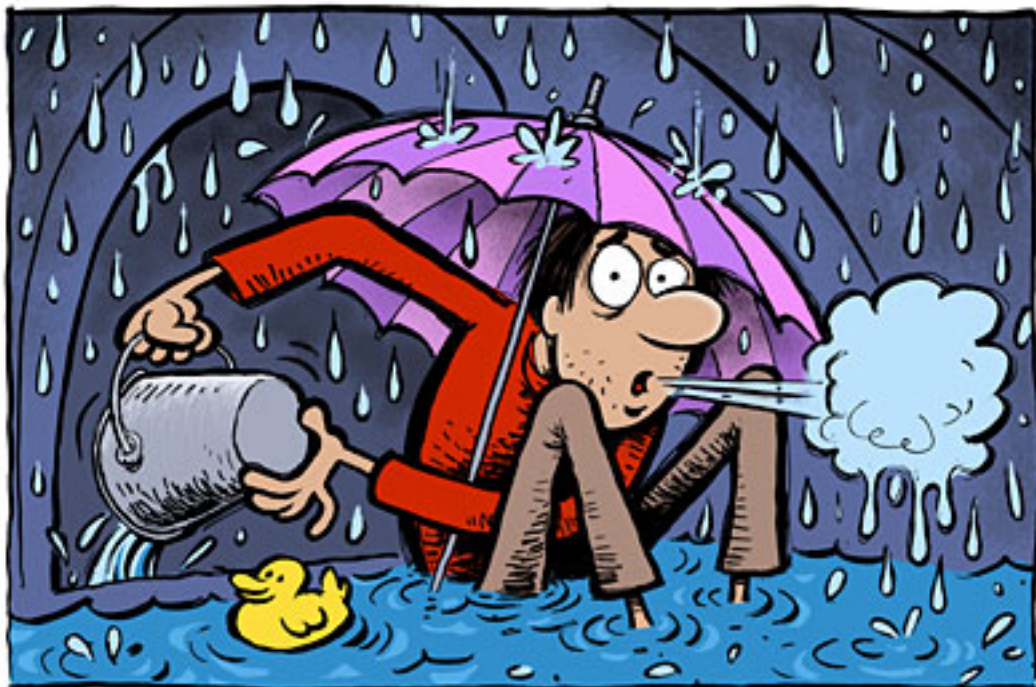


Condensation in Single-walled Shelters: Contributing Factors and Tips for Reduction

Condensation in single-walled shelters is a fact of life, but there are many ways to greatly reduce its effects.

by Will Rietveld | 2007-06-20 03:00:00-06

Introduction



Single-walled shelters are much lighter than double-walled tents and are a great way to save some serious weight. Almost all of the Backpacking Light staff routinely use some type of single-walled shelter for most of their trips. However, many people new to lightweight backpacking purchase a single-walled tent to reduce weight, and then get rid of it because “the condensation was terrible.” This article will teach you the techniques that expert backpackers use to solve this problem.

Single-walled shelters are notorious for collecting condensation on the inside of the walls. There are many variables that determine whether - and how much - condensation will occur. Two campers can pitch the same tent in the same area on the same night and have totally different condensation scenarios, and we’ll explain why below. Technique can help you avoid or minimize condensation, but tent design is very important too. And there are definitely situations where nothing can be done to avoid the dreaded drip.

When we describe condensation issues in our shelter reviews, or when readers discuss their experiences with condensation in our forums, keep in mind that differences in shelter design, campsite location, and shelter use are HUGE factors in condensation formation.

The message of this article is: if you use a single-walled shelter, it is imperative that you educate yourself about the factors that cause condensation, and learn the techniques to avoid or minimize condensation. There's no good reason to avoid using a single-walled shelter because it's "prone to condensation." Condensation is easy to manage and even avoid if you do the right things.



Interior condensation is a fact of life with a single-walled shelter. In this article I explain why that is the case and reveal techniques that minimize condensation.

In a situation like this wet September snowstorm at 12,800 feet, condensation WILL occur inside a single-walled shelter. I repeatedly wiped the inside walls of this Tarptent Contrail before slapping them to shake off the snow, so the condensation wouldn't splatter onto my gear. By morning I had 6 inches of snow on the ground. I stayed dry and warm.

The key questions to be addressed in this article are:

- What is a single-walled shelter?
- How does water vapor move around?
- Where does the moisture come from?
- When does condensation occur?
- Why is condensation more likely to occur inside a single-walled shelter?
- Does breathable fabric make any difference?
- What variables affect shelter condensation?
- What techniques can be used to minimize condensation?
- How does technique vary with shelter type?
- What can be done once condensation occurs?

- What are the best shelter options for a damp climate?

Single-walled Shelters

Single-walled shelters are a diverse category, and include the following groups:

Conventional Tent Designs



The Hilleberg Rajd (2 pounds 2 ounces) is constructed of Kerlon 1200, a proprietary silnylon-like fabric. This group is designed like a conventional floored tent except the main tent body has one wall instead of two. They are made of a lightweight non-breathable waterproof fabric. Examples are the Sierra Designs Baku series, The North Face Vario 23, some Nemo tents, and Hilleberg tents.

Breathable Fabric Tents



The Big Sky Revolution 2P (2 pounds 15 ounces) is constructed of Epic fabric. These tents are also designed like a traditional floored tent except they are made of a breathable fabric. Examples are water-repellent/breathable Epic fabric in the Big Sky Products Revolution series and several Black Diamond tents, proprietary waterproof/breathable urethane laminates like Sierra Designs' DriZone and Nemo Osmo, or a PTFE construction like Gore-Tex Respiration Positive and Integral Designs' Tegraltex.

Tarptent-Type Shelters



The Six Moon Designs Lunar Solo (23 ounces) is constructed of silnylon (shown with the front beak tied back). These minimalist shelters come with or without a floor, and work like a tent. They are typically made of silnylon and make extensive use of mesh around the sides and entry for ventilation and bug protection. Examples are Tarptents, Six Moon Designs tents, some GoLite shelters, and the AntiGravityGear Tarptent.

Shaped Tarp Shelters



The floorless Integral Designs Silshelter (16.5 ounces) is constructed of silnylon. These enclosed floorless shelters are made of waterproof fabric like silnylon or spinnaker cloth, usually do not have mesh sidewalls and doors, and can be pitched at different heights. Examples are the Gossamer Gear SpinnShelter, Integral Designs Silshelter, GoLite Hex, and the Six Moon Designs Gatewood Cape.

Tarps



The Gossamer Gear SpinnTwinn (8 ounces) is constructed of spinnaker fabric.

This floorless group is usually a rectangular piece of lightweight waterproof fabric that can be pitched in a myriad of configurations and heights.

Although single-walled shelters vary greatly in design, the key factors that affect condensation are 1) how enclosed they are, 2) whether or not they have a floor and 3) how much ventilation they provide. The implications of these differences will be discussed in the following sections.

How Does Water Vapor Move Around?

I'll keep this part as simple and relevant as possible, but there are a few meteorological terms and processes that must be defined to understand the condensation process and factors that affect it.

Phases of Water

Water can exist as a solid (ice), a liquid, or a gas (water vapor). It is constantly changing from one form to another, with the absorption or release of energy with each phase change. The gaseous form is water vapor which is typically mixed with the air, and is not visible to the naked eye.

Evaporation

This is the process by which liquid water is converted into water vapor. In the liquid phase, water is held together by intermolecular forces. As the temperature is raised, the molecules move more vigorously (vapor pressure increases) and increasingly have sufficient energy to escape from their neighbors to form water vapor. Evaporation is therefore slow at low temperatures but faster at higher temperatures.

Air movement is by far the most effective means to remove moisture from a shelter.

Evaporative Cooling

Energy is required to change the phase of water from a liquid to a vapor, which results in a cooling of the surrounding environment. The reverse occurs (heat is released) when water vapor condenses back to liquid water.

Humidity

A measure of the amount of water vapor in the air. When the air contains the maximum amount it can hold at a given temperature it is said to be saturated.

Relative Humidity

The ratio (in percent) of the moisture actually in the air to the moisture it would hold if it were saturated at the same temperature. It is a useful index of dryness or dampness, and for determining how readily the air will absorb more moisture.

Temperature and Pressure Differences

An increase in temperature increases the vapor pressure, which allows the air to absorb more moisture. As a rule of thumb, every 18 °F increase in temperature doubles the amount of moisture that the air can hold. Air, with the water vapor it contains, moves in response to temperature and pressure differences. Under a steep gradient, water will readily evaporate and move around; but under a lower gradient, the process is limited and slow. Since air temperature works against us at night (as it cools, it holds less moisture, not more), air movement is by far the most effective means to remove moisture from a shelter.

Dew Point

The dew point is the temperature to which the air must cool to become saturated with moisture. With further cooling below the dew point temperature, water vapor condenses out of the air into liquid water, usually on a cold surface. The higher the dew point temperature, the higher the actual moisture content of the air. If that air mass cools below the dew point we are talking about some serious condensation!

Condensation

This is a phase-change process in which water vapor converts into a liquid when the air temperature drops below the dew point. Film condensation typically forms on a cold surface such as a tent wall, which is cooled by the surrounding air and nighttime infrared radiation. Condensation releases heat, which provides some buffering of the cooling process and tends to maintain the temperature near freezing.

Nighttime Infrared Radiation

The Earth receives heat from the sun by radiation during the day. At night that heat is lost into space in the form of invisible long wavelength infrared radiation. On a clear night the heat loss is unimpeded, and temperatures drop quickly, especially if the air is dry. However clouds, tree cover, water vapor, and carbon dioxide act as a blanket to retain the heat (the greenhouse effect), so the overnight temperature is warmer.

Where Does the Moisture Come From?



Our breathing adds a lot of water vapor to the inside of a closed shelter.

There's more moisture in your shelter than you think. We are talking about water vapor here, which is a gas, and it's not visible. There are a number of sources that can put moisture inside a tent or other single-walled shelter.

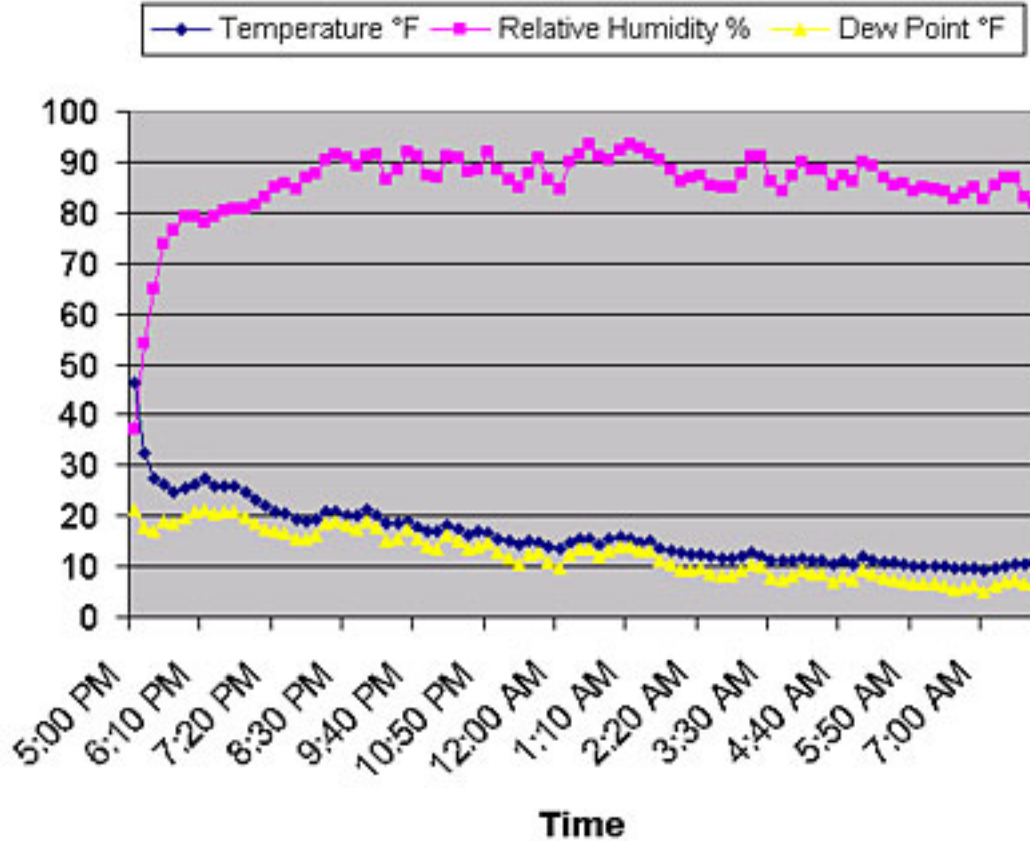
Breathing

An average person exhales about 2 liters of water each day in the form of water vapor, so breathing inside a tent adds a lot of water vapor. If a tent is well ventilated, much of that vapor is exhausted. If the relative humidity of incoming air is low or moderate, there is "room" for the air to hold more water vapor. However, a tent is a "shelter" by definition, so much of the water vapor we exhale adds to the water vapor that is already in the tent, which increases the relative humidity inside the tent. Nighttime cooling further increases the relative humidity of the air inside the tent.

Incoming Air

If the air outside the tent already has high relative humidity (e.g., rainy weather), the air coming into the tent doesn't have much "room" for more water vapor. Additional water vapor is added to the air very slowly, and tends to stay in the tent because it has nowhere to go.

Empty Tent Environment on a Cold Night



Environment inside an empty tent (Tarptent Rainbow) on a cold December night. The important point here is that the relative humidity normally climbs to high levels at night as the air cools. In this case there was no condensation because the air temperature did not reach the dew point temperature (but it came very close). Adding extra water vapor from occupants' breathing or wet gear or cooking increases the humidity to saturation levels, which results in condensation, unless the moisture is somehow exhausted from the tent. Measurements were taken with a Kestrel 4000 Pocket Weather Tracker.

Wet Clothing or Gear

We often put wet gear in a tent vestibule and change out of wet or damp clothing and dry them inside the tent. That introduces a lot of moisture into the tent, which can substantially raise the relative humidity of the air inside the tent in some conditions.

Evaporation from the Ground

This factor is more significant in a floorless shelter. Water vapor from the ground or vegetation exposed within the tent can be trapped within the shelter and significantly raise the relative humidity level.

Proximity to a Wet Area

Although you may not anticipate this in the warm afternoon sun, camping close to a lake, stream or marsh can result in a very damp night. These damp low-lying areas are cooler at night and the air typically becomes saturated with water vapor (high relative humidity), which is a recipe for condensation.

Cooking

If you choose to cook in the vestibule of your tent, you are adding a lot of water vapor to the interior of the tent from the combustion of the fuel (which produces water vapor and carbon dioxide) and steam that escapes from your cook pot.

When Does Condensation Occur?

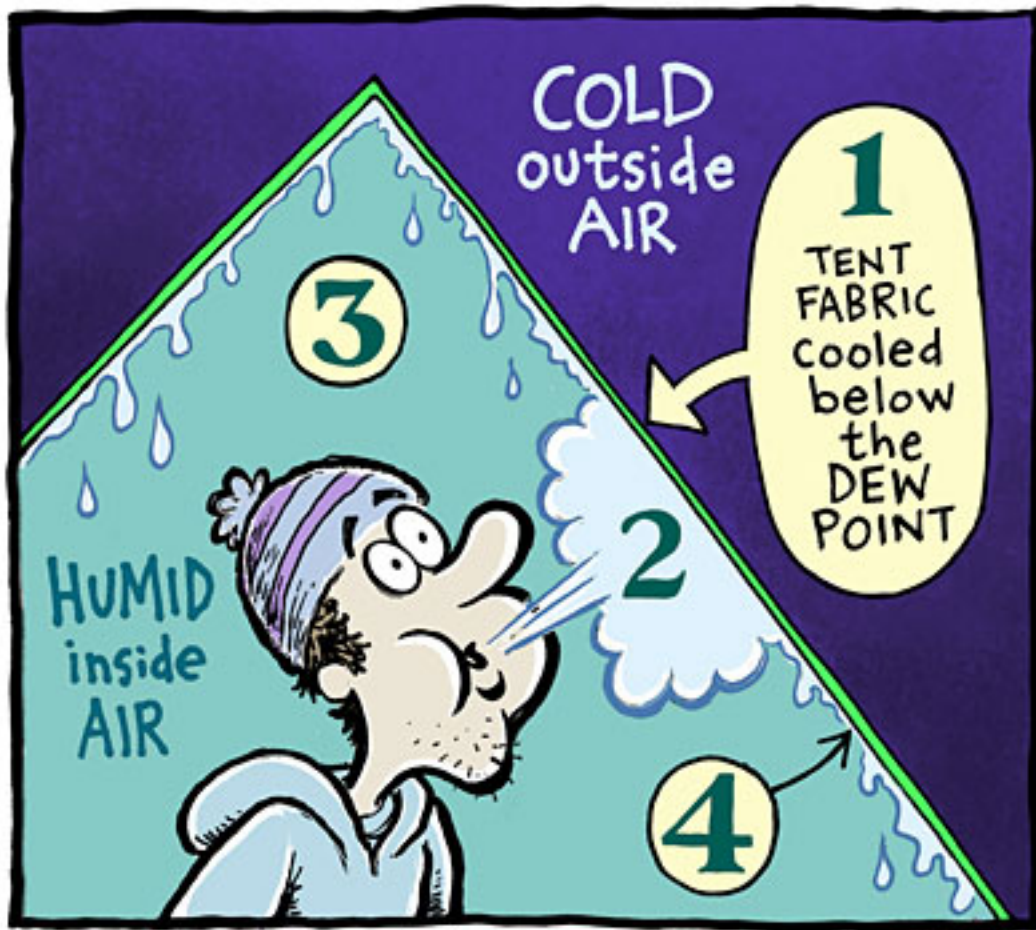
Condensation is simply a phase change of water from water vapor (a gas) to liquid water. Warm air can hold a lot of water vapor; cool air holds much less. As the air cools at night the amount of water vapor it can hold decreases. Condensation can occur at any humidity level as long as the air temperature cools below the dew point temperature (defined above). Film condensation most commonly occurs on a cold surface. The principle is similar to condensation or frost forming on the inside of your car window, or condensation on a glass of ice water, or your eyeglasses fogging up.

Here are some examples:

- You are on a summertime trip in the mountains, or on a spring or fall trip at lower elevations. An afternoon shower or recent storm is followed by a clear, calm night with a substantial temperature drop. Condensation!
- You bivouac in your shelter during a prolonged rain or wet snowstorm. The air is saturated with water vapor, its calm, and the temperature drops a few degrees overnight. Get out your towel!
- You are using an enclosed shelter with few ventilation options on a clear/calm/cool night, and you choose to close the shelter's entry door to keep the tent warmer and exclude critters. Cue the dripping!

How Tent Condensation Happens

For a detailed description of water balance and tent condensation processes, read Mariah Walton's research report on [Night Time Condensation on Different Tarp and Tent Fabrics](#). The key is that: condensation occurs when the temperature of the tent fabric drops below the dew point of the surrounding air. As Ms. Walton explains, the process can become complex because of multiple interacting variables. The simplified process is as follows:



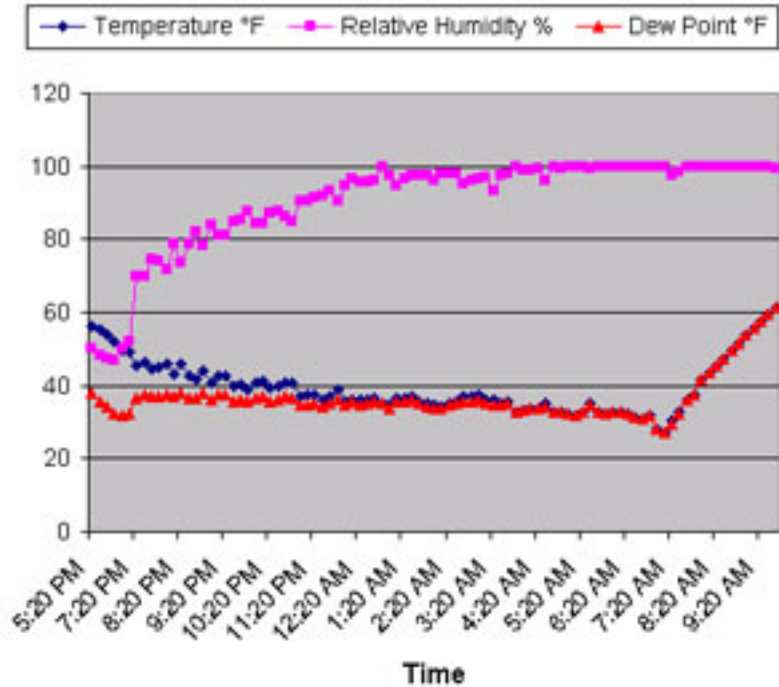
1. Because of nighttime infrared radiation, along with the cooling effect of outside colder air and breezes, the tent walls cool to a temperature below the air temperature, creating a cold surface (like a glass of ice water).
2. Campers inside the tent generate lots of water vapor from exhalations, which adds to the moisture already in the air.
3. As the air temperature drops at night, relative humidity goes up, approaching the dew point.
4. On a still night and with restricted ventilation, abundant moisture is trapped within the tent. Air near the cold tent walls drops below the dew point temperature, resulting in a film of condensation on the surface. When the air temperature is below freezing, condensation occurs as frost on the inside of the tent.

Some people have disputed the contention that the tent walls cool down below the ambient air temperature, claiming that heat released by campers, convection, and the latent heat released from condensation will tend to equalize the temperature. That may be true for a double wall tent, but my own measurements support Mariah Walton's report that the shell of a single-walled tent actually cools below the ambient temperature, resulting in condensation earlier and more abundantly than the ambient temperature:dew point relationship would indicate.



Measurement of tent wall temperature using a TPI Infrared Thermometer. On several nights I measured tent wall temperatures that were 15 to 36 °F colder than the air temperature. On one occasion, a light breeze increased the difference to 42 °F because of convective cooling. I couldn't believe the numbers at first, so I checked the infrared thermometer on a bottle of water at different temperatures (measured with a mercury thermometer) and found it to be right on.

Condensation Scenario - Gossamer Gear SpinnTwinn Tarp



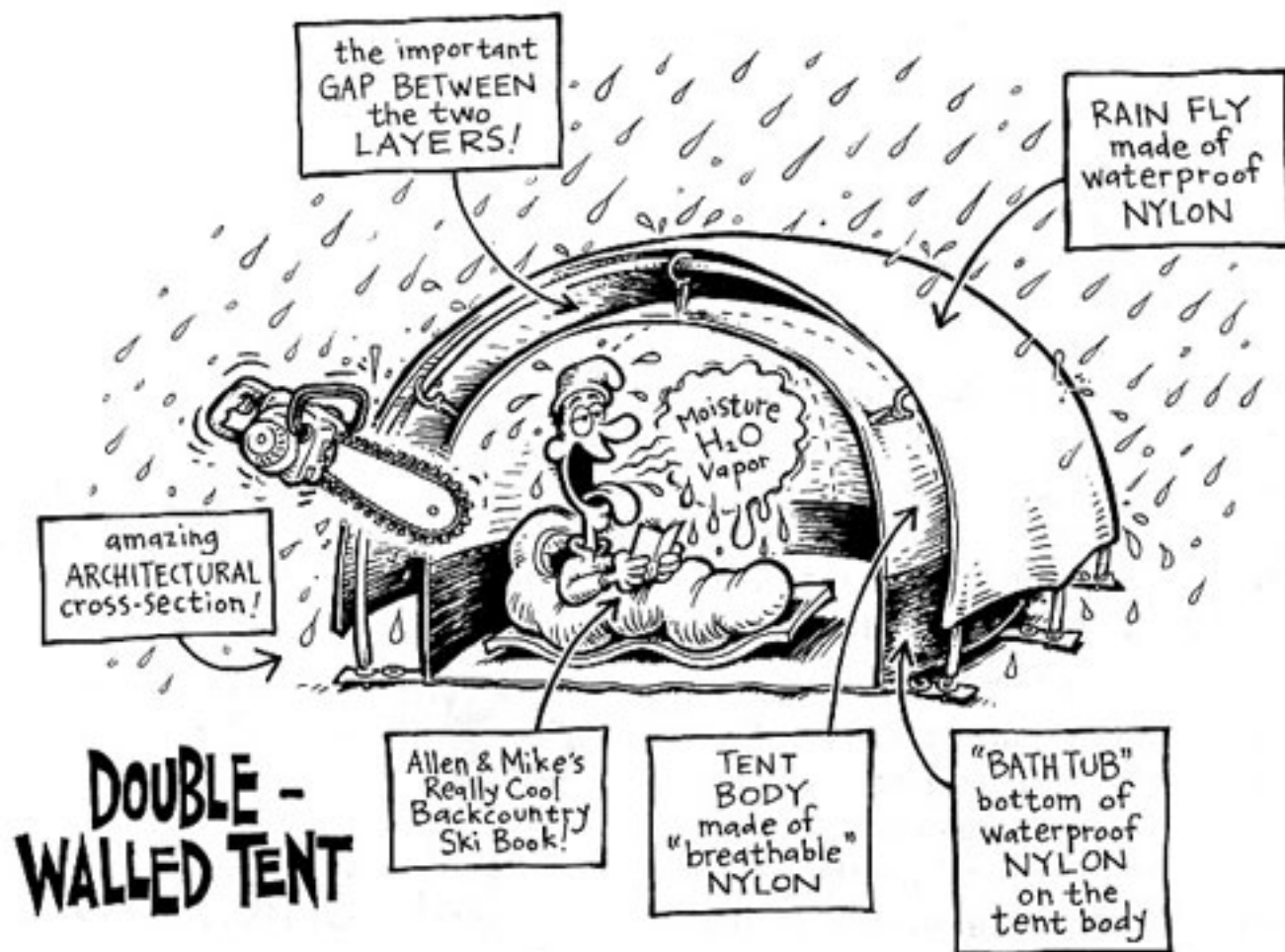
This example demonstrates the condensation-forming effect of tent wall cooling. We slept under a Gossamer Gear SpinnTwinn tarp on a cold, still November night while backpacking at Arches National Park, Utah. As the air cooled from 52 °F down to freezing, the relative humidity steadily increased. Ambient temperature dropped below the dew point at about 2 AM, which is the time when condensation would be expected to begin. However, heavy condensation was already occurring on the inside of the tarp by midnight, due to the cooling of the tarp fabric below the ambient temperature. By morning (right photo) we had heavy condensation on the inside surface of the tarp. (Measurements were taken with a Kestrel 4000 Pocket Weather Tracker.)

Single-walled versus Double-walled

The main factor that makes a single-walled shelter more prone to condensation than a double-walled shelter is that the separation between the inner environment of the tent and the outside environment is just a single layer of fabric. There's no buffering between the inside and outside environments, and as we have just shown, the tent walls "super cool" well below the ambient temperature, making it a "cold body" for the formation of film condensation.

In contrast, a double wall tent has an air-permeable inner wall, a waterproof outer wall, and a layer of air in between. Moisture vapor passes through the inner wall into the space between the walls. If ventilation between the walls is good, the moisture is whisked away, but if ventilation is restricted, condensation or frost is likely to occur on the inner surface of the tent fly. Also, the "semi-dead" air space between the inner and outer walls of the tent is a partial insulator, which keeps the area under the tent fly warmer, delaying condensation formation. This "semi-dead" air space also keeps the inner tent walls a lot warmer (compared to a single-walled tent) and substantially delays condensation

on the inside surface of the inner tent. Double wall tents work best if the inner wall is fabric and not mesh, and they are warmer inside too. I have measured temperatures inside a double wall tent that were as much as 17 °F warmer than the ambient temperature outside. A solid fabric inner tent sheds dripping condensation from an outer fly while a mesh inner tent can allow condensation to drip down into the interior of the tent.



Breathable Fabric

A tent made of a breathable fabric (like Epic or an ePTFE laminate) helps to exhaust moisture because it allows water vapor to pass through the tent walls. However, breathable fabric transmits moisture vapor best at warmer temperatures and is only effective in combination with good tent ventilation. Why? Because a gas (in this case water vapor) has higher molecular energy (vapor pressure) at higher temperatures and more readily diffuses through a fabric matrix, its moisture vapor transmission rate is higher. At cooler temperatures the opposite is true, and very little moisture vapor actually passes through the fabric. On a cool, still night a breathable fabric tent “super cools” well below the ambient temperature and develops condensation on the inside as readily as a non-breathable fabric tent like silnylon.

Tent ventilation is the primary mechanism to exhaust moisture from any single-walled tent, especially at low temperatures. A tent made of non-breathable fabric (like silnylon) is totally dependent on ventilation to exhaust moisture. For effective ventilation, it is very important to have sufficient air inlet space and an adequate exhaust vent at the top of the tent. Serious condensation occurs when ventilation is inadequate, water vapor builds up inside the tent, and the temperature drops below the dew point.



Heavy condensation on a cool night inside a Big Sky Products Revolution 1P tent constructed of breathable Epic fabric.

Bottom line, even a breathable fabric cannot stop condensation from forming if the fabric temperature drops below the dew point. Once that happens, splash! Breathable fabric definitely helps to exhaust moisture at warmer temperatures. Sub-freezing - nope. In prolonged rainy conditions, Epic fabric can make the situation worse because it “weeps” moisture to the inside, which makes the condensation problem worse. Once the tent walls are wet, it is doubtful that the fabric breathes very much, if at all.

eVENT is the gold standard for single-walled breathable fabric tents, but unfortunately it is no longer available for use in shelters. For details, read [The eVENT Single-walled Tent: Here, Then Gone - What's Replacing It?](#). The moisture vapor transmission rate of eVENT fabric is excellent at low as well as high humidity levels, resulting in a dry tent over a wider range of conditions.

What Variables Affect Shelter Condensation?

There are many variables that affect tent condensation, and being aware of them can help you reduce or minimize the problem.

Shelter Design

A shelter made of silnylon with few ventilation options will be a condensation chamber compared to one with mesh sides and high vents. The vents on some shelters are big and work well, while those on some tents are not very effective. Breathable fabric, like Epic, and waterproof/breathable fabrics work well in warmer weather to allow water vapor to pass through the fabric to the outside. While adequate ventilation is essential, it is also important to have a means to control the amount of airflow through the shelter.

Campsite Selection



Choosing an upland campsite above a valley bottom is warmer and less humid at night, and the views are often better too. Leaving the vestibule and entry door open at night (when bugs and weather allow it) really increases tent ventilation. (Tarptent Double Rainbow on the left and Squall 2 on the right).

A low area, like a valley bottom, is colder at night and the temperature is more likely to hit the dew point. A low marshy area or wet meadow is even more likely to produce condensation. Moving your shelter a few hundred feet can make a big difference. A terrace above a valley bottom, or a spot under some trees will be warmer and less humid, so condensation is less likely to form. Choosing an open area on higher ground can be helpful to get more nighttime breezes.

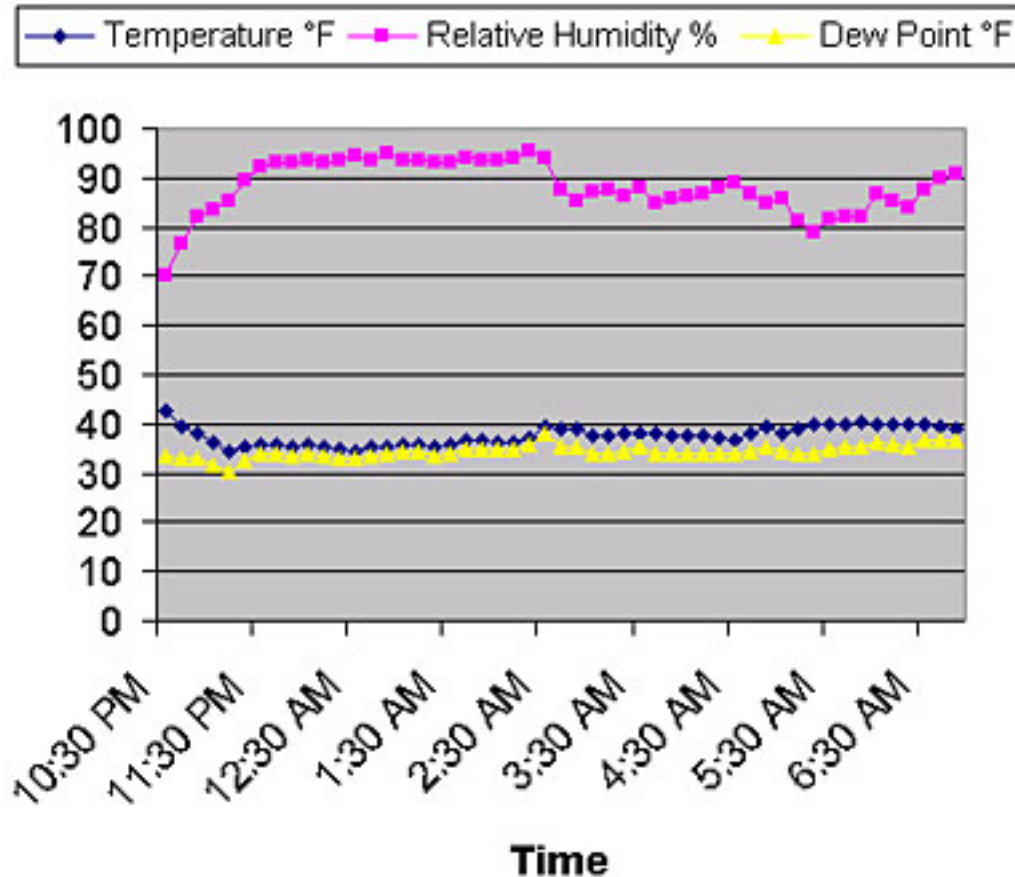
Weather Conditions

Under warm/humid or rainy conditions, it doesn't take very much nighttime cooling to produce condensation. Nighttime breezes help a LOT to reduce condensation. A common condensation scenario that produces lots of condensation is an afternoon or evening rain followed by a clear/calm night with a large temperature drop. Splish! Or how about a steady rain all night? Condensation! In snowy conditions when it is cold outside, water vapor from our exhalations can cause instant condensation or frost on the inside of a tent - identical to the situation where the windows fog or ice up when you get into your car when it is cold outside. Under sub-zero conditions the dew point temperature is very close to the ambient temperature, so a person's warm breath produces instant frost unless a breeze exhausts the moisture.

How the Shelter is Used

Many single-walled shelters have a vestibule or beak plus a mesh entry door. Under calmer conditions it is always best to leave the vestibule and door open as much as weather and bugs allow. No-see-um mesh GREATLY reduces airflow through a shelter. You will be amazed at the difference it makes to leave a mesh door open at night (little condensation) versus zipping it closed (significant condensation). A higher pitch with a larger air gap along the tent's mesh sides will provide better ventilation, and reduce condensation.

Six Moon Designs Lunar Duo - Mesh Doors Closed, Then Open



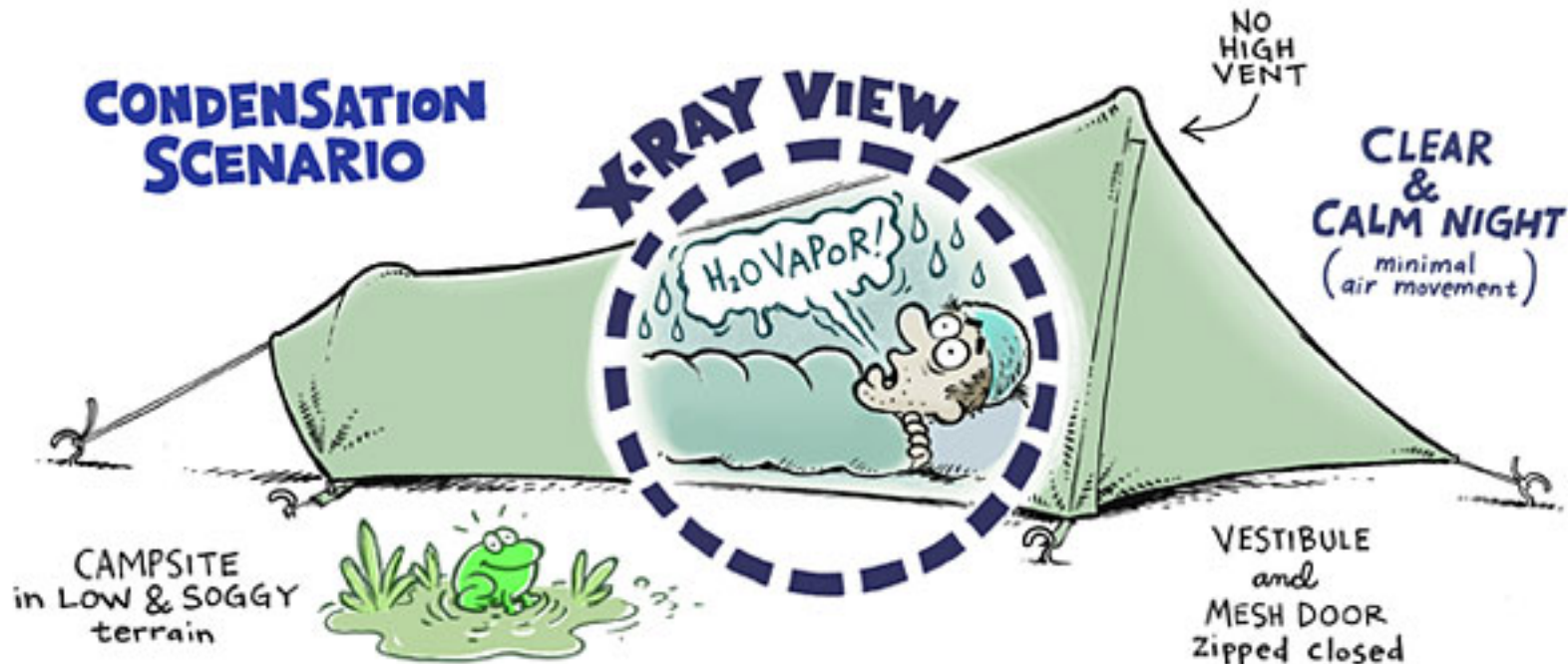
Opening the mesh doors of a tent makes a BIG difference in reducing or avoiding condensation. I slept in a Six Moon Designs Lunar Duo tent with the mesh doors closed the first part of the night until about 2:30 AM. By then, the relative humidity reached 95% and there was moderate condensation inside the tent. I opened the mesh doors (with vestibules closed) the second half of the night, which lowered the relative humidity by 10%. The condensation was gone by morning. (Measurements were taken with a Kestrel 4000 Pocket Weather Tracker.)

Number of Occupants in the Shelter

Think of people (and pets) as humidifiers - they pump out copious amounts of warm humid air inside the shelter all night. Unless the tent is well-vented, guess how that humidity ends up? Yep, as condensation (or frost) on the inside tent walls. Cooking inside the tent's vestibule in inclement weather can exacerbate the problem because burning fuel and heating water puts out large amounts of water vapor.

Combinations of the Above

When we combine the above factors the probability of condensation really increases. For example, take two people sleeping in a silnylon tent in a wet meadow after it has rained in the afternoon on a clear/cool/still night with the mesh door zipped closed. Condensation city! (But not unusual.)



Factors that increase condensation inside a single-walled tent include: 1) limiting ventilation, 2) choosing a campsite in low wet terrain, 3) a clear/calm/cool night, and 4) closing the mesh door and vestibule at night.

How to Minimize Condensation

Condensation is a fact of life if you use a single-walled shelter, but you can easily live with it if you manage it. The way to manage condensation is to understand what causes it and then choose the conditions and utilize the practices that minimize condensation.

Take Advantage of Site Conditions

The conditions that influence condensation are 1) campsite location and microclimate, 2) tent ventilation (or lack of it) and 3) prevailing breezes. Choose a campsite on higher ground like a bench or ridge. Avoid wet areas like a valley bottom or wet meadow. A campsite sheltered by trees is warmer at night because the trees hold in heat and create a warmer microclimate underneath. Alternatively, an open location may be better for breezes.

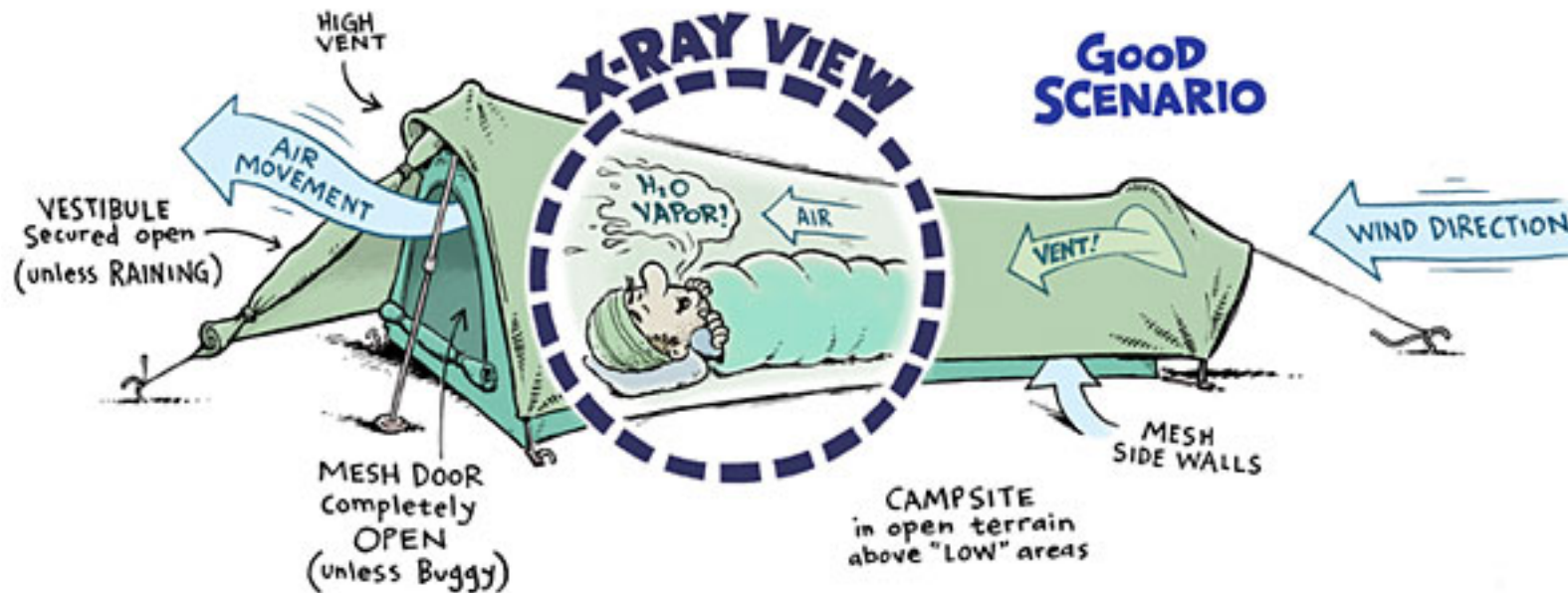
Select the Right Shelter

Choose a single-walled tent that is well designed for ventilation. Features to look for include a mesh entry door and sidewalls, and one or more top vents on the main body of the tent (not just on the vestibule). Convective air flow with entry at a low point and exit at a high point is very effective for exhausting heat and moisture, just like the attic ventilation in your house. Breezes accelerate this process. Other tent

attributes for condensation management are steep walls and a taut pitch so water doesn't puddle and condensation runs down rather than dripping.

Take Advantage of Available Breezes

A nighttime breeze can make a HUGE difference, especially in rainy or snowy conditions. Practices that minimize condensation mainly influence ventilation. Orienting your tent so the breeze blows through will help expel moisture. It's important to open your shelter up to maximize ventilation as much as bugs and weather will allow. This includes leaving a vestibule and mesh entry door open at night. Many people want to zip the mesh entry door closed at night to keep the tent warmer and keep critters out, but no-see-um mesh GREATLY impedes the movement of air. So if you zip the mesh door closed at night, expect a lot more condensation. Also, many tarptents have variable pitch heights. The higher you pitch the tent the larger the air gap and improved ventilation at the bottom of the tent.



Factors that minimize condensation inside a single-walled tent include: 1) choosing a well-designed tent with good ventilation, 2) choosing a dry campsite location, 3) aligning the foot of the tent into a breeze, and 4) leaving the mesh door and vestibule open at night if possible. In the summertime, we are often looking for a breeze to improve tent ventilation, but sometimes it's too much and we can feel the wind chill inside our tarp or tarptent. In those situations enough air is moving to keep condensation at bay, your shelter should allow you to control the amount of air movement through the tent.

Condensation Differences Among Different Single-walled Shelter Types

Basically the more enclosed a shelter is (like a conventional tent), the greater the need for designed-in ventilation systems. A tent made of silnylon for example needs some very large hooded vents or mesh panels to provide adequate top ventilation (the chimney effect), cross ventilation, and flow-through ventilation. Otherwise it's a condensation chamber. Tarptent-style shelters typically use a combination of mesh wall panels plus top vents to provide adequate ventilation. Shaped and flat tarps can be raised or lowered above the ground to increase or decrease ventilation.

A single-walled conventional tent made of breathable fabric has the capacity to transmit water vapor through the fabric. However, (as discussed in the section on breathable fabric) that function only plays a significant role at warmer temperatures, and then it can be remarkable. Tent ventilation is still the primary and most effective means to exhaust water vapor, especially at lower temperatures. The lack of a tent floor can make a difference under the right set of conditions, for example, a floorless tarptent-type shelter setup over wet ground or vegetation. Evaporation and transpiration puts additional water vapor into the shelter, and if ventilation is restricted on a clear/cool/still night, the condensation can be horrendous. With a good breeze, there's no problem.

What can be Done Once Condensation Occurs?

There are some conditions where condensation is unavoidable - like a steady rain or wet snow, a buggy night with doors sealed, or a calm night with a big temperature drop. Even with all doors and vents open, condensation is unavoidable sometimes. That's just part of backpacking.

Under those conditions the best way to manage condensation is to wipe the inner walls of the tent and maintain ventilation as much as possible. Wiping the tent walls with a pack towel or bandana is very effective, and it beats brushing against the walls with your clothing or sleeping bag. Also, the impact of large raindrops or hail hitting a single-walled tent will splatter condensation from the inside walls onto you and your gear, so that's another good reason to wipe the walls.

If you prefer a down bag, get one with a good DWR finish. It's amazing how much dripping condensation and rain splatter these bags can handle. Also, it's a good idea to put some gear (like an empty backpack) between your sleeping bag and the tent wall so you don't inadvertently brush against it while sleeping.

A wet shelter dries very slowly in the morning because the air is cool and humidity is high. A common practice to get going in the morning is to simply stuff the wet shelter in one of your packs' outside mesh pockets, or attach the stuffed shelter to the outside of your pack. During a midday break or the next evening, pitching the shelter in warmer/drier air and direct sun will dry it out very quickly.

Best Shelters for a Wet Climate

If you live in a region where tent condensation is a major problem, or if you don't want to deal with the issue at all, then you still have choices. If you don't want to deal with interior condensation in any climate, you should seriously consider getting a lightweight double wall tent, one with good ventilation inside and between the walls.

One's gear kit needs to be adjusted for camping in a wet climate. A roomy lightweight single-walled or double wall tent can work very well if it has loads of flow-through ventilation. A tarp can also be very successful because it has the most ventilation. The real key is keeping your critical gear dry, especially your insulating clothing and sleeping bag. Synthetic insulation is better under persistent wet conditions.

Conclusion

You don't have to be a masochist to enjoy the benefits of a lightweight single-walled shelter. Lightweight and ultralight backpacking requires more than a set of specialized gear; it also requires a good knowledge of the principles and techniques for its proper use. Many backpackers thoroughly enjoy gaining knowledge about the activity they love because it allows them to adapt to most any condition.

A good bit of technique is required to minimize condensation and maintain comfort in a single-walled shelter. It's all simple physics and common sense, and once understood it becomes second nature. Somehow ultralight backpacking draws us in - like the wilderness calling - we want to continually explore new places and continue learning. All it takes is strong legs and a healthy mind.

About the Author



Will Rietveld has BS and MS degrees in Forest Science and a PhD in Ecological Physiology and Biochemistry. He spent his entire career with the Research Division of the USDA Forest Service, where he worked as a research scientist, project manager, and national R&D program administrator.

Now retired, he lives in southern Colorado where he takes up a new career of backpacking year-round in the mountains and canyon country of the Southwest. He has been a lightweight backpacker for 40 years and an ultralight backpacker for 8 years.

Will joined the Backpacking Light staff in April 2004. For Will, gear testing and writing reviews and technical articles on outdoor gear fits in well with his passion for ultralight backpacking, and utilizes his research and writing skills from his former career.

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See this article and more at Backpackinglight.com

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