

# Your well and septic system - After a wildfire

FACT SHEET SWP-109

September 2012

Wildfires happen throughout rural Montana and can be problematic for those living in or near coniferous forests and hilly or mountainous terrain. A wildfire can impact a well or septic system either directly, by burning across these features, or indirectly by burning in the watershed. This fact sheet describes actions you can take to ensure you have safe water to drink and a functioning wastewater system following a wildfire. Most of the information provided here is derived from the state environmental health programs in Arizona and Colorado, two states with extensive experience on wildfire impacts to rural homeowners.



## ***Drinking Water Concerns - Wells***

Your well may be physically damaged by a fire, at risk of microbial contamination due to loss of pressure during a fire, or subject to long term changes in taste, odor, or chemical make-up following a fire.

For physical damage, perform a visual inspection of your well and all other pipes and appurtenances which work together to bring water into your household. The things you should be looking for include:

- Damage to your well's electrical supply,
- Damage to above-ground PVC pipes used to bring water to your home,
- Damage to well houses and equipment such as chlorinators, filters, or controls,

- Damage to well cap or the rubber seal or O-ring under the well cap,
- Damage to pressure tanks caused by exposure to excessive heat,
- Damage to storage tanks, vents and overflow pipes,
- If any damage is found, you should contact the appropriate licensed contractor or driller to repair the damage.

If your water system lost pressure or was disconnected from electrical power, it is advisable to make sure it is not contaminated with coliform bacteria. To see if your well and plumbing maintained positive pressure during the fire, turn on a faucet in the household to see if water comes out. You should not hear any air being released from the faucet. The flow of water should be steady and uninterrupted. If you do hear air escaping from the faucet with water intermittently spurting out, that is an indication that the well and household plumbing had a loss of pressure and should be checked to make sure it is bacteriologically safe

Laboratories generally charge between \$20 and \$50 for a coliform bacteria test. You can find a list of certified laboratories at: <http://waterquality.montana.edu/well-ed/testingawell/index.html>. Bacteria samples must be collected in an approved container using proper sample collection procedures. The lab will provide you with the correct sample bottles, forms, and collection instructions.

While awaiting sample results, you can use your water for flushing toilets and it is reasonably safe to use in a shower or bath (but take care to avoid swallowing water). You should boil or disinfect (see **Attachment 1**) water for drinking or cooking purposes and for washing dishes or other cooking utensils. If your well is reported to contain coliform bacteria, the well and water system can be disinfected (see **Attachment 2**) and re-sampled. If contamination persists following disinfection, contact your local health department for assistance. Instructions for disinfecting water for drinking and for disinfecting a well are attached.

Generally, the amount of bacteria that can safely be consumed by common household pets is much higher than it is for humans. However, you may wish to consult your veterinarian for additional pet-related questions. See also the link under **Other Resources** for MSU Extension information relating to livestock and wildfire.

A fire close to your well or somewhere upgradient in the watershed may result in a change in the taste or odor of your water; you may notice that your water tastes or smells earthy, smoky or burnt. While this is to be expected and not likely a direct health threat, you may need to thoroughly flush your water lines.

Keep in mind that specific aquifer conditions, water use, and the nature of the fire will dictate how long this issue persists.

### ***Wastewater Concerns - Septic Systems***

Fire will likely have little effect on septic systems since they are usually several feet underground. However it is possible that firefighting activities, such as the digging of fire breaks or the use of heavy equipment, might damage some systems. When you return to your home or business, check the area around your septic system for signs of damage. If you have sewage visibly exposed or on the surface, limit access to the area especially by children and pets. Then disinfect the area with bleach or hydrated lime and contact your local health department for assistance in evaluating the condition of your wastewater treatment system. Here are some guidelines for handling areas contaminated by sewage:

- Protective clothing (at a minimum, rubber or latex gloves and rubber boots) should be worn when cleaning up a sewage spill. (Dispose of gloves and wash rubber boots when leaving spill site). Keep children and pet away from cleanup activities. Note that hydrated lime is a caustic material and can be dangerous to handle and apply. Lime should only be used or applied by people experienced in using this material.
- Do not mix cleaning / disinfecting products or chemicals They can react with one another to produce toxic vapor or liquid substances.
- If the spilled material can't be recovered using hand tools, a commercial vacuum / pump truck should be called to remove all visible liquid and solid material.
- When the area is visibly clean, either a chlorine / water solution (using Clorox or an equal bleach) or hydrated lime should be spread across the spill area to disinfect. You can verify the chlorine concentration by using test paper available at food supply warehouses or chemical supply companies.
- If the spill occurred in a heavily populated area and odor may be an issue or within 100 feet of surface water, hydrated lime should be applied to the spill area in place of chlorine bleach. The hydrated lime will raise the pH to 12, which will disinfect the area. By raising the pH to 12 for at least 1 hour, the area will be disinfected. You can test the pH by using litmus paper obtained at a chemical supply facility. Because lime is a caustic material, access to the area treated with lime must be restricted during the disinfection period.
- When the spill area has been cleansed (24 hours after the chlorine solution or hydrate lime has been spread), the barriers can be removed and access to the area restored.

## ***Wildfire and the Watershed***

The primary impacts to fish and wildlife will be from runoff entering streams and lakes from areas burned by the fire. The runoff may carry extra sediment and ash, which can kill fish by robbing the streams of oxygen. Fires may also release pollutants normally found in soil and in living and decaying plants that can be washed into streams and lakes either through runoff or transported through the air.

Flooding is a concern when recently burned areas receive rainfall. Vegetation and forest litter that once slowed runoff are gone. Soils become hydrophobic which means rainwater or snowmelt will run-off instead of infiltrating. Even a very light rain can cause small to large ash and debris flows. Homeowners on slopes below burned areas should assess drainage patterns and keep culverts open. Ash/debris flows are often a sudden and dangerous consequence of wildfire. An increased amount of sediment and ash will end up in the surface water by erosion, landslides, and/or flooding in areas where the vegetation that once stabilized the soil has been removed.

Fire retardants are fire- suppression chemicals used to slow or smother wildfires. Most of ingredients in these products are common chemicals found in fertilizers (ammonia, nitrogen and phosphorus), household cleansers, soaps, cosmetics and paints. Generally, exposure to the retardants results in minimal problems for humans. The usual complaints are of mild skin and eye irritation. These chemicals also have minimal effects on wildlife, vegetation and soils. However, they may have adverse impacts to water quality and may impact fish or other aquatic life. The retardants can cause fish kills if applied directly over lakes and streams. This is because ammonia is in many of the retardants and ammonia is very toxic to fish. Retardants may also contain large quantities of nitrogen and phosphorus, which if flushed into a stream or lake can use up all the oxygen in the water body. If the retardant has not been sprayed directly over lakes and streams, the possibility of runoff will depend largely on the amount of rainfall, the steepness of the terrain, and the size of the receiving stream or lake. A United States Forest Service sheet describing wildland fire chemical clean-up is attached (**Attachment 3**).

Experience suggests that potential impacts to groundwater quality following a wildfire are generally minor but are difficult to predict since impacts are wholly dependent on conditions in the watershed, intensity of the fire, and local hydrogeology. Notably, research shows that metals (iron, manganese, magnesium) in groundwater may increase but are usually below the maximum contaminant level established for drinking water by the federal Safe Drinking Water Act.

## REFERENCES

Arizona Department of Environmental Quality. *Fact Sheet -Water Quality Concerns from Wildfire*. 2011.

Boerner, C. et al. *Impacts of Wildfire in Clear Creek Watershed on the City of Golden's Drinking Water Supply*. Colorado School of Mines. 2012.

Colorado Department of Public Health and Environment. *Wildfire Recovery Guidance for Water Quality Issues*. 2012

Gill, D. D. *The Impacts of Forest Fires on Drinking Water Quality*. Unpublished. 2004.

Writer, J.H. and S.F. Murphy. *Wildfire Effects on Source-Water Quality—Lessons from*

Gimenez, A. et al. *Long-term forest fire retardants: a review of quality, effectiveness, application and environmental considerations*. International Journal of Wildland Fire, 1-15. 2004.

USGS. *Fourmile Canyon Fire, Colorado, and Implications for Drinking-Water Treatment*. US Geological Survey. Fact Sheet 2012-3095. 2012.

## OTHER RESOURCES

Colorado Department of Public Health and Environment. Wildfire Recovery Guidance. <http://www.colorado.gov/cs/Satellite/CDPHE-Main/CBON/1251627134922>. 2012

Colorado Geological Survey. Post Wildfire Hazards - Mudslides (Debris Flows). [http://www.co.nrcs.usda.gov/news/pas/2012\\_Fires/CGS\\_Post-Wildfire\\_Mudslides.pdf](http://www.co.nrcs.usda.gov/news/pas/2012_Fires/CGS_Post-Wildfire_Mudslides.pdf). 2012.

Montana State University Extension. *After Wildfire - Information for landowners coping with the aftermath of wildfire*. (<http://msuextension.org/publications/OutdoorsEnvironmentandWildlife/4455.pdf>) 2002.

US Forest Service. Aerial Application of Fire Retardant. <http://www.fs.fed.us/fire/retardant/index.html>. 2012

US Geological Survey. Southern California - Wildfires and Debris Flows. <http://pubs.usgs.gov/fs/2005/3106/pdf/FS-3106.pdf>. 2005

# ATTACHMENT 1

## Disinfecting Drinking Water (from US EPA)

When boiling is not practical, certain chemicals will kill most harmful or disease-causing organisms.

For chemical disinfection to be effective the water must be filtered and settled first. Chlorine and iodine are the two chemicals commonly used to treat water. They are somewhat effective in protecting against exposure to *Giardia*, but may not be effective in controlling more resistant organisms like *Cryptosporidium*. Chlorine is generally more effective than iodine in controlling *Giardia*, and both disinfectants work much better in warm water.

**You can use non-scented, household chlorine bleach that contains a chlorine compound to disinfect water.**

Do not use non-chlorine bleach to disinfect water. Typically, household chlorine bleaches will be 5.25% available chlorine. Follow the procedure written on the label. When the necessary procedure is not given, find the percentage of available chlorine on the label and use the information in the following table as a guide (1/8 teaspoon and 8 drops are about the same quantity).

Available Chlorine	Drops per Quart/Gallon of Clear Water	Drops per Liter of Clear Water
1%	10 per Quart - 40 per Gallon	10 per Liter
4-6%	2 per Quart - 8 per Gallon (1/8 teaspoon)	2 per Liter
7-10%	1 per Quart - 4 per Gallon	1 per Liter

(If the strength of the bleach is unknown, add ten drops per quart or liter of filtered and settled water. Double the amount of chlorine for cloudy, murky or colored water or water that is extremely cold.)

Mix the treated water thoroughly and allow it to stand, preferably covered, for 30 minutes. The water should have a slight chlorine odor. If not, repeat the dosage and allow the water to stand for an additional 15 minutes. If the treated water has too strong a chlorine taste, allow the water to stand exposed to the air for a few hours or pour it from one clean container to another several times.

# ATTACHMENT 2

## Shock Chlorination for Wells

*What should I do if my water is contaminated with bacteria?*

*First, don't panic! Bacterial contamination is common. Studies show that more than 40 percent of private water supplies are contaminated with coliform bacteria. These are common bacteria that have been inadvertently introduced into your well, and they can be removed. If your well is reported to have E. coli or fecal coliform bacteria, do not use the water and contact your local health department for guidance.*

Shock chlorination is a one-time treatment designed to kill bacteria in the well and water system. Shock chlorination is the preferred disinfection treatment for private well systems because it is simple, cheap and effective for most situations. The amount of chlorine used in well treatment is determined by the well's diameter and depth of water. A 200 ppm solution of chlorine in the well and plumbing system for a period of at least 2 hours is required, although overnight is preferable. Chlorine bleach is the most often use liquid chlorine (sodium hypochlorite) for domestic well disinfection. Unless you are confident about safely performing shock chlorination yourself, contact a licensed water well contractor to perform the procedure.

**Step 1. Clean exterior and accessible interior surfaces.** Turn off the electricity to the well and remove the well cap. Scrub the accessible interior surfaces of the cap with the chlorine solution (1 quart of chlorine laundry bleach per 5 gallons water), avoiding electrical connections. Replace a non-sanitary well cap with a sanitary well cap (<https://deq.mt.gov/Portals/112/Water/WPB/SWP/PDFs/SaniWellCapsVent.pdf>)

**Step 2. Calculate the amount of chlorine needed.** Determine the volume in the well and holding tank or cistern using Tables 1 and 2. Add 100 gallons for the water stored in the plumbing, pressure tank and water heater. Use Table 3 to determine how much chlorine is needed per 100 gallons of water in your well and plumbing system. For most homeowners, the cheapest and simplest method is to dilute common liquid bleach with water in a clean 5 gallon bucket.

*(Note: Always wear protective clothes, gloves and goggles when handling chlorine, and work in a well ventilated area. If chlorine comes into contact with the skin, and especially the eyes, stop immediately and wash thoroughly with clean water.)*

Well diameter (inches)	Storage per foot of water depth (gallons per foot)
2	0.16

3	0.37
4	0.65
5	1.02
6	1.47
8	2.61
10	4.08
12	5.87

Table 2. Capacity of storage tanks or cisterns.					
Depth (in feet)	Diameter of round cistern or length of side of square cistern (in feet)				
	6	7	8	9	10
<b>Round type</b>	<b>Cistern capacity, gallons</b>				
5	1,055	1,440	1,880	2,380	2,935
6	1,266	1,728	2,256	2,856	3,522
7	1,477	2,016	2,632	3,332	4,109
8	1,688	2,304	3,008	3,808	4,696
9	1,899	2,592	3,384	4,284	5,283
10	2,110	2,592	3,760	4,760	5,870
Per foot of depth	211	288	376	476	587
<b>Square type</b>	<b>Cistern capacity, gallons</b>				
5	1,345	1,835	2,395	3,030	3,740
6	1,614	2,202	2,874	3,636	4,488
7	1,883	2,569	3,353	4,242	5,236
8	2,152	2,936	3,832	4,848	5,984
9	2,421	3,303	4,311	5,454	6,732
10	2,690	3,670	4,790	6,060	7,480
Per foot of depth	269	367	479	606	748

**Example:**

You have a 6-inch diameter well casing that is 150 feet deep and it is 50 feet to the static water level (the water level when not pumping). From Table 1 you estimate that you have approximately 150 gallons of water stored in the well casing (100 feet of water x 1.47 gal per foot of 6" pipe = 147 gallons). Add an additional 100 gallons

for the plumbing system (150 + 100 = 250 gallons of water needing treatment). From Table 3, you determine that 3 pints of household bleach are needed per 100 gallons of system capacity.

$$250 \text{ gallons capacity} \times \frac{3 \text{ pt bleach}}{100 \text{ gallons capacity}} = 7.5 \text{ pt bleach}$$

Table 3. Chlorine mix ratio for a 200 ppm solution.		
Chlorine Product	% Active Chlorine	Amount needed for 200 ppm solution
Liquid laundry bleach	5.25%	3 pt/100 gallon

**Step 3. Add the chlorine solution to the well and circulate.** Pour the diluted chlorine solution into the well (it is still open because you already cleaned the well cap). Turn on the electricity. Next, use a hose that is connected as near to the well as possible and run water back down the well for at least 15 to 20 minutes to recirculate the chlorinated water. Thoroughly rinse the sides of the well casing and the pitless adapter during recirculation. Wash the well interior but **avoid electrical wiring and connections.**

**Step 4. Disinfect the household plumbing.** Before disinfecting the household plumbing system, disconnect or bypass any carbon filters or reverse osmosis equipment. Next, open the cold and hot water faucets, one at a time, and let the water run until a strong chlorine odor is detected from each faucet. Flush toilets until chlorine odor is apparent. Once the chlorine has reached all points in the system, allow it to stand undisturbed overnight. Turn off the hot water heater during this time and be sure the house is well-ventilated.

**Step 5. Flush the system.** The next morning, use an outdoor hydrant or faucet to flush the chlorinated water out of the system onto a safe area where desirable vegetation will not be harmed, such as a gravel driveway far away from any surface water or stream. Chlorine will evaporate to harmless levels within one to two days. Do not allow more than 100 gallons of chlorine-treated water to enter the septic system. After the chlorine is drained from the system, run water through the taps until the strong chlorine odor is gone. A slight residual chlorine taste and odor will likely remain in the water for a couple days. The water should now be safe for human consumption; however, it is advisable to retest the water for bacteria after one week to ensure the problem is resolved. You may need to clean faucet aerators or valves on the water system to remove any debris broken loose during the disinfection process.

# ATTACHMENT 3



## Wild Fire Chemical Clean-Up



Many of the suggestions and precautions are useful for all categories of wildland fire chemicals. Specific suggestions are given for foams and water enhancers (gels) when they differ from those given for long-term retardants.

Long-term retardants are typically applied from fixed-wing aircraft or helicopters.

### People:

- Retardant contains ammonia and will sting if it gets into cuts or scratches or comes into contact with chapped or sunburned skin.
- Wash thoroughly with a gentle soap and water to remove all residues as many of the fire chemicals are drying to the skin.
- After washing use a good quality hand cream to minimize drying and chapping.

### Structures (wood / metal):

- The red color of retardants comes from iron oxide (rust) which can be very difficult to remove.
- Wash retardant off as soon as possible. Some of these products may discolor metal.
- Dampen a stained surface with water. Scrubbing with a damp stiff-bristled brush dipped in borax has been effective.
- Power washers may drive the red colorant into the surface of the wood and should generally be avoided.
- Restrict water use to prevent puddles which may be attractive to pets.
- Avoid leaving standing puddles of water by using absorbent materials such as sand, soil, or other materials.

### Vegetation:

- Rinse retardant off vegetation. Avoid leaving standing puddles of water by using absorbent materials such as sand, soil, or other materials.
- Leaf burn may occur since retardants contain levels of fertilizer higher than what is often sold at garden stores. This causes vegetation and plants to appear dead after contact. However they will generally recover and grow back - usually within one to two months.
- As with any garden produce, wash fruit and vegetables thoroughly before using.

### **Pets & Other Animals:**

- Shampoo thoroughly as many of the products are very drying to skin.
- Use materials that will effectively absorb any puddles after shampooing, or in areas that animals may have access to. Materials such as sand / soil / or other absorbents should be used on any standing water or puddles.
- Avoid ingestion of water - keep animals away from puddles.
- If your pet appears ill from drinking out of puddles or standing water, make sure your veterinarian knows the animal may have ingested a detergent-based product.

**Class A Foam products are frequently applied from ground equipment. They may be applied from helicopters and some fixed-wing airtankers.**

- Class A foams are strong detergents similar to those used for hand-washing dishes. They are generally easy to clean-up.
- If a fire was close enough to bake the foam onto windows, scrape the residue off with a paint scraper.
- Treatment of persistent residues with a tub and tile cleaner designed to remove soap residues may be effective.
- Keep pets away from the area.
- Avoid ingestion of water by pets and other animals - keep animals away from puddles.
- If your pet appears ill from drinking out of puddles or standing water, make sure your veterinarian knows the animal may have ingested a detergent-based product.

**Water Enhancers may be applied from ground equipment and by aerial application.**

- Water enhancers contain very efficient water absorbers similar to those used in disposable diapers.
- These products tend to be very slippery and hold water in place for several hours to several days. After the product has dried, it may become wet and slippery again if exposed to water.
- They may be difficult to wash off of buildings and equipment due to the oils in the formulations.
- For new structures or others with siding and paint in good condition, a power washer with a good, degreasing detergent may be of use.
- For structures with older siding or surface treatments or log structures, dampening the surface and scrubbing with borax and a stiff bristle brush is preferred to minimize damage to the surface.
- If your pet appears ill from drinking out of puddles or standing water, make sure your veterinarian knows the animal may have ingested a product containing super absorbent polymers.

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