THE SURVIVAL ISSUE

BACKPACKER

THE OUTDOORS AT YOUR DOORSTEP

123 LIFE SAVING SKILLS

HOW TO

LIGHT A FIRE IN ANY WEATHER

FIND WATER IN THE DESERT

BUILD A SURVIVAL SHELTER

STAY WARM IN KILLER STORMS

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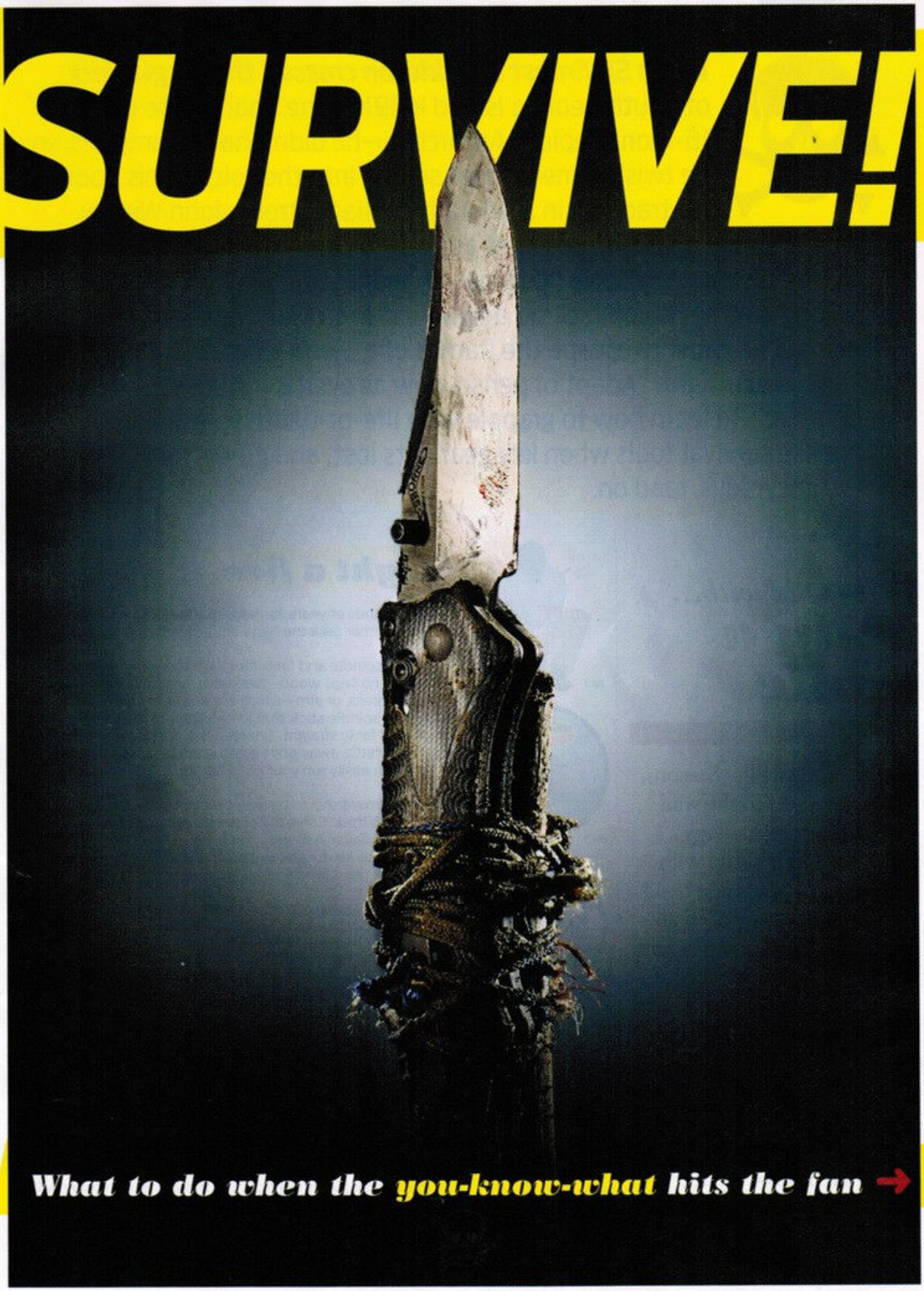
50-Mile Life List

America's 10 best weeklong routes

OCTOBER 2010

SURVIVE!



What to do when the *you-know-what* hits the fan

When Sir Ernest Shackleton crossed the icy glaciers of South Georgia Island in 1916—the final hurdle of his 16-month epic in Antarctica—he didn't have crampons, so he twisted metal boat screws into the soles of his boots for traction. In a similarly brilliant stroke, John Wesley Powell, trapped on a cliff 400 feet above the Colorado River without a rope, had his men scramble up to nearby ledges and pin him to the wall with long oars so he could climb down. And John Muir crawled inside a hollow tree trunk to escape the flames of a Sierra wildfire. It seems H.G. Wells was right: "Adapt or perish, now as ever, is nature's inexorable imperative." To learn how to grapple with life-or-death scenarios, improvise survival tools when key gear gets lost, and grade your own emergency skills, read on.

In the wild with...

Only a Knife

Long before satellite beacons, humans thrived in the wild with the best technology available: a knife. And with that one tool and some basic knowledge, they fulfilled all life-sustaining needs. Flagstaff, Arizona–based survival expert Tony Nester helps today's tech-dependent humans get back to their primal roots with his popular "Knife Only" course. "A knifeless man is a lifeless man," Nester says. Here is how to cut, slice, and pry your way out of any mess with these survival fundamentals.

fig. 1

fig. 2

fig. 3

Survival Secret
Always carry a reliable firestarter. Nester favors a magnesium spark rod and Vaseline-coated cotton balls, which burn even in rain. Rub one teaspoon of Vaseline into a cotton ball; pack a few loosely in a film canister. Also good: butane lighters.

Light a fire

For thousands of years, humans made fire by rubbing two sticks together (aka the hand drill). Here's how to make one:

1. For the spindle and fireboard, find some dry, soft, and non-resinous (no sap) wood—like yucca, cottonwood, poplar, cedar, cypress, or elm—which are easier to create friction with. The spindle stick should be about 16 inches long, ¾-inch thick, and fairly straight. Sharpen the bottom end like a pencil tip, and whittle away any jagged or rough spots on the shaft so you can easily run your hands along it.

2. The fireboard should be about six inches by one inch wide, and ¾-inch thick. Carve this rectangular piece so it lies flat on the ground. Cut a V-shaped notch, half as deep as the board, into the edge. Next, carve out a pencil-eraser-size depression at the base of the V, where you will place the spindle tip.

3. Position a leaf, piece of thin bark, or your knife blade (anything as thick as an index card) under the board to catch the coal that will fall out of the board's notch.

4. For the tinder bundle, gather dry and pithy materials (cattails, mullein, grass, bark, moss), and shape them into a bird's nest. Place it within arm's reach.

5. Get in a stable kneeling or sitting position, with one foot on the edge of the fireboard to steady it. Put the tip of the spindle in the board's depression, and place your hands at the top. Using significant downward pressure, roll your hands back and forth, up and down the spindle. Go slowly at first to deepen the board's notch. Then go faster (a lot faster), bearing down on the spindle with your body weight as you roll it in your hands. Hot dust will be generated first, then smoke, and as the spindle glows red from the friction, a tiny ember will appear in the notch. If the ember doesn't automatically fall into your catching device, gingerly tap the board.

6. Transfer the ember to the center of the tinder, blow gently until you have flames, then erect small sticks around it, tepee-style.

PHOTO BY COURTESY. TEXT BY ANNETTE MCGIVNEY. KNIFE: BENCHMADE (PREVIOUS PAGE)

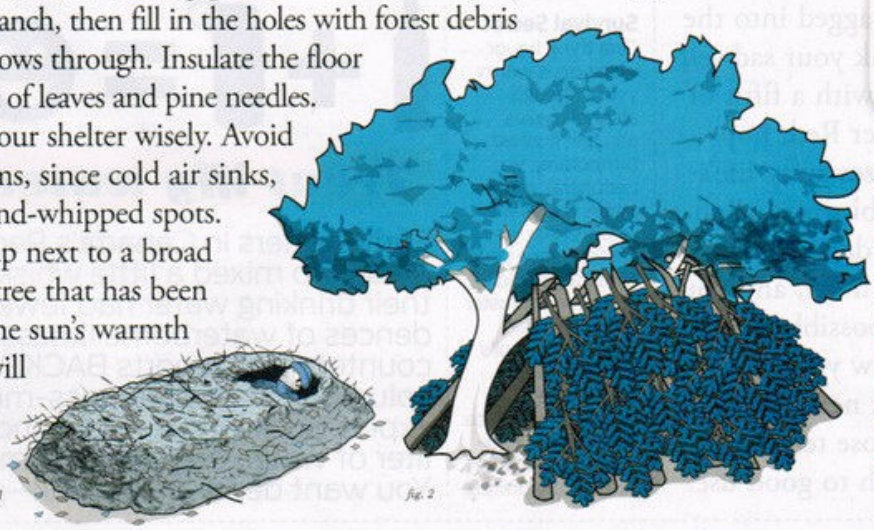
Photography by **Dan Saelinger** /// *Illustrations by* **Peter Sucheski**

Build a shelter

The most energy-efficient option is to create a nest. Pile up leaves, pine needles, and moss to create a giant sleeping bag that will trap your body heat. Make the mound about the length and width of a single mattress and five feet high, if possible. "You should have two feet of insulation below you and two feet above," Nester says. "I've stayed warm like this on 10°F nights." To tuck yourself in, scoop out a trough in the middle, sit inside butt first, then pull the debris over your body, working up from your feet.

On rainy nights fashion a lean-to against a short tree like a juniper. Use a sturdy, low branch as the shelter's ridgepole. Knife-chop boughs (or scavenge) and lean them against the branch, then fill in the holes with forest debris so no light shows through. Insulate the floor with one foot of leaves and pine needles.

Also, site your shelter wisely. Avoid ravine bottoms, since cold air sinks, and high, wind-whipped spots. Instead, set up next to a broad rock face or tree that has been soaking up the sun's warmth all day and will release it at night.



Cave Man
For instructions on building an emergency winter shelter, see **backpacker.com/snowshelter.**

Survival Secret
For hours of extra warmth, place football-size rocks at the campfire's edge until they're warm to the touch. Hug one against your chest (under a jacket but over a shirt), and put one between your legs and another near your neck or head.

Find food

In most emergencies, food isn't a priority. Depending on your extra reserves (love handles were never so welcome), it takes a month or more to starve to death. Conserve energy and water by staying put rather than foraging. "The fasting body taps into its fuel stores," Nester says. "In survival situations, people can last 25 percent longer this way compared to those who burn calories looking for a measly morsel."

But you *can* graze on nearby food like: acorns and other tree nuts; ants and ant larvae; grasshoppers and crickets (roast these first to avoid stomach upset); and fish.

To make a fishing spear, carve a 10-inch tip onto a sturdy stick about eight feet long and 1.5 inches thick; saplings work well. Harden the tip in hot coals for a few minutes. Then pin a fish to the creek bed and grab it with your hands.

Find H_2O

Stay cool Hole up in the shade and wait until dusk to hunt for water. If you have a bottle of liquid left, drink it at your normal pace, or until your urine is mostly clear. "Rationing water, especially in the desert or the tropics, hastens heat exhaustion," says Nester.

Search smartly Top spots to look: shady areas at the base of north-facing cliffs; islands of green vegetation; rock depressions; tree trunk cavities; undercut banks or shady, outer bends in dry riverbeds; and anywhere you see birds and insects gathering. No sources nearby? Head down gullies, or dig wells with your knife: Find a spot that's likely near the water table such as a riverbed. Dig a few holes, about two feet deep, and wait five minutes. If water seeps up, line the hole with pebbles so it's less porous. Sop up mud with a shirt and wring the moisture into your mouth.

No purification method? Guzzle anyway. Most water bugs take weeks to incubate, but you can die in days from dehydration.

That's Not a Knife

« This is a knife! A **Swedish Mora** with a 3⅞-inch fixed blade is Tony Nester's preferred tool for bushcraft ($20, apathways.com). The reason: A fixed blade with a full tang (meaning the blade runs through the length of the handle) is stronger, so the handle never breaks. He favors carbon steel because you can sharpen it against a smooth river stone using an arcing motion against the rock. It also sparks when you strike the back of the blade with a piece of quartzite, flint, or chert.

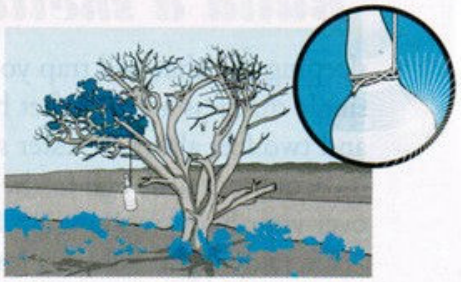
Lost with...

Only a Bottle of Whiskey

So you've zigzagged into the woods to drink your sad self into oblivion with a fifth of Johnnie Walker Red, hoping night freezes away life's pain. Then a bluebird alights on your shoulder, chirps a sweet song of hope, and you realize life is possibly worth living. But now you're lost! Crikey—what next? Well, friend, dry those tears and put that hooch to good use.

Signal for help

Survival guru Tony Nester suggests tying a bandana or shoelace around the bottle's neck, then hanging the bottle somewhere elevated, like a tree branch. The key is to get it off the ground, so you expose more surface area and maximize glint. This passive signaling method also frees you up to perform key tasks like shelter-building. Any shiny object will work: bottles, mirrors, space blankets, hubcaps, bike parts, even a machete.

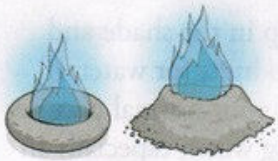


Survival Secret
One thing liquor won't do is warm you: Although alcohol makes you feel flushed temporarily, via peripheral vasodilation, the dilated vessels near your skin's surface shed heat into a cold environment faster than narrower vessels. Alcohol's diuretic effect further abets hypothermia, since temperature control is harder when you're dehydrated.

Treat iffy water

Early settlers in Canada's Red River area who mixed a little whiskey into their drinking water had fewer incidences of waterborne illness than their counterparts, reports BACKPACKER columnist and wilderness-medicine expert Buck Tilton. Add a shot to your liter of water, then wait 20 minutes. You want dead—not drunk—giardia.

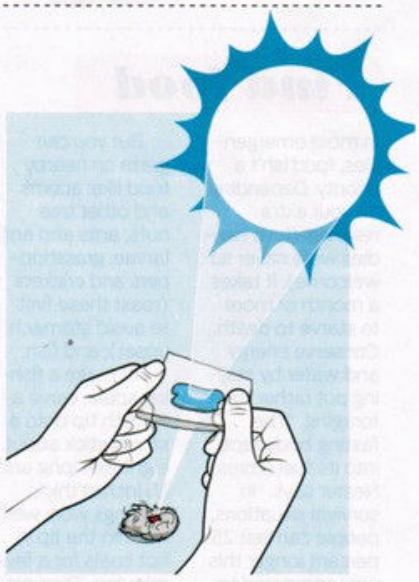
Start a fire



To make wood more flammable, **whiskey-soak** it to the core, then wait a few minutes so the vapors disperse, reducing the risk of a fireball. In damp conditions, resinous woods (pine, spruce, fir, mesquite)—which have a lower ignition point—work best; avoid oaks and maples.

Nester also suggests filling a small can (like a tuna or Altoids can) with whiskey and lighting it. Or you can build a **sand fire** by scooping a cupful of dirt into a mound; it must be a dry substrate like sand, or clay formed into a small clay pinch pot. Then pour in a quart of whiskey. It should burn 10 to 30 minutes; as the flame dies, use a stirring stick to bring fuel back to the surface and add a few minutes of life. Although your sand fire won't be hot enough to boil water, it can provide warmth, heat food, or help light a signal fire. For the latter, feed in twigs, then transfer the burning twigs to a fire pit. (Beware of wildfire hazard in dry backcountry areas.)

If you don't have a lighter, pour out the whiskey, fill the bottle with water, and start a fire **magnifying-glass style.** With the sun at its zenith (11 a.m. to 2 p.m.), focus the sun's beams onto some rotten, punky wood, dry cow pies, or elk droppings until you get a glowing ember. Nestle this in grass or dry bark, then blow it into a flame. If the bottle has broken, try a shard: Add one or two beads of liquid, then lie flat with your forearms supported, focusing the beam as per above, with the water-droplet side facing the sun. You must let the pinpoint of light concentrate for 20 to 30 seconds on the tinder before it will ignite, so keep still and be patient.



Care for cuts

Now imagine you're injured—does the old cowboy "whiskey in the wound" method work? Modern liquor, including bourbon, clocks in at 40 percent alcohol, only half the punch of the Wild West moonshines, but it still kills topical germs, Tilton says. It might also kill healthy cells, however, and it burns like hell, making clean water a better option. Whiskey does work to sterilize instruments and to blunt pain—drinking two ounces of 90-proof George Dickel reduces pain roughly 50 percent for two hours.

Injured with...

No First-Aid Kit

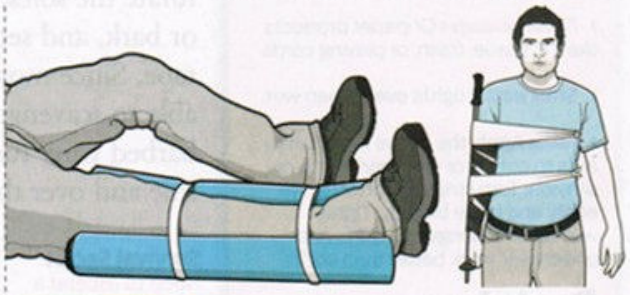
You're hiking. You slip. You're hurt. But the first-aid kit is back in the car—12 miles away. What should you do? First, don't panic. "You can improvise almost everything in your first-aid kit," says Tod Schimelpfenig, curriculum director of the Wilderness Medicine Institute of the National Outdoor Leadership School.

Wound cleaners

Research shows that plain ol' water cleans cuts very effectively. Irrigate the injury with at least one liter of the cleanest water available; ideally, use purified water (iodine is fine) and squirt it through a bladder or zip-top bag. If you have soap, apply it to the surrounding skin but not inside the wound itself, rinsing with water when you're done. Otherwise, just bandage it until you're back in antiseptic's reach.

Bandage

Find the cleanest fabric handy, tear off a piece, then fold or crumple it, and place it on the cut. Apply pressure. If you need to add more bandages, apply them without removing the first. Once bleeding has stopped, clean the wound and rebandage. Hold fabric in place with straps or strips of cloth. For gaping (nonvenomous) wounds, use ¼-inch strips of duct tape to close the cut as close as possible to the original skin position.



Splints

The key is creativity. Some good choices: long bundles of grass (align them lengthwise along the limb); your sleeping pad; a stove screen; trekking poles; sticks; or pack stays. Secure the splint with strips of cloth, straps, or vines. Make sure the splint is firm but padded, and immobilizes the joints above and below the fracture (so if you break your shinbone, immobilize the knee and ankle). The splint shouldn't constrict blood flow, and it should allow access to fingers and toes, so you can check circulation.

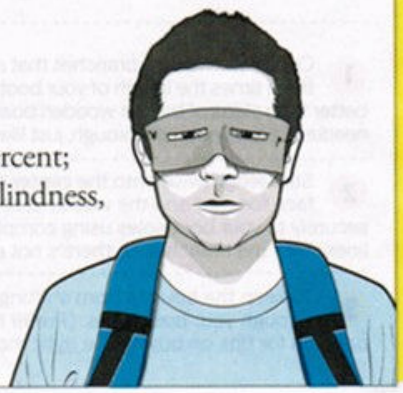
Nature's antibiotic

People have applied old-man's beard (usnea) as an antiseptic for centuries. These greenish, hair-like tufts grow on tree branches worldwide. Pull back the main stem's sheath; usnea has a white cord in the center. Place a clump on the cut.

Above treeline with...

No Sunglasses

For every 1,000 vertical feet gained, UV exposure increases by five percent; and snowfields reflect 90 percent of the sun's glare. To prevent snowblindness, always wear sunglasses. But if a fashionable marmot swipes your Ray-Bans, cut UV exposure by folding a one-foot piece of duct tape in half to cover the sticky side. Cut eye slits one-inch wide and ¼-inch tall; punch holes in the ends; and tie them with a cord.



Need fire but have... No Tinder

When the ground is drenched, look in your pack for dry, flammable fuel.

Burn this...

› **Alcohol-based hand sanitizer** A grape-size dab will burn almost invisibly for 90 seconds.

› **White gas** Though it evaporates in the open air, it does so slowly.

› **Cooking oil** Unrefined oils work best.

› **DEET bug sprays** Burning OFF! might create some unhealthy fumes, but it's worth it if you need a fire.

› **Gauze bandages** Or paper products like TP, tissue, trash, or playing cards

› **Steel wool** It lights even when wet.

› **Fabric** Apply the above fire accelerants to cotton or wool garments, or silnylon. Torn strips of cotton ignite easily and blaze brightly. Tighter weaves burn longer, so shirts and underwear work better than socks.

Don't burn...

› **Butane from an opened lighter** When exposed to air, it evaporates quickly.

› **Polyester** Synthetics light slowly and melt into a fire-killing plastic

Crossing an icefield with... No Crampons

You're floundering on a frozen snowfield while your crampons sit forlorn and forgotten on the credenza at home. If you encounter steep snow or icy trails without crampons, it's best to turn back or find another way. But if quitting isn't an option, you can increase traction on snow and ice by embedding nails or screws in your boot treads. If you're loathe to perforate the soles, drive the screws through a thin plank of wood or bark, and secure one plank to each foot with straps or duct tape. Since most hikers don't pack extra screws, you might be able to scavenge them from a miner's cabin or fence. Strands of barbed wire, rusty mattress springs (stretched flush against the sole and over the sides), and shredded aluminum-can bottoms also work. A less effective but more widely available approach is to wrap a densely knotted rope around the bottom of your shoes, like tire chains. Polar explorer Ranulph Fiennes depended on this approach while descending the Beardmore Glacier during his successful 1992-93 Antarctic crossing.

Survival Secret
Need to ascend a steep snowfield but don't have an ice axe? Carry a tent stake to help you self-arrest in case of an unexpected and possibly perilous slide.

Stuck in powder with... No Snowshoes

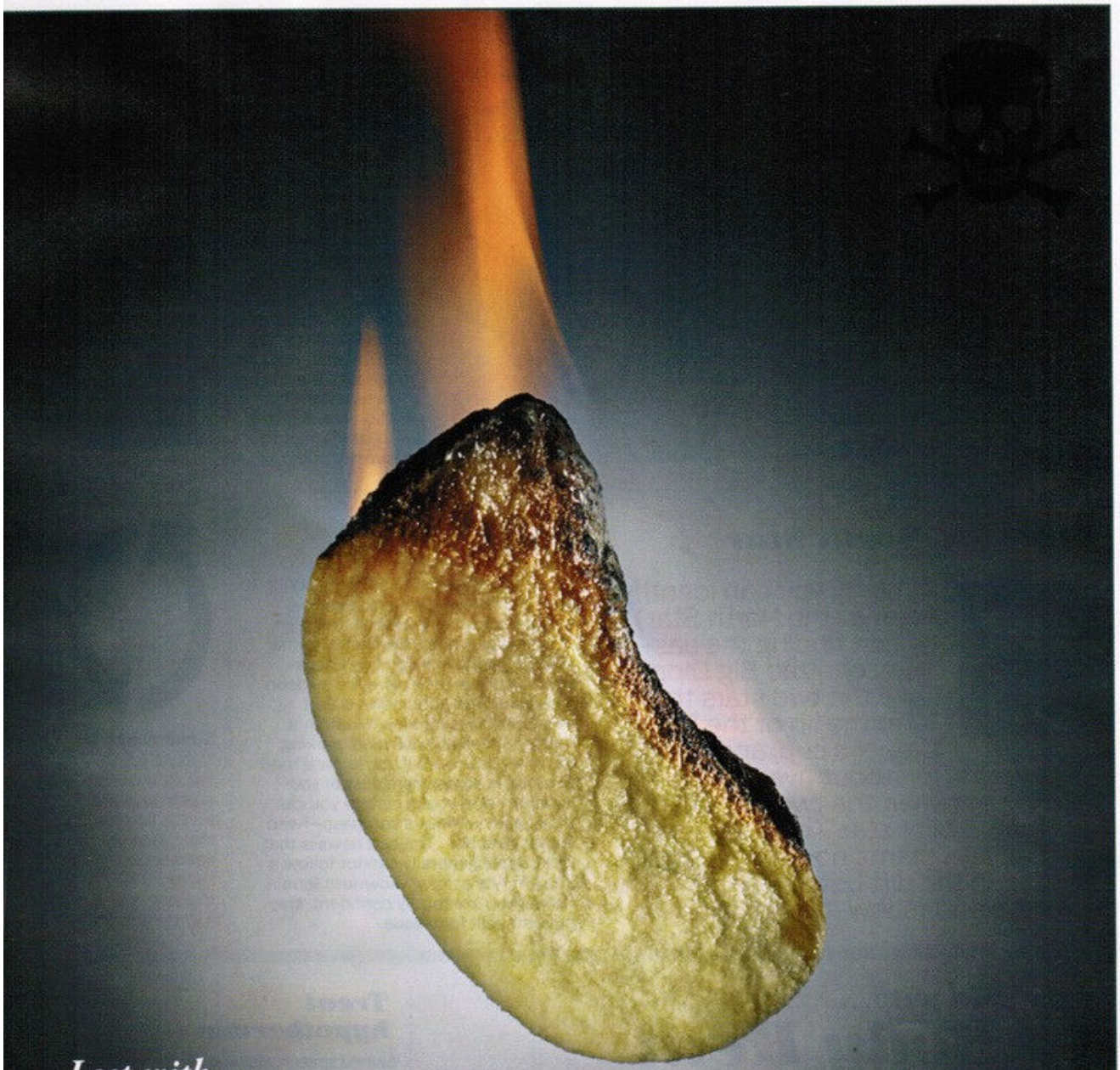
Few forms of hiking are more frustrating, exhausting, and potentially dead-ending than postholing (aka, flailing through thigh-deep snow). If a storm struck overnight or you forgot to pack snowshoes—but still have miles to go—save energy and stay drier by constructing your own Ojibwas.

1 Cut down two pine branches that are still green, full of needles, and about three times the length of your boots. Densely needled boughs perform better than strips of bark or wooden boards because the gaps between the needles let the snow sift through, just like the lattices found in regular snowshoes.

2 Step lengthwise onto the center of each branch; orient them so the tips face forward and the woody stems extend behind you. Strap the boughs securely to your boot soles using compression straps, cordage, or tent guylines. Trim the branches so there's not excess overlap, which can trip you up.

3 To keep the boughs from shifting as you walk, weave the straps through your boot laces. (Prefer high-performance snowshoes? See page 53 for tips on buying the right model.)

PHOTO BY COURTESY; TEXT BY JASON STEVENSON; JONATHAN DORN (JUNK FOOD)



Lost with...

Only Some Junk Food

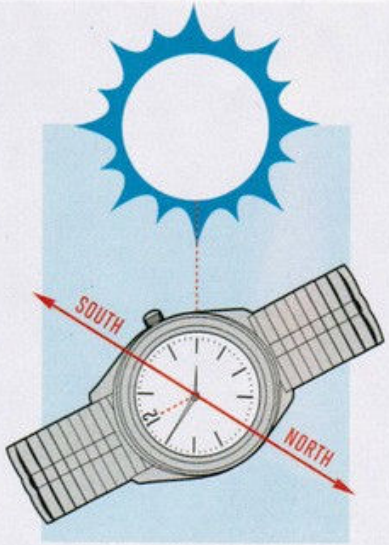
Word up to Eric Schlosser and all you other health-food ninnies out there: A bag of greasy chips could save your triglyceride-loathing, carb-counting, GMO-bashing arses.

Here in the world of professional backpacking, those of us who have been around the backcountry block and have seen some things—and, yes, escaped a few brushes with physical and other kinds of nearly certain death—we possess a secret survival method that's as effective as it is unorthodox. Variously known as the Pringles Primer, the Fritos Firestarter, or the (more on this later) Fritos Firebomb, this mystery is one we reveal here only because, frankly, photographer Dan Saelinger shot a really cool picture of it. Inadvertently invented at an '80s bonfire in southern Ohio, the technique is dirtbag simple: Flick a Bic under a greasy sliver of potato, and that all-American farm product will burn for 45 to 60 seconds (per 1.87g serving—the weight of an average chip these miserly days). The flame won't cook the rabbit you just snared, but several blazing crisps will lick your recalcitrant kindling enough to get a real fire going. We never carry chips on trips (though we love Tim's Cascade Jalapeño afterward), but extensive testing reveals that Fritos Scoops! is the *sine qua non* of incendiary snacks. As for the Firebomb, put on your pyro thinking cap and imagine a white gas marinade.

Off-course with...

No Map or Compass

Uh-oh, you forgot to download free maps at Backpacker.com, and now you're lost in the woods without any navigational tools. Smart! Now follow these rules to get found.



Orient yourself

Start by locating the sun. It rises in the east and sets in the west (yes, lost persons have messed this up). It also sits low on the southern horizon during winter and, by midsummer, is almost overhead. If the time is close to noon, use this watch method to fix a direction more accurately: Take an analog watch (or draw one on the ground, taking the time from your digital watch). Position the watch so the hour hand points at the sun. The line that bisects the angle between the hour hand and 12 o'clock (1 o'clock during DST) is aligned north to south; find north by recalling that the sun tracks through the southern horizon.

Find the North Star

At night, you can identify Polaris (the North Star) by first finding the easily recognized Big Dipper. Take the two stars that form the lip of the Big Dipper's cup, and trace a line upward (for about five times the distance between the two stars) until you reach a faint star. This is Polaris, and it always points north. Mark this direction in the dirt before sheltering for the night, and follow it in the morning.

Backtrack

Stop moving and start thinking about your last known location, usually a singular spot like a summit, trail sign, river crossing, or a lake. Return to that place if possible. If you can't backtrack, you'll need to navigate by dead reckoning. The good news is that most hikers lose their way within a mile of a marked trail, road, parking lot, or structure. So if you know a road or a trail is somewhere east of your location—and you're certain you can travel east without a compass—head in that direction. The bad news is that lost people generally cannot follow a straight line across wilderness terrain. Unless you are totally confident, stay put and wait for rescue.

Survival Secret
If you're lost, regularly double-check your direction as you hike to make sure you're not wandering in circles or letting the terrain determine your path.

In the cold with...

No Body Heat

Fording the river didn't seem risky until the moment your butt hit the water. Now you're soaked up to your pits as the evening mercury drops below 45°F. Your goal: Prevent hypothermia.

Get dry

Find a spot sheltered from the wind and, if possible, in the sun. Remove wet clothing, including socks and underwear, and don the warmest, driest layers you have; cover your head and neck, too. No dry clothes? Start a fire. Also, insulate yourself from the ground with a pad or pack.

Warm things up

Still shivering or feeling clumsy? You need to raise your temp fast. Pitch your tent and unroll your sleeping bag inside, so it's ready. Do jumping jacks, and cook up a warm drink that has no caffeine or alcohol (both are diuretics, and dehydration hampers temperature regulation).

Treat hypothermia

Slurred speech, resisting help, and confusion signal hypothermia's downward spiral. If those symptoms develop, zip the victim into a dry sleeping bag, treat for shock by raising his feet, and place a water bottle or bladder filled with lukewarm—not hot—water against his chest, back, groin, and head. Before you strip naked to spoon with your buddy, know that a 1994 Canadian study in the *Journal of Applied Physiology* showed that body-to-body contact doesn't warm up hypothermia victims any faster than applying heated water bottles at these key areas. Plus, it chills another person.

Survival Secret
Sugary drinks and foods boost a hypothermic person's ability to generate body heat. For other key tips, check out BACKPACKER'S *Outdoor Survival: Skills to Survive and Stay Alive* ($13, falcon.com).

PHOTO BY GENNY FULLERTON; TEXT BY JASON STEVENSON, ANNETTE MCGIVNEY (CACTUS SECRET)

Famished but with...

No Cooking Pots

Doing more (fresh-baked pizza and rumaki hors d'oeuvres) with less (a canister stove and a frying pan) is the essence of backcountry cooking. But when you're stuck without pots, pans, or utensils for more than a week, knowing how to cook and boil water with these four stand-in containers can be a vital, calorie-providing skill.

Steam-cook in zip-top bags

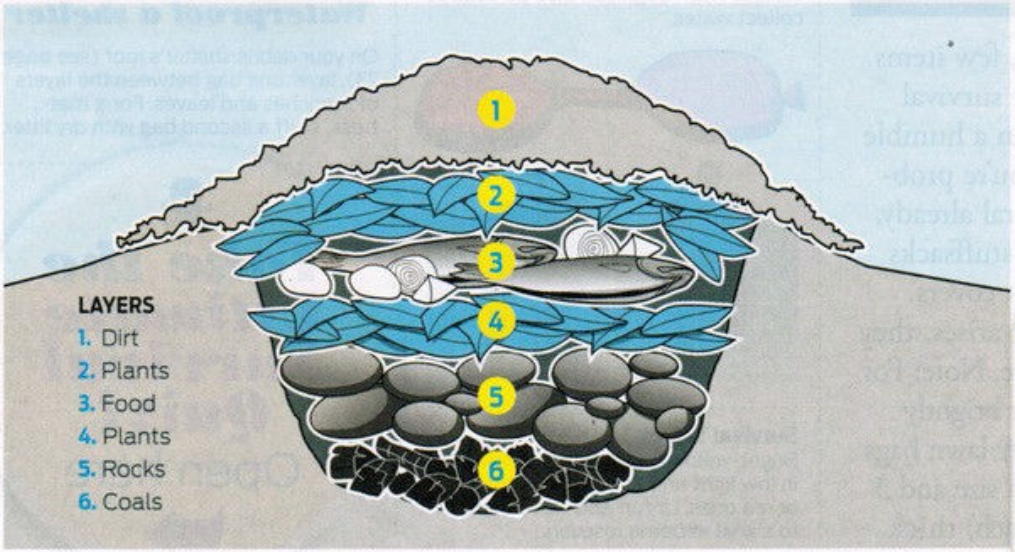
Unlike foil pouches, zip-top plastic bags won't survive high heat. But you can steam-cook with them. First, place a flat rock atop a stove or fire. (Note: Avoid using river rocks; the latent water inside their crevices might cause the rocks to expand and fracture when heated.) Suspend a zipped bag containing your water and uncooked food (pasta, rice, vegetables, tea, etc.) directly over the hot rock. Drip water onto the rock to generate steam, which will cook the food without destroying the bag. Cooking times vary widely, but ballpark is 10 minutes.

Heat pouches

To cook freeze-dried meals without a pot, remove the dry food from the foil pouch, fill it with water, and heat it over a stove or fire. When the water boils, add the food, and mix as instructed. Save the bag to heat additional water later.

Bake dinner in a pit oven

If you're feeling prehistoric, light a wood fire in a hole about one foot deep and three feet wide. When the fire peaks, add large rocks; as the flames die into coals, cover the rocks with wet, green plant material—the wetter, the better. Add a layer of uncooked food (red meat, fish, veggies), then a second layer of flora. Cover the pit with two to four inches of dirt and wait several hours until the food is cooked.



Survival Secrets

Use tent stakes—not poles—to create a grill over a fire, since they resist heat better.

A prickly pear pad effectively filters water. Slice the pad in half and place both halves, insides facing down, in the water container or well (let sediment settle in the container first). The pad's thick gum will soak up most of the dirt and nasty bacteria after about 30 minutes.

Boil-in-the-bottle

It is possible to boil water in plastic jugs—even flimsy #1 PET soda bottles. Since too much heat will melt plastic, shield the bottle from direct flames by suspending it from a cord or shoelace four to six inches above the fire. Spin the bottle to distribute the heat. Hard plastic bottles and water bladders are more heat-resistant, but still never put them directly in flames.

The Survival Encyclopedia

Find 7 ways to light a fire (including with your cell phone!), 10 essential knots, and much more at our Survival 101 Center at **backpacker.com/survival101.**

In the backcountry with...

A Missing Partner

Josh and Jacob Gately, two brothers from Missouri, began their descent of Colorado's Mount of the Holy Cross together back in October 2007. As mist swirled around them at 13,000 feet, Jacob hiked ahead of his brother and became separated by the rugged terrain. When Josh arrived at basecamp a few hours later, his brother wasn't there. Scenarios like this play out all the time in the wilderness. If faced with it, here's what to do.

1. Do a hasty search

First, look at your watch. Knowing how long your buddy has been gone will help you and SAR teams calculate how far he might have traveled. Then organize anyone else in camp for a quick hunt in the immediate vicinity. Spend only an hour sweeping the area, because only 40 percent of hasty searches are successful.

2. Backtrack

If you don't make contact quickly, leave a note in case he returns, then head toward the last known point where you saw the missing person. If that fails, apply these stats to the terrain around you to determine where to search next: Two-thirds of lost hikers show up within two miles of their final known location; more than half move downhill; and 75 percent follow trails, streams, drainages, and other easy paths (at an average speed of two mph). One-third continue to move after dark, but most stop moving after 24 hours.

3. Call in help

If the lost hiker doesn't turn up within a few hours, or you're concerned about cold weather or his ability to survive the night, contact rangers or call 911 to initiate a professional search. That's what Josh did, and two days later, a SAR team discovered Jacob hypothermic and frostbitten—but alive.

Stick together

"Start as a group, hike as a group, and end as a group," says Lt. Todd Bogardus, SAR coordinator with New Hampshire Fish and Game. Since groups naturally spread out, make it a rule to assemble at every junction, turn, and sign. Also, assign a sweeper to bring up the rear, and make sure everyone carries a map and a whistle, and knows the rally point (like a campsite or a trailhead).

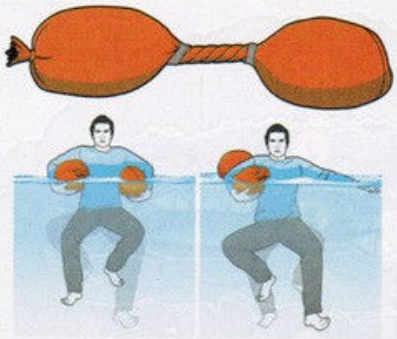
Lost with...

Only a Trash Bag

Ounce for ounce, few items can improve your survival chances more than a humble trash bag. And you're probably packing several already, as liners for your stuffsacks and as cheap pack covers. But when trouble arises, they can do much more. Note: For these tasks, opt for brightly colored, heavy-duty lawn bags 30 to 55 gallons in size and 3 mils (1/1000 of an inch) thick.

Cross a river

Create two buoyancy chambers—and a place in-between to grab on to—by filling the bottom of the trash bag with air and cinching down the middle section with tape or cord. Then inflate the top of the bag with air and tie it closed. Trash bags can also be used to collect water.



Survival Secret
Bright-yellow bags are more visible in low light and at night than black or red ones. Unfurl and wave them to signal airborne rescuers.

Improvise a rainshell

Cut slits for your head and arms, and slip the bag over your torso. Shivering from the wind? Tuck the end into your pants and stuff the interior with dry leaves.

Waterproof a shelter

On your debris shelter's roof (see page 73), layer one bag between the layers of branches and leaves. For a mattress, stuff a second bag with dry litter.

Take the Ultimate Survival Quiz!
Open here

TEXT BY JASON STEVENSON

In dire straits with enough battery life for...

Only One Call

"Hello, this is 911. Please state your emergency." If you're calling for backcountry help on your cell phone, what you say—or sob incoherently—next could determine when you get rescued.

Give the 411

Assume your first call will be your only call, because storms, fading signals, and dying batteries can disrupt connections. "You initially need to give your name, problem, general location, physical condition, and cell number to the 911 dispatcher," says Lt. Todd Bogardus, SAR coordinator with New Hampshire Fish and Game. Before calling, write these details down, check your map, complete an injury inventory, and take a deep breath—a calm, prepared caller tends to communicate better and get key details correct. SAR teams also need to know your last known location. This can be a trailhead, a lake, a road or river crossing, a summit, or a trail sign. Focus on known places because lost hikers often misjudge their current position by many miles. Providing additional details like a GPS waypoint, terrain conditions, sun position, types of nearby trees, river crossings, and distinctive landmarks can narrow a search zone, Bogardus says.

Survival Secret
Extend your cell phone's battery life by warming it in an inner pocket before turning it on to make a call. Storing the batteries at cold temperatures is fine, however, and won't drain the power.

Enable your phone

Before leaving for a hike, activate your phone's SAR-friendly "Location" options, under the settings menu. Most newer (post-2005) phones contain a GPS chip that tells emergency responders your approximate position—either through cell-tower triangulation, satellite fixes, or both. Enabling the "Location" function for all calls, not just to 911, makes it easier for cell phone companies to find you. Also, make sure call-forwarding and automatic voicemail are disabled. Most importantly, keep your phone turned off and stuffed inside your pack until you need it (to preserve the batteries).

Must cross a raging river with...

No Personal Flotation Device

Drowning is the #2 cause of outdoor deaths (falls are #1), so avoid wading waist-deep or too-fast rivers (a tossed, fist-size rock shouldn't move downstream before sinking), but if no choice exists:

Remove your backpack If you topple with it strapped to your back, the pack will force your torso and head underwater, so unbuckle the waist and sternum straps. If the water is up to your waist or above, wrap your pack in a waterproof bag, and either push or tow it across the river. Yes, it will float.

Hang on to your sleeping pad This is probably your most buoyant gear. Partially inflate the pad, then roll it up, and make arm loops from the compression straps so it can be your emergency PFD as you wade or swim; this also leaves your hands free for poles. Foam pads also work.

Make water wings Link two or more empty plastic water bottles or bladders together with straps to create a chain of buoys.

Use your trousers Remove your pants, tie off the cuffs, grasp the open waistband, and plunge it top first into the water to fill the legs with air. The Red Cross teaches this when no better options exist. Note: Even Bear Grylls had trouble crossing a lake with only his pants keeping him afloat (he had to re-inflate them midway).

Choose your route Wider or braided channels signal slower, shallower water. Face the current at a 45-degree angle and carry poles or sticks. If walking across, wear shoes sans socks for traction. If swimming, go barefoot; sodden boots will drag you down.

Wait! Did you take the *Ultimate Survival Quiz?*

PHOTOS BY (CLOCKWISE FROM TOP) TAYLOR LOCKWOOD (2); JOHN BURCHAM; JAKUB JIRSAK/ISTOCK; KONRAD WOTHE/MINDEN; RANDY MAYOR/GETTY; ISTOCK (2); AM WU/ISTOCK; ISTOCK. TEXT BY JASON STEVENSON
QUIZ TEXT BY KRISTIN BJORNSEN, CASEY LYONS, ANNETTE MCGIVNEY, MATT SAMET, JASON STEVENSON

Stuck at a remote trailhead with...

A Dead Car Battery

The click, click, *crap* of a dead battery is about as welcome as the rattle of a diamondback in the latrine. Here's what to do.

Check the juice Clean crusty deposits from inside the battery posts and terminals. That ensures the engine's starter is receiving a full charge, says AAA-certified master technician Michael Calkins. Nothing? Ask another hiker for a jump. If no one is around, call AAA. No cell reception? Don't worry. As long as the dashboard warning lights flash when you turn the key—indicating the battery has some juice—you have options.

Warm the battery If you think subzero temps (and not the overhead dome light) drained the battery, you can try warming it up (at 5°F, a lead-acid battery produces only half of its normal cranking power). Calkins recommends removing the battery from the engine block and placing it in a pot of hot (not boiling) water, submerged to within two inches of the battery top. Don't fully immerse it, or place a heat source directly under the pot. Hot water bottles and bladders are less effective, but will still warm up the internal plates. After an hour, try starting the car. Never place a stove or flames near a battery being charged or jumped; it could ignite hydrogen gases.

Try pushing If you drive a manual (stick shift) car, you can push-start it if the battery retains enough reserve power to activate the car's computer, Calkins says. Shut off the radio, heat, and anything electrical, turn the key to the 'on' position, and press down the clutch as you shift into first gear. Release the brake pedal, and tell your friends to start pushing. As the car speeds up to 5 or 10 mph (downhill helps), release the clutch, let the engine turn, and give it gas. Note: This doesn't work with an automatic because the transmission won't allow the engine to be cranked by the wheels' motion.

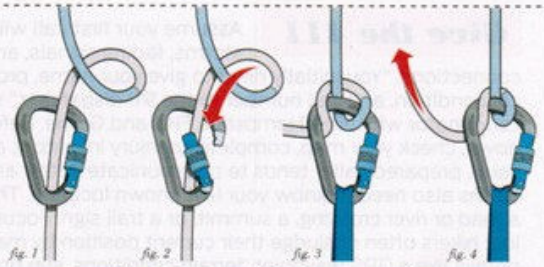
Be proactive Get your car inspected pretrip, and buy a portable jump-starter like Black & Decker's Start It ($90, amazon.com).

Cliffed out with...

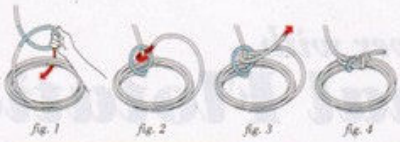
No Climbing Gear

Now you've done it, fumblefingers: bobbled your belay/rappel device or dropped your harness, with one 5.8 pitch left before the summit and three pitches below you back to the ridge. What to do? Other than screaming *Mommy*, you have options.

Belay without a device



Use a locking carabiner and a **Munter hitch,** popularized in the 1960s by the Swiss guide Werner Munter. This easy, bomber knot has 2.5 kN of holding power when locked off—versus the roughly 2 kN of most belay devices. Ideally, you'll have a pear-shaped HMS biner, which easily fits two bends of the rope. First, draw the rope through the biner, and form a bight with a half-twist. Flip the bight another 180 degrees and clip it into the biner (fig. 2). **To lock it off,** bring the brake-hand strand parallel with the side entering the biner (fig. 4). To rappel (with double lines), form the Munter with both rope strands together. Caveat: Keep the knot clear of the biner gate to lower the risk of opening. Oh, and Munters kink ropes to an unholy degree, so use them sparingly.



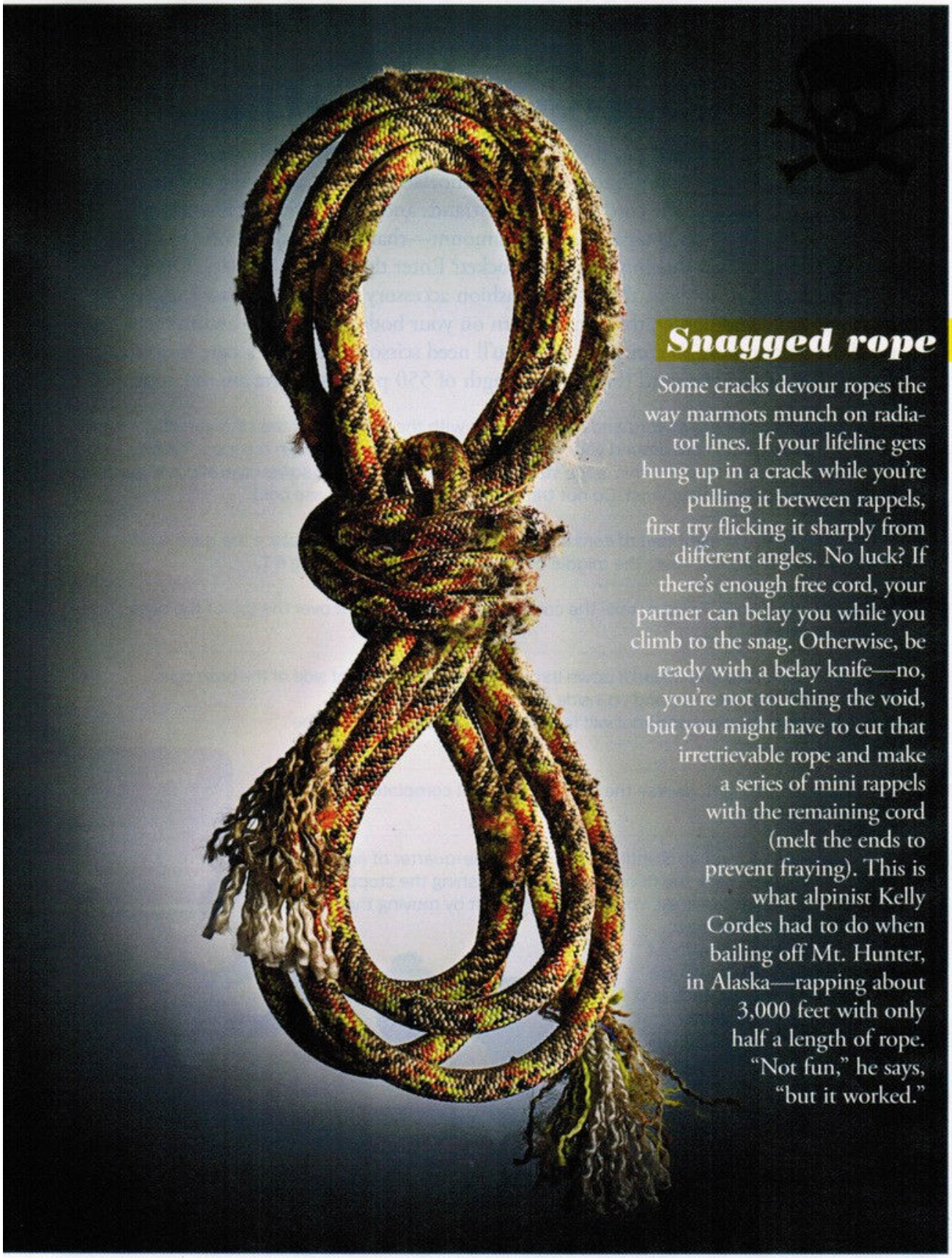
Climb without a harness

Let's say you took it off to pee...in a windstorm. Whoops! Or, more likely, you just didn't bring it, not realizing your "fourth class" objective was actually 5.6. You still have options. Back in the day before harnesses, climbers tied the rope around their waists with a **bowline on a coil**. This method can snap ribs in a big fall, but it works in a pinch. Bring the rope snugly around your waist at least three times, leaving two to three feet of tail. Form a bight with a half-twist. Bring this under and back through your waist coils, then tie a bowline with the tail. Add an overhand backup with the remaining tail (fig. 4). Voilà, you're ready to climb. Comfort tip: Jerry-rig leg loops by girth-hitching slings around your gams; clip them to all of the waist coils.

Rappel without a harness

Say—blackest of horrors—you must rappel sans harness. It's time for the Dülfersitz. Here's how: Straddle the rappel ropes, bringing them back around one leg and across your hip, then up over the opposite shoulder. Now bring the rope down and across your back, where the brake hand holds it beside the wrapped hip. Step backward over the edge, and use your brake hand and the rope's cross-body friction to meter your descent—go slowly! While the rope's friction is punishing (pad your clothing accordingly), rope rash beats an appearance in next year's volume of *Accidents in North American Mountaineering.*

TEXT BY JASON STEVENSON (CAR BATTERY); MATT SAMET (CLIMBING GEAR)



Snagged rope

Some cracks devour ropes the way marmots munch on radiator lines. If your lifeline gets hung up in a crack while you're pulling it between rappels, first try flicking it sharply from different angles. No luck? If there's enough free cord, your partner can belay you while you climb to the snag. Otherwise, be ready with a belay knife—no, you're not touching the void, but you might have to cut that irretrievable rope and make a series of mini rappels with the remaining cord (melt the ends to prevent fraying). This is what alpinist Kelly Cordes had to do when bailing off Mt. Hunter, in Alaska—rapping about 3,000 feet with only half a length of rope. "Not fun," he says, "but it worked."

DIY Survival Bracelet

In an emergency, paracord can prove just as valuable as a knife and firestarter. You can use it for lashings, tourniquets, makeshift shoelaces, snares, and tying splints. You can even tease out the cord's individual strands and make a fishing line or sewing thread. But how do you carry a useful amount—that will always be on your person—without just shoving it in your pocket? Enter the survival bracelet. Often worn by American soldiers, this is not a fashion accessory but a survival tool. Just like your knife and lighter, this can be worn on your body, in case you become separated from your gear. To construct one, you'll need scissors, a lighter, a tape measure, and 10 feet of 550 paracord (breaking strength of 550 pounds). Here are the steps:

1. Cut a two-foot length of cord and melt the ends with the lighter. Fold the cord in half. Wrap the doubled-up cord around your wrist, pulling the tag ends through the loop. Tie an overhand knot with the ends; this is the stopper knot. Adjust the knot so you can slip a finger between the cord and your wrist. Do not trim the ends. This is your base cord.

2. Lay the remaining eight feet of cord in front of you horizontally. Now place the base cord—with the loop at the top—over the middle of the eight-foot cord, forming a T.

3. Make a cobra knot. To start, take the cord on the left and bring it over the top of the base cord to form an S.

4. Take the right cord and thread it down through the loop on the right side of the base cord; then go under the base cord and up inside the loop on the left and pull tight. Make sure the overhand knot will fit through the small opening at the top of the base cord.

5. Starting on the right, reverse the process. This will complete the first cobra knot.

6. Repeat steps 3 through 5 until you are about one-quarter of an inch from the stopper knot. Check the fit on your wrist by pushing the stopper knot through the loop at the apex. You can adjust the fit by moving the overhand knot up or down. The bracelet needs to fit snugly without being too tight. When you are satisfied, trim the tag ends and melt them with the lighter.

7. To wear, push the stopper knot through the loop to hold the bracelet securely on your wrist. If desired, you can also add wooden toggles, buttons, buckles, and other fastening methods. To use the cord, simply unweave the bracelet.

Accessorize
Find a step-by-step slideshow on building this bracelet at **backpacker.com/survivalbracelet.**

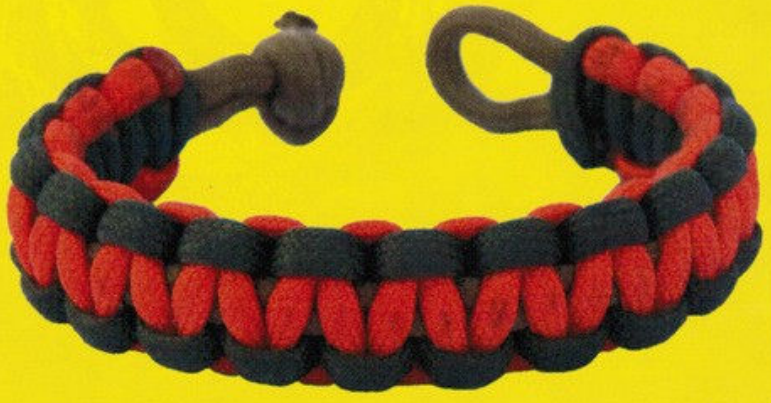


PHOTO BY GENNY FULLERTON. TEXT BY BILL WADSWORTH