what we observed, particularly along roadsides or in other areas where exotics were prevalent before the fire. Additional research, in the Hayman and in other Colorado fires, is needed to develop a more thorough understanding of how plant communities respond to wildfire over both the short and long term.

For more information about this research, please feel free to contact me by email at [pforwalt@fs.fed.us](mailto:pforwalt@fs.fed.us).

### Plant Diversity Profile

Over 20 exotic species were found in the Hayman Fire plots, many of which became considerably more abundant in the years following the fire. Data on the percent of plots containing ten of the most common exotic species we encountered are shown below. Colorado noxious weeds are marked with an \*.

Percent of plots

| Species                                       | Prefire | Postfire Year 1 | Postfire Year 2 | Postfire Year 3 | Postfire Year 4 | Postfire Year 5 | Postfire Year 10 |
|---|---------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| Smooth brome, <i>Bromus inermis</i>           | 5       | 5               | 5               | 10              | 5               | 20              | 25               |
| Cheatgrass, <i>Bromus tectorum</i> *          | 0       | 0               | 0               | 0               | 0               | 20              | 20               |
| Musk thistle, <i>Carduus nutans</i> *         | 0       | 0               | 10              | 15              | 25              | 25              | 20               |
| Canada thistle, <i>Cirsium arvense</i> *      | 0       | 25              | 25              | 35              | 25              | 45              | 35               |
| Prickly lettuce, <i>Lactuca serriola</i>      | 0       | 55              | 55              | 75              | 60              | 85              | 35               |
| Butter and eggs, <i>Linaria vulgaris</i> *    | 5       | 5               | 40              | 20              | 15              | 15              | 35               |
| Common dandelion, <i>Taraxacum officinale</i> | 40      | 25              | 45              | 60              | 80              | 85              | 70               |
| Yellow salsify, <i>Tragopogon dubius</i>      | 5       | 0               | 35              | 45              | 50              | 80              | 60               |
| Triticale, <i>Triticosecale rimpaii</i>       | 0       | 55              | 25              | 50              | 5               | 5               | 0                |
| Common mullein, <i>Verbascum thapsus</i> *    | 30      | 80              | 90              | 100             | 85              | 100             | 95               |

## Beyond the Grasses

By Pawnee Buttes Seed Inc. staff

The High Park Fire was ignited on June 9, 2012 by a lightning strike. For the next three weeks firefighters fought to keep the fire from spreading and to save homes. In total, 87,284 acres burned, 259 homes were destroyed, and one person lost her life. After the fire, the area was plagued with mudslides and the Poudre River ran black with ash and debris. During one of the most devastating wildfire seasons on record, Pawnee Buttes Seed set a goal to help landowners and industry professionals affected by the wildfires. The result was one of the more challenging, but also most rewarding, Grass Tours we have ever hosted.

Pawnee Buttes Seed, in conjunction with Colorado State University - Larimer County Extension and the Natural Resource Conservation Service of Larimer

County, hosted "Rising Above the Ashes," in the High Park Burn Area on August 8 and 9. The goal of this tour was to educate as many people as possible about the importance of re-vegetating burned land



and how to properly mitigate erosion. The participants came from a wide variety of backgrounds and experiences including:

landowners, NRCS professionals, Conservation District employees, foresters, city employees, reclamation companies, etc. In all, 63 participants hopped on passenger vans each morning to visit a total of eight sites and learn from experts in the fields of weed management, erosion control, re-vegetation, forestry management, fire ecology, water quality, native plants and wildlife.

The first day of the tour included four stops at sites where a variety of post-fire erosion control mitigation practices were implemented. Soldier Canyon in Lory State Park showcased aerial seeding where broadcast and/or drill seeding was impossible due to steep slopes and difficult terrain. This part of the Canyon was of particular concern due to its drainage into Horsetooth Reservoir. The seed mix included four native grasses, two native forbs and

## Poudre Partnership Focuses on Protecting Land after High Park Fire

By Steve Ryder, Colorado State Weed Coordinator

A first-of-its-kind project in Colorado has been developed in order to protect the land affected by the High Park Fire. The goal of the Poudre Partnership is to develop a cohesive noxious weed management partnership through a coordinated effort by federal, state and local agencies in conjunction with land owners and managers.

The ultimate goal of the partnership is to develop a statewide model for future collaborative projects where multi-agency collaboration would be beneficial. The first effort will focus on the High Park Fire region including the Poudre River, North



Fork Poudre River, Seaman Reservoir and city and county natural areas and open spaces.

Invasive weed species, primarily leafy spurge and Dalmatian toadflax, were present across various public and private lands at the time of the High Park wildfire in June 2012. These perennial weed infestations have significantly expanded since the fire and need to be addressed before management becomes insurmountable and native plant communities become any more negatively impacted.

Noxious weeds have the ability to invade land, harm economic crops or native plant communities, poison livestock, and carry detrimental insects, diseases, or parasites.

The Poudre Partnership is comprised of three components: awareness, prevention and treatment. The objectives include limiting or extinguishing the growth of noxious weeds, developing consistent actions from landowners and land managers, creating collaboration between federal, state, and local agencies, harmonizing priorities across agencies, and minimizing organizational costs. While agencies have worked cooperatively in the past, this is the first time they have all coordinated for a post-fire weed management strike.

Year 1: inventory, survey, mapping and treatment of leafy spurge and Dalmatian toadflax along the designated lands in a coordinated fashion.

Year 2: treatment and surveying for re-seeding and restoration.

Year 3: treatment, restoration, monitoring, and photo documentation of the project's progress.

An education component will also be developed including information posted at trailheads, parking lots, kiosks, and during community events.

Agencies involved in the Poudre Partnership include the Colorado Department of Agriculture, Colorado Parks and Wildlife, Colorado State Land Board, Colorado Department of Transportation, BLM, US Department of Agriculture's Animal and Plant Health Inspection Service, US Forest Service, Larimer County Weed District, Larimer County Parks & Open Lands, the cities of Fort Collins and Greeley, and private land owners.

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a quick growing sterile annual. Wood and straw mulch was also applied aerially.

The second stop was a private property in Paradise Park. The landowners talked to the tour participants about their struggles with post-fire sedimentation damage. After contacting the NRCS for advice they broadcast a 5-way native seed mix, installed straw wattles, and mulched using wood chips from the dead trees they removed from the site. Both the 5-way seed mix and the mix used in Soldier Canyon were chosen by John Fusaro of the Ft. Collins NRCS office, because the species are native to the area, commercially available, and reasonably priced.

A stop in Rist Canyon gave the attendees an opportunity to view a slope that had the potential for a mudslide that could close Rist Canyon Road. With the help of the Colorado Forest Service and the NRCS, the landowner was able to mitigate this threat and is in the process of implementing erosion control methods in other less critical areas of the property. At the final stop on the first day, the group looked at improved creek crossings installed by Larimer County Road and Bridge on Rist Creek since the fire. Runoff in the burn scar is expected to be 10 times more than normal for the next 10 years. Larger culverts help manage the increased flow and a high water alert system was put in to provide early warnings of conditions that may lead to flooding.

The second day of the Grass Tour began with a visit to a site at the top of a very steep and rocky mountain. The landowners felt it was extremely important to re-vegetate as soon as possible to prevent erosion that could potentially damage the neighbor's property. Post-fire lodgepole pine seedlings were seen throughout the property. The second site gave the tour participants a chance to compare areas that had been aerial seeded, broadcast seeded, and not seeded. At a second location on this site was a rock spillway where each stone was installed by hand to reduce headcutting on the roadside.

The final stop of the tour was in Stratton Park. The landowner was in the process of building his retirement home when the High Park Fire devastated the site. Like so many affected by the fire, he refused to let the loss of his partially constructed and yet to be insured home get him down. He told the tour participants that this fire was the best thing that ever happened. It thinned out the overcrowded forest and cleaned up the understory that was overrun with fallen trees and flammable debris. Not only did he not have to worry about another catastrophic fire destroying his home in his lifetime, but the view was greatly improved. In addition to sharing his positive attitude, the landowner also shared his trial and error

experience broadcast seeding.

Throughout the tour, a wide variety of speakers shared their insights with the group. John Fusaro talked about the NRCS' role in the mitigation taking place at each site we visited. He also

### **The efforts are proof positive that re-vegetating after a wildfire reduces erosion.**

shared pictures of the sites in the fall of 2012 after the initial mitigation efforts began. The change to each property was remarkable. Lisa Voytko, with the City of Fort Collins, spoke about the challenges the city has faced in maintaining the water quality since the High Park Fire. Fire ecology and post-fire riparian concerns were addressed by Julie Ash and Dr. Jerry Barker from Walsh Environmental, as well as Laurie Huckaby with the Rocky Mountain Research Station.

Cameron Landis with Colorado Parks & Wildlife shared his observations throughout the re-vegetation process in Soldier Canyon and Boyd Lebeda, a District Forester with Colorado State Forest Service, spoke about helping landowners deal with the dead or damaged trees on their property. On hand to speak about the changes Larimer County has implemented to reduce the flooding in Rist Canyon were Dale Miller of Larimer County Road and Bridge and Rusty McDaniel of Larimer County Engineering. Colorado Parks & Wildlife Manager Chad Morgan and Seth Gallagher of the Rocky Mountain Bird Observatory discussed the impact of the fire on the wildlife in area.

While visiting the sites Larimer County Weed District Manager Tim D'Amato discussed the five most prevalent weeds occurring in the burn area and methods for treating them. He also shared the successes of the weed control program that Larimer County Weed District was able to implement at no cost for landowners affected by the burn. Marin Chambers, with the Rocky Mountain Research Station, spoke about the importance of native species to a

healthy habitat and shared some of the research she conducted in the Hayman burn scar.

The efforts of the landowners and the professionals assisting them are proof positive that re-vegetating after a wildfire reduces erosion. Thank you does not seem a sufficient way to express our gratitude to the speakers and landowners who contributed to the tour. Their expertise and experiences made for a very educational and hugely successful event. This landscape will not ever look the same in our lifetimes, but the blood, sweat, and tears of the landowners, the dedication of the industry professionals assisting them, and adequate moisture from Mother Nature has resulted in a whole new kind of beauty. 🔍

