
# Past Meets the Present: Using Old Burns in Fire Management

*Using previous burned areas in fire management has long been an important part of the strategies and tactics used by fire crews. However, with the increasing size of fires across the Southwest, current fires are bumping into previous burns more often. We spoke with fire and land managers to find out the role previous burns play in current fire management, prescribed fire planning, and the potential benefits or negative consequences of allowing fires to reburn areas that have experienced high severity fire in the recent past.*

Over the past two decades the size of wildfires has dramatically increased across the Southwest. These large burned areas have become so common that newer wildfires are burning into and around them. While fire managers increasingly use these previous burns as treatments that either stop or slow fire spread and mitigate fire behavior, the interaction of past and current wildfires has important management and ecological consequences. We spoke with land and fire managers across the Southwest to answer the following questions:

- How do fire managers use previous burns in management of current fires?
- Are previous burns being used to plan and implement prescribed fires?
- How are previous burn severity and other factors considered when determining how to use previous burns in wildfire management or prescribed fire programs?
- Are there potential negative consequences when a current wildfire enters an area already impacted by high severity fire?

We begin by describing how previous fires played a role in the management of some recent, large wildfires in the Southwest: the Las Conchas fire, Poco fire, and the Whitewater-Baldy Complex. We then spotlight the fire program at Grand Canyon National Park, which has been using fire history, burn severity, and fire effects data as an essential part of decision-making in wildfire management and in the Park's prescribed fire program.

**How the Cerro Grand Fire Saved Los Alamos**

The 2011 Las Conchas was a massive, fast-moving fire spurred on by high winds and drought conditions. It eventually grew to about 136,000 acres, and at the time was the largest fire in New Mexico history (it was surpassed in 2012 by the 297,000 acre Whitewater-Baldy Complex).

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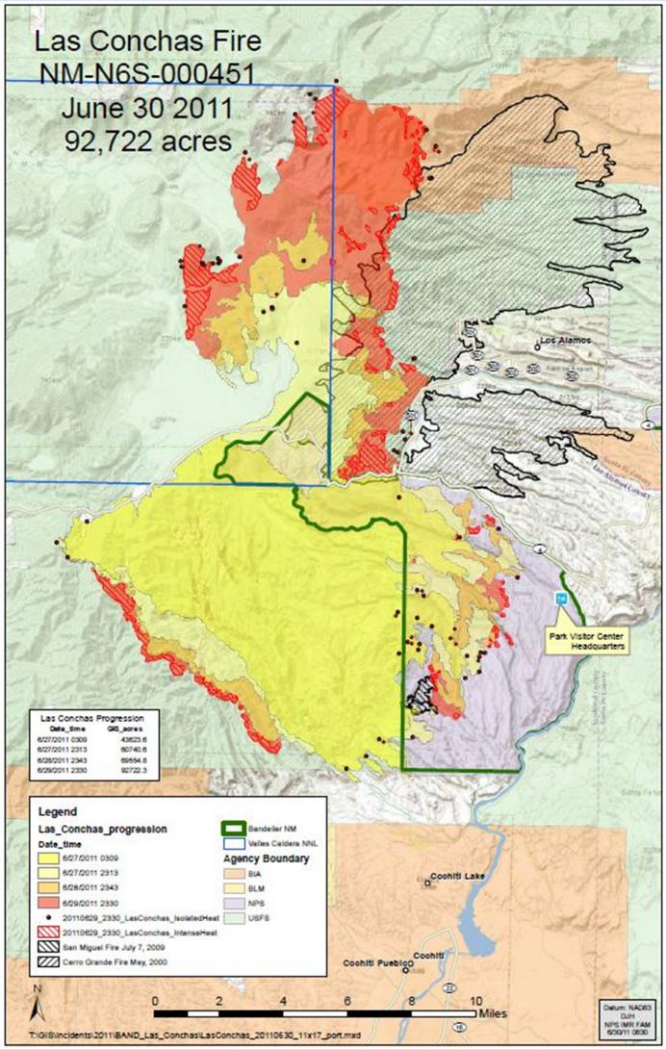
Moving quickly after ignition, the fire barreled across the landscape towards the town of Los Alamos and the Los Alamos National Laboratory. As flames and black smoke from the fire shot into the sky above New Mexico's Jemez Mountains outside of Los Alamos, it was a scene eerily reminiscent of 11 years earlier when the 2000 Cerro Grande fire swept into the town and destroyed 350 homes. This time, however, the Las Conchas fire spared Los Alamos, thanks in large part to the reduced fuels resulting from the Cerro Grande fire eleven years earlier.

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*Las Conchas fire perimeter on June 30, 2011. Black hatching represents the perimeter of the 2000 Cerro Grande fire.*

"The only thing that kept the town and the Laboratory from being incinerated was the fact that the Cerro Grande fire had burned a scar on the perimeter of the town and the Laboratory," says Williams Armstrong, a fuels specialist with the Santa Fe National Forest.

Once the Las Conchas fire hit the area burned by the Cerro Grande fire, it slowed and dropped to the ground. It was still a very dangerous and intense fire, but it was not running in the crowns and spotting. Fire crews were able to get out in front of it, establish containment lines, and conduct burnout operations that kept the fire out of the town and the Lab.

Although previously burned areas can minimize the impacts of future fires, re-burning an area can also have negative consequences. On the Santa Clara Pueblo reservation, the Las Conchas burned through a large reforestation project that was implemented after the Cerro Grande fire, killing most of the 1.5 million trees that were planted. The fire also scuttled much of the work done in a cutthroat trout restoration project on Santa Clara Creek. Moreover, some of the areas that burned with high severity, such as around St. Peter's Dome in Bandalier National Monument and several drainages above Los Alamos on the Santa Fe National Forest were completely denuded of vegetation. Since the fire, erosion has been a serious problem and flooding and debris flows have caused considerable destruction downstream.

Extensive mortality of piñon pine, ponderosa pine, and Douglas-fir trees, killed in the 2011 Las Conchas Fire in the Jemez Mountains, New Mexico. Photos: Craig Allen, USGS

"The Las Conchas was not a gentle, beneficial fire," says Armstrong. "This fire burned with enough severity that we are losing a tremendous amount of topsoil and it's having downstream impacts that are proving to be very costly."

Besides the Cerro Grande, the Las Conchas fire also bumped into a number of other previously burned areas, including the 1996 Dome fire. When the Las Conchas burned through the Dome fire area, it swept through much of the shrubby, scrub oak vegetation that had regrown since 1996. It also killed many of the surviving conifer seed trees that had survived the Dome fire and that and represented potential forest regeneration.

The Las Conchas represents the complex trade-offs of positive and negative impacts that always embody wildfire management, especially in an era of heavy fuels and drought conditions that are creating large fires with extreme fire behavior. Next, we describe a fire management scenario that is more common – fire managers herding a fire into a previous burned area in order to buy time for containment.

**When Managed, Multiple-Objective Wildfires Pay Off: The Poco Fire**

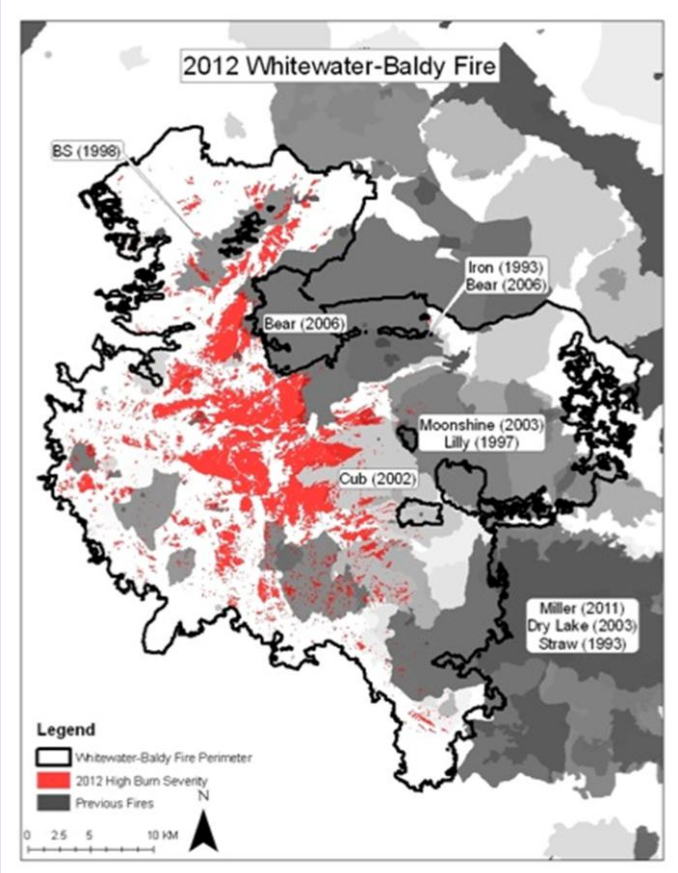
In June 2012, the Poco fire ignited on the Tonto National Forest. The fire was burning under extreme conditions and could have potentially grown beyond its eventual 11,000 acres. However, the fire ran into the burned area of the 2011 Bluff Fire, a fire managed for multiple objectives, which aided in the containment and suppression efforts on the Poco fire. Matt Reidy, the Incident Commander for the Northern Arizona Type 2 Incident Management Team, says that when the Poco fire ran into the burned area from the Bluff fire it significantly changed fire behavior.

"The Poco fire at that time was a very active fire making short runs; it was spotting a quarter of a mile, half a mile out. The fuels conditions were extremely dry. So, when the Poco fire interacted with the previous Bluff fire the fire intensities dramatically decreased," says Reidy.

As the intensities dropped and the rates of spread slowed, fire crews were able to take advantage of the shift in fire behavior. They completed flanking actions

around the sides of the fire. This allowed crews to complete other suppression actions that that had been suspended before the fire behavior changes that occurred when the fire entered the Bluff fire burned area.

"That gave us 3 or 4 days that allowed us to actually implement our suppression actions," says Reidy. "Had the Bluff fire not occurred and the Forest not managed that fire, the fuels would have been continuous. The Poco fire would have continued past the point of where we would be able to manage it and the outcomes would have been much different."




High severity patches (in red) on the Whitewater-Baldy fire overlaid on top of past fires in the Gila National Forest. Credit: Jose Iniguez, USFS [(Click here for a larger image)]

**Fire History in the Gila Wilderness: The Whitewater-Baldy Complex:**

The Whitewater-Baldy Complex burned almost entirely in the Gila Wilderness, and the history of wildfire management in the Wilderness was key in its management. Over the past 40 years, wildfires have been allowed to burn more frequently in the Gila National Forest than in most other national forests. Large portions of the Whitewater-Baldy fire burned with less severity than other recent large fires in the Southwest because there was less fuel to power the extreme fire behavior that has become relatively common elsewhere. In fact, more than half the fire's total area had burned at least once in the last few decades ([Read Jose Iniguez's observations and analysis regarding the Whitewater-Baldy Complex]). Robert Gallardo, district fire management officer on the Gila National Forest, says that older burned areas are scattered and overlapping throughout the Wilderness.

"With our years of managing fire in the Wilderness, we have created a mosaic pattern of burns," says Gallardo. "In areas in which we have had previous burns, we usually get low to moderate fire behavior."

In late May 2012, two lightning strikes about 3–4 miles apart started the Whitewater and Baldy fires in high elevation mixed conifer, aspen, and spruce-fir forests. Two winters of below average snowfall had left soils and fuels extremely dry. Both the Baldy fire and Whitewater fire were managed under full suppression because of existing drought conditions and the fact that it was still

over a month until the expected start of monsoon season. However, on May 23, significant winds drove the two fires together and 48,000 acres burned in one day. The fire burned for two more months, eventually burning 297,845 acres.

It did not take long before the Whitewater-Baldy Complex started bumping into the burned areas from previous fires, including the 2002 Cub fire and the 2006 Bear fire. As the fire moved through the ten-year-old burned area of the Cub fire, severity decreased from high to low/moderate, and the fire completely stopped in the six-year-old Bear fire, which was a stand replacing fire that did not contain enough fuels to carry the Whitewater-Baldy.
However, the fire was also able to move around these older burned areas and spread into other areas of the Forest. To the north, the fire encountered the burned area from the 1998 BS fire and a relatively recent prescribed fire that allowed firefighters to stop the advance of the fire. As the fire moved to the east, it came out of the high elevation forest and moved into the lower elevations. Here, it encountered some classic, open, "park-like" ponderosa pine forests that had burned three to four times in the last few decades, including the 2011 Miller fire, which burned over 88,000 acres of ponderosa pine at moderate to low severity. When the Whitewater-Baldy hit these areas, the severity dropped from high to low, and even to very low, essentially becoming a maintenance burn that cleaned up undergrowth and killed smaller trees.

"Once the fire came off the high elevations, it started transitioning into the mixed-conifer and more ponderosa pine. When the fire hit the Miller fire and other previous fires that we had managed, the fire just hit the ground and was a low

Ponderosa pine stand on Iron Creek Mesa. This area burned in the Whitewater-Baldy Fire in 2012, but had also burned in 1993 and 2006. Photos: Jose Iniguez, USFS

intensity ground fire," says Gallardo.

High burn severity impacted 38,570 acres, or 13% of the total burned area within the Whitewater-Baldy perimeter. The vast majority of this occurred in high elevation, spruce-fir and some mixed conifer forests. This is not completely negative from an ecological standpoint since these forests are adapted to stand replacing fires (Margolis, Swetnam, and Allen 2004). Yet, the patch sizes for the high severity burns were larger (and included large stands of mixed conifer that will take longer to recover) than has historically occurred on the Gila. Margolis, Swetnam, and Allen (2011) found that stand-replacing fire patches as large as 707 acres historically occurred in the mixed conifer-aspen zone of upper montane forests in the Southwest, and patches as large as 1287 acres historically occurred in the spruce-fir zone. However, on the Whitewater-Baldy, there were a few 5,000 acre holes blasted into these forests as a result of fuel build-up and dry conditions.

Overall, fire and land managers on the Gila believe that the fire will be a net positive. The medium and low severity fire that covered 87% of the burned area will increase the resilience of many of the forest stands. As Jose Iniguez has pointed out, more acres were treated with the Whitewater-Baldy and the 2011 Miller fire than are proposed for the entire ten-year, Four Forest Restoration Initiative.

Land managers across the Southwest are recognizing the value of restoring fire to landscapes, as has been done successfully in areas of the Gila. Similarly, Grand Canyon National Park has developed a unique approach to restoring a natural fire regime in the Park's forests by integrating previous burns into fire planning and management in a much more proactive and scientific manner.

**Putting Fire Science to Work at Grand Canyon National Park**

For over a decade, fire and land managers at the Park have gathered extensive data on fire history, burn severity, and fire effects. That data drives a great deal of the decision-making at the Park in relation to fire, from the establishment of management action points on current wildfires to planning landscape-scale prescribed burns. The overall aim is to break up the landscape and reduce the risk of high severity fires in areas in which they are not desired.

As part of the Park's fire program, burn severity analyses have been done conducted through the national Monitoring Trends in Burn Severity (MTBS) program (http://www.mtbs.gov/) for every large fire (larger than 1,000 acres) in the Park since 2000 (51 fires, 125,000 acres). MTBS uses Landsat satellite imagery to determine the severity for large fires across the country. Grand Canyon takes the MTBS products and customizes to their sites through accuracy assessments or what are known as composite burn index (CBI) plots that are used to ground-truth the satellite imagery. Chris Marks, the deputy fire management officer for the Park says that the focus on fire history and burn severity is key to the success of the Grand Canyon fire program.

"We look at previous burns and previous burn severity from the get-go on every start. Those are the key factors we look at to determine if we can manage the fire for multiple objectives or if we need to just go ahead and fully suppress the fire. We take a good look at the fire history around the start. We want to know if that fire will have high severity effects, will it be an intense fire, and will it move really fast," says Marks.

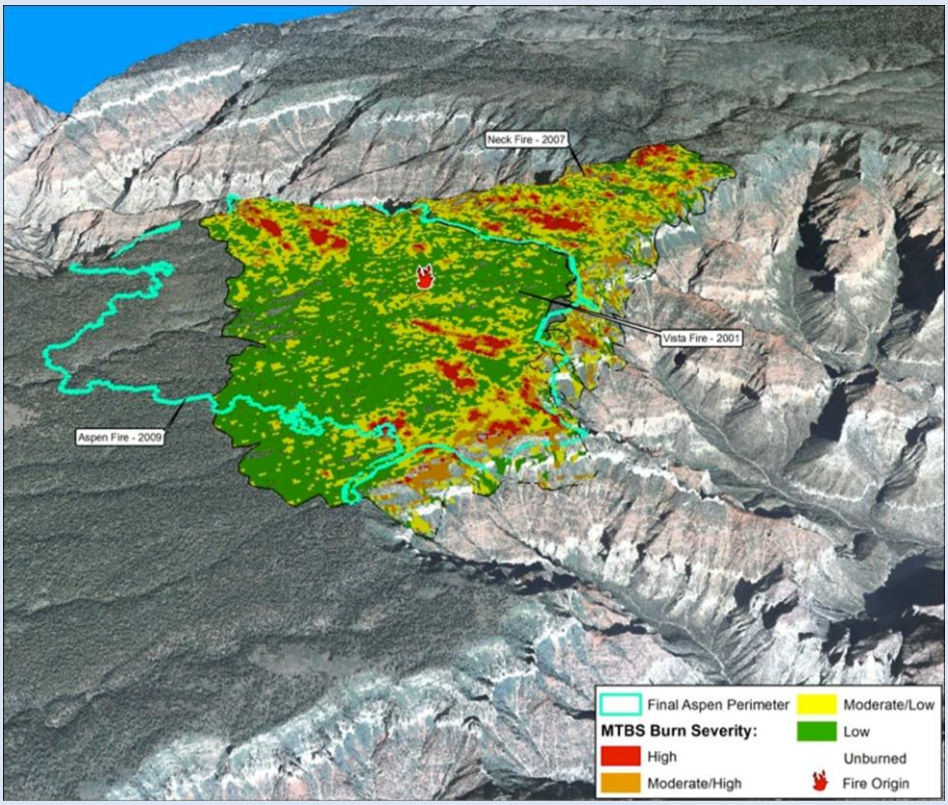
According to Marks, everyone from firefighters to Park administrators uses

the burn severity data to make decisions on fire. They use fire history and burn severity data to develop planning areas, management action points, and to look at the potential for managing fire around values at risk.

"It informs tactical decisions as well," says Marks. "For example, can we cut line from a road to a high severity burn area and just burn out that area, knowing once the fire gets to the high severity area it isn't going to move much farther than that. So instead of cutting 3 miles of fireline, maybe we can cut only a half a mile of line and use that high severity area like a natural barrier like a river, outcrop or area with no fuels."

Windy Bunn is the fire ecologist for Grand Canyon National Park. She says that that the fire team has learned from experience what to expect when a fire moves into a previous burn. They found that fires will not burn into an area that burned only 2-4 years prior, even if the previous fire burned with low severity. Between 4 and 8 years, there might be a little burning into the old fire, but not much, and it will not generally burn completely through.

"Once we get to the 8-10 year time frame, we typically see the new fires burning completely through the old fires in almost all the vegetation types, no matter the severity of that past fire," says Bunn.
Eric Gdula is the fire GIS specialist for the park, one of only a handful of GIS specialists in the NPS that work exclusively on fire. He says that the 2009




Burn severity was used in decision-making on the Aspen Fire. The flame marks the ignition point and teal shows the final fire perimeter. Burn severity in previous burns was used to manage the fire. Credit: Eric Gdula, NPS

Aspen Fire is a good example of how the Park uses burn severity data in wildfire management. The Aspen fire ignited just to the north of the developed area on the North Rim of the canyon. Park managers thought that the fire was a good candidate for long-term management, but there was concern that it would move north and get established in a more remote area with few control options. So, the fire team looked at the burn severity data and the fuels data and the area in which the fire was going to burn. They found that the fire had ignited in an area that had burned in 2001 at low and medium severity. So, they knew it would not burn as hot as it potentially could in other areas, where it would be a first entry fire. Second, the team saw that if the fire moved north it would bump into the two-year-old burned area of the Neck fire of 2007, which burned primarily at high severity, and that it would not move north. The park managed the fire and it did in fact run into the burned area to the north at which point it died and did not move any further.

"The Aspen fire burned about 5,000 acres and when we did severity analysis the following year we got really good effects from this fire," says Gdula.

Analysis of the burn severity data has also led to some insights into the design and application of the prescribed burns. Specifically, the Grand Canyon fire team noticed that a lot of the high severity patches on the landscape occur on south-facing aspects. Historically, the south-facing slopes had more of ponderosa pine component, and therefore more low severity fire. The ponderosa pine is still there, but many of the south aspects also have significant mixed conifer components. The team decided to begin burning the south aspects in the winter by helicopter to reduce fuel loading.

"We may only get 30% consumption on those burns, but when a wildfire does come through, it has to go through a broken landscape," says Marks. "So, we have eliminated this homogenous landscape of unburned, mixed conifer fuels by breaking it up and burning the south slopes, and leaving the north slopes unburned. We have a pretty good potential of losing the entire area if we don't."

*"We have a decent amount of data on the effects of single entry fires and in some cases of multiple entry fires on our landscape. But we still have a lot of questions. We have seen some really positive effects but we have also seen some effects that are outside the range of our objectives. We don't necessarily have a policy where we always allow a second fire to burn through an old fire area or we always prevent it from burning through that area. We are still experimenting and trying to learn from each fire event what the effects will be and when we should allow new fires to burn into old fires and when we should take a more aggressive suppression action on those fires."*

--Windy Bunn, fire ecologist, Grand Canyon National Park

**Conclusion**

Not all burns are the same and fire managers must collect important information about these areas before deciding how to use them in management of current fires. Also, depending on the severity of the first fire, a second fire may or may not be desirable from an ecological perspective. According to fire managers across the Southwest, there are a lot of factors that are important when you are looking at how to use a previous burned area in current fire decision-making. Some of the questions that should be asked and answered are:

- How did the fire burn or what was the quality of the fire?
- What was the original fuel type and what is the current fuel condition?
- How long since that piece of ground burned?

Collecting and analyzing burn severity data can give a really good estimate of the quality of the burn. According to Chris Marks, it is not enough to simply identify management decisions. "If there is a line on the ground and you know it has been three years since the fire, that tells you some information but if you have a line on the ground with severity data it is a whole lot more information," says Marks.

*Written by Josh McDaniel, February 2013.*

**References**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The Southwest Fire Science Consortium is a way for managers, scientists, and policymakers to interact and share science in ways that can effectively move new fire science information to management practices.


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