

Backpacking Stoves: How to Choose

Backpacking stoves are light, reliable and support the [Leave No Trace](#) ethic. In many backcountry areas, open fires are prohibited due to forest-fire danger or the scarcity of available firewood, so a stove is your only option. For most backpackers, your main decision will be between the 2 broad stove categories: **canister fuel vs. liquid fuel**. You may also want to consider one of the growing number of **alternative-fuel** options now available.

For some quick stove insight, see the stove recommendation chart that follows:

Activity	Recommended Stove Type
Summer backpacking	Canister or integrated stove system
Winter or high-elevation use	Liquid-fuel stove
To boil water only	Integrated stove system (canister)
Ultralight backpacking	Canister or alternative-fuel stove
Large groups	Liquid-fuel stove
"Gourmet" camp cooking	Any model with flame control and a stable base
International travel	Multifuel stove

What's Your Preference: Boiling or Simmering?

Some backpackers want a stove that **boils water rapidly** for rehydrating freeze-dried meals or melting snow for water. Others want a stove that offers more **precise simmering control** for gourmet-style cooking.

Manufacturers provide *estimates* of how quickly their stoves take water from ambient temperature to boiling. Unfortunately, no standardized test for determining water-boiling speed exists, so be aware that the estimates may not offer true apples-to-apples comparisons.

Some general boiling and simmering guidance:

- **Integrated canister systems** boil water fastest while also using minimal fuel. Simmering is possible, but it's an afterthought in their designs.
- **Canister stoves** boil water quickly, and some models are good to excellent at simmering—great for camp gourmets.
- **Liquid-fuel stoves** boil water very quickly, even in cold weather. Simmering ability varies widely by model.
- **Alternate-fuel stoves** are intended primarily for boiling, though they are slower, sometimes by minutes. The [BioLite CampStove](#) model offers decent simmering capabilities.

Group Size

If camping in a group of 3 or more, it's smart to bring more than 1 stove. Otherwise, if you're hungry and last in line for that single stove, the wait can seem interminable. With modern stoves being so small and light, it's not uncommon for each backpacker to bring their own stove.

Trip Length and Estimating Fuel Needs

In his book, *The Ultimate Hiker's Gear Guide*, author Andrew Skurka estimates a typical 8-ounce fuel canister should heat about 30 pints of water. That's about 60 cups. A freeze-dried meal usually requires 2 or more cups of water to rehydrate, so a canister is a good bet for 15 to 20 meals—barring cold temps, high winds or similar factors that could diminish stove performance.

Liquid-fuel stoves use refillable fuel bottles, and you can peek inside to gauge your fuel supply. With canister stoves, you can only shake the sealed canister and guess how much fuel remains. So carrying a spare is beneficial even though that means more weight and bulk in your pack.

Skurka's calculation—60 cups of water heated per 8 ounces of fuel carried—is a good estimate for any canister or liquid-fuel stove. Your results, of course, may vary. Field experience will help you calculate how much fuel is needed for your style of cooking.

A Closer Look:

Canister Stoves

Canisters run on pre-pressurized gases: isobutane (primarily) and propane. Isobutane burns hot and clean, and in colder conditions it outperforms conventional butane. The canister self-seals when the stove is detached, eliminating the possibility of fuel spills.

Fuel canisters connect to stoves in 2 ways:

Upright: The stove screws into the top of the fuel canister. This is the smallest, lightest option. Downsides? Tall profile is prone to tip-overs; small pots don't hold large pots well.

Low-profile: The burner sits on its own base and a fuel hose connects it to the canister. Canisters can be inverted to improve cold-weather performance; large pot supports improve pot stability. Cons? It's a bit heavier and bulkier.

The biggest drawback is that upright canisters depressurize in the cold (32°F or lower) leading to weak or no flame. Normal pressure resumes when the canister temperature is increased.

Tip: In cold weather, keep the canister warm by putting it in your sleeping bag at night or hiking with it in your jacket pocket. Place a bit of foam underneath it when cooking.

Pros

Very easy to use
Compact and lightweight
No fuel spill risk
No priming required
Fast maximum heat output
Good flame control (simmering)
Burns cleanly (no soot)

* Exceptions: pressure-regulated or inverted-canister models.

Cons

Fuel, per ounce, is more expensive
Poor cold-weather performance*
Heat output drops as canister empties
Difficult to gauge remaining fuel level
Hard to find fuel outside U.S.
Upright models susceptible to tip-overs

Other considerations:

- **Warning:** For stoves that attach directly to the canister, a windscreen must not be used because it traps excessive heat. This creates the potential of fuel exploding.
- Low-profile canister stoves (those that separate the canister from the stove) may allow the use of a windscreen to improve efficiency.
- Some models have a built-in pressure regulator to provide consistent heat output throughout the life of the canister. This improves cold weather performance, too.
- Stabilizers, sometimes sold separately, can be attached to the bottom of fuel canisters to reduce the chance of tipping over.

Integrated Stove Systems (Canister)

One popular option for the canister-stove shopper is an integrated stove system such as the **Jetboil** series.

With this approach, the canister stove is paired with a cooking pot (and optional accessories such as a French press for coffee making) designed to work specifically with that stove.

Here's how these compare with traditional canister stoves:

Integrated Canister Stove Systems

Pros

Fast boiling times
Excellent fuel efficiency
Built-in wind buffer

Cons

Less versatile for use with other pots
More expensive

Liquid-fuel Stoves

What fuels do liquid-fuel stoves use? All run on so-called **white gas**, or naphtha, as it's known in the fuel industry. It is a highly refined fuel processed to leave few or no impurities in the final product. It burns hot and clean, performs well in below-freezing temperatures and, compared to the per-ounce cost of canister fuel, is much less expensive.

Some backpacking stoves (a few camping stoves, too) are **multifuel stoves**. Depending on the model they may also operate on kerosene, jet fuel, diesel or non-oxygenated unleaded auto gasoline. This can be useful for international travelers who face limited fuel choices outside the U.S.

None of these fuels are as purely refined as white gas, and any impurities they carry may, over time, clog stove parts such as the fuel tube.

Pros

- Excellent cold-weather performance
- Fuel is inexpensive (good for groups)
- Low-profile design for a stable base
- Easy to gauge fuel level
- No canister to discard

White gas is known to degrade over time. The fresher the fuel, the less likely it will cause clogs. If using aged white gas (not advised), use a filter to strain out any tiny sediment that might be lurking within. If older white gas shows a tint of color, that's often a sign it's past its prime.

Two potential downsides to liquid-fuel stoves:

1. They typically require **periodic maintenance**, such as cleaning the fuel hose or replacing O-rings (in the stove and on fuel bottles).
2. Most require **priming**, which involves igniting a few drips of fuel in a cup below the burner, creating a small flame that preheats the fuel line. This enables the stove to convert liquid fuel into a vapor.

Multifuel Stoves (Liquid Fuel)

Some liquid-fuel stoves can accommodate various fuels including some or all of the following: white gas, unleaded auto gasoline, kerosene, jet fuel and diesel. These stoves can cost a bit more and require more maintenance but the added fuel versatility makes them a great choice for international travelers.

A comparison of the most common liquid fuels:

	Advantages	Disadvantages
White gas	<ul style="list-style-type: none">› Cleanest, most efficient fuel choice› Spilled fuel evaporates quickly› Readily available in U.S.› Best for cold weather use	<ul style="list-style-type: none">› Priming usually required› Spilled fuel very flammable
Kerosene	<ul style="list-style-type: none">› Spilled fuel won't ignite easily› Fuel sold throughout world› High heat output	<ul style="list-style-type: none">› Priming required› Spilled fuel evaporates slowly› Noticeable odor
Unleaded auto gas	<ul style="list-style-type: none">› Most readily available in U.S.	<ul style="list-style-type: none">› Priming usually required› Spilled fuel very flammable› Gas additives can lead to clogging

Alternative-fuel Stoves

Wood-burning stoves burn twigs and leaves you gather in the backcountry. Upside : You carry no fuel, a nice idea for longer trips. Downside: Finding dry fuel during wet weather can be challenging.

Denatured alcohol stoves have few or no moving parts to worry about, weigh very little and burn silently. Alcohol does not burn as hot as canister fuel or white gas, so it takes longer to boil water and requires more fuel. Alcohol fuel can be hard to find outside the U.S. These stoves appeal most to ultralight backpackers.

Sold-fuel tablet stoves are another popular choice with ultralight backpackers thanks to their compact size. Also good for emergency kits. Downside: They are slow to bring water to a boil.

Comparing Stove Specifications

Once you've decided on a stove category, compare models using the following performance attributes:

- **Burn time:** how long a stove burns using a given amount of fuel.
- **Average boil time:** time required to bring 1 liter of 70°F water to a boil (based on an average of 3 timed boils).
- **Liters of water boiled (per 100g of fuel):** the "miles per gallon" rating for fuel efficiency at full stove power. Note: When stoves are operated at less than full power, they are even more efficient.
- **Pot stability:** how well a stove's support arms hold a typical cooking pot.
- **Stove stability:** the stability of a stove's design.
- **Ease of operation:** what stoves are the easiest to operate?

Stove Usage Tips

Any stove:

- **Warning:** Do NOT cook inside tents or enclosed spaces. This can cause carbon monoxide poisoning and create a high fire risk.
- Check all fuel lines, valves and connections for leaks before lighting your stove.
- Operate your stove on the most level surface possible.
- Use a lid when cooking.

Canister stoves:

- New fuel canisters usually contain a small amount of air near the top; after this bleeds off, the fuel will flow and ignite. If the stove tips, a large yellow flame-up may occur.
- Never use a windscreen with a canister stove.
- Always carry stormproof matches in case the Piezo igniter doesn't work.

Liquid-fuel stoves:

- Don't fill a fuel tank to the brim. Fuel expands as it warms, so leaving an air space prevents excessive pressure buildup.
- Empty the fuel tank before storing your stove for several months or longer.
- If using auto fuel, avoid the oxygenated gas found in some areas of the U.S., especially during winter. It breaks down vital stove components.
- Use alcohol for priming. It helps to keep your stove soot-free.
- Use a windscreen.
- Consider using a heat exchanger for cold weather or extended trips—it promotes faster boiling and saves fuel.
- Don't spill fuel on bare skin. In extreme cold, this can cause frostbite due to the rapid evaporation of fuel.