



What's Burning in Your Campfire? Garbage In, Toxics Out

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For most overnight campers, camping and campfires seem to go together. Campfires are not only psychologically reassuring, they seem to offer an easy way to get rid of trash.

But after cooking dinner, is it wise to burn the garbage in your campfire? How benign are the fumes generated when you burn a cardboard box printed with colorful advertising or a resealable sandwich bag?

The Missoula Technology and Development Center (MTDC) analyzed gas emissions and ash content from 27 products that are commonly burned in campfires. The garbage items ranged from batteries to baby diapers.

Many toxic air pollutants and heavy metals are human carcinogens that may increase the incidence of cancer. Toxic pollutants can be inhaled, absorbed through the skin, or ingested in contaminated food or water. Laboratory research has documented the emissions of some toxic air pollutants from burning wood. Many of these compounds are known to be carcinogenic to humans. This informal study will discuss the most prevalent toxic pollutants released when wood is burned in a campfire and any major increases in pollutants when garbage is added to the campfire.

Garbage burned in a campfire can create fumes that campers inhale. The garbage may leave traces of heavy metals in the campfire ash. When the ash is scattered, as is common when cleaning up campfires, the ash may expose workers, animals, and plants to toxic metals. Garbage should not be burned in a campfire, but should be packed out and disposed of properly.

Analysis

Each of 29 simulated campfires (figure 1) in the study burned 107 grams

of ponderosa pine branches and 43 grams of ponderosa pine needles. The campfires were conducted as open-air burns for the most realistic simulation of a campfire. Two campfires were burned without garbage items, establishing a baseline for levels of compounds in the smoke and ash of a campfire that just burned wood.

Small amounts of specific garbage items were added to each of 27 other campfires (table 1) when the fire was intense enough to consume the garbage. Typically, when the garbage was added to the campfire, the flames would diminish

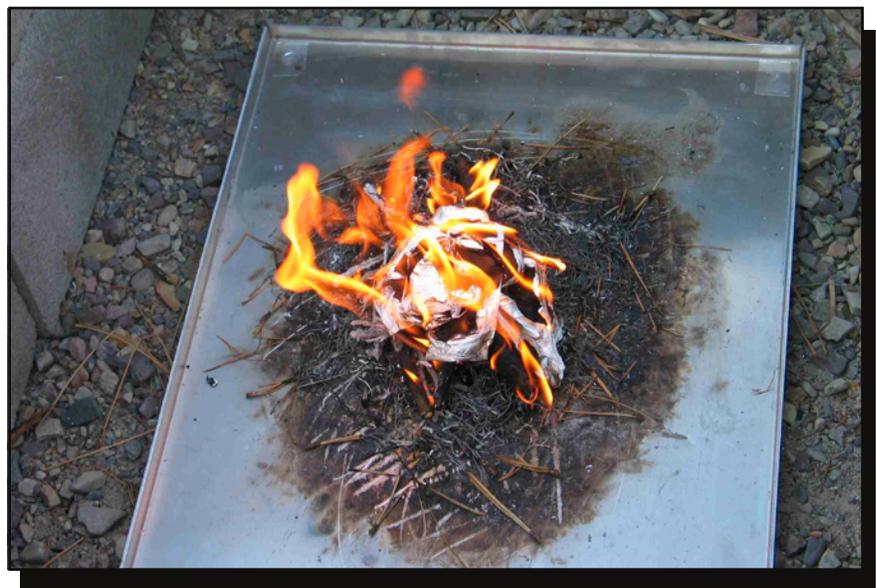


Figure 1—Aluminum foil burning in a simulated campfire.



Table 1—Garbage items burned in 27 simulated campfires during the study.

Garbage item	Residue in the ash
No. 6 polystyrene clear plastic packaging (for doughnuts, cookies, and similar items)	Tar-like residue
No. 1 polyethylene terephthalate 20-ounce clear pop bottles (two)	Hard residue present
Baby diaper (one)	Black foam-like residue
Cigarette and candy wrappers	Aluminum wrapper intact
Snack-size chip bags	No visible residue
No. 6 polystyrene styrofoam cups (six)	Very hard black resin residue
Alkaline (two) and lithium (two) batteries	Blackened batteries left intact
Pieces of a fiberglass spinning rod and clear fishing line	Rod blackened but intact, line melted
Military Meal-Ready-to-Eat packaging with the expended heater packet	Hardened muddy-colored residue (from exterior package) and solid foil layers intact
Duct tape, masking tape, Kevlar tape, and strapping tape	Strings from Kevlar and strapping left intact; goo-like residue visible in ash
Packaging for freeze-dried meals (colored foil, plastic, plain foil)	Foil intact; hardened muddy-colored residue
White plastic lids (four) for disposable hot beverage cups	Yellow residue
Three white and three brown plastic forks and spoons	Yellow residue
Webbing, buckle, and padded strap from a backpack	Hardened black residue
No. 4 polyethylene terephthalate black plastic tray	Black residue
Peanut can with plastic lid (paper, foil, tin)	Tin was intact; some foil particles were intact
Nickel-cadmium batteries (three)	Batteries sizzled and one popped, but the batteries were intact
Colored cardboard box	Large particles left intact
Aluminum foil	Most of the foil left intact
Clear plastic sheet (Visqueen)	Yellowish hardened residue
Instant soup and hot cocoa packaging (paper, plastic, and foil)	Foil left intact
Hard plastic container (No. 5 polypropylene base, No. 4 low-density polyethylene lid)	Yellow residue
Plastic grocery produce bags and resealable plastic sandwich bags	Yellow residue
Plastic grocery carry-out bags: four No. 2 high-density polyethylene bags (three white and one blue)	Blue residue
Snack packaging (plastic and foil)	Yellow residue
Aluminum pop can	Can lost color but was mostly intact
Blue plastic plate with B2 marking on bottom	Hard, blue residue