Unplanned Wildfire in Areas With Slash Piles

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Each year, fuel treatments reduce the likelihood of uncharacteristically severe wildland fire in overstocked stands across millions of acres in the United States. Typically, these treatments target small-diameter trees for removal, producing large amounts of unmerchantable material and increasing surface fuels. Currently, few commercial markets for this woody material exist, so it is commonly piled and burned onsite. Occasionally, unplanned wildfires burn piles before managers are able to burn them under controlled conditions. Little has been written or documented about piles burned during wildfires, making it difficult to assess the threat posed by unburned piles.

In an effort to better understand the prevalence, causes, and impacts of unplanned burning of piles, we reviewed the available literature and interviewed managers from across the country. A review of the literature suggests that treated units with unburned slash piles and untreated units with ladder fuels will experience similar fire behavior and effects. What follows is a first step that will hopefully call attention to the issue and help frame incisive questions for future research.

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Why Are There Unburned Piles?

Piles are built and left to dry because green wood burns poorly. For example, the Forest Service's Lake Tahoe Basin Management Unit in California states that it takes about 18 months for piles to dry sufficiently for effective consumption when burned.

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Weather also delays burning; material cut in the spring or summer is often left until conditions are safe for burning. In many areas, managers burn piles when there is snow on the ground to prevent unwanted fire spread. Lack of snow can delay pile burning. The Coalition for the Upper South Platte in Colorado was unable to burn thousands of piles during the winter of 2012–2013 because snow depth did not meet its pile burn guidelines (Steiner 2014). In many forests, there is a backlog of unburned piles because of limitations imposed by air quality restrictions, unfavorable weather conditions, available resources, and even funding (Bailey 2014; USDA Forest Service 2014).

Piling and burning is common in the wildland–urban interface (WUI), where the proximity of homes makes broadcast burning more challenging. However, piles in the WUI can be a target for arson. In 2006, for example, at a California campground, arsonist-ignited piles required a handcrew, engine, and helicopter to contain the fire at 1.4 acres (0.6 ha) (Jacobs 2014).

Do Piles Affect Fire Behavior?

One of the key questions is whether or how fire behavior changes in the presence of unburned piles. From the perspective of a wildfire, unburned piles are simply redistributed fuels. Boles and branches from the canopy aggregated into piles contain the same amount of fuel in a different arrangement. An assessment of the 2007 Angora Fire in California stated that the convective and radiant heat output in untreated stands and stands with piles would be similar because the same amount of fuel would burn (Murphy and others 2007).

However, piling fuels can change fuel moistures by converting live fuels to dead fuels, which can affect flame length, fireline intensity, burning duration, and other aspects of fire behavior. Moving biomass from standing trees to piles decreases canopy bulk density, ladder fuels, and canopy continuity, which can reduce fire intensity and severity.

Yet reducing stem and canopy density opens the stand to higher wind speeds and increased fire behavior. For example, the 2010 Fourmile Canyon Fire in Colorado burned more intensely through stands with piles than through adjacent untreated stands in the Gold Hill area because of increased wind speeds in the thinned stands (Graham and others 2012). An experimental burn at Nenana Ridge in Alaska that mimicked wildfire conditions showed that a stand with windrowed fuels had a lower maximum temperature but longer heating time than a stand with a lop-and-scatter treatment (Butler and others 2012).

In some cases, even though the piles had not been burned before wildfires occurred, fire behavior was less active than in an untreated stand. In 2004, for example, the Cal Hollow Fire threatened the community of Central, UT. A fuel break had been put in place in the pinyon–juniper forest above the community, but the fire occurred before the piles generated during fuel break installation could be burned under controlled conditions (USDA Forest Service 2013). The fire was in the tree crowns when it approached the fuel break, but it dropped to the surface in the treated area, although it did burn intensely in the piles. Retardant drops and other suppression activities successfully contained the fire before it could enter the community (McAvoy 2004).

Slash burned under controlled conditions in March 2013 as part of a Joint Fire Science research project on the ecological effects of pile burning at the Santa Clara Pueblo, NM. Photo: Alexander Evans, Forest Guild.

Similarly, during the 2005 Camp 32 Fire in Montana, the untreated stand supported an active crown fire, but when the fire entered the stand with unburned piles it switched to a passive crown fire (Hvizdak 2014; USDA Forest Service 2006).

Wildfire in stands with unburned piles may have more spotting, as was observed when large landing piles ignited during the 2008 American River Complex Fire in California, causing torching of nearby trees and spotting (Safford 2008). During the 2013 Rail Fire on the Modoc National Forest in California, the rate of spread of the fire front decreased when the wildfire encountered a treatment where material had recently been piled. However, the uncured (or green) piles contributed to spotting, which ultimately made containment difficult (Heald 2014). In contrast, during the Angora Fire, spotting distance in stands with unburned handpiles was shorter than in untreated stands (Murphy and others 2007).

In addition to generating embers, piles can also be receptive to embers from other sources. For example, the 2013 Andrews Creek Fire in Oregon ignited piles in a recently thinned Douglas-fir stand. The fire then spotted from pile to pile but did not spread far outside the footprint of the piles (Skrip 2014).

The Tin Cup Fire in August 2007 on the Bitterroot National Forest in Montana as it moves through a stand that had been thinned and piled and was slated to be burned in fall 2007. Photo: Tobin Kelley, Forest Service.

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How Do Burning Piles Affect Wildfire Control?

In terms of wildfire control, ease of access to the affected area may influence operational success. In cases where there is good access (that is, proximity to roads and trails) for staging suppression activities, wildfires in stands with piles may be easier to control than in comparable untreated stands, particularly if the piling activities reduced the horizontal continuity of the surface fuel layer. However, where access is difficult, wildfires in piles may be more difficult to control than fires in untreated or lop-and-scatter treatments because of the intense heat generated by burning piles.

When the Angora Fire burned an area with piles, the fire resisted control because access was difficult; however, an area with piles that burned during the American River Complex Fire was accessible by a public road, giving suppression personnel better access for firefighting apparatus and therefore making the fire easier to control (Safford 2008). Similarly, safe, successful fire suppression in an area with piles on the 1999 Alder Fire in Grand Teton National Park, WY, was made possible by escape routes (via paved road) and ready access to plentiful water supplies (McFarland 2014). The fast-moving 2008 Jack Fire burned through an area with piles of western juniper in Lava Beds National Monument in northern California. When ignited by the wildfire, the piles burned very intensely, but the fire was contained with minimum-impact strategies such as use of existing roads and water rather than ground-disturbing methods (Augustine 2014; Farris 2014). When the 2007 Tin Cup Fire in Montana entered treated areas, it moved from a crown to a surface fire, even though not all of the piles had been burned before the fire front arrived at the piled area (Bitter Root RC&D 2014).

Do Piles Alter Wildfire Effects?

Unburned piles add to the wide array of factors that govern the effects of wildfires on the residual stand. An area with handpiles that burned during the Angora Fire had slightly lower severity because of wider crown spacing when compared to similar completely untreated stands (Murphy and others 2007).

The 2011 Wallow Fire in Arizona affected both stands with a lop-and-scatter treatment and stands with piles that had yet to be burned. Although both types of treatments resulted in canopy mortality, mortality in the piled treatment was concentrated around the pile locations (particularly for landing piles), whereas the lop-and-scatter treatment was associated with complete mortality (Bostwick and others 2011; Palmer and others 2011). In some areas that burned in the Wallow Fire near Nutrioso, AZ, the delayed mortality of the overstory trees near piles appeared to be driven by the long fire residence time associated with the burning piles (Bigelow 2014).

A review of the literature suggests that treated units with unburned slash piles and untreated units with ladder fuels will experience similar fire behavior and effects.

In a number of cases when wildfire encountered unburned piles, the effects were worse than in similar untreated stands. On the 2007 East Zone Complex Fire in Idaho, tree mortality was higher in an area burned with piles than in comparable untreated areas (Hudak and others 2011). When the 2011 Cougar Fire in California reached accumulations of trees cut by feller-bunchers and left to cure, the result was higher fire severity (Farris 2014; Safford and others 2012). Wimberly and others (2009) studied unfinished fuel treatments that burned in the 2005 Camp 32 Fire and the 2006 Warm Fire in Arizona. Although their analysis did not focus specifically on the impact of unplanned fire in piled fuels, they found that thinning without treatment of the resulting slash increased burn severity. An analysis of the 2007 Tin Cup Fire found that crown burn effects were similar between partially treated units with slash piles and untreated units with ladder fuels (Harrington and others 2010).

Where topography drives an increase in fire intensity, fuel treatments are often overwhelmed. For example, during the 2012 Little Bear Fire in New Mexico, burnout operations sent fire uphill into a stand where handpiled fuels had yet to be treated. The result was high levels of mortality in the residual stand (Kuhar 2012).

Research Needs

Based on our review of the available reports and interviews with managers, it appears that unplanned fire in areas with piles is not common. Our search uncovered only 20 examples in the last decade. Although our review of the literature and our limited survey of the management community might reflect a significant underestimate, the fact remains that it is three orders of magnitude smaller than the total number of wildfires that occur each year. Therefore, wildfires in areas with piles remain a minor occurrence in the broader context. Even in cases like the East Zone Complex Fire in Idaho, where 156 acres (63 ha) of piles did burn in a wildfire, another 954 acres (386 ha) of piles had been burned under controlled conditions before the wildfire arrived (Hudak and others 2011). Piles do not always exacerbate wildfire activity and severity; there are also cases where, either because of location (easier access) or the rearrangement of surface fuels across the larger stand (disrupting horizontal fuel continuity), unburned piles increase control opportunities and potentially reduce wildfire severity.

We consider this report to be a first look at the issue of wildfires burning areas with piled fuels. Given the dearth of information and quantitative study, we suggest that the topic warrants additional inquiry. A more indepth investigation of the area affected could help define the scope of the issue. A simple inventory of the total area with piles and of the annual area with piles burned during wildfires would be a good place to start. Planned experiments should also be initiated and opportunistic postfire measurements taken to assess how the presence of piles—and the corresponding changes in stand structure and surface fuels due to fuel treatments—affect fire intensity and severity. Land managers can then better weigh the risks and benefits associated with piling as a fuel treatment.

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References

Augustine, A. 2014. Park successfully uses minimum impact tactics to contain fire, Lava Beds National Monument, California. <http://www.forestsandrangelands.gov/success/stories/2008/nfp_2008_ca_nps_labe_firefighting.shtml>, last accessed September 2016.

Bailey, J. 2014. Personal communication. 7 February. Fuels Planner, Okanogan–Wenatchee National Forest, Naches Ranger District, Naches, WA
Bigelow, R. 2014. Personal communication. 11 February. Fuels specialist, Manti–La Sal National Forest, Sanpete Ranger District, Ephraim, UT.
Bitter Root RC&D (Resource Conservation and Development). 2014. Making things happen: 3 success stories. Hamilton, MT. <http://bitterrootrcd.org/successStories.htm#tin>, last accessed September 2016.
Bostwick, P.; Menakis, J.P; Sexton, T. 2011. How fuel treatments saved homes from the Wallow Fire. Albuqueque, NM: USDA Forest Service, Southwestern Region.
Butler, B.W.; Ottmar, R.D.; Rupp, T.S. [and others]. 2012. Quantifying the effect of fuel reduction treatments on fire behavior in boreal forests. Canadian Journal of Forest Research. 43(1): 97–102.
Farris, C. 2014. Personal communication. 3 March. Fire Ecologist, National Park Service, Klamath-South Cascades Network, Klamath Falls, OR.
Graham, R.; Finney, M; McHugh, C. [and others]. 2012. Fourmile Canyon Fire findings. Gen. Tech. Rep. RMRS–GTR–289. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
Harrington, M.; Noonan-Wright, E. 2010. The influence of an incomplete fuels treatment on fire behavior and effects in the 2007 Tin Cup Fire, Bitterroot National Forest, Montana. In: Wade, D.D.; Robinson, M.L., eds. Proceedings of 3rd Fire Behavior and Fuels Conference; 25–29 October 2010; Spokane, WA. Birmingham, AL: International Association of Wildland Fire.
Heald, K. 2014. Personal communication. 7 February. Fuel specialist, Modoc National Forest, Warner Mountain Ranger District, Cedarville, CA.
Hudak, A.T.; Rickert, I.; Morgan, P. [and others]. 2011. Review of fuel treatment effectiveness in forests and rangelands and a case study from the 2007 megafires in central Idaho, USA. Gen. Tech. Rep. RMRS–GTR–252. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
Hvizdak, R. 2014. Personal communication. 7 February. Retired fire management officer, Kootenai National Forest, Rexford Ranger District, Rexford, MT.
Jacobs, B. 2014. Personal communication. 10 February. Fuels management specialist, Sequoia and Kings Canyon National Parks, National Park Service, Three Rivers, CA.
Kuhar, K. 2012. Fuel treatment effectiveness report, Little Bear Fire. Ruidoso, NM: USDA Forest Service, Lincoln National Forest, Smokey Bear Ranger District.
McAvoy, D. 2004. Fire plan and fuelbreak help save community from wildfire. Utah Forestry News. 8(4): 1–3.
McFarland, M. 2014. Personal communication. 7 February. Deputy fire management officer, National Park Service, Grand Teton National Park, Moose, WY.
Murphy, K.; Rich, T.; Sexton, T. 2007. An assessment of fuel treatment effects on fire behavior, suppression effectiveness, and structure ignition on the Angora Fire. Tech. Pap. R5–TP–025. Vallejo, CA: USDA Forest Service, Pacific Southwest Region.
Palmer, J.; Pitts, J.; Bostwick, P. 2011. Webinar: Fuel treatment effectiveness on the 2011 Wallow Fire. Fire Research and Management Exchange System. <https://www.frames.gov/rcs/11000/11148.html>, last accessed September 2016.
Safford, H. 2008. Fire severity in fuel treatments American River Complex Fire, Tahoe National Forest, California. Vallejo, CA: USDA Forest Service, Pacific Southwest Region.
Safford, H.D.; Stevens, J.T.; Merriam, K. [and others]. 2012. Fuel treatment effectiveness in California yellow pine and mixed conifer forests. Forest Ecology and Management. 274: 17–28.
Skrip, P. 2014. Personal communication. 7 February. Forester, Douglas Forest Protective Association, Roseburg, OR.
Steiner, M. 2014. Snowy winter allows hundreds of slash piles burns to lessen Colorado fire danger. Colorado Springs, CO: Colorado Springs Gazette, 9 February.
USDA Forest Service. 2006. Hazardous fuels and prescribed burn projects—Fuel treatment and the Camp 32 Fire: A success story, Montana 2005. <https://www.forestsandrangelands.gov/success/documents/05_mt_nf_fule_treatment_hfr.pdf>, last accessed September 2016.
USDA Forest Service. 2013. New Harmony-Central fuelbreak improvement environmental assessment. St. George, UT: Dixie National Forest, Pine Valley Ranger District.
USDA Forest Service. 2014. Lake Tahoe Basin multi-jurisdictional fuel reduction and wildfire prevention strategy. South Lake Tahoe, CA: Lake Tahoe Basin Management Unit.
Wimberly, M.C.; Cochrane, M.A.; Baer, A.D.; Pabst, K. 2009. Assessing fuel treatment effectiveness using satellite imagery and spatial statistics. Ecological Applications. 19(6): 1377–1384.